THE IMPORTANCE OF PRESERVING THE ECOSYSTEM OF THE VILUN LAGOON
RËNDËSIA E RUAJTJES SË EKOSISTEMIT TË LAGUNËS SË VILUNIT

ARJANA YLLI and ANI KOCI KALLFA
Departmentr of Bioteknologjise, University of Tirana, Tirana, Albania
E-mail: ariana_ylli@yahoo.co.uk

Abstract
The Viluni wetland ecosystem is located on the Adriatic coast of Albania. By this study we evaluated in detail the physical, chemical and environmental factors that may have affected the situation of the aquatic and environmental ecosystem of Vilun Lagoon. During the monitoring period are assessed a number of parameters in order to identify mutual relationships between various indicators of natural ecosystem of Viluni Lagoon, as temperature, pH, underwater meadow. The study aims to assess the trophic state and the water quality of the ecosystem, through the characteristics of some seasonal indicators. Aquatic ecosystem assessment was conducted in spring - fall period during the year 2015. Through field observations we do assessments and collected samples, and in laboratory were analyzed and evaluated physical, biological and environmental indicators.
Key words**:** ecosystem, bio-indicators, water quality, trophic state.

Përmbledhje
Ekosistemi ligatinor i Vilunit ndodhet në bregdetin Adriatik të Shqipërisë. Me anë të këtij studimi vlerësojmë në detaje faktorët fizike, kimike e mjedisore që mund të kenë ndikuar në gjendjen e ekosistemit ujor dhe mjedisor të Lagunës së Vilunit. Gjatë periudhës se monitorimit janë vlerësuar një sërë parametrash me qëllim që të identifikohen marrëdhëniet e ndërsjellat midis treguesve të ndryshëm të ekosistemit natyror të Lagunës së Vilunit, si temperatura, pH, tabanët nënujore. Studimi ka për synim të vlerësoje gjendjen trofike dhe cilësinë e ujerave të këtij ekosistemi, përmes karakteristikave të disa treguesve sezonale. Vlerësimi i ekosistemit ujor është kryer në periudhën pranvere - vjeshtë përgjatë vitit 2015. Nëpërmjet vëzhgimeve në terren janë bërë vlerësimeve dhe janë mbledhur kampione, ndërsa përmes punës në laborator janë analizuar e përcaktuar treguesit fizikë, biologjikë e mjedisorë.
Fjalët çelës*:* ekosistem, bioindikatorët, cilësia e ujërave, gjendja trofike.

Introduction

Albania is well known for a rich biodiversity and variety of habitats, due to the long coastline in relation to the land surface. Wetlands and lagoons are areas with shallow water. These systems lie parallel to the coastline and are affected by evaporation and precipitation of matter inflowing into lagoon, hence the fluctuation of temperature and salinity, depend on the season and seasonal rainfall. Lagoons are so sensitive to urban, industrial and agricultural pollution and often the damages from the pollution are unrecoverable in these areas. Climatic conditions, topography, soil composition and geology, the amount of water and flow of water in and out lagoon determine the type of wetland and therefore the living world and variety of habitats in it (10, 11, 9).

Water lagoon systems are characterized by an appreciable number of environmental parameters, which may be chemical, physical and biological. Monitoring and assessment of water systems has to do with the periodic assessment of these parameters (15, 16), directly in the field or in the laboratory. Our country has many coastal lagoons, and most of them are environmentally protected areas in Albania, but some are nominated as protected areas globally by international networks and organizations for environmental protection. The Viluni Lagoon in Velipoje is object of our study, which has been chosen as a Ramsar site (11, 12). The ecosystem has been selected for several reasons:

- The ecosystem is known for a rich biodiversity of fauna and flora, with national and international importance,
- The ecosystem was declared a protected area at the national level,
- It is also estimated in global and regional level, being involved in several international conventions and instruments of environmental protection.

For these reasons, it is necessary to preserve and improve its environmental situation. Since 2002, periodic monitoring and assessments are conducted for the Viluni ecosystem, near Velipoje – in south of Shkodra, by the Albanian research institutes (Institute of Biological Research). We used these reports during our study to carry out a comparative assessment of the trophic state and water quality on time (3, 8, 9). During a five year period in Viluni Lagoon have occurred many transformations, for reasons of climate change, but also the negative interference due to urban development and trading units. During a short five year period many changes and transformations have

taken place, based on climatic change, but also due to negative intrusive of urban and industrial development around lagoon.

Along with increased attention to environmental protection, this ecosystem is faced with a rapid growing of population, tourism, agricultural and economic activities, due to its position near the touristic area ih full extension.

The study aims to assess the state of the ecosystem in general and the lagoon in particular, on the trophic state and water quality based on certain parameters. At the same time, we get information on physical indicators (temperature, water flow, communication sea - lagoon and the flow waters by drainage of the field areas, historical changes to the coastline), chemical indicators (pH etc) and the environment (flora and fauna, protected areas, factors affecting the environment as urban and industrial waste, agricultural and tourism development), as well as other indicators that are considered important for this study.

The paper aims to assess the state of the ecosystem of the Viluni Lagoon on biological and environmental aspects, focusing on water quality, vegetation of underwater meadow that characterizes these environments and the relevance of these, physical, chemical, environmental indicators and other factors identified as important. Assessing the impact of various factors on this lagoon, as growth of urban activity and increased of pollution from organic and inorganic agriculture waste, the state of communication channels sea - lagoon, sedimentation and erosion, etc, all are indicators that present the state of the lagoon.

Figure 1: Sampling stations in Vilun lagoon and communication channels with sea and pumping station

Material and Methods

Four stations were selected in Viluni lagoon for evaluation and sampling (Fig. 1). Sampling stations were selected to represent different profiles of exchange water, but also various physical and chemical parameters due to anthropogenic factors which assumed that can affect trophic status or water quality, such as proximity to urban activity or communication channels with the sea and the pumping station collected with drainage system.

Water samples were collected for analysis by bottle submerged in depth and 15 m from coastline. Water samples were collected at the same time in all stations for evaluation of nitrite and phosphorus, as well as to assess other characteristics. The samples are placed at 4^0 C, in dark room (1, 2, 6, 7).

Stations coordinates measured by GPS:

St.1 - N 41^o 52' 09.6"; E 019^o 26' 42.3"
St.2 - N 41^o 52' 05.2"; E 019^o 27' 03.6"
St.3 - N 41^o 52' 00.8"; E 019^o 27' 05.1"
St.4 - N 41^o 51' 46.4"; E 019^o 26' 53.3"

To evaluate the presence and quantity of different chemical compound we used AQUANAL - Okotest Water Laboratory and its protocol. The AQUANAL contains six tests on substances dissolved in water, Ammonium (NH_4^+), Nitrate (NO_3), Nitrite (NO_2), Phosphate (PO_4^{3-}), pH – value and Total hardness. The tests can be performed in a short time using the provided reagents with a color code for each test, which corresponds to the anticipated color produced in the particular test.

Results and Discussion

Sampling stations for assessment of the ecosystem actual state are selected in such way to have not only a geographic extension, but to represent all various conditions of the ecosystem and the lagoon waters. The first station is selected in the depth of the lagoon, far away from residential areas and communication with sea water, inside the lagoon with sweet waters. The water in this station is affected by the presence of water flows through drainage system channels that are connected with fields and surrounding lands (Fig. 1).

Table 1: Values of the water temperature in the lagoon during the monitoring period

Months	Temperature (^{0}C)			
2015	Vilun 1	Vilun 2	Vilun 3	Vilun 4
April	24	25	27	26
May	25	24	22	24
June	24	22	22	20
July	22	21	21	20
September	29	30	28	28

Measured temperatures in waters throughout the period of monitoring are higher than measured temperatures during last study (2010 – 2013). We observed a decrease of water level in the lagoon.

Table 2: Water pH - values in the lagoon during the monitoring period

Months	pH - value with AQUANAL			
2015	Vilun 1	Vilun 2	Vilun 3	Vilun 4
April	8.5	8.5	8.5	8.5
May	8.5	9.0	8.5	8.5
June	9.0	8.5	9.0	9.0
July	8.5	8.5	8.5	8.5
September	8.5	8.5	9.0	8.0

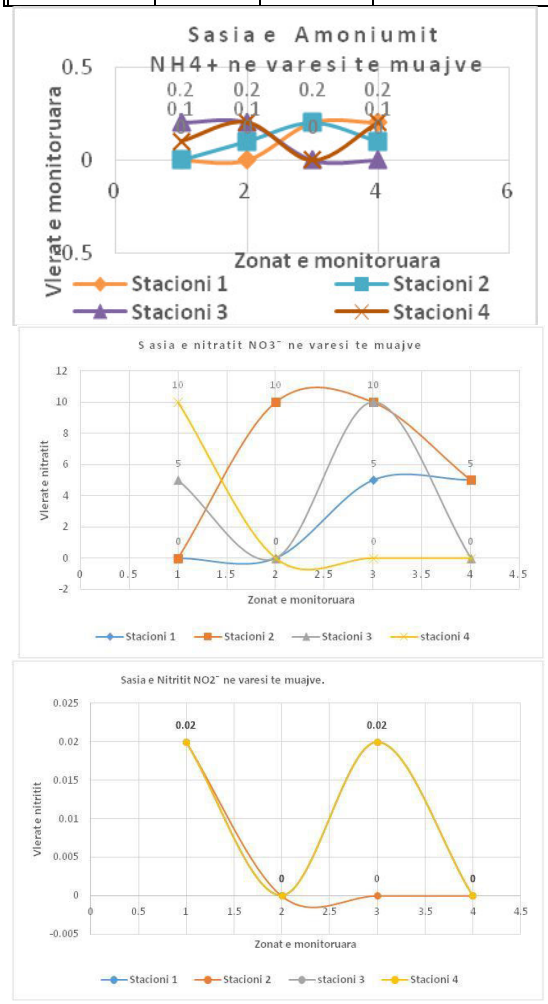


Figure 2: Graphics of the quantity of Ammonium (NH_4^+), NItrate (NO_3), Nitrite (NO_2) in different months of the monitoring period – 2015

Measured pH – values in the lagoon show clearly a basic trend to the value 8.5. This is most evident in two stations that have resulted more polluted (Table 2).

During the last year (2014 – 2015) the pumping station was never been in operation and rainfall in this period have been scarce. In September, the water level has been considerably increased and the temperature was gone up to 30^0 C and this block or hinder livelihood of a part of organisms in waters. This high temperature reduces the amount of oxygen dissolved in the lagoon water (Table 1).

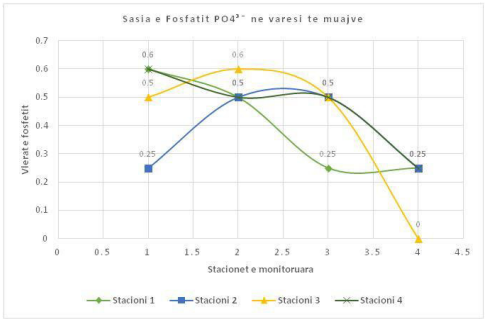


Figure 3: Graphics of the quantity of Phosphate (PO_4^{3-}), in different months of the monitoring period – 2015

In July and September the values of different indicators were above the permitted level, but under the critical values that can endanger the life in aquatic ecosystem of the lagoon. (7) This situation is presented under different graphs, where the ecological situation is more sensitive in Station 4 (Figure 2). Table 1, that presents the measured temperature during the monitoring period, clearly indicates not common water temperature of the lagoon due to the lack of rainfall in this period.

During summer period near station 4, it was apparent the attendance of a great number of people in beaches nearby, and consequently it was observed the growth of the values of measured

indicator: Ammonium (NH_4^+), NItrate (NO_3), Nitrite (NO_2) and Phosphate (PO_4^{3-}), especially in July (Fig. 2 and 3).

Figure 4. Lagoon vegetation in May 2015

Figure 5: Lagoon vegetation in July 2015 and in end of July 2015

The agricultural land waters flow through channels directly into surface waters (lagoons), without being treated for decontamination and cleaning. These waters contain high levels of phosphorus, which, as a nutrient, stimulates the process of eutrophication.(3,5) The increase of phosphorus content in urban discharge is related with the use of detergents containing phosphorus by the population (Official Gazette of the Republic of Albania, 2011). The high content of phosphorus influences the development of the underwater meadow. In May the plants were totally growing and had green color (Figure 3) and the waters had optimal temperature for their vegetation. (13,14) This picture of lagoon vegetation is closely related with the indicators values: Ammonium (NH_4^+), Nitrate (NO_3), Nitrite (NO_2) and Phosphate (PO_4^{3-}). In contrary, in July, the situation is very dramatic; a part of vegetation was rotten and covered by algae (Figure 4). Finally in the Vilun Lagoon, it is evident the decrease of water quantity and the increase of pollution from urbane, agriculture and touristic activities (Figure 2).

Conclusions

It has been observed that during the last two years in some lagoon areas its depth was decreased with a few centimeters and particularly in some areas up to 40 cm. Therefore, rehabilitation measures must be implemented in order to conserve the state and avoid the increase of trophic state, as in the following:

- Maintenance of the communication of the lagoon with the sea through the existing channel.
- In order to avoid the impact of urban activities and tourism, appropriate measures for urbanization and waste management must be implemented. Placement of waste collection tanks in inhabited and beach areas, as needed and if possible, installment of septic tanks in newly constructed bars and restaurants is another recommended measure.
- Organization of further monitoring of the wetland system, in order to know better and consciously the state.

Literature

1. APHA (1992), Standard Methods for Examination of Water and Wastewater, 18th edition. American Public Health Association, Washington, D.C.
2. Aminot A, Rey F (2000), Standard procedure for the determination of chlorophyll *a* by spectroscopic methods. International Council for Exploration of the Sea. Danimarke. ISSN 0903-2606.
3. Acikgoz I, Baykal T (2005), The algal flora of Karagol (Cubuk-Ankara), Journal of Egirdir Faculty of Fisheries 1, 38-55 (in Turkish).
4. Agusto F, Bamigbola M, (2007), Numerical Treatment of the Mathematical Models for Water Pollution, Research Journal of applied Sciences 2(5), 548-556, Medwell Journals
5. Apostolaki ET, Holmer M, Marba and Karakassis I (2010), "Degrading seagrass (Posidonia oceanica) ecosystems: a source of dissolved matter in the Mediterranean." Hydrobiologia 649(1), 13-23.
6. ASABE (2010), EP403.3. Design of Anaerobic Lagoons for Animal Waste Management. In ASABE Standards 2010, 814-818.
7. Alexandre A, Silva J and Santos R (2010), "Inorganic nitrogen uptake and related enzymatic activity in the seagrass Zostera noltii." Marine Ecology-an Evolutionary Perspective 31(4), 539-545.
8. Babani F, Kongjika E, Mullaj A, Ylli A (2007), “Trophic state of Albanian water ecosystems based on phytoplankton photosynthetic pigments” in

Rivers and Citizens, ed. M. Pinna, Universita di Salento, pp. 27–37.
9. Babani, F, Kongjika, Kraja, A, Stamo, I (2007) “Trophic state and water quality of some Adriatic lagoons” in Environmental features and sustainable development of Albanian and Apulian Wetlands, ATTI, 19-25
10. CARDS (2006), Plani lokal i veprimit në mjedis, Komuna Velipoje. [online] http://archive.rec.org/albania/Projects/LEAPs/REAP_Albanian_Final.pdf CARDS, 2006 (1). Plani Rajonal i Veprimit në Mjedis
11. Engineering toolbox (2014), [online] http://www.engineeringtoolbox.com/oxygen-solubility-water-d_841.html.
12. Fletorja zyrtare e Republikes se Shqiperise (2012), Nr. 167, 27.12.2012. Vendim Nr. 838 i KM per Miratimin e Raportit te Gjendjes se Mjedisit ne Shqiperi, per vitin 2011.
13. Håkanson dhe Boulion (2002), Empirical and dynamical models to predict the cover, biomass and production of macrophytes in lakes. Ecological Modelling 151, 213–243
14. Håkånson L, Boulion V (2001) Regularities in Primary Production. Secchi depth and fish yield and a new system to define trophic and humid state indices for lake ecosystems. Internat. Rev. Hydrobiol. 86, 23-62.
15. Miho A (2011), Monitorimi Biologjik Mjedisor, FShN, UT, Tirana: 1-400
16. Miho A, Kashta L, Beqiraj S (2013)*Between the Land and the Sea - Ecoguide to discover the transitional waters of Albania*, Study University of Tirana, 1-462

IMAGE FLUORESCENCE PHOTOSYNTHETIC OF PLANTS AND THEIR ACTIVITY IN THE PRESENCE OF STRESS AIR POLLUTION

Eriola Hida
Polytechnic University of Tirana, Albania
eri_zhuri@yahoo.com

Abtract
The stress of air pollution have an important role in photosynthetic activity of plants. The aim of this study is the identification of changes in the photosynthetic activity of plants by the imaging chlorophyll fluorescnece imaging during the induction kinetics, as a factor of pollution from the metallurgical complec in surrounding areas of Elbasan.. The experiment was conducted in three different areas from metallurgical complex, characterized by unequel levels of pollution. Fluorescence images of leaves were measured using the FluorCam 700MF. Many environmental and stress factors will effect either directly and indirectly the rate of photosynthesis. It is established that the rate of photosynthetic quantum conversion and the health state of the photosynthetic apparatus can be measured by the non-destructive in vivo chlorophyll fluorescence. The activity indicator values of photosynthetic apparatus suffer a substantial reduction in high pollution areas.
Keywords: spontaneous plants, chlorophyll fluorescence imaging, induction kinetics, photosynthetic apparatus

Introduction

In nature plants are repeatedly exposed to a variety of stressors which affect growth, physiological functions and yield. Stressors affect either directly or indirectly the photosynthetic performance of leaves and can modify their optical and fluorescence properties. The chlorophyll (*Chl*) fluorescence signatures of plants have been applied as an efficient tool to describe and investigate the photosynthetic light processes and quantum conversion at physiological conditions as well as to detect stress effects in the photosynthetic apparatus (Lichtenthaler 1996, Buschmann and Lichtenthaler, Krause and Weis, 1991; Lichtenthaler and Miehé, 1997; Lichtentaler and Babani, 2004; Schreiber1986). Various parameters and ratios of the Chl fluorescence determined from the induction kinetics (Kautsky effect) can be used as indicators of the functional state or stress damage of the photosynthetic apparatus and photosynthetic electron transport (Babani and Lichtenthaler, 1996; Buschmann and Lichtenthaler, 1998; Govindjee 1995, 2004).
The objective of the presented research is the evaluation of damage by plant in two different season on spontaneous plants characterizing the photosynthetic performance by imaging of chlorophyll fluorescence signature. Imaging of Chl fluorescence kinetics correctly screening the emission heterogeneity reflects localized biotic or abiotic stress or heterogeneous metabolism. Offering the possibility to study distribution and patchiness of fluorescence signatures over the whole leaf area these techniques were developed as invaluable tool for determining the photosynthetic performance of plants

Materials and Methods

Plant material

They analyzed the endemic-spontaneous plants *Cercius siliquastrum,* grown in different steel plant pollution conditions were analyzed. Study areas were chosen in three different locations: - Bradashesh area 1, near of Elbasanit, in 2km distance of pollution source; Petresh area 2 – Petresh, in 14km distance of pollution source and – Dajt areas 3, characterzed of optimal conditions and used as control area. In each areas, the leaves are selected from 6 different branches in the same position and orientacion to the sun.

Chlorophyll fluorescence imaging of induction kinetics

Chlorophyll (Chl) fluorescence induction kinetics were measured using the FluorCam 700MF kinetics imaging system constructed by Photon Systems Instrumentto capture kinetics and 2-dimensional maps of key fluorescence parameters. The fluorescence emission is induced by two sets of 325 super-bright orange light emitting diodes (LED's) (wavelength 605nm) that provide excitation flashes or a continuous actinic irradiance controlled by defined protocol. Fluorescence images are captured by CCD camera. The images are taken at 12-bit resolution in 512 x 512 pixels of CCD chip. The size of an analyzed object is smaller than 10 × 13 cm.
The chlorophyll (Chl) fluorescence images and induction kinetics were measured on pre-darkened leaves (30 min) using the FluorCam quenching protocol. The images of the measured Chl fluorescence intensity were obtained on false

colour, whereby black is the lowest (zero) and red

Cercius siliquastrum							
Image Fluorescence parameters		**Fo**	**Fm**	**Fv**	**Fo'**	**Fm'**	**Fv'**
Area 1	mean	111.5	416.3	304.8	138.5	179.3	40.9
	std	4.55	15.23	12.97	5.78	6.38	3.17
Area 2	mean	106.97	411.76	304.79	158.57	210.33	51.76
	std	6.61	37.97	32.54	15.68	22.70	8.28
Area 3 (	mean	127.2	479.3	352.1	166.8	212.2	45.4
	std	7.39	21.33	21.34	8.06	22.41	21.58

the highest fluorescence intensity.

Chlorophyll fluorescence images of parameters as F_0 and $F_{0'}$(minimum fluorescence in the dark and in the light-adapted states), Fm and Fm' (maximum fluorescence in the dark and in the light-adapted states), Fp, (initial fluorescence increase caused by the actinic light exposure) and Fs, (steady-state fluorescence in actinic light exposure) were recorded.

Results and Discussion

Fluorescence images and fluorescence image ratios of leaves of *Cercius siliquastrum.*

The images of the measured Chl fluorescence intensity were obtained on false colour, whereby black is the lowest (zero) and red the highest fluorescence intensity

Images of all analyzed leaves of Figure1, exhibited almost the same distribution as well as the same level of fluorescence signal over the whole leaf area showing no irregularities and nearly uniform distribution of fluorescence signatures.

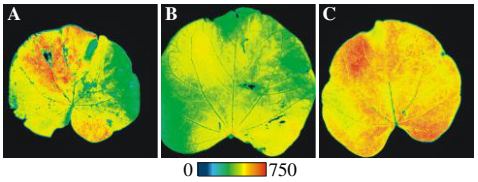


Figura 1 Images at the maximum fluorescence in the dark Fm (A), of *Cercis siliquastrumx* në in pollution areas Bradashesh - 2km (A), Petresh - 14km (B) and in optimal conditions in Dajti areas (C) (pseudoscale 0 - 750).

Mean values of fluorescence in leaf and the values of indicators to analyze the activity of fluorescence on the leaves area Dajt, which is the higher than in the two ther areas, which are characterized by a high level of pollution.

Induced fluorescence image parameters

Table 1. Induced fluorescence image parameters of leaves of *Cercis siliquastrum* in pollution areas Bradashesh (2km), Petresh (14km) and in optimal conditions in Dajti area (Mean of six leaves).

The mean values of imagin fluorescence parameters demonstrated a cange of leaves in various areas. Also, among the three areas are changes shows by the decrease of values in polluted areas compared to the area that is in the optimal conditions.

Image fluorescence ratios

The fluorescence radios RFd of *Cercius siliquastrum* in Krrabe area showed a considerable reduction of the activity of the photosynthetic aparatus of leaves than of leaves in Dajti area.

Cercius siliquastrum							
Image Fluorescence ratios		**Fm /Fo**	**Fv/ Fm**	**Fm' /Fo'**	**qN**	**NPQ**	**Rfd**
Area 1	mes	3.66	0.74	1.35	0.855	1.287	**1.57**
	std	0.35	0.02	0.06	0.018	0.085	**0.08**
Area 2	mes	3.77	0.73	1.29	0.85	1.08	**1.38**
	std	0.05	0.00	0.01	0.02	0.17	**0.04**
Area 3	mes	3.85	0.74	1.29	0.90	1.41	**1.77**
	std	0.25	0.05	0.06	0.02	0.04	**0.17**

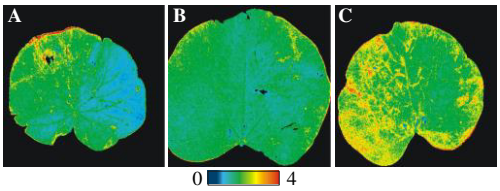


Figura 2. Image fluorescence radios of leaves of *Cercis siliquastrumx* in pollution areas Bradashesh - 2km (A), Petresh - 14km (B) and in optimal conditions in Dajt area (C) (pseudoscale 0 - 4).

Tabela 2. Image fluorescence radios RFd of leaves of *Cercius siliquastrum* in optimal conditions (Dajt), and leaves in strees conditions (Petresh), pollution (Bradadashesh) (mean of six different leaves).

The radios values of, Rfd showed a higher mean values of plants in optimal condition (area 3 the values is 1.77), compare to the other areas which are in the effect of pollution exposure near of metalurgical complex (area 2 values 1.38 and area 1 values 1.57).

Results

The values fluorescence images parameters in the leaves of endemic plants of *Cercius siliquastrum* grown in optimal conditions Dajti area exhibited a high photosynthetic activity as is demonstrate by the values of flurescence radios which evaluate the plant vitalit and kuantum yield of photosynthetic apparatus (Rfd=1.77 and Fm/Fo=3.85).

Activity of photosynthetic apparatus of leaves grown stele air pollution in Petresh areas, was generally lower than activity of plants grown in optimal conditions (Rfd=1.38 and Fm/Fo=3.77.

Activity of photosynthetic apparatus of leaves grown stele air pollution in Bradashesh areas, was generally lower than activity of plants grown in optimal conditions 9Rfd=1.57 dhe Fm/Fo=3.66)

Observed differences on imaging of chlorophyll fluorescence signature and photosynthetic pigment content of spontaneous plants allowed to characterize the photosynthetic performance in order to evaluate the damage by plant in Bradashesh and Petresh where RFd values are lower compare to the Dajti area with optimal conditions

References

1. Babani F. and Lichtenthaler H. K. (1996): Light-induced and age-dependent development of chloroplasts in etiolated barley leaves as visualized by determination of photosynthetic pigments, CO_2 assimilation rates and different kinds of chlorophyll fluorescence ratios. J. Plant Physiol. 148: 555-566.
2. Buschmann C. and Lichtenthaler H. K. (1998): Principles and characteristics of multi-colour fluorescence imaging of plants. J. Plant Physiol. 152: 297-314.
3. Govindjee R. (1995): Sixty-three years since Kautsky: Chlorophyll a fluorescence. Australian Journal of Plant Physiology. Vol. 22: 131-160.
4. Govindjee R. (2004): Chlorophyll *a* fluorescence: A bit of basics and history. In: Papageorgiou G., Govindjee (eds.) Chlorophyll fluorescence: A signature of Photosynthesis. Kluwer Academic Publishers, Dordrecht, The Netherlands. pp. 1-42.
5. Krause G. H. and Weis E. (1991): Chlorophyll fluorescence and photosynthesis: the basics. Ann. Rev. Plant. Physiol. Plant. Mol. Biol. 42: 313-349.
6. Lichtenthaler H. K. (1987): Chlorophylls and carotenoids, the pigments of photosynthetic biomembranes. In: Douce R., Packer L. (eds.): Methods Enzymol. Vol. 148: pp. 350-382. Academic Press Inc. New York.
7. Lichtenthaler H. K. and Babani F. (2000): Detection of photosynthetic activity and water stress by imaging the red chlorophyll fluorescence. Plant Physiology Biochemistry. Vol. 38: 889-895.
8. Lichtenthaler H. K., Babani F. (2004): Light adaptation and senescence of the photosynthetic apparatus. Changes in pigment composition, chlorophyll fluorescence parameters and photosynthetic activity during light adaptation, In George Papageorgiou G, Govindjee R. (eds): Chlorophyll Fluorescence: A Signature of Photosynthesis, Kluwer Academic Publishers. Dordrecht, The Netherlands, pp. 713-736.
9. Lichtenthaler H. K. and Buschmann C. (2001): Chlorophylls and carotenoids–Measurement and characterisation by UV-VIS. Current Protocols in Food Analytical Chemistry (CPFA), (Supplement 1), pp. F4.3.1–F4.3.8. John Wiley, New York.
10. Lichtenthaler H. K. and Miehe J. A. (1997): Fluorescence imaging as a diagnostic tool for plant stress. Trends Plant Sci. Vol. 2: 316-320.
11. Lichtenthaler H. K., Babani F., Langsdorf G. (2007): Chlorophyll fluorescence imaging of photosynthetic activity in sun and shade leaves of trees. Photosynthesis Research, 93: 235-244.
12. Lichtenthaler H. K., Babani F., Langsdorf G., Buschmann C. (2000): Measurement of differences in red chlorophyll fluorescence and photosynthetic activity between sun and shade leaves by fluorescence imaging. Photosynthetica38: 521-529.
13. Krause, G.H., Weis, E. (1991): Chlorophyll fluorescence and photosynthesis: the basics. - Ann. Rev. Plant Physiol. Plant Mol. Biol. 42: 313-349.
14. Nedbal L., Soukupova J., Kaftan D., Whitmarsh J. and Trtilek M. (2000): Kinetic imaging of chlorophyll fluorescence using modulated light. Photosynthesis Research, Res. 66: 3-12.
15. Schreiber U. (2004): Pulse-Amplitude (PAM) fluorometry and saturation pulse method.
16. In: Papageorgiou G., Govindjee (eds.) Chlorophyll fluorescence: A signature of Photosynthesis. Kluwer Academic Publishers, Dordrecht, The Netherlands, pp. 279-319.

THE EFFECT OF DIFFERENT STOCKING DENSITY ON BROILER' GROWTH PERFORMANCE
EFEKTI I NORMAVE TE NDRYSHME TE DENDESISE NE PERFORMANCEN E RRITJES SE BROILEREVE

ELENI MAVROMATI[a], SABAH SENA[b], LUMTURI SENA[b]
[a]Shkolla e mesme teknike ekonomike, Tiranë
[b]Departamenti i Prodhimit Shtazor, Fakulteti i Bujqësisë dhe Mjedisit,
Universiteti Bujqësor i Tiranës
(E-mail: el-ma65@hotmail.com)

PERMBLEDHJE
Objektivi i këtij studimi është vlerësimi i efektit të normave të ndryshme të dendësisë në treguesit e performancës së zogjve të mishit. Për këtë qëllim u përdorën 600 krere zogj mishi të hibridit Cobb 500. Zogjtë erdhën në fermë në moshë një ditëshe dhe u ndanë përkatësisht në dy grupe për periudhën 0-35 ditë. Në grupin e kontrollit u mbajtën 20 krerë/m^2, ndërsa në atë të eksperimentit 15 krerë/m^2. Ulja e normës së dendësisë me 5 krerë/m^2 përmirësoi dukshëm ($p \leq 0.05$) peshën e gjallë në masën 5.2%, shtesën e peshës në masën 10.4% dhe rezen e mishit me 1.42%. Zogjtë e grupit të eksperimentit përdorën 0.17g ushqim më pak për njësinë e shtesës së peshës. Rezulatet tregojnë se ulja e dendësisë nga 20 – 15 krerë/m^2 çon në efekte pozitive në treguesit e performancës, gjë që mund tu rekomandohet fermerëve në shqipëri.
Fjalë çelës: broiler, performanca e rritjes, norma e dendësisë

SUMMARY
The purpose of this study is to evaluate the effect of different stocking density on performance indicators in broilers. To achieve the study were used 600 heads birds of hybrid Cobb 500, aged a day and divided respectively in two groups which stayed for a period of 35 days. In the control group were held 20 heads /m², whereas in the experiment group 15 heads / m². Reduction of the density rate by 5 heads/m², improved significantly ($p \leq 0.05$) live weight in 5.2%, the weight gain will extent of 10.4% more and meat radiance of 1.42%. The birds in the experimental group used 0.17g less feed per unit of weight gain. The results show that the decrease in density from 20 to 15 heads / m², leads to positive effects on growth performance indicators of broilers, thing that can be recommended Albanian farmers.
Key words: broilers, growth performance, stocking density

HYRJE
Në kushtet e vendit tonë duke parë zhvillimin e shpejtë të sektorit të prodhimit të mishit të shpendëve është e nevojshme të studjohen faktorët që ndikojnë dhe mund të çojnë në përmirësimin e performancës së zogjve broiler.
Është e natyrshme që të mendojme se zogjtë do të performojnë më mirë kur kanë më shumë sipërfaqe në dispozicion. Me rritjen e dendësisë së zogjve një shqetësim tjetër është mirëqenja (Thomas D.G et al, 2004; Škrbić, Z. et al, 2009; Scahaw 2000; Directive 2007/43/CE.http:/ec.europa.eu).
Shumë studimeve kanë treguar se rritja e dendësisë së zogjve mbi normë ndikon negativisht në rritjen e brojlerëve, mirëqenjen e tyre, konsumin dhe shpërblimin e ushqimit (Reenivasaiah P.V.S, 2008; Utnik-Banaś K, 2014).

Ky impakt negativ në performancë mund të zbutet nëpërmjet korigjimit të kushteve të mikroklimës dhe të praktikave të menaxhimit (Mortari A.C et al, 2002; Ohajianya D.O et al, 2009).
Objektivi i këtij studimi është përcaktimi i efektit të normave të ndryshme të dendësisë në performancën e brojlerëve.

MATERIALI DHE METODA
Eksperimenti u krye në një fermë në zonën e Myzeqesë. U krijuan dy grupe zogjsh, bazuar në krahasimet analogjike te racës, moshës, produktivitetit dhe te gjëndjes shëndetësore.
Gjatë periudhës së eksperimentit, zogjtë u mbajtën në të njëtin ambjent (kotec), me rritje horizontale, me të njëjta kushte ambjentale, me kushte të njëjta trajtimi. Sasia dhe cilësia e ushqimit ishte e njëjtë për të dy grupet.
Gjatë periudhës së rritjes (0-5 javë), ndërsa në grupin e kontrollit u mbajtën 20 zogj/m^2 (norma e dendësisë e aplikuar në fermë), në atë të eksperimentit u mbajtën 15 zogj/m^2.
U ndoqën treguesit e më poshtëm:

1.-Pesha trupore e zogjve ne fillim të eksperimentit, që monitorohej për cdo javë deri ne përfundimin e eksperimentit. Për këtë qëllim 5% (15 zogj) e zogjve të zgjedhur në mënyrë rastësore peshoheshin ne të njëjtën ditë dhe në të njëjtën kohë përpara ngrënies.
2.-Uniformiteti i tufës: Për këtë qëllim Cv (Uniformiteti) u llogarit bazuar në tabelën e guidës së racës Cobb. Koeficienti I variacionit I përllogarit si më poshtë:
Cv % = [standartin e deviacionit (g) ÷ peshën mesatare trupore (g)] x 100
3.-Konsumi i ushqimit për cdo grup (në kg). Në fund të cdo periudhe , përllogatitej sasia e konsumit të ushqimit për çdo grup. Këto të dhëna u përdorën për të përllogaritur shpërblimin e ushqimit (FCR) për kilogram të peshës së gjallë trupore.
4.-Përllogaritja e konsumit total të ushqimit për zog dhe për kilogram të peshës së shtuar.
Rezultatet e më sipërme u përpunuan statistikisht me metodën statistikore descriptive ANOVA dhe për krahasimet u përdor tTest.

