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Clonal selection of "Kryps Berati" variety of olive

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Abstract

The "Kryps Berati" is the principal olive table in Albania with more than 80 % of the national production and occupies 17% of the olive groves surface.By classical method were defined four parcels with this variety composed of 1273 heterogeneous trees in different areas have been subjected to clonally selection. The increasing and stability of production, and the big fruit and tolerance to disease were the breeding objectives.After five years of the phenotype selection of individuals from principal olive population (first phase) there were 27 trees head-clones selected. Selected head-clones were evaluated for the progressive yield and periodicity index. In the second phase, a comparison among the head-clones were for the yield, periodicity index, size of fruit and the ratio pulp / stone were realized.At the end of the study five clones for the periodicity index, and four for the size fruit + ratio pulp/stone, and two clones for oil content were selected. Study shows that phenotypic variance and the heads-clone frequency, were highly influenced by the genotype effect and interaction genotype x environment.

In conclusion: The clones have great variation compared to the average population and their multiplication in the future will make the heterogeneous population replacement with another homogeneous population, and greater genetic capacity.

Keywords: Selection; Clonally; Variety: olive; genotype

1. Introduction

The olive by name Kryps Berati, is a variety with more heterogeneous population, with a significant periodicity and different morphological characteristics. Researches for his selection, they aim to selecting new clones, very adapted to the local environment, with big fruit and report pulp / stone, higher oil content and lower periodicity, [2, 3]. The trees that possess these indicators have the changes compared with the standard of the population. Experiments on genetic improvement of Kryps Berati cv. are implemented in the period 1997-2008, project in the framework of the bilateral Italy-Albania and financed by IAM-Bari Italy. Genetic improvement through clonally method it is aimed at increasing the performance varietal, exploiting the heterogeneity of the population base, because they are primary genetic resources as the effect of selection. Subsequently, will be their exploitation for purposes of multiplication.

The material selected will have longer period of use especially, for multiplication and the creation of new olive groves [2, 6]. IF, selected trees will results in infections they have to pass the protocols of sanification. In these circumstances, the final aim of this study has been to create the pre-base material at olive, the creation of conservation repositories, and guaranteed reproduction of the material. This variety has more heterogeneous population and should increase performance for the constant production and fruit caliber.

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2. Material and Methods

Searches are conducted in the period 1995-2008, for the selection and creation of primary sources.

2.1. experimental scheme

The principal scheme of selection was by Kafazi 1970 and Huet 1961, [7, 8]. Byprincipal scheme were defined four parcels with this variety composed of 1273 heterogeneous trees in four different areas. The trees of primary selection were defined in four different locations: ne Bilce, Kala, Kutalli and Shamogjin, *figure 1*. Selection was for the constant production andfruit calibre (CP+FC). The positive selection is based on phenotype, i.e. the choices each year, of positive trees. The method applied is classified into (three) phases: *see scheme of figure no. 1*.

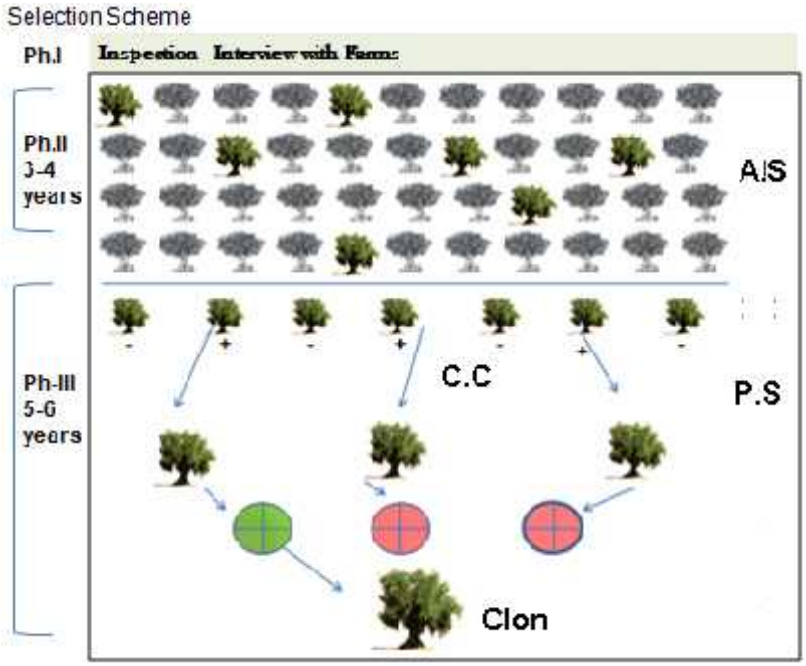

Figure 1. General scheme of the selection of the olive Kryps Berati varieties, realized at four different areas.

