

Date-palm leaf particle boards – a wood substitute for various applications

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ABSTRACT

Particle – Boards have been successfully developed from Date – palm leaves, the agro-waste,¹ in the laboratory scale as well as successful pilot plant trial had been conducted in a reputed Board making factory of West Bengal. The Physico- mechanical properties of Date- Palm leaf Particle- Board have been measured and showed very encouraging result. A successful application of Date – Palm leaf (DPL) had been translated for fitting false ceiling of Room No – 1 of NIRJAFT Trainees' hostel in the Month of May. The cost of the DPL Particle Board is about 20% of the cost of the plywood/wood material.

Key words : DPL, Particle – Boards, Properties, Optimization, Utilisation

INTRODUCTION

No research work has ever been done to develop the particle Board from DPL in India and abroad². In the world, Iraq has been producing thermal insulating Boards for covering electrical wires. In India, NIRJAFT (I.C.A.R.), 12, Regent Park, Kolkata – 40 only has done successful research work in the laboratory scale to produce the DPL Boards and its application for the false ceiling.

Wood resources are continuously depleting while the demand is increasing day by day with the growth income, population in general and increased activity in the construction sector with a view to conserve the forest resource and consequently shortage of wood, the existing wood, plywood, fibre board can't meet the increasing demand³. Currently present requirement of wood is 31 million cubic meters whereas,

the estimated production is only 16 million cubic meters (FAO Report). In this back- drop, low cost particle Boards from DPL, the annually renewable agro-wastes, may be developed as the substitute of the costly wood product.

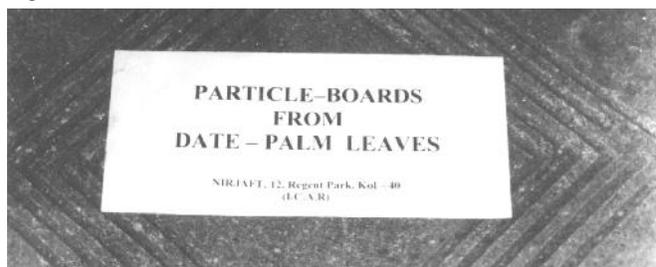
REVIEW OF LITERATURE

India is bestowed with huge agricultural wastes and value added items like particle- Board may be developed at low cost but no research work has ever been done to develop particle board from Date- Palm leaves , the agro-waste. In Abroad, North Africa has been using DPL for making huts. Mature leaves are made into mats, screens, baskets, crates and fans. The processed leaflets, combined with ground up peanuts shells and corn cobs are used for making insulating boards. The leaf petioles have been found to be the good source of cellulose pulp. It has been tested as material for filtering drainage pipes in Iraq, as a substitute for imported filters.

MATERIALS AND METHODS

Matured Date palm leaves (60 days' of age) were air dried for 7 days. The dried leaves were cut to small pieces ($1/2^2$ to 1^2) and then chipped / ground in a grinding machine. The chipped DPL particles

Fig. 1 :



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(40 mesh) after uniform mixture with synthetic resins (Urea – Formaldehyde & Phenol – Formaldehyde) and natural resin (Tamarind seed powder) were taken separately in a metallic frame ($6^2 \times 6^2$) and were pressed in a hydraulic machine under specific temperature (160°C), pressure ($20\text{Kg}/\text{cm}^2$) and time of 20 minute. Nine types of DPL Particle- Boards using three varieties of resin of different concentrations (10 %, 15% & 20%) were developed keeping all the parameters (time, temperature and pressure) unaltered. The relevant physical and mechanical properties Viz. moisture content (%), Density (gm / cm^3), water absorption (%), Bulk swelling (%), Thickness swelling (%), Tensile strength (N/ mm^2), Flexural modulus (Mpa), Impact strength (Kg.m) etc. were determined to assess the suitability of DPL Boards as a substitute of costly wood products. Tensile strength and Flexural strength of DPL Boards were measured in Instron Tensile strength Tester (No. 5567, 30 KN max Load) and impact strength of boards were measured in Avery Impact Testing M/C. The photographs of DPL Particle Board (fig. 1) and application for false ceiling (fig. 2) have been presented.

Fig. 2 :



RESULTS AND DISCUSSION

Date palm leaf (DPL) is more or less similar to wood in chemical composition (Table – 1)⁴. So it may be used as a replacement of wood depending upon the end uses. Various characteristics of DPL Particle – Boards using different concentrations of resins (U.F., P.F. and T.S.P.) are given in Table – 2 and Table – 3. The results of Table – 2 indicates that as the resin concentration increases, the tensile strength, Flexural modulus and Impact strength increases. From Table – 3, it appears that water absorption (%), Bulk swelling (%) and Thickness swelling (%) in water increased from 1 hr to 24 hrs soaking time but with the gradual increase of the concentration of the resins, the reverse trend (Decreasing) was observed. Boards