REZULTATET DHE DISKUTIMI

1) Pesha trupore.

Gjatë periudhës eksperimentale që zgjati 35 ditë sa edhe kohëzgjatja e periudhës së rritjes së zogjve deri në realizimin e tyre për në thertore u monitorua pesha e gjallë e tyre për çdo javë. Peshimi i zogjve u bë me peshore automatike. Numri i krerëve të peshuar ishte 15, ose 5% e tufës për secilin grup. Peshimi i zogjve u krye në një orë të caktuar (ora 7), në mëngjes, para dhënjes së ushqimit për të dy grupet.
Në tabelën e mëposhtme paraqitet pesha e gjallë e zogjve e monitoruar për çdo jave:

Tabela 1. *Ecuria e peshës së gjalle të zogjve sipas grupeve* ***(M±SD)***

Mosha në javë	Kontrolli	Eksperimenti	tStat	tcrit	Standarti
Dita e parë	46.70±4.184	46.60±5.589	0.042	1.761	**52**
1	161.60±3.942	164.80±9.213	-1.223	1.761	164
2	339.47±10.783	342.53±9.523	-1.212	1.761	**430**
3	775.00±41.961	825.00±45.000	**-2.621**	1.761	**843**
4	1211.33±86.344	1320.30±82.494	**-3.539**	1.761	**1397**
5	1760.30±140.400	1960.00±150.350	**-2.45**	1.761	**2017**

Nga tabela mund të konstatojmë se për dy javët e para të rritjes diferencat midis grupeve përsa i përket peshës së gjallë janë të papërfillshme. Në javën e tretë dhe deri në fund pesha e zogjve të grupit të eksperimentit (me 15 krerë/m^2) paraqet epërsi ndaj kontrollit (me 20 krerë/m^2). Zogjtë e grupit të eksperimentit, në përfundim të rritjes peshojnë 199.7g, ose 10.2% më tepër se zogjtë e kontrollit ($p \leq 0.05$). Inferioriteti i grupit të kontrollit lidhet me hapësiren e pamjaftueshme jetësore krahasimisht me atë të eksperimentit.
Nëse bëjmë krahasimin me standartin e hibridit cobb 500, do të shohim se përveç javës së parë,

në të gjitha javët e tjera të rritjes zogjtë e të dy grupeve manifestojnë pesha më të ulta në krahasim me të. Në përfundim të rritjes, në moshën 35 ditëshe, zogjve të grupit të eksperimentit do ti duheshin edhe 57g për të arritur peshën e standartit të hibridit.
Rezultatet e disa studimeve konfirmojne efektin negativ të normave të larta të dendësisë në peshën trupore të zogjve (Mortari et al, 2002, Skrbic et al, 2007). Rezultatet ndryshojnë sipas normave të dendësisë të aplikuara. Me avancimin në moshë të brojlerëve intensifikohet edhe efekti i dendësisë (Skrbic, 2007, 2009; Feddes et al. (2002) raportojnë peshë trupore më të ulët në broiler kur dëndësia rritej nga 14 në 18 krerë zogj për m^2.

Uniformiteti i peshës së gjallë (CV%)

Uniformiteti më i lartë është një shans më i madh për të qenë korrekt në të ushqyerin e të gjithë shpendëve të tufës. Shumë menaxherë pranojnë vlerën prej 80% (±10%) ose 85% (±15%) si standarte të uniformitetit. Shkaqet e prishjes së uniformitetit janë si pasojë e shpërndarjes së ngadalshme të ushqimit, e mosmarrjes së të gjitha lëndëve ushqyese si pasojë e shpërbërjes së ushqimit, fronti i pamjaftueshëm i ngrënies së ushqimit, dhënia e pamjaftueshme e ujit, dendësia e shpendëve mbi normë, mossigurimi i një mikroklime optimale si dhe sëmundjet në tufë (Leeson, S; and J D Summers, 2000).
Në studimin tonë, për të dy grupet pas çdo peshimi të zogjve është llogaritur edhe uniformiteti i peshës së gjallë. Bazuar në "Cobb Broiler Management Guide, 2010", mund të vlerësojmë edhe uniformitetin e tufës për secilin grup.
Në tabelën e mëposhtme paraqitet uniformiteti i zogjve të të dy grupeve gjatë rritjes.

Tabela nr 2. *Krahasimi i uniformitetit të peshës së gjallë midis grupeve sipas javëve*

Java	Kontrolli		Eksperimenti	
	Cv (%)	Uniformiteti (%)	Cv (%)	Uniformiteti (%)
Në fillim	8.95	(73.3)	11.96	(58.2)
1	2.44	Mbi 95	5.59	90.4
2	3.18	Mbi 95	2.78	Mbi 95
3	5.41	95.4	5.45	95.4
4	7.13	84.7	6.25	90.4
5	7.98	78.8	7.67	78.8

Nga tabela e mesipërme shohim se në ditën e parë zogjtë nuk kanë uniformitet te kënaqshëm, sidomos kjo është më e theksuar në grupin e eksperimentit. Kushtet e mira të mbarështrimit dhe të ushqyerit kanë bërë që vlera e uniformitetit të përmirësohet dukshëm në të dyja grupet që në javën e parë. Në vazhdimësi uniformiteti ka qenë shumë i mirë në të dy grupet, me diferenca të vogla në favor të grupit të eksperimentit.

Shtesa e peshës

Në tabelën e mëposhtme paraqitet shtesa mesatare ditore dhe javore e peshës për të dy grupet gjatë rritjes deri ne 35 ditë.

Tabela nr 3. *Shtesa javore e peshës për zogjtë sipas grupeve (g/zog/javë)*

Java	G. Kontrollit (20 kr/m2)		G. Eksperimentit (15kr/m2)		Standarti	
	g/zog/javë	g/zog/ditë	g/zog/javë	g/zog/ditë	g/zog/javë	g/zog/ditë
1	114.90	16.41	118.20	16.89	**123**	**17.57**
2	177.87	25.41	177.73	25.39	**266**	**38**
3	435.53	62.21	**482.47**	68.92	413	59
4	436.33	62.33	495.33	70.76	**554**	**79.14**
5	548.97	78.42	**639.7**	91.39	620	88.57

Gjatë gjithë periudhës së rritjes duket qartë se shtesa e peshës për çdo javë është më e lartë në grupin e eksperimentit (15 krerë/m2), me përjashtim të javës së dytë, ku diferencat janë të papërfillshme. Shtesa e peshës në zogjtë e grupit ku dendësia ishte më e madhe (20 krerë/m2) ishte përkatësisht sipas javëve: në javën e parë 2.8%, në të tretën 9.7, në të katërtën 11.9 dhe në të pestën 14.2% më e ulët se në zogjtë që u mbajtën në dendësi më të ulët (15 krerë/m2).

Nëse e krahasojmë grupin më të mirë (eksperimentin) me standartin për këtë tregues shohim se ka pasur epërsi vetëm në javët e tretë dhe të pestë përkatësisht me 69.47g dhe 19.7g.

Për të gjithë periudhën e rritjes shtesa mesatare ka qenë 1713.6 (ose 49g/ditë) për kontrollin dhe 1913.4 (ose 56g/ditë) për eksperimentin. Pra, grupi në të cilin zogjtë u mbajtën 15 krerë/m^2 u arrit një shtesë peshe në total prej 10.4% më e lartë.

Shpërblimi i ushqimit

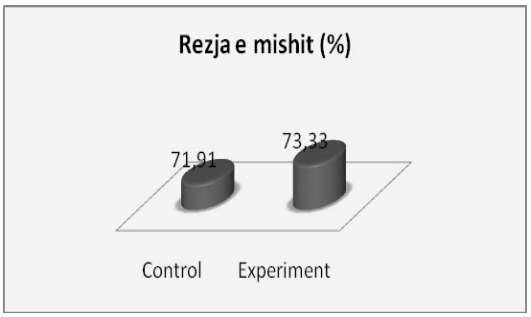
Sasia dhe cilësia e ushqimit për zogjtë e të dy grupeve ka qenë e njëjtë gjatë gjithë periudhës së rritjes. Le të shohim se si është përdorur ky ushqim për njësinë e peshës nga zogjtë e secilit grup.

Tabela nr 4*. Shpërblimi i ushqimit sipas javëve për zogjtë e secilit grup*

Java	Kontrolli	Eksperimenti	Standarti
1	1.17	1.09	
2	1.49	1.49	
3	1.01	0.91	
4	2.16	1.90	
5	2.96	2.54	
Totali	1.76 ±0.80	1.59± 0.66	1.56

Nga tabela e mësipërme vërejmë se me përjashtim të javës së dytë (ku koeficienti i shpërblimit të ushqimit ka vlera të njëjta për të dy grupet), në të gjitha javët e tjera ushqimi është përdorur më me efikasitet nga zogjtë e grupit të eksperimentit. Në total, për të gjithë periudhën është përdorur 0.17g ushqim për g shtesë peshe (ose 9.7%) më pak nga zogjtë e eksperimentit. Diferencat për këtë tregues janë sinjifikative për P≤0.05 (tstat = 2.29 dhe tcrit = 2.13). Pra, faktori i marrë në studim ka ndikuar për një përmirësim të shpërblimit të ushqimit për njësinë e peshës së gjallë.

Grafiku Nr 1. Rrezja e mishit



Bazuar në peshën e gjallë të realizuar për zog në moshën 35 ditëshe, për secilin grup do të prodhohet përkatësisht 528.1 kg (kontrolli) dhe 588 kg (eksperimenti) peshë e gjallë. Bazuar në rrezen e mishit për secilin grup do të prodhohet përkatësisht 379.8 dhe 431.2kg mish peshë e therur. Pra, grupi i zogjve i mbajtur me dendësi 15 krerë/m^2, realizoi 51.4kg, ose 11.9% më tepër mish peshë të therur.

Mortaliteti

Vlen të theksohet se nga të dy grupet nuk ka pasur asnjë dëmtim të zogjve gjatë periudhës së rritjes.

KONKLUZIONE:

Të dhënat e përftuara nga ky studim tregojnë se me uljen e dendësisë së brojlerëve nga 20-15 krerë/m^2, U përmirësua pesha e gjallë dhe shtesa e peshës duke filluar nga java e tretë e rritjes. Në përfundim të rritjes (në 35 ditë) u arrit një peshë prej 199.7g ose 10.2% më e lartë dhe një shtesë mesatare ditore prej 7g më tepër.

U përmirësua përdorimi i ushqimit për njësi të peshës së gjallë (FCR) me 9.7%.

LITERATURA

1.Feddes. J. J.R; E.J.Emmanuel; M.J. Zuidhoft(2002). Broiler performance, bodyweight variance, feed and water intake, and carcass quality at different stocking densities. Poultry Science Association, Inc..

Shpërblimi i ushqimit në grupin e eksperimentit është i afërt me standartin e hibridit Cobb 500, është përdorur 0.03g ushqim (ose 1.9%) më tepër për të realizuar njësinë e shtesës së peshës në krahasim me standartin e hibridit.

Rrezja e mishit

Në përfundim të rritjes, në thertore u analizua rezja e mishit për 10 krerë zogj nga secili grup. Zogjtë e grupit të kontrollit rezultuan me reze prej 71.91%, ndërsa ata të eksperimentit me reze 73.33%. Megjithëse ndryshimi në vlerë midis grupeve është i vogël (1.42%), persëri diferencat vërtetohen statistikisht për (tstat = -2.36 dhe tCrit = 1.73).

2.Leeson, S and J D Summers (2000). Broiler Breeder Production. University book Guelph Ontario Canada.

3.Mortari A.C, Rosa A.P, Zanella I, Neto C.B, Visentin P.R, Brites L.B.P(2002). Performance of broilers reared in different population density, in winter, in South Brazil. Ciência Rural. 32:(3).

4.Ohajianya D.O, Oguoma N.N.O(2009). Effects of floor space on economic efficiency of broiler producers in Imo state. Journal of economics theory 3(1); 1-3

5.Reenivasaiah P.V.S (2008): Textbook of poultry science. VCI syllabus.

6.Scahaw (2000). The welfare of chickens kept for meat production (broilers). Scientific Committee on Animal Health and Animal Welfare, European Commission, Brussels, Belgium. 150

7.Škrbi ć Z(2007). Efekti gustine naseljenosti i svetlosnog programa na proizvodne i klanične osobine brojlerskih pilića različitog genotipa. Doktorska disertacija. Poljoprivredni fakultet, Beograd.

8.Škrbić, Z. Pavlovski Z, Lukić M. Stocking(2009) density – factor of production performance, quality and broiler welfare. Biotechnology in Animal Husbandry. 25 (5-6): 359-372.

9.Cobb Broiler Management Guide (2010).

10.Directive 2007/43/CE. http:/ec.europa.eu./food/animal/welfare/farm/broilers_en.htm

11.Thomas D.G., Ravindran V., Thomas D.V., Camden B.J., Cottam Y.H., Morel P.C.H., Cook C.J. (2004): Influence of stocking density on the performance, carcass characteristics and selected welfare indicators of broiler chickens. New Zealand Veterinary Journal, 52: 76-81.

12.Utnik-Banaś K, Żmija J, Sowula-Skrzyńska E (2014). Economic aspects of reducing stocking density in broiler chicken production using the example of farms in southern Poland. Ann. Anim. Sci. 14 (3): 663

ESTIMATION OF HETEROSIS FOR THE SPIKE TRAITS IN F1 GENERATION IN BREAD WHEAT
VLERËSIMI I HETEROZISIT PËR TIPARE TË KALLIRIT TË GRURIT TË BUKËS NË GJENERATËN F1

SHUKRI FETAHU[A], IMER RUSINOVCI[A], SALI ALIU[A], SALIH SALIHU[1], DUKAGJIN ZEKA[A], QËNDRIM SHABANI[A], HANS-PETER KAUL[B] AND FETAH ELEZI[c]

[a] *University of Prishtina "Hasan Prishtina", Faculty of Agriculture and Veterinary, Kosova*

[b]University of Natural Resources and Life Sciences, Vienna. Austria

[c]*Agrucultural University of Tirana- Faculty of Agriculture and Environment, Tirana Albania.*

(Corresponding author: imer.rusinovci@uni-pr.edu

Përmbledhje

Qëllimi i hulumtimit ishte vlerësimi i magnitudës së heterozisit, pas kryqëzimeve të 20 prindërve, për tipare të kallirit të grurit, mbi mesataren e prindërve (MP) dhe mbi prindërit më të mirë (PM) në 10 gjenotipe në gjeneratën F1, Zhvillimi i gjenotipit me potencial gjenetikë të lartë për rendiment dhe tolerante ndaj thatësirës është një nga objektivat kryesorë në të gjitha programet e seleksionimit të grurit. Dizajni i fushave dhe vlerësimit ishin: DFV = (20-Prindërit + 10-Gjenotip-F1 x 3-Përsëritje x 3-Parametrat x 10- bimë) = 2.700 rezultate. Dallime sinjifikante u regjistruan për parametrat si raporti prind-pasardhësve (P1 P2 x / F1). Variacioni i heterozisit ishte, për gjatësi të kallirit GJK(-6, 32 deri + 20, 64%), numri i kallëzave për kallinj^{-1} NKK (-6,51 deri 20, 71%).

Fjalët çelës : Grurë, Prindërit, heterosis, kallinj, kallëza.

Summary

The aim of this research was estimation of the magnitude of heterosis, after crossing of 20 parents, related to the spike traits in bread wheat, over mid parents (MP) and better parents (BP) in 10 genotypes, in the F1 generation. Development of high yielding and drought tolerant genotypes is one of the main objectives of all wheat breeding programs. Field design and evaluation were: FDE= (20-Parents+10-Genotypes -F1 x 3-Replications x 3-Parameters x 10- plants) = 2.700 results. Highly significant differences were recorded for all parameters as ratio parent-offspring (P1 x P2/F1). Magnitude of heterosis was: for spike length SL (-6, 32 to + 20, 64%); number of spikelet's spike^{-1} NSS (-6.51 to +20, 71%).

Key words: Wheat, parents, heterosis, spike, spiklets.

Introduction

The average yield and the amount of wheat production in Kosova, recently and in the near future cannot fulfill the needs and demands of consumers, because there exists a gap (150 to 200. 000 tons year^{-1} (Fetahu et al., 2015a). Wheat yield and production in Kosova depend on the quality of imported seed varieties, mainly from the region (Fetahu et al. 2008; 2012). The hybridisation of F1 generation is superior over either parent for one or more characters, and it is known as hybrid vigor or heterosis. Hybridization or crossing of two plants differing from each other in one or more characters to get offspring with new desirable characters, as a result of gene recombination (Fetahu et al. 2015b). Therefore, crossbreeding of the parents with wide variability is a standard method in the programs for development of wheat cultivars (Ihsannullah, 2001; Hussain et al., 2006). Singh et al. (2004) also suggested that the heterosis in relation to the better parent could be useful to optimize heterozygous combination. Parental selection represents the major step in the development of new high-yielding cultivars, and the efficient identification of superior hybrid combinations is a fundamental issue in wheat breeding programs (Gowda et al., 2010). The performance of the hybrids is estimated in terms of the percentage increase or decrease of their performance over the mid-parent and better parent (Inamullah et al., 2006). Generally, positive heterosis is desired in the selection for yield and its components (Lamkey and Edwards, 1999). From the perspective of the breeder, heterobeltiosis, over the better parent, is more effective than heterosis, particularly in the breeding of self-pollinating crops, where the objective is to identify superior hybrids. The aim of research was estimation the magnitude of heterosis, related to the spike traits in bread wheat, over mid parents (MP) and better parents (BP) in 10 genotypes of F1 generation, in order to create and develop desired genotypes of bread wheat.

II. Material and methods

The field trials (20 parents and 10- genotypes of F1generation), was set up as randomized complete block design (RCBD) with three replications, during the growing seasons 2013/14, at the experimental didactic farm (EDF), Faculty of Agriculture and Veterinary, which is located (42º38'97"N and 21º08'45"E, altitude 570 m). Parents and genotypes of F_1 generation were evaluated under experimental field condition for spike length (SL, cm spike^{-1}), spikelet's number spike^{-1} (SNS). Field design and evaluation were done according to the formula: FDE= (20-Parents + 10-Genotypes-F1 x 3-Replications x 2-Parameters x 10- plants) = 1800 results.

Measurements: The measurements were conducted at the field and laboratory, by randomly selection of 10 plants of F1 generation and their parents per plot. Heterosis (Ht) over mid-parent (MP), and heterobeltiosis (Hb) over better parent (BP), were estimated as deviation of F1 value from the MP and BP values. SL and SNS, was determined at harvest time when all the randomly selected plants were evaluated.

Magnitude of heterosis into the F1, over mid parent (MP) and better parent (BP) (heterobeltiosis) for SL and SNS were estimated by formulas:

$$Ht(\%) = \frac{F1 - MP}{MP} x100; \qquad Hb(\%) = \frac{F1 - BP}{BP} x100$$

H(%)=Heterosis; MP=mid parent; Hb(%)=Heterobeltiosis; BP=better parent; F1= first generation.

Statistical analysis: The mean of each selected plants was used for statistical analysis, for all characters. In order to determine significant differences among parents and F1 genotype, the mean values for SL and SNS, were subjected to one-way (ANOVA). Differences of means for SL and SNS, were identified using (LSD p=0.05 and LSDp=0.01), according to the software ©MINITAB-16. The comparisons of mean values for characters of parents and F1 generation were used model, Hsu's MCB (Multiple Comparisons with the Best).

Table 1. Parental material and F1 generation

Parental material	**F1**
(Wlasta x Renesanca.)x L6/4 -2010	**G-1**
L6 /12 -2010 x L5 /2 - 2010	**G-2**
(L 28 x L2)x(LC - Petja x Evropa-90)	**G-3**
(L12 x L2)x(L28 x L2)	**G-4**
(LC- Petja x Renesanca)x(Kristal x	**G-5**
L6 /17x L1 /2010	**G-6**
(MV- 05-96 x L20)x(L20 x L7)	**G-7**
(Arap x MV- 05 - 96)x E8	**G-8**
(L28 x L26) x(Isaingrain x Cadet)	**G-9**
(L20 x Kristal)x LC-Petja x Evropa-90	**G-10**

Results and discussion

Mean results for SL and SNS, over MP and better parent BP in F1 generation, indicated highly significant differences among them. Mean value for (P1; P2; MP and F1), and analysis of variance with comparisons among them are presented in Table 2. Analysis of variance has revealed and identified highly significant differences among 20 parents and 10 F1-genotypes for SL and SNS, and significant differences suggested the presence of wide genetic diversity in crossbreeding parental material. Mean results over MP or heterosis (Ht) and over BP or heterobeltiosis (Hb), also their contribution of percentages of each parent into the all crossing among parents for SL and SNS are given in Fig. 1 and 2.

Spike length (SL). Mean genes value for F1 generation regarding SL, were μ= 8.78 cm spike^{-1}. The maximum and minimum values were found in different genotypes, which were developed in F1 generation, as a result of specific crossbreeding of different parents. Genotypes with maximum and minimum value were: G-8=11.06 and G-5=7.8 cm spke^{-1}, and difference among them was 3.26 cm spike^{-1}, or overall variability was 37.12%.

Significant variability, compared with μ value of F1 generation, were observed for genotype G-8, difference were +2.28 cm spike^{-1} or +25.96% and for G-5 difference were -0.98 cm spike^{-1} or -11, 16%. The mean values for SL, for F1 generation were: μ=8.58 cm spike^{-1} and positive heterosis it was found in genotype combination G-6-F1, with Ht=20, 64%, but for G-7-F1, while negative heterosis were Ht=-6, 32% (Fig.1 and 2).

The mean value of all genotypes in the F1 generation, for SL was μ=8.87 cm spike^{-1}, and overall heterobeltiosis was Hb=±27, 72%. Positive heterobeltiosis for SL had G-8 with 13, 0%, compared with BP value, on the other hand, negative value had G-3-F-1, Hb=-14, 72%. This variability of F1 generation is expected, based on the parental diversity of genes and mode of inheritance for SL.

Previous studies on wheat have reported extreme positive values of heterobeltiosis and heterosis (48 and 60%, respectively) for grain yield (Hussain et al., 2007; Beche et al., 2013).

In the breeding programs and development of desired offspring in wheat, the spike traits depend from parental diversity and mode of heritability, as

well combination and diversity of alleles. For spike length, different results were reported by previous authors (Fetahu, et al., 2008; Aliu and Fetahu, 2010; Fetahu et al., 2013). Heterosis values correlated to the genotype base of parents involved in breeding program, and ability of combination as well position of the gene for a specific trait. The SL heterosis enables access in the selection of genotypes for reproduction in next generation, in which is found positive heterosis, and these genotypes could be as perspective base of development of new wheat genotypes.

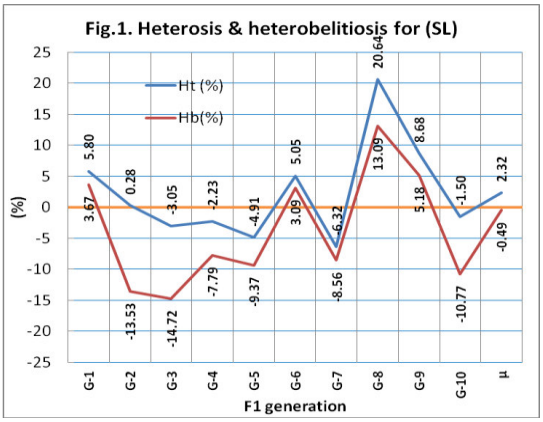
A positive value for Ht and Hb for same genotype, allows the use of a specific genotype G-8-F1, and other genotypes that have a positive value. Observed negative values of Ht and Hb for certain heterotic F1 genotype may indicate that they have accumulated deleterious genes which cause difficulties for selection in wheat breeding programs, as suggested by Emer et al. (2010). The predominance of additive genetic influences on non-additive effects has been reported in several studies, suggesting that this mechanism could be effectively used in the selection of promising crosses in conventional plant breeding (Joshi et al., 2004; Topal et al., 2004).

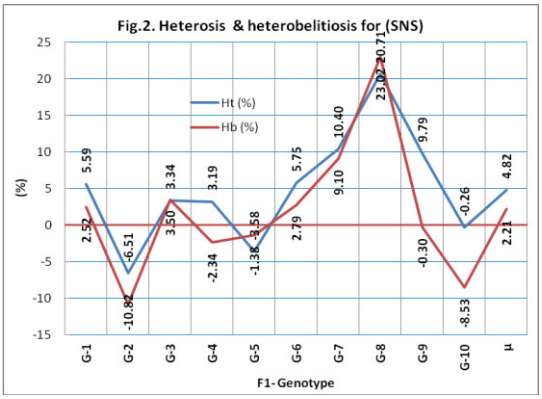
Other authors have also observed an extent of heterosis for different traits in the F_1 ranging from -55.2% to +32.8% (Akbar et al., 2007), -22.5% to +62.1% (Joshi et al., 2004).

Table 2. Mean value for spike traits and their comparison for parents and F1 generation

	Spike Length cm spike^{-1} (SL)				**Spiklets number spike^{-1} (SNS)**			
Nr.	P1	P2	MP	F1	P1	P2	MP	F1
G-1	8.02^{ab}	8.36^{ab}	8.19^{a}	8.67^{ab}	14.44^{ab}	15.33^{a}	14.89^{ab}	15.72^{ab}
G-2	9.51^{ab}	6.89^{b}	8.20^{a}	8.22^{ab}	16.63^{ab}	15.10^{a}	15.87^{ab}	14.83^{ab}
G-3	9.51^{ab}	7.22^{b}	8.37^{a}	8.11^{b}	14.00^{ab}	14.04^{a}	14.02^{ab}	14.49^{ab}
G-4	7.58^{b}	8.55^{ab}	8.07^{a}	7.89^{b}	13.10^{b}	14.67^{a}	13.88^{b}	14.32^{ab}
G-5	7.80^{ab}	8.61^{ab}	8.21^{a}	7.80^{b}	14.64^{ab}	14.00^{a}	14.32^{ab}	13.81^{b}
G-6	8.94^{ab}	8.61^{ab}	8.78^{a}	9.22^{ab}	15.89^{ab}	15.00^{a}	15.45^{ab}	16.33^{ab}
G-7	9.46^{ab}	9.01^{ab}	9.24^{a}	8.65^{ab}	15.12^{ab}	14.77^{a}	14.95^{ab}	16.50^{ab}
G-8	8.55^{ab}	9.78^{a}	9.17^{a}	11.06^{a}	15.33^{ab}	14.77^{a}	15.05^{ab}	18.17^{a}
G-9	8.55^{ab}	8.00^{ab}	8.28^{a}	9.00^{ab}	17.50^{ab}	14.28^{a}	15.89^{ab}	17.45^{ab}
G-10	10.33^{a}	8.39^{ab}	9.36^{a}	9.22^{ab}	18.10^{a}	15.10^{a}	16.60^{a}	16.56^{ab}
μ	8.83^{ab}	8.34^{ab}	8.58^{a}	8.78^{b}	15.48^{ab}	14.71^{a}	15.09^{ab}	15.82^{ab}
Means that do not share a letter are significantly different.								

Spiklets number per spike (SNS). Mean genetic value for mid parents (MP) and F1 generation, regarding SNS were μ=15, 09 spikelets spike^{-1} and μ=15.82 spikelets spike^{-1}. While genotype in F1 generation, from parental combination, it showed for maximum and minimum value were for SNS: G-8=18, 17 and G-5=13, 81 spikelets spike^{-1}, and difference among them were 4, 36 spikelets spike^{-1} or 23.16% (Table 2). Significant positive and negative heterosis, were observed for crossing combination in the G-8, with a value Ht=20, 71% and G-2 minimum value -6, 51%. Also regarding heterobeltiosis value for different genotypes combination for maximum and minimum value were in G-8 =23.02% and G-2=-10, 82% (Fig.2). Obtained results shown for the possibility of development of new wheat genotypes, at the genotype G-8, particularly for spiklets number per spike. In this regards could be concluded that this inheritance may be useful to improve spiklets number per spike, having more spiklets, increasing grain number and harvest index. Other studies (Budak &Yıldırım, 1996; Abdullah et al., 2002), reported super dominance gene actions for different quantitative character in some cross combinations in bred wheat.





Conclusions

Based on the research and analysis of crossbreeding of different parents, and inheritance of the spike length and spiklets per spike, positive values for heterosis and heterobeltiosis for the genotypes of the F_1 generation could be concluded as follows:

Spike length for two sets of parents had average values, but the genetic variability and range of the variability within the group was higher than among groups.

The diversity of male and female parents showed a high heritability potential for the spike length and spiklets number spike^{-1}, phenotypic values of the F1 generation or (MP), and better parent (BP), and their comparisons were highly significantly different in level of LSDp=0.05.

Spike length and spike number per spike in bred wheat, in general female parents had the greater impact than males, and magnitude of variation interval was wider among female than the male parents.

The values for spike character according to the estimation indicator for heterosis and heterobeltiosis, as results of different parental genotype are achieved different values.

Both indicators Ht and Hb, having interest in a wheat breeding with minimal advantage for Hb, which enables for more precisely identification wheat genotypes of perspective for next reproduction generation.

Acknowledgement

The authors express sincere gratitude to the Ministry of Education Sciences and Technology (MEST), for providing funding for the research in plant genetics and cross breeding in wheat.

References:

Abdullah G.M., A.S.Khan, Z. Ali (2002): Heterosis Study of Certain Important Traits in Wheat. Heterosis studies in wheat / Int. J. Agri. Biol., Vol. 4, No. 3, 2002.

Akbar M, Khan MA, Rehman A, Ahmad N (2007) Heterosis and heterobeltiosis for improvement of wheat grain yield. J Agric Res. 45:87-94.

Aliu S., Fetahu Sh. (2010): Determination on Genetic Variation for Morphological Traits and Yield Components of New Winter Wheat (Triticum aestivum L.) Lines. Not Sci Biol 2 (1) 2010, 121-124.

Beche E., C. L. Silva, E.S. Pagliosa, M.A. Capelin, J. Franke,G. Matei, G. Benin (2013): Hybrid performance and heterosis in early segregate populations of Brazilian spring wheat. AJCS 7(1):51-57.

Budak, N. and M.B. Yıldırım. 1996. Heterosis in bread wheat. Turk. J. Agric. For., 20: 345-347.

Emre I., Tonk FA, Tosun M (2010) Heterosis for yield and its components in bread wheat crosses among powdery mildew resistant and susceptible genotypes. Pak J Bot.42(1):513-522.

Fetahu Sh., B. Cërvadiku (2012): Gjendja dhe perspektiva prodhimtarisë së drithërave dhe të farës në Kosovë. Shkenca&Teknologjia» **Error! Hyperlink reference not valid.**.

Fetahu Sh., I. Rusinovci, S. Aliu, Q. Shabani, A. Beluli, R. Zogaj (2015a); Variability of agronomic traits among different wheat cultivars from Croatia under agro ecological conditions of Kosovo. Proceedings. 50th Croatian and 10th International Symposium on Agriculture. Opatija. Croatia (226–229).

Fetahu Sh., I. Rusinovci, S. Aliu, S. Salihu, R. Zogaj, A. Beluli, K. Bislimi, H. Mankolli (2013): Evaluation of harvest index and spike traits of different wheat

cultivars from Croatia under agro ecological conditions of Kosovo. pp.451-456. https://sites.google.com/a/ubt...ice-2013/proceeding-book-ice2013

Fetahu Sh., S. Aliu , I.Rusinovci, D. Zeka, Q. Shabani , H. P. Kaul, F. Elezi (2015b): Determination of heterosis and heterobeltiosis for plant height and spike grain weight of f1 generation in bread wheat. International Journal of Ecosystems and Ecology Sciences (IJEES).Vol. 5 (3): 431-436 (2015).

Fetahu Sh., Sali A., S. Kaciu, I. Rusinovci, M. Gjonbalaj (2008): Characteristics of production potential for yield and biomass of new winter wheat (Triticum aestivum L) line developed in Kosova conditions. Eucarpia, Proceedings of the XVIII Eucarpia General Congress 9-12 September 2008. Valencia, Spain. ISBN: 978-84-8363-302-1. pp. 367-372.

Gowda M, Kling C, Würschum T, Liu W, Maurer HP, Hahn V, Reif JC (2010): Hybrid Breeding in Durum Wheat: Heterosis and Combining Ability. Crop Sci. 50: 2224-2230.

Hussain F, Hussain M, Iqbal MM, Akhtar MA, Zulkiffal M, Riaz-ud-din H (2007) Heterosis studies in wheat crosses. J Agric Res. 45:337-343.

Hussain, F., M. A. Khan, M. A. Akhtar, M. Zulkiffal and R. Din (2006). Estimation of heterotic and heterobeltiotic effects in bread wheat. Abstracts published by Wheat Research Institute, Faisalabad, Pakistan. Int. Wheat Sem. February 20-21, 2006. p. 20 - 21.

Ihsanullah and F. Mohammad (2001). Correlation of yield and yield associated traits in spring wheat. Sarhad J. Agric., 17(1): 97-100.

Inamullah HA, Mohammad F, Din SU, Hassan G, Gul R (2006) Evaluation of the heterotic and heterobeltiotic potential of wheat genotypes for improved yield. Pak J Bot.38:1159-1167.

Joshi SK, Sharma SN, Singhania DL, Sain RS (2004) Combining ability in the F1 and F2 generations of diallel cross in hexaploid wheat (Triticum aestivum L. Thell). Hereditas. 141(2):115-121.

Lamkey KR, Edwards JW (1999).The quantitative genetics of heterosis, p. 31–48 in: The Genetics and Exploitation of Heterosis in Crops, edited by Coors JG and Pandey S. CropSci Society of America.

Singh, H., S. N. Sharma and R. S. Sain (2004). Heterosis studies for yield and its components in bread wheat over environments. Hereditas, 141: 106-114.

Topal A, Aydın C, Akgün N, Babaoglu M (2004) Diallel cross analysis in durum wheat Triticum durum Desf.): identification of best parents for some kernel physical features. Field Crop Res. 87: 1-12.

