

Effect of Plant Extracts on Specific Gravity of *Pinus roxburghii* Sargent Wood

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ABSTRACT

Specific gravity of wood is an important physical property of wood. It is help to utilize the wood to different purpose. Present investigation “Effect of plant extracts on specific gravity of *Pinus roxburghii* Sargent wood” was carried out to examine the effect of plant extract viz., *Acorus calamus* and *Parthenium hysterophorus* on specific gravity of wood. Wood samples treated with *A. calamus* extract, maximum wood specific gravity is recorded for the wood samples treated with the 2% concentrate of plants extract for the methanol (0.5872) and petroleum ether extracts (0.5995) and minimum was noticed in untreated wood samples 0.4868 and 0.5388 respectively. Wood samples treated with *P. hysterophorus* extract maximum specific gravity was recorded for

the wood samples treated at 2% concentrate of plants extract for the methanol (0.5682) and petroleum ether extracts (0.5326) and lowest specific gravity of wood samples was recorded for the untreated wood samples (0.5322) and (0.4868) respectively for control sample of methanol and petroleum ether. Investigation show the improved the specific gravity of wood and specific gravity of wood directly related to the utilization of wood. Present investigation help to develop natural wood preservatives which not affect the environmental and human health.

Keywords Specific gravity, Plant extracts, Solvents, *Pinus roxburghii* wood.

INTRODUCTION

Chir pine (*Pinus roxburghii*) is one of the important tree species of lower Himalayas it is belongs to family Pinaceae. In India is distributed in the Himachal Pradesh, Jammu and Kashmir, Uttar Pradesh, Uttarakhand and some pockets of Madhya Pradesh. Physical properties of wood i.e., wood color, wood specific gravity, density, luster, hardness and flexibility of wood depend on the chemical constitute of wood and atmospheric conditions. Physical properties of wood indicator to determine the quality of wood and fit for utilization. Specific gravity of wood is key feature to researchers. It is major effects on yield and quality of final products (Barefoot *et al.* 1970). Its

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effects on yield, quality and heritability it is become of most important characteristics for the indirect selection for the tree improvement program (Zobel *et al.* 1978). Another importance of specific gravity is selection of raw material for paper industry. Specific gravity is an important parameter to determine wood quality, pulp yield and strength of paper (Jyske *et al.* 2008, Elliot 1970, Panshin and Dezeeuw 1980). In the present work one of the non durable timber ie. *Pinus roxburghii* Sargent has been selected. Present investigation was focused on to understand the effect of the plant extracts on wood specific gravity and density of wood, which is help in further development of plant extract based wood preservatives (Meena *et al.* 2017). Utilization of natural plant extracts for the improve specific gravity of wood are better for the wood utilization as well as environment condition, ecology and natural biodiversity (Meena *et al.* 2017). Chemical wood preservatives are used for improve the quality of wood is harmful for the people and nature. Keep in view all the effects of chemical preservatives present investigation “Effect of plant extracts on specific gravity of *Pinus roxburghii* Sargent wood” carried out for the improve the specific gravity of wood with help of plant extract of *Acorus calamus* and *Parthenium hysterophorus*.

MATERIALS AND METHODS

Preparation of wood samples

Wood samples procured from the local carpenter were cut in to the dimensions of 5 × 2.5 × 2.5 cm, longitudinal, radial and tangential respectively (± 25, ± 0.15, ± 0.15 cm longitudinal, radial, and tangential respectively). Wood samples prepared from the heart wood of the selected tree species.

Collection of plant materials

The extract of two plant species viz. *Acorus calamus* L. and *Parthenium hysterophorus* L. were selected for the study as both the plants possess antifungal property. The rhizomes of *Acorus calamus* L. were collected from Nauni and Khaltu Village, whereas the aerial parts of *Parthenium hysterophorus* L. were collected from the University Campus area. The collected samples were initially dry separately in open

conditions under shade condition for the 20 days. The dried material was converted into powdered in wood grinder machine and again dried in oven for 24 hr at 50 + 1°C temperature and it finely powdered.

Preparation of extract solution for dip treatment

Prepared extract (2 % stock solution) was used to prepare 0.25, 0.50, 1.00, 1.50, 2.00% different concentrations for dip treatment. The wood samples for control were dipped in 5% methanol solution prepared with distilled water. After dip treatment, the wood samples were first dried in open air condition and then dried at 105 ± 2 °C up to constant weights.

