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INDICES ZONALITY OF GRAPEVINE CULTIVATION

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Abstract

The development of viticulture in Albania and introduction of grape varieties, require studies and preliminary estimates for regionalization of genetic material.

This research presents the results of analysis that airspace calculated the connections between biological, morphological, technological and geographical indicators. Method applied, was based in monitor and analysis of morphological, climatic and geographical indices, regarding genetic characteristics of Vlosh, Kallmet and Shesh I Zi cultivars. Evaluations are conducted in eight provinces entirety, which generalizes the Albanian climate. We were monitoring: (i) Six biological indices technological: and 4, (ii) Climate valences, per: edaphic moisture, air humidity, average daily temperature, absolute minimum and maximum: (iii) Geographic indices for: length (N), width (E), and the height (H). Computerization and statistical analysis of the data was performed with Diva GIS 75 (bioclimatic modelling domain), catminat code and JMP software (discriminated method) which have been the main aims: (i) Index correlation and (ii) Suitability Index.

Results have shown that the suitability index has a strong correlation ($r^2 = 0.98$), calculated between geographical position, edaphic humidity, air humidity, air temperature and index $\Sigma (t - t^0)$. According discriminate method, there is projection 8 PLOTS with suitability different: excellent adaptability has 32% of the territory in the area I, II, and III. Areas ongoing width geographical latitude, do restriction performance of biological indicators and have reduced to minimum, alternative of cultivation. Analysis of average isotherm temperature, precipitation, and biological constant, has conducted macro zones of territory, valid for any program cultivation and agronomic administration.

In conclusion we can say that cultivars Kallmet, Vloshand Shesh I Zi in zonal areas 1, 2, 3 have high biological compatibility and achieves superior technological indicators.

***Key words**: Zonality, Edaphic humidity, Air humidity, Isotherm, Grapevine.*

1. Introduction

Albania lies between geographic the parallels 39 degrees and 42 degrees of latitude and 19 degrees - 21 degrees of geographic width. The relief is hilly - mountainous, with topographic depressions in the east and hilly field in west of the country, becoming cause of the climatic diversity of this country. The vineyard area is 12 thousand hectares and has the tendency to increase up to 30 thousand hectares, with new vineyards for specialized product. Many types of qualitative wines are produced in the west, where the percentage of sugar goes above 22%, whereas in the eastern part where the natural synthesis does not exceed 16 - 17%, in cider they add industrial sugar to increase it up to 19 - 21% [7]. In these circumstances of expansion with vineyards and new varieties requires studies and preliminary estimates for the regionalization of the genetic material, with the climate and land. The expansion of vineyards and new varieties is being connected with previous estimates (reference) [5], for the regionalization of genetic material, with the climate and land. In many cases they are based on the biological indicators of Catminat/code [1] to make the analysis of the space and profitability, based on the links between biological, morphological, geographical and technological indicators and reference [8].

Through this research it is predicted a theoretical adaptation for three autochthonous varieties with wine destination and conceited the effect of inhibiting and developing indicators of the cultivation alternative [9].

2. Materials and Methods

The evaluations are conducted in eight regions, the entirety of which constitutes the Albanian climate. There were monitored: (i) six biological indices: vegetative, flowering, ripening, peronospora resistance, quality and sugar; (ii) climate indices: edaphic humidity, air humidity, average temperature, minimum and maximum absolute, pluvial metrics; (iii) geographical index per length (N), the width (E), the height (H) [6]. Computerization and statistical analysis of the data was performed with DIVA.GIS 75 (bioclimatic modeling domain), and JMP software (discriminate method) which have been the main aims: (i) correlation index; and (ii) suitability index. The climate data and biological indices are computerized, crosslinked with the zonal spaces to take the corresponding spaces (maps) to assist a geographical bioclimatic/domain system and the analysis of the discriminate method [3]. The data are integrated in a regressive way to make the macro zonal assessment of the territory.

The climate data are drawn from the Albanian climate owned by the Hydro meteorological Institute, carried out for an average period of 30 years of the period 1960 to 1990.

