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RESEARCH ARTICLE **(Open Access)**

Assessment of the olive territory thrung bio-morphological and geographical analysis.

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Abstract:

Autochthonous germoplasm of the olive with 156 accessions, (O europaea L. ssp. Sativa Hoffm, ssp. O. Oleaster Hoffm, and ssp. Sylvestris), has been analyzed with biological valences of the species (catminate code) and D-GIS (Bioclim / Domain, to identify diversity and suitability of the territory for olive cultivation. Cartography with spatial analysis detects areas of different height diversity levels. (a lot of estimators and variability). In the explored space, 20-37% of the territory resulted excellent for olive cultivation. In the analysis of spatial density, the area of Albania has two major hearths: the Ionian and Adriatic Hearth. In general, 21 genotypes resulted synonyms of 7 standard *cv, whereas* 21 genotypes resulted homonymous. PCA between correlation matrices of all variables, classified 16 unrelated variables explaining >95 % of total variance. PCoA indexes eigevectors positioned genotypes and their characters according to their degree of variability in negative or positive space. (Axes, x, y and z).

Keyword*:* O europaea; germoplasm; Autochthonous; diversity; olive

1. Introduction

There are about 156 varieties and autochthonous ecotypes among the three olea subspecies: (Olea EuropaeaL.ssp.SativaHoffm, ssp. Olea Europaea OleasterHoffmans, and ssp. Olea Europaea Sylvestris Mill.), which cohabit in the greatest part of the territory, [1,2]. Olive's expansion is regional and homogenous although there is no study on biological correlations, climate and terrain. Expansion should be studied with the suitability phenomenon, inherited characteristics and efficiency as a result of periodicity, [1,6,7]. The purpose of this research was to find the connection between bio-climatological and terrestrial ratios through statistical methods in order to assess the suitability of the territory.

2. Material and Methods

2.1 Morfologji.

Genotypes and ecotypes of the olive population were collected from territories reaching even climate extremes. The basic terms were: centennial genotype in extreme climate areas and representative loci of the origin. The geographical characteristics were registered via GPS: H, N, E. Taxon was analyzed per age, terrain, biometrics, fruit characters, endocarp and leaf. Morphological description was performed according to Rezgen

2.2 Geographical characteristics :

Climatic data were analyzed according to isotherms, whereas taxon about biological valences of the three subspecies according to catminat code. The most important ones were: valence of light, temperature, continentality, air humidity, edaphic humidity, geography, diversity, technology, efflorescence, soil reaction (pH), soil fertility, soil texture. *Bioclim/Domain* was used to identify distribution, density, diversity and genetic wealth. Suitability of the territory was estimated through biological valences for olive cultivation; principal components analysis (PCA) for variation dominants, whereas *PCoA* for distribution on the negative and positive space of the axis coordinates. Cluster for resemblance of the genotypes and climatic components for the genetic distances of the accessions, analysis for the distribution of N against the frequency of H, E and main biological valences. *(Table-1)* [10]

3. Results and Discussion

3.1 Morphological and bioclimatological analysis:

About 156 accessions of the Olea Europea L species were collected within the frontier areas of climate and olives. Considering the part of the

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explored territory as far as genetic resources and diversity are concerned, both result to be rich, [4,5,6]. The centennial accessions have been cultivated for centuries under specific weather regimes, in situ. Several limiting factors such as extreme geographical position, temperature, and precipitation have defined the region of subspecies distribution, [7, 9]. *In figure-1*, the geographical position and biological valences have caused different genetic diversity and distribution on the territory as well as a wide frequency of the quantitative characteristics, *(Table-1*). The widespread varieties in a wide diapason have caused avoidance of high frequency of the characteristics. [7]. These have caused polymorphic variation within the quantitative characteristics. E.g. Kaninjot cv has a coefficient of variation 8.3% per oil percentage. The genotypes have variations of qualitative and quantitative characteristics, such as endocarp weight 0.7%, pulp weight 3.7%, and fruit weight 3.9%, leaf width 3.4%, leaf length 4.5%, leaf surface 4.6%. Colour index 2.9%, temperature variation (t-t^0), 11.8%, *SAS. 2008: SAS users guide*.

