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Research Paper :

Study on milling techniques for finger millets (*Eleusine coracana*)

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ABSTRACT

Flour mill (laboratory model) was evaluated for its milling performance for two ragi varieties GPU-28 and L-15 under different plate clearances, feed rates and plate speeds. Grinding plate clearances selected for the study were 0.3, 0.5 and 0.7mm, feed rates tested were 90, 100 and 115 kg/h and plate speeds taken were 450, 600 and 700 rpm. Flour mill was evaluated for its milling efficiency and milling loss under different combinations of plate clearances, feed rates and plate speeds. The flour recovery was recorded at each plate clearance, feed rate and plate speed combination. The different fractions of flour obtained from the above study were analyzed for their fineness modulus, nutritive value and consistency. Milling efficiency decreased with the increase in plate clearance. The increase in feed rate and plate speed increased the milling efficiency initially to an optimum level later on decreased with further increase in feed rate and plate speed. Milling efficiency decreased form 85.0 to 61.7 per cent and 83.7 to 61.9 per cent with the increase in plate clearance from 0.3 to 0.7 mm for GPU-28 and L-15 varieties of ragi, respectively. The maximum milling efficiency of 85.0 per cent was recorded at the combination of 600 rpm plate speed for GPU-28 and 83.7 per cent for L-15 ragi seeds. Fineness modulus of flour increased with the increase in plate clearance. As the feed rate and plate speed increased up to an optimum level, the fineness modulus decreased and further increase in feed rate and plate speed, increased the fineness modulus. Fineness modulus increased from 2.04 to 3.44 and 2.05 to 3.45 with the increase in plate clearance from 0.3 to 0.7 mm for the ragi flour from varieties GPU-28 and L-15, respectively. The least fineness modulus was recorded at 0.3mm clearance followed by 0.5 mm. Fineness modulus decreased from 2.18 to 2.04 and 2.21 to 2.05 with the increase in feed rate and attained the least value at a feed rate of about 100 kg/h for GPU-28 and L-15 ragi flours. Beyond this, the fineness modulus increased as the feed rate increased. Fineness modulus decreased from 2.36 to 2.04 and from 2.37 to 2.05 as the plate speed increased from 450 rpm to 600 rpm and it increased with further increase in plate speed in case of both the varieties of ragi. The fineness modulus recorded the least values of 2.04 and 2.05 at 600 rpm plate speed for GPU-28 and L-15 varieties ragi flour, respectively.

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Key words : Milling efficiency, Milling loss, Feed rate, Fineness modulus

The grain milling requirement of almost 80 per cent countries is being met being conventional milling using "Burr mill" operated by either mechanical or electrical energy. Not much recent information is available on threshing and milling of small sized millets. Flour mill fitted with cast steel plates and emery stones have since successfully replaced the stone discs made from natural red stones. There are good numbers of conventional types of flour mills are used in urban and rural areas. The overall efficiency of these mills was found to be very low and requires improvements. In the recent years milling technology has sufficiently advanced. The development of cast steel plates on which the radial grooves of the same width, beginning from periphery running up to the centre is a significant improvement to increase the overall milling efficiency of small domestic flour mills.

The milling efficiency not only depends on the hardness on the grain to be milled but also on the material hardness and sharpness of the radial groove on the plate surface (Ramkumar *et al.*, 1997). The cast steel plates/ emery stones can be moulded to the desired shape, size and hardness. The properties of these stones can thus be controlled by the selection of appropriate quality raw materials through good manufacturing practices.

Kurein and Desikachar (1966) studied the preparation of refined white flour from ragi using a