ENGINEERING & TECHNOLOGY

Khulna University Studies 1 (1): 19-21

SAWING, PLANING AND SHAPING CHARACTERISTICS OF FIVE MANGROVE SPECIES.

M. Obaidullah Hannan*, A.K. Fazlul Hoque, Md. Anisul Islam

Forestry and Wood Technology Discipline, Khulna University, Khulna-9208, Bangladesh.

Accepted February 1998

Abstract: Sawing, planing and shaping characteristics of five mangrove species, viz., baen (*Avicennia officinalis*), gewa (*Excoecaria agallocha*), kankra (*Bruguiera* spp.), passur (*Xylocarpus mekongensis*) and sundri (*Heritiera fomes*) were studied. Three types of band saw blades, viz., spring set, swage set and stellite tipped, were used for sawing operation. Of these saws, stellite tipped blades showed excellent ripping performance in sawing sundri, passur and kankra whereas swaged set saws performed better in ripping gewa, baen and passur. In planing test the performance of kankra was average and others were average to poor in quality. In shaping test kankra showed good shaping quality, baen and gewa were fair, and sundri and passur were poor.

Keywords: Sawing; Planing; Shaping; Mangrove wood; Wood Technology.

Introduction

The Sundrabans is the single largest mangrove forest in the world with an area of about 4,016 sq. km (Chaffey *et al*., 1985) which is about 4% of the total land mass of Bangladesh. The mean standing volume (upto 10 cm top diameter; under bark) of commercially important tree species is 26.69 m^3/ha (Reza *et al*., 1992). Commercially important trees include sundri (*Heritiera fomes*), gewa (*Excoecaria agallocha*), passur (*Xylocarpus mekongensis*), dhundal (*X. granatum*), kankra (*Bruguiera* spp.), keora (*Sonneratia apetala*) and baen (*Avicennia officinalis*). Of this, sundri, passur and dhundal are recognized as valuable timber. As timber resources, the others are of local importance only and mostly used by poor people.

Information on machinability, in addition to that on mechanical properties, is desirable for timbers that are converted for cabinet and furniture work. For such uses, surface smoothness and economy with which a timber can be worked might be considered the most important of all properties. Unless a timber machines fairly well and with moderate ease, it is not economically suitable for furniture production, regardless of its other virtues (Davis, 1962). Sattar (1981), Sattar and Bhattacharjee (1983, 1988) and Bhattacharjee and Sattar (1987) studied physical and mechanical properties of some of the mangrove species. Khaleque and Hannan (1993) studied the machining and hand-tool properties of sundri, passur, kankra, gewa and baen. This evaluation of sawing, planing and shaping characteristics of sundri, gewa, passur, baen and kankra was undertaken as a part of exploring the timber potential of mangrove forest resources.

* Corresponding author Tel: +88-(041) 721791, 720171-3, Fax: +88-041-731244, e-mail: <ku@bdonline.com>

DOI: https://doi.org/10.53808/KUS.1999.1.1.21-23-se

Materials and Methods

Logs of sundri, gewa, passur, baen and kankra were procured from the Sundarbans. Three types of saw blades, viz., spring set, swaged set and stellite tipped, were used in conducting sawing test. Saw blades were 10 cm in width. A total of 15 logs of each species, five logs for each of the three types of saw blades, were converted to 2.54 cm (1 inch) thick planks by plain sawing at Bangladesh Forest Research Institute's saw mill. During sawing feed rate was maintained constant at 100 cm per minute. Smoothness of cut was considered the critical factor in judging the machinabilty of the species. Frequency and severity of cutting defects were graded on numerical scale as per ASTM standard: Grade 4 was considered excellent (defect free), Grade 3 – good, Grade 2 – fair and Grade 1 – poor.

Converted green planks were kiln dried to 12% moisture content and 10 samples of each species were dressed to 2 cm x 10 cm x 122 cm in sizes. These samples were further converted to 2 cm x 10 cm x 90 cm and 2 cm x 7.5 cm x 30 cm planks for planing and shaping tests respectively. Planing, the peripheral milling to smooth surface(s) of wooden work piece or to bring it to a prescribed thickness (Koch, 1964), was tested by a Whitney 105 single surface planer with four knive that operates at 3000 revolution per minute (rpm). The cutting angle was 25°. Shaping, the peripheral milling to cut an edge profile or edge pattern on a workpiece, was tested with a belt drive, single spindle shaper with a 6.4 cm diameter cutter operated at 6380 rpm. To ensure sharpness of the machine during all tests, knives were changed frequently.