DENTAL RADIOGRAPHY EXPOSURES AND HEALTH RISKS
EKSPOZIMET DHE RREZIQET SHËNDETËSORE NGA RADIOGRAFIA DENTARE

ANTUELA SINANI [a)], KOSTANDIN DOLLANI [b)]
"Eqrem çabej" University, Gjirokastra, Albania; asinani@uogj.edu.al
Radiation Protection Institute, Tirana, Albania

PËRMBLEDHJE
Radiografia dentare është një burim i rëndësishëm i ekspozimeve të publikut ndaj rrezatimit si rezultat i frekuencës së lartë të proçedurave të ndryshme; si radiografitë intraorale, panoramike dhe cefalometrike. Në studimin tonë përshkruhet matja e dozës sipërfaqësore hyrëse për ekspozimet intraorale bazuar në përdorimin e dozimetrave termolumineshente. Rezultatet e matjeve kanë treguar një përputhje të mirë me nivelet e pranuara ndërkombëtarisht të ekspozimit për proçedura të tilla. Bazuar në të dhënat e literaturës në studim shqyrtohet lidhja midis proçedurave dentare me rreziqet e pritshme shëndetësore; si meningioma dhe kanceri i tiroides. Ky studim është përpjekja e parë në vend për vlerësimin e ekspozimeve të përmendura dhe efektet përkatëse të rrezatimit.
Fjalët çelës: radiografia dentare, doza hyrëse sipërfaqësore, dozimetria termolumeneshente, rreziqet shëndetësore.

SUMMARY
Dental radiography is an important source of radiation exposures to public as result of high frequency of the different procedures like intraoral, panoramic and cephalometric. In our study is described the measurement of entrance surface dose for intraoral exposures based in using of the thermoluminescent dosimeters. The results of the measurements have shown a good compliance with international accepted guidance levels of exposures for such procedures. Based in the literature data in the study it is considered the relationship of dental procedures with expected health risk of detriment like meningioma and thyroid cancer. This study is the first attempt in the country for evaluation of the mentioned exposures and the related stochastic effects of radiation.
Key words: dental radiography, entrance surface dose, thermoluminescent dosimeter, health risk

INTRODUCTION

Medical radiations are the main sources for the radiations of the population. According to the data from UNSCEAR, the average yearly number in the world for medical examinations through the use of X-rays is 3.5 billion **(UNSCEAR 2010).**

Referring to the diagnostic levels (**ICRP 1996**, (**IAEA 2001**), dental radiology has the same spread as the diagnostic radiology of other organs, including the nuclear medicine.

The Dose Reference Levels, or DRL, established by different international organizations for dental radiology can serve to avoid the excessive dosage of the patient, which not only doesn't contribute in the medical diagnostic, while it increases the health hazards, among which we can mention

meningioma (benign tumors in the brain), and the thyroid gland cancer. On the other hand, these levels serve to achieve the optimization of the process during the examination through X-rays, with the purpose of having the best quality images and a dosage as low as possible for the patient. Recently, as was mentioned above, the dental radiology has expanded, because except the intraoral examinations, there are being widely the Panoramex radiography and cephalometric analysis.

The estimation of the entrance surface doze, or ESD, is one of the basic dosemetric intake measurement tools to determine the dosage of the patient, and the appropriate average for optimization and the combination with the diagnostic reference levels.

The measurement of the ESD levels for the patient also serves as a basic component for the quality of the securing program for the departments
with X-rays. ESD is an indicator of the absorbed dosage from the surface of the body of the patient (the face) in the entry points of the radiation with X-rays.

The measurement of ESD can be done directly from the thermoluminescent dosemeters, TLD, or from the ionization chamber, and in the diagnostic radiography this dose is proportional with the time of exposure, the pressure of the tube, filtration and the colimim of the beam (**Parry et al.2002**). It is important to take into consideration that taking an image through an ionization radiation is always accompanied with a risk for possible damage, such as: the induction of tumors and genetic damages (***Robb-Nicholson, C.2009***). ESD can serve as an important factor for the measurement of such damages.

MATERIALS AND METHODS

In our study have been used thermoluminescent dosemeters (TLD-100 Harshaw, Figure. 1) to measure directly ESD during the process of exposing to the patient. For this purpose, for special examinations of the exposures in dental radiography, we put into place the thermoluminescent dosemeters to measure ESD during the radiation of the patients.

Figure 1. *Dosimeter TLD-100*

We have done 10 exposures for the intraoral examination (tooth radiography), which is the most widely used standard examination, and we have determined an average value for the ESD.

The measurements were made in an apparatus for dental scanners with a pressure in the tube of 70kV, a current of 8 mA and exposure time of 0.3 seconds, so the product current-time is 2.4 mAs. (8 mA, 0.3 s). The measurements were taken in collaboration with the radiological dental medics.

The measurements were made by putting thermoluminescent dosemeters on an water phantom in the shape of a cube with dimensions 10x10x10 cm^3. The distance from the tube of X-rays to the place of ESD measurement is 25 cm, and the diameter of the beams of the X-rays is 6 cm.

RESULTS

The results for the superficial entrance dosage in the intraoral examination expressed in millisieverts through the measurement of ESD with thermoluminescent dosemeters are shown in Table 1. Also, in this table are shown the value of kilo voltage of the X-rays tube, the value of the product of the current with the exposure time in mAs.

Nr.	Intraoral examination	Vlera e kV	Vlera e mAs	ESD (mSv)
1	Intraoral	70 kV	2,4 mAs	**2,86**
2	Intraoral	70 kV	2,4 mAs	**2,82**
3	Intraoral	70 kV	2,4 mAs	**3,10**
4	Intraoral	70 kV	2,4 mAs	**2,72**
5	Intraoral	70 kV	2,4 mAs	**2,76**
6	Intraoral	70 kV	2,4 mAs	**2,54**
7	Intraoral	70 kV	2,4 mAs	**2,96**
8	Intraoral	70 kV	2,4 mAs	**2,78**
9	Intraoral	70 kV	2,4 mAs	**2,64**
10	Intraoral	70 kV	2,4 mAs	**2,83**

Table 1

Based on the values in the above table for ESD, we take an average value of 2.80 mSv, with a deviation standard of 0.16 mSv, or a relative margin of 5 % (0.16/2.80) 100 %.

The determined values for ESD of the intraoral dental scanners are under the dose reference levels for these examinations by specialized organizations, which are 7 mSv (International Agency of Atomic Energy) and 4 mSv (European Union).

CONCLUSIONS

The values determined for the radiation of dental scanners showed that these radiations are under the limits of the superficial entry dosage of 7 mSv or 4 mSv, defined from specialized organization in this kind of radiations. In all the aforementioned cases, we have seen a good correspondence of all the results for the intraoral dental radiographic examinations. To take into consideration the health risk of radiation from the stochastic effects it is necessary to calculate the effective dosage of the aforementioned radiation.

According to the general regulations, the effective dosage is equal to $1/10^{th}$ of ESD.

This means that, if the values of ESD radiations vary between 0.1 mSv and 25 mSv, then the corresponding effective doses are between 0.01 mSv and 2.5 mSv. Based on the very low superficial entry dosages found (2.80 mSv) we see that the effective dosage during the examination of the patients with X-rays is very little (0.28 mSv), so the health risks from the stochastic effects is very low, and the probability to cause damage is also very low. However, the application of a healthy control through X-ray examinations is a permanent duty of the medical staff.

REFERENCES

1. **(IAEA 2001)** International Conference on Development and Using Dose Guidance (Reference) Levels in Radiology and Nuclear Medicine Examinations, International Atomic Energy Agency, Vienna, Austria.

2. **(Parry et al. 1998)** R.A. Parry, S.A. Glaze, B.R.. Archer, The AAPM/RSNA Physics Tutorial for Residents Typical Patient Radiation Doses in RSNA Scientific Assembly, New York, USA.

3. **(Robb-Nicholson, C.2009)** Hearth Risk from Medical Imaging, Harvard Health Publications, Harvard Medical School, USA.

4. **(UNSCEAR 2010)** Sources and Effects of Ionizing Radiation, United Nations Scientific Commission on Effects of Atomic Radiation, United Nations, NewYork. **(ICRP 1996)** International Commission on Radiological Protection, Radiological Protection and Safety in Medicine, ICRP Publication 73, Annals of ICRP 26, No.2 (Pergamon Press, Oxford).

WELDABILITY OF STEEL AT LOW TEMPERATURES
SALDUESHMËRIA E ÇELIKUT NË TEMPERATURA TË ULËTA

RRAHIM MAKKSUTI[1], HYSNI OSMANI[2], MURSEL RAMA[3]

[1]Faculty of Applied Sciences, State University of Tetova, Ilindeni, p.n. Tetova, MACEDONIA
rrahimmaksuti@yahoo.com,

[2]Faculty of Mechanical Engineering, University of Prishtina "HASAN PRISHTINA" Kodra e Diellit, p.n. Prishtina, KOSOVA
hysni.osmani@uni-pr.edu

[3]Faculty of Geosciences, University of Mitrovica "ISA BOLETINI", Minatori p.n. Mitrovica, KOSOVA
murselrama@yahoo.com

PËRMBLEDHJE

Çeliku për prodhimin e tubave të salduar duhet të posedojë saldueshmëri të mirë, që të realizohet efikasitet dhe efektivitet i lartë i procesit prodhues në linjat e prodhimit (in line) dhe në terren, gjatë saldimit të tubave në tubacione në gjatësi të mëdha dhe në kushte ku veprojnë temperatura të ulëta. Qëllimi i këtij punimi është përcaktimi i saldueshmërisë së çelikut API Grade X52 në temperaturë të ulët (0^{o}C), që përdoret për prodhimin e tubave të salduar, përkatësisht tubacioneve. Ekuivalenti i karbonit (C_E), provat mekanike dhe analiza metalografike e bashkësisë së salduar janë realizuar me qëllim të vlerësimit të saldueshmërisë. Rezultatet e provave mekanike dhe analizës metalografike dëshmojnë se çeliku API Grade X52, në temperaturë të ulët (0^{o}C) ka saldueshmëri të shkëlqyeshme, andaj tubat e prodhuar mund të saldohen në tubacione me gjatësi të mëdha, lehtë dhe pa pengesa, duke siguruar kështu efikasitet dhe efektivitet të lartë prodhues.
Fjalët çelës: saldueshmëri, temperatura të ulëta, çelik, tuba, tubacione.

SUMMARY

The steel for the production of welded pipes must possess good weldability to achieve high efficiency and effectiveness of the production process in production lines (in line) and ground, during welding of pipes in long distance pipelines and in lower temperature conditions. The purpose of this paper is to define the weldability of API Grade X52 steel at low temperature (0°C), which is used for the production of welded pipes, respectively pipelines. Carbon equivalent (C_E), mechanical testing and metallographic analysis of the welded joint were conducted in order to assess the weldability. The results of mechanical tests and metallographic analysis show that steel API Grade X52, at low temperature (0°C) has excellent weldability, so the pipes produced can be welded in long distance pipelines, easy and unhindered, thereby ensuring high production efficiency and effectiveness.
Key words: weldability, low temperatures, steel, pipes, pipelines.

1. INTRODUCTION

The implementation of the welding technology in general and the production of welded pipes in particular, is enabled only due to the ability of steel to be welded, respectively its good weldability. So, weldability as technological property determines the application of welding production technology, which in recent times increasingly finds wide use in all industrial sectors.

Steel is one of the main materials used for the production of welded structures in general and in particular welded pipes, thanks to the ability for welding, respectively its good weldability. It is worth mentioning that this feature technology is very complex and depends on many influencing factors, starting from steel's chemical composition through the history of production, namely its processing, welding technology applied to the interaction with the terms of the environment, namely temperature, air humidity, wind intensity in an open ground and so forth.

Therefore, in this paper made we will assess the weldability of API Grade X52 steel at low temperature (0°C), through carbon equivalent (C_E) and the experimental determination of other mechanical-technological and metallographic characteristics of the welded joint from this steel.

2. LITERATURE REVIEW

In literature there are different definitions of the term steel weldability, while according to the simplest definition and more concise one, by the word weldability it is meant the ability of the steel to be nicely welded without any mistakes /1/. it is worth mentioning that the welding ability, respectively weldability is a very broad concept and complicated because it is not only referred to the material but also to other conditions and activities that should be considered before the implementation of the welding process, during the realization of the welding process and after the completion of the welding process. During the welding of micro alloying steels, used for the production of pipes for pipelines, the term weldability means the ability of steel to be welded and welded and to create welded joints without

mistakes that meets the engineering and economic conditions /2/. In defining the term of weldability, in most cases it also includes the susceptibility to cracking during welding or subsequent heat treatment, the establishment of hardened microstructure in the transitional zone (TZ) of the weld seam, as well as providing resistance to corrosion, resistance to high temperatures, low temperatures, etc. /3,4,5/. It is worth mentioning that all definitions which refer to weldability mainly focus on providing the mechanical characteristics of the welded joint and its microstructural homogeneity.

Depending on the type of steel that is subject to welding and environmental conditions where the welding process is applied, the whole set of indicators that determine the meaning of weldability, changes as well. In this case, we must differ the weldability of the steel coils used for the production of pipes in production lines (in line) and the weldability of the same steel transformed into tubes, which are welded on the ground, in different constructive and environment conditions, assembled in pipelines for the transmission of fluids in great length and under high pressures.

Methods for assessing weldability are mainly based on the review of the basic properties of the steel and the consideration of the respective welding process to ensure homogeneous welded joint and certain mechanical properties, to meet the using requirements. Weldability is evaluated not only by its basic properties, but also by the welding process and regime, complementary metal composition, flux, electrode coating, protective gas, welded joint construction and using conditions.

For the evaluation of steel weldability, it is mainly used the known method of carbon equivalent (C_E), which is largely applied, especially in low-carbon steels /1/. Although it is believed that steels with low carbon equivalent (C_E) are immune to the occurrence of cracks, this does not mean that these steels cannot have other failures in the welded joint, namely in the heat affected zone (HAZ) and the welded seam (WS). Therefore it is important to mention that the carbon equivalent (C_E) is only an indicative parameter for assessing the weldability and should never be based on its values to ensure the integrity of the welded joint.

Dearden and O'Neill /6,7/ mentioned as first authors of the implementation of carbon equivalent (C_E) for the assessment of steel weldability through the equation:

$$C_E = C + \frac{P}{2} + \frac{M_n}{6} + \frac{M_o}{4} + \frac{C_r + V}{5} + \frac{N_i}{15} [\% \dots \dots (1)$$

According to the International Institute of Welding (IIW)/1,6,7/, the equation for the determination of carbon equivalent (C_E) have this form:

$$C_E = C + \frac{M_n}{6} + \frac{C_u + N_i}{15} + \frac{C_r + M_o + V}{5} [\%] \dots \dots (2)$$

It is worth mentioning that in the literature there are also many other relations for the determination of carbon equivalent (C_E).

3. EXPERIMENTAL PART

3.1.Materials and method

In this paper, it is assessed the weldability of micro alloying steel API Grade X52 /8/, the chemical composition and mechanical properties of which, according to the manufacturer's Attest, are given in Table 1 and 2.

Tab.1. Chemical composition of steel API Grade X52

Sample	Chemical composition (%)									
	C	Mn	P	S	Si	Al	Ni	Cr	Nb	Zr
	%									
Melting	0.088	1.073	0.010	0.012	0.248	0.068	0.020	0.014	0.021	0.082
Coils	0.096	1.086	0.011	0.013	0.239	0.060	0.016	0.015	0.020	0.090

Tab.2. Mechanical properties of steel API Grade X52

Direction	Mechanical properties				
	Re	Rm	Re/Rm	A_2	Kv (-40°C) ISO-V-5
	MPa			%	J/cm^2
Longitudinal (L)	432	533	0.810	40.0	14.1
Transversal (T)	449	550	0.816	34.5	8.8

3.2.Weldability assessment according to Carbon Equivalent (C_E)

Based on the chemical composition of steel API Grade X52 (Table 1), for the assessment of the steel's weldability, it is defined the carbon equivalent (C_E) by relations (1) and (2) for melted steel, respectively the steel's hot rolled coils and the gained results are given in Table 3.

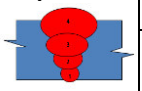
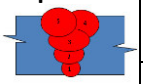
Tab.3. Carbon equivalent values (C_E)

Carbon equivalent (C_E)		
According to formula	Chemical composition	Carbon equivalent (C_E)[%]
1	Melting	0.275
	Coils	0.286
2	Melting	0.270
	Coils	0.281

3.3. Experimental assessment of weldability

For experimental assessment of the weldability there were taken plates from steel API Grade X52, size (600x1000x7.92) mm, which after preparing the edges and after cooling (0°) were subjected to manual metal arc welding (MMAW), with the welding parameters according to Table 4. Two options of welding were used: option-1, electrode alloyed with 0.75% Ni, with Rm = (560-620) MPa and impact toughness Kv = 60 J (-40°C) and option-2, electrode alloyed with 0.35% Mo, with Rm = 617MPa and impact toughness Kv=94.8J (-30°C).

Tab.4. Manual metal arc welding parameters

Welding option	Welding parameters							
	Layer	Polarity	Electrode type	Electrode	I (A)	U (V)	v (cm/min)	Linear energy
Option-1 	1	-	1	4	90-100	25-30	11.5-13.5	12.5
	2	+	1	5	140-160	24-27	18.5-22.5	11.2
	3	+	1	5	140-160	24-27	26.5-31.5	7.9
	4	+	1	5	140-160	24-27	24.0-31.5	8.3
Option-2 	1	-	1	4	90-100	25-30	14.0-18.0	9.8
	2	+	2	4	240-260	22-23	30.0-37.5	10.0
	3	+	2	4	240-260	22-23	40.0-44.0	8.0
	4	+	2	4	240-260	22-23	42.0-48.5	7.5
	5	+	2	4	240-260	22-23	46.5-52.5	6.8

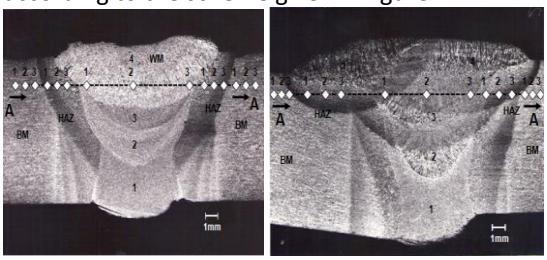
After welding, in order to verify the quality of the welded joint, respectively to assess the weldability of steel API Grade X52, samples were taken for tensile testing, impact toughness testing, hardness testing and metallographic analysis.

Tensile testing of the welded joint is realized in the universal testing machine MOHR-FEDERHAFF-LOSENHAUSEN, in order to determine the ultimate tensile strength (Rm).

The impact toughness testing was conducted for the base metal (BM), heat affected zone (HAZ) and weld metal (WM) at the temperature (-40° C), in Charpy's pendulum, MOHR-FEDERHAFF-LOSENHAUSEN.

Metallographic analysis, respectively the macro-structure of the welded joint is realized in two selected samples, representing option-1 and option-2 of MMA welding. After the metallographic standard sample preparation, respectively after grinding and polishing, the samples were subjected to chemical attacking with 1% nitric acid alcoholic solution (1% NITAL), figure 1.

Hardness testing (HV5) was conducted on samples prepared for metallographic macroscopic analysis, according to the scheme given in figure 1.



(1) (2)

Fig.1. Macrostructure and hardness testing

4. RESULTS AND DISCUSSION

Carbon Equivalent (C_E), Table 3 is defined separately for melted steel and hot rolled coils. The maximum value of equivalent carbon (C_E=0,286%) calculated according to the formula (1) is lower than the referenced value of carbon equivalent (C_E<0.4%), which according to the data in the literature /9/ means that steel API Grade X52 possesses excellent weldability.

Tensile testing results that show ultimate tensile strength (Rm) of the welded joint are presented in graphic form, figure 2.

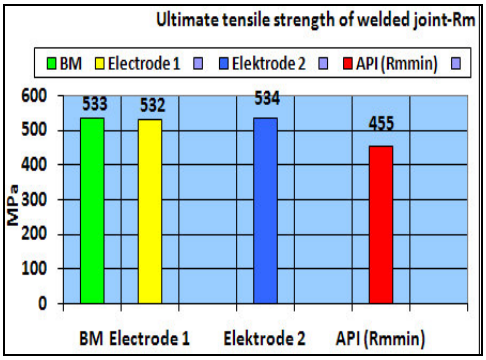


Fig.2. Ultimate tensile strength (Rm)

Average values of the ultimate tensile strength for both welding options (Rm = 532MPa-option 1) and (Rm = 534MPa-option 2) figure 2, are greater than the minimum value of ultimate tensile strength (Rm_{min}=455MPa), for steel API Grade X52, specified according to the standard of API /8/ and approximately equal to the ultimate tensile strength of the base metal (Rm = 533MPa-MB). It is worth mentioning that for both welding options, there are gained approximately equal ultimate tensile strength values, with a symbolic difference (about 0.19%). The position of fracture, respectively of the destruction of all tested samples occurred almost in the base metal (MB) outside the welded joint, or

outside the heat affected zone (HAZ) except in one case when fracture, respectively the destruction has occurred in the heat affected zone (HAZ) and this is an additional proof for the excellent weldability of steel API Grade X52 and for appropriate selection of electrodes and welding parameters.

The impact toughness (Kv), characterizes the resistance of the material to the action of the dynamic forces and in this case, the impact toughness (Kv) is defined separately for the constitutive parts of the welded joint, to the base metal (BM), the heat affected zone (HAZ) and weld metal (WM), at the temperature (-40°C). Graphic presentation, Figure 3, shows the average value of three individual samples for base metal (BM), weld metal (WM) and heat affected zone (HAZ), with V-notch of the samples positioned in the transitional zone (0mm), in distance of (2mm), respectively 5mm from the transitional zone, measured along the central part of the thickness of the samples.

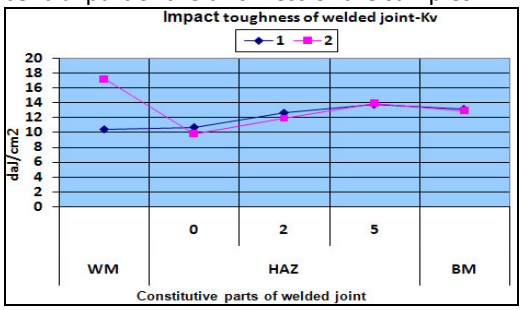


Fig.3. Impact toughness (Kv)

The average minimum value for the heat affected zone (Kv_{HAZ} =9.8dJ/cm^2), position (0mm), Figure 3, in the temperature (-40°C) is greater than the average minimum specified value (Kv=3.5dJ/cm^2), according to the standard API /8/ for API Grade X52 steel at the temperature (0°C).

The results of hardness measurement (HV5) figure 4, show the change of hardness along the welded joint, for both welding cases (option-1 and option-2). Maximum difference (ΔH_1= HV_{max}-HV_{min}=187-158=29HV), respectively (ΔH_2= HV_{max}-HV_{min}=201-175=26HV), shows a uniform hardness distribution along the welded joint, which on one hand, means that there were selected appropriate welding parameters, and on the other hand it is shown that the weldability of steel is excellent.

The metallographic macroscopic analysis of the welded joint, figure 1, reflects the cross section of the welded joint and shows good penetration between layers of welding on one hand and on the other hand also good penetration between layers of welding and base metal. Not observed cracking and other imperfections.

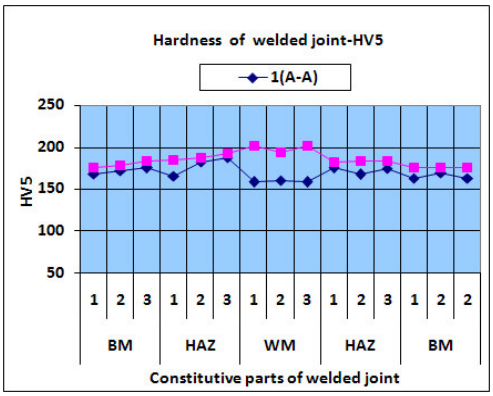


Fig.4. Hardness (HV5)

5. CONCLUSION

Based on the literature review and analysis of experimental results, it is concludes that:

-carbon equivalent (C_E) of API Grade X52 steel is low therefore the steel has excellent weldability,

-the weldability of steel API Grade X52 evaluated in terms of the mechanical properties of the welded joint, respectively in terms of ultimate tensile strength (Rm), impact toughness (Kv) and hardness (HV5), it is also excellent in both welding cases and it is carried out "overmatching" effect,

-the metallographic macroscopic analysis clearly demonstrates good penetration between the welding layers and welding layers and base metal and there is not created cracking, respectively other structural imperfections, so from this aspect, API Grade X52 steel has excellent weldability and can be recommended for production of welded pipes and pipelines.

References

1. Bytyçi B, Osmani H (1996), Saldimi I, Universiteti i Prishtinës, Prishtinë.
2. Wright R. R (1975), The field welding of transmission pipelines, Part 1-Pipe material and its weldability, Welding and Metal and Fabrication, July/August, 446-449.
3. Meester B.D (1997), The weldability of modern structural TMCP steels, ISIJ International, Vol.37, No.6, 537-551.
4. Suzuki H (1983), Weldability of Modern Structural Steels in Japan, Transactions ISIJ, Vol. 23, 189-204.
5. Hrivnjak I (1995), Weldability of modern steel materials, ISIJ International, Vol.35, No.10, 1148-1156.
6. Dearden, J. and O'Neill, H (1940), a guide to the selection and welding of low alloy structural steels. Trans. Inst. Weld. 3: 203-214.
7. Kasuya T, Yurioka N (1993), Carbon equivalent and multiplying factor for harden ability of steel, Welding research supplement, 263s-268s.

8. API (2004), American Petroleum Institute, Specification for line pipe, Washington, D.C.
9. Omajene J, Martikianen J, Paul K (2014), Weldability of thermo mechanically- rolled steel used in oil and gas offshore structures, IJES, Vol. 3, Issue 5, 62-69.

AN OVERVIEW ON CRYPTOGRAPHIC ALGORITHMS IN CLOUD SYSTEMS AND SECURITY ISSUES

BLERINA ÇELIKU
Fan S. Noli University, Department of Informatics and Physics, Korçë
blerinaceliku81@gmail.com

Abstract. Computer and data security is the subject of such discussions that deal with security and organizations. The security of data is required not only at storage but especially during transmission. We have different solutions, protocols or cryptographic services or techniques involved in communication security but their use and implementation is not so easy. E-commerce and online transactions are things we face nowadays. In every organization we have sensitive data and the way we organize and protect them is crucial. We have to beware of several threats, identifying them and find the proper solution. Authentication is also an important issue dealing with organizations and their behavior. In this review paper have been mentioned different cloud solutions, their security issues and encryption technologies to keep our data secure. Cryptographic algorithms and Public Key Infrastructures are also integrated in security solutions and cloud systems are likely to be the right choice for us.

Përmbledhje. Siguria e të dhënave kompjuterike në hapësirën ruajtëse dhe në lëvizje bëhet shpesh subjekt i diskutimeve rreth sigurisë dhe organizatave. Ekzistojnë zgjidhje të ndryshme, protokolle, teknika dhe shërbime kriptografike që përfshihen në sigurinë e komunikacionit por përdorimi dhe implementimi i tyre nuk është i lehtë. Tregtia elektronike dhe transaksionet online janë gjëra që i hasim shpesh. Gjithnjë kemi të bëjmë me të dhëna të rëndësishme dhe mënyra sesi i organizojmë dhe ruajmë ato është thelbësore. Çështja është që të ruhemi nga rreziqet, t'i identifikojmë ato dhe të gjejmë zgjidhjen e duhur. Autentifikimi gjithashtu është një çështje e rëndësishme në lidhje me organizatat dhe sjelljen e tyre. Në këtë përmbledhje janë përmendur zgjidhje të ndryshme Cloud, çështjet e sigurisë dhe teknologjitë e enkriptimit. Algoritmet kriptografikë dhe infrastrukturat me çelës publik janë të integruara në zgjidhjet e sigurisë dhe sistemet Cloud kanë gjasa të jenë zgjedhja e duhur për ne.
Keywords: PKI, cloud, threat, E-commerce, Authentication.

I. Introduction

Security and control becomes more important. The exponential growth in the volume of data lead to problems in management and effective controlling where companies are facing problems. Cloud computing is a new way to provide computational resources over the Internet in a transparent and easy manner, also in order to protect data and manage more effectively and efficiently. Frost & Sullivan defines cloud computing as a flexible and scalable IT environment in which service providers leverage virtualization technologies to create and distribute computing resources to customers on an as-needed basis, through a private or public network and where the service is priced according to a per-use basis[1]. Cloud computing is an evolving paradigm. According to National Institute of Standards and Technology (NIST), it is a model for enabling on-demand network access to a shared pool of computational resources, comprised of three service models, four deployment models and some basic characteristics [2]. These service models are: Software as a Service (SaaS), in which the service provided to the user is in the form of an application that runs on a cloud infrastructure; Platform as a Service (PaaS), in which the user can deploy its own applications in the provider's infrastructure; and Infrastructure as a Service (IaaS), in which the user has access to the computational resources themselves, in the form of virtual machines, storage, networks and others. The deployment models are the private, community, public and hybrid cloud, and refer to the location of the cloud infrastructure, who has access to it and who is responsible for its management.

The main advantages of cloud computing are the reduction of IT costs and increased flexibility, scalability and the possibility to pay only for the used resources. We live in a digital world where apps of all kinds and the overall customer experience have become essential to success. Cryptography can be involved in cloud security. This is a review of cryptography and cloud security issues.

II. Cryptographic Algorithms and PKI.s

Nowadays there are many cryptographic methods and algorithms in use. The question is what cryptographic scheme we must choose in what application. The areas of using cryptography vary from secure commerce to protecting passwords and data in transit or in rest. Today, individuals have very little control over the way their data are acquired, shared or used [5]. Based on the number of keys

employed in encryption and decryption there are three types of algorithms: SKC (Secret Key Cryptography) – uses a single key, PKC (Public Key Cryptography) – uses one key for encryption and another for decryption and Hash Functions – uses a mathematical transformation to irreversibly "encrypt" information [6]. Several algorithms such as Blowfish can be used for cloud security. RSA is a PKC algorithm that can be modified and used for cloud security. Hash algorithms are used to ensure the file integrity and are employed to encrypt passwords (MD algorithms, SHA standards). *Secure use of cryptography requires trust* [6]. There are a lot of trust models in use today; PGP (Pretty Good Privacy), Kerberos and Certificates. Certificates and the collection of CAs will form a Public Key Infrastructure (PKI). As electronic commerce changes the way we do business the Internet has changed the way in which we communicate. Also we have heard about IPsec, SSL, S-HTTP, S-MIME, X.509 that are some of the algorithms mostly in use. Encryption and new paradigms such as Predicate and Homomorphic encryption are also used.

III. Cloud Computing

Cloud computing allows basic internet users and companies to manage files, information and applications without installing any software on their computers. A cloud infrastructure is the collection of hardware and software that enables five essential characteristics of cloud computing: *On-demand self-service, Broad network access, Resource pooling, Rapid elasticity and Measured service* [2]. Other key factors that have enabled cloud computing evolving include the *virtualization* technology, the development of universal high-speed bandwidth, and universal software interoperability standards, said UK cloud computing pioneer Jamie Turner. When we have to deploy a cloud computing model we focus on the economic benefits of shared use that can provide higher-quality and faster services at a lower cost to users. Among the cloud opportunities (cloud for business grow, agility and cost reduction) to reshaping IT and transforming business there are different challenges that IT decision makers have to face during cloud adoption. Before developing a cloud strategy we have to understand our business and long-term needs. Knowing where data will reside is essential as the location has a significant impact on its privacy and confidentiality, as well as the legal obligations of those who process and store the data. Key security features of the solution include authentication/ID management, access control, encryption and key management. Some of the benefits of cloud computing include: Improved Security (57%), Access Data anytime, anywhere (58%), Cost Savings (73%), Speed of Response (65%), Multi-User Access and No File Transfer. The numbers are different but the conclusion is that being able to respond more quickly to changing business requirements is a critical advantage of a cloud model. Naturally we do the question: Why isn't everyone moving to the Cloud? Almost fears are Security ones: 62% believe that storing data on servers outside of the business is a significant security risk. Lack of education is an important reason why people don't either know nothing (71%) or a little (26%) about what cloud computing really is [15].

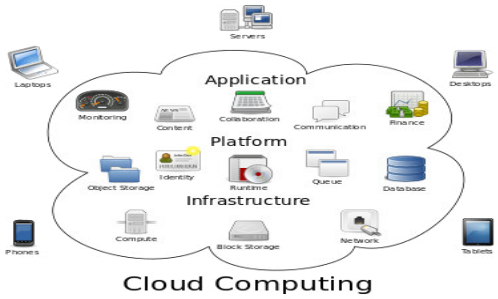


Figure 1: Cloud Computing General View

IV. Cloud Solutions and their Application

The services delivered through the cloud, – SaaS, IaaS and PaaS[1], offer several value propositions to consumers, summarized in the figure below.

Figure 2: Value Proposition of Cloud Computing

There are many cloud solutions according to different model clouds. The global cloud computing market is expected to reach approximately US$86 billion in 2016 from an estimated US$36 billion in 2013, growing at a compound annual growth rate of 33.4%. While SaaS continues to be the most popular cloud service, IaaS is witnessing growing adoption and is expected to grow at 40% per annum for the 2013-2016 period [1]. We may use a cloud to protect our company's email exchange with a cloud-based, SaaS email hosting solution with everything our business needs for managing email continuity,

archiving and security [7]. One drawback of SaaS comes with storing the users' data on the cloud provider's server. As a result, there could be unauthorized access to the data. For this reason, users are increasingly adopting intelligent third-party key-management systems to help secure their data [15]. Private Cloud Delivers High-Performance Computing in a Secure Environment and this is Ideal for Environments requiring the highest level of security, such as SOX, GLBA, HIPAA, and PCI etc. Public Cloud Offers High Performance, Security and Availability. With Public Cloud, IT resources—applications, compute, storage, and networking—are securely delivered as a service, deploying infrastructure capacity on demand, on a shared multi-tenant platform. Varied use cases for hybrid cloud composition exist. For example, an organization may store sensitive client data on a private cloud application, but interconnect that application to a business intelligence application provided on a public cloud as a Saas. This example extends the capabilities of the enterprise to deliver a specific business service through the addition of externally available public cloud services. Generally it is preferred a public cloud adoption from a business and considering that CIA (Confidentiality, Integrity, Availability) is very crucial in data security. According to Dr. Curran in a public cloud the core principle is the encryption of data and the proper encryption too. A company should ensure a security strategy built in; including secure endpoint authentication, integrity verification and on-the-fly data encryption. More so than ever, security breaches can greatly affect a company's public reputation," he concluded [16].

V. Cloud Security Issues

In the last years, cloud computing has grown from being a promising business concept to one of the fastest growing segments of the IT industry. According to the Cloud Security Alliance, the top three threats in the cloud are "Insecure Interfaces and API's", "Data Loss & Leakage", and "Hardware Failure"[15]. But as more and more information is placed in the cloud, concerns are beginning to grow about just how safe this environment is.

cloud computing has grown from being a promising business concept to one of the fastest growing segments of the IT industry. Now, recession-hit companies are increasingly realising that simply by tapping into the cloud they can gain fast access to best-of-breed business applications or drastically boost their infrastructure resources, all at negligible cost. But as more and more information on individuals and companies is placed in the cloud, concerns are beginning to grow about just how safe an environment it is.