Specific gravity

Specific gravity was determined by the maximum moisture content method (Smith 1954) with the following formula :

$$\text{Specific gravity} = \frac{1}{\frac{Mm - Mo}{Mo} + \frac{1}{GS}}$$

Where,

Mm = Fresh weight of the sample having maximum moisture i.e. fully saturated in water,

Mo = Oven dried constant weight of the sample,

GS = Average density of wood substance, a constant, having value 1.53.

RESULTS AND DISCUSSIONS

Effect of *Acorus calamus* and *Parthenium hysterophorus* extracts treatment on specific gravity of *Pinus roxburghii* wood

Analysis of variance of reflected significance difference among the different concentration at 5 per cent level of significance. The data effects of *A. calamus* extracts treatment on specific gravity of wood *P. Roxburghii* are presented in the Table 1. Among the treated wood samples the maximum specific gravity was noticed for the wood samples treated with the 2% concentrate of plants extract for the methanol (0.5872) and petroleum ether extracts (0.5995) and

Table 1. Effect of *Acorus calamus* extracts treatment on specific gravity of *Pinus roxburghii* wood.

Treatments	Methanol	Petroleum ether
0.25	0.5245	0.5446
0.50	0.5260	0.5662
1.00	0.5309	0.5689
1.50	0.5670	0.5776
2.0	0.5872	0.5995
Control	0.4868	0.5388
Cd (1%)	0.0268	0.0238
SEm	0.0062	0.0055

lowest specific gravity of wood samples was recorded for the untreated wood samples 0.4868 and 0.5388 respectively for control sample of methanol and petroleum ether.

A critical scrutiny of result of effect on *Parthenium hysterophorus* presented in Table 2 reflected significance difference among the different concentration. The maximum specific gravity was recorded for the wood samples treated at 2% concentrate of plants extract for the methanol (0.5682) and petroleum ether extracts (0.5326) and lowest specific gravity of wood samples was recorded for the untreated wood samples (0.5322) and (0.4868) respectively for control sample of methanol and petroleum ether. Treated wood samples with both of plant extractives showed significant change in the specific gravity of wood. Altitudinal Variation in Specific Gravity of *Pinus roxburghii* (Chir-pine) in Garhwal Himalaya region reported by the Kumar *et al.* (2018). Dias *et al.* (2018) also reported that the variation in density pattern of longitudinal variation with an increase from east to west in *P. nigra* at six sites in Portugal. Variation in specific gravity of wood in different provenances of teak was reported by Meena *et al.* (2016). Machado *et al.* (2014) noticed that the significant variation in wood density with site, tree and within tree (longitudinal and radial) were studied for blackwood (*Acacia melanoxylon* R. Br.) grown in four sites in Portugal. Uniyal *et al.* (2002) also reported in the variation in specific gravity of 23 provenances of *Pinus roxburghii* viz. Selected from different four states i.e., Himachal Pradesh, Jammu and Kashmir, Uttar Pradesh and Arunachal Pradesh. You *et al.* (2021) reported that variation in the wood density differed five geographic sources Chinese fir.

Table 2. Effect of *Parthenium hysterophorus* extracts treatment on specific gravity of *Pinus roxburghii* wood.

Treatments	Methanol	Petroleum ether
0.25	0.5207	0.5039
0.50	0.5370	0.5172
1.00	0.5476	0.5142
1.50	0.5664	0.5245
2.0	0.5682	0.5326
Control	0.5322	0.4868
Cd (1%)	0.0313	0.0099
SEm	0.0072	0.0023

CONCLUSION

Present investigation carried out for the screening of the effects of plants extracts on wood specific gravity of wood. Selected both botanicals confirmed that the significant effects on specific gravity of wood. However, petroleum ether extracts of *A. calamus* more effective as compare to the methanol extracts of *A. calamus*. In case of *P. hysterophorus* extracts methanol extracts was found more effective than petroleum ether extract. Effect of plant extracts on physical and mechanical properties of wood are reported very less than chemical treatment. Natural extract significantly improve the specific gravity of wood and other properties of wood i.e., there is need to research on the effects of plant extracts on wood properties. Present study is help to understand the behavior of wood after the treatment of wood with plant extractives and it is also helpful to develop natural wood preservatives.

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