RESEARCH PAPER International Journal of Agricultural Sciences, Vol. 5 Issue 1, January to May, 2009 : 129-133

Corrugated fibre board boxes from sisal (*Agave sisalana*) - An alternative to wooden packages

DAWN C.P. AMBROSE* AND C.T. DEVADAS[1]
Central Institute of Agricultural Engineering, Regional Centre, COIMBATORE (T.N.) INDIA

ABSTRACT

A study was taken up to develop a process for making corrugated fiber board boxes from the leafy fibre crop, *Agave sisalana* commonly known as sisal. Cooking pressure of 1.73 kg/cm^2, 3 per cent NaOH concentration and 20 minutes cooking time was found to be the optimum process parameters for producing high strength sisal paper boards. Regular Slotted Container (RSC) type Corrugated Fibre Board boxes of 3 and 5 ply having internal dimensions of 220x110x180mm were made using the developed material. The developed boxes were packed with grapes and tested for their strength under laboratory and field conditions. Free fall test revealed no damage to the boxes. Transportation test proved that 5 ply boxes were better than 3 ply boxes in terms of damage to the box and to the produce. The cost of the box was worked out to be Rs.3.50 where as the cost of the market product is around Rs. 5.75 per box.

Key words : Sisal, Paperboard, Quality, Corrugated fibre board boxes, Laboratory tests, Field tests.

INTRODUCTION

Corrugated Fiber Board (CFB) is the most popular raw material used for transport package of a wide variety of products including fresh fruits and vegetables and is suitable for all different modes of transport. The increased shortage of forest produce due to felling of trees and the strict ban by the Government on deforestation has led to the demand on the package made of wood which is used since time immemorial for transportation of horticultural produce. Non–wood fibrous raw material could fill in this gap/demand where cheap and durable packages are required. Corrugated Fiber Board boxes can considerably reduce the threat of ecological imbalance that may be caused by continuous use of timber.

Sisal also known as 'Agave' is a large genus of short – stemmed half woody plants, bearing a rosette of long, erect, pointed fleshy leaves. The world annual production of sisal is 36,900 MT (Anonymous, 2000). Each sisal plant yields about 250-300 leaves during its lifetime of 7-8 years and sisal fibre is well suited for cordage of all kinds. Sisal contains 64 per cent cellulose, 28 per cent hemi-cellulose, 9 per cent lignin and 0.7 per cent ash (Mitra, 1999). It has been reported that out of the total area of cultivation of this crop, only half the area of cultivation is utilized for extraction of fiber. The crop is left unused in most of the places resulting in loss of fiber and revenue. The fiber has very good resistance to water and microbial attack. The present investigation was taken up to exploit the potential of sisal for making paper boards suitable for the production of corrugated fiber board boxes that can be used for packaging and transportation of fresh produce.

MATERIALS AND METHODS

Process for making paper boards from sisal:

About six kg of sisal leaves of 1-1.5 m length were chopped into small pieces of 5 to 7 cm length. The chopped raw material was cooked in an autoclave at different pressures of 1.38 kg/cm^2, 1.73 kg/cm^2 and 2.08 kg/cm^2 (absolute), respectively. The duration of cooking was varied as 10, 15 and 20 minutes at each pressure. Sodium hydroxide was added at the level of 1, 3 and 5 per cent by weight to the raw material at the time of digestion. The cooked material was washed in water to remove the residual caustic soda and pulped in the beater (Holland type) by adding waste paper to the pulp at different ratios by weight depending on the treatment and also by adding chemicals such as alum, china clay and rosin. The pulp was transferred into a tray at the bottom of an autovat. The free water from the sheets was squeezed out in a hydraulic press. The sheets were then sun dried and the wrinkles on the sheets were removed in a calendaring machine. The paper sheets were cut into desired size in a shearing machine for further testing of quality.

Testing the properties of sisal paper boards:

– The breaking length (B_l) of the paper is the length of a uniform strip just sufficient to cause the strip to break under its own weight when suspended freely from one end. The breaking length of paper is obtained by using the formula :

*** Author for correspondence.** [1]Department of Food and Agricultural Process Engineering, Agricultural Engineering College and Research Institute, TNAU, COIMBATORE (T.N.) INDIA