

Research Paper :

Effect of feed rate and different set of clearance on recovery of husk in Isabgul processing plant

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ABSTRACT

Energy audit was carried out in Isabgul processing plant to study the effect of different feed rate and set of clearances on recovery of husk in order to improve system efficiency. Energy utilization efficiency can also be improved by identifying the feed rate and clearances between under runner disk, where maximum husk recovery is obtained. Four different feed rate and four set of clearances between under runner disk were selected and each feed rate was tried at four set of clearance. The result showed that the percentage of husk recovered was affected significantly due to different feed rate and clearances. The 175 kg/hr feed rate recorded highest husk percentage *i.e.*, 27.15 per cent under treatment combination of Set-3 (Clearances between under runner disk ranging from 1.55 mm. to 1.18 mm.).

Key words : Isabgul (Psyllium), Husk, Dehusking, Feed rate, Clearance

India is one of the major producer and processor of the Isabgul (PSYLLIUM) in the world. Isabgul has very good export potential among all crude drugs. According to trade estimates, 90 per cent of the domestic production of Isabgul is exported. Isabgul is marketed in husk powder forms. Isabgul processing mainly involves cleaning, polishing, dehusking and aspiration. The Isabgul seeds are passed through the dehusking machines several times (7 to 8 times) to remove completely the husk layer. The important machine used in dehusking is under runner disc sheller having emery coating on the inside surface to provide abrasive surface. The manufacturing of Isabgul product is not an organized industry. The capacity, output of processed material operating parameters, power requirement and specification of machinery varies from industry to industry. Energy utilization efficiency can also be improved by identifying the feed rate and clearances between under runner disk sheller, where maximum husk recovery is obtained (Chinnam *et al.*, 1980). Study was conducted to find out the best combination of feed rate and clearance between under runner disk to get maximum recovery of husk with best quality.

METHODOLOGY

This chapter deals with the selection of raw material, procedures followed for determination of physical properties, selection of Isabgul processing industry for experiment, cleaning and dehusking unit for Isabgul seed, specifications of machinery, performance evaluation of existing plant, energy measurement and experimental set-

up to study the effects of different feed rate and set of clearances on recovery of husk, in order to improve system efficiency. Dried Isabgul variety GI-2 harvested in summer season was procured and various impurities like dust, sand, undersized and oversized impurities, light and heavy impurities and stones, have been removed in cleaning unit. After gravity separation bold Isabgul seeds was passed through the dehusking machine several times (7 to 8 times) to remove completely the husk layer. The important machine used in dehusking is under runner disk sheller having emery coating on the inside surface to provide abrasive action. The type of coating is being kept same in all the under runner disk sheller used for dehusking of Isabgul. Clearance between emery disks is adjustable. A post aspiration system is provided with post aspirator mounted at the discharge end with air control valve unit for separation of husks. Husk suctioned by fan unit and collected into husk collection cyclone through ducting. Separate fan unit with dynamically balanced impeller and flat belt drive with common drive system to separate husk and other byproduct like lali and gola. Eight numbers of twin leg type bucket elevator is provided in the dehusking unit for material transportation. The above complete system is mounted on sturdy common structured frame/structure and gets its drive from common counter drive system by 50 mm. Shaft and 10 hp motor. Grading of Isabgul husk collected from eight different dehusker unit is done at three desk type husk screen grader, which gets its drive from 2 h.p. electric motor. In this unit Isabgul husk is separated on size basis. Performance evaluation

of existing Isabgul processing plant was carried out to find out recovery of husk. The overall performance evaluation of the plant was carried out keeping in view the objectives of the study, flow chart and flow chart and schematic diagram of the process and by identifying all mass and energy inputs and outputs (Singh and Ilyas, 1977). Study was conducted to identify the scope to increase efficiency of unit operation. For that four different feed rate of Isabgul seed (*i.e.*, 165, 170, 175, 180 kg/hr) and four set of clearances (Table 1) between under runner disk were selected (Dillon, 1981). Each feed rate was tried at four set of clearance individually. At the end of test run recovery of Isabgul husk obtained was recorded. Results found for different interactions between feed rate and set of clearances are reported in Table 2.

Table 1 : Description of various set of clearance selected for the test (Clearance in mm.)

Set-1	Set-2	Set-3	Set-4
1.65	1.60	1.55	1.50
1.60	1.55	1.50	1.45
1.54	1.49	1.44	1.39
1.45	1.40	1.35	1.30
1.38	1.33	1.28	1.23
1.32	1.27	1.22	1.17
1.29	1.24	1.19	1.14
1.28	1.23	1.18	1.13

RESULTS AND DISCUSSION

The result obtained during investigation (Table 2) shows that maximum husk percentage of 27.15 was recorded under treatment combination of Set-3 with feed rate of 175 kg/hr. The result shows that the percentage of husk recovered was affected significantly due to different feed rate and set of clearances. The 175 kg/hr feed rate recorded highest husk percentage *i.e.*, 27.15

Table 2 : Effect of different set of clearances on husk recovery

Husk recovery at various interactions between feed rate and set of clearances					
Sr. No.	Feed rate	Set			
		1	2	3	4
1.	165	25.12	25.42	25.46	23.45
2.	170	25.42	25.54	25.80	23.80
3.	175	25.95	26.35	27.15	24.53
4.	180	25.28	25.68	25.87	24.37
	S.E. ±	0.091			
	C.D. (P=0.05)	0.264			
	C.V. %	0.62			

per cent under treatment combination of Set-3 and minimum husk recovery of 23.45 per cent was obtained in federate 165 kg/hr under treatment combination of Set-4. All the sets *viz.*, Set-1, Set-2, Set-3 and Set-4 have influenced significantly on the husk percentage. Data further show that the interaction effect of set and feed rate was also found significant. Fig.1 shows that husk recovery increased gradually up to treatment combination of Set-3 and feed rate 180kg/hr when test was carried out at various interactions between feed rate and set of clearances, but after that it reduced to subsequent amount at treatment combination of Set-4 and feed rate 165, 170, 175 and 180 kg/hr.

Fig. 1 shows that maximum husk percentage of 27.15 was recorded under treatment combination of set-3 with feed rate of 175 kg/hr, which was found best combination for Isabgul processing plant.

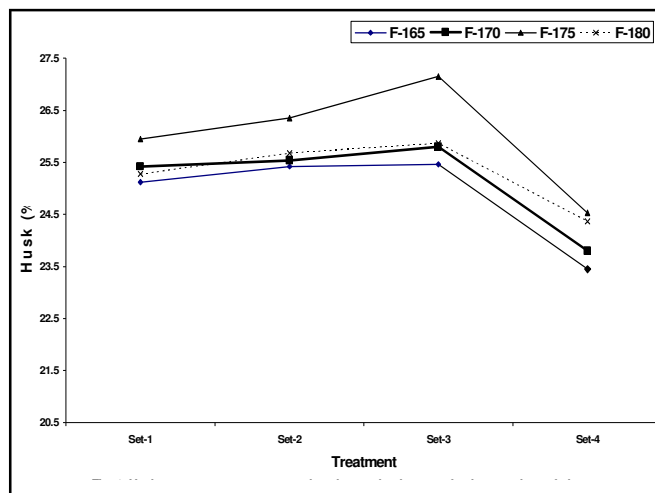


Fig. 1 : Husk percentage recovery at various interaction between feed rate and set of clearances

Conclusion:

From the results obtained it may be concluded that maximum husk percentage of 27.15 was recorded under treatment combination of set 3 with feed rate of 175 kg/hr.

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