These tests were carried out according to ASTM standard: D-1666-64 (Anon, 1969). Defects in the planing and shaping test were evaluated following Davis (1962).

Results and Discussion

The results of sawing with different types of blades are shown in Table- 1. The performance of spring set saws was generally poor for all mangrove species and was inversely related with the density of wood. The performance of swage set blades was generally good or very good. Though no definite relationship between sawing quality and wood density was noticed, excellent performance was observed with low and medium density woods. Very poor performance in sawing kankra was not due to the high density but probably due to the inter-locked grain of the wood. Of the three types of saws stellite tipped blades performed the best. The sawing quality was very good for all wood densities and grains however, and it was excellent with high density/refractory woods.

Table- 1. Sawing characteristics of five mangrove species.

Species	Specific gravity Air dry volume *	Sawing quality		
		Spring set	Swage set	Stellite tipped
Baen (*Avicennia officinalis*)	0.56	2	4	3
Gewa (*Excoecaria agallocha*)	0.40	3	4	3
Kankra (*Bruguiera* spp.)	0.86	1	1	4
Passur (*Xylocarpus mekongensis*)	0.59	2	4	4
Sundri (*Heritiera fomes*)	0.96	1	3	4

* Source: Sattar, 1981.

In machining test, out of five species, kankra showed fair planing quality and the performance of the rest was below average level (Table- 2). Khaleque and Hannan (1993) in carpenter's hand-tool test observed a better performance with sundri and gewa. Table- 2 indicates no relationship between planing quality and specific gravity of wood. It was observed that occurrence of defect free samples depended on the grain and texture of wood. In shaping test kankra

showed good shaping quality. Gewa, baen and passur were fair, and sundri was poor in shaping quality.

Table- 2. Planing and shaping characteristics of five mangrove species.

Species	Specific gravity Air dry volume *	% of defect free samples	
		Planing	Shaping
Baen (*Avicennia officinalis*)	0.56	40	60
Gewa (*Excoecaria agallocha*)	0.40	40	60
Kankra (*Bruguiera* spp.)	0.86	50	70
Passur (*Xylocarpus mekongensis*)	0.59	40	50
Sundri (*Heritiera fomes*)	0.96	30	40

* Source: Sattar, 1981.

Conclusion

Stellite tipped blades were found to be the most suitable for sawing mangrove timbers. Except kankra, other mangrove species were found to be below average standard in planing test. Among the species tested kankra showed best shaping quality. However, the scope of this study does not include any recommendation for particular species for end-use. Results of this study are of indicative values. Further investigation is recommended to help in the selection of a species for a specific use.

References

Anon, 1969. *Book of ASTM Standard, Part 16. D 1666-64*. Americal Society for Testing Materials, pp. 566-590.

Bhattacharjee, D.K. and Sattar, M.A., 1987. Physical and mechanical properties of kankra and passur. Timber Physics Series, Bulletin 11. Bangladesh Forest Research Institute, Chittagong, 8 pp.

Chaffey, D.R., Miller, F.R. and Sandom, J.H., 1985. A forest inventory of the Sundarbans, Bangladesh. Main Report, Overseas Development Administration, UK., 140 pp.

Davis, E.M., 1962. Machining and related charteristics of United States hardwoods. US Dept. Agr. Tech. Bul. No. 1267, 68 pp.

Khaleque, M.A. and Hannan, M.O., 1993. Machining and handtool properties of five mangrove species. Woodworking Series, Bulletin 8. Bangladesh Forest Research Institute, Chittagong, 7 pp.

Koch, P., 1964. *Wood Machining Processes*. The Ronald Press Co., NY., 530 pp.

Reza, N.A., Kibria, M.G., Waziullah, A.K.M., Chowdhury, M.H., Rahman, A. and Islam, S.S., 1992. Forest Statistics of Bangladesh. Forest Economics and Statistics Division, Bulletin 3. Bangladesh Forest Research Institute, Chittagong, 54 pp.

Sattar, M.A., 1981. Some physical properties of 116 Bangladeshi timbers. Wood Seasoning Series, Bulletin 7. Bangladesh Forest Research Institute, Chittagong, 15 pp.

Sattar, M.A. and Bhattacharjee, D.K., 1983. Strength properties of keora. Timber Physics Series, Bulletin 7. Bangladesh Forest Research Institute, Chittagong, 6 pp.

Sattar, M.A. and Bhattacharjee, D.K., 1988. Physical and mechanical properties of sundri and baen. Timber Physics series, Bulletin 10. Bangladesh Forest Research Institute, Chittagong, 8 pp.