(i) The massive choice. Two years, inspection and selection of trees in each year to: great production and big calibre of fruits. Trees that resulted without fruit were eliminated, according to qualification of trees base of the selection in collaboration with farmers [10].

(ii) The evaluations were performed three years, when the value of maturation index was 3.5-3.6

(iii) Study tree / tree, of selected fund in phase (i + ii).

During the third phase (iii) six years, the selected trees in the phase (ii) were studied for five main indicators: (1) the yield / tree and volume to the crown, (2) the coefficient of periodicity, (3) the dimensions of the fruit, (4) the ratio pulp / endocarp, (5) the percentage of oil in the fruit. The periodicity index is calculated by Pearce and Dobersek-Urbank 1967, according to formula:

$$I = \sqrt{\frac{1}{n-1}\sum_{1=2}^{n} \left(\frac{P(i)-P(i-1)}{P(i)+P(i-1)}\right)^2}$$

Where: (n) the number of years of production observed and P (i) production of the years (i) [11].
The standard deviation has analyzed the level of variance of the average yield for years of the first and second phase, based on the formula: $\sigma = \sqrt{\frac{\sum(Yi - \hat{Y})^2}{n-1}}$ where: Yi- year yield (x), Ŷ- The average yield of the years. *n*. the number of years.
The level of variability between clones candidate is calculated by the formula: $CV = \frac{\sigma}{\mu}$ .100 where: δ- standard deviation, μ- average sample.

2.2. Indices of selection; (i) The trees, that possess constant production (+) and great yield (x). (ii) Tree with constant production (+) and fruit size (y). (+ y). (iii) High oil content in the fruit (z). Tree who possess some features, (+x y z) [5, 9].

*2.3. Statistically analysis:*The variables of each sample are computerized in the JMP software for: the size statistics, the average, standard deviation and variance of the population. After, the descriptive statistics analysis and coefficient of variation, periodicity index, biological density, the traits mean values were used to perform principal component (PCA), quality test of choice and cluster analyses of genetic similarity. All these, was studied via the UN weighted pair-group method with arithmetic averages (UPGMA) using JMP ver.8.0.3. [1, 13]

3. Results and Discussion

3.1. Selection of population.

Selection of population of Kryps Berati variety, as selected seven individuals who, he has realized of the yield improvement, coefficient of periodicity, the fruit size and oil content in fruit. In the future, their multiplication and distribution will make the replacement of the population standard level[12, 14]. Inspection of experimental fields was expressed in table 1. In the first year, in four representative olive groves are based on the study trees. After the analysis any tree (two years), are qualified 116 trees, or 2% compared to the initial trees. While in the last year only 27 trees are selected, which are selected from 1273 parent's trees study in *table 1*. The selected trees were presented for each experimental field at the end of the first phase.

Table2. Clonal selection fields of Kryps Berati olive varieties, over the years of the phase (i) and (ii)

Phase i and ii Area	Ph-1 2 years	Ph- 2 year III	 year IV	 year V	 year-VI	 %
Kutalli Yrte, Stane	328	39	24	11	6	**1.8**
Kala Bregu Kasolles	245	26	16	9	4	**1.63**
Bilce – Nazif Hajdini	577	32	21	11	11	**5.54**
Shamogjin, Vlore	223	19	12	10	6	**2.69**
in total	1273	**116**	73	41	27	**2.12**
In %	**100**	**9.1**	**5.7**	**3.2**	**2.1**	**2.1**

The inspection tree / tree and the trees choice with production and big fruit was performed at the time of maturation. Selection of positive trees in each year were been tested to pass in a second phase for study.

