



Spread and Study of sp. *Castanea sativa* in the Albania

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Abstract: Chestnut is one of the most remarkable trees in terms of greatness, hardness and endurance, as well as the most nutritious fruits in terms of nutritional value. It is not much known as industrial useful wood and therefore the use of this wood is scarce in the furniture and production of wood for construction. In patriarchal times, chestnuts have been used as wood for the production of beams in the construction of houses because it is distinguished for a high resistance to atmospheric and biological agents. Its fruits are used as nutrition not only delicious but also nourishing. Traditional culture has recognized chestnut as a tree of bread or as a means of exchange with other foods. Economic importance, even though it has been declining, chestnuts still occupy an important place in the agricultural economies of Albania, especially with the recent efforts of the Albanian government to turn the Albanian cultural identity as its representative, as in the highly urbanized foreign markets is especially demanding as a bio species. For livestock this species has emerged as valuable food for their fattening by farmers. Green dough and fruit are very nutritious and farmers use these for feeding small livestock as sheep of goat in the dry summer period and that of dense autumn rains. Green Fruit of *Castanea sativa* Mill carefully squeezed without damaging the embryo brought from the village of Gjoçaj with geographic coordinates 42°11'78"N 20°06'29". We have used cleavage methods, colloid methods, and biochemical protocols.

Keywords: Chestnut, nutrition, *Castanea sativa*, colloid method.

Introduction

Castanea Sativa Mill species has a total number of chromosomes $2n = 24$ (Fedorov 1974). The origin of the European chestnut (*Castanea sativa* Mill), is from Asia Minor. Even today, many species of wild chestnuts are found on the southern coast of the Black Sea. Discovered fossils show the presence of European chestnut in the pre-glacial age, about 25 million years ago.

Chestnut foliage begins in late April, or beginning of May depending on altitude, terrain exposure and variety. Flowering begins in the first half and continues in the second half of June and at high altitude until the first decade of July.

Fruit ripening starts in late September and runs until October 25. There are varieties that mature even in early November. During flowering when the weather is hot and dry, it is difficult to pollinate the flowers. As a result, trees link fewer fruits, fewer cones, and the number of fruits per cones decreases since Alvisi (1979) has shown before. Intense rains and low temperatures at the time of flowering hinder flower pollination and consequently the shape of flowers. When the summer is humid, as occasional rains occasionally fall, the chestnut leaves fall prematurely. This usually occurs from the beginning of September as a result of being affected by *Mycosphaerella macuilflorum*. Chestnuts are very resistant to summer drought. Chestnut is very demanding on light, a characteristic that must necessarily be taken into consideration by its growers. It very hardly supports shading in the garden. This is agreement with results obtained from Brevigleri (1951).

Chestnut belongs to the Fagaceae family where oak trees are included. There are four main species known as European, Chinese, Japanese and American. *Castanea sativa* Mill or sweet chestnut as it is known in Europe is also known as Spanish chestnut or spanish chestnut which is the only species in America,

We mention some species: *C. almifolia*. *C. crenata* (Japanese Chestnut). *C. dentate* (American Chestnut). *C. henryyi*. *C. mollissima* (Chinese Chestnuts). *C. ozarkensis* or *C. chinkapin*. *C. pumila*. *C. seguini*, etc. since Rolando (2000) has shown before.

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Table 1. Scientific classification of *C. Sativa* Mill.

Type	Magnoliophyta
Class	Magnoliopsida
Order	Fagales
Family	Fagaceae
Genus	Castanea
Species	<i>Castanea sativa</i> Mill

Chestnut belongs to the genus *Castanea*, a genus of which 13 species of chestnut originate from the temperate zones of the boreal hemisphere. Chestnuts are widespread in the mountainous regions of the Caucasus, in the Southern Caspian Sea, in the Spanish Sub-Alpine Mountains, in France on the outskirts of Paris and particularly in the Normandy forests. It is found almost everywhere in Italy and Spain since Avolio (1985; 1987) and Baggio (1987) have shown before. In Central Europe, widespread in most favorable regions such as the Fohn valley (Switzerland), the Canton of Ticino, the Rhine area (Germany), especially in the Western Black Forest. Chestnuts are mainly found in Turkey, Syria, Algeria, Tunisia, Morocco, etc.

