

Size reduction of selected spices using knife mill: Experimental investigation and model fitting.

ABSTRACT

The process of size reduction is significant in numerous industries to improve performance and meet specification. This research is undertaken to study the size reduction of three spices, namely cinnamon, coriander and star anise as influenced by loading weight and grinding time. Grinding was conducted in a knife mill. The dependent variables used for assessing performance were grinding efficiency, size reduction ratio and grinding rate. Simple experimental model was built using Microsoft Excel for showing the relationship between cumulative size reduction function (B_{ij}) and selectivity function (S_i) with the physical properties like density, moisture content and hardness of spices used. It was observed that there was a gradual decrease in size of spices up to grinding of 1 min and then became constant. Among the three spices, cinnamon achieved the highest size reduction as evaluated by efficiency, size reduction rate and size reduction ratio. The optimum loading weight for grinding was found 30 g irrespective of the type of spices. The data of cumulative size reduction function, selectivity and particle size fitted to second-order polynomial equation with the highest goodness of fit. This study indicated that the size reduction/grinding using knife mill was greatly influenced by physical properties of spices among the factors studied.

Keyword: Knife milling; Cinnamon; Coriander; Star anise; Grinding.