The selection intensity was greater in Bilce 5.54 %, smaller in the Kala (Bregu Kasolles) 1.63%, while the average value is 2.12%.

In the second phase, trees candidate clones, income of the first phase were studied for tree to tree in 6 years. After six years of the second phase, the size statistics, the average, the standard deviation and the variance of population resulted very different.

3.2. Statistical analysis of choices.

The statistical size was as an expression of the average of the observed trees. Seven trees are selected at the end of the research period. The average of each indicator has a significant variance compared to the average population. Variance of the selection differential was 0.07 to 13.5, dev stand and cv. 4.9 to 39.2%.

Table 3. Statistical indices for the principal components, included in PC[1], and deviation compared to the average of the population for fruit (g), CV (%), Oil (%), Fruit (D), stand.dev.

C.Clon	**Fruit (g)**	**Stone (g)**	**Oil (%)**	**Fruit (D)**	**Fruit (d)**	**Yield Kg/tre**	**C.V**	**D.S**	**Dev.S (-)**	**Fruit (g) (+)**	**Oil % (+)**	**Fruit (D)(+)**
KKB10	5.44	0.6	21.6	25.5	20.3	26.8	35.8	9.6			1.7	
KKB11	6.76	0.54	21.6	23.1	19.2	20.6	19.9	4.1	7.1	0.76	1.7	
KKB12	6.34	0.65	20	27.1	20	29	60.3	17.5	0.0	0.34	0.1	2.3
KKB13	5.77	0.58	22.1	24.7	21.1	24	64.1	15.4			2.2	
KKB14	6.18	0.72	23.1	27.8	20.4	32.3	56.6	18.3			3.2	2.3
KKB15	5.35	0.62	19.8	24.1	20.2	29.1	66.5	19.3				
BKB1	5.49	0.64	17.8	23.9	19.4	30.8	34.4	10.6				
BKB2	5.03	0.63	18.4	23.4	18.5	24	47	11.3				
B KB3	4.97	0.59	24	25.2	18.8	32.1	57.9	18.6			4.1	
B KB4	5.31	0.56	20.8	26	19.4	30.3	13.2	4	7.2		0.9	0.5
BKB5	5.24	0.59	22.1	25.2	19.7	23	43.9	10.1			2.2	
BKB6	5.92	0.63	21.8	25.9	20.9	37.8	54.7	20.7			1.9	0.4
BKB7	5.57	0.65	23.4	25.6	20.4	18.3	53.5	9.8			3.5	
BKB8	5.36	0.68	24.8	26.2	19.9	16	51.2	8.2	3.0		4.9	0.7
BKB9	5.53	0.67	20.6	25.9	21	21	14.7	3.1	8.1		0.7	0.4
K660	6.91	0.87	19.3	24.8	19.7	63.8	32.2	20.6		0.91		
K661	6.78	0.63	20.2	26.2	19.9	39.6	14.6	5.8	5.4	0.78	0.3	0.7
K662	6.33	0.58	18.7	25.9	20.3	56.5	17.5	9.9	1.3	0.33		0.4
K663	5.61	0.62	18.9	23.3	19.4	25.8	44.5	11.5				
K664	5.48	0.57	17.9	23.5	19.2	28.6	50	14.3				
K665	7.13	0.64	18.6	27.3	20.7	55.5	16.9	9.4	1.8	1.13		1.8
V222	7.44	0.79	17.7	27.5	21.6	34	14.4	4.9	6.3	1.44		2.0
V223	5.45	0.62	17.3	26.1	20	30.6	56.5	17.3				0.6
V224	6.94	0.79	16.9	26.3	19.4	37.3	13.1	4.9	6.3	0.94		0.8
V225	6.66	0.6	16.2	26.8	21.1	44	13.6	6	5.2	0.66		1.3
V226	7.33	0.71	17.4	27.8	22.1	57.5	9.3	5.4	5.8	1.33		2.3
V227	6.45	0.63	18.2	25.7	21.3	61.5	21.7	13.4		0.45		0.2
Mean	6.02	0.64	19.9	25.5	20.1	34.4	36.6	11.2				
St.Dev	0.7	0.07	2.33	1.37	0.87	13.5	19.4	5.6				
St.Err	0.14	0.01	0.45	0.26	0.16	2.61	3.73	1.07				
CV	11.6	10.9	11.7	5.4	4.9	39.2	53.0	50.0				
Upper 95%	6.32	0.67	20.8	26.1	20.4	39.8	43.9	13.5				
Lower 95%	5.73	0.61	19.0	25.0	19.7	29.0	28.5	9.0				