Materias and Methods

The *Castanea Sativa* Mill micro-pollination protocol comprises 4 stages:

- Start
- Breeding
- Rooting
- Plant acclimatization.

We will not dwell too much on the rooting and acclimatization phase because they are phases that are not needed for this paper.

When the initial explants are obtained from juvenile plants, the chestnut micro-pollination presents no problems. Conventionally obtained seeds should be grown in the greenhouse or preferably in a climatic chamber in order to lower the rate of explants contamination. This is agreement with results obtained from Zekaj (2013).

Green fruits of *Castanea sativa* Mill. carefully trimmed without damaging the embryo, brought from the village of Gjoçaj with geographical coordinates 42 ° 11'78 "N 20 ° 06'29" E.

We have used stereomicroscope, light microscope, Olympus microscope, digital camera, lama, lamella, toluidine blue, methylene blue, scotch, nail polish, distilled water, razors, scissors, cytometric ocular, cytometric lamina, hydrolytic enzymes, test methods, colloidal methods, working protocols etc. This is agreement with results obtained from Zekaj (2013).

Histological study techniques include: Macroscopic techniques; Stereomicroscope observation technique. Microscopic staining and colloidal techniques: Preparation of preparations for microscopic study This is agreement with results obtained from Zekaj (2013).

In conventional 40x light microscopy with colloidal technique such images of the mouths are obtained in the lower epidermis of the leaf (in situ). The pores are chaotic and often found on leaves.

Results and Discussion

The natural chestnut forests in Albania cover a total area of about 12 thousand hectares. In the Tropoja region (mainly in: Kolgecaj and Leke-Bibaj), they occupy the first place nationally with about 2,000 hectares. Chestnuts in the Tropoja area are distributed in several municipalities, as well as near "Bajram Curri" Municipality. Specifically, in the commune of Bujan there are about 600 ha of chestnut forests, about 500 ha in Mark-Gegaj, about 270 ha in Leke-Bibaj, about 15 ha in Pacite and about 100 ha in the Municipality of Bajram Curri since Elezi (1990) and Xhomara (2011) have shown before.

Their skin is polished as long as they are young (gray *C.sativa*). Over the years the skin becomes darker, thicker and deeper furrows become more visible. Wood, bark and leaves contain 6-14% tannin. The leaves are simple, oval or lance, obtuse and spaced at wide angles. Once the leaves appear, the chestnuts begin to bloom. The flowers are planted in flowers of both kinds, but always in the same

plant as the chestnuts are monoic plants. When roasted chestnut pollen emits a very strong aroma that causes the bee to be attracted for pollination and nectar intake, remember that chestnut honey is one of the most valuable and high quality honey.

Dried grains contain up to 14% sugar, 16-34% starch, 8% protein and 3% cellulose. Vitamin C is contained in 1500 mg / kg dry matter. Having cross pollination, lonely chestnuts over 300 m distance from companions will produce low yields and insects are the best pollinators especially bees and spring bulbs.

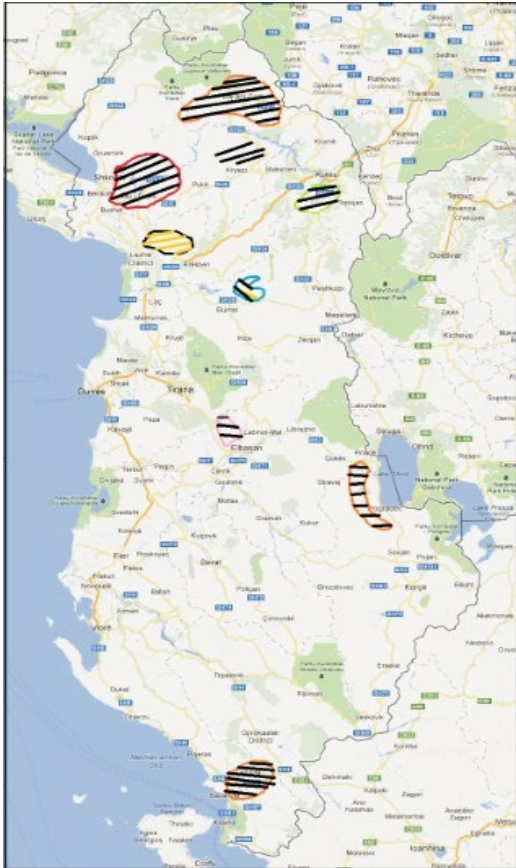


Figure 1. Map of distribution of *Castanea Sativa*



Figure 2. Chestnuts in flowering period (E. Lala)

