QUANTITY OF WATER SOLUBLES IN SOME HARDWOOD SPECIES (A BASIS FOR THEIR RELATIVE SUITABILITY IN WOOD CEMENT BOARD)

S.M. Yasin and T.A. Qureshi*

Abstract

The quantity of water solubles of eight hardwood species was determined as a basis for assessing their suitability for wood cement boards. From the values it is predicted that poplars would provide a better raw material for wood-cement boards than *Acacia nilotica* Willd., followed by *Dalbergia sissoo* Roxb., and *Tamarix aphylla* Vahl., while among the poplars, *Populus alba* L., would be better than *P. deltoides* Marsh., *P. cilliata* Wall., *P. euphratica* Olivier and *P. X euramericana* (Dode) Guinier.

Introduction

Wood-based panel products provide an efficient way of using low grade woods and other manufacturing waste from the wood processing industries. The cost and poor availability of synthetic resins combined with limited resistance of resin-bonded particleboards against the weather elements has caused the development of minerals-bonded panels. These products are resistant to termites, fungi, fire and weather elements and are easily workable with common wood working tools and conventional fasteners such as adhesives, nails and screws. Furthermore, the easy availability of portland cement is of added advantage (Prestemon, 1975; Weatherwax and Tarkow, 1964).

A major handicap to the development of wood-cement composites is the inconsistent behavior of different wood species for developing wood-cement bond strength. Although the effects of individual-species influence on the setting of portland cement is substantial. Some species produce excellent wood-cement panels while others do not. Researchers attribute such bonding inconsistencies mainly to the amount of the alkali and water solubles in wood which even in small amounts tend to inhibit cement hydration and consequently cement setting, thereby partially or completely obstructing the crystalline formation essential to strength development. (Biblis and Lo, 1968; Fischer *et. al* ., 1974; Kohler, 1964; Preusser *et. al* .,1960). With a view to utilize wood in wood-cement boards, water extraction prior to wood cement mixing and calcium chloride addition to wood-cement mixture are useful (Zhengtian, 1986; Hofstrand *et. al* ., 1984).

In Pakistan, the industrial production of wood-cement board is in its infancy stage. Presently, only one cement-bonded particleboard unit is installed at Jauharabad. The producer is interested in using the easily available low quality hardwoods like, small-size

*The authors are Composite Wood Officer and Assistant Composite Wood Officer at Pakistan Forest Institute, Peshawar respectively.

shisham, khagal, kikar and poplars for producing cement-bonded particleboard. For predicting the relative suitability of these species, it was predicting to gather information on quantities of their water solubles.

Materials and Methods

The material for this study included wood which was obtained from the following three sources:

1. *Tamarix aphylla* Vanl. (khagal), *Dalbergia sissoo* Roxb. (shisham) and *Acacia nilotica* Willd. (kikar) wood (approximately 8-10 years of age) was supplied by Haramain Ltd., Jauharabad.

2. *Populus alba* L., *P. deltoides* Marsh., *P. euphratica* Olivier and *P.x euramericana* (Dode) Guinier wood (5-6 years of age) was obtained from a standing crop in the Silviculture Research Garden, Pakistan Forest Institute, Peshawar.

3. *Populus ciliata* Wall., wood (5-6 years of age) was procured from the PFI Wood Anatomy Laboratory.

After debarking, the wood was converted into sawdust by Wiley Mill. The sawdust was then extracted separately with hot and cold water, according to TAPPI Method T 207 om-81. (TAPPI 1981).

Results and Discussion

The results on water solubles of different wood species are shown in table 1.

Table 1

Hot and cold water solubles from eight wood species.

Name of species	Water solubles (%)	
	Hot water	Cold water
1. *Populus alba* L.	2.44	1.14
2. *P. deltoides* Marsh.	2.81	1.58
3. *P. ciliata* Wall.	4.28	2.82
4. *P. euphratica* Olivier	4.43	1.95
5. *P. x euramericana* (Dode) Guinier	5.53	3.24
6. *Acacia nilotica* Willd.	7.81	4.39
7. *Dalbergia sissoo* Roxb.	9.05	5.97
8. *Tamarix aphylla* Vahl.	9.21	5.18

The quantity of water solubles in poplars is invariably less as compared to that in kikar, shisham, and khagal. Similarly, in the poplars, amount of water solubles varies with the species and stand from lower to the high values as *populus alba, P. deltoides, P. ciliata, P. euphratica* and *P. x euramericana.* The cold water solubles are low in quantity as compared to hot water solubles. The difference indicates that hot water solubles include some materials in addition to those dissolved in cold water. According to TAPPI (1981), the cold water extracts materials such as tannins, gums, sugars and colouring matter present in the wood, while the hot water removes also the starches for it hydrolyses polysaccharides, thereby increasing their degree of solubility . According to Biblis and Lo (1986), the strength of the wood-cement board is inversely proportional to the quantity of water solubles contained in the wood, lower is the strength of the wood-cement board. On this basis, *Populus alba* ,in the present study, appears to stand at the top and *Tamarix aphylla* at the bottom in terms of strength in the wood-cement board, the other species standing in order in between (Table 1).

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