There are 14 varieties and 17 autochthonous ecotypes newly collected which have not been described in literature in the past. Generally there is taxonomic confusion as a lot of different varieties are called with the same name, while on the other hand the same variety might be called with different names. A total of 21 genotypes have resulted synonyms to 7 standard varieties, whereas 23 genotypes resulted homonyms.

In figure 1, the biological and geographical indices of the three subspecies (Sativa, Oleaster, and Sylvestris), have different distributions compared to longitude (N), frequency of height (H) and latitude (E). The accessions have geographical position with significant variation (cv=9.7%), compared to the average longitude. Within the primary and secondary areas of cultivation the coefficient of variation is 7.7% and 11.8%. Relations HE/N are strong (r^2=0.84), and have proved limitation of olive cultivation to altitude following the increase of geographical longitude and latitude. Average altitude in the Ionic area is 148m, whereas in the northern area 111.2m. Average altitude is 168.6m. Average altitude of collection resulted to be 514m in the south and 214 m in highlands, (north).

Table 1. The main biological indices by the code catminat and the bioclim / domain, for three olive subbspecies Olea europaea L. ssp.sativa, olea eeuropaea ssp.oleaster and ssp.sylvestris.

	LV	*TV*	*GV*	*DV*	*HEV*	*AHV*	*MI*	*NEH I*	*MaI*	*RI*	**MeI**
O.europaea sativa	8	7	7	6	4	4	8	7	10.5	114	10.51
O europaea oleaster	8	7	7	5	4	4	6	7	5.32	31	6.32
O.europaea sylvestris	8	8	8	5	3	3	4	8	3.14	11	1.54

LV- Light valence, TV-Temperature Valence, GV-geographical Valence, DV-Diversity Valence, HEV-Humidity edaphic Valence, AHV-Air humidity Valence, MI- morphological index. NEH-index, MaI- Margalef Index, RI-Richness index, MeI-Menhinick index

In fi*gure-2*, Olea diversity index has proved heterogeneous distribution, significant geographical variation and the existence of genetic differentiation. The map of spatial analysis has defined the loci and values of genetic diversity which have a great variation, 45.1%. Analysis of spatial density presents two spread loci as the most appropriate space for olive cultivation; (i) the Ionian and ii) Adriatic loci. Demarcation line between the two climatic loci is at a longitude of 40^{0}50’00’’, whereas maximal expansion at 42^{0}30’ 00’’. Autochthonous diversity is made up of 65 varieties of the population, but only 14 of them have an average to big population.

Regional suitability: Seven varieties of ancient origin have been acclimatized and have formed the ecozones of origin, which are called loci. The genotypes of the three subspecies are characterized by thermal constants of different biological indices. There are strong correlations between the age of genotypes and climate (r^2= 0.77-0.94). An indicator of suitability is the old age of genotypes which goes from 300 to 3000 years old, [9, 11]. The genotypes have constantly preserved and inherited genetic characteristics, thus making the phenotype the expression of relations genotype-environment [9]. With the analysis of the constants in figure-3, the olive is regionalized in two growth loci. The genotypes are spread at a longitude of 39-42, and latitude of 19-20.15 degrees, and altitude of 0-514m. According to catminat code, gross area of suitability is about 470 thousand hectares (*alpha=0.05*), which includes the current available surface of the olive (55 thousand ha), orchard, field crop, etc. A total of three plots have been differentiated referring to figures-3 and 4, on the regional distribution of the coordinate axis. Variables out of the plots are unreliable referring

to the level of authenticity, p=0.05. Whereas according to Bioclim/domain 20-37% of the territory results to be brilliant for the growth of *Olea Europaea Sativa*, O*leaster and Sylvestris*. Good 15-30%, 2.5-5% of average suitability and 0-2.5% low, whereas 26.5-38% of the territory was considered unsuitable. The map has been calculated based on the valences of the three subspecies, spatial analysis, richness estimators and variety richness.

