# ADMINISTRATION OF BIODIVERSITY OF THE AUTOCHTHONES OLIVE TREES IN ALBANIA

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***Abstract:*** *Olive trees in Albania, located in the East Shore of Mediterranean, are considered as an important point of biologic diversity. Referring to Zhukovsk and Bahtjejev, our country is included in the seventh Mediterranean climate centre, based on the origin and formation of the cultivated plants. As conclusion Albanian flora is genetically linked by the Euro-Asiatic flora of the East and West Mediterranean. For 20 years in Albania have been tried to explore, characterize and evaluation of the existent biodiversity. These kinds of researches that have had their origin since 1985 in the Olive Trees Institute, have been undertaken in order to: prevent genetic erosion in the Olea family. Taking into account: the spontaneous expansion of oleo plants by the age over 20 centuries, the diversity of the varieties, the number and exploitation of the olive trees before 1940 (1200), climate conditions and the evidence about the antic olive culture the main centers of olive trees diversity are: Antic olive trees of the Tirana region (Preze, Ndroq, Petrele, Linze, Brar, Kruje), antic olive trees of the Vlora region (Kanine, Bestrove, Narte, Panaja, Trevllazer, Dhermi, Himare, Palase, Qeparo, Borsh). Identification activity did take place in two phases: firstly: identification of the list of the autochthon cultivars, through consultations of the archive for the different varieties of the Albanian territory. Secondly: evaluation of the autochthon varieties, their origin and as well their identification, preservation and recuperation for deeper evaluation. Actually in Albania there are identified 46 genotypes. Out of which 22 have been fully analyzed in terms of morphologic character and genetic variability, 11 are accessions or synonymous. Three cultivars are widely disseminated. Today, 22 olive cultivars are the biodiversity cultivars to be used in the olive plantations of Albania. Regarding the biochemical and molecular analyses, this was able only in the last 5 years. For all the Albanian cultivars (22) was undertaken RAPD analyses, RAPD analyses of 22 cultivars hold up (support) the hypothesis of the autochthon origin of our olive trees and their limited dissemination out of their core origin areas. Have been described agronomic and technologic characteristics of the main variety and cloning list. Physic characteristics of the olive oil of the main cultivars in correlation with vermin resistant. The purpose of germ-plasma characterization was the total and actual knowledge of this biological diversity through application of a program of variety characterization: i) to have the best and proper genotype for different agronomic demands which directly influence in the productivity and the quality of the olive oil; and (ii) to supply the private farmers and other entities all the varietals asset which have contributed to the olive oil production in Albania. In Albania there are 5 olive varieties, which are considered as economically viable, because the area occupied by them is 5 % of the total olive area. The most popular variety is "Kalinjot", which cover 45 % of the total area*

***Key words:*** *biodiversity, autochthones cultivar, RAPD-analysis*

## INTRODUCTION

Albania is very sensitive to its development of olive-culture for product variation and type and has made efforts through various programs for the identification and preservation of germ plasma, with the aim of evaluation and its sustainable use. In the last 20 years the activity for identification was conducted in two phases; firstly to inventory; based on indigenous strains list, consultation for other varieties signaling and arguing as native in the Albanian territory

and secondly assessing the identity of indigenous varieties, recovery and conservation simultaneously for deep assessment of fruit-tree collections.

## MATERIAL AND METHODS

Searches for olive resource management are realized through; inventory, identification and morphological characterization, clone selection in the population of 5 main strains, evaluation of behavior in ex situ. **Inventory** is based on the information of the Farm, and was conducted in three ancient origins Hearth (i) Kalinjotit Hearth, (ii) white olive Hearth (iii) Hearth PM Berat. Information formulated in a file that contains 5 characters; a) Name of the farm, b) No. of olive trees under the available strains, c) age, d) olive trees no identified for study interest, e) Yield of oil /year.

**Clone_selection** Planned in cv. Kalinjot, KMB, AUT, the Hall Himara that form about 80% of general olive-tree surface. Selection objectives have been (i) Selection accessory with constant production that hovers from 0,0 - 0,30. CC (ii) Selection of individuals with variability in the percentage of oil/ fruit/ dry biomass (1.5-2 % higher than standard variation), (iii) Accessories (individual) with the variability of the caliber of fruit at a distance of 0,2-0,5 g. standard variation.

