Journal of Agroecology and Natural Resource Management
p-ISSN: 2394-0786, e-ISSN: 2394-0794, Volume 4, Issue 3; April-June, 2017, pp. 201-202

http://www.krishisanskriti.org/Publication.html

Estimation of Holocellulose Content in some Coniferous Wood of Western Himalayas

Kanica Chauhan[1], K.R. Sharma[2] and Bhupender Dutt[3]

[1,2,3]Dr.Y.S.P.U.H.F, Nauni Solan
E-mail: [1]kanicachauhan@gmail.com, [2]krai1960@yahoo.com, [3]bdbfp@yahoo.co.in

Abstract—*The present studies were conducted on variation in holocellulose content in some coniferous wood from different sites of Himachal pradesh. The data on holocellulose content for different species, the maximum value of 68.29 per cent was recorded in S2 (Pinus wallichiana) which was statistically at par with S4 (66.50%) and S1 (67.33%) minimum value of 60.89 per cent was noticed in S3 (Abies pindrow). Among the sites, maximum value of 66.87 per cent was observed in L3 (Solan) which was statistically at par with L2 (65.96%) and minimum value of 64.52 per cent in L1 (Chamba). The interactions between species and sites were found to be statistically non significant and ranged between 59.45 to 68.75 per cent. The study would help to utilize the findings and developing future strategies for screening of coniferous wood for utilization.*

1. INTRODUCTION

Hemicelluloses, also known as polyose is a carbohydrate polymer, but it differs from cellulose in many aspects, notably that it is non-crystalline and its degree of polymerization is much lower than cellulose (Siau, 1984). Lignin, the final component of the composite, is an aromatic polymer and along with hemicelluloses can be thought of as forming the matrix of the composite, creating a sheath surrounding the cellulose core. The combination of cellulose (40-50%) and hemicelluloses (15-25%) are called holocellulose and usually account for 65-75% of wood dry weight (Rowell 2013).Extractive contents consist of lipids (terpenoide, fat, wax, fatacides) and phenolic connexions (single phenolics, stilbenel, lignane, flavonoide, tannin). There are no structural elements, which could be solved in natural liquids and water, included. The most amounts of ingredients can be found in core wood, wood ray, root wood, branch formation and at the bark. The above mentioned ingredients define wood colour, smell and durability as well as quality of pulping and drying & gluing properties. The physico-chemical properties of wood are also important parameter for the preliminary characterization of cellulose raw material and its potentiality for pulp and paper, fuel wood, timber and certain other non – timber products for their related uses. The solubility of wood in various solvents is a measure of the extraneous components. The species containing large amount of extractives have better durability, dimensional stability and plasticization. For this reason, it is imperative to study extractives present in wood. The cold water soluble contents are generally tannins, gums, salts and sugars. The hot water soluble content of wood are tannins, gums, sugars, salts and phenols and the components soluble in alcohol-benzene are oleoresin, fats, and waxes (Nimkar and Sharma 2006). Therefore, the present investigation was conducted to study the variation in holocellulose content of coniferous wood from different sites.

2. MATERIALS AND METHODS

Experimental materials included 5 species of Pinaceae and locations are as follows:

Table 1: Experimental site and planting material.

SPECIES	SITES
1. Pinus roxburghii (S1)	Chamba(L1), Sundernagar(L2) and Solan(L3)
2. Pinus wallichiana (S2)	Chamba(L1), Sundernagar(L2) and Solan(L3)
3. Abies pindrow (S3)	Chamba(L1), Sundernagar(L2) and Solan(L3)
4. Picea smithiana (S4)	Chamba(L1), Sundernagar(L2) and Solan(L3)
5. Cedrus deodara (S5)	Chamba(L1), Sundernagar(L2) and Solan(L3)

The present investigation was carried out in the department of Forest Products, College of Forestry, Dr Y. S Parmar university of Horticulture and Forestry, Nauni, Solan (HP). The wood samples of 5 species for the present work were procured from the local markets of Chamba, Sundernagar and Solan and further, after oven drying converted into saw dust with the help of Chipper cum grinder. Five grams oven dry sample pre-extracted with alcohol-benzene (1:2v/v) was taken in a conical flask and 160 ml of distilled water was added to it. The contents were treated with 1.5 gram of sodium chlorite and 10 drops of acetic acid at 70-

80˚C on a water bath for one hour. The process was repeated four times till the meal became white. The contents were then filtered through IG-2 crucible, washed with water and finally with acetone. The sample was dried in an oven at 105 ± 2˚C to a constant weight. The extracted holocellulose content was calculated on the basis of the oven dry weight. The data recorded was statistically analyzed by using completely block design (factorial) in three replication for each treatment as described by Panse and Sukhatme (1978).

