PINUS NIGRA ARNOLD. FOLIAGE

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SUMMARY: Under the forest foliage utilization concept, the pH, petroleum ether, and alcohol-benzene extractive contents of Pinus nigra Arnold. Foliage and the annual foliage potential of Turkish forest with the creation of new jobs by foliage collection were examined. The pH of needles was 4.5 and that of foliage branches was 5.2. The alcohol-benzene soluble extractive content of foliage was greater than that of petroleum ether. By the hand collection of foliage would create 65.000 full-time new jobs and add 521 480 tons of muka into a food chain.

Key Words: Forest Foliage, muka, biomass.

INTRODUCTION

The forest foliage is defined as the parts of the tree including all needles, leaves, twigs, shoots, and branches up to 0.6 cm in diameter (3,4). Traditional timber harvesting concerns stemwood only. Including foliage and the other components of the tree such as small branches and root systems have not been utilized and left on the ground as residue. Even though these components account about 50 percent of the total dry biomass production in conifers, they have not been included in the traditional forest management plans (6,7).

The increasing demands for wood fiber and environmental concerns have stimulated interest in whole-tree harvesting (i.e. the harvesting of roots, stumps foliage and branches in addition to stem wood) or full-tree harvesting (i.e the harvesting of the entire above-ground portions of a tree) systems (2,3,6). These biomass harvesting is technically possible if the economic utilizations of the tree components are achieved.

The forest foliage is considered to be as a source of raw material in the area of agriculture, pharmacology, medicine, veterinary practice, cosmetics, and confectionery (4,7). The most developed use of foliage is as a vitamin supplement in animal and poultry feeds (2). However, its utilization is not a new concept and its history may start with the primitive man. Presently, more than 100 000 tons of foliage are utilized in USSR as a fodder supplement named "muka" each year and that is expected to rise (2,3,8). The major chemicals in foliage include essential oils, phenolic extractives, vitamins, chlorophylis, coratenoids, protein and mineral components (1,2). Chlorophyll-carotene paste, sodium chlorophyll, provitamin concentrate would be obtained with the petroleum ether extraction of foliage or essential oils with steamdistillation (1,4).

In addition to the source of raw material for use in many fields, the foliage utilizations have some other advantages for developing countries. These are: a) labor-intensive foliage collection creates new jobs or, additional income to forest villagers; b) increasing incomes of forest villagers may decrease their heavy pressures on forests by clearing forest for crops and destroying natural regeneration with livelyhood graze; c) the pest incidence and the forest fires may be reduced with a clean forest; and d) the feed producing factories would have a change to get an additional vitamin supplement as alfalfa for their feed productions.

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The purpose of this study is to examine *Pinus nigra Arnold*. Foliage in accord with the forest foliage utilization concept. For this, its pH value, petroleum ether, and alcohol-benzene soluble extractive contents are determined. In addition, a foliage potential of forest and the new jobs for the Villagers from the collection of forest foliage are evaluated in Turkey.

MATERIALS AND METHODS

The 19-year-old *Pinus nigra* Arnold. Plantation Located near the Middle East Technical University in Ankara was used as the sampling area. The foliage was collected by cutting one foliage branch every fifth free as walking through from one side of the plantation to the other side in August. The collected foliage was separated into needles and foliage branches. Then, throughly mixed samples were air dried and milled with Wiley Mill.

The pH values were obtained for needles and branches separately by the slope intercept method of Stamm (5). The petroleum ether and alcohol-benzene soluble extractive contents were determined with ASTM (The American Society for Testing and Materials) D1107-56 and ASTH D1108-56 respectively.

The total annual foliage potential in Turkey was estimated on the basis of annual commercial wood harvest and the assumptions used by Keays (4). The amount of the possible new jobs from foliage collection was calculated by using economic value of the estimated foliage potential as used for muka and the legal base payment for a worker.