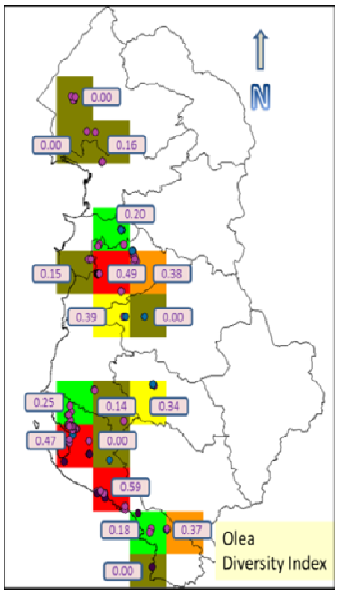

Figure- 1, distribution of 156 genotypes in view of longitude (N), frequency of altitude (H) and latitude (E) of the climatic cultivation areal.

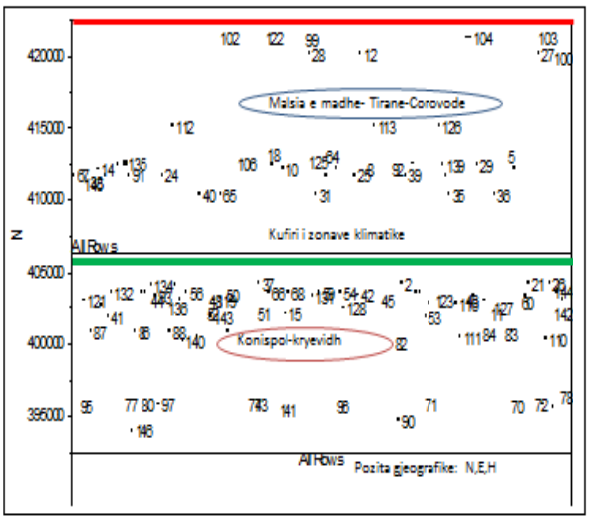

Figure-2, index of olive genetic diversity, for the three subspecies and 156 olive genotypes carried out through bioclim/domain and biological valences.

Analysis of bioclimograms proved differentiation among the geographical areas; for the climate ($t\text{-}t^0$), subspecies, genotypes and their density, [8]. Given the data 5 genotypes of their population possess 78% of the surface, (Kaninjot, KrypsBerati, BardhiTiranes, KrypsElbasani, Mixan,), whereas 151 other accessions possess 22% of the overall surface of the olive.

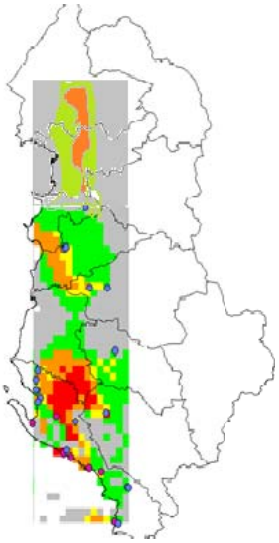

Figure-3 Regionalization of the climatic areas and optimal region for olive cultivation realized according to Bioclim/Domain and Cadminat code.

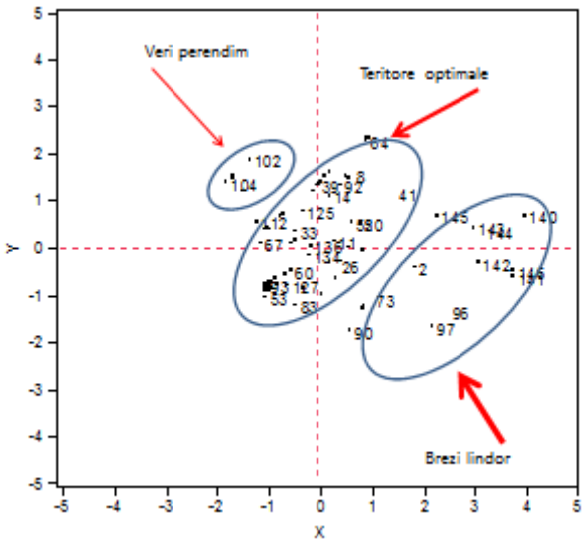

Figure-4 Analysis of the main coordinates for 156 genotypes based on the morphological components and Cadminate code. PC1 and PC2 constitute 88% of the total variation. The characters were distributed in four representative spaces positive and negative of PC1 and PC2.