1. ***Every breached security system was once thought infallible***: SaaS and PaaS providers all trumpet the robustness of their systems, often claiming that security in the cloud is tighter than in most enterprises. Google was forced to make an apology in February when its Gmail service collapsed in Europe, while Salesforce.com is still smarting from a phishing attack in 2007 which duped a staff member into revealing passwords [8].
2. ***Understand the risks of cloud computing***: Cloud service users must be vigilant in understanding the risks of data breaches in this environment. "At the heart of cloud infrastructure is this idea of multi-tenancy and decoupling between specific hardware resources and applications," explains Data monitor senior analyst Vuk Trifković. For their part, companies must be vigilant, for instance about how passwords are assigned, protected and changed.
3. ***How cloud hosting companies have approached security***: Companies need to know, whether a software change might actually alter its security settings. Google has invested a lot of money into the cloud space, where it recognizes that having a reputation for security is a key determinant of success.
4. ***Local law and jurisdiction where data is held***: Possibly even more pressing an issue than standards in this new frontier is the emerging question of jurisdiction. Data that might be secure in one country may not be secure in another.
5. ***Best practice for companies in the cloud***: Inquiring about exception monitoring systems, Being vigilant around updates and making sure that staff doesn't suddenly gain access privileges they're not supposed to. Being careful to develop good policies around passwords; how they are created, protected and changed.

VI. Conclusions and Future Work

From the beginning of cloud computing the vision was for everyone on the globe to be interconnected and accessing programs and data at any site, from anywhere. Nowadays, if we own a business the next thing is creating a website and then the big issue is to keep our data in secure. As we understand today's applications are moving towards a cloud model as they become more available through the web, requiring more data processing. We are facing with some risks in cloud computing technology;

connection, service provider, technology and foreign security dependencies [15].

Also there are several threats and vulnerabilities in our application. Against them we can use several protection methods and tools; for ex. cryptographic algorithms and we have to study them. In the future we are going to simulate a cloud system and constitute a cryptographic scheme for monitoring data, server, network, data location and application security metrics. Additionally, more industries are turning to cloud technology as an efficient way to improve quality services due to its capabilities to reduce overhead costs, downtime, and automate infrastructure deployment. Because cloud computing is not only a distributed computing paradigm but also a business paradigm.

References

1. Frost & Sullivan: Cloud Computing – Creating Value for Businesses Across the Globe, http://www.fujitsu.com

2. Mell P. & Grance T., The nist definition of cloud computing. http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf (2011) [retrieved: Sept, 2014]

3. Vitti Figueiredo Artur Pedro, dos Santos Ricardo Daniel, Westphall Becker Carlos, Westphall Merkle Carla, Vieira Maciel Magno Kleber, Current Issues in Cloud Computing Security and Management, available online at http://www.researchgate.net/profile/Carlos_Westphall/publications

4. The impact of cloud. A curated report by the Economist Intelligence Unit, http://www.fujitsu.com

5. Kessler C. Gary, An Overview of Cryptography, http://www.garykessler.net/library/crypto.html#intro

6. Enterprise Cloud & Managed Services and Solutions, http://www.windstreambusiness.com/products/

7. Top five cloud computing security issues, http://www.computerweekly.com/

8. Eecke Van Patrick, DLA Piper Brussels Professor University Antwerpen: Cloud Computing Legal issues.

9. Silva P., Westphall C., Mattos M., & Santos D., "An architecture for risk analysis in cloud," in ICNS 2014, The Tenth International Conference on Networking and Services, 2014, pp. 29–33.

10. Ren K., Wang C., and Wang Q., "Security challenges for the public cloud," Internet Computing, IEEE, vol. 16, no. 1, jan.-feb. 2012, pp. 69–73.

11. Shaikh F. and Haider S., "Security threats in cloud computing," in Internet Technology and Secured Transactions (ICITST), 2011 International Conference for, 2011, pp. 214–219.

12. T. T. W. Group et al., "The notorious nine: cloud computing top threats in 2013," Cloud Security Alliance, 2013.

13. Grobauer B., Walloschek T., and Stocker E., "Understanding cloud computing vulnerabilities," Security Privacy, IEEE, vol. 9, no. 2, march-april 2011, pp. 50 –57.

14. Cloud Computing Concerns and Issues, http://www.onbile.com/info/category/type/articles/

15. http://zeendo.com/info/what-cloud-computing-means-2/

16. Dr. Curran Kevin http://www.computing.co.uk/ctg/news/2375805/-trust-has-gone-from-cloud-providers-argues-security-expert-following-snapchat-icloud-and-dropbox-breaches

THE MAIN PARAMETERS NECESSARY FOR PLANNING A WAN NETWORK
PARAMETRAT KRYESOR PËR PLANIFIKIM TË NJË WAN RRJETE

B. AHMEDI[A]
State University of Tetovo, Faculty of Mathematics and Natural Sciences, Tetovo, Macedonia
basri.ahmedi@unite.edu.mk
P. Mitrevski[b]
University of St. Clement Ohridski, Faculty of Technical Sciences, Bitola
, Macedonia
pece.mitrevski@uklo.edu.mk

Përmbledhje- Fazat për dizajnimin e një rrjete përfshijnë: përkufizimin e kërkesave për rrjetën, krijimin e grafit, aplikimin e algoritmit për gjetjen e shtegut më të shkurtër të grafit, krijimin e matricës së trafikut, koston e teknologjisë që do të përdoret dhe koston e shërbimeve për të cilin rrjeta është menduar. Në rajone të ndryshme vlerat e këtyre parametrave ndryshojnë, sepse llogaritja e tyre varet drejtpërdrejt nga të dhënat "në teren": numri i banorëve, distanca midis qyteteve, dendësia e trafikut, llogaritja e Erlang-ut të rrjetës dhe llogaritja e bandwidth-it për secilën degë. Identifikimi dhe vlerësimi i këtyre parametrave është i nevojshëm për të zhvilluar një model që mund të përcaktojë kuadrin e saktë i cili do të shfrytëzohet gjatë planifikimit të një WAN rrjete në një regjion. Sipas këtyre parametrave të përpunuara, kjo rrjetë duhet të plotësojë nevojat për të cilat krijohet duke marrë para sysh edhe kosto minimale.
Fjalë çelës: WAN, matricë e trafikut, dendësia e trafikut

Abstract- The stages in designing a network include: definition of requirements for which the network is made, creation of the graph, application of the algorithm for finding the shortest path between graph's nodes, creation of the traffic matrix, cost of technology to be used, cost of the services for which the network is intended. The values of these parameters differ for different regions, because their calculation depends directly on "the ground" data: the number of inhabitants, the distance between populated areas, the density of network traffic, the calculation of Erlang and network's bandwidth for each branch. The identification and evaluation of these parameters is necessary for developing a model that can determine the exact frame which will be used while planning a WAN network in a region. With these processed parameters, this network is supposed to meet the needs for which it's created while taking into account a minimal cost.
Keywords: WAN, traffic matrix, network traffic density

INTRODUCTION

If the number of the network users is low, not much calculation is needed for such simple networks. If the number of users is high, it needs to be made a planning in order to meet the requirements for which the network is designed. In this case, before building such a network some calculations should take place. Given that every network is specific there isn't a unique which will be applied for planning. In this case, in help come some science disciplines like the graph theory, Adjacency matrices, algorithms for finding the shortest path, statistic data for the population structure, information for the technological technical level of the network equipment etc. So for planning a network we need additional knowledge in these areas. One of the main elements during the process of planning networks is also the number of users. This paper tries to contribute in this direction. Beginning from the endeavor so far for developing a methodology for planning and modeling WAN networks this paper follows the main steps but adds another indicator called SEI (Socio-Economic Indicator). In order to have a better prediction for the data transfer capacities across the graph's branches, the population structure is divided in some groups: , I_2-the number of employees in the private sector, I_3-the number of pupils , I_4-the number of college students, I_5-the number of unemployed, I_6- other. The application of the SEI in the methodology of WAN planning and modeling gives more accurate opportunities for calculating the maximal boundaries of the Bandwidth of the graph's branches which describe the network.

I THEORETICAL BACKGROUND AND METHODOLOGY

The calculation of the traffic between the graph's points is found in the paper of Sami Saleh Al-Wakeel [2]. In this paper Al-Wakeel applies the TC formula

which calculates the traffic in branches dividing the population structure by the time of usage of the network in two household groups: residential and commercial. In this case it is created a model of a WAN network in Saudi Arabia which is concentrated in the characteristics that the network should have: fulfillment of the requirements for which the network is created, creation of the relevant topology and minimal cost. The steps for planning a network set by the author create an algorithm. Those step are:

-the definition of the requirements for which the WAN is created.

-application of the topology that corresponds the netwok

-calculation of the average value of the communication between graph's nodes (Creating the Communication matrix).

The second paper that gives a serious contribution in this area is Andrea De Montis' paper. The case is about a network that is used for interurban communication in the region of Sardinia in Italy. In order to describe the network a graph with nodes and branches is used. There are required indicators which describe the: variability in the network communication, importance of the topology in the network, differentiation of the peripheral and central routes of the graph, attempt for dedicating and describing the sociodemographic variables(population number, population structure in different nodes and the monthly income of the employees). This graph's nodes represent 375 municipalities of the region of Sardinia and consider three global indicators: geographic, social and demographic. These indicators in every municipality are variable. In the paper there is emphasized the importance of the population structure: employees, college students, pupils but a mathematical model which will influence the calculation of the network's communication matrix isn't created.

The third paper of the authors Taylor, W.J., Zhu, G.X., Dekkers, J. & Marshall, S.[10] intends to identify the demographic and socioeconomic factors for the usage of internet in the computer network of Central Queensland Region in Australia. Here arises the hypothesis that internet usage varies depending the population structure (teenagers, men, women, urban or rural population, intellectual or not, wealthy or not, employees or not). The paper makes obvious this difference. The paper concludes that the socioeconomic and demographic factor dictate the planning of a computer network in this region in Australia.

The paper of authors Maurizio Naldi and Claudia Solaris main purpose is the traffic delivery of the users of the network that connects a wide region of 25 million inhabitants and 313 geographical locations. This paper aims to detect variable traffic generation in network's branches and Erlang change of graph's branches.

Mathew Roughan's paper from University of Adelaida in Australy attempt to make the identification and ordering of the concrete necessary steps for planning a WAN network. Those steps include: calculation of traffic in the network's branches, prediction of the network load, the average calculation of the traffic given that in disposal there may be memorized data from years behind. The traffic in a network depends from the profile of the requirement and from the generation of data which flow through the network. The paper intends to make it obvious that even though the process of planning a computer network is complex, it is possible a very rough planning.

II RESULTS

a)Calculation of SEI

The population structure is considered a very important element during the planning of a WAN network but there isn't a concrete mathematical model for this factor. For more accurate calculation of the WAN traffic in a city the population structure needs to be divided in various types of users and a mathematical model which helps the planning accuracy is created. In this paper this is measured through the Socio Economic Indicator SEI which represents a linear sum of the multiplication w and a_i ($0 \le a_i \le 1$).

$$SEI = \sum_{i=1}^{k} w_i a_i$$

Weights w_i are defined based in the statistical reports in the respective city.

W_1-72% usage of network from the public sector.(Statistical office Nr.8.1.11.31)

W_2-36% network usage from private subjects(Statistical office Nr.8.1.12.25)

W_3- 96,4% network usage from pupils (Statistical office Nr.8.1.12.28)

W_4- 96,4% network usage from college students (Statistical office Nr.8.1.12.28)

W_5- % unemployed users

W_6-% other users

a_1-percentage of employees in the public sector in that city

a_2- percentage of employees in the private sector in that city

a_3-percentage of pupils in that city

a_4- percentage of college students in that city

a_5- percentage of unemployed in that city

a_6-percentage of other inhabitants

$$a_1 = \frac{I_1}{P},\ a_2 = \frac{I_2}{P},\ a_3 = \frac{I_3}{P},\ a_4 = \frac{I_4}{P}, a_5 = \frac{I_5}{P}, a_6 = \frac{I_6}{P}$$

I_1--number of employees in the public sector
I_2- number of employees in the private sector
I_3- number of pupils
I_4- number of college students
I_5- number of unemployed
I_6 - number of other inhabitants
P- number of inhabitants in the city
The sum of these parameters and calculation according to the respective formulas provides a measurement scalar for every city in which we have created a SEI. This is shown in the table below

	City	Households	Populations	w1	w2	w3	w4	w5	w6	N	employes	I_1	$\alpha_1=I1/N$	I_2	$\alpha_2=I2/N$	I_3	$\alpha_3=I3/N$		I_4	$\alpha4=I4/N$	I_5	$\alpha5=I5/N$	I_6	$\alpha_6=I6/N$	SEI
				level of the republic								no. public sector (40%)		no. business sector (60%)		elementary students	High School students		no. students		no.unemployed		no.other		
1	Struga	14485	63376	0,720	0,360	0,964	0,964	0,25	0,25	63376	47811	19124,4	0,302	28686,6	0,453	6006	3229	0,146		0	3034	0,048	3296	0,052	0,546
2	Ohrid	16012	55749	0,720	0,360	0,964	0,964	0,25	0,25	55749	39074	15629,6	0,280	23444,4	0,421	4906	2605	0,135	1742	0,031	3809	0,068	3613	0,065	0,547
3	Bitola	28942	95385	0,720	0,360	0,964	0,964	0,25	0,25	95385	66955	26782	0,281	40173	0,421	7421	4604	0,126	2973	0,031	6838	0,072	6594	0,069	0,541
4	Debar	3917	19542	0,720	0,360	0,964	0,964	0,25	0,25	19542	13306	5322,4	0,272	7983,6	0,409	2306	713	0,154		0	1211	0,062	2006	0,103	0,533
5	Kicevo		47700	0,720	0,360	0,964	0,964	0,25	0,25	47700	34354	13741,6	0,288	20612,4	0,432	3997	2327	0,133	599	0,013	3238	0,068	3185	0,067	0,537
6	Krushevo	2706	9684	0,720	0,360	0,964	0,964	0,25	0,25	9684	7121	2848,4	0,294	4272,6	0,441	804	298	0,114		0	837	0,086	624	0,064	0,518
7	Prilep	24398	76768	0,720	0,360	0,964	0,964	0,25	0,25	76768	50641	20256,4	0,264	30384,6	0,396	6741	3977	0,140	1152	0,015	6760	0,088	7497	0,098	0,528
8	Gostivar	18091	81042	0,720	0,360	0,964	0,964	0,25	0,25	81042	60136	24054,4	0,297	36081,6	0,445	7083	4844	0,147		0	3546	0,044	5433	0,067	0,544
9	Tetovo	20094	86580	0,720	0,360	0,964	0,964	0,25	0,25	86580	41528	16611,2	0,192	24916,8	0,288	10114	9795	0,230	6670	0,077	9761	0,113	8712	0,101	0,591
10	Skopje	146566	506926	0,720	0,360	0,964	0,964	0,25	0,25	5E+05	3E+05	138894	0,274	208341,6	0,411	53586	27692	0,160	32911	0,065	15874	0,031	29627	0,058	0,585
11	Kumanovo	27984	105484	0,720	0,360	0,964	0,964	0,25	0,25	1E+05	68806	27442,4	0,260	41163,6	0,390	11303	6514	0,169	1732	0,016	6472	0,061	10857	0,103	0,548
12	Kriva Palanka	6600	20820	0,720	0,360	0,964	0,964	0,25	0,25	20820	13503	5401,2	0,259	8101,8	0,389	1718	843	0,123		0	3154	0,151	1602	0,077	0,503
13	Sveti	5698	18497	0,720	0,360	0,964	0,964	0,25	0,25	18497	12787	5106,8	0,276	7660,2	0,414	1454	661	0,114	205	0,011	1843	0,100	1567	0,085	0,515
14	Shtip	15065	47796	0,720	0,360	0,964	0,964	0,25	0,25	47796	34171	13668,4	0,286	20502,6	0,429	4147	2794	0,145	1500	0,031	2434	0,051	2750	0,058	0,558
15	Veles	16959	55108	0,720	0,360	0,964	0,964	0,25	0,25	55108	38479	15391,6	0,279	23087,4	0,419	4579	2763	0,133	375	0,007	2995	0,054	5917	0,107	0,527
16	Kocani	11981	38092	0,720	0,360	0,964	0,964	0,25	0,25	38092	24041	9616,4	0,252	14424,6	0,379	3134	1719	0,127	2858	0,075	2884	0,076	3456	0,091	0,555
17	Radovish	8270	28244	0,720	0,360	0,964	0,964	0,25	0,25	28244	19009	7603,6	0,269	11405,4	0,404	2661	894	0,126	2119	0,075	1593	0,056	1968	0,070	0,564
18	Negotino	5898	19212	0,720	0,360	0,964	0,964	0,25	0,25	19212	14431	5772,4	0,300	8658,6	0,451	1817	775	0,135		0	1085	0,056	1104	0,057	0,537
19	Kavadaci	12026	38741	0,720	0,360	0,964	0,964	0,25	0,25	38741	27702	11080,8	0,286	16621,2	0,429	3438	1860	0,137		0	3513	0,091	2228	0,058	0,529
20	Strumica	15896	54876	0,720	0,360	0,964	0,964	0,25	0,25	54876	33452	13380,8	0,245	20071,2	0,367	5491	4018	0,174		0	2344	0,043	9371	0,171	0,530
21	Gevgelija	7221	22988	0,720	0,360	0,964	0,964	0,25	0,25	22988	15561	6224,4	0,271	9336,6	0,406	1869	991	0,124	2160	0,094	1459	0,063	948	0,041	0,578
	Σ	345453	1492410																						

Table.1 Calculation of the SEI for some cities in the region

b)Calculation of the traffic for every city

The graph theory helps for creating the communication matrix. A graph is created, whose nodes correspond with the network's nodes, respectively (i.e. cities). After designing the graph, the matrix is structured and its elements represent average value of quantity of data transfer between graphs nodes. This value is different between two nodes and in different points of time. The calculation of the communication matrix is based in the number of the inhabitants in a city (node), number of households, and time of using the network. By the term "household" we understand a collective family composed from a number of people that live together in a house or institution. In a city there are two types of households: residential and commercial. The usage of the network by these two categories is not the same based on the time of the usage and the volume of data transfer. The number of households for one node of the graph can be calculated by the following equation [2]:

$$T = \frac{P}{N}$$

- T: No. of households
- P: No. of city's inhabitants
- N: No. of inhabitants in one home (e.g. in Macedonia this number is 3.5) [2,4].

The total traffic for any city is calculated as:

$$TF = C * \frac{P}{N} * \frac{CC * CL}{24} + R * \frac{P}{N} * \frac{CR * RL}{24} * \text{SEI}$$

- TF: The total traffic for any city
- C: Commercial households in percent
- P: No. of inhabitants per city
- N: No. of inhabitants per household
- CC: No. of calls per commercial household per day (24 hours)
- CL: Commercial call duration (in hours)
- R: Percent of residential households
- CR: No. of calls per residential household per day
- RL: Residential call duration (in hours)

Cities	households (RM 2002)	Population	N= 3,5 T	CT(15%)	RT(85%)	TC (CT*CL*4)/24, CL=1/2 h	TR (RT*RL*1)/24, RL=1/2 h	TF = TC+TR	SEI	(TC+TR)* SEI
Struga	14485	63376	18107,43	2716,11	15391,31	226,34	320,65	547,00	0,54566	298,47
Ohrid	16012	55749	15928,29	2389,24	13539,04	199,10	282,06	481,17	0,54653	262,97
Bitola	28942	95385	27252,86	4087,93	23164,93	340,66	482,60	823,26	0,54056	445,02
Debar	3917	19542	5583,43	837,51	4745,91	69,79	98,87	168,67	0,53325	89,94
Kicevo		47700	13628,57	2044,29	11584,29	170,36	241,34	411,70	0,53656	220,90
Krushevo	2706	9684	2766,86	415,03	2351,83	34,59	49,00	83,58	0,51803	43,30
Prilep	24398	76768	21933,71	3290,06	18643,66	274,17	388,41	662,58	0,52795	349,81
Gostivar	18091	81042	23154,86	3473,23	19681,63	289,44	410,03	699,47	0,54356	380,20
Tetovo	20094	86580	24737,14	3710,57	21026,57	309,21	438,05	747,27	0,59102	441,65
Skopje	146566	506926	144836,00	21725,40	123110,60	1810,45	2564,80	4375,25	0,58482	2558,74
Kumanovo	27984	105484	30138,29	4520,74	25617,54	376,73	533,70	910,43	0,54752	498,48
Kriva Pallanka	6600	20820	5948,57	892,29	5056,29	74,36	105,34	179,70	0,50256	90,31
Sveti Nikolle	5698	18497	5284,86	792,73	4492,13	66,06	93,59	159,65	0,51487	82,20
Shtip	15065	47796	13656,00	2048,40	11607,60	170,70	241,83	412,53	0,55769	230,06
Veles	16959	55108	15745,14	2361,77	13383,37	196,81	278,82	475,65	0,52734	250,82
Koçani	11981	38092	10883,43	1632,51	9250,91	136,04	192,73	328,77	0,55484	182,42
Radovish	8270	28244	8069,71	1210,46	6859,26	100,87	142,90	243,77	0,56439	137,58
Negotino	5898	19212	5489,14	823,37	4665,77	68,61	97,20	165,82	0,53712	89,06
Kavadarci	12026	38741	11068,86	1660,33	9408,53	138,36	196,01	334,37	0,52927	176,97
Strumica	15896	54676	15621,71	2343,26	13278,46	195,27	276,63	471,91	0,52958	249,91
Gevgelija	7221	22988	6568,00	985,20	5582,80	82,10	116,31	198,41	0,57786	114,65
Σ	345453	1492410	426402,86	63960,43	362442,43	5330,04	7550,88	12880,92		

Table2 The traffic from various cities with SEI

c) The calculation of the traffic matrix for every pair of the graph

The traffic between cities A and B is calculated by entering the respective values in:

$$T_{AB} = T_A * \frac{P_B}{P_T}$$

- T_{AB} : Traffic between cities A and B
- T_A : Traffic from city A with other cities
- P_B : Number of inhabitants in city B
- P_T : The total population for all 21 cities

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	Cities	Struga	Ohrid	Bitola	Debar	Kicevo	Krushevo	Prilep	Gostivar	Tetovo	Skopje	Kumanovo	Kriva Palanka	Sveti Nikole	Shtip	Veles	Kocani	Radovish	Negotino	Kavadarci	Strumica	Gevgelija
1	Struga		22,34	37,8	7,64	18,76	3,68	29,8	32,2	37,6	218	42,4	7,66	6,98	19,54	21,4	15,5	11,68	7,56	15,04	21,2	9,74
2	Ohrid	22,34		33,20	6,72	16,50	3,24	26,20	28,40	33,00	191,20	37,20	6,74	6,14	17,18	18,74	13,62	10,29	6,66	13,22	18,68	8,56
3	Bitola	37,8	33,20		11,50	28,24	5,54	44,72	48,60	56,46	327,08	63,72	11,54	10,50	29,40	32,06	23,32	17,58	11,38	22,62	31,94	14,66
4	Debar	7,64	6,72	11,50		5,78	1,14	9,16	9,96	11,56	67,00	13,06	2,36	2,16	6,02	6,56	4,78	3,60	2,34	4,64	6,54	3,00
5	Kicevo	18,76	16,50	28,24	5,78		2,76	22,36	24,30	28,24	163,56	31,86	5,78	5,26	14,70	16,04	11,66	8,80	5,70	11,32	15,98	7,32
6	Krushevo	3,68	3,24	5,54	1,14	2,76		4,54	4,94	5,74	33,20	6,46	1,18	1,06	2,98	3,26	2,36	1,78	1,16	2,30	3,24	1,48
7	Prilep	29,8	26,20	44,72	9,16	22,36	4,54		39,2	45,4	263,2	51,2	9,2	8,4	23,6	25,8	18,8	14,2	9,2	18,2	25,8	11,8
8	Gostivar	32,2	28,40	48,60	9,96	24,30	4,94	39,2		48,0	277,8	54,2	9,8	9,0	25,0	27,2	19,8	15,0	9,6	19,2	27,2	12,4
9	Tetovo	37,6	33,00	56,46	11,56	28,24	5,74	45,4	48,0		296,80	57,84	10,48	9,54	26,70	29,10	21,16	15,96	10,32	20,54	29,00	13,30
10	Skopje	218	191,20	327,08	67,00	163,56	33,20	263,2	277,8	296,80		338,6	61,40	55,80	156,2	170,40	124,00	93,40	60,60	120,20	35,40	77,80
11	Kumanovo	42,4	37,20	63,72	13,06	31,86	6,46	51,2	54,2	57,84	338,6		12,76	11,62	32,52	35,46	25,78	19,44	12,60	15,02	35,32	16,20
12	Kriva Palanka	7,66	6,74	11,54	2,36	5,78	1,18	9,2	9,8	10,48	61,40	12,76		2,30	6,42	7,00	5,08	3,84	2,48	4,94	6,98	3,20
13	Sveti nikole	6,98	6,14	10,50	2,16	5,26	1,06	8,4	9,0	9,54	55,80	11,62	2,30		5,7	6,22	4,52	3,42	2,20	4,38	6,20	2,84
14	Shtip	19,54	17,18	29,40	6,02	14,70	2,98	23,6	25,0	26,70	156,2	32,52	6,42	5,7		16,06	11,68	8,80	5,70	11,32	16,00	7,34
15	Veles	21,4	18,74	32,06	6,56	16,04	3,26	25,8	27,2	29,10	170,40	35,46	7,00	6,22	16,06		13,48	10,16	6,58	13,06	18,46	8,46
16	Kocani	15,5	13,62	23,32	4,78	11,66	2,36	18,8	19,8	21,16	124,00	25,78	5,08	4,52	11,68	13,48		7,02	4,54	9,02	12,74	5,84
17	Radovish	11,68	10,29	17,58	3,60	8,80	1,78	14,2	15,0	15,96	93,40	19,44	3,84	3,42	8,80	10,16	7,02		3,38	6,70	9,46	4,34
18	Negotino	7,56	6,66	11,38	2,34	5,70	1,16	9,2	9,6	10,32	60,60	12,60	2,48	2,20	5,70	6,58	4,54	3,38		4,56	6,44	2,96
19	Kavadarci	15,04	13,22	22,62	4,64	11,32	2,30	18,2	19,2	20,54	120,20	15,02	4,94	4,38	11,32	13,06	9,02	6,70	4,56		12,98	5,96
20	Strumica	21,2	18,68	31,94	6,54	15,98	3,24	25,8	27,2	29,00	35,40	35,32	6,98	6,20	16,00	18,46	12,74	9,46	6,44	12,98		8,40
21	Gevgelija	9,74	8,56	14,66	3,00	7,32	1,48	11,8	12,4	13,30	77,80	16,20	3,20	2,84	7,34	8,46	5,84	4,34	2,96	5,96	8,40	

Tables 2 Traffic matrix between 21 cities with SEI

Greater internet users in this network which is imagined to be created are college students and pupils. The application of SEI in the calculation of the traffic between inhabitants would change this state and that will be noticed in those cities where the number of students and pupils is high and we have an increasing of the traffic between nodes of cities like Skopje-Bitola(327,8=08-279,64=47,44), Skopje-Tetovo (296,8-254= 42,8). There are not evident changes in calculation of the traffic with SEI and without it if the number of greater users isn't high eg. Gevgelija-Koçani (5,84-5,06 =0,78), Struga-Veles (21,4- 20,2 =1,2).

d)The application of the algorithm for finding the shortest path

The position of a node in a graph is important. If this node is located in the middle of the graph, through the branches which it is linked with the other nodes doesn't flow just the traffic between the two respective nodes but it can flow the traffic of other nodes-cities. Does the traffic of another node flows through a branch is established by the application of the algorithm for finding the shortest path. The most suitable for this problem is the algorithm of Floyd Warshall who finds the shortest path between all the pairs of the graph. With this the routes of traffic are known and next the load of a branch is calculated (Erlang)

e) Calculation of the Bandwidth

Given that now the sum of the traffic in a branch which connects two nodes of the graph is known, the bandwidth can be calculated. If the calculated value of an Erlang of a branch is multiplied with 64kbps, the result is the bandwidth of that branch. Bandwidth=

ERLANG*64 kbps. If an ISP provider wants from one node of the graph to provide the requirement of the 20 cities-nodes of the graph. In this case given that we have completed all the steps, the last step is calculating the bandwidth between branches: Tetovo, Gostivar-Kicevo, Gostivar-Debar.

	LINK	Erlang(traffic)	Bandwidth(bps)	Kbps	Mbps
1	Gostivar-Tetovo	261,3	16723200	16723,2	**16,7232**
2	Gostivar-Debar	35,33	2261120	2261,12	**2,26112**
3	Gostivar-Kicevo	74,32	4756480	4756,48	**4,75648**

Table 3 Calculating the Bandwidth for an ISP provider from the city of Gostivar

From table 3 we can conclude that if the provider wants to reach the requirements of the users of the network should rent the capacities: Gostivar-Tetovë (16,7232) + Gostivar-Kicevo(4,75648)+Gostivar-Debar(2,26112)=23,7407 Mbps. Finally according to this result we rent the respective package: 34 Mbps(for 50 km) which is provided by the companies that provide such services.

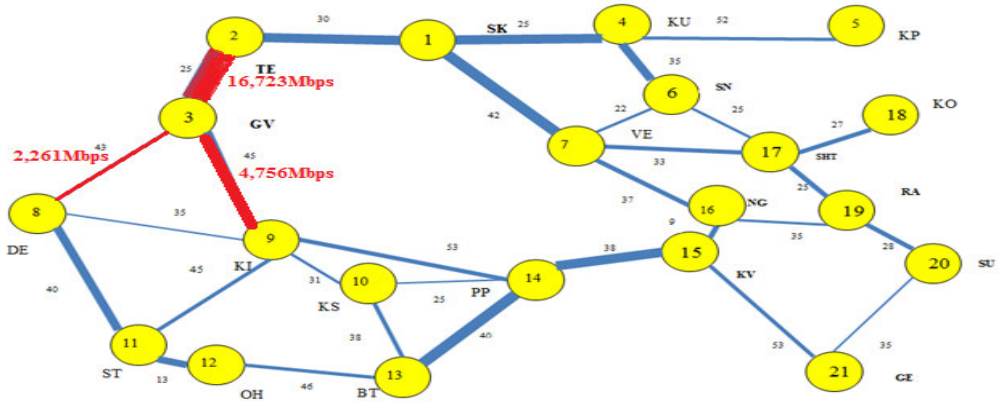


Fig.1 Calculation of Bandwidth for one city

III CONCLUSION

The calculation of a set of parameters gives indicators which help planning and modeling WAN networks with adequate capacity and minimal cost. These include: calculate the SEI(Socio-economic Indicator), the communication matrix for each city with SEI, the total traffic for any city, the communication matrix between all cities with SEI, calculate the shortest path between nodes of the graph using Floyd-Warshall algorithm, calculate the Erlang and Bandwidth of branches which link 21 nodes-cities of the graph. The calculation of the main parameters gives the opportunity that for every node of the graph we calculate the bandwidth of the branches.

REFERENCES

[1] Joe Habraken, "Osnove umrezavanja", Mikro Knjiga, Beograd, 2002.

[2] Sami Saleh Al-Wakeel, "Development of Planning and Cost Models for Designing A Wide Area Network in Kingdom of Saudi Arabia", Research Report #9, Research Center, College of Computer and Information Sciences, King Saud University, 2009.

[3] Thomas H. Cormen, Charles E. Leirserson, Ronald L. Rivest and Clifford Stein, **"**Introduction to Algorithms", 3rd edition, The MIT Press, 2009.

[4] Државен завод за Статистика**, „**Вкупно население, домаќинство и станови според територијалната организација на Република Македонија**"**, Скопје, 2005**.**

[5] Ivica Huk, "Floyd-Warshallov algoritam", Sveucilište u Splitu, Odjel za stručne studije, Split, 2005.

[6] Dorlir Behluli, **"**Algoritmet për gjetjen e shtegut më të shkurtër nga burimi i vetëm", Universiteti i Prishtinë, 2007.

[7] Cvetković D., Sokarovski R., "Osnovi na teorijata na grafovi", Matematicki institut, Skopje, 1975.

[8] J. Scott Marcus, "Designig Wide Area Networks and Internetworks", Addison-Wesley, 1999.

[9] De Montis, A., Barthelemy, M., Chessa, A. & Vespignani, A., "The structure of Inter-Urban traffic: A weighted network analysis", 2007.

[10] Taylor, W.J., Zhu, G.X., Dekkers, J. & Marshall, S., "Socio-Economic Factors Affecting Home Internet Usage Patterns in Central Queensland", Informing Science Journal, Vol. 6, Central Queensland University, Rockhampton, Qld, Australia, 2003.

[11] Matthew Roughan, Robust Network Planning, University of Adelaide, 2009,Adelaide, South Australia
[12] http://www.google.com/search?hl=en&q=source+code+in+c%2B%2B+floyd+warshall, (Accessed October, 2013)
[13] http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html , (Accessed October, 2013)
[14] http://cs.wellesley.edu/~cs231/fall01/shortest-paths.pdf , (Accessed October, 2013)
[15] http://ics.uci.edu/~eppstein/161960208.html, (Accessed October, 2013)

REFRACTIVE INDICES, DENSITIES AND EXCESS MOLAR VOLUMES OF BINARY SYSTEMS METHANOL+WATER AND ETHANOL+WATER AT T = 293.15 K

INDEKSET E THYERJES, DENSITETET DHE VËLLIMET MOLARE TË SISTEMEVE BINARE METANOL+UJË DHE ETANOL+UJË NË T = 293.15 K

FISNIK ALIAJ[1], NAIM SYLA[1], ARLINDA BYTYQI-DAMONI[2]

[1]Department of Physics, FMNS, University of Prishtina, Mother Theresa St.5, 10000 Prishtina, Kosova

[2]Department of Chemistry, FE, University of Prishtina, Agim Ramadani St.nn, 10000 Prishtina, Kosova

e-mail: fisnik.aliaj@uni-pr.edu

PËRMBLEDHJE

Indekset e thyerjes, n_D, dhe densitetet, ρ të përzierjeve binare metanol + ujë dhe etanol + ujë janë matur në temperaturën T=293.15 K dhe shtypje atmosferike, përgjatë tërë zonës së fraksioneve molare. Indekset e thyerjes janë matur me anë të refraktometrit Abbe me një saktësi të matjes prej ±0.0002. Densitetet janë përcaktuar me anën e metodës piknometrike me një saktësi të majtës prej ±0.1 kg/m^3. Vëllimet molare shtesë, V^E, dhe devijimet në indeksin e thyerjes, Δn_D, janë përqasur me ndihmën e polinomeve Redlich-Kister dhe një vlerësim i parametrave të përqasjes dhe devijimet standarde përkatëse janë dhënë. Veç kësaj, indekset e thyerjes së përzierjeve binare janë parashikuar duke përdorur shtatë rregulla teorike dhe empirike të përzierjes, dhe rezultatet e fituara janë diskutuar në terma të përqindjeve mesatare të devijimit. Vëllimet molare shtesë V^E në të dyja sistemet kanë qenë negative, dhe përputhën shumë mirë me të dhënat nga literatura.