Selection was conducted in two phases (i) the first phase, selection and inspection of the strain population with 500-1200 age-long trees; main indicators: productivity to kg / tree in the ripening time and information of the farm productivity for the two last years.

About 3 hundred trees and trees massive are processed of culling with inferior indicators.

(ii) Second phase: the study of trees is carried out for 6 years for indicators; productivity kg / tree / year is carried out during the ripening time 5-10 December, oil / tree / year in% l.fr, is performed on a measure homogeneous pastry of 5 kg., Fruit weight calculated from the weight of 100 fruits / tree in grams. Regulation of production through the periodicity coefficient (CC), extracted from Pearce and Dobersek-Urbank on the production of each tree / year.

$$I = \frac{1}{n-1} * \frac{P(i) - P(i-1)}{\sqrt{P(i) + P(i-1)}}$$

Where **n**- represents the number of observations, or weighing and **P** (i) production of the year (i), Selection is done through variance analysis, with turkey-Kramer (Hsd) and cluster (hierarchical clustering, average) and for each individual is proved the variability and distance from each other and from the standard variety.

**Evaluation of olive strains behavior** evaluation of 44 olive strains behavior with native and foreign origin, is completed in Vlora climate, in the south west of the country. The collection is a homogeneous fertility field created in 1992. In each year is realized a maintenance technology. Each strain is represented by two trees. The main indicators of research have been (i) the starting year of production (calculated after the year of planting), (ii) Yield in kg/tree/year. (iii) The weight of fruit, based on the weight of 100 fruit and in each year (iv). Percentage of oil in % of l.fr/year (iv) the constant of production (CP) calculated according to the coefficient Pearce and Dobersek-Urbank for each tree / year.

## RESULTS AND DISCUSSIONS

Studies on the management of olive native resources have been important and are performed on age-long trees found which assume consolidated genetic features. Maintenance, studying and improvement of them are a great responsibility and that is transmitted from generation to generation. In the framework of this research major achievements have been

inventory of genetic property, clone selection in five main varieties and evaluation of strains in an ex situ collection.

**1. Inventory and identification of olive resources**: After a 20 years job were identified 46 native strains. Of these 22 were characterized for morphological characters, 11 are accessions; 5 strains result in massive spread in the entire territory while 22 olive strains constitute on useful and usable biodiversity today. In the territory of the country, 5 olive varieties are considered of economic importance because surfaces of each occupy over 5% of the general surface. The most widespread strain is «Kalinjot» which occupies about 45% of olive surface.

*Table 1.*

The main olive homes (hearths) in Albania

| Label | No | Home of AUT | Home of KMB | Home of Kalinjoti |
|---|---|---|---|---|
| Cv. expl.& characterized | 40 | 24 | 5 | 11 |
| Biotype | 47 | 26 | 2 | 19 |
| O.oleaster identify | 10 | 5 | 1 | 4 |
| O.oleaster without id. | 12 | 8 | - | 4 |
| O.europea not characteriz. | 55 | 37 | 2 | 16 |
| Total…….. | 164 | 100 | 10 | 54 |

As seen in tab.1, more than 50 strains are cultivated and are important, but there is a fund of wild species with genetic closeness with cultivated once. There are species and old strains that are regional in small hearths and still cultivated as a result of large adaptation. Format of olive cultivation in Albania are old probably before JC or so old as in other Mediterranean coasts. Identified format of cultivated and wild result in164 names with enough synonymous of them. In addition to the time they are constantly changing, and as a result of natural selection indigenous varieties occupy 90% of that general area, while about 10% are foreign strains as Frantoio, Lecino etc. From all this diversity, only a small number of strains and the country species have economic values and have completed the need for food in centuries. Certification of olive identity has been evaluated on the basis of morphological features by exploiting descriptors of UPOV, IPGRI, while the use of molecular analysis has become possible only in recent years.

