



**University of Zabol**

Graduate school

Faculty of Natural resource

Wood and Paper Science and Technology

**The Thesis Submitted for the Degree of Master of Science**

**(In Composite wood products)**

**Improvement water resistance in  
Mimosa natural tannin adhesive**

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## **Abstract**

In the process of production of compressed wooden plates usually made from waste wood, wood particles are connected with a type of adhesive under high pressure and temperature. Most common adhesives used in the manufacture of these products are formaldehyde-based. Today, most studies are focused on the improvement of the features of natural adhesives without formaldehyde in the manufacture of compressed wooden plates. The condensed tannin is a natural and formaldehyde-free adhesive and the water-proof of which was studied in manufacture of particleboard. The adhesive amount was fixed to 10 percent of the particleboard weight. Different additives including furfuryl alcohol, latex, sunflower oil, almond oil, coconut oil, herb seed Hindi cassia, cedar, resin, wax, and polyethylene were added to it 1 to 20 percent by weight of the dried adhesive. Pressing time of 5 minutes at 200 ° C and a pressure of 18 kg/ cm <sup>2</sup> were considered. The physical and mechanical properties of particleboard made were determined by using standard EN Europe and statistically analyzed by using one-way ANOVA in a completely randomized design with the confidence level of 95%. Also, using the technique of infrared spectroscopy, the change in the structure of condensed tannins if combined with additives, was investigated. The results showed that the impact of each 10 additives upon the measured physical and mechanical properties were significant. The 3 additives of furfuryl alcohol, coconut oil and Hindi cassia, reducing the hydrophilic hydroxyl groups, caused a chemical change in the molecular structure of condensed tannins and improved water resistance of the adhesive. As for water absorption (2 and 24 h) and thickness swelling (2 and 24), the 3 additives of furfuryl alcohol, coconut oil, and Hindi cassia were better than other additives. The Hindi cassia with internal bond strength of 0/56 MPa, water absorption after 2 hours of 54/36 %, the water absorption after 24 hours of 62/ 18 %, thickness swelling 2 hours of 15/7 %, the thickness swelling after 24 of 17/85 %, the tensile strength of 16/52 Mpa, and elasticity module of 2906 MPa was found to be the best additive. Based on the results, the addition of Hindi cassia, by 15 % of the weight of the dry wood of the condensed natural tannin of Mimosa type, improved the water resistance in a way that water absorption and thickness swelling were according to the standards and internal bond strength, bending strength, and elasticity module were of a great deal.

**Keywords:** Condensed Tannin, Furfuryl, Cassia, Water-Proof, Resin, Coconut Oil.