3. Results and Discussion

3.1 Bio climatological analysis

In Dendrogram 1 (Figure 1), the presented spaces have indicated a vegetative period of the vine with major changes from one country to another. Referred One-way ANOVA, the vegetative period has a coefficient of variation, CV = 48% and signifies the change between the number of active days; from 177 days in Korca up to 294 days in Saranda. The vegetative constant YC = Σ (t - t0) is 1195, in the minimum limit in Korca and takes the maximum threshold in Saranda 2835 degrees. The spaces (plots), over the biological zero have shown the level of variability, dendrogram - 1 and represent the variability between analyzed climates.

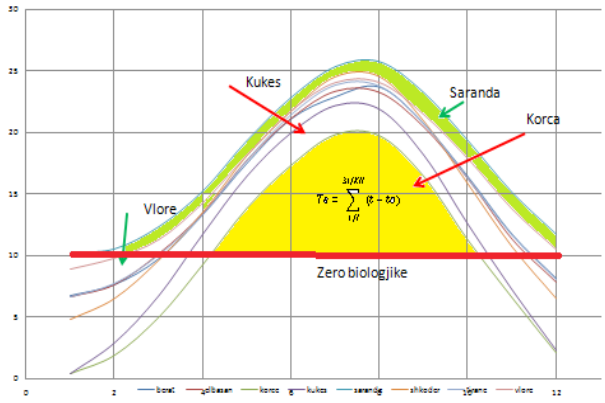

Figure 1. The vegetative constant of the vine presented for 8 regions, Korca, Kukes, Vlora, Saranda, Berat, Elbasan, Shkoder and Tirana

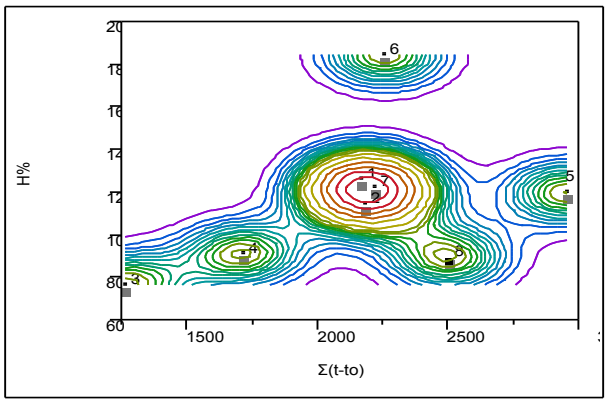

Figure 2. The regressive analysis, discriminant method for the links resulting between the vegetative constant and pluviometric indicators

Table 1. The main bioclimatic indices of vine in Albania

	T^{0m}	P	Σ^{ter}	N^{DR}	H	Σ^{DA}	K^{Hidr}	K^{TR}	K^{biol}	V^{G}
Berat	15.1	1264.3	2082	88.5	250	226	4.8	1009	4	5
Elbasan	15	1148	2099	99.5	260	206	4.3	998	4	5
Korce	10.3	765.1	1195	94.1	700	177	5.6	438	2	3
Kukes	11.9	910.5	1642	94.5	350	184	4.3	730	2	3
Sarande	17.7	1196.4	2835	87.2	60	294	3.4	1420	6	6
Shkoder	14.8	1844.4	2171	103	60	217	4.1	1107	4	5
Tirane	15.2	1219.2	2126	97.8	200	235	3.3	1047	4	5
Vlore	16.3	892	2430	82.4	150	269	3.3	1252	5	6

T^{0m} - the average temperature, P - Precipitation, Σ^{ter} - thermal sum, N^{dr} - days precipitation height, Σ^{DA} - Sum days actives, K^{Hidr} - Constant hydrometric, K^{TR} - Thermal reproductive valence, K^{biol} - Biological valence, V^{G} - Geographic valence.

Three varieties of vine in correlation with climate have favor vegetative and reproductive development in different situations climate from the unfavorable in Korca and Kukes; with 438 to good or very good in Vlora and Saranda, respectively; 1252 and 1420. PLOTS 3, 4, 5 and 6 have space to approximate the respective districts Berat, Elbasan, Tirana and Shkodra. Their changes are better than Korce, Kukes but weaker than Saranda, Vlora. Constant vegetative for cultivar Vlosh is 2300, Σ (t - t0), cv. Kallmet 2120 Σ (t - t0), cv. Shesh 2080 Σ (t - t0).