Mill in Albania

Chestnuts are widespread in many countries around the world, and in Albania they meet in the form of forest massifs known as cashews or chestnuts. The largest massifs are found in Bajram Curri, Kolgecaj, Lekbibaj (Tropoja), Shimi (Kukes), Dukagjin, Mes, Shllak, Reç (Shkodra), Kashnjet (Lezha), Msuç, Gjoçaj, Macukull (Mat) Shupal (Tirana), Zrvaska (Pogradec), Gurakuq, Gracen and Shmil (Elbasan), Librazhd, Delvina, Saranda, Tepelena (Elezi 1990; Xhomara 2011).

Castanea sativa Mill has a monoic, deciduous trunk tree branching 2–3 m from the ground, with perennial bark and many wide and majestic cracks and crowns. The loops are singles. Leaves are long, apex with numerous and lustrous nerves.

The flowers are male and female in the same flower respectively at the top and bottom. Male flowers are 6-angled with 8-20 fringes, female flowers 5-8 teeth and 6-8 barrels. Ovary has 6-8 turns and 8-9 pillars. The fruits range from 1-3 grains depending on the successful egg bag pollination. What is worth noting is that chestnuts are treated more for fruit than for wood as chestnut wood is not very practical in the wood processing industry. Taste and nutritional values have been known since ancient times and many hill-and-mountain tribes have used chestnut as a food reserve in difficult times since Brevigleri (1951) has shown before.

Burrel chestnut tree has an altitude of 800-1100 m above sea level. Widespread in regions bordered by hills beaten by the wind and sun, it numbers over 3'500 individuals over 50, over 4'000 individuals over 25, and thousands of young mammals. The maximum trunk height reaches 25 m but the isolated chestnuts tend to extend the crown by remaining dwarf. Old chestnuts generally atrophy

the early top giving preference to lateral branch growth. The diameter of the trunk reaches up to 1.5-2m.



Figure 3. a) in its entirety; b) loops; c) chestnuts in winter; d) roots; e) fruits; f) leaves (E. Lala)



Figure 4. Male chestnut flowers



Figure 5. Female chestnut flowers



Figure 6. A chestnut bun with ripe fruit (E. Lala)

Chestnut begins to produce its leaves in early April as it finishes growing at the end of April and begins to bloom in early June yielding bloom shaped flower like 20-30 cm long sticks and hundreds of fringes, one single flower bud is able to give 5-12 parts. Characteristic of these parts is their very strong aroma that attracts bees due to the high amount of honey and pollen contained in parts but also being mono species, pollination by bees and winds is vital to chestnut. The parent flower has a fake part which usually serves as a pistil that cuts pollen grains and thus fertilizes the eggs in the ovary which will then give the next egg whilst the eggs will bear future fruit has Breviglieri (1951) has shown before.



Figure 7. Left: chestnut palm leaves; Right: flowering male flowers and some female flowers

At maturity the pupae turn yellow to light brown and begin to break through the wet cover after the September rains, and at the end of September the first drop of the first grains that are usually wormy or shrubby begins. The massive downturn begins on the first weekend of October, indicating that maturity has already taken place. Healthy squash on average contains 2-3 grains 1.2 cm high, 1

cm wide and 2-2.5 cm long and eggplant in glossy black. The grains weigh up to 10-13 grams and 1 kg = 75-100 grains has Zekaj (2013) has shown before.

The best time to collect the grains is the first 10-20 days of October because the maturity is already complete and a comprehensive action is needed before the leaf fall due to wintering makes it difficult to collect the grains through the leaves. The leaves in winter begin to fall when they have a "golden" yellow, at this point the chestnuts fall in winter and the first sign is the lymph circulating in the trunk.