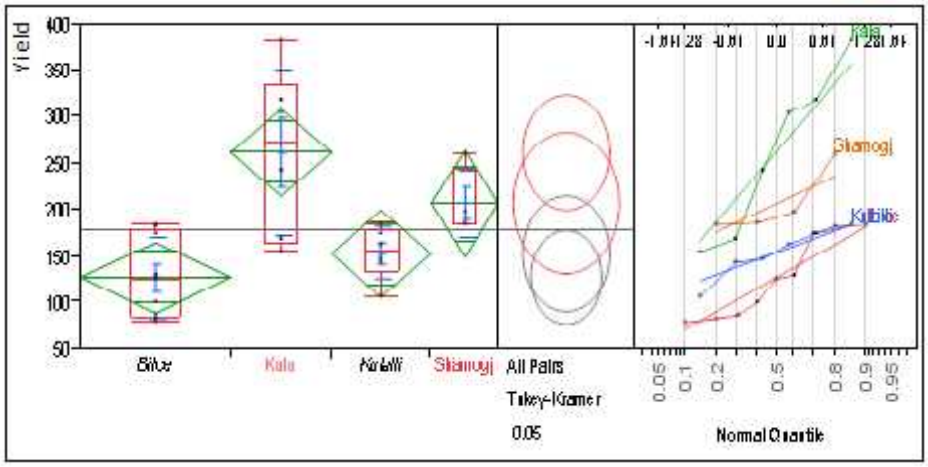

Figure 4. Analysis of the variance for parent parcel by total production, variances test averages and the distribution of the quintiles.

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According to the data in Table 3 and 5, the particular yield was phenotypic expression, and results associated with two factors; (i) genetic wealth of the individual (internal factor) and (ii) ecosystem or environment (external factor) [11].

Study shows that phenotypic variance and the heads-clone frequency, were highly influenced by the genotype effect and interaction genotype x environment. The level of authenticity was high, because the total number of trees analyzed and the samples was great and the values obtained are tested for p = 0:05, for all the indices studied.

It is difficult to conclude that the gene that represents these tree-clones will have the ability to heritage of the traits in the next reproductions. But trees clones, each year were reflected the same positive features. In this way, they have the highest suitability index and possess genetic information that makes them different from the population. Thus, at the end of the second phase, they

Have a high probability for being clones. Because they have the highest average, small stand.dev between years, and great variation compared to average population of the trees selected in the F.2

Every tree-clone and each selection criterion, they were been significant changes compared to average population in F2, *tukey test* and Nonparametric: Spearman's ρ, has tested the connections for variable by variable, prob>P <.0001*

Referring to Table 3, 27 trees represent the population in the second phase and having average population 36.6 for CP. The averages have the dominance in the population of the Castle and Shamogjin, and stand.dev 11.2. Fruit yields have the shown variation between years, cv. 34.4.

In the table 5, the population of seven trees selected vas resulted 14,1 CP, while DS 4.61. In this way the young population changes 41% for CP. Individual clones yield was great, in the same time good index of periodicity, having certified that the potential of clones is linked with the genetic heredity.

Figure 5.The average population, coefficient of periodicity and stand.dev for seven clone's olive

Clone	C.P	D.S	Std.Dev(-)
BKB4	13.2	4	7.2
BKB9	14.7	3.1	8.1
K661	14.6	5.8	5.4
KKB11	19.9	4.1	7.1
V224	13.1	4.9	6.3
V226	9.3	5.4	5.8
V222	14.4	4.9	6.3
Mean	14.1714	4.614	6.612
Std Dev	3.13991	0.921	0.923
Std Err Mean	1.18677	0.301	0.349
CV	21.9	19.5	13.6

Figure 6. Multivariate Principal Components / Factor Analysis/Score Plot for 27 candidate olive clone, based on the main features defining the variability.