Fjalët çelës: refraktometri Abbe, polinomet Redlich-Kister, përzierjet binare, vëllimi molar shtesë

SUMMARY

Refractive indices, n_D, and densities, ρ of methanol + water and ethanol + water binary liquid mixtures have been measured at T=293.15 K and atmospheric pressure, over the whole mole fraction range. Refractive indices were measured using an Abbe refractometer with an overall measurement accuracy of ±0.0002. Densities were determined with a pycnometer method with an overall accuracy of ±0.1 kg/m^3. Excess molar volumes, V^E, and deviations in the refractive indices, Δn_D, computed from experimental data, were fitted to the Redlich-Kister polynomial equation and an estimation of the adjustable parameters and standard deviations is given. Furthermore, refractive indices of the binary liquid mixtures were predicted by using seven theoretical and empirical mixing rules, and the obtained results were discussed in terms of average percentage deviations. Excess molar volumes V^E in both systems were negative, and agree very well with the literature data.

Key words: Abbe refractometer, Redlich-Kister polynomials, binary mixtures, excess molar volume

INTRODUCTION

Experimental speed of sound, density, viscosity and refractive index data for liquid mixtures composed of technologically important organic compounds are found to be of great importance both in theory and for industrial purposes. Thermodynamic, volumetric and refractometric parameters such as: molar volume, molar refraction, adiabatic compressibility, intermolecular free length, internal pressure, and many more, may be evaluated from experimental speed of sound, density, viscosity and refractive index data. Furthermore, the excess counterparts of many of the above parameters have been used extensively to interpret qualitatively the type of molecular interactions in many binary liquid mixtures [5, 14-17].

In this study, we report on the density and refractive index data for the binary liquid mixtures of Methanol + Water and Ethanol + Water, as well as for the pure liquids constituting the above binary systems at 293.15 K and atmospheric pressure. From experimental density and refractive index data, excess molar volumes and deviation in refractive indices on mixing were calculated. Furthermore, several mixing rules have been used to predict the refractive indices of the investigated binary systems.

MATERIALS AND METHODS

The chemicals used were triply distilled water, methanol (purity >99.8 %, Sigma-Aldrich) and ethanol (purity >99.8 %. Carlo Erba). Methanol and ethanol were used without further treatment. The purity of the chemicals was assessed by measuring

their densities and refractive indices at temperature 293.15 K and comparing with literature values.

Liquid mixtures, of the investigated binary systems methanol + water and ethanol + water, were freshly prepared in air tight glass bottles by mixing carefully selected volumes of the pure liquids at temperature ~293 K. Extreme care was taken to minimize the preferential evaporation during mixing process, and afterwards during the measurements.

The refractive indices for the sodium D-line, n_D, of the pure liquids as well as those of binary liquid mixtures were measured with a calibrated Abbe refractometer (type AR-12) that has an overall measurement accuracy of ±0.0002. The calibration of the refractometer was performed with triply distilled water, and the readings were verified by using the standard solid sample (K9) supplied with the apparatus. The temperature of the experimental liquids was controlled, within the limits of ±0.04 K, by circulating water into the refractometer using a circulating pump connected to a constant temperature water bath.

The densities of the pure liquids and of binary liquid mixtures were determined with the pycnometer method. The pycnometer made of borosilicate glass having a bulb capacity of approximately 25×10^{-6} m^3 was calibrated with benzene (of G.R. grade with purity >99.8 % from Lach-Ner) at 293.15 K. The pycnometer with experimental liquid was immersed for about 30 minutes in a thermostatic water bath maintained at 293.15 ± 0.04 K, in order to minimize the temperature fluctuations. Mass measurements were made with an analytical balance that has an accuracy of $\pm0.1\times10^{-6}$ kg.

Table 1. Densities and refractive indices of the pure liquids, measured in our laboratory and those reported in literature, at T = 293.15 K and atmospheric pressure.

Liquid	ρ_{Exp} ($kg\cdot m^{-3}$)	ρ_{LIT} ($kg\cdot m^{-3}$)	$n_{D\ EXP}$	$n_{D\ LIT}$
Water	998.1	998.2[1]	1.3330	1.3330[1]
Methanol	791.4	791.3[1]	1.3277	1.3281[2]
Ethanol	789.9	789.4[1]	1.3613	1.3612[2]
				1.3613[3]

RESULTS AND DISCUSSION

A comparison of our measurements of density and refractive index with the data reported in literature for the pure liquids is shown in table 1. An excellent agreement was found between experimental values found in our laboratory and those reported in literature.

Densities and refractive indices of the methanol + water (M+W) and ethanol + water (E+W) liquid mixtures measured at 293.15 K and atmospheric pressure are listed in table 2.

Table 2. Mole fractions of alcohols, x_1, densities, ρ, refractive indices, n_D, excess molar volumes, V^E, and deviations in refractive index, Δn_D, of the investigated binary liquid mixtures at 293.15 K and atmospheric pressure. Volume fractions after mixing, ϕ_1, of the alcohols are also listed.

Mole Fraction, x_1	Volume Fraction, ϕ_1	Density, ρ ($kg\cdot m^{-3}$)	Refractive index, n_D	Excess Molar Volume, V^E (10^{-6} $m^3\cdot mol^{-1}$)	Deviation in Refractive index, Δn_D
(x_1) Methanol + (x_2) Water					
0.0	0.0000	998.1	1.3330	0.0000	0.0000
0.1	0.2025	971.1	1.3372	-0.2976	0.0053
0.2	0.3692	949.3	1.3406	-0.6046	0.0096
0.3	0.5067	927.1	1.3423	-0.8103	0.0120
0.4	0.6210	906.0	1.3424	-0.9476	0.0127
0.5	0.7161	885.3	1.3414	-0.9973	0.0122
0.6	0.7944	864.3	1.3397	-0.9313	0.0109
0.7	0.8606	845.2	1.3375	-0.8245	0.0091
0.8	0.9151	826.0	1.3349	-0.6046	0.0067
0.9	0.9612	808.2	1.3320	-0.3333	0.0041
1.0	1.0000	791.4	1.3277	0.0000	0.0000
(x_1) Ethanol + (x_2) Water					
0.0	0.0000	998.1	1.3330	0.0000	0.0000
0.1	0.2712	968.2	1.3466	-0.5724	0.0059
0.2	0.4629	937.5	1.3567	-0.9031	0.0106
0.3	0.6017	908.9	1.3620	-1.0508	0.0120
0.4	0.7062	885.0	1.3642	-1.1228	0.0112

0.5	0.7862	863.9	1.3648	-1.0959	0.0095
0.6	0.8497	846.2	1.3649	-1.0322	0.0079
0.7	0.9002	830.2	1.3647	-0.8867	0.0062
0.8	0.9412	816.1	1.3639	-0.6928	0.0043
0.9	0.9736	802.5	1.3629	-0.3842	0.0023
1.0	1.0000	789.9	1.3613	0.0000	0.0000

The experimental values of densities were used to calculate the excess molar volumes, V^E, applying the equation (1)

$$V^E = \sum_{i=1}^{2} x_i M_i \left(\rho^{-1} - \rho_i^{-1}\right), \qquad (1)$$

where ρ is the density of the liquid mixture; x_i, M_i, and ρ_i, are the mole fraction, molar mass and density of the pure component liquids, respectively. In table 2 are given the calculated excess molar volumes for the M+W and E+W binary liquid mixtures.

It is evident from table 2 that the experimental refractive indices show a maximum between 0.3 and 0.4 mole fractions of methanol, and between 0.5 and 0.7 mole fractions of ethanol for the M+W and E+W liquid mixtures, respectively, which agrees considerably well with the results of Herraez and Belda [2]. According to Sharma et al. [4], the deviation in refractive index, Δn_D, is a quantity of interest that is closely related to changes in molecular polarisabilities on mixing of component and is also considered as a barometer of interaction between components. Deviation in refractive index has been extensively studied for various binary liquid mixtures [2, 4-9].

In this work, the deviations in refractive index, Δn_D, were calculated from experimental results as suggested by Brocos et al. [9] on a volume fraction basis, i.e., according to equation (2)

$$\Delta n_D = n_D - \sum_{i=1}^{2} \phi_i n_{D,i} \ . \qquad (2)$$

In equation (2), n_D is the refractive index of the mixture; $n_{D,i}$ and ϕ_i are the refractive indices and volume fractions of the pure component liquids, respectively. The volume fractions were calculated according to the following equation

$$\phi_i = \frac{x_i M_i \rho_i^{-1}}{\sum_{j=1}^{2} x_j M_j \rho_j^{-1}} \ . \qquad (3)$$

The deviations in refractive index and volume fractions calculated according to Eq.(2) and Eq.(3), respectively, for the M+W and E+W liquid mixtures are given in table 2.

The calculated excess molar volumes and the deviations in refractive indices on mixing, for the M+W and E+W liquid mixtures, were fitted by the Redlich-Kister [18] polynomial equation of the following form:

$$Y = x_1 x_2 \sum_{i=1}^{5} A_i \left(x_1 - x_2\right)^{i-1} \qquad (4)$$

where $Y = V^E$ or Δn_D; x_1 and x_2 are the mole fractions of alcohols and water, respectively, and the polynomial coefficients A_i (i = 1, 2, …,5) are parameters that were obtained by fitting the equation (4) to the experimental values of V^E and Δn_D (given in table 2) with a least-squares method. The standard deviations were calculated by using the expression

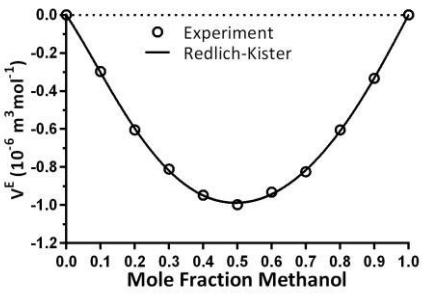
$$\sigma = \left[\frac{\sum_{i=1}^{N} (Y_{\text{exp.}} - Y_{calc.})_i^2}{N - p} \right]^{\frac{1}{2}} , \qquad (5)$$

where Y refers to V^E or Δn_D; N is the number of experimental data points; and p is the number of polynomial coefficients. The subscripts *exp.* and *calc.* represent the experimental value and calculated value, respectively. The values of the polynomial coefficients, A_i, and the standard deviations, σ, for V^E and Δn_D are summarized in table 3.

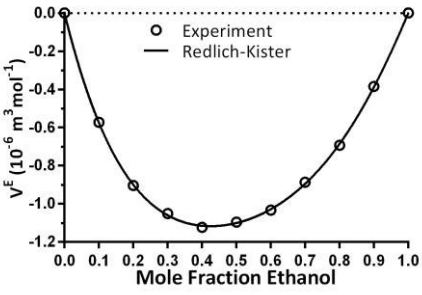
Table 3. Coefficients, A_i, and standard deviations, σ of V^E and Δn_D for the M+W and E+W binary liquid mixtures at 293.15 K and atmospheric pressure.

Excess Molar Volume, V^E		
System / Parameter	**M+W**	**E+W**
A_1	-3.952	-4.400
A_2	0.08703	0.8782
A_3	0.2891	-1.607
A_4	-0.4529	0.6455
A_5	0.6141	0.2187
σ	0.008942	0.007270
Refractive index deviation, Δn_D		

System / Parameter	M+W	E+W
A_1	0.04887	0.03818
A_2	-0.02044	-0.03749
A_3	0.008185	0.03901
A_4	0.01758	0.01729
A_5	-0.005018	-0.04313
σ	8.033×10^{-5}	1.270×10^{-4}

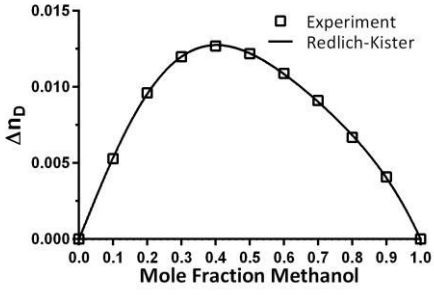


(a)

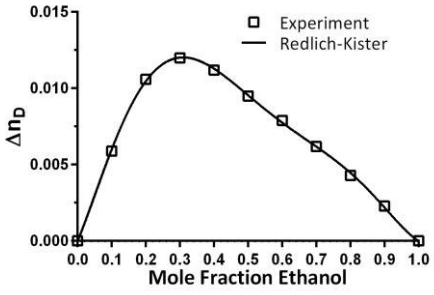


(b)

Figure 1. Excess molar volume plotted against the mole fraction for (a) Methanol+Water and (b) Ethanol+Water binary liquid mixtures.



(a)



(b)

Figure 2. Refractive index deviation plotted against the mole fraction for (a) Methanol+Water and (b) Ethanol+Water binary liquid mixtures.

Table 4. Comparison of minimal values of V^E measured and reported in literature at 293.15 K and atmospheric pressure.

	(*x*) Methanol + Water		(*x*) Ethanol + Water	
Ref.	*x*	V^E (Min) (cm^3/mol)	*x*	V^E (Min) (cm^3/mol)
This work	0.5	-0.9973	0.4	-1.1228
[13]	0.5	-0.9959‡	0.4	-1.1034‡
[2]	0.5	-0.9942‡	-	-
[3]	-	-	0.4	-1.0684‡,#

T = 298.15 K

‡ Interpolated from data given at compositions different from the ones investigated in this work.

Graphical variations of calculated V^E and Δn_D, and the curves representing the best fit values obtained from equation (4) are plotted in Figures 1 and 2, respectively, for the binary liquid mixtures of M+W and E+W. Evidently, both binary mixtures showed negative values for V^E, indicating that there is volume contraction on mixing which may be as a result of strong heteromolecular interactions in the liquid mixtures. Strong heteromolecular interactions may be attributed to charge transfer, dipole-dipole, dipole-induced dipole and hydrogen bonding between the unlike components of the liquid mixtures [10].

V^E shows a minimum located at 0.5 for M+W and 0.4 for E+W binary liquid mixtures. The minimum values of V^E are in excellent agreement with the values found in literature, as can be seen in table 4.

Δn_D values are positive for both binary liquid mixtures over the whole composition range, and seem to be negatively correlated with V^E values. The negative correlation of Δn_D with V^E is a widely valid rule and it may be used as a quick check on the consistency of the data pertaining to V^E [9].

The experimental refractive indices were also compared with the predicted results from the mixing rules proposed by Lorentz and Lorenz (L-L), Eykman (Eyk), Edwards (Edw), Gladstone and Dale (G-D), Eyring and John (E-J), Newton (New), and Oster (Ost), which are given as follows [6, 7, 11, 12]:

$$\text{(L-L):}\ \frac{n_{D,\text{pred.}}^2-1}{n_{D,\text{pred.}}^2+2}=\sum_{i=1}^{2}\phi_i\left(\frac{n_{D,i}^2-1}{n_{D,i}^2+2}\right) \qquad (6)$$

$$\text{(Eyk):}\ \frac{n_{D,\text{pred.}}^2-1}{n_{D,\text{pred.}}^2+0.4}=\sum_{i=1}^{2}\phi_i\left(\frac{n_{D,i}^2-1}{n_{D,i}^2+0.4}\right) \qquad (7)$$

$$\text{(Edw):}\ \frac{n_{D,\text{pred.}}-1}{n_{D,\text{pred.}}}=\sum_{i=1}^{2}\phi_i\left(\frac{n_{D,i}-1}{n_{D,i}}\right) \qquad (8)$$

(G-D): $n_{D,\text{pred.}} - 1 = \sum_{i=1}^{2} \phi_i \left(n_{D,i} - 1 \right)$ (9)

(E-J): $n_{D,\text{pred.}} = \left(\sum_{i=1}^{2} \phi_i n_{D,i}^{1/2} \right)^2$ (10)

(New): $n_{D,\text{pred.}}^2 - 1 = \sum_{i=1}^{2} \phi_i \left(n_{D,i}^2 - 1 \right)$ (11)

(Ost): $$\frac{\left(n_{D,\text{pred.}}^2 - 1 \right)\left(2n_{D,\text{pred.}}^2 + 1 \right)}{n_{D,\text{pred.}}^2} = \sum_{i=1}^{2} \phi_i \left[\frac{\left(n_{D,i}^2 - 1 \right)\left(2n_{D,i}^2 + 1 \right)}{n_{D,i}^2} \right]$$ (12)

In equations (6) to (12), $n_{D,\text{pred.}}$, $n_{D,i}$ and ϕ_i are the predicted refractive index of the mixture, refractive indices and volume fractions of the pure liquids, respectively.

The percentage absolute average deviations (PAAD) of the experimental results from those predicted for the refractive indices are shown in table 5 and are calculated by

$$PAAD(\%) = \frac{100}{N} \sum_{i=1}^{N} \left(\frac{\left| n_{D,\text{exp.}} - n_{D,\text{pred.}} \right|}{n_{D,\text{exp.}}} \right)_i , \quad (13)$$

where N is the number of experimental data points; *exp.* and *pred.* represent the experimental and predicted values, respectively.

As it can be seen in table 5, all the mixing rules performed well for both binary liquid mixtures. Evidently, the Newton's (New) mixing rule showed the best agreement with the experimental values followed by the Oster's (Ost) and Gladstone-Dale's (G-D) mixing rule. The mixing rule by Eykman (Eyk) showed the least agreement with the experimental values. Based on PAAD data, the predicting ability of the mixing rules follows the sequence New > Ost > G-D > E-J > L-L > Edw > Eyk for both binary liquid mixtures.

Table 5. Percentage absolute average deviations (PAAD) in refractive indices for the M+W and E+W binary liquid mixtures at 293.15 K and atmospheric pressure.

Mixing rules	M+W	E+W
L-L	0.56005	0.46959
Eyk	0.56020	0.47333
Edw	0.56017	0.47257
G-D	0.55996	0.46715
E-J	0.56001	0.46850
New	0.55986	0.46445
Ost	0.55991	0.46587

CONCLUSIONS

Densities and refractive indices of methanol + water (M+W), and ethanol + water (E+W) binary liquid mixtures were measured at 293.15 K and atmospheric pressure. From experimental densities and refractive indices, the excess molar volumes, V^E, and deviation in refractive indices on mixing, Δn_D, were calculated.

The values of V^E were negative for both M+W and E+W liquid mixtures, which is an indication of strong intermolecular interactions between the unlike components of the liquid mixtures. The minimum values of V^E, located at 0.5 for M+W and 0.4 for E+W liquid mixtures, are in excellent agreement with the values found in literature.

The values of Δn_D were positive for both M+W and E+W liquid mixtures and are negatively correlated with V^E values, which is a widely valid rule and it may be used as a quick check on the consistency of the data pertaining to V^E.

The experimental values of V^E and Δn_D were successfully correlated with the composition data by means of a five parameter Redlich-Kister type polynomials.

The experimental refractive indices were compared with the predicted results from seven theoretical and empirical mixing rules, namely: Lorentz and Lorenz (L-L), Eykman (Eyk), Edwards (Edw), Gladstone and Dale (G-D), Eyring and John (E-J), Newton (New), and Oster (Ost). All the mixing rules performed well for both binary liquid mixtures. It can be concluded, based on PAAD data, that the predicting ability of the mixing rules follows the sequence New > Ost > G-D > E-J > L-L > Edw > Eyk for both binary liquid mixtures.

ACKNOWLEDGEMENT

Department of Chemistry of FE - University of Prishtina is acknowledged for providing the resources necessary for performing this investigation.

REFERENCES

1. Speight JG (2005): Lange's Handbook of Chemistry, 16 ed., McGraw-Hill, New York. pp. 716-725.
2. Herraez JV and Belda R (2006): Refractive indices, densities and excess molar volumes of monoalcohols + water. J. Solution Chem., 35, 1315-1328.

3. Fantao MJ and Iglesias M (2002): Effect of temperature on the refractive index of aliphatic hydroxilic mixtures (C2-C3). Int. J. Thermophys., 23, 513-527.
4. Sharma S, Bhalodia J, Ramani J, and Patel R (2011): Density, excess molar volumes and refractive indices of β-pinene with o, m, p-xylene and toluene at 303.15, 308.15 and 313.15 K. Phys. Chem. Liq., 49, 765-776.
5. Sheu Y-W and Tu Ch-H (2006): Refractive indices and surface tensions of binary mixtures of isoamyl acetate, ethyl caproate, ethyl benzoate, isoamyl butyrate, ethyl phaenylacetate, and ethyl coprylate with ethanol at (288.15, 298.15, 308.15 and 318.15) K. J. Chem. Eng. Data, 51, 1634-1641.
6. Crisciu A, Secuianu C, and Feroiu V (2014): Densities and refractive indices of 1-hexanol + n-pentadecane binary system at temperatures from (293.15 to 323.15) K. Rev. Chim. (Bucharest), 65, 76-79.
7. Bhatia SC, Tripathi N, and Dubey GP (2001): Refractive indices of binary liquid mixtures of squalane with benzene, cyclohexane and hexane at 298.15 to 313.15 K. Indian J. Pure Appl. Phys., 39, 776-780.
8. Rodríguez A, Canosa J, and Tojo J (2001): Density, refractive index, and speed of sound of binary mixtures (diethyl carbonate + alcohols) at several temperatures. J. Chem. Eng. Data, 46, 1506-1515.
9. Brocos P, Piñeiro Á, Bravo R, and Amigo A (2003): Refractive indices, molar volumes and molar refractions of binary liquid mixtures: concepts and correlations. Phys. Chem. Chem. Phys., 5, 550-557.
10. Wahab MA, Ali MA, Mottaleb MA (2002): Volumetric behaviour of binary liquid mixtures at a temperature of 303.15 K. Bull. Korean Chem. Soc., 23, 953-956.
11. Kumar KA, Srinivasu Ch, and Raju KTSS (2014): Refractive indices measurements for 1,4-dioxane + 1-butanol binary mixture at five temperatures. Int. J. Appl. Sci. Eng. Res., 3, 651-658.
12. Mehra R (2003): Application of refractive index mixing rules in binary systems of hexadecane and heptadecane with n-alkanols at different temperatures. Proc. Indian Acad. Sci. (Chem. Sci.), 115, 147-154.
13. Benson GC, and Kiyohara O (1980): Thermodynamics of aqueous mixtures of nonelectrolytes. I. Excess volumes of Water – n-Alcohols mixtures at several temperatures. J. Solution Chem., 9, 791-804.
14. Chen H-W, and Tu Ch-H (2005): Densities, viscosities, and Refractive indices for binary and ternary mixtures of acetone, ethanol and 2,2,4-Trimethylpentane. J. Chem. Eng. Data, 50, 1262-1269.
15. Aralaguppi MI, Jadar CV, and Aminabhavi TM (1999): Density, viscosity, refractive index, and speed of sound in binary mixtures of acrylonitrile with methanol, ethanol, propan-1-ol, butan-1-ol, pentan-1-ol, hexan-1-ol, heptan-1-ol, and butan-2-ol. J. Chem. Eng. Data, 44, 216-221.
16. Baltazar AE, Rodríguez AL, Hall KR, Estrada MR, and Silva GAI (2003): Experimental densities and excess volumes for binary mixtures containing propionic acid, acetone, and water from 283.15 K to 323.15 K at atmospheric pressure. J. Chem. Eng. Data, 48, 1425-1431.
17. Zhou Q, Song Y, Yu Y, He H, and Zhang S (2010): Density and excess molar volume for binary mixtures of naphthenic acid ionic liquids and ethanol. J. Chem. Eng. Data, 55, 1105-1108.
18. Redlich O and Kister AT (1948): Algebraic representation of thermodynamic properties and the classification of solutions. Ind. Eng. Chem., 40, 345-348.

EDGEWORTH EXPANSIONS FOR BOOTSTRAP CONFIDENCE INTERVALS CORRECTNESS
ZBËRTHIMET EDGEWORTH PËR SAKTËSINË E INTERVALEVE TË BESIMIT BOOTSTRAP

EDLIRA DONEFSKI[1], DANJELA BRAHO[2]
[1]Department of Mathematics-Informatics-Physics, "Fan S. Noli" University, Korçë, Albania
[2]Department of Mathematics-Informatics-Physics, "Fan S. Noli" University, Korçë, Albania
*e-mail: edadonefski@yahoo.com

PËRMBLEDHJE
Intervalet e besimit bootstrap u përcaktuan për herë të parë nga Efroni. Vend të rëndësishëm në teorinë asimptotike për intervalet e besimit bootstrap zenë zbërthimet e Edgeworth. Hall argumentoi hollësisht zbatimin e këtyre zbërthimeve tek intervalet e besimit bootstrap. Sipas tij zbërthimet e Edgeworth janë rezultativë në rendin e saktësisë së këtyre intervaleve. Në këtë punim, ne do të do të krahasojmë rezultatet e simulimeve të intervaleve të besimit bootstrap: të zakonshëm, të studentizuar, kuantile dhe me korrektësi të zhvendosur (BCa). Në punim kemi gjetur me anë të zbërthimeve dhe rendin e saktësisë së probabilitetit të mbulimit të intervaleve të besimit. Me anë të programimeve në R kemi kryer simulime dhe kemi ndërtuar intervale të besimit bootstrap me metodat e mësipërme dhe kemi llogaritur probabilitetin e mbulimit të tyre.
Fjalët kyçe: zbërthimi Edgeworth, bootstrap, interval besimi, probabilitet mbulimi
SUMMARY
Bootstrap confidence intervals were introduced by Efron. Much of the asymptotic theory for bootstrap confidence intervals is based on formal Edgeworth expansions. Hall provided a detailed account of the application of these techniques to bootstrap confidence intervals where he found them to be very useful in obtaining the order of accuracy for the intervals. In this paper, we will give a comparison of simulation results of these bootstrap confidence intervals: basic, studentized, percentile and bias-corrected adjusted (BCa). Also, we will present the order of accuracy of coverage probability of confidence intervals using Edgeworth expansions. With the help of programming in R we have done simulations and we have constructed bootstrap confidence intervals applying the above methods. We have calculated coverage probabilities of these intervals.
Key words: Edgeworth expansion, bootstrap, confidence intervals, coverage probability

---

INTRODUCTION

In this paper, we will see bootstrap confidence intervals procedures: basic, studentized, percentile and bias-corrected adjusted (BCa) and we will give a comparison of simulation results for these bootstrap confidence intervals. Bootstrap confidence intervals were introduced by Efron. More bootstrap samples were recommended to be generated for confidence intervals. Much of the asymptotic theory for these intervals is based on Edgeworth expansions. Hall provided a detailed account of the application of these techniques to bootstrap confidence intervals where he found them to be very useful in obtaining the order of accuracy for the intervals. So, we will present the order of accuracy of coverage probability of confidence intervals using Edgeworth expansions. With the help of programming in R we have done simulations, we have constructed bootstrap confidence intervals and we have calculated coverage probabilities of these intervals.

BOOTSTRAP CONFIDENCE INTERVALS

Bootstrap methods. Efron [7] approximate the unknown distribution of $\hat{\theta}$ from the data sample itself. This is done by repeatedly random samples (called resamples), from the original data sample. These resamples contain the same number of data points n, as the original sample. Because the values are drawn with replacement, the same sample value can occur more than once within a resample. The desired statistic $\hat{\theta}$ is calculated for each resample (denote each resample statistic $\hat{\theta}^*$). The distribution of these $\hat{\theta}^*$'s is an empirical approximation of the population distribution of $\hat{\theta}$. We can use it to find a confidence interval (CI) for $\hat{\theta}$.

A variety of different concepts for producing approximate confidence intervals have been proposed (see e.g. [5] or [6]). Four rather elementary concepts are:

Bootstrap Percentile Interval: In order to construct a confidence interval for a parameter θ we need to know how $\hat{\theta}$ as an estimator of θ varies in repeated sampling from the population. The $(100-\alpha)\%$ bootstrap percentile interval contains the middle $(100-\alpha)\%$ of the bootstrap distribution taking the $\alpha/2$ and $(1-\alpha/2)$ percentile of the bootstrap distribution as interval endpoints: $\left[q^*_{\alpha/2}, q^*_{100-\alpha/2}\right]$. With q^*_c we denote the c percentile of the bootstrap distribution.

Basic Bootstrap Interval: To create a $(100-\alpha)\%$ confidence interval for a parameter θ based on a sample estimate $\hat{\theta}$, we determine the distance that we plausible expect $\hat{\theta}$ to fall from θ at the $\alpha\%$ level. If we knew critical values c_1 and c_2 such that $P(c_1 \le \hat{\theta} - \theta \le c_2) = 1 - \alpha/100$, then we could rearrange the inequalities as follows $P(\hat{\theta} - c_2 \le \theta \le \hat{\theta} - c_1) = 1 - \alpha/100$ to produce a $(100-\alpha)\%$ confidence interval for θ. As we don't know the distribution of $\hat{\theta}$ (or of $\hat{\theta} - \theta$) and their percentiles, we take the corresponding percentiles of the bootstrap distribution. Under the assumption that the percentiles of the sampling distribution and the bootstrap distribution are very close, we obtain

$$(100-\alpha)\% = P(q^*_{\alpha/2} - \hat{\theta} \le \hat{\theta}^* - \hat{\theta} \le q^*_{100-\alpha/2} - \hat{\theta})$$
$$\approx P(q^*_{\alpha/2} - \hat{\theta} \le \hat{\theta} - \theta \le q^*_{100-\alpha/2} - \hat{\theta})$$
$$= P(2\hat{\theta} - q^*_{100-\alpha/2} \le \theta \le 2\hat{\theta} - q^*_{\alpha/2})$$

resulting in $[2\hat{\theta} - q^*_{100-\alpha/2}, 2\hat{\theta} - q^*_{\alpha/2}]$.

Studentized Bootstrap Interval: Similar to the standard normal case the interval is constructed according to $\hat{\theta} \pm q^*_{\alpha} \cdot SE_{Boot}$, where SE_{Boot} is the standard error of the estimator $\hat{\theta}$, estimated from the bootstrap distribution.

BCa Bootstrap Interval: This interval combines the transformation preserving property of the adjusted percentile method and the good coverage properties of the studentized bootstrap confidence intervals. It is a percentile method, where the quantiles to be obtained from the bootstrapped distribution are a function of bias-correction and acceleration terms (see [8], [11]).

EDGEWORTH EXPANSION

Let θ be unknown parameter and $\hat{\theta}_n$ its estimator based on sample size of *n*. Then, for all *x*:

$$P\left(\sqrt{n}\frac{\hat{\theta}_n - \theta}{\sigma} \le x\right) \to \Phi(x), \quad n \to \infty,$$

where $\Phi(x) = \int_{-\infty}^{x} \phi(t)dt$, $\phi(t) = \frac{1}{\sqrt{2\pi}} e^{-\frac{t^3}{2}}$.

Often we can write this as power series in $n^{-\frac{1}{2}}$, (see [2], [3], [4], [10])

$$P\left(\sqrt{n}\frac{\hat{\theta}_n - \theta}{\sigma} \le x\right) = \Phi(x) + n^{-\frac{1}{2}} p_1(x)\phi(x) + \cdots + n^{-\frac{j}{2}} p_j(x)\phi(x) + o(n^{-\frac{j}{2}})$$

This expansion is called Edgeworth Expansion and exists in the sense that for a fixed number of approximating terms, the remainder term is of lower order than the last included term.

In fact, the remainder term $o(n^{-j/2})$ is much smaller, namely $O(n^{-\frac{j+1}{2}})$, [9].

Suppose we have a sample $X_1, \dots, X_n$ and $\hat{\theta}_n = \sum_{i=1}^{n} X_i$,

then,

$$p_1(x) = -\frac{1}{6}\kappa_3(x^2 - 1)$$

$$p_2(x) = -x\left(\frac{1}{24}\kappa_4(x^2 - 3) + \frac{1}{72}\kappa_3^2(x^4 - 10x^2 + 15)\right)$$

where κ_j are the cumulants of X, in particular

$\kappa_3 = E(X - EX)^3$

$\kappa_4 = E(X - EX)^4 - 3(VarX)^2$.

The third cumulant κ_3 refers to skewness, so the term of $n^{-1/2}$ order corrects the basic Normal approximation for the main effect of skewness, while κ_4 refers to kurtosis, so the term of order n^{-1} corrects for the main effect of kurtosis and the secondary effect of skewness.

EDGEWORTH EXPANSIONS FOR CONFIDENCE INTERVALS CORRECTNESS

Suppose we construct a confidence interval (CI) based on the standard normal approximation to

$$S_n = \sqrt{n}(\hat{\theta}_n - \theta)/\sigma$$

where σ is the asymptotic variance of $\sqrt{n}\hat{\theta}_n$.

We will say that a CI has asymptotic coverage α, if

$$P(\theta \in CI) \to \alpha, \text{ as } n \to \infty.$$

We call α the nominal coverage of the CI, for details [10]. The coverage error of CI is the difference between true coverage and nominal coverage,

$$coverage\ error = P(\theta \in CI) - \alpha.$$

One-sided nominal α -level confidence intervals:

$$I_1 = (-\infty, \hat{\theta} + n^{-1/2}\sigma z_\alpha)$$

where z_α is defined by $\Phi(z_\alpha) = \alpha$.

$$P(\theta \in I_1) = P\left(\theta < \hat{\theta} + n^{-1/2}\sigma z_\alpha\right) = P(S_n > -z_\alpha)$$
$$= 1 - (\Phi(-z_\alpha) + n^{-1/2}p_1(-z_\alpha)\phi(-z_\alpha) + O(n^{-1}))$$
$$= \alpha - n^{-1/2}p_1(z_\alpha)\phi(z_\alpha) + O(n^{-1})$$
$$= \alpha + O(n^{-1/2})$$

Two-sided nominal α -level confidence intervals:

$$I_2 = (\hat{\theta} - n^{-1/2}\sigma x_\alpha, \hat{\theta} + n^{-1/2}\sigma x_\alpha)$$

where $x_\alpha = z_{(1+\alpha)/2}$.

$$P(\theta \in I_2) = P(S_n \le x_\alpha) - P(S_n \le -x_\alpha)$$
$$= \Phi(x_\alpha) - \Phi(-x_\alpha)$$
$$+n^{-1/2}[p_1(x_\alpha)\phi(x_\alpha) - p_1(-x_\alpha)\phi(-x_\alpha)]$$
$$+n^{-1}[p_2(x_\alpha)\phi(x_\alpha) - p_2(-x_\alpha)\phi(-x_\alpha)]$$
$$+n^{-3/2}[p_3(x_\alpha)\phi(x_\alpha) - p_3(-x_\alpha)\phi(-x_\alpha)]$$
$$+ O(n^{-2})$$
$$= \alpha + 2n^{-1}p_2(x_\alpha)\phi(x_\alpha) + O(n^{-2}) = \alpha + O(n^{-1})$$

To summarize: Coverage error of one-sided CI: $O(n^{-1/2})$, for two-sided CI: $O(n^{-1})$. The confidence interval that has coverage error of order $n^{-1/2}$ is a first-order correct confidence interval. The confidence interval that has coverge error of order n^{-1} is a second-order correct confidence interval.
This fact has important ramifications for bootstrap iteration, since it means that each iteration reduces the order of error by a factor $n^{-1/2}$ in the case of first-order correct CI, but by n^{-1} in the case of second-order correct CI.