Climate: Chestnut fits best in the continental climate of the Burrel area with minimum temperatures of 2 ° C-17 ° C and maximum average of 12 ° C-31 ° C. In sun-beaten hills, production is more abundant than in secluded and shady or sunny days.

Humidity: Average humidity ranges to 68% and amplitude humidity fluctuations are moderately extreme ranging from 60% in summer to 80% during winter months. Humidity plays a significant role in chestnut production because in its absence, grains are failing as in the case of 2012 which resulted in fatal low chestnut production. Also when the humidity is high and lasts for a period of time as in 2014, production will decline as it plays a role in the spread of pests, especially parasites and viruses, causing early death of embryos. A narrow amplitude steady humidity would be very efficient in productivity as it happened in 2013 where as a result of overproduction the price of the product in the market fell.

Soil: Chestnut prefers hilly, plain but drained soils. In deep and thick soils up to about 150-155 cm in the soil, the plants grow very well and produce fruit in satisfactory quality and quantity. Under these conditions, the surface of the land where the chestnuts are, occupies almost 100% of the area with chestnut plants. In such soils, trunk circumference, height, and productivity reach optimal limits, indicative of variations depending on species.

Generally chestnut augmentation is accomplished with seed-added material on which grafting is applied, or longer, the grafting season varies depending on the method of growth and the area in question. Speaking of hybridization, parent selection is required first; pollination is not difficult as being a mono-flowered plant separates the male flower from the parent.

Efforts have been made in Albania by many fruit and forestry scholars to describe chestnut cultivars, but there are no cultivars except ecotypes that come from cross pollination. In most cases, grafting has been used between different species and numerous species to rescue chestnut-related diseases.

The problem remains *Curculio elephas* (worm) which lays eggs in mature chestnuts since Elezi (1990) and Xhomara (2011) have shown before.

Table 2. Some general data on the geography of chestnut spreading in Albania

Districts	Area in acres	Altitude (m)
Dibër	172	400-900
Elbasan	168	400-855
Gjirokastër	199	750-1000
Korçë	151	800-1000
Krujë	147	480-816
Kukës	617	443-680
Lezhë	133	250-400
Librazhd	337	350-800
Mat	353	448-540
Mirditë	69	500-700
Pogradec	1728	800-1100
Pukë	185	500-790
Sarandë	220	700-1000
Shkodër	1604	250-505
Tiranë	318	350-800
Tropojë	1800	165-1100

Chestnut contains, although in small quantities, Vitamin A, Thiamine, Riboflavin, phosphorus, iron, sodium, potassium, etc. The calories contained in chestnuts are less than those of walnut and many other fruits of this group, they contain no cholesterol, they are low in fat and these are unsaturated (oily) fats, and have no gluten. The carbohydrate content is comparable to that of wheat and rice, with twice as many starches as potato. Contains about 8% of different sugars mainly sucrose, glucose, fructose etc. As long as the chestnut is immature, it has high water content that gradually disappears with its ripening, guaranteeing storage and at the same time hydrolyzing the starch into fructose and glucose. The other important feature is that the chestnut fruit contains all the non-synthesized or essential amino acids.

We do not get much data from the stereomicroscope. Mostly we observe the construction of the leaf nerves (in situ). Below are two pictures from the in situ leaf stereomicroscope:



Figure 8. View of the nerves of the lower epidermis. (Photo by E. Lala)



Figure 9. View of the nerves of the upper epidermis (Photo E. Lala)

In frequent observations and examinations looking for differences between in vitro and in situ environments, it was observed whether or not the presence of organs such as mouths, trichomes, parenchymal cells, woods, crystals, etc. were present or not there in two individuals of sp. *Castanea sativa* whether in vitro cultures or in-situ adult individuals.