**2. Clone Selection**: Knowledge of the characteristics of varieties has allowed an optimal use of them. Native strains have very good characteristics of better quality of fruit and oil. But in terms of economic break even they are inefficient and many time no break even. The main cause of no break even is periodicity of production. Beginners of periodicity are many factors, technological, genetic, climatic and pathogen. Under the biological unity (kind-environment) are found different conformism levels between plants terrain and climate which are expressed in the way of fructification in different quantities and qualities. In populations of local varieties are studied for a long period, and selected clones with constant production without periodicity, with higher rates of oil, with large-sized fruit and resistance of Cycloconium oleaginum which differ from standard varieties. From the agronomic standpoint a large number of characters have been improved considerably; the constant of production (Periodicity) in cv; Kalinjot, the Bardhi Tirana, KM Berati, the Hall of Himara, and the Bardhi of Kruje. Pourcentage of oil in the fruit several percent higher than standard varieties, the report pulp/shell, caliber of fruits, fertility of inflorescence, cycloconium resistance etc. This

progress has been achieved thanks to the reasonable exploitation and manipulation of genetic diversity available in the main strains population and the existence of centennial individuals. Within this research, are selected 41 clones in the population of 6 main native varieties to appropriate places of origin, (tab. 2).

**3. Clone Selection of CV «the Bardhi of Tirana»** Cv. of olive "the Bardhi of Tirana" is the main olive of the central Albania. It occupies 85% of the surface in this area. The high percentage of oil but small fruit size. Standard variety with 25% oil in the ripening time and weight of fruit 2:12 grams. It has a high value of production periodicity that wavers 0.56-0.60, and that makes no significant cultivation and its further spread.

*Table 2.*

No. of clones selected in the population of 5 native varieties

| Clone characteristics | KALINJOT | B.KRUJE | H.HIMARA | B.TIRANA | KM.BERAT |
|---|---|---|---|---|---|
| Oil percentage | 5 | - | 1 | - | 5 |
| Constant of production | 3 | 1 | - | 2 | 7 |
| Fruit size | 2 | 1 | 2 | 1 | 2 |
| Fitopathogen resistance | 1 | - | - | - | 1 |

In these circumstances research for improvement have consisted in implementing rigorous of clone selection methodology. Research in the first phase have confirmed heterogeneous through massive evaluation of 600 trees. All trees were analyzed and were selected the best trees for study and were destroyed trees that have not completed the basic characteristics of selection, habitat and production. After mass selection 300 trees are selected (50%) which are distinguished for their regulation of production. Then, these individuals are observed for 5 years of annual and so on the same method, for production, in kg/tree/year, the percentage of oil on a pastry degree 5 kg/tree/year at the time of harvest, (in % of the fresh material), average fruit weight calculated to 100 fruits of each tree/year. Results obtained in each year and every tree, testified that there is huge variability between trees, though they are in the same environment and belong to the same species.

**The calculated total production**: At the end of studying years, as a result of production data for every tree and every year is presented a very wide variance. From this fact and survey of a large number of trees for their selection with a positive sense are destroyed trees with lower indicators oriented on a "threshold" that corresponds the value and the indicator of periodicity (0.4) For this reason after the third year are eliminated 95% of trees and study for selection has continued with only 16 (95%) trees, selected for higher constant production, higher oil percentage and fruit size better than the standard.
In the last two years of research, on the same method was appreciated trees- Clone and was achieved the selection of those that differ from standard population. 8 individuals were selected (No. 21, 67.213, 188, 184, 200, 192.220) that have a constant production level with indicator 'periodicity' (CP) low (023-0.40) different from standard variety (0.5-06). Individuals selected are statistically certified in Anova test with average cluster method through which groups are given to individuals with near from each other and with evident differences between groups.

**Percentage of oil:** Percentage of oil is analyzed in fresh weight. Weight of fruits voices high value in 5-10/12, of each year which is the time of harvest. Within 16 individuals selected for high production constant compared with standard variety turned variability within their proximity and distance from each other and from the variety standard. This thing was achieved by applying analysis of variance (ANOVA test) Tukey-Kramer method. It resulted

that the average percentage values of oil characteristic for each individual has proved a great level of variability within them. In Fig. 3, is observed that trees nr.79, 72, 200, 213, 88, 171 have a dominant position against the others at a distance (2-3,2%) for LSD 2134. BT 200 individual presents significant changes and great distance from all other trees.

