THE CHANGE GRAFT IN WALNUT AND THE IMPORTANCE OF IT IN TERMS OF WALNUT GROWING IN MACEDONIA

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Abstract

Top-working may be one of successful methods used for changing one variety to another when walnut trees don’t produce sufficient yield. Top-working application that enables to replace unproductive or poor quality walnut varieties with better quality ones is a simple, easy and reliable operation for growers. Therefore, it can make more efficient the walnut orchards in Macedonia. Seedling walnut trees that don’t yield in the walnut orchards can be also brought into production. Top-working can therefore contribute to walnut cultivation in Macedonia.

Grafting methods such as ‘bark graft’ and ‘modified bark graft’ can be operated on the main branches with 25 - 30 cm trunk diameter of 10 - 15 year old walnut trees or seedling trees. In these methods, the trunk or main branches can be grafted with cross-cut above 2 - 3 m from the level for walnut seedling trees. After the trunk of tree is cut for xylem exudation two weeks before grafting in early spring, the grafting application is done in late March when air temperature reaches to 20 - 25 °C. The suitable temperatures for walnut top-working coincide with in early April in Macedonia. The shoots should be taken in January, February and March, and stored at 4 °C in the refrigerator until grafting season. A graft master can averagely make 15 pcs of top-working in a day depending on the age and location of tree.

The graft take is usually resulted in high success rates. The grafted trees begin to yield a few years later, and tree yields are closer to their peers within 5 - 7 years.

Key words: Key words: Walnut, Juglans regia, Change graft, Shove grafting, Under shell.

1. Introduction

Macedonia is an agriculture based country. The agriculture sector traditionally plays a significant role in the economy of Macedonia. On the other hand, soil structure and climate of the country is very suitable for agriculture and when it is taken into consideration that the soil in the tilled lands of Macedonia is not tired and contaminated, significance of the agriculture and stockbreeding increases more and more.

The tilled lands are comprised of cereals and gardens, orchards, vineyards and meadow with the rates of 81.8%, 2.4%, 4.7% and 11.2% respectively. Tilled land per capita is 0.625 hectare in the country and it is higher than the average of EU countries which is 0.35 hectare. The undeveloped land rate is very high and constitutes 35% of the agricultural lands.

80% of the agricultural lands are cultivated by the private sector. Agricultural products export which is between 180 and 230 million USD constitutes 20% of the total export of the country [1].

The advantages of Macedonia concerning the agriculture sector are fertile lands, abundant labor and the climate conditions which show different characteristics in different regions of the country and enable production of various products. Moderate continental climate is dominant in valleys and plains in the northern and middle regions and the Mediterranean transition climate prevails in the southern regions in Macedonia which is located in between 40° and 42° northern latitude. The mountainous terrains of which average altitude is over 1200 meters are under the domination of mountain climate. Moreover, there are high plateaus all over the country which are convenient for horticultural products and sheep & goat farming. The average temperature that is around 25 °C may increase up to 40 °C in the hottest days of summer and decrease to -20 °C in winters [1].

The forests cover 37% of the Macedonia territory. These forests are formed of coppice and high forest with the rates of 70% and 30% respectively. Fruit and vegetable production (including grape) reached to its
highest level in 2004. Fruit and vegetable production corresponds to 32% and 18.5% of the agricultural production respectively. In other words, fruit and vegetable are produced in 40% and 23% of the total agricultural lands respectively.

In the period between 2000 and 2005, the land covered by vegetables (including grape) reached to 43,400 hectares. The fruits produced are grape (62%), apple (18%), plum (7%), sour cherry (5%), peach (3%), pear (2%), apricot (1%) and cherry (1%) [1].

Average annual fruit production in the aforesaid period realized as 118,000 tons (excluding grape) and the apple constitutes 60% of the total production. Production of cherry, sour cherry, peach, apricot and plum corresponded to nearly 35% of total fruit production.

Although walnut production seems to have very low amounts compared to other fruits, there are 125906 walnut trees in Macedonia and total cultivated land is 643.65 hectares. The regions having most walnut trees in Macedonia which was separated to 8 agricultural regions are Southwest (28630), Polog (21070) and Northeast (19285) regions respectively [2] (Table 1).

Within the scope of analysis and evaluations, giving importance to walnut cultivation is emphasized among investment issues which are needed and seemed to be possible to actualize in agricultural sector in Macedonia. Present walnut cultivation is made with ungrafted seedling rootstocks.

2. Materials and Methods

Walnut trees have been grafted by Top-Working. The trees whose years are between 5-150 can be used by this method and were the kind of trees was walnut (Juglans regia). Also, the Top-Working applications was made in April.

2.1 Walnut top-working

2.1.1 Shove grafting

Walnut Top-Working are used within the purpose of changing walnut trees from young to old that are grown from seeds, have poor quality fruits or are not suitable for the lands they grow into suitable types for the lands. Over 90% succeed is obtained by making Walnut Top-Working in main branches and stocks, diameter of which are from 4 - 5 cm to 25 - 30 cm. Cuttings are obtained in February-March while walnuts are resting and stocked inside wet cloth or perlite in 4 °C. To protect cuttings to get moldy any fungicidal can be used.

