(III)

WOOD CHARACTERISTICS OF *POPULUS DELTOIDES* AS AFFECTED BY HIGH DENSITY PLANTATION

High density plantations are found to give 3 to 6 times more biomass per unit area than conventional practices. This has lead to the large scale high density plantation of most of the species for fuel and biomass production. In this wave, pulp and paper industries accepted raw material from such sources and even raised their own plantation of high densities. Among all species *Populus* got great impetus as raw material in pulp and paper industry. The present study was thus coined to see the effect of high density plantations of *Populus deltoides* on wood characteristics.

The experiment was laid out in 1986 with three spacing viz 60 x 60 cm, 90 x 90 cm, 120 x 120 cm in a randomised block design with seven replications. The plots were harvested in 1999 i.e. 13 years after plantation. Moisture content, specific gravity, fibre length lignin content and biomass was determined. Moisture content was determined by taking the differences in weight of 5 cm discs of freshly felled tree and its oven dry weight ($105^{\circ} \pm 1^{\circ}C$). Specific gravity was determined by maximum moisture content method as used by Smith (1954). Length of the fibre was determined by macerating the shaving of wood in Jaffery's fluid i.e. 10% chromic acid and 10% nitric acid for 48 hours (Pandey *et al.*, 1968). The samples were than thoroughly washed, stained with safranine and teased in 10% glycerine. The measurement of fibre length were made with the help of ocular micrometer standardised with the help of stage micrometer. Wood lignin content was analysed following Anon. (1959). The data was put to statistical analysis following Gomez and Gomez (1984).

Data presented in Table 1 reveals that moisture content, lignin and specific gravity were not affected significantly with spacing. However, specify gravity was highest (0.399) at 60 x 60 cm spacing and least (0.379) at lowest density (120 x 120 cm). Whereas, lignin content showed a reverse trend being minimum (16.81%) in 60 x 60 cm spacing and maximum (17.35%) in 120 x 120 cm spacings. Fibre length showed statistically significant variation among all the spacing. The fibre length was least (0.68 mm) in higher density i.e. at 60 x 60 cm spaced tree, 0.78 mm at 90 x 90 cm spacing and maximum 0.87 mm at lowest density i.e. 120 x 120 cm spacing. The total above-ground biomass was maximum (218.08 t/ha) in plots where trees were spaced at 60 x 60 cm and least biomass accumulation (145.07 t/ha) was observed in plots where trees were spaced at 120 x 120 cm. The non-significant results of effect of spacing on moisture is in accordance with Kumar (1996) for *Eucalyptus tereticornis*.

Specific gravity also showed non-significant results with spacing. This might be due to the fact that lignin content has

Table 1

Effect of spacing on wood properties of Populus deltoides

Spacing (cm)	Specific gravity	Fibre length (mm)	Lignin content (%)	Moisture content (%)	Biomass (t/ha)
60 x 60	0.399	0.680	16.81	40.48	218.08
90 x 90	0.395	0.780	16.92	39.77	183.34
120 x 120	0.379	0.870	17.35	40.20	145.07
SEm±	0.015	0.003	0.51	1.25	4.49
$C.D_{0.05}$	NS	0.006	NS	NS	9.80

not shown any difference with regard to spacing. These findings are in line with those of Chauhan *et al.* (1983) in *Eucalyptus tereticornis* and Javadi *et al.* (1983) in Sitka spruce. Non-significant results of lignin content have also been obtained by Kumar (1996) and Sharma (1997). Spacing had a significant effect on fibre length. This may be because of less competition in lower density as a result of which fibre length increased. These results are in accordance with the findings of Sharma (1997) in *Robinia pseudoacacia*.

The foregoing results and discussion reveals that at higher density no doubt higher biomass is produced but lignin content decreases and also the fibre length. The decrease in lignin is an advantage as lesser chemicals will be required to separate the fibre and decolourise the pulp obtained, as lignin acts as a binding material and also impart dark colour to the pulp. Thus if low grade pulp is to be produced we can go for high density plantation but for papers where long fibres are required for strength of the paper, wider spacings are advised.

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Department of Silviculture and Agroforestry,
University of Horticulture and Forestry,
Nauni, Solan (Himachal Pradesh).

S.D. Bhardwaj,
Pankaj Panwar
and Sachil Gautam