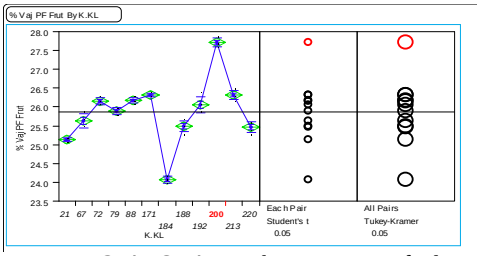


Figure 3: ANOVA test, the percentage of oil

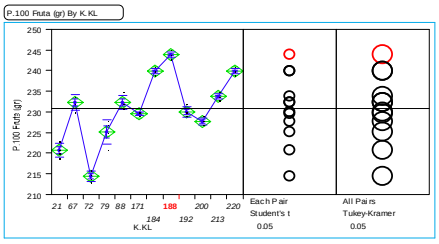


Figure 4: ANOVA test, weight of 100 fruits

Product of oil metabolic synthesis in fruit to 27.5% makes this individual with evident distance 1.5% to those of the same group and 3.5% in distance to st. var. And other accessions of this group have proved their genetic quality with stressed distance from standard, aftermath of individual metabolic process.

**Caliber of fruit**; changes to calibrate the fruit, are expressed in grams. And for 16 accessions selected after 6 years are verified in December 5-10 of each year enough values with evident changes. At this time the weight of the fruit has already taken the maximum value after which it reduced as a result of dehydration that undergoes fruit by strengthening of a biotic factors. Among 16 individuals is observed a great variability of fruit weight, which moves from 2.09 g. (n.245) in 2.44gr (n.188). According to analysis in ANOVA test (Tukey-Kramer) for LSD 2012, (Fig.4) accessions group with high fruit weight occupied a dominant position in relation to other individuals. Individuals with nr188, 67, 192, 88.171, 220 have evident changes (0.2-0.35 grams) of standards and testifies for genetic character and high economic values that will have their breeding and propagation in comparison with others within variety population. Tree no.188 has fruit weight 2.44gram that for 2:37 LSD, represents significant changes with all other trees and great distance to variety standard. (0.3gram). Significant changes between clones and standard for oil percentage and fruit weight are certified in each year and on many years average prove for sustainable individual characters.

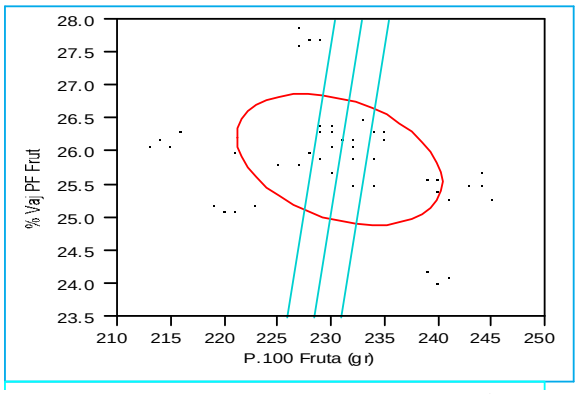


Figure 5: ANOVA test, x% oil Bivariate P.fr

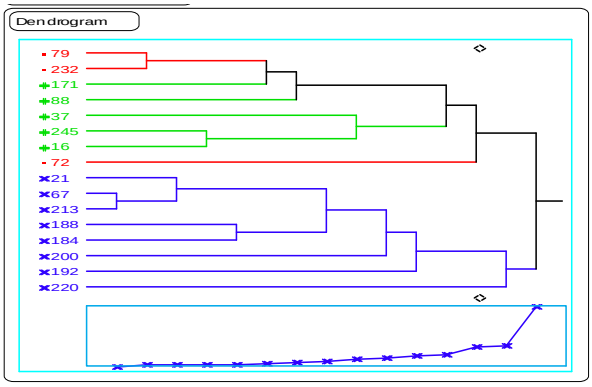


Figure 6: ANOVA test average hierarchical clustering of clones

Approximation percentage points for oil and fruit weight were verifying through two factorial analysis and were found several possible correlation for density ellipses P = 99. In Figure 5, are found accessions variables, which own higher percentage of oil and higher fruit weight too. Outside this ellipse on the left are those with low percentage of oil while on the right accessions with great fruit weight.