EDGEWORTH EXPANSION FOR STUDENTIZED BOOTSTRAP CASE

We will consider the studentized bootstrap case, see [1].
Consider the following Edgeworth expansion of $(\hat{\theta}-\theta)/\hat{\sigma}$:

$$P\left(\frac{\hat{\theta}-\theta}{\hat{\sigma}} \le x\right) = \Phi(x) + n^{-1/2}p_1(x)\phi(x) + O(n^{-1}).$$

The bootstrap version of Edgeworth expansion usually remains valid in conditional sense, i.e.

$$\hat{P}\left(\frac{\hat{\theta}^* - \hat{\theta}}{\hat{\sigma}^*} \le x\right) = \Phi(x) + n^{-1/2}\hat{p}_1(x)\phi(x) + \cdots + n^{-j/2}\hat{p}_j(x)\phi(x) + \cdots$$

Use the first expansion term only, i.e.

$$\hat{P}\left(\frac{\hat{\theta}^* - \hat{\theta}}{\hat{\sigma}^*} \le x\right) = \Phi(x) + n^{-1/2}\hat{p}_1(x)\phi(x) + O_q(n^{-1})$$

The polynomial $\hat{p}$ is bootstrap version of *p* and the notation "$O_q(n^{-1})$" denotes a random variable that is of order n^{-1} "in probability".
Usually $\hat{p}_1(x) - p_1(x) = O_q(n^{-1/2})$.
Then

$$P\left(\frac{\hat{\theta}-\theta}{\hat{\sigma}} \le x\right) - \hat{P}\left(\frac{\hat{\theta}^*-\hat{\theta}}{\hat{\sigma}^*} \le x\right) = O(n^{-1}).$$

Thus the studentized bootstrap results is in a better rate of convergence than the normal approximation (which is $O(n^{-1/2})$ only).
For the non-studentized bootstrap the rate of convergence is only $O(n^{-1/2})$.
So, we can conclude that basic and percentile intervals are first-order correct confidence intervals. Studentized and BCa intervals are second-order correct confidence intervals.

COMPARISON OF BOOTSTRAP CONFIDENCE INTERVALS

We will illustrate this comparison with an example. Let we consider selling prices of 30 homes in Tirana city, taken from "Çelësi" newspaper. We will do necessary data processing, necessary simulations of this data set, in R programming. Our data set is: 63, 47, 60, 48, 63, 55, 60, 37, 37, 55, 72, 70, 52, 85, 45, 48, 55, 58, 65, 48, 60, 53, 35, 66, 63, 60, 60, 52, 80, 57 (each 000€). Our data came from a normal distribution. Along our work, we have done the simulation for R=1000 bootstrap samples. The mean of our data is nearly 56.96 (000 €). We have calculated different 95% and 99% confidence intervals, like: basic, studentized, percentile and BCa. Here are the results:

	95% CI	Width	Midpoint
Basic	[52.67, 60.97]	8.3	56.82
Stud.	[52.76, 61.29]	8.53	57.025
Perc.	[52.97, 61.27]	8.3	57.12
BCa	[52.97, 61.30]	8.33	57.135

	99% CI	Width	Midpoint
Basic	[51.23, 62.30]	11.07	56.765
Stud.	[51.02, 63.14]	12.12	57.08
Perc.	[51.63, 62.70]	11.07	57.165
BCa	[51.71, 62.86]	11.15	57.285

We can see from the tables that Studentized interval is wider than the other for both cases 95% and 99% levels. The less wide intervals are basic and percentiles intervals. The midpoints of basic and studentized intervals are closer to mean of our data and their values are similar with each other. The midpoints of percentiles and BCa intervals are similar for both cases. 99% level confidence intervals have greater width than 95% level intervals. Midpoints of 95% level confidence intervals are closer to mean of the data than 99% level intervals.
Also, we have calculated coverage probability (CP) for 95% and 99% level, of the confidence interval for mean, for our normal data, coverage probability of the *t* distribution and coverage probability of bootstrap confidence intervals for the mean. The results are as follow:

	CI for mean	CI for *t* distr.	Boot. CI for mean
CP- 95%	0.956	0.948	0.943
CP- 99%	0.993	0.991	0.99

We can see that coverage probability of non bootstrap confidence intervals is closer to our level

95%, than bootstrap confidence intervals. But the coverage probability of bootstrap confidence intervals is closer to 99% level, than non bootstrap confidence intervals.

CONCLUSIONS

At the end of this paper we gave a comparison of simulation results of these bootstrap confidence intervals: basic, studentized, percentile and BCa. We gave the tables of this comparison and we concluded that studentized interval is wider than the others. The wider intervals are studentized and BCa. The midpoints of basic and studentized intervals are closer to mean of our data. Midpoints of 95% level confidence intervals are closer to mean of the data than 99% level intervals. Also, we presented the order of accuracy of coverage probability of confidence intervals using Edgeworth expansions. With the help of programming in R we have done simulations, we have constructed bootstrap confidence intervals and we have calculated coverage probabilities of these intervals. So, coverage probability of nonbootstrap confidence intervals is better than coverage probability of bootstrap case for 95% level and for level 99% coverage probability of bootstrap case is better than non bootstrapconfidence intervals.

REFERENCES

1. Abramovitch L. And Singh K. (1985). *Edgeworth corrected pivotal statistics and the bootstrap*. Ann. Statist. 13.

2.Basna R. (2010): *Edgeworth Expansion and Saddlepoint Approximation for Descrete Data with Applications the Chance Games.* Linnéuniversitetet.

3.Butler R.W. (2007): *Saddlepoint Approximation with Applications.* Cambridge University Press, New York, USA, 145.

4.Casella G. and Berger R. L. (2002): *Statistical Inference, second edition.* The Wadsworth Group, USA. 83-87.

5.Davison A. C. and Hinkley D. V. (1997). *Bootstrap Methods and their Applications*. Cambridge, England: Cambridge University Press.

6.DiCiccio T. J., & Efron B. (1996). *Bootstrap Confidence Intervals (with discussion*). Statistical Science, 11(3), 189-228.

7.Efron B. (1979). The *Jackknife, the Bootstrap, and Other Resampling Plans*. Philadelphia:SIAM Press.

8.Efron B. and Tibshirani R. J. (1993). "*An Introduction to the Bootstrap*." New York: Chapman and Hall.

9.Essen C. G. (1968): *On the Remainder Term in the Central Limit Theorem.* Arkiv Mathematic 8.

10.Hall P. (1992). *The Bootstrap and Edgeworth Expansion.* New York: Springer.

11.Schenker N. (1985). *Qualms about bootstrap confidence intervals*. J. Amer. Statist. Assoc. 80

ON THE MARTINGALE STATISTICAL CONVERGENCE
MBI KONVERGJENCËN STATISTIKORE TË MARTINGALEVE

DANJELA BRAHO[1], EDLIRA DONEFSKI[1]
[1]University "F. S. Noli", Department of Mathematics, Informatics and Physics, Korce, Albania.
e-mail: danjelabraho@ymail.com

PERMBLEDHJE
Konvergjenca statistikore, megjithëse është formuluar rreth 70 vite më parë, në ditët e sotme është koncept që gjen zbatime në fusha të ndryshme të matematikës si në teorinë e masës, seritë trigonometrike, grupet topologjike, teorinë e numrave, hapësirat e Banach, etj. Konvergjenca e martingaleve të funksioneve me vlera në një hapësirë të Banach është trajtuar së pari nga Scalora dhe Chatterji, ndërsa konvergjenca e martingaleve të funksioneve Bochner dhe Pettis të integrueshëm ka qënë temë kryesore studimi e 10 viteve të fundit. Në këtë punim meren në shqyrtim martingale të funksioneve statistikisht të integrueshëm sipas Pettis. Provohet se lema e Uhl për martingalet e funksioneve Pettis të integrueshëm vlen edhe për martingalet e funksioneve st-Pettis të integrueshëm. Në veçanti provohet se një martingale e mbyllur është statistikisht konvergjente sipas normës Pettis. Për më tepër vërtetohet një teoremë konvergjence për martingalet e funksioneve st-Pettis të integrueshëm.
Fjalët çelës: martingale statistikisht konvergjente, st-Pettis i integrueshëm

ABSTRACT
Statistical convergence although is formulated around 70 years before is a concept with many applications in different fields of mathematics as measure theory, trigonometric series, topological groups, number theory, approximation theory, Banach space, etc. The subject of convergence of martingales of functions with values in a Banach space was first treated by Scalora and Chatterji. Convergence of martingales of Bochner and Pettis integrable functions also has been the theme of many papers written over the last ten years. In this paper the martingales of statistically Pettis integrable functions are considered. We extend Uhl's lemma for martingales of Pettis integrable functions to martingales of st-Pettis integrable functions. In particular it is proved that a closed martingale is statistically convergent in the Pettis norm. Moreover we prove a convergence theorem for martingales of st-Pettis integrable functions.
Key words: statistical convergent martingale, st-Pettis integrable

1. INTODUCTION

In recent years, several authors have considered various extensions of the martingale convergence theorems of Uhl [1] as Marraffa [10]. Convergence of martingales of Bochner integrable functions also has been the theme of many papers written over the last ten years. On the other hand martingales of weakly integrable functions have received comparatively little attention, possibly because of theory [7], in the study of strong integral summability, trigonometric series [12] and Banach space [13].

In [11] we have arrived some results on convergence theorems for martingales of statistical Bochner integrable functions. In Section 3 we prove analogous results for statistical Pettis integrable martingales. In particular it is proved that a closed martingale converges statistically in the norm. Also is proved an extension of Lemma 1.4 of Uhl [1] to a martingale of st-Pettis integrable functions. Moreover a convergence theorem for st-Pettis integrable martingales is proved.

the apparent lack of a real structure theory for Pettis integrable functions.

Statistical convergence turned out to be one of the most active fields of research. It seems to have many applications in different fields of mathematics such as: topological groups [2], number theory, measure theory, approximation

2. DEFINITIONS AND PRELIMINARIES

Let E be a Banach space with norm $\|\ \|$, B(E) its unit ball and E* its dual. A subset T of E* is called a total set over E, if $f(x)=0$ for each $f\in T$ implies x=0. Throughout this note $(\Omega,\mathcal{F},P)$ is a probability space and $(\mathcal{F}_n)_{n\in N}$ a family of sub-σ-algebras of $\mathcal{F}$ such that $\mathcal{F}_m\subset\mathcal{F}_n$ if $m<n$. Moreover, without loss of generality, we will assume that $\mathcal{F}$ is the completion of $\sigma(\bigcup_n\mathcal{F}_n)$.

Definition 1: A process $(f_n,\mathcal{F}_n,n\in\square)$ is called a martingale if

i) $(f_n, n \geq 0)$ is adapted to the filtration $(\mathcal{F}_n : n \geq 0)$

ii) $E(|f_n|) < \infty, \forall n$

iii) $\forall n \leq n+1 \quad \forall A \in \mathcal{F}_n \quad \int_A f_n d\mu = \int_A f_{n+1} d\mu$

We follow the notions about the convergence of sequences introduced by Fridy [5], [6] and Gökhan [8], as well as the approach of Schoenberg [9] about integration. The base line concept is the statistical convergence of Fridy [4].

Let $\{f_k\}$ be a sequence of functions with value in vectorial space. For each x of the domain, we consider the functional sequence $(f_k(x))$. We denote with S the set of x where the sequence $\{f_k(x)\}$ converges. The function f defined as

$$f(x) = \lim_{k\to\infty} f_k(x) \; ; \; x \in S$$

is called the limit function of the sequence $\{f_k\}$, we say that sequence $\{f_k\}$ converges pointwise to f for every $x \in S$.

Definition 2: A sequence of functions $\{f_k(x)\}$ is said to be pointwise statistically convergent to f if for every $\varepsilon > 0$ and $x \in S$,

$$\| f_k(x) - f(x) \| < \varepsilon \quad \text{almost all k (a.a.k).}$$

We write $st - \lim f_k(x) = f(x)$ on S.

Definition 3: A sequence of functions $\{f_k(x)\}$ is statistically Cauchy if for each $\varepsilon > 0$, there exists a number $N = N(\varepsilon)$ such that for $n > N(\varepsilon)$

$$\| f_k(x) - f_N(x) \| < \varepsilon .$$

A subset A of the ordered set N of natural numbers is said to have density $\delta(A)$, if $\lim_{n\to\infty} \frac{|A_n|}{n} = \delta(A)$, where $A_n = \{k < n; \, k \in A\}$ and $|A|$ denotes the cardinality of set $A \subset N$.

Lemma Salat. A sequence (x_k) is statistically convergent to L if and only if there exists a set K = $\{k_1<k_2<\ldots\} \subset \mathbb{N}$ that $\delta(K) = 1$ and $\lim_{n\to\infty} x_{k_n} = L$.

The set K is directed and the sequence (x_{k_n}) is called the essential subsequence of (x_k). The above lemma can be formulated:

A sequence (x_k) is statistically convergent to L if and only if there is exists an essential subsequence (x_{k_n}) which converges in usual meaning to limes L. We write $\lim_k f_k = L$.

We can formulate an immediate corollary of Salat's lemma.

The sequence $\{f_k(x)\}$ where $f_k : S \to X$, (X a vectorial normed space) is statistically convergent to f(x), if and only if, there exists an essential subsequence (f_{k_n}) of it that is convergent to f(x).

We follow the definition for statistically Pettis integrable functions from [3].

Let (Ω, Σ, μ) be a measurable space with finite measure μ and X a Banach space.

Definition 4: Let E be a subset of the set Ω. The function $f : \Omega \to X$ is called **statistically Pettis integrable** if

a) The function $x^* f$ is statistically Bochner integrable for every $x^* \in X^*$

b) There exists an element x_E of X such that $x^*(x_E) = st - \int_E x^*(f) \, d\mu$ for every $x^* \in X^*$

The element x_E is called indefinite statistical Pettis integral and denote $x_E = st - \int_E f \, d\mu$.

The set of statistical Pettis integrable functions is a linear space we denote with $\mathcal{P}'(\mathcal{E})$.

In this case we will use $||f|| = \begin{cases} \sup_{n\in K} \int_E \lim f_n d\mu \\ 0 \quad \text{for n} \notin \text{K} \end{cases}$

as a norm for Pettis integral.

3. MAIN RESULT

The following proposition is an extension of Lemma 1.4 of Uhl [1] to a martingale of st-Pettis integrable functions. The proof follows with suitable changes.

Proposition 1. Let $(f_n, \mathcal{F}_n)$ be a martingale of st-Pettis integrable functions.

Then the following are equivalent

(i) there exists an st- Pettis integrable function f such that f_n is $\|.\|$-statistical convergent to f.

(ii) there exists an st- Pettis integrable function f such that $E(f \mid \mathcal{F}_n) = f_n$ for each $n \in$.

(iii) there exists an st- Pettis integrable function f such that for each $A \in \bigcup_n \mathcal{F}_n$ $st - \lim_n P\int_A f_n = st - P\int_A f$.

Proof. Assume (i) holds. Then there exists a function $f : \Omega \to E$, which is st- Pettis integrable and such that $\lim_{n\to\infty} \frac{1}{n} \left| \{k \leq n : \| f_k - f \| \geq \varepsilon\} \right| = 0$

or $\| f_k - f \| < \varepsilon$ a.a.k.

Since $\| f_k - f \| = \sup_{n\in K} \int_A \lim \| f_n - f_k \| d\mu$ we have that

$st - \lim_n P\int_A f_n = P\int_A f$ for all $A \in \mathcal{F}$

and (iii) holds. Moreover if $A \in \mathcal{F}_m$, we get, by the martingale condition, that for all $n > m$

$P\int_A f_n = P\int_A f_m$. Then $P\int_A f = P\int_A f_m$, i.e. $E(f \mid \mathcal{F}_n) = f_n$ that implies (ii).

Conversely assume (iii). Since (f_n) is a martingale it follows that $P\int_A f_n = P\int_A f_m$ for all $n > m$ and $A \in \mathcal{F}_m$, therefore $P\int_A f = P\int_A f_n$, that is $E(f \mid \mathcal{F}_m) = f_m$.

Since f is st- Pettis integrable there exists a simple function $f_\varepsilon = \sum_{i=1}^{l} x_i I_{A_i}$ for which $\|f - f_\varepsilon\| < \frac{\varepsilon}{2}$.

We can assume that, for $i = 1,\ldots,l$, $A_i \in \mathcal{F}_{m_0}$. Hence for $n > m_0$ considering that $E(f_\varepsilon \mid \mathcal{F}_{m_0}) = f_\varepsilon$ and that the conditional expectation is a contraction

$$\| f - f_n\| \le \|f - f_\varepsilon\| + \|f - f_\varepsilon\| <$$

$$< \frac{\varepsilon}{2} + \|E_P((f_\varepsilon - f) \mid \mathcal{F}_n)\| \le$$

$$\le \frac{\varepsilon}{2} + \|f_\varepsilon - f\| < \frac{\varepsilon}{2} + \frac{\varepsilon}{2} = \varepsilon$$

Thus f_n is $\|.\|$-statistical convergence to f , then (i) holds. Trivially (ii) implies (iii) and proposition follows.

The condition (ii) $\Longrightarrow$ (i) in the previous proposition says that a closed martingale is $\|.\|$- statistical convergent. We have the following proposition:

Proposition 2. Let $(f_n, \mathcal{F}_n)$ be a martingale of st-Pettis integrable functions. Then, for all $A \in \bigcup_n \mathcal{F}_n$, the set function $\mu(A) = st - \lim_n P\int_A f_n$ is absolutely continuous and has norm relatively compact range, if and only if the martingale $(f_n, \mathcal{F}_n)$ is $\|.\|-$ st-Cauchy.

Proof. First we prove the necessary part.

Since μ has norm relatively compact range, by Hoffman-Jorgensen Theorem for each $\varepsilon > 0$ there exists a function $H_\varepsilon : \Omega \to E$ such that $H_\varepsilon = \sum_{i=1}^{k} x_i I_{A_i}$ with $A_i \in \bigcup_n \mathcal{F}_n$ and $x_i \in E$ so that

$$\sup\left\{\left\|\mu(A) - \int_A H_\varepsilon\right\| : A \in \bigcup_n \mathcal{F}_n\right\} < \varepsilon .$$

Take $\varepsilon > 0$ and let $H = H_{\varepsilon/4}$, there exist m_0 for which $A_i \in \mathcal{F}_{m_0}$, for $i = 1,\ldots,k$. Since $\mu(A) = st - \lim_n P\int_A f_n$ there is m_0 , such that $\left\|\mu(A) - P\int_A f_n\right\| < \frac{\varepsilon}{4}$ for $n > m_0$. Let $n, m \ge m_0$.

We have

$$\sup\left\{\left\|P\int_A (f_n - f_m)\right\| : A \in \bigcup_n \mathcal{F}_n\right\}$$

$$\le \sup\left\{\left\|P\int_A (f_n - H)\right\| : A \in \bigcup_n \mathcal{F}_n\right\}$$

$$+ \sup\left\{\left\|P\int_A (H - f_m)\right\| : A \in \bigcup_n \mathcal{F}_n\right\}$$

$$\le \sup\left\{\left\|P\int_A f_n - \mu(A)\right\| : A \in \bigcup_n \mathcal{F}_n\right\}$$

$$+ \sup\left\{\left\|\mu(A) - P\int_A H\right\| : A \in \bigcup_n \mathcal{F}_n\right\}$$

$$+ \sup\left\{\left\|P\int_A f_m - \mu(A)\right\| : A \in \bigcup_n \mathcal{F}_n\right\}$$

$$+ \sup\left\{\left\|\mu(A) - P\int_A H\right\| : A \in \bigcup_n \mathcal{F}_n\right\}$$

$$< \frac{\varepsilon}{4} + \frac{\varepsilon}{4} + \frac{\varepsilon}{4} + \frac{\varepsilon}{4} < \varepsilon$$

Then $\| f_n - f_m \| < \varepsilon$ for $n, m \ge m_0$.

Conversely choose $\varepsilon > 0$ and find m_0 such that if $n, m \ge m_0$ then $\| f_n - f_m \| < \varepsilon$. If $\mu_n(A) = P\int_A f_n$ for $A \in \bigcup_n \mathcal{F}_n$ then $\|\mu_n(A) - \mu_m(A)\| \le \| f_n - f_m \| < \varepsilon$.

So the sequence of measures μ_n is Cauchy, therefore $\lim_n \mu_n(A) = \mu(A)$ exists. The functions f_n are st-Pettis integrable, then μ_n has a norm relatively compact range and since the convergence is uniform in $A \in \bigcup_n \mathcal{F}_n$ it follows that μ is absolutely continuous and has a norm relatively compact range.

Theorem 1: Let $(f_n, \mathcal{F}_n)$ be an uniformly integrable martingale of st- Pettis integrable functions and suppose that there exists a st- weakly measurable function $f : \Omega \to E$ such that $x*(f_n)$ converges statistically to $x*(f)$ a.s.. Then f_n is $\|.\|$-statistically convergent to f .

Proof. Since $(f_n)_n$ is uniformly integrable the set function $\nu : \bigcup_n \mathcal{F}_n \to E$ defined as

$$\nu(A) = st - \lim_n P\int_A f_n$$

is an absolutely continuous measure of bounded variation and it can be extended to the whole $\mathcal{F}$ to be an absolutely continuous measure of bounded variation. Moreover for each $\omega \not\in N$ with $P(N) = 0$, $x*(f_n(\omega))$ converges statistically to $x*(f(\omega))$ for each $x* \in E^*$. Hence since f is st-Pettis integrable and $\nu(\Omega) = P\int_\Omega f$. Then for each $A \in \bigcup_n \mathcal{F}_n$, $st - \lim_n P\int_A f_n = P\int_A f$ and the assert folows from Proposition 1.

References

[1] Uhl J.J, Jr. (1972), Martingales of strongly measurable Pettis integrable functions, Trans. of American Math. Soc., Vol. 167, 369-378.

[2] Çakalli H, (2009) A study on statistical convergence. Functional analysis, approximation and computation 1:2, 19-24.

[3] Caushi A, Tato A, (2012) A statistical integral of Bochner type on Banach space, Hikari Ltd Appl. Math. Sci., Vol. 6, no. 137-140, 6857-6870.

[4] Fridy J.A, (1985) "On statistical convergence," Analysis, Vol. 5, no. 4, pp. 301–313.

[5] Fridy J.A, (1993) "Statistical limit points," Proceedings of the American Mathematical Society, vol. 118, no. 4, pp. 1187–1192.

[6] Fridy J.A, Orhan C, (1997) Statistical limit superior and limit inferior, Proc. Amer. Math. Soc., 125, nr. 12, 3625-3631.

[7] Gadijev A.D. and Orhan C, (2002) Some approximation theorems via statistical convergence, Rocky Mountain j. Math., 32, 129-138.

[8] Gökhan A, Güngör M, (2002) On pointwise statistical convergence, Indian Journal of pure and application mathematics, 33(9): 1379-1384.

[9] Schoenberg I. J, (1959) The integrability of certain functions and related summability methods. The American Mathematical Monthly, vol 66, no. 5 pp. 361-375.

[10] Marraffa V, (2000) Convergence of Banach valued stochastic processes of Pettis and McShane integrable functions, AMS Special Session on Nonabsolute Integration University of Toronto, Toronto, Canada, September 23-24.

[11] Braho D, Caushi A, (2015) On the Statistical Convergence of Martingales, Hikari Ltd Appl. Math. Sci., Vol. 9, no. 17, 821- 830.

[12] Zigmund A, (1979) Trigonometric Series. Second sd., Cambridge Univ. Press, Cambridge.

[13] Connor J, Ganichev M and Kadets V, (1989) "A characterization of Banach spaces with separable duals via weak statistical convergence," Journal of Mathematical Analysis and Applications, vol. 244, no. 1, pp. 251–261.

ANTIBIOTIKORESISTANCE IN SOME ISOLATED STRAINS OF SALMONELLA ENTERITIDIS FROM EGG PRODUCTION BIRDS IN THE REGION OF LIPJAN IN KOSOVO

HYZER RIZANI, BESART JASHARI**, SMAJL RIZANI**, PRANVERA CABELI*, TANA SHTYLLA*, SONILA COCOLI*, MUSLI KOZHANI****

* Agricultural University of Tirana, Faculty of Veterinary Medicine, Tirana, Albania

**Food and Veterinary Agency, the Food and Veterinary Laboratory, Prishtina, KOSOVO

Email: hyzer.rizani@gmail.com

Përmbledhje

Qëllimi i këtij studimi ka qenë përcaktimi i ndieshmerisë dhe rezistencës ndaj antibiotikëve të disa shtameve të izoluara të gjinisë Salmonella enteritidis në fermat dhe pularit private për prodhimin e vezëve në Lipjan-Kosovë Izolimi dhe identifikimi është bërë sipas ISO 6579:2002. Nga 104 mostrat e analizuara janë izoluar 11 (10,6 %) shtame të Salmonella spp., dhe nga këto janë konfirmuar 6 (5,76%) shtame të Salmonella enteritidis. Testi i antibiogramit është kryer në 6 shtame të salmonella enteritidis me metodën Kirby-Bauer. Disk metoda e testit të difuzionit në përputhshmeri me standardin e instituteve dhe laboratoreve klinike CLSI. Është përdorur Mueller Hinton agar me disqet e antibiotikëve të grupeve të ndryshme ku kemi fituar këto rezultate në ndjeshmëri dhe rezistencë: Gentamicin 10mcg-S/61.5 dhe R/23.1%, Trimethoprim-sulfamethoxazole Sxt 25 mcg – S/38.5 dhe R/7.7 %, Ampicilin Amp 2 mcg S/15.4 dhe R– 61.5% dhe Cephalexin CL 30mg-S/15.4 dhe R/7.7%.

Fjalët çelës: Patogjen ,pulari, rezistencë, shtame, antibiogram

Summary

The purpose of this study has been the definition of sensitivity and resistance to antibiotics some strains isolated of Salmonella enteritidis genus in farms and private poultry for the production of eggs in Lipjan - Kosovo. Isolation and identification is made according to ISO 6579: 2002. Out of 104 samples analyzed are isolated 11 (10.6%) strains of Salmonella spp., and from the following are confirmed 6 (5.76%) strains of Salmonella enteritidis. Antibiotic test was conducted in six strains of Salmonella enteritidiswith Kirby-Bauer method. Disk diffusion test method in compliance with standard clinical laboratories, institutes and CLSI. Mueller Hinton agar was used with drives of antibiotics of different groups where we get these results in sensitivity and resistance: gentamicin 10mcg-S / 61.5 and R / 23.1%, Trimethoprim-sulfamethoxazole SXT 25 mcg - S / 38.5 and R / 7.7% , Ampicillin Amp 2 mcg S / R 15.4 and 61.5% and Cephalexin 30mg CL-S / 15.4 and R / 7.7%.

Key words: Pathogen, poultry, resistance, strains, sensitivity.

INTRODUCTION

Salmonella represents a bacterial disease of the intestinal tract. Representatives of a group Salmonella gender are bacteria that cause typhoid fever, food poisoning, gastroenteritis, enteric fever and other diseases in humans. Salmonella enteritidis is a gram-negative bacterium shaped rod, known as the cause of the prevalence of diarrheal disease in humans [1]. People become infected mainly through contaminated water or food, especially meat, poultry and eggs. Poultry products and eggs are often contaminated with S. enteritidis, whereas beef products are usually contaminated with S. typhimurium. The fight against these bacteria consists in choosing effective antibiotics when treatment is critical of invasive infections caused by gender of Salmonella species, because of their resistance to antibiotics has increased. Antimicrobial resistance is an increasing problem for human and veterinary public health, since has increase of morbidity and mortality in man and animal. Antibiotics are used to treat infected animals to protect them from infectious diseases, but extensive use of antibiotics can lead to the selection and spread of resistant pathogens like S.enteritidis, who transmitted to humans through contaminated food.

MATERIAL AND METHODS

The study is conducted at the Laboratory of Food and Veterinary Agency in Kosovo. The study was conducted during the period of January to December 2014, with samples of eggs, stool, and organs. There were investigated 104 samples , they were isolated from 11 strains of Salmonella spp, 6 of them are strains of Salmonella enteritidis. 6 tested strains of Salmonella enteritidis in sensitivity and resistance to various antibiotics. Testing is performed by Kirby-Bauer disk diffusion method in accordance with the CLSI standards [1]. The material

used for testing is: Mueller Hinton Agar ground 2 rehydrated in 90 mm plates, NaCl 0.9%, antibiotics, Gentamicin 10mcg, Trimethoprim-sulfamethoxazole SXT 25 mcg, 2 mcg Amp Ampicillin, and 30 mg Cephalexin CL. S.enteritidis strains are previously prepared on the enriched BPW ground, plates are then transferred to the MHA-2 where the extension is done uniformly across the surface of the platter. Later drives antibiotics are placed at a certain distance and the plates were entered and incubated at 37 ^{0}C for 24 hours. After incubation, the results are examined by measurements by noniusit (kaliperit) for each disk (antibiotic).

RESULTS AND DISCUSSION

Laboratory examinations were carried out in Second Level of Security and isolated strains Salmonella enteritidis were tested by antibiograms method. The results obtained for strains in the study are as follows: 61.5% gentamicin, the antibiotic sulfamethoxazole 38.5%. Salmonella enteritidis strains showed the highest resistance to Ampicillin 61.5%, while the average of sensitivity is shown by antibiotic cephalexin 76.9%.

Table 1. Percentage of sensitivity and resistance of the Salmonella enteritidis, towards some antibiotics**.**

Gentamicin (10mcg), Trimethoprim-sulfamethoxazole (SXT 25 mcg), Ampicillin (Amp 2 mcg), cephalexin (CL 30 mg).

As seen from the table above, the strains in the study tested by the method of Kirby Bauer's showed these results in sensitivity 61.5% gentamicin 10mcg, and less sensitive to 38.5% Trimethoprim-sulfamethoxazole SXT 25 mcg ,resistant is shown in antibiotic Ampicillin Amp 2 mcg with 61.5% and with average sensitivity antibiotic cephalexin CL 30 mg 76.9%. The strains of Salmonella enteritidis continue to show resistance toward Ampicillin antibiotic where the 32 isolates 21 are presented as resistant to the Ampicillin antibiotic or expressed in percentage 65.62% in national center for toxicological research in Iraq [7].

Photo.1. Salmonella enteritidis, in Nutrient-Agar

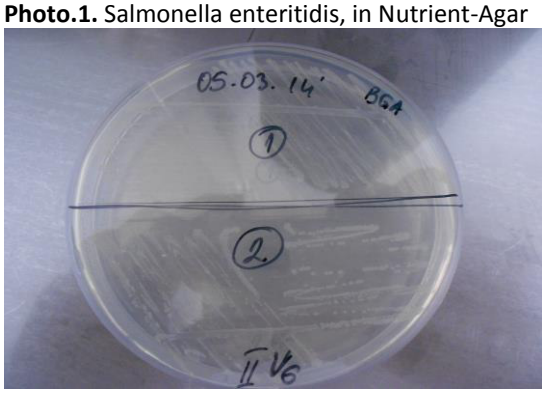
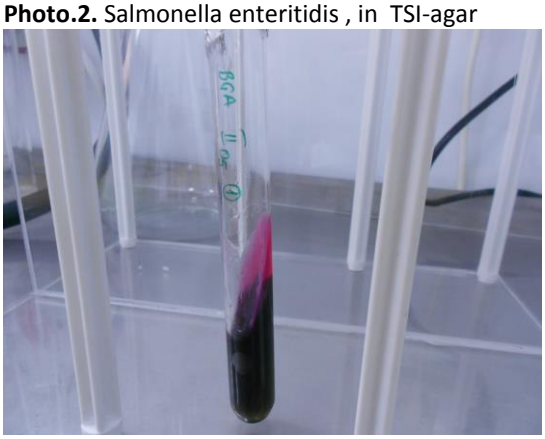


Photo.2. Salmonella enteritidis , in TSI-agar



Also in research conducted in poultry farms in China in 2008, from collected 311 strains from different sources are isolated two serovars, Salmonella indiana 133 (42.8%) and Salmonella enteritidis 178 (57.2%) and is estimated antimicrobial resistance. The results of this study present a resistance and sensitivity consistent with our results [8]. Concern increasing microbial resistance to antibiotics shown in research done in many countries of the world where such a research was done in Brazil and was seen an increase of antibiotic to 18.9% of resistance to ampicillin and gentamicin 9.6%) during the study period [6:10]. Antimicrobial resistance of strains of the Salmonella enteritidis is generally encoded by plasmids, which is obtained as a result of the constant pressure of indiscriminate use of antibiotics in human and veterinary medicine [9].

CONCLUSION

Results obtained on strains of Salmonella enteritidis with sensitivity testing and antimicrobial resistance are as follows:

For the first time evidence of antibiogrames is performed for Salmonella enteritidis strains isolated in poultry farms in the region of Ferizaj

No	Chosen antibiotics	Nr. Of strains	Sensitivity
1	Gentamicin 10mcg	6	61.5%
2	Trimethoprim-sulfamethoxazole	6	38.5%
3	Ampicilin Amp 2 mcg	6	15.4%
4	Cephalexin CL 30 mg	6	15.4%

•Salmonella enteritidis has shown sensitivity to the antibiotic Gentamicin 10 mcg with 61.5% percentage, also a slightly lower sensitivity is presented in antibiotic Trimethoprim-sulfamethoxazole SXT 25 mcg with 38.5% and the antibiotic cephalexin CL 30 with 15.4%.

•Salmonella enteritidis strains are shown resistant to the antibiotic Ampicillin featuring Amp 2 mcg with 61.5% percentage.

• While the antibiotic cephalexin CL 30 mg of Salmonella enteritidis strains presented intermediate 76.9%, also in antibiotic Trimethoprim-sulfamethoxazole SXT 25 mcg presented a percentage of 53.8%.

The first results show that the use of antibiotics in poultry industry in Kosovo becomes indiscrimination. This underlines the need to use antibiotics carefully in veterinary practice to avoid problems of antibiotiko - resistance growing and in human medicine.

