

EXTRACTION OF RESINOUS ROOT WOODS AS AN ALTERNATIVE SOURCE OF RESIN IN TURKEY

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Abstract: *To meet increasing market demands on resin raw material and its derivatives leads to the search for new alternative sources. The resin, which is generally produced by opening the wounds on the standing trees, can be produced by extracting from the root parts of the trees. Especially after the pine trees are cut, there is a high accumulation of resin in the stump on the soil surface and the root parts under the soil. These parts of the trees that are left under the soil surface are called resinous root wood and in recent years its importance as an alternative source of resin production is increasing in Turkey. In this study, technical information about pine root wood and its extraction was given and methods of producing resinous root wood were presented. The information obtained from forest service was evaluated in terms of marketing of resinous root wood. It is anticipated that the production of resinous pine root wood will be promising alternative source of resin raw material with the arrangements that can be made to provide alternative job opportunities to the local people in rural areas.*

Key words: *root wood extraction, resinous wood, resin production, Black pine, non wood.*

1. Introduction

Among the products obtained from the forests, there are also non-wood products beside the wood raw materials. Turkey has very large variety of non-wood forest products [6] and 60% of the economic value gained from exported forest products comes from non-wood products [1]. Main non-wood products include resin, fagaceae, gallnut, daphnia leaf, pine nuts, carob, sumac, chestnut, lime flower,

angrek etc. Availability of the non-wood products are important sources of income for the local people living in the vicinity of the forests. In addition, production of various non-wood products in the concept of pharmacy, veterinary medicine as well as food products contribute to economy. According to the data obtained from Forestry Statistics of Turkey covering the period of 1988-2016 [3], non-wood forest products that have been produced

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more than 10 tons annually were listed in Table 1 [6].

Table 1

The forest products produced more than 10 tons annually between 1988 and 2016

Non-wood products and species	Average production [tons/year]
Various underbrush non-wood species	11391
Raw leaves of <i>Laurus nobilis (daphnia)</i>	7839
Resinous root woods	5552
Non-resinous root wood	3236
Raw <i>Thymus spp.</i>	2245
<i>Cone pine</i>	2005
Leaves of <i>Folium myrti</i>	614
<i>Salvia sp.</i>	468
Cistus	453
Carob	311
Chestnut	257
<i>Rosmarinus officinalis</i>	247
Moss	168
Çalba (<i>Ballota cristata, B. saxatilis</i>)	129
Resin	120
<i>Ruscus aculeatus</i>	89
<i>Cyclamen cilicium, C. coum, C. hederefolium</i>	76
<i>Erica arborea</i> , ling-root	49
<i>Lavandula officinalis</i>	48
Rhododendron	47
<i>Dryopteris</i>	38
<i>Leucojum aestivum</i>	36
<i>Hedera helix</i>	30
<i>Tilia sp.</i>	30
<i>Galanthus elwasii, G. woronowii</i>	28
Faggot and shoot of <i>Buxus sempervirens</i>	26
Fir faggot	23
<i>Anemone blanda</i>	18

One of the most important non-wood forest products is resin in Turkey. Resin, which is a chemical mixture containing colophony and turpentine, is a valuable product mostly obtained from coniferous trees by various methods. Resin Acid-

paste method is generally used to produce the resin in the forest areas designated as resin production areas (Figure 1). Production efficiency in this method is increasing every year. The annual yield per tree in Brutian pine stands is about 1.5 kg

in Turkey, while the efficiency is about 3-3.5 kg in the case of major resin producer countries. The most important reason for the difference in productivity is the fact that these countries make resin production in the plantation forests

generated for resin production purpose. However, resin is produced in natural forests in Turkey and there are no specific forests generated for resin production purposes [5].



Fig. 1. Resin production using resin acid-paste method

Demand on resin has been reduced with the production of synthetic chemicals, but the resin has recently become a highly demanded product again [1]. The resinous root woods left in the forest without any process during timber extraction have important opportunity to improve the amount of resin and economic gain from the non-wood forest products (Figure 2). These root woods that are under the soil contain large amount of resin. Particularly, the Black pine wood parts are rotting in time, while the resin can stay in the soil for a long time. When the trends of non-wood forest products in the period 1988-2016 are examined, it is seen that production of the root woods are unstable (Figure 3). However, figure shows that there has been a significant increase in the production of resinous root

wood in last few years probably due to the increasing market demand to resin.

In the world as well as in Turkey, it is important to have new production resources to meet the increasing demand for resin and its derivatives. The resin can be obtained by opening the wounds on the planted trees, as well as by extraction of resinous root woods, especially in coniferous stands. As a result of extracting resinous pine root woods, the high quality resin containing turpentine, pine-oil and colophony can be produced. Thus, after the production of pine wood roots remaining on the soil surface and in the soil, extra resin are evaluated and contributed to the economy and also new business lines are generated.