While through the hierarchical analysis average clustering method (fig.6), for delivery, proximity and distance to each other and grouping for the coefficient of periodicity is noticed a great variability, which moves from 0.23 (nr.200), in 0.74 (nr.37), and has grouped accessions by level of proximity to 3 groups:

1. Group with alternation coefficient 0.44-0.65 composed of individuals, 79, 232, 72.which are characterized by irregular products and small weight of fruit.

2. Groups with alternation coefficient 0-66-0.74 composed of individuals; 171, 88 37, 245, and 16, characterized for average fruit weight without changes to the variety standards.

3. Groups with alternation coefficient 0.23-0.40 composed of individual's nr.21, 67,213,188, 184, 200.192, 220 of which are characterized for high regularity of production, and high average fruit weight.

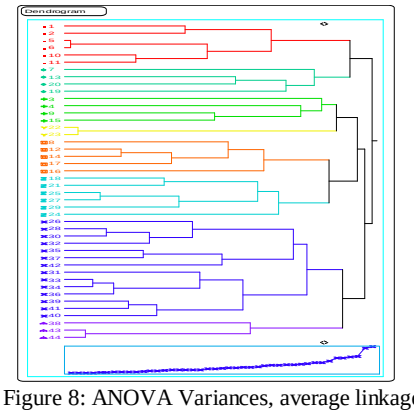


Figure 8: ANOVA Variances, average linkage method

Figure 9: Screen house for olive clones

*Table 7.*

Key data K. clones in Bardhi CV of Tirana

| K. Clone | Efficiency kg/tree | | | | | | Coeff. of Periodicity | Weight 100 Fruits | % of Oil |
|---|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | | (gram) | (new) |
| BT 79 | 30 | 80 | 40 | 15 | 70 | 50 | 0.44063 | 225 | 26.0 |
| BT 21 | 40 | 70 | 35 | 30 | 30 | 70 | 0.26510 | 220 | 25.1 |
| BT 67 | 50 | 60 | 40 | 15 | 15 | 30 | 0.27055 | 232 | 25.7 |
| BT 72 | 40 | 20 | 15 | 60 | 30 | 0 | 0.56615 | 215 | 26.1 |
| BT 188 | 25 | 10 | 25 | 20 | 25 | 40 | 0.29842 | 244 | 25.4 |
| BT 232 | 15 | 20 | 30 | 15 | 0 | 10 | 0.65901 | 213 | 24.7 |
| BT 200 | 10 | 25 | 15 | 20 | 20 | 20 | 0.23090 | 228 | 27.5 |
| BT 213 | 20 | 15 | 35 | 15 | 15 | 10 | 0.27582 | 234 | 26.2 |
| BT 37 | 25 | 10 | 20 | 4 | 0 | 10 | 0.74016 | 215 | 24.4 |
| BT 192 | 30 | 10 | 25 | 40 | 25 | 30 | 0.33119 | 230 | 26.0 |
| BT 184 | 20 | 15 | 25 | 20 | 5 | 5 | 0.30174 | 240 | 24.1 |
| BT 88 | 25 | 20 | 20 | 25 | 0 | 20 | 0.63634 | 230 | 26.0 |
| BT 220 | 30 | 10 | 20 | 15 | 5 | 13 | 0.40719 | 240 | 25.5 |
| BT 171 | 15 | 0 | 30 | 15 | 0 | 1 | 0.66972 | 230 | 26.4 |
| BT 245 | 40 | 20 | 80 | 0 | 15 | 20 | 0.70590 | 209 | 24.8 |
| BT 16 | 35 | 15 | 50 | 0 | 10 | 10 | 0.69999 | 211 | 24.2 |