LITERATURE

1. Çabeli, P. a. (2006). Bakteriologjia-Mykologji Veterinare. Tiranë: Universiteti Bujqësori Tiranës.
2. F. Polo a, M. F., & *, I. I. (2006, January 17). http://onlinelibrary.wiley.com. Retrieved fromttp://onlinelibrary.wiley.com/doi/10.1111/j.1574-6968.1998.tb12919.x/references.
3. Bauer KA, J Sherris, M Turk.: Antibiotic susceptibility testing by standardized single disc method.Amer. J Clin Pathol, 1966 45: 493-496.
4. Jan Hudzicki: Kirby-Bauer Disk Diffusion Susceptibility Test Protocol. American Society for Microbiology, Washington, DC 2009, Accessed 10 September 2010
5. Salm-Surv, G. (2003). Laboratory Protocols . In R. S. Hendriksen, Laboratory Protocols Level 1 Training Course Identification of Salmonella. Global Salm-Surv.
6. Costa RG, Festivo ML, Araujo MS, Reis EM, Lázaro NS, Rodrigues DP.Antimicrobial susceptibility and serovars of salmonella circulating in commercialpoultry carcasses and poultry products in Brazil. J Food Prot. 2013Dec;76(12):2011-7. doi: 10.4315/0362-028X.JFP-13-164. PubMed PMID: 24290674.
7. Mezal EH, Sabol A, Khan MA, Ali N, Stefanova R, Khan AA. Isolation andmolecular characterization of Salmonella enterica serovar Enteritidis from poultry house and clinical samples during 2010. Food Microbiol. 2014Apr;38:67-74. doi: 10.1016/j.fm.2013.08.003. Epub 2013 Aug 27. PubMed PMID:24290628.
8. Lu Y, Wu CM, Wu GJ, Zhao HY, He T, Cao XY, Dai L, Xia LN, Qin SS, Shen JZ. Prevalence of antimicrobial resistance among Salmonella isolates from chicken in China. Foodborne Pathog Dis. 2011 Jan;8(1):45-53. doi: 10.1089/fpd.2010.0605.Epub 2010 Nov 17. PubMed PMID: 21083518.
9. Threlfall EJ, Frost JA: Plasmid profile typing can be used to subdivide phage type 49 of Salmonella typhimurium outbreakinvestigation. Epid emiol Infect 1990, 104: 243-51.
10. Vaz CS, Streck AF, Michael GB, Marks FS, Rodrigues DP, Dos Reis EM, CardosoMR, Canal CW. Antimicrobial resistance and subtyping of Salmonella enterica subspecies enterica serovar Enteritidis isolated from human outbreaks and poultryin southern Brazil. Poult Sci. 2010 Jul;89(7):1530-6. doi: 10.3382/ps.2009-00453.PubMed PMID: 20548083.
11. Hulaj Beqe, Çabeli Pranvera, Goga Izedin, Shtylla Tana.: Isolation, identification and prevalence of Salmonella spp. in some poultry farm for egg production in Kosovo Albanian j.agric.sci. ISSN: 22182020,(2012), (Special Edition) Copyright © Agricultural University of Tirana.

SIMULATED REGRESION DATA SET USING MULTIPLE IMPUTATION FOR MISSING DATA
SIMULIM TË DHËNASH TË REGRESIT DUKE PËRDORUR IMPUTACIONIN E SHUMËFISHTË PËR VLERAT QË MUNGOJNË

ELJONA MILO[a], LORENA MARGO[a]
[a]Department of Mathematics,Informatics and Physics "Fan S Noli" University, Korçë , Albania
Corresponding author Eljona Milo, eljonamilo@yahoo.com

Përmbledhje
Metodat e regresit kanë rezultuar një mjet i rëndësishëm i analizës së të dhënave, sidomos për gjetjen e lidhjes midis variablave të varur dhe variablave të pavarur. Për shkak se të dhënat e humbura hasen pothuajse në çdo studim, ato mund të zvogëlojnë performancën e intervaleve të besimit, reduktojnë konkluzionin statistikor dhe sjellin zhvendosje të parametrave të vlerësimit, për këtë arsye do të shohim lloje të ndryshme mekanizmash për plotësimin e vlerave të humbura si dhe efektet e tyre në analizën e këtyre të dhënave. Do të shohim imputacionin e shumëfishtë si një zgjidhje të mundshme. Ideja themelore është që të plotësohen vlerat e humbura tek të dhënat regresit me një vlerën e përshtatshme, bazuar tek të dhënat që disponojmë. Do të përdorim gjuhën e programimit R për të realizuar simulimet dhe do të krahasojmë rezultatet e vlerësimeve me dhe pa imputacionin e shumëfishtë kur dihet se të dhënat kanë humbur në mënyrë të rastësishme.
Fjalët Çelës : Regresion, vlera të humbura, imputacioni i shumëfishtë.
Abstract
Regression methods have became an important component of any data analysis focused in describing the relation between the dependent variables and independent variables. Because the missing data arises in virtually every study, they may degrade the performance of confidence intervals, reduce statistical power and bias parameter estimate. We first will see various types of missing data mechanisms that data can go missing, each of which has a different effect on the analysis. In this case we see multiple imputation as a possible solution. The basic idea is to fill in the missing data from regression with a appropriate value, based on any information at hand. We will use the R language for the simulations and we will compare the results from the regression with and without multiple imputation when the data are missing completely at random. We will show that under the missing data mechanisms can derive valid inferences using simulations data sets.

Key words: Regression, missing value, multiple imputation, R packages.

INTRODUCION

Regression analysis is used for explaining or modeling the relationship between a single variable *Y*, called the *response*, *output* or *dependent* variable, and one or more *predictor*, *input*, *independent* or *explanatory* variables, $X_1,...,X_p$. When $p=1$ it is called simple regression but when $p>1$ it is called multiple regression or sometimes multivariate regression. When there is more than one *Y*, then it is called multivariate multiple regression, which we will not be covering here.

The response must be a continuous variable but the explanatory variables can be continuous, discrete or categorical.

Statistical inference with missing data is an important applied problem, because missing values are commonly encountered in practice. In this article I update earlier reviews for a particular missing-data problem, namely, inference for the regression, of $Y=X_{p+1}$ on p variables $X_1,...,X_p$, based on a random sample of n cases, when some of the X values are missing.

Research has primarily focused on homoscedastic linear regression, where

$$E(Y/X_1,...,X_p)=\beta_0+\sum_{j=1}^{p}\beta_j X_j$$

$$\text{var}(Y/X_1,...,X_p)=\sigma^2 \quad (1)$$

Write $\beta=(\beta_1,...,\beta_p)$. If $X_1,...,X_p,Y$ have a joint distribution with mean $\mu=(\mu_1,...,\mu_p,\mu_y)$ and covariance matrix $\Sigma=\begin{pmatrix}\Sigma_{xx} & \Sigma_{xy}\\ \Sigma_{yx} & \Sigma_{yy}\end{pmatrix}$, then standard regression theory gives $\beta=\Sigma_{yx}\Sigma_{xx}^{-1}$,

$$\beta_0=\mu_y-\sum_{j=1}^{p}\beta_j\mu_j\,,\ \sigma^2=\sigma_{yy}-\Sigma_{yx}\Sigma_{xx}^{-1}\Sigma_{xy} \quad (2)$$

With complete data, least squares (LS) estimates are obtained by replacing , μ and Σ by sample first and second moments; the primary problem considered is to develop estimates of parameters and associated precision when some data are missing.

MATERIALS AND METHODS

Multiple imputation

In multiple imputation, the imputatin process is repeated multiple times resulting in multiple imputed datasets. In this method the imputation uncertainty is accounted for by creating these multiple datasets. The multiple imputation process contains three phases: the imputation phase, the analysis phase and the pooling phase (Rubin, 1987; Shafer, 1997; Van Buuren, 2012).

Multiple imputation works well when missing data are MAR (Missing At Random). In the imputation model, the variables that are related to missingness, can be included and the bias is reduced and estimates are more precise.

In the first phase, the imputation phase, several copies of the data set are created each containing different imputed values. The imputed values are estimated using the means and covariance of the observed data. Regression equations are used to predict the incomplete values from the complete values and a normally distributed residual term is added to each value to restore variability. This procedure is similar to stochastic regression imputation. This process is iterated several times, updating the regression parameters after every iteration, to obtain different imputed values each time. Every so many iterations, one imputed dataset is stored until the required number of imputed datasets is reached.

The specification of the correct imputation model is very important for the performance of multiple imputation. Firstly, it is important to include the correct variables in the imputation process. Accordingly, all variables that are of substantial interest should be included in the imputation model, so the predictor variables, covariates and outcome variables from the main analysis. Besides these variables, auxiliary variables can be included to improve the estimation of the imputed values. Secondly, it is important to have an imputation model that fits the distribution assumptions of the data. So when incomplete data are continuous and normally distributed, a multivariate normal distribution or linear regression can be used for the imputation.

In the second phase, the analysis phase, the statistical analysis is carried out. On each imputed dataset, the analysis is carried out that would have been applied had the data been complete. That way as many sets of results are created as the number of imputed datasets created in the imputation phase. Finally, in the pooling phase, the multiple sets of results or parameter estimates are combined into a single set of results.

Missing value mechanisms

There are three important cases to distinguish for the responsible generating processes behind missing values (see Rubin, 1976; Schafer, 1997; Little and Rubin, 2002). Let $X=\left(x_{ij}\right),1\le i\le n,1\le j\le p$ denote the data, where n is the number of observations and p the number of observed variables (dimensions), and let $M=\left(M_{ij}\right),1\le i\le n,1\le j\le p$ be an indicator whether an observation is missing $\left(M_{ij}=1\right)$ or not $\left(M_{ij}=0\right)$. The missing data mechanism is characterized by the conditional distribution of M given X, denoted by $f\left(M/X,\phi\right)$, where ϕ indicates unknown parameters. Then the missing values are MAR, if it holds for the probability of missingness that

$$f\left(M/X,\phi\right)=f\left(M/X_{obs},\phi\right) \quad (1)$$

where $X=(\mathrm{X}_{obs},\mathrm{X}_{miss})$ denotes the complete data, and X_{obs} and X_{miss} are the observed and missing parts, respectively. Hence the distribution of missingness does not depend on the missing part X_{miss}.

If in addition the distribution of missingness does not depend on the observed part X_{obs}, the important special case of MAR called Missing Completely At Random (MCAR) is obtained, given by

$$f\left(M/X,\phi\right)=f\left(M/\phi\right) \quad (2)$$

If Equation (1) is violated and the patterns of missingness are in some way related to the outcome variables, i.e., the probability of missingness depends on X_{miss}, the missing values are said to be Missing Not At Random (MNAR). This relates to the equation $f\left(M/X,\phi\right)=f\left(M/(X_{obs},X_{miss}),\phi\right)$. (3)

Hence the missing values cannot be fully explained by the observed part of the data.

It is often difficult to detect the missing values mechanism in practice exactly, because this would require the knowledge of the missing values themselves (Little and Rubin, 2002). Multivariate data with missing values in several variables can make it even more complicated to distinguish between the missing value mechanisms. The situation can become even worse in case of outliers, inhomogeneous data or skewed data distributions. Nevertheless, those are general limitations for detecting missing value mechanisms not only affecting visualization. Visualization of missing values provides a fast way to distinguish between MCAR and MAR situations, as well as to gain insight into the quality and various other aspects of the underlying data at the same time.

MAR responses in the linear model

Consider the linear model $y = X\beta + e$ (4)

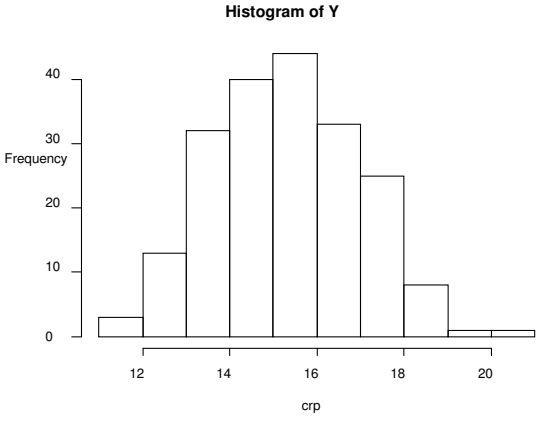
where β is a $p \times 1$ vector of unknown parameters, **X** is an $n \times p$ full rank matrix of explanatory variables including an intercept, and **e** is an $n \times 1$ vector of random errors with $e \sim N(0, \sigma^2 I)$, where σ^2 is assumed unknown throughout. We assume throughout that **X** is fully observed and the components of **y** are MAR. For simplicity, we rearrange the data so that $y_1 = (y_1, \ldots, y_{nt})^t$ are fully observed and $y_2 = (y_{nt+1}, \ldots, y_n)^t$ are MAR, and assume that the corresponding $n_1 \times p$ and $n_2 \times p$ matrices of fixed covariates $\mathbf{X_1}$ and $\mathbf{X_2}$ for $\mathbf{y}_1$ and $\mathbf{y}_2$ are full-rank, $n_1 + n_2 = n$ and $p < n_1$. Therefore, we write $y = (y_1^t, y_2^t)^t$ and $X = (X_1^t, X_2^t)^t$.

RESULTS AND DISCUSSION

Simulated Regression Data Set

Suppose we have the following regression equation $Y = 5 + 0.2 \times age + 0.5 \times sex$. Assume sex is coded as 1 = male, and 0 = female, so males have slightly higher values than females, and Y tends to rise with age, by about 2 points per decade. Suppose that the residual standard deviation is $\sigma = 1$.

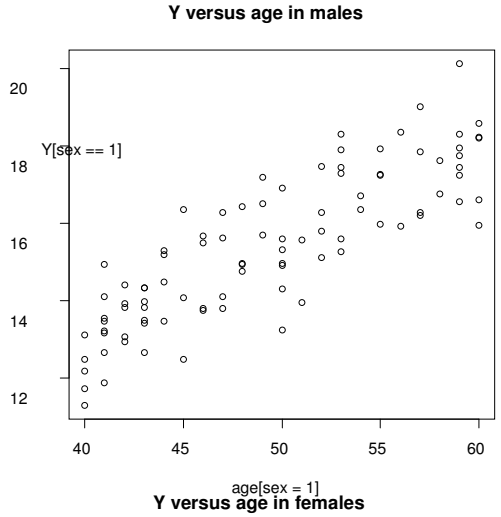
We will now simulate data on 200 subjects, aged between 40 and 60 years old, and evenly divided between males and females. We can simulate such a data set in R. With hist(age) comand we see the graphic of this data

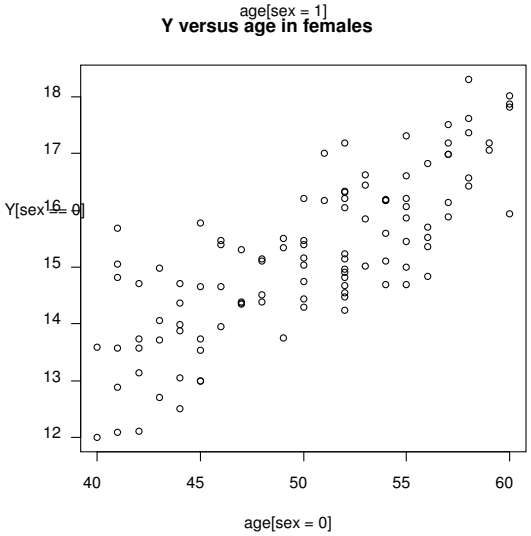


We use in R software the following regression equation:

Y <- 5 + 0.2*age + 0.5*sex + rnorm (200, mean=0, sd=1).

We can examine the scatter plots in both males and females:





Finally, we can do a frequent regression analysis in R to check that the two coefficients are well estimated by least squares, and with no missing data, and we see:

Residual standard error: **0.9449** on **197** degrees of freedom

Multiple R-squared**: 0.6755**, Adjusted R-squared: **0.6722**

F-statistic: 205.1 on 2 and 197 DF, p-value: < 2.2e-16

So everything seems to have worked extremely well. This is not at all surprising, since we simulated data via an exactly linear equation, and then estimated coeffcients from a model that was exactly correct. What happens if we have missing data? Suppose that, in particular, 1/3 of the age and 1/3 of the sex data are in fact missing.

First suppose they are missing completely at random (MCAR). As the name implies, under MCAR, the data points are simply missing completely at random,

with no relation of the probability of being missing to any values in the data set. To create a data set that is MCAR, we simply need to delete some items in each of the age and sex variables. We create the missing data and try the regression again, and we obtain:

Residual standard error: **0.9518** on **131** degrees of freedom (66 observations deleted due to missingness)
Multiple R-squared: **0.6596**, Adjusted R-squared: **0.6544**
F-statistic: 126.9 on 2 and 131 DF, p-value: < 2.2e-16

Note two effects of the MCAR missing data: First, much “power" is lost, as estimation now based on only 131 DF, rather than the 197 we had before, i.e., only 79 subjects were used in the analysis. Thus, standard errors have increased considerably. Age still reasonably well estimated, but not sex. 95% CI still easily includes both effects of age and sex, however, so no evidence of bias in the analysis. In general, under MCAR, expect loss of power, but no bias.
We can do a similar analysis, but with MAR rather than MCAR. In MCAR, the missing data probabilities are completely unrelated to the values of the missing items or any other values in the data set. In contrast, for MAR missing data, the probability that an item is missing can be related to values, but only observed values, not unobserved values. The idea is that under MAR data, one can use observed values to “recapture" the essence of the missing data, and so still derive valid inferences.
Both MCAR and MAR missing data mechanisms are termed ignorable, because conditional on the observed data set, one can derive valid inferences. Missing data mechanisms are termed nonignorable if the missing data can depend on unobserved values, so that even conditioning on the observed data does not produce valid inferences.
In practice, one can never know if missing data mechanisms are ignorable or not, so it is wise to present several analyses considering both cases, and investigate robustness of inferences to various assumptions. Note that the width of the CI went from about 0.47 (no missing data) to 0.63 with the missing data, but there was no bias, the mean being about 15.3 in both cases.
To simulate a data set that is MAR, we need to delete missing data not at random, but in a systematic and biased fashion. To remain ignorable, we need to delete values such that the bias can (more or less, in real practice) be corrected with the observed data at hand. So, what happens if we delete Y values from higher age values, and delete more Y values from males compared to females? Clearly, this will cause a bias in estimated Y values (but not necessarily in the regression values, as regression coefficients are the same regardless of age, sex, or Y values). Can we adjust back to recapture the ”true" mean values of Y?
First, let's create a data set with an MAR missing mechanism, where Y values tend to be missing from persons with higher ages. Age ranges from 40 to 60 in our data set. We will delete Y values in the range from 40 to 49 with a rate of 10%, while Y values from ages in the range 50 to 60 will be deleted with a probability of 0.6.

See our result in Table 1:

	Mean	CI95%
Reg.(real data)	15.3	0.47
MCAR Reg	15.2	0.63
MAR Reg	14.8	0.55

Table 1

Note that the mean point estimate is quite far from the”true" value of 15.3, and even the 95% CI misses the true value by quite a large margin.

CONCLUCIONS

So, here we have seen two problems associated with missing data: Lack of precision is estimated values due to lower sample size, and biased estimation due to data not being missing completely at random.
We have seen two extremes of the use of multiple imputation: In the first case, not much was gained, as with MCAR data the case deletion method did quite well. In the second case multiple was extremely useful, adjusting for bias in the MAR data, and increasing precision beyond what was in the original data set by itself.
While multiple imputation is sometimes useful, it can also sometimes do worse than other methods. Further, except for simulated data sets, one cannot usually tell which sort of situation we are in.
All of the above have assumed MCAR or MAR missing data mechanisms. Under MCAR or MAR, the missing data mechanism is “ignorable", meaning in practice that the data analyst can derive valid inferences from the data, provided a technique like multiple imputation is use

REFERENCES

1.Allison. P.D (2005). Fixed Effects Regression Using SAS. Cary,
NC:SAS Institute

2. J.G.Ibrahim ,S.R Lipstiz, M.H.Chen, (1999)Missing linear models when the missing data mechanism is nonignorable, J.Roy.Statist. Soc.Ser.B 61 173-190

3. Allison.P.D (2001).Missing Data .London: Sagee Publications, Inc

4. B. and Schenker.N (1986). Multiple Imputation for interval estimation from simple random samples with ignorable nonresponse. Journal of the American Statistical Assocation, 81,366-374

5 Gelman.A, King G, Liu C (1988). Not Asked and Not Answered: Multiple Imputation for Multiple Surveys. Journal of the American Statisrical Association. 93 (443), 846-857.

6.Horton.N.J, Lipsitz(2001). Multiple Imputation in Practice: Comparison of Software Packages for Regresion Model With Missing Variables. The American Statistician,vol55,p 244-254

7.Kropko,J,Goodrich.B,Gelman.A,Hill.J(2013).
Multiple Imputation for Continuous and Categorical Data: Comparing Joint and Conditional Approaches

8. Little. R, Rubin.D (1987).Statistical Analysis with Missing Data. Wiley, New York

9. Little. R, Rubin.D (2002).Statistical Analysis with Missing Data.2nd edition. John Wiley&Sons,Hoboken

10.Julian.J .F (2002). Practical Regression and Anova using R

11. Rubin D (1976).Inference and Missing Data. Biometrika, Vol.63, No3, 581-592

12. Schafer.L.J (1997).Analysis of Incomplete Multivariate Data.

13. Lipsitz SR, Ibrahim JG. A conditional model for incomplete covariates in parametric regression models. Biometrika. 1996;83:916–922.

14. Rubin D. Discussion to S. F. Nielsen (2003): Discussion on multiple imputation. International Statistical Review. 71:619–625.

15. Allison, P. D. (2001). Missing Data. London: Sage Publications, Inc.

16. Chen.Q , Ibrahim.JG , Chen.MH, Senchaudhuri.P (2008). Theory and inference for regression models with missing response and covariates. Journal of Multivariate Analysis. 2008;99:1302–1331

17. Liu.F , Rubin. D (2014). Using Multiple Imputation for Vote Choice.Data:A Comparison across Multiple Imputation, Open Journal of political ScienceVol.4,No.2

18. van Buuren S (2012). *Flexible Imputation of Missing Data*. Chapman & Hall/CRC Press, Boca Raton, FL. 342 pages. ISBN 9781439868249

DIFFERENT METHODS OF ESTIMATION FOR NEW LIFETIME DISTRIBUTION
METODA TË NDRYSHME PËR VLERËSIMIN E PARAMETRAVE PËR SHPËRNDARJEN E RE KOHORE

ARBËR QOSHJA
Departamenti i Matematikës së Aplikuar, Tiranë
Universiteti i Tiranës
Shqipëri
arberqoshja1@gmail.com

Abstract: - In this paper, firstly we briefly describe some different classic and modern methods of estimations, namely method of maximum likelihood estimators, method of moments estimators, method of percentile based estimators, method of least squares estimators, Maximum product spacing estimates, Methods of minimum distances, method of Cramer-von-Misses and methods of Anderson-Darling. The aim of this paper is to consider different estimators for new lifetime distributions which is introduced by in 2014 by Sarhan et al. We will use Monte Carlo simulations to conclude which method has better performance basen on their mean square error on the basis of simulates sample from pdf of NLD with varying sample sizes. We calculate MLEs, LSEs, LSWEs, MADEs, MPSs etc estimators of lambda based on each generated sample.

Key-words : New lifetime distribution; Lindley distribution; Bias; Mean squared errors; Method of moment estimators; Least squares estimators; Simulations.

Introduction

Lifetime distribution represents an attempt to describe, mathematically, the length of the life of a system or a device. Lifetime distributions are most frequently used in the fields like medicine, engineering etc. Many parametric models such as exponential, gamma, Weibull have been frequently used in statistical literature to analyze lifetime data. But there is no clear motivation for the gamma and Weibull distributions. They only have more general mathematical closed form than the exponential distribution with one additional parameter.

Recently, one parameter Lindley distribution has attracted the researchers for its use in modelling lifetime data, and it has been observed in several papers that this distribution has performed excellently. The Lindley distribution was originally proposed by Lindley in the context of Bayesian statistics, as a counter example of fiducial statistics which can be seen that as a mixture of $\exp(\theta)$ and $gamma(2,\theta)$.

Some of the advances in the literature of Lindley distribution are given by Ghitany et al. (2011) who has introduced a two-parameter weighted Lindley distribution and has pointed that Lindley distribution is particularly useful in modeling biological data from mortality studies. Mahmoudi et al. (2010) have proposed generalized Poisson Lindley distribution. Bakouch et al. (2012) have come up with extended Lindley (EL) distribution, Adamidis and Loukas (1998) have introduced exponential geometric (EG) distribution. Shanker et al. (2013) have introduced a two-parameter Lindley distribution. Zakerzadeh et al. (2012) have proposed a new two parameter lifetime distribution: model and properties. M.K. Hassan (2008) has introduced convolution of Lindley distribution. Ghitany et al. (2013) worked on the estimation of the reliability of a stress-strength system from power Lindley distribution. Elbatal et al. (2013) has proposed a new generalized Lindley distribution.

Definition 1. *A random variable X is said to have Lindley distribution with parameter θ if its probability density function is defined as:*

$$g_X(x,\theta)=\frac{\theta^2}{1+\theta^2}(1+x)e^{-\theta\cdot x};\ x>0,\theta>0, \qquad (1)$$

with cumulative distribution function

$$G_X(x,\theta)=1-\frac{e^{-\theta\cdot x}(1+\theta+\theta x)}{1+\theta}. \qquad (2)$$

In 2014, Sarhan et al. introduced a new one-parameter distribution called new lifetime distribution which is similar to the Lindley distribution.For more detail see [12].

Definition 2. *A continuous random variable X is said to have new lifetime distribution if the probability density of X is:*

$$f(t)=\frac{\beta}{1+\beta}\left[\beta+(1+2\beta t)e^{-\beta t}\right]e^{-\beta t} \qquad (3)$$

The comulative distribution function of new lifetime distribution is:

$$F(t) = 1 - \frac{1}{1+\beta}\left[\beta + (1+\beta t)e^{-\beta t}\right]e^{-\beta t} \quad (4)$$

The survival function of new lifetime distribution is:

$$S(t) = \frac{1}{1+\beta}\left[\beta + (1+\beta t)e^{-\beta t}\right]e^{-\beta t} \quad (5)$$

and the hazard rate distribution is given by:

$$h(t) = \frac{\beta\left[\beta + (1+2\beta t)e^{-\beta t}\right]}{\beta + (1+2\beta t)e^{-\beta t}} \quad (6)$$

The main aim of this paper is to consider different estimators and study how the estimators of the different unknown parameter behave for different sample sizes

2. Maximum likelihood estimates

Let $x_1, x_2, ..., x_n$ be a (iid) observed random sample of size n from new lifetime distribution (3). Then, the likelihood function based on observed sample is defined as

$$l(x,\beta) = \left[\frac{\beta}{1+\beta}\right]^n e^{\beta\sum_{i=1}^{n} x_i} \prod_{i=1}^{n}\left[\beta + (1+2\beta x)e^{-\beta x_i}\right] \quad (7)$$

The log-likelihood function corresponding to (7) is given by

$$\log l = n\ln\beta - n\ln(1+\beta) - \beta\sum_{i=1}^{n} x_i + \prod_{i=1}^{n}\ln\left[\beta + (1+2\beta x)e^{-\beta x_i}\right] \quad (8)$$

The maximum likelihood estimates $\hat{\beta}$ of β can be obtained as the simultaneous solution of the following non-linear equations:

$$\frac{\partial \log l}{\partial \beta} = 0 \quad (9)$$

3. Moments Estimators

The moments of estimators of the one-parameter new lifetime distribution can be obtained by equating the first theoretical moment of (3) with the sample moments $\frac{1}{n}\sum_{i=1}^{n} x_i$, *because* the law of large numbers states that $\frac{1}{n}\sum_{i=1}^{n} x_i \to \mu_X, n \to \infty$, *so*

$$\frac{1}{n}\sum_{i=1}^{n} x_i = \frac{1}{1+\beta}\left[1 + \frac{1}{4}\left(1 + \frac{1}{\beta}\right)\right] \quad (10)$$

4. Method of Modified Moments

The estimate $\hat{\beta}$ of β by using method of modified moments, can be obtained by solving the non-linear equation

$$\frac{\sqrt{Var(X \mid \beta)}}{E(X \mid \beta)} - \frac{s}{\bar{x}} = 0 \quad (11)$$

where $\bar{x}$ and *s* are the sample mean and sample standard deviation respectively.

5. Maximum product spacing estimates

The maximum product spacing (MPS) method has been proposed by Cheng and Amin which is based on an idea that the differences of the consecutive points should be identically distributed.

The geometric mean of the differences is given as

$$GM = \sqrt[n+1]{\prod_{i=1}^{n+1} D_i} \quad (12)$$

where, the difference D_i is defined as

$$D_i = \int_{x_{(i-1)}}^{x_{(i)}} f(x,)dx; \quad i = 1,2,\ldots,n+1. \quad (13)$$

where, $F(x_{(0)},\beta) = 0$ and $F(x_{(n+1)},\beta) = 1$. The MPS estimator $\hat{\beta}_{PS}$ of β is obtained by maximizing the geometric mean (GM) of the differences. Substituting (3) in (12) and taking logarithm of the above expression, we will have

$$LogGM == \frac{1}{n+1}\sum_{i=1}^{n+1}\log\left[F(x_{(i)},\beta) - F(x_{(i-1)},\beta)\right] \quad (14)$$

The MPS estimator $\hat{\beta}_{PS}$ of β can be obtained as the simultaneous solution of the following non-linear equation:

$$\frac{\partial LogGM}{\partial \beta} = = \frac{1}{n+1}\sum_{i=1}^{n+1}\left[\frac{F'_\beta(x_{(i)},\beta) - F'_\beta(x_{(i-1)},\beta)}{F(x_{(i)},\beta) - F(x_{(i-1)},\beta)}\right] = 0 \quad (15)$$

6. Methods of Minimum Distances

Most theoretical studies of minimum distance estimation, and most applications, make use of

"distance" measures which underlie already-established goodness of fit tests: the test statistic used in one of these tests is used as the distance measure to be minimized.In this subsection we present three estimation methods for $\hat{\beta}$ based on the minimization, with respect to β, of the goodness-of-fit statistics. This class of statistics is based on the difference between the estimate of the cumulative distribution function and the empirical distribution function.

6.1 Method of Cramer-von-Mises

The Cramer-von - Mises uses the integral of the squared difference between the empirical and the estimated distribution function. The Crame-von Mises estimates $\hat{\beta}$ of the parameters β *is* obtained by minimizing, with respect to β the function:

$$C(\beta) = \frac{1}{12n} + \sum_{i=1}^{n}\left(F(x_i \mid \beta) - \frac{2i-1}{2n} \right)^2 \qquad (16)$$

6.2 The Anderson-Darling estimates

The Anderson-Darling test is similar to the Cramér–von Mises criterion except that the integral is of a weighted version of the squared difference, where the weighting relates the variance of the empirical distribution function

The Anderson-Darling test was developed in 1952 by T.W. Anderson and D.A. Darling as an alternative to other statistical tests for detecting sample distributions departure from normality. The Anderson-Darling estimates $\hat{\beta}$ of the parameter β is obtained by minimizing, with respect to β, the function:

$$A(\beta) = -n - \frac{1}{n}\sum_{i=1}^{n}(2i-1)\left(\log F(x_i \mid \beta) + \log \overline{F}(x_i \mid \beta)\right) \qquad (17)$$

6.3 The Right tail Anderson-Darling estimates

The Right-tail Anderson-Darling estimates $\hat{\beta}$ of the parameter β is obtained

by minimizing, with respect to β, the function:

$$R(\beta) = -\frac{n}{2} - 2\sum_{i=1}^{n} F(x_i \mid \beta) - \frac{1}{n}\sum_{i=1}^{n}(2i-1)\log \overline{F}(x_i \mid \beta) \qquad (18)$$

7. Least square estimates

The least square estimators and weighted least square estimators were proposed by Swain, Venkataraman and Wilson to estimate the parameters of Beta distributions.

Let $x_{(1)}, x_{(2)}, \dots, x_{(n)}$ be the ordered sample of size n drawn the new weighted Lindley distribution population (3). Then, the expectation of the empirical cumulative distribution function is defined as

$$E\left[F\left(X_{(i)}\right)\right] = \frac{i}{n+1}; i = 1,2,\dots,n$$

The least square estimates (LSEs) $\hat{\beta}_{LS}$ of β are obtained by minimizing

$$Z(\beta) = \sum_{i=1}^{n}\left(F\left(x_{(i)},\beta\right) - \frac{i}{n+1}\right)^2$$

Therefore, $\hat{\beta}_{LS}$ of β can be obtained as the solution of the following equation:

$$\frac{\partial Z(\beta)}{\partial \beta} = \sum_{i=1}^{n} F'_{\beta}\left(x_{(i)},\beta\right)\left(F\left(x_{(i)},\beta\right) - \frac{i}{n+1}\right) = 0$$

The weighted least square estimators of the unknown parameters can be obtained by minimizing

$$\sum_{j=1}^{n} w_j\left[F(X_{(j)}) - \frac{j}{n+1}\right]^2$$

with respect to β.

8. Simulation algorithms and study

To generate a random sample of size *n* from New Lifetime distribution, we follow the following steps:

1. Set n, $\Theta = (\beta)$ and initial value x^0.
2. Generate $U \sim Unifrom\,(0,1)$.
3. Update x^0 by using the Newton's formula
$$x^* = x^0 - R(x^0, \Theta)$$
where, $R(x^0, \Theta) = \frac{F_X(x^0,\beta) - U}{f_X(x^0,\beta)}$, $F_X(.)$ and $f_X(.)$ are cdf and pdf of new lifetime distribution, respectively.
4. If $|x^0 - x^*| \leq \epsilon$, (very small, $\epsilon > 0$ tolerance limit), then store $x = x^*$ as a sample from new lifetime distribution.
5. If $|x^0 - x^*| > \epsilon$, then, set $x^0 = x^*$ and go to step 3.
6. Repeat steps 3-5, n times for $x_1, x_2, \dots, x_n$ respectively.

8 Comparison study of the proposed estimators

This subsection deals with the comparisons study of the proposed estimators in terms of their mean square error on the basis of simulates sample from pdf or New Lifetime distribution with varying sample sizes. For this purpose, we take β =3, arbitrarily and *n*=10,20,…,50. All the algorithms are coded in R, a statistical computing environment and we used algorithm given above for simulations purpose.
We calculate Maximum likelihood estimation(MLE),methods of moments (MM), modified method of moments(MME), Least square estimatior(LSE), Percentile estimation (PE), L-moments estimation (LME), Maximum product spacing(MPS), Cramer-von Mises estimation (CME) and Anderson Darling estimation (ADE) of β based on each generated sample. This proses is repeated 1000 of times, and average estimates and corresponding mean square errors are computed and also reported in Table 1 and 2.
To assess the performance of the methods, we calculated the bias and the mean-squared error for the simulated estimates of θ

$$Bias(\hat{\theta}) = \frac{1}{N}\sum_{i=1}^{N}(\hat{\theta}_i - \theta),$$

$$MSE(\hat{\theta}) = \frac{1}{N}\sum_{i=1}^{N}(\hat{\theta}_i - \theta)^2.$$

From Table 1 and Table 2 it can be observed that as sample size increases the mean square error decreases, it proves the consistency of the estimators. The least square estimator(LSE) of parameter β is superior than the others methods of estimation.