Fig. 2. Resinous root woods [1]

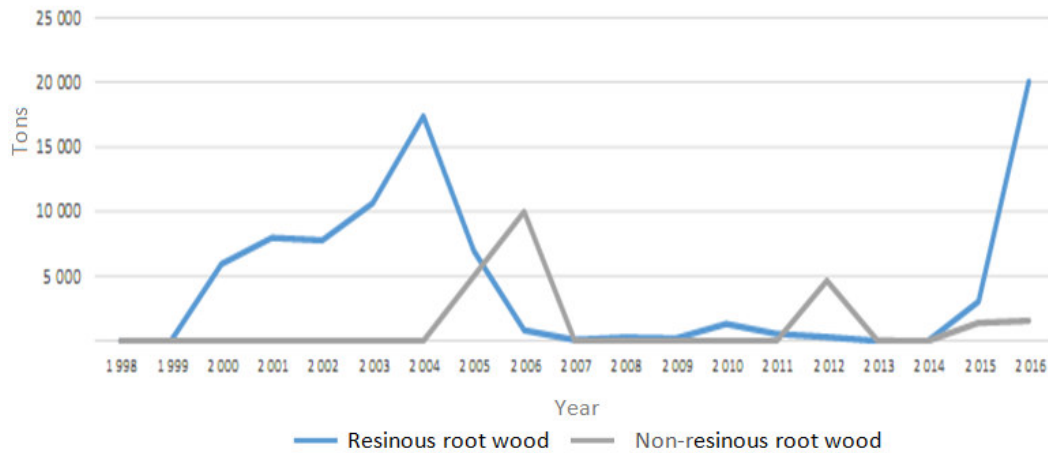


Fig. 3. Trend of root wood production (tons/year) [6]

In this study, it was aimed to present technical information about pine root wood and methods of producing resinous root wood. The extraction of root wood was evaluated under three main stages including preparation, extraction, and storage stage. Besides, marketing of resinous root wood was evaluated based on the information obtained from forest service in the regional.

2. Root Wood Production

2.1. Preparation Stage

Roots remaining under soil and resin stored stumps are removed with the help of human-power based systems, mechanized systems, or other forms of extraction systems (Figure 4). The areas where the pine root woods will be

produced should not be selected from regeneration areas, production forests, or from the areas that are subject to erosion hazards. The production sites should be close to the existing forest roads. Production of resinous root wood should not be allowed on areas that are susceptible to forest fires. Surely no production can be done from standing trees.

Production should be carried out in areas where wood production activities are completed and there is no any other forestry activity. It is possible to produce the existing roots of trees that have been produced in the past years. Depending on the production technique and the quantity to be produced, the production areas can be selected from one or more divisional batches without deteriorating field integrity. With the finalization of the contract, the field will be handed over to the person receiving the business after visiting the production area with forest engineer and the forest ranger, showing the boundaries of the area [2].

2.2. Extraction and Storage Stage

After roots and stumps are removed from the soil by workers or stump removal machinery, extraction should be well planned to prevent damages on residual trees and young seedlings during production. After removing the crushed pine root woods from the soil, they should be cleaned from the pieces of stones and the soil and transported to the designated landing areas (Figure 5). The roots should never be rolled during extraction and the roads should not be blocked during operation [2].

The start and completion dates of extraction activities should be determined according to seasonal conditions, other forestry activities and capacity and conditions of work to be done. If the work cannot be completed within the given periods, additional time may be granted if there is a valid reason in the administration [4].

After transporting root woods at the landing areas, they should be loaded into the logging trucks and then trucks should



Fig. 4. Stump removing techniques

be weighed by tons. Since there are difficulties in stacking and storing root wood since the root woods are not in a regular structure, the quantity can be determined and sold before moving to the

sales depot (Figure 6). Since root woods do not have regular structure, there is a difficulty in stacking and storing, therefore, it is very important to determine the buyers before production [2].



Fig. 5. Transporting root woods



Fig. 6. Resinous root woods

3. Sales of Root Wood

The unit sale prices of resinous root wood are determined by the purchase and sale commission of Forestry Enterprise Directorate and then approved by the Forestry Regional Directorate. Since periods of storage entrance and exit are very long, there are losses on quantity.

Besides, loading and unloading time in storage increase which then increases the total costs. For these reasons, it is preferable to make sales through the alive-auction, which guarantees the sales [4].

In recent years, there are factories which produce resin from the pine root wood as also request the root woods from

the forest services [1]. Forestry Enterprise Directorates in the regions dominated by Black pine stands make harvest plans for root woods and the pine trees that are subject to sale are evaluated and sold to these factories. Root woods that are brought to the factory with trucks are first shredded by the shredder and further divided into smaller pieces. Then, products are transferred to the extraction unit for hexagonal treatment and the raw resin is separated from the sawdust. The resin containing turpentine and colophony is exported to foreign countries and therefore provide higher income to economy (Figure 7). One of these factories located in Edremit province of Balıkesir in Turkey annually exports about 600-700 tons of resin produced from pine root woods [7].



Fig. 7. Resinous root woods (up) and resin production process (dpwn) [1]

4. Conclusions

Non-wood forest products are used for various purposes such as pharmacy, veterinary medicine, and food products. The non-wood products are important sources of income for the rural people. Turkey has very large variety of non-wood forest products and one of the most important non-wood forest products is resin. To meet the increasing demand for resin and its derivatives, it is important to have new production resources. The resinous root woods containing important amount of resin can be alternative source of resin production.

General Directorate of Forestry (GDF) has increased the amount of production and income of non-wood forest products in Turkey. In this context, OGM's goal is to produce 350 thousand tons of non-wood forest products in general each year. Thus, it is necessary to plan the production of the resin obtained from the pine root wood, which has a high proportion in this potential production. Besides, it is very important to determine the buyers before production because it is difficult to store root woods for long time.

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