2.1.2 Grafting

With the purpose of preparation for grafting and permitting of xylem sap flow, stocks or main branches above 15 - 20 cm of actual grafting place are cut within March while buds are starting to come up. Grafting is started to be done in the early May after the late frost risk passes or when the weather is warm - when the heat reaches 20 - 25 degree under shadow. While grafting, graft application is made in place which is re-cut from fresh and live part being under 15 - 20 cm of part that is cut before in rootstock (within March). Fresh-live tissue is brought to light by shooting edge of cut part with a sharp knife. So, dead tissue caused by saw is cleared away. After that, cutting is prepared. Cross cut is made in lower end of cutting in the manner that there are two solid eyes in cutting. Cut is made in the rear side of lower end of cutting, the way that making cambium appeared. Area on rootstock where bark is smooth is detected and vertical cutting is made on bark. However xylem tissue of tree is not damaged. Other side of cutting is marked on rootstock by putting cutting upon rootstock, cut is made on other side according to cutting size and so double sided cutting.
is made on rootstock bark. After that, rootstock bark is slightly opened with protruding part of grafting knife or with a dry cutting. Cutting is placed in this open part. Rootstock barks being below the cutting and two sides of cutting are stapled to stock. Parts in which there are cuttings are surrounded on rootstock with grafting tape. Cutting surfaces of rootstocks are covered preferably with grafting wax or soil or nylon. Grafting wax is applied to the head parts of cutting (Figure 1). As an alternative application, firstly grafting wax is applied to cutting edges of rootstock and then by fastening with nylon below the graft place of rootstock, soil is filled about the middle of cuttings. If the weather is around 25 °C or over 25 °C during the days following grafting, buds are started to spread.

2.1.3 Under Shell
Cuttings that will be used in grafting can change according to the age of rootstock. If body diameters of rootstocks are narrow 1 - 2 aged branches are used, if large 2 or 3 aged branches are used. Cuttings are again obtained resting period and kept in 4 °C. Rootstocks are prepared as in the bark graft. Grafting is again started when the heat reaches 20 - 25 °C. 4 - 5 cm watermelon slice shape inwards (as deep as the thickness of cutting used for grafting) cutting is made on the cutting surface of trees that will be grafted in accordance with thickness of cutting (Figure 2). After cutting surfaces are shot, cutting for grafting is prepared according to this cutting and cutting is placed on rootstock. Overlapping of cambium tissues under bark is noted. Cutting is nailed to rootstock with a thin nail. Cutting edges are puttied with grafting wax and then surrounded with grafting tape. As an alternative application, an overall thick nylon is surrounded to the cutting place of rootstock and grafting application is completed by filling soil to there.

2.2 Treatment works in grafts
With checking trees after the grafting from time to time soil of grafting areas that is dry, is moisturized by watering and cuttings is provided to be live. Offshoots of rootstocks are ripped. When graft offshoot reached approximately 25 - 30 cm, stake is linked to tree or main branch. By linking stake to graft offshoot, offshoot is protected to be crashed due to wind and perching of birds.
3. Results and Discussion

Top-Working applications success in walnut (*Juglans regia*) was above 90%. About 5000 number walnut trees were changed to standard cultivar from genotype by this method. This method has been used in Giresun, Kahramanmaraş and especially Çorum and getting more spread to other provinces. This method will develop the standard walnut growing in Macedonia. In about 10 years, by per year if 10000 number walnut graft in Macedonia walnut growing would have the standard their own property. Using this method will certainly make their fruit better.

4. Conclusions

- Walnut Top-Working has a great success. Above 90% success is obtained with suitable time, well kept cutting and a qualified vaccinator. Graft master, depending on the age of trees, can make 10 - 15 graft for old trees and 20 - 30 graft for thin bodied trees.

- In our studies it is determined that walnut trees grafted with Walnut Top-Working start to yield as much as the standard equal (in the same age) trees within at the latest 6 - 7 years. For example, a standard walnut tree being 20 years old yields 100 kg walnuts (Şen et al. [4]). A walnut tree being grafted in its 13 year old can yield 100 kg standard quality walnuts 7 years later when it reaches its 20 years old. It is possible to get more products from older walnut trees. So, it is not the right way to continue production with trees that do not have a market share, are easily get wormy, thick shelled, affected by spring cold, inside of which is hard to get and that are unproductive. Changing these trees with highly qualified standard ones means that production will be standardized within maximum 7 years (Figure 3).

- Approximately 125906 thousand walnut trees are grown in Macedonia [2]. Country walnut production is 4952 tones and yield per decare is approximately 95.23 kg/da [3]. I we take into consideration that in Turkey, yield per decare is between 330 - 370 kg/da, it can be seen that in Macedonia trees are relatively unproductive. So, it is advised to start Walnut Top-Working to increase walnut production and to transform available walnut trees into standard ones in Macedonia. Contribution of Walnut Top-Working will be on the high level for the standardization of walnut production in Macedonia.

5. References


![Figure 3. Periods of Change Grafting in walnut, a (Grafting - photo 2004), b (Photo 2007), c (Photo 2011)](image-url)