Table 1: Estimates and mean square errors (in IInd row of each cell) of the proposed estimators with varying sample size

	MLE	ME	MME	LSE	PCE	LME
10	2.8442	2.3890 1	2.647 0	3.1442	2.890 1	3.647 0
	1.1717	1.4215	0.679 8	1.0717	1.321 5	1.079 8
20	2.9193	2.9866	2.822 1	3.0893	2.986 6	3.224 0
	0.3925	0.5933	0.296 9	0.3214 5	0.493 3	0.596 9
30	2.9457 3	2.9886	2.858 3	3.0173	2.988 6	3.228 3
	0.2298	0.2882	0.190 2	0.2098	0.283 2	0.390 2
40	2.9723 5	2.9952	2.880 5	3.0115	2.995 2	3.200 5
	0.1590	0.2119	0.134 5	0.1420	0.211 9	0.238 5
50	3.0965	2.9934	2.893 2	3.0110	2.993 4	3.093 2
	0.1252	0.1682	0.114 1	0.0552	0.168 2	0.214 1

Table 2: Estimates and mean square errors (in IInd row of each cell) of the proposed estimators with varying sample size

n	MPS	CME	ADE
10	3.3442	2.6901	2.2470
	1.2717	1.3215	0.9798
20	3.2293	2.7866	2.5240
	0.3925	0.4933	0.7969
30	3.1273	2.8886	2.7583
	0.2598	0.3182	0.3942
40	3.1115	2.9052	2.7805
	0.1590	0.3119	0.2385
50	3.1065	2.9134	2.8032
	0.1252	0.1982	0.2141

Conclusions

In this paper we have considered different estimation procedures for estimating the unknown parameter of a new lifetime distribution. It is not possible to compare different methods theoretically, and we have used some simulations to compare different estimators. We have compared different estimators mainly with respect to biases and mean squared errors. It is observed that the least square estimator (LSE) of parameter β work very well in terms of biases and mean squared errors, although it is quite involved computationally. The performances of the least square estimator are also quite satisfactory. We recommend use of the least square estimator estimators for all practical purposes.

References

[1] Adamidis K., and Loukas S.,(1998) A lifetime distribution with decreasing failure rate, *Statistics and Probability Letters*, Vol(39), 35-42.

[2] Bakouch H. S., Al-Zahrani B. M., Al-Shomrani A. A., Marchi V. A., and Louzada F.,(2012) An extended Lindley distribution, *Journal of the Korean Statistical Society*, Vol(41), 75-85.

[3] Corsini G, Gini F, Gerco MV (2002). Cramer-Rao bounds and estimation of the parameters of the Gumbel distribution. IEEE, 31(3): 1202-1204.

[4] Cheng, R. C. H., and N. A. K. Amin. "Estimating parameters in continuous univariate distributions with a shifted origin." Journal of the Royal Statistical Society. Series B (Methodological) (1983): 394-403.

[5] Elbatal I., Merovci F., and Elgarhy M.(2013): A new generalized Lindley distribution, *Mathematical Theory and Modeling*, Vol(3) no. 13.

[6] Ghitany M. E., Alqallaf F., Al-Mutairi D. K., and Husain H. A., (2011) A two-parameter weighted Lindley distribution and its applications to survival data, *Mathematics and Computers in Simulation*, Vol. (81), no. 6,1190-1201.

[7] Ghitany M. E., Al-Mutairi D. K., and Aboukhamseen S. M. , (2013) Estimation of the reliability of a stress-strength system from power Lindley distributions, *Communications in Statistics - Simulation and Computation*, Vol (78), 493-506.

[8] Ghitany M. E., Atieh B., and Nadarajah, S., (2008) Lindley distribution and its application, *Mathematics and Computers in Simulation*, Vol (78), 493-506.

[9] Joŕda P.,(2010) Computer generation of random variables with Lindley or Poisson-Lindley distribution via the Lambert W function, *Mathematics and Computers in Simulation*, Vol(81), 851-859.

[10] Lindley D. V.,(1958) Fiducial distributions and Bayesâ™ theorem, *Journal of the Royal Statistical Society*, *Series B (Methodological)*,102-107.

[11] Mahmoudi E., and Zakerzadeh H., (2010) Generalized Poisson Lindley distribution, *Communications in Statistics: Theory and Methods*, Vol (39), 1785-1798.

[12] Sarhan, A. M., Tadj, L., & Hamilton, D. C. (2014). A new lifetime distribution and its power transformation. *Journal of Probability and Statistics*, *2014*.

[13] Shanker R., Sharma S., and Shanker R., (2013) A Two-Parameter Lindley Distribution for Modeling Waiting and Survival Times Data, *Applied Mathematics*, Vol (4), 363-368.

[14] Zakerzadeh, H. and Mahmoudi, E.,(2012) A new two parameter lifetime distribution: model and properties. arXiv:1204.4248 v1 [stat.CO].

COMPARING BLOCK BOOTSTRAP PROCEDURES FOR PERIODICALLY CORRELATED TIME SERIES
KRAHASIM I PROCEDURAVE BOOTSTRAP ME BLLOQE PËR SERITË KOHORE TË KORRELUARA PERIODIKISHT

LORENA MARGO[a], ELJONA MILO[a]
[a]Department of Mathematics, Informatics and Physics
"Fan S. Noli" University Korçë, Albania
Corresponding author Lorena Margo: lorena.margo@yahoo.com

Përmbledhje
Bootstrap me blloqe ka rezultuar një metodë e përshtatshme për vlerësimin e shpërndarjes vlerësuesve edhe në rastin e serive kohore. Mbështetur tek disa metoda bootstrap me blloqe në seritë kohore të korreluara periodikisht, kemi realizuar simulime të disa modeleve të tilla. Kemi ndërtuar intervalet e besimit bootstrap për pritjen matematike të përgjithshme për modelet e zgjedhur dhe kemi llogaritur probabilitetin e mbulimit të tyre. E gjithë kjo është realizuar duke përdorur gjuhën e programimit R. Nga rezultatet e simulimeve kemi realizuar një krahasim të metodave bootstrap me blloqe për vlerësimin intervalor të serive kohore të korreluara periodikisht.
Fjalët çelës: Bootstrap me blloqe, seri kohore, rizgjedhje, sezonalitet.

Summary
Block bootstrap resulted an useful method for estimating the distribution of estimators even in the case of time series. We have performed simulations of Periodically Correlated time series models using block bootstrap methods. We constructed the bootstrap equal-tailed pointwise confidence intervals for the overall mean of the chosen time series models and we calculated the Actual Coverage Probability in each case. The simulations are performed using the R environment. Based on the results obtained we realized a comparison of block bootstrap procedures in interval estimation of Periodically Correlated time series.
Key words Block bootstrap, time series, resampling, seasonality.

INTRODUCTION

The bootstrap presented by Efron resulted an important method for estimating the distribution of an estimator or test statistic applying the resampling of the data. The results obtained in the case of independent and identically distributed observations (i.i.d) sustain the efficience of the bootstrap procedure. Some problems associate the use of the i.i.d bootstrap in the case of dependent data (see Singh 1981 and Babu and Singh 1983). With intentions to adapt the bootstrap procedure in dependent data, the data are divided into blocks and then these blocks are resampled in a way that preserve the dependence structure of the data (Kunsch 1989). Periodic time series are encountered environment to construct the bootstrap equal-tailed pointwise confidence intervals for the overall mean of the chosen time series. We will calculate the Actual Coverage Probability (ACP) in estimating the overall mean using different block bootstrap procedures for Periodically Correlated time series data. The paper is organized as follows: In the second section we present Periodically Correlated Time Series as a special class of periodic time series and also we will present procedures for periodic time series realizing a comparison between these procedures. In the third section we present the results obtained by using R software to calculate the in different fields and the study of this special class of time series resulted a challenge for many researchers. When bootstrapping time series data that contain a seasonal component it is necessary to take in consideration the periodicity. We are interested in Periodically Correlated Time Series with period T, which is a time series where the mean and the covariance of the series remains the same when shifted T units of time. With the main intention to realize a simulation comparison of the performance of several block bootstrap procedures, we will make simulations of Periodically Correlated Time Series models. The simulations are performed using the R

ACP for the overall mean in our chosen Periodically Correlated time series models using two block bootstrap procedures, the Generalized Seasonal Block Bootstrap and the Block Bootstrap of the Residuals and also we realize a comparison of the obtained results.

MATERIALS AND METHODS

A time series X_t is a seasonal (periodic) time series with period T if X_t and X_{t+T} have the same distribution. A special class of seasonal time series are Periodically Correlated time series, also known

as Cyclostationary time series. The time series X_t is called Periodically Correlated with period T if the mean and the covariance of the series remains the same when shifted T units of time. So, X_t is periodically correlated if:

$E(X_{t+T})=E(X_t)$,

$cov(X_{t+T},X_{s+T})=cov(X_t,X_s)$ for all integers s and t.

The class of Periodically Correlated time series is quite large. Many processes encountered in nature arise from periodic phenomena and the notion related to these processes seems to initiate with Bennett (1958) who called them cyclostationary processes. With intention to estimate the parameters of interest, several block bootstrap methods were presented from researchers. When we study periodically correlated data, these methods must be able to considerate the periodicity present. Many block bootstrap procedures were proposed for time series, especially for stationary time series, but there are not as much that deal with time series that contain a seasonal component (and generally these time series are not stationary). There are several attempts with intention to adapt the classical block bootstrap procedures even in the case of periodic time series and good results are obtained in some specific models, but as stated by empirical procedures, there is a lack of efficiency of classical block bootstrap procedures in many models of Periodically Correlated time series.

Politis (2001) proposed a modification of the block bootstrap of Kunsch (1989), and called this method the Seasonal Block Bootstrap (SBB), which is a resampling algorithm for time series with a seasonal component with block whose size and starting points are integer multiples of the period. This block bootstrap procedure is useful in obtaining interval estimates for the seasonal means and the overall mean. Despite the good results that associate this block bootstrap procedure, it contain a restriction in the relative size of the period and the block size, because it is required that the sample size of the series and also the starting points of the blocks must be of the order of the period.

Chan et. al. (2004) proposed a version of block bootstrap for time series with periodicity that works by making a partition of the period into small time intervals and divide the periodic data into blocks that correspond temporally to each of intervals and form a new time series of bootstrap data. This resampling procedure was designed especially for the time series with long periodicities. In the case of time series with fixed-length periodicity, the block bootstrap procedure proposed by Chan et. al (2004) is not consistent. Under some specific conditions, Synowiecki (2007) established the consistency of the Moving Block Bootstrap for nonstationary time series with periodic and almost periodic structure. Although it is difficult to obtain good results when one or more conditions required are not fulfilled.

Dudek et. al (2013) propose the Generalized Seasonal Block Bootstrap (GSBB) that is a modification of the block bootstrap of Politis that resulted suitable for periodic time series with fixed length periodicities of arbitrary size as related to block size and also to the sample size. The resampling algorithm proposed works by dividing the series into blocks of observations of desired length, independent from periodicity and then these blocks are resampled in a way that retain the periodicity. Because the block size can be chosen independenly from the period, the usual asymptotic considerations for block size choice avoid the problems that associate the method proposed by Chan et al. (2004) and also the Seasonal Block Bootstrap of Politis. This method resulted consistent for the seasonal means and the overall mean of a periodically correlated time series. (see Dudek et. al. 2013, 2014). The actual coverage probabilities for the bootstrap simultaneous confidence intervals constructed, are very close to nominal ones for the wide range of the block length choice in some models of Periodically Correlated Time Series. Another block bootstrap method for periodic time series, that resulted a real competitor of other block bootstrap procedures, is the Block Bootstrap resampling of the 'Residuals' (BBR). It consists in using block bootstrap resampling in the residuals of the original series after the seasonal means are estimated and removed. In some models of Periodically Correlated time series this block bootstrap procedure empirically gives good results compared to the other methods. Based on consequent simulations with chosen Periodically Correlated time series models we will demonstrate that when using BBR are obtained good results as well as using GSBB method and in some cases the results using BBR outperform those obtained by GSBB method. We constructed programs using the R language and the algorithms of the proposed methods and we realised a simulation comparison of the performance of these proposed block bootstrap procedures in two models of Periodically Correlated time series.

RESULTS AND DISCUSSIONS

We will be focused in two models of periodically correlated time series.

Model 1 $X_t=\sin\left(\frac{2\pi t}{T}\right)+\cos(\frac{2\pi t}{T})e_t$

where e_t~N(0,1).

Model 2 $X_t=Y_t\left((t \bmod T)+1\right)+\sin(\frac{2\pi t}{T})$ where Y_t are independent random variables uniformly distributed on [-0.5;0.5].

The R software is used to obtain confidence intervals and to calculate the ACP for the overall mean in our chosen models using GSBB and BBR. The period chosen is T=12, we choose two values for the sample size N=120 and N=240 and the chosen block lengths are from the set {2, 3, …, 30}. We conducted a number of related simulations with 1000 Monte Carlo trials and 500 bootstrap replications. The simulations are used to construct the bootstrap equal-tailed pointwise confidence intervals for the overall mean. We calculated the Actual Coverage Probabilities (ACPs) using the Generalized Seasonal Block Bootstrap (GSBB) and the Block Bootstrap of Residuals (BBR) with the Nominal Coverage Probability (NCP) 0.95.
In the tables below we present the optimal block length choice for both procedures. In the figures we present the graphs of ACP values obtained from our simulations.

Table 1 Optimal block length choice for both models using GSBB method together with the ACPs for each model.

Table 2 Optimal block length choice for both models using BBR method together with the ACPs for each model.

		BBR	
Model	**N**	**Optimal block length**	**ACP**
Model 1	**120**	**9**	**0.948**
	240	**11**	**0.95**
Model 2	**120**	**11**	**0.938**
	240	**3**	**0.95**

Figure 1 ACPs for the Model 1, N=120 b∈{2,3,…,30} and the NCP value (the interrupted line) for both procedures.

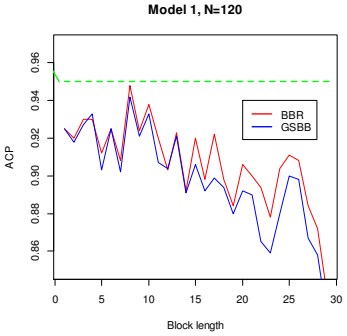


Figure 2 ACPs for the model 1, N=240, b∈{2,3,…,30} and the NCP value (the interrupted line) for both procedures.

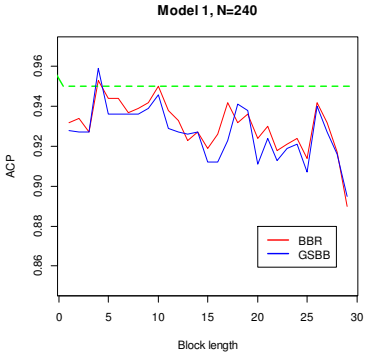


Figure 3 ACPs for the Model 2, N=120 b∈{2,3,…,30} and the NCP value (the interrupted line) for both procedures.

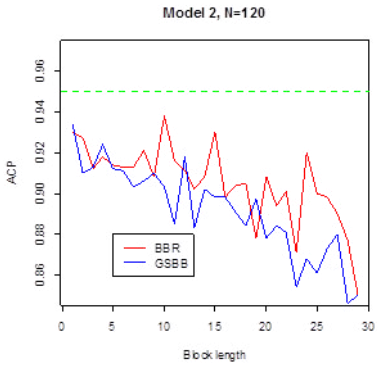
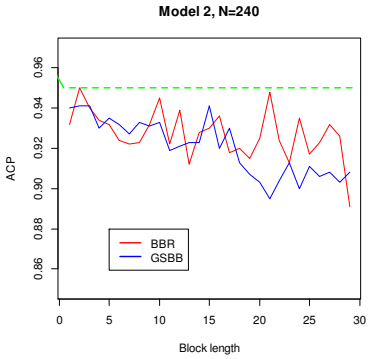


Figure 4 ACPs for the Model 2, N=240, b∈{2,3,…,30} and the NCP value (the interrupted line) for both procedures.



The ACPs for both models when N=120 and N=240 are mostly higher when using BBR in our proposed models. In model 1 we have better results than the model 2. The results for the ACP in the case of N=240 are noticeably higher (near 0.95) than those obtained when N=120 for both methods, with better results when we use BBR.

CONCLUSIONS

Although theorically and empirically GSBB resulted a suitable method in many cases of time series with periodic structure, BBR enjoys good properties as well. In our proposed models of Periodically

Correlated time series, the results obtained using BBR outperform those obtained from GSBB. Based on the results we conclude that BBR resulted a good alternative in resampling Periodically Correlated Time and it is important to do further studies of the performance of this procedure in other Periodically Correlated time series models.

BIBLIOGRAPHY

1. Babu G. J., Singh K. (1983), Inference on means using the bootstrap. Ann. Statist. 11, 999–1003.
2. Bennett W. R. (1958), Statistics of regenerative digital transmission, Bell System Tech. J.vol.37.pp 1501-1542.
3. Buhlmann P. (2002), Bootstraps for Time Series *Statistical* Science, Vol. 17, No. 1, 52–72.
4. Chan V., Lahiri S. N., Meeker W.Q., (2004). Block bootstrap estimation of the distribution of cumulative outdoor degradation. Technometrics 46, pp. 215–224.
5. Dudek A. E., Potorski P., Simulation comparison of CBB and GSBB in overall mean estimation problem for PC time series, Research partially supported by the Polish Ministry of Science and Higher Education and AGH local grant.
6. Dudek A. E., Leskow J., Paparoditis E., Politis D. N. (2014), A generalized block bootstrap for seasonal time series, Journal of Time Series Analysis.
7. Dudek A. E., Maiz S., Elbadaoui M. (2014), Generalized Seasonal Block Bootstrap in frequency analysis of cyclostationary signals, Signal Processing.
8. Efron B. (1979), Bootstrap methods: Another look at the jackknife, Ann. Statis. 7, 1-26.
9. Gardner W. A., Napolitano A., Paura L. (2006), Cyclostationarity:Half a century of research, Signal Processing 86 639-697.
10. Hurd H. L., Miamee A. (2007), Periodically Correlated Random Sequences, Spectral Theory and Practice, Whiley & Sons.
11. Kunsch H. (1989), The Jackknife and the Bootstrap for general stationary observations, Ann. Stat.17, 1217-1241.
12. Lahiri S. N., (2003), Resampling Methods for Dependent Data, Springer, New York.
13. Lenart L., Leskow J.and Synowiecki R. (2008), Subsampling in testing autocovariance for periodically correlated time series. J. Time Ser. Anal., 29(6), 995-1018.
14. Margo L., Ekonomi L., Milo E. (2015): A comparison of block bootstrap procedures for periodic time series, Mathematics and Natural Sciences, Proceedings of the Sixth International Scientific Conference (FMNS), South-West University “Neofit Rilski”, Blagoevgrad, Bulgaria, Volume 1, pp.92-97.
15. Margo L., Milo E. (2014), Bootstrapping Periodically Correlated Time Series, SPNA 2014, Proceedings book, p.209-215.
16. Nordman D. J. and Lahiri S. N. (2012), Block Bootstraps for Time Series With Fixed Regressors, Journal of the American Statistical Associacion,107(479), 233-246.
17. Politis D. N. (2001), Resampling time series with seasonal components, in Frontiers in Data Mining and Bioinformatics. In: Proceedings of the 33rd Symposium on the Interface of Computing Science and Statistics, Orange County, California, pp. 619–621.
18. Politis D. N. (2003), The impact of Bootstrap Methods on time series Analysis, Statistical Science, Vol.18, No.2.219-230.
19. Singh K. (1981), On the asymptotic accuracy of Efron’s bootstrap. Ann. Statist. 9 1187–1195.
20. Synowiecki R. (2007), Consistency and application of moving block bootstrap for nonstationary time series with periodic and almost periodic structure, Bernoulli, 11, 13 (4), 1151-1178.

ENVIRONMENTAL INDICATORS IMPACT ON THE QUALITY OF OLIVE OIL

ALMA SHEHU[1], ELISA PEÇI[2], FATMIRA ALLMUÇA[3]
Ministry of Agriculture, Rural Development and Water; National Food Authority; Albania, e-mail: shehu.alma@gmail.com
Food Quality Sector. Department of Toxicology and Quality. Food Safety and Veterinary Institute, Albania.
Food Quality Sector. Department of Toxicology and Quality. Food Safety and Veterinary Institute, Albania.

ABSTRACT÷
Olive growing and olive oil production is increasing in Albania. During 2014 it was produced about 145,000 tons of olives, compared with 2007 when produced about 27,600 tons/year. Since 2007, olive plantation area has increased by about 65%. Olive production is concentrated in: Berat District 23.80%, Vlora District 23.40%, Fier District 18.70% and Elbasan District 17.80%, which together represent 83.60% of total production in Albania. The purpose of the study is to evaluate and determine the physical and chemical quality indicators of olive oil in Albania, under the influence of environmental factors (climatic conditions, especially rainfall). The determination of acidity, peroxide value, specific absorbance at 232 and 270 were carried out according to the EC method (EEC/2568/91). Ten samples were analyzed during 2013-2014 and ten others during 2014-2015. All samples analyzed during the first year were within the standards, while most of the values for the parameters specified during the second year, don't exceed the limit established for extra virgin olive oil.
Key-words: Olive oil quality, olive oil, acidity, environmental indicators, extra virgin oil.

INTRODUCTION

The origin of olive cultivation is lost in the depths of centuries. The origin of olive in Albania is believed to be in Çamëria, where one of the symbols of this region is precisely the olive tree. From some source data, the cultivation for the first time in the Balkans and Albanian lands, takes root precisely in the region of Epirus, in Çamëria, some 6,000 years before our era. Schymni (Greek geographer), three centuries before the birth of Christ describes Epirus and Illyria as: "A warm and prosperous place, full of olive trees and good vineyards".

Production of olive and olive oil in Albania has increased from year to year. Olive is characterized by being a strong and lasting plant, with the ability to live and produce in unsuitable climatic conditions. Environmental factors, besides conditioning the distribution of such species, have played an essential role in production. Indeed, when the olive plant is found in difficult climatic zones displays a conditioning factor of production known as "production periodicity". Temperature has a special significance in olive distribution and growth, as it is the first parameter that determines its geographical distribution. Temperature influences on the vegetative growth, morphological differentiation of buds and flowers, fruit formation and ripening, and thus in the plant's production capacity. Temperature also affects the chemical characteristics of the oil. It is observed that in cold areas, besides fruits having smaller size and less oil content, there are differences in terms of fatty acids in the oil. Light influences in different ways on the production of olive oil. For this reason, it is necessary both for the morphological development of the plant, as well as for the production.

There is a direct link between the amount of light in the crown of the plant and production. Wind is an important factor for vegetative growth and production of oil. It directly affects pollination, so the productivity of the plant. Olive gives good results if the water content in the soil is well distributed during the spring-summer period. In this case, the positive effects are seen on the fructification and oil accumulation.

On the other hand, harvesting techniques affect the quality of the olive fruit. Harvesting is a delicate operation that if done badly, adversely affects the quality and quantity of oil (it is established by the damages caused to the fruit of olive tree). Among the numerous parasites that damage olive, the olive fly (Bactrocera oleae) is the most dangerous in our areas and in general in the Mediterranean area. The damage of olive fly can reach levels that can cause loss of production, provoking premature fall of fruits, reducing the oil range and deterioration of oil quality, effects which occur even during oil storage thus lowering the threshold of the classification as extra virgin oil.

MATERIALS AND METHODS

Samples are taken directly from oil producers in the respective regions and stored in 0,75 l dark glass bottles. They are transported by refrigerated boxes at a temperature of 6°C, while in the lab are stored at a temperature of 4°C.

Determination of acidity÷

Determination of acidity was conducted following the official method of the European Union (EEC) No 2568/91, June 11th 1991. Acidity of a fatty substance means the percentage content of free fatty acids (oleic acid). The fat synthesized from the fruit, is

biologically neutral, while the presence of free fatty acids is an anomaly which comes as a result of the bad condition of fruit, incorrect oil processing process or improper storage.

Determination of Peroxide Index

Determination of peroxides is used as an indicator or as an indicator of initial oxidation of olive oil, because it measures the content of hydroperoxides. Peroxide value is a parameter that depends on the storage conditions such as light, temperature and storage time. Determination of peroxides was conducted following the official method of the European Union (EEC) No 2568/91, June 11th 1991. The level of peroxides value is expressed in milliequivalents of active oxygen per kilogram of oil (mEq O_2/kg).

Determination of UV absorbance

Determination of UV absorbance was conducted following the official method of the European Union (EEC) No 2568/91, 11th June 1991. The unsaturated fatty acids contain non-conjugated double bonds which do not absorb the wavelengths between 210nm and 300 nm, whereas the conjugated double bonds, dienes and trienes absorb the wavelengths at 232nm and 268nm respectively. The conjugated diene (ΔK) displays an absorption at the 232nm whereas the triene at 268nm. Through the measurement of ΔK, the oil oxidative situation is indirectly estimated.

RESULTS AND DISCUSSIONS

Free acidity÷

Referring to Fig. 1, It is clearly seen that the values of indicators of free acidity are very high for the second year under study with the exception of samples No. 3 and No. 9, which showed a lower level of acidity. This can be attributed to the wet year and consequently the level of fruit infestation from the olive fly (Bactrocera oleae). Similar results are achieved by Abderezak Tamendjari et al, 2009; Allmuca et al, 2015 etc.

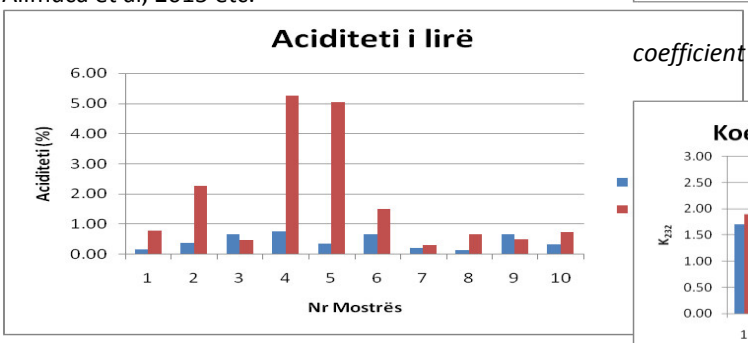


Fig. 1. Free acidity during 2013-2014 and 2014-2015

Peroxide Index÷

As seen from fig. 2 the same phenomenon is repeated: during 2014-2015 is observed an increasing trend of index peroxides. However, only sample 4 does not result in the standard allowed, while all the other samples fall within the norms (Referring

Law No. 87/2013 , On categorization of production, denomination and marketing of olive oil and olive-pomace oil, Regulation No. 475 dated July,10, 2003 "On the characteristics of olive oil). From this we can see that most of the oils are not old and the oxidation process is not in an advanced stage.

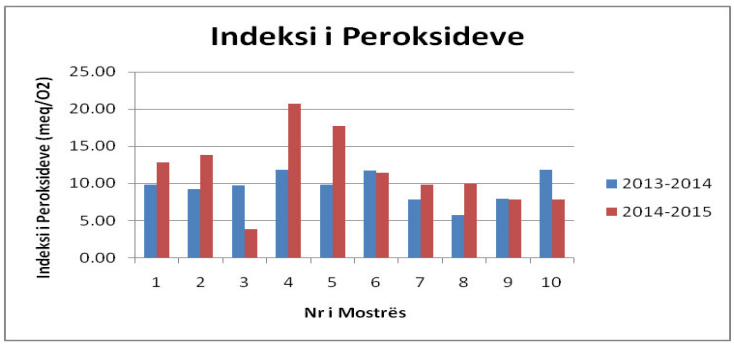


Fig.2. Peroxide Index during 2013-2014 and 2014-2015

UV absorption coefficient:

Referring to Fig. 3 and 4, in general for the two years under study samples fall within the standards allowed, exception here makes only sample 4 that for the second year is out of limits (referring the Albanian legislation for olive oil).

To both, the absorption coefficient and peroxides index, are indicators of oil oxidation.

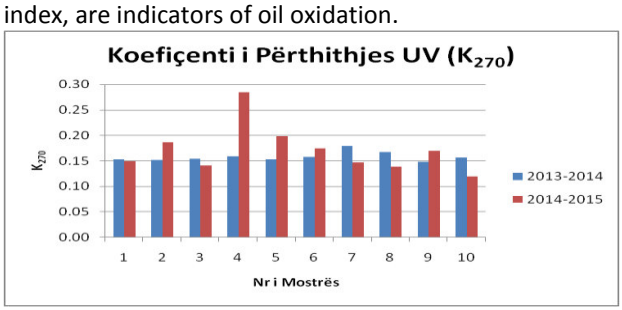


Fig 3. UV absorption coefficient (K_{270}) during 2013-2014 and 2014- 2015

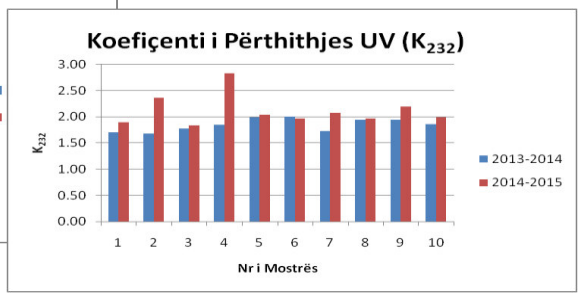


Fig.4. UV absorption coefficient (K_{232}) during 2013-2014 and 2014-2015

Referring to table (1), we see that there is a growing trend in terms of physical-chemical indicators for 2014-2015, compared to the 2013-2014 production year.

Table. 1. The physical and chemical indicators of samples during two years of production

2013-2014					2014-2015			
Sample No.	Acidity	PI	K_{232}	K_{270}	Acidity	PI	K_{232}	K_{270}
1	0.16	9.91	1.70	0.15	0.78	12.87	1.90	0.15
2	0.39	9.29	1.68	0.15	2.28	13.83	2.37	0.19
3	0.66	9.81	1.77	0.15	0.47	3.90	1.84	0.14
4	0.77	11.88	1.85	0.16	5.25	20.70	2.83	0.28
5	0.36	9.91	2.00	0.15	5.05	17.71	2.04	0.20
6	0.67	11.74	2.00	0.16	1.51	11.46	1.97	0.18
7	0.22	7.89	1.73	0.18	0.30	9.88	2.07	0.15
8	0.14	5.80	1.94	0.17	0.67	9.92	1.97	0.14
9	0.67	7.99	1.95	0.15	0.50	7.85	2.20	0.17
10	0.33	11.82	1.86	0.16	0.74	7.84	1.99	0.12

PI – Peroxide Index

During 2013-2014 production year, all the samples taken for analysis were classified in the category of extra virgin oils, (referring acidity values, based on the Albanian legislation for olive oil).

For the second year under study year (2014-2015), out of 10 samples analyzed only 6 of them were classified in the category of extra virgin oils, one sample was classified as virgin, one sample as usual virgin, while two samples resulted as non-consumable, in the category of Lampante oils and respectively samples 4 and 5.

Such results in the second year can be explained by the climatic conditions of a wet year and due to the high level of infestation caused by the olive fly (Bactrocera oleae). Referring to the data from Meteorological Service of the Armed Forces of the Republic of Albania, the production year (2014-2015) has been a year with high precipitation levels (which means high humidity) and with average temperatures below 25˚C, conditions which favor the intensification of attacking rate from the olive fly.

Moreover, data from the Ministry of Agriculture, Rural Development and Water Management (MARDWM) show that the infection level from the olive fly (Bactrocera oleae) was rather high for the last year. According to Tamendjari et al. 2009 fruits at the time of color changing from green to violet are more resistant to infection from olive flies than fruits in the moment of the black color.

CONCLUSIONS AND RECOMMENDATIONS

From the samples analyzed it showed that, olive oils of local production are of good quality, because they were the demands of quality oil.

To produce a high quality olive oil, the importance is quality of olive production technology and climatic conditions in which the olive trees grow.

Referring to the results obtained for domestic olive oil , it results that olive oil domestic production is good quality .

For oils which have shown a high peroxide index and consequently high levels of UV absorbance, an indicator of oil oxidation, it is recommended to show maximum care in storage of oil in stainless steel non-oxidizing deposits, with controlled temperature and humidity.

In the wet years where the infection level from the olive flies is high, except for necessary phyto-sanitary treatments, it is recommended to harvest olive fruits at the time of color changing (from green to violet) in order to obtain qualitative oils.

REFERENCES:

1. Abderezak Tamendjari, Franca Angerosa, Soraya Mettouchi and Mohand Mouloud Bellal. The effect of Fly Attack (Bactrocera Oleae) on The Quality and Phenolic Content of Chemlal Olive Oil, Grasas y Aceites, 60 (5), Octubre-Diciembre, 507-513, 2009

2. Allmuça, F. (2015). Studimi bionomik i mizës së ullirit (*Bactrocera oleae*) në zonën e Tiranës.
3. Beltrán, G., Del Rio, C., Sánchez, S., Martínez, L. (2004). Influence of harvest date and crop yield on the fatty acid composition of virgin olive oils from Cv. 'Picual'. J. Agric. Food Chem., 52: 3434-3440.
4. European Union (EEC) No 2568/91, June 11th 1991.
5. Kiristsakis, A. K. (1992). El Aceite de Oliva. A. Madrid Vicente, Ediciones. Madrid.
Lave, S., Wodner, M. (1991). Factors affecting the nature of oil accumulation in fruit of olive (Olea europea L.) cultivars. Journal of Horticultural Science., 66 (5): 583-591.
6. Ligji nr. 87/2013, për kategorizimin e prodhimit, emërtimin dhe tregtimin e vajit të ullirit dhe vajit të bërsisë së ullirit.
7. Rregullorja Nr 475 dt 10.07.2003 "Per karakteristikat e vajrave te ullirit".
8. VKM 555 date 27.06.2013, per miratimin e rregullores "Per karakteristikat e cilesise dhe kriteret e natyrshmerise se vajit te ullirit dhe vajit te bersive te ullirit".
9. Council Regulation (EC) 1234/2007 , October 22, 2007 "On creation of a common organization of agricultural markets and specific provisions for certain agricultural products " (Single CMO Regulation) CELEX number : 32007R1234 ,
10. Commission Implementing Regulation (EU) no. 29/2012 , January 13, 2012 " On the standards of marketing olive oil" , CELEX number : 32012R0029 , the Official Journal of the European Union , Series L , no. 12 dated January,14.2012 , page 14-21