The biological valence maturity with correlation with indicator local thermal, Branas reflected link restrictive character of the country in eastern climate, which have major impacts on biological maturity, the percentage of sugar and synthesis of elements poliphenolic responsible quality. Hydrothermal constant of each area analyzed, as more hydro/thermal period. Phenological bloom-ripening was very different and has fluctuated between values (2500 < KHT < 5100). Optimal thresholds is Tirana area, while the area of Shkodra, Berat had values without appropriate to in this period of significant that biological needs require limits to P > 5000. [2].

Constant hydrometric, has been depending on the number of days with rain fall, their quantity and intensity. Average data of 8 zones, show that rain falls begin in October and have dynamically growing up until March that for this period constitutes 69% of the annual amount, and its intensity is 102 - 122 mm/month. Period April - September brought 31% of annual rainfall and intensity of 31 - 68 mm/month. The change between the two periods compared is CV = 42.8%. The vine cultivars biological need per 450 mm, period May to October and completion. The bio-physiological needs of precipitation meets only 68% while the difference reserves are stored in the soil from winter precipitation. The number of rainfall days has been the characteristics and zoning as their quantity, which have been 82 days/year up 103 days/year.

In dendrogram 2 (Figure 2), are given correlative analysis and the spatial Σ^{ter} and P, calculated with SG (discriminant method). Interaction of two indexes and biological indicators varietal, give space in 6 analytic PLOTS for (I^P) suitability index. For higher IP expressed in PLOT 3 and 2 between 2200⁰ and 1800 mm. Spatial PLOT, expanded (1, 7, 2), presents suitability average against valences varietal. (8) Space of the 6 PLOT, represents the area more convenient at altitudes up to 300, while the PLOTS 5 and 8, have average indicator suitability level, Location by scale, Loglikelihood Contour. But I^P, less suitable, have spaces, in PLOTS 4 and 3, which these climate indicators become limiting on product quality (2).

The coefficient H/T the district analyzed is 3.3 to 6. In this case districts that include PLOT 1 (Saranda, Vlora) are appropriate because they were within the index (2 - 4) appropriate while the second instance areas are: Berat, Elbasan, Tirana. Space for around Shkodra with all appropriate thermal conditions corresponds with exaggerated rainfall at the time of flowering, which adds sensitivity to fungi peronospora type, and botrytis [4]. The number of sunny days in eight areas is 177 days/year up to 294 days/year, and is inversely correlated with average temperature and biological requirements of indigenous varieties of wine.

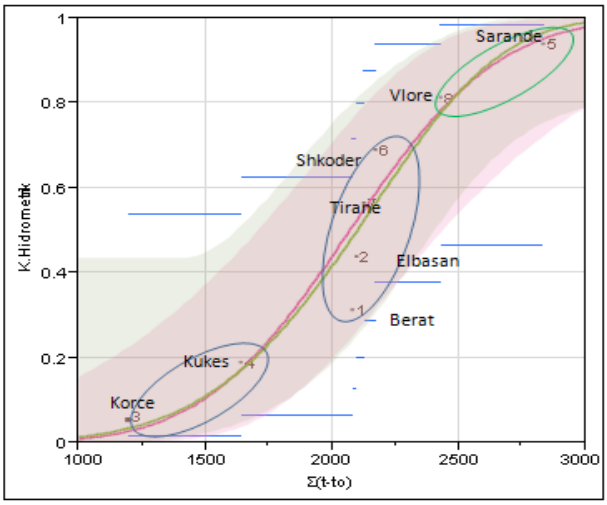

Figure 3. Presentation of compliance K^v

3.2 The climate and geographical position

Analyzing the geography of the following is the length N of 39⁰ 38′ to 42⁰ 39′, and the width 19⁰ to 21⁰, which represent heterogeneity of living things. The average temperature was in correlation with longitude and latitude and has gone downhill from south to north following the longitude (664⁰ (t-t⁰) which responds CV = 24%. We continued width (E), the average temperature is reduced 1235⁰ (t-t⁰). The average temperature of active period is different, following the width and confirmed that the impact of latitudes (E), temperature reduction is 63% while the geographical length (N) 37%. In dendrogram 3, with DG bioclimatic/domain and bi-variate Density, STD Kernel, demonstrating resultants the interaction between Valencia biological, zoning on canvas classifying five spaces characteristic development. While cartographic presentation by DG - 75 in the Figure 4, presents the same concept but in climate zonality of vines with wine destination.