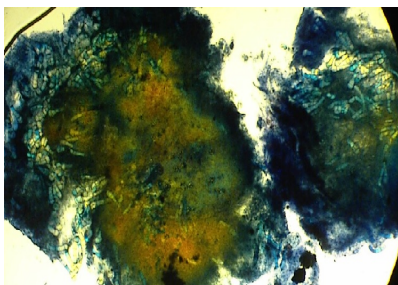


Figure 10. Callus colored with methylene blue where trichomes are clearly visible (photo E. Lala)

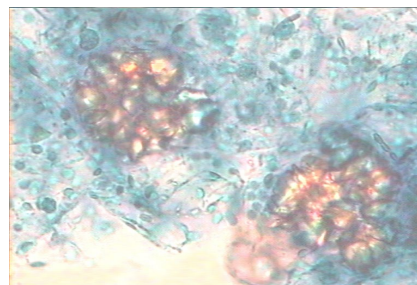


Figure 11. A view of the woods and crystalloids in the structure of the callus is also seen in the glandular and no trichomes (Zh. Zekaj)

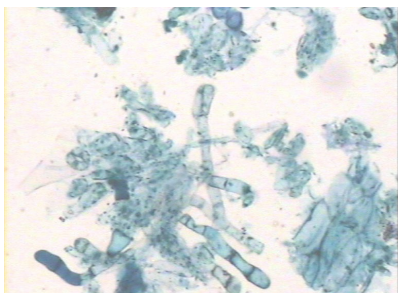


Figure 12. Callus of the bud treated with hydrolytic enzymes. The percussion bundles and peltate glandular trichomes appear

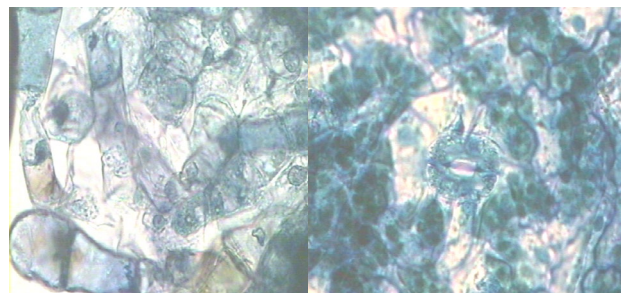


Figure 13. The first photo shows trichomes as cellular macrostructures, while the second photo shows a typical area of trichomes where the mouth is surrounded by chloroplasts dark blue with methylene blue. (Zh. Zekaj).

If we compare the statistical data of in vivo pores (5 leaves analyzed) and in vitro pores (one leaf analyzed due to limited material) we realize that the number of pores / microscopic field changes drastically, in ratio 2.5 with 1, that is, for each in vivo domain we have 2.5 times more pores than in vitro domain. This results from increased metabolism, aeration and transpiration of the substrate (which the plant needs to prepare itself in-vivo through complex photosynthetic processes) and moisture compared to the in-vitro plant that is in a transition state between heterotrophy and autotrophy since Zekaj (2013) has shown before.

The length and width of the mouths (pores) between the same species but in different environments (in vitro cultures and in-vivo natural environment) almost does not change except that in in vitro cultures the mouth (pores) appears to be assembled as a bean while being elongated elliptical in vivo leaves.

The stomatal index is roughly the same and oscillates at 35-50% and despite the fact that the oral / microscopic ratio is lower in the in vitro leaf, the epidermal cell count is also low and this is due to the size of the these in vitro epidermal cells that manifest with intense cell division and differentiation that is higher than in in-vivo cells.

Conclusions

Chestnut (*Castanea sativa* Mill) is a species of Sup-Mediterranean Atlantic. The area of its propagation is similar to the Bung (*Q. sessiflora*).

Chestnuts are widespread in many countries around the world, and in Albania they meet in the form of forest massifs known as cashews or chestnuts. The largest massifs are found throughout Albania.

What is worth noting is that chestnuts are treated more for fruit than for wood as chestnut wood is not very practical in the wood processing industry. Taste and nutritional values have been known since ancient times and many hill-and-mountain tribes have used chestnut as a food reserve in difficult times. The cultivation of cultivars requires a very strict selection method and these cultivars to be preserved and fixed by cloning (also applying in vitro methods and vegetative growth or grafting). Later on, after the establishment of the cultivars, their choice would depend on the climate, the terrain and the exposure to sun-struck areas.

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