

Short Communication

Effect of phenol formaldehyde resin on thickness, moisture content, density and water absorption of particle board

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ABSTRACT

Gliricidia, *Gliricidia maculate* is a promising source of lignocellulosic material and can be utilized for preparation of particle board. Suitability of gliricidia as a raw material for preparation of particle board manufacture has been evaluated. The results showed that gliricidia is suitable for making particle board. The particle boards were prepared with 12 and 14 per cent phenol formaldehyde resin content. Thickness of the board varied from 6.9 mm to 8.3 mm while moisture content varied from 5.5 to 7.7 per cent. Maximum thickness and moisture content were recorded in the board prepared with 6 per cent resin content whereas density varied from 0.69 to 0.73 g/cm³. Maximum density was recorded in boards prepared from 14 per cent of resin content. Water absorption of the boards for 2 hours and 24 hours soaking in water varied from 19.95 to 58.87 and 35.57 to 76.99 per cent respectively. Increase in the amount of resin showed decrease in water absorption property.

Keywords: Particle board; gliricidia; density; phenol formaldehyde; resin

INTRODUCTION

A particle board is a board or sheet constituted from fragments of wood and other lignocellulosic material bonded with organic binder with the help of one or more agents like heat, pressure, humidity, catalyst etc. Particle board is reconstituted constructional panel particularly developed as a substitute for natural constructional wood and is made from low grade waste woods or from certain

agricultural ligneous wastes. In that respect it assumes one of the greatest importance in the wood panel products industry from the point of view of conservation of scarce forest resources in a country. Particle board offers a mean to utilize as much as the forest and industrial wood waste as possible. There is no doubt that this board is going to stay for a long time due to plenty of raw materials, manufacturing properties and product properties.

It is possible to make particle board from many species of wood and its quality depends upon various factors such as wood species, size and shape of the particle, density of the raw material (Lynam 1969) and the amount and type of resin used (Larmore 1959).

MATERIAL and METHODS

Gliricidia maculate raw material was collected from the campus of Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola. The woody raw material was cut into small pieces with the help of cross cutting machine (mini Combiplaner) and then it was sun-dried to remove excess moisture. The dried small cross cut pieces were further reduced with the help of wood grinder to convert into small particles. The ground materials were sun-dried for 8 to 15 days so as to bring down the moisture level up to 11 to 12 per cent.

About 500 g of dried sawdust was taken for making each particle board. The dried sawdust was uniformly blended with different resin content viz 6, 8, 10, 12 and 14 per cent on the basis of dried particles of *G maculate* and solid content of phenol formaldehyde resin. The resin blended particles were air-dried to bring down the moisture content to about 10-12 per cent and blended particles were uniformly laid to form mats in a wooden mould. The mats were pressed in the hydraulic hot press at specific pressure of 300 lbs/inch² and gauge

pressure of 91.86 lbs/inch² at temperature of 150 to 155°C for about 12 minutes for making each particle board. The single layer flat pressed particle boards were made.

Particle boards thus obtained were conditioned at room temperature for one week before preparation of test specimens and then tested for various physical properties such as thickness variation, density, moisture content and water absorption due to surface absorption as per the procedure laid down in IS: 2380 (Anon 1977) and IS: 3087 (Anon 1985).

RESULTS and DISCUSSION

The results of the present investigation are given in Table 1. The thickness of the board varied from 6.9 mm to 8.3 mm while moisture content varied from 5.5 to 7.7 per cent. Maximum thickness (8.3 mm) and moisture content (7.7%) were recorded in the board prepared with 6 per cent resin content whereas minimum thickness (6.9 mm) and moisture content (5.5%) were recorded in the boards prepared from 14 per cent of resin content. Maximum density (0.73 g/cm³) was recorded in boards prepared from 14 per cent of resin content whereas minimum (0.69 g/cm³) in boards prepared from 6 per cent. Water absorption test of the boards for 2 and 24 hours soaking in water varied from 19.95 to 58.87 and 35.57 to 76.99 per cent respectively. Boards prepared from 12 and 14 per cent

Table 1. Effect of phenol formaldehyde resin on thickness, moisture content, density and water absorption of particle board

Quantity of resin used (%)	Thickness (mm)	Moisture content (%)	Density (g/cm ³)	Water absorption after 2 h (%)	Water absorption after 24 h (%)
6	8.3	7.7	0.69	58.87	76.99
8	7.9	7.4	0.69	40.54	62.23
10	7.7	6.9	0.71	36.77	53.71
12	7.2	6.3	0.72	24.01	45.63
14	6.9	5.5	0.73	19.95	35.57
Requirement of IS: 3087 (1985)	-	5 to 15	0.5 to 0.9	£ 25	£ 50

resin content met the requirement of IS specifications of water absorption for 2 and 24 hours. Other boards did not meet the requirement of specification. With increase in resin content from 6 to 14 per cent the water absorption value decreased significantly when soaked in water for a certain interval of time. Similar type of results have been reported by Nimkar and Singh (2000) and Nimkar et al (2003) for the boards prepared from *Bambusa polymorpha*, Kshirsagar (2010) for the boards made from *Dendrocalmus strictus* and Parab (2011) for the boards prepared from sawdust of hardwood species. Gawali (2013) revealed that moisture content of the boards made from *Lantana camera* Linn were found within the limit of IS specification.

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Received: 1.3.2015

Accepted: 23.7.2015