3. RESULT AND DISCUSSION

The data obtained for holocellulose content of coniferous wood from different sites are presented in Table 1. Analysis of variance (Table 2) reflected significant difference in holocellulose content in wood for different species and sites at 5 per cent level of significance. For different species, the maximum value of 68.29 per cent was recorded in S_2 (*Pinus wallichiana)* which was statistically at par with S_4 (66.50%) and S_1 (67.33%) minimum value of 60.89 per cent was noticed in S_3 (*Abies pindrow*). Among the sites, maximum value of 66.87 per cent was observed in L_3 (Solan) which was statistically at par with L_2 (65.96%) and minimum value of 64.52 per cent in L_1 (Chamba). The interactions between species and sites were found to be statistically non significant and ranged between 59.45 to 68.75 per cent.

Holocellulose, which constitute cellulose and hemicelluloses, is the major portion of fibrous raw material. Variation in holocellulose content for different species from various sites can be attributed to inconsistent environment conditions and genetic constitution. Similar results have been reported by different researcher in *Leucaena leucocephala* (Diaz *et al.*, 2007 and Lopez *et al.*, 2008), which are in conformity with the results of the current work. Donmez *et al*., (2012) reported the holocellulose and lignin content of *Cedrus libani* cones to be 63.44 per cent and 30.79 per cent respectively. Sczukowski *et al.* (2008) have reported variation in lignin and holocellulose contents of *Salix viminalis* and its cross with *Salix purpurea.* Guler *et al*., (2007) have observed an increase in holocellulose content from juvenile to maturity stage (64.7 to 72.2%).

Table 2: Variation in holocellulose (%) of coniferous wood from different

	Sites (L)			
Species (S)	**L_1(Chamba)**	**L_2(Sundernagar)**	**L_3(Solan)**	**Mean**
S_1(*Pinus roxburghii*)	66.30	67.48	68.21	67.33
S_2(*Pinus wallichiana*)	67.57	68.56	68.75	68.29
S_3(*Abies pindrow*)	59.45	60.79	62.43	60.89
S_4(*Cedrus deodara*)	65.14	66.69	67.66	66.50
S_5(*Picea smithiana*)	64.14	66.26	67.30	65.90
Mean	64.52	65.96	66.87	

$CD_{0.05}$	
Species (S)	1.84
Site (L)	1.43
Species× Site (S×L)	NS

4. ACKNOWLEDGEMENTS

This work was supported in part by a grant from the Department of Science and technology fellowship, GOI (New Delhi).

REFERENCES

[1] Anonymous, (1959c). Holocellulose in wood. Official standard. T12m-59 .Tech. Assoc. Pulp and Pap. Ind., New york. pp 36-37.

[2] Siau J F. 1984. Transport processes in wood. New York, Springer-VerlagInc. pp 35-72

[3] Roger M Rowell. 2013. Handbook of wood chemistry and wood composites. 2nd ed. CRC Press, London. p.2

[4] Perez J, Munozdorado J, De La Rubia and Martinez J. 2002. Biodegradation and biological treatments of cellulose, hemicellulose and lignin: an overview. *International Microbiology Journal* **5**(1)**:** 53-63

[5] Guler C, Copur Y, Akgul M and Buyuksari U. 2007. Some chemical, physical and mechanical properties of juvenile wood from black pine (*Pinus nigra* Arnold) plantations. *Journal of Applied Sciences* **7**(5): 755-758

[6] Diaz M J, Garcia M M, Eugenio M E, Tapias R, Fernandez M and Lopez F. 2007. Variations in fiber length and some pulp chemical properties of *Leucaena* varieties. *Industrial Crops and Products* **26:**142-150.

[7] Lopez F, Garcia M M, Yanez R, Tapias R, Fernandez M and Diaz M J. 2008.*Leucaena* species valoration for biomass and paper production in 1 and 2 year harvest.*Bioresource Technology* **99**: 4846-4853.

[8] Donmez E I, Hafizoglu H and Tümen A K I. 2012. Chemical composition of fourteen different coniferous species cones growing naturally in turkey. *Wood research* **57**(2): 339-344

[9] Sczukowski S, Pradzynski W, Waliszewska B and Wojech R. 2008.Chemical composition and heat of combustion of new varieties of Salix genus. *Annals of Warsaw University of Life Sciences, Forestry and Wood Technology* **66**: 101-106.

[10] Nimkar A U and Sharma K R. 2006. Variation in bark thickness and specific gravity if wood is high resin yielders of chir pine (*Pinus roxburghii*). *My Forest* **42**(3): 279-283

[11] Panse, V.G. and Sukhatme, P.V. (1978). Statistical method for agricultural workers, ICAR, New Delhi, p 610