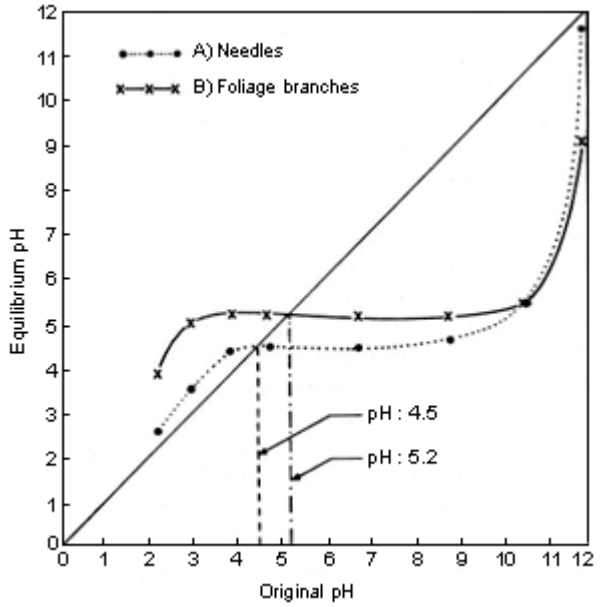

Figure 1: The pH values of Pinus nigra Arnold. foliage: A) ph 4.5 for needles; B) pH 5.2 for foliage branches.

RESULTS

The pH Value

The most of the forest trees can grow on neutral or less acidic soils. Obtaining the pH value, other than an academic importance may be a helpful tool for an improving soil quality whether to leave foliage on land after commercial timber harvesting or to remove it, depending on soil acidity. The pH values for needles and foliage branches including buds, bark and wood parts of *Pinus nigra* were 4.5 and 5.2 respectively as seen in Figure 1. The lower pH value of needles as compared to the foliage branches may be explained with having an active role of needles in photosynthesis.

Extractive Content

The needles and the foliage branches of *Pinus nigra* were extracted separately with petroleum ether and the ratio of 1:2 alcohol-benzene solution. The fresh samples were used for each solvent extraction, therefore, the same sample was not used consecutively in both solvents. The total amount of soluble extractive contents for the needles and the foliage branches are given in Table 1. The alcohol-benzene extractive contents were greater than that of petroleum ether. However, if the petroleum ether is used to produce chlorophyllcarotene paste and its subsequent chemicals as sodium chlorophyll, provitamin concentrate, conifer wax, essential oils, and conifer salt residures given by Barton (1), the amount of soluble extractives in needles and foliage branches looks encouraging for economic production (7).

Table 1 : The Soluble Extractive Contents of Needles and Foliage Branches in Pinus nigra Arnold.

Solvent	Percent Soluble Extractive Content Calculated on Dry Weight Bases	
	Needles	Foliage Bronches
Petroleum Ether	8.70	13.97
Alcohol: Benzen (1:2)	19.36	18.03

Foliage Potential and Its Social Value

The amount of recoverable foliage from commercial timber harvesting depends on several variables such as tree species, height, stand density, site index, crown ratio, and harvesting time. Therefore, the following assumptions for the calculation of practically recoverable foliage potential

and its conversion yield to muka and chlorophyll-carotene paste used by Keays (4) is still acceptable until the real foliage value included in the forest management plans. These as sumptions are: a) 2.5 cubic meters of timbers equals to one ton of dry weight, b) a recoverable commercial foliage is 10 percent of dry weight of timber and foliage yields to a 100 percent muka and 3 percent chlorophyll-carotene paste. By using these assumptions and the average annual wood production including timber, mine and telephone poles, industrial and pulpwood of 13 037 000 m^3 in Turkey, the expected amount of muka and chlorophyll-carotene paste would be 521.480 and 15 640 tons respectively. By the hand collection of this forest foliage may create about 65 000 full-time new jobs to forest villagers.

DISCUSSION

Foliage of commercial timber harvesting is a potential source for vitamin supplement as muka in animal and poultry feeds and some chemical source for medicinal, pharmaceutical, and vitamin additive purposes. For the time being, the foliage has been left on forest land as residue. There are many utilization possibilities and the various products will be technically obtained from the foliage (1,3,4,8).

The amount of *Pinus nigra* Arnold foliage extractive content would not be under estimated and its feasible utilization areas would be developed. In addition, the foliage collection by hand may create new jobs for forest vilagers, and any amount of foliage utilized only as fodder food supplement means that much of food transferred for human consumption. Further, more clinical and field studies have to be done for the full utilization of foliage.

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