Macro zoning of zonal space in Figures 3 and 4, is the product of the correlation of bioclimatic, geographic indices and some subdivision effects of statistical variations. The continuous research for behavior and testing varieties will characterize the effects of soil quality on the agrobiologic characteristics. The analysis on the basis of biological Valencia (*Catminate Code*) characterized inadequacies, simultaneously conclud-

ed that in the future could become a rational planning for new vineyards, summer species based on biological needs and environmental factors. Space 3 and 4, we dug up evidence that their bioclimatic indices are restrictive for the development of vine cultivars. While in the west of the country's wine, vine can be cultivated without restriction and is guaranteed to achieve product quality. The interaction and analysis between indices confirmed the hypothesis that can be cultivated Vitis across the country. In this context, areas 3 and 4, (eastern part of the country), contains some limiting biological factors that summer cultivars have selected some varieties especially for the table with vegetative constant C^v, less than $1600^{0(t-t0)}$.

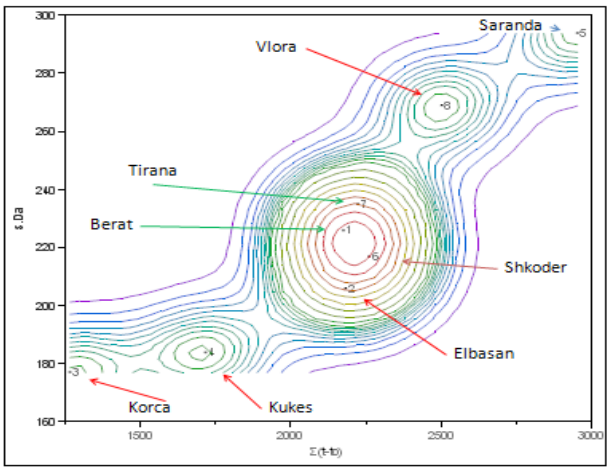

Figure 4. Bio climate gram of grapevine of vine in various space weathering

4. Conclusions

- Three varieties of grapevine Vlosh, Shesh and Kallmet do not have homogeneous suitability level in all territory, because to biological varietal characteristics.

- The ideal areas for the development of three varieties of wine are from Saranda to Vlora under the influence Ionic Mediterranean climate.

- Whereas the territories Berat-Shkoder include the western of the country, under the influence of Mediterranean-Adriatic climate and have average level appropriateness.

- The researches in the future of the characteristics of vine and links with the environment will provide the full conclusions on the effects of climate or geography of each area.

5. References

[1] Hairi I., Belul G., Benard R. (2013). *Assessment of the olive territory thrung bio-morphological and geographical analysis*. Albanian J. Agric. Sci., 12, (4), pp. 715-719.

[2] Edlira K., Albert K. (2011). *Development of vineyards according climate isotherms in Tirana region*. International Conference of Ecosystems (ICE) Proceedings, Tirana, Albania, ISBN: 978-9928-4068-1-1.

[3] Branas J., Bernon G., and Levadoux l. (1946). *Elements de viticulture generale*. Imp. deham, Montpellier, France.

[4] Champagnol F. (1984). *Eléments de physiologie de la vigne et de viticulture générale*. F. Champagnol, Saint - Gely - du Fesc, pp. 129.

[5] Amerine, M. A. & Winkler A. J. (1944). *Composition and quality of musts and wines of Californian grapes*. Hilgardia, 15, pp. 493-637.

[6] Hunter J. J. & Archer E. (2001). *Short-term Cultivation Strategies to Improve Grape Quality*. In: Proc. 7th Viticulture and Enology Latin-American Congress, Montevideo, Uruguay.

[7] Hunter J. J. & Bonnardot V. (2004). Climatic *Requirements for Optimal Physiological Processes: A Factor in Viticultural Zoning*. In: Proc. Joint International Conference on Viticultural Zoning, Cape Town, South Africa.

[8] Tonietto J. & Carbonneau A. (2004). *A Multicriteria Climatic Classification System for Grape-growing Regions Worldwide*. Agri culture and Forest Meteorology, pp. 81-97.

[9] Weaver M. V. (2006). *Report on the Judges Report Back Session*. Old Mutual Trophy Wine show, featured on the SA Wine Industry website.
<URL http://www.sawine.co.za. Accessed 25 April 2014.