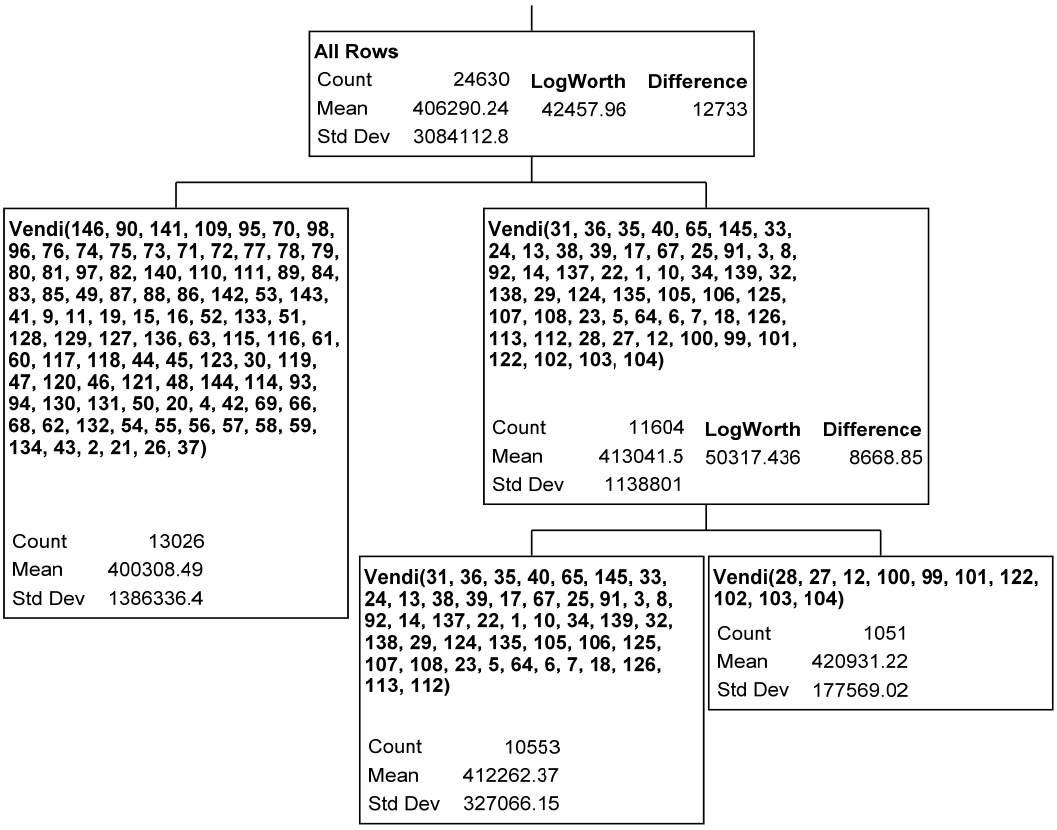

Figure-5: Grouping of olive accessions according to geographic proximity of morphological and biological indices, analyzed jmp / Crossvalidation.

According to Diva/Gis analysis, two micro loci have high diversity in the Ionic area of 0.59 and 0.47, whereas in the Adriatic locus (TR) one locus has an index of 0.49. Index value Margalef (*M=3.14*), has selected several areas in Vlore, Himare, Tirane, Mallakaster of high diversity for the number of cultivated subspecies, varieties and biotypes, [5,6,11].

4. Conclusions

- In 156 olive accessions that were collected there is a taxonomic confusion of two aspects: (a) Homonymy- different varieties are called with the same name. (b) Synonymy- the same variety with different names.
- Autochthonous diversity is made up of 65 varieties of the population, but only 14 of them have an average to big population. Subsp.sylvestris resulted considerably distant compared to ssp.oleaster (71.3%) and to ssp. Sativa (91.3%).
- 20-37% of the territory resulted magnificent for the growth of Olea Europaea Sativa, Oleaster and Sylvestris, whereas 26.5-38% of the territory was not suitable.

5. References

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