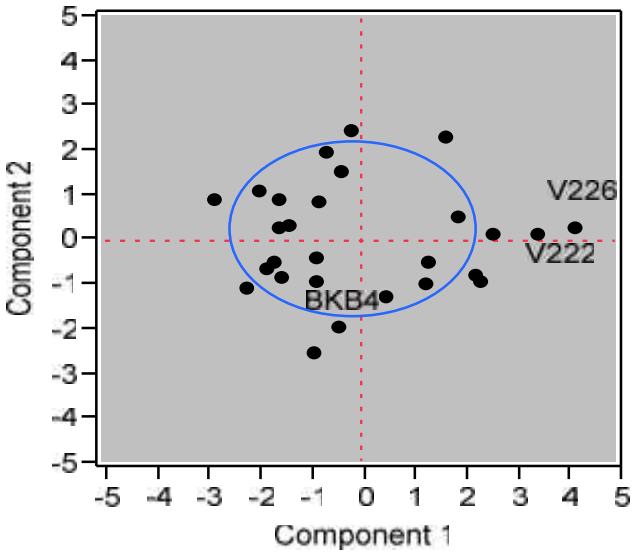
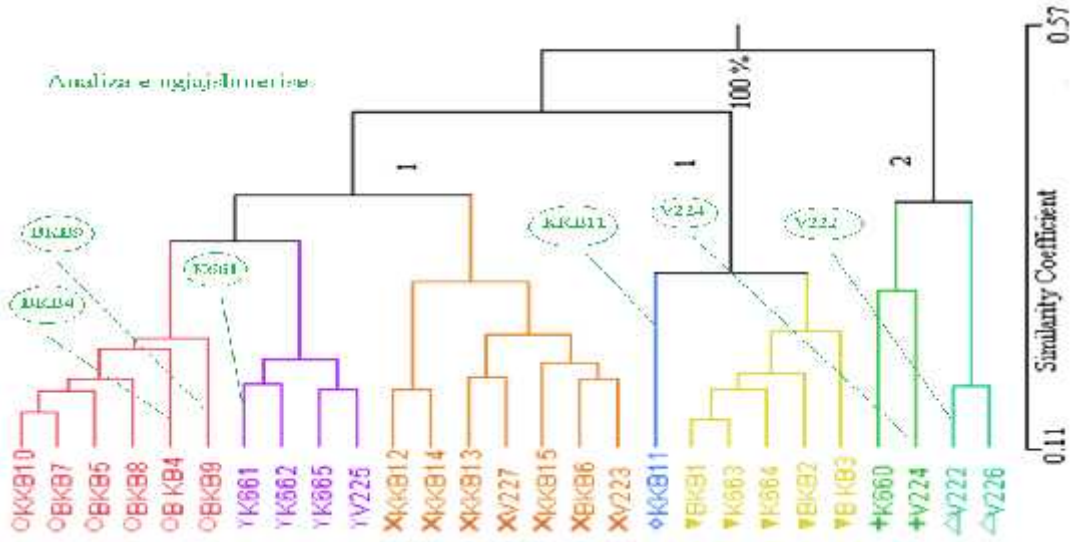


Figure 7. The similarity analysis for genotypes of olive,based on the main features defining the Similarity.



3.3. the choice of clones.

We figure 6, is noted that, correlation between stand.dev and coefficient of the periodicity is strong, r=095. Eleven clones have changes and they are arranged outside the circle of individuals with great similarities. *While in figure 7*, the clones have had different levels of similarity, analyzed by fixed distance of similarities, (0.193). The population variation of the F-2 was great, *36.6*% whereas, the new population variation F-3 was small, *14.1%*. According to the classification system was resulted: KB111 and KB111 possessed three characters (+ y z). Three clones possess CP + CF + O. Two clones possess CP + CF. An clone possess CF.

4. Conclusions

The clones have great variation compared to the average population and their multiplication in the future will make the heterogeneous population replacement with another homogeneous population, and greater genetic capacity.

Characteristics of clones compared to the average population of trees of the first phase and the second was due to the connections of Genotype-Environment, which are expressed in their phenotype. Improvement of the KB variety, in the context of the study of autochthon genetic resources, has made acknowledgment of genetic property, characterization of its diversity in order to improve the population of this variety.

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