**4. Evaluation of strains in collection**

A list of varieties, 44 varieties of olive with country and foreign origin, are studied in the period from 1992 to 2005, in Vlora climatic conditions (P. Mezini). Field has been with homogeneous fertility, and each strain is planted in an occasional scheme and is represented by two trees. Seedlings of each variety have been 3 years age, quite uniform at the time of planting. Techniques for creating and technology for maintenance of trees has been the same. Estimates have been important because they have determined optimum production as a result of the demands of varieties to environmental conditions. Olive strains after 10 years of observation have shown evident changes from one another for vegetative growth and dynamics of the crown volume, ability to flourish and to differentiate the first product. Vegetative growth resulted in differences between varieties. Trees are characterized in the early years for strong vegetative growth for the forming of the crown which constitutes the basis of fructification. In general strains with greatest production in the first years are associated with less vegetative growth, whereas when the production has been small vegetative growth has been great. Strains, Manzanilla, Pendolino, Koroneiki, Amigdanolia have started first producing in the second year and have continued this phenomenon in various ways, in other years. While strains Unafka, BOCI, Kallmet, KME, KMB, Kalinjot, B. Tir, Kushan, H. Himara, Nisiot, Marx had started the first production in year 5-7.

**Features of production and uniformity**. Fructification of trees has been a genetic expression, ie, predisposition of strains to flourish and fructify in dealing with climate and other environmental elements, and in these circumstances any type exposes variety characteristics. Evident expression of this conformity is the efficiency in fruit productivity and distribution in all years. Analysis in groups cluster analysis (figure 8), for the production of strains and distribution by years expressed in values of coefficient of periodicity has determined the proximity between strains and has made the collection of those whose values are approximate. Indicators included in the evaluation of the behavior of strains in Vlora climatic environment are performed with the method of clusters (cluster analysis) by JMP statistical program, for indicators of fruit biometric, endocarps, oil percentage and production performance for each tree and kind. In 44 studied strains through groups analysis for the

coefficient of periodicity taken into consideration the performance for five years is obtained the dendogram presented in Fig 8, in its analysis with "Average Linkage method" are shown 7 groups:

1. Strains with alternative coefficient (0.09-0.12), Lecino, Manzanilla, Amigdanolia, Koroneki

2. Strains with alternative coefficient (0.20-0.30), Koratina, Karboncela, Kotruvsi, Mixan, Pulazeqin, Cunatis, Black olive, Nivica 1, KMB, Kalinjot, B. Tirana, French, H. Yahoo, Kushan.

3. Strains with alternative coefficient (0.3-0.44); Pikual, Amphissa, Mastoidis, Pendolino, Lukova 3, Ascolana.

4. Strains with alternative coefficient (0.45-0.55), Lukova 2, Grosso di Spagna, B. Kruja, Halneiqis, Gordal.

5. Strains with alternative coefficient (0.56-0.67), Kalamon, Nisiot Marks, Kukurela, Unafka, Judge, Managjel, KME, Karolea.

6. Strains with alternative coefficient (0.68-078) composed of strains: Kripsi Kruja, Olive Red Lukova 5, Leucocarpa.

7. Strains with alternative coefficient (0.87-0.88), BOCI and Kallmet

## CONCLUSIONS

1. Inventory and preservation of indigenous olive genotypes testifies the great wealth of genetic of Olea europeae in Albania. About 164 of identified cultivated and wild forms, are names with enough synonymous, of which about 50 cv are cultivated and have economic importance.

2. Clone selection in the population of five indigenous strains with age-long has individualized, and certified 40 clones that represent distance from the standard variety in terms of technological and economic indicators and will affect in the improvement of new olive-culture parameters that will run (flaw) from them.

3. In the population of cv UBT, are selected eight individuals with great variability of production constant (CP), no. 21, 67,213,188, 184, 200.192, 220 which have very large differences compared with the standard variety. For the percentage of oil in fruit (in% of l.th), clones differ 2– 3%. Changes in the caliber of the fruits have been confirmed in 6 clones. Clones improve the average weight of fruit 02.-0.35 grams compared to standard variety.

4. In terms of Vlora climate 4 strains have manifested high constant production 0.09-0.12 (Pendolino, manzanilla, Koroneiqi, amigdanolia), after which rank cv: Koratina, Karboncela, Kotruvsi, Mixan, Pulazeqin, Cunatis, Black olive, Nivica 1, KMB, Kalinjot, B. Tirana, Freng, H. Himara, Kushan with a very good periodicity coefficient (0.2-0.3)

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