# Influence of Pellet Size on Extraction Rate of Rice Bran Oil

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Particle size is one of the most important variables influencing the rate of extraction of oil-bearing materials. Rice bran is a floury material and any attempt to extract the oil directly poses problems due to so much fines. Hence rice bran needs granulation or pelletization to facilitate extraction. The present study is an attempt to establish the effect pellet size has on the rate of extraction of rice bran with hexane.

Extraction rates were determined by the percolation method in which fresh solvent is percolated through the sample and the recovered oil is measured at successive time intervals. All the extractions in this study used commercial hexane essentially at its boiling point. All variables other than the size of the pellets were kept constant in each series of experiments.

Pellets were made with diameters of 16 mm and 13 mm and lengths of 9 mm and 4 mm. Rice bran and the pellets were extracted and the percentage of residual oil content was estimated after different time intervals.

A graph of the percentage of residual oil on a moisture-free basis against extraction time in minutes has been plotted on log-log paper so that the curves approximate straight lines, as shown in Figure 1.

The time to reach a residual oil of 1% has been taken as an index of extraction rate. It will be noted that the time to 1% residual oil is least in the case of rice bran. It clearly shows that the time to 1% residual oil decreases as the size of the pellets or surface area/g increases.

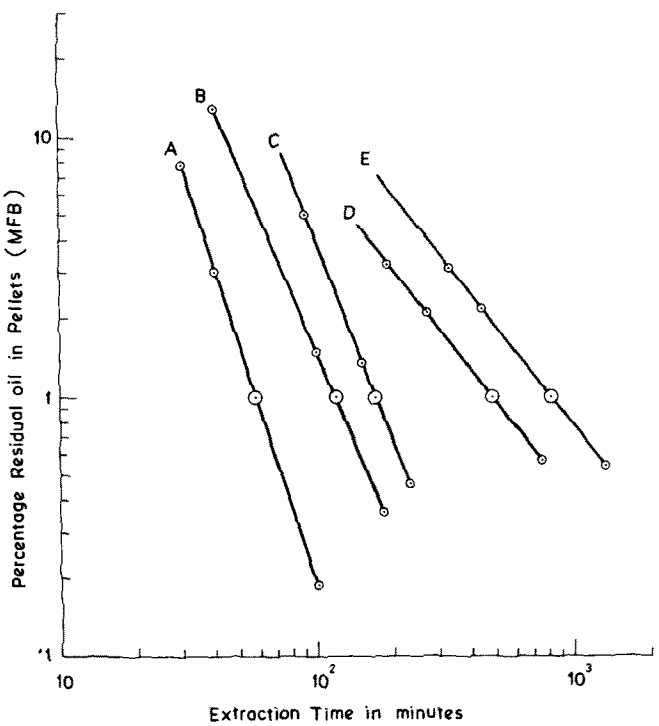


**FIG. 1. Relation of extraction time and residual oil (rice bran pellets/hexane system). MFB = moisture-free basis. (A) Rice bran; (B) 13 mm diameter X 4 mm pellets; (C) 16 mm diameter X 4 mm pellets; (D) 13 mm diameter X 9 mm pellets; (E) 16 mm diameter X 9 mm pellets.**

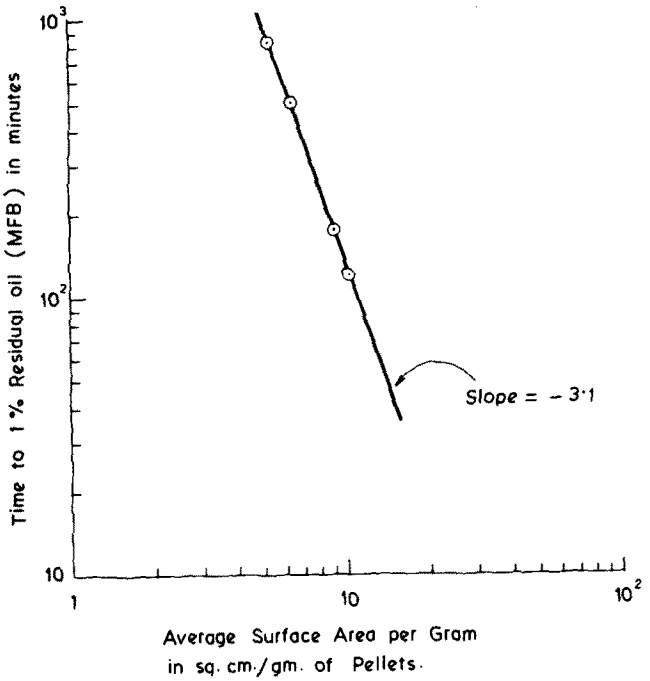


**FIG. 2. Effect of pellet size on extraction time. MFB = moisture-free basis.**

From this graph the times to 1% residual oil contents were read and crossplots made showing the relation between time to 1% and surface area per gram of the different pellets as shown in Figure 2. From this graph we find that it is straight line with a slope of -3.1.

The general equation of such a line is

$$\log T = n \log S + \log K$$

or

$$T = KS^n = KS^{-3.1}$$

where T = time to 1% residual oil, K = intercept at 1 sq cm ordinate, S = surface area in sq cm/g, and n = slope of the line. This equation shows that the time to 1% residual oil is an exponential function of the surface area/g of pellets.

The greater the length and diameter of the pellet, the lesser the surface area/g; hence, the time to reach 1% residual oil increases considerably. The most important aspect is that for a given diameter, as the length of the pellet increases extraction time also increases. So, in rice bran solvent extraction plants there should also be full control on the length of the pellets which is normally not done. The shape of the pellets should be such that the surface area/g is maximum.