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OIL SEED PROCESSING TECHNOLOGY IN PAKISTAN
Part-V. Field Performance of the Modified Lahore Expeller

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Field performance of the traditional and the modified Lahore Expeller (4") has been comparatively evaluated. Based on data for two years on the processing of rapeseeds, it has been found that the modified expeller shows improvements over the traditional expeller in processing capacity and oil yield, 52% and 2.75% respectively. Scope for further improvements in the Lahore Expeller (4") and suggestions there of are also discussed.

Key words: Processing technology, Modified expeller, Comparative evaluation.

Introduction

In the previous publication [1] comparative performance of the traditional and the modified Lahore Expeller (4") on different oil seeds was compared and evaluated. At that time it was questioned that the advantages claimed would need verifications after field testing of the modified expeller. Consequently, therefore, the data on the field performance of the modified expeller, covering a period of 2 years, has been collected and presented in the present paper. This data relates only to the processing of rapeseeds as traditionally they are processed regularly and continuously by the small processors. This follow-up action has indicated that the modified expeller shows definite improvements over the traditional expeller particularly in the processing capacity and oil yield. The modified expeller also shows definite trends of less energy consumption compared to the traditional expeller under the field conditions.

Another aspect that was examined during the follow- up/ extension services to determine further scope for improvement in the design of the expeller and to carry out R&D to achieve this objective. As a result of the present studies the scope has been determined, suggestions are provided and the results of R&D actually carried out in this regard will be brought out shortly.

However, industrial extension activities were also carried out with a veiw to disseminating the improved technology. These included production and marketing of improved technology in collaboration with the manufacturers who were provided with drawings and necessary assistance in fabrication of the improved equipment. The processors were also given instructions for the proper use and maintenance of the equipment. As a result of this activity, it was learnt that a large number of such units were fabricated and sold to the customers satisfactorily operative in the field.

Material and Methods

Processors/owners of the modified and traditional expellers (5 in each category), who have been working for 2 or more years, were selected for collection of the experimental data at Sites in and around Lahore. The expellers were operated for 8 hrs. per day regualrly for one week continuously. Cleaned and sun dried rape and mustard seeds were processed for recording the data.

The data on quantity of seeds processed, oil and cake obtained, cost of repair and maintenance and energy consumption was recorded.

Results and Discussion

The production data on the modified and the traditional expeller (4") under field conditions on the processing of rape seeds is recorded in Tables 1 and 2 respectively. This performance (for seven days of the modified and traditional expellers 4") is compared in Table 3. It is noted that the performance of the modified expeller is more enhanced, particularly its

TABLE 1. MODIFIED OIL EXPELLER 4" PER WEEK PRODUCTION DATA ON RAPESEED. (WEEK = 7 DAYS; 1 DAY=9 HRS. WORKING).

S. No.	Quantity of seed (kg)	Quantity of oil (kg)	Quantity of cake (kg)	Residual oil in cake (%)	Unit consumption (kwh)
1.	3360	1260(37.5%)	2016(60%)	8.8-10.0	369.6
2.	3080	1040(33.75)	1962(63.7%)	8.5-10.0	347.2
3.	2800	980 (35%)	1755(62.7%)	9.0-10.0	336.0
4.	3024	1058 (35%)	1881(62.2%)	8.3-9.4	336.0
5.	3192	1117(35%)	1995(62.5%)	8.5-9.2	342.0
Aver.	3091.2	1091(35.25%)	1921.8(62.22%)	8.3-10.0	346.2

capacity potential is much higher (52%) compared to the traditional expeller. The modified expeller also has a higher crushing capacity, 3091.2 kg seeds per 7-days whereas the unmodified expeller takes 10.17 days to crush the same quantity of seeds.

The modified expeller processes 3091 kg oilseeds (rapeseeds) with an oil yield of 1091 kg (35.25%). Comparatively the unmodified expeller processes 2032.8 kg (32.5%) per week basis. It, therefore, means that 2.75% extra oil yield is obtained by the modified expeller. In other words the modified expeller provides 86.4 kg more oil from the same seeds (3091 kg) when processed in comparison with the traditional expeller.

Power consumption on modified expeller (Fig. 1.) is 112 wh/kg seed and on unmodified expeller (Fig. 2.) it is 124 wh/kg seed. Thus, there is nearly 10% saving in energy consumption on the modified expeller. The design features of both the expellers have already been provided in the previous publications [1-5].

The most wearing parts of the expellers are enlisted and repair frequency is compared in Table 4. The discharge worms are repaired by rebuilding through welding and machining

TABLE 2. TRADITIONAL EXPELLER 4" PER WEEK PRODUCTION DATA ON RAPESEED. (WEEK=7 DAYS; 1 DAY=9 HRS. WORKING).

S. No.	Quantity of seed (kg)	Quantity of oil (kg)	Quantity of cake (kg)	Residual oil in cake (%)	Unit consumption (kwh)
1.	2397	676 (32%)	1594 (66.5%)	12.0-12.5	269
2.	2240	701 (31.3%)	1483 (66.2%)	11.5-12.5	258
3.	2167	702 (32.4%)	1408 (65.0%)	11.0-12.0	241
4.	1680	571 (34.0%)	1063 (63.3%)	12.0-12.7	238
5.	1780	551 (32.8%)	1083 (64.5%)	10.3-12.0	252
Aver.	2032.8	658.4 (32.5%)	1326 (65.1%)	10.3-12.5	251.6

TABLE 3. COMPARATIVE PERFORMANCE OF THE TRADITIONAL AND MODIFIED EXPELLER (4").

S. No.	Characteristics	Modified expeller	Traditional expeller
1.	Quantity of seeds processed	3091 kg	2032.8 kg
2.	Yield of oil	1091 kg	658.6 kg
3.	Yield of cake	1922 kg	326.0 kg
4.	Residual oil in cake	7.8 - 9.5%	10.3 - 12.5%
5.	Unit consumption (kwh)	346 or (112 wh/kg seed)	252 or (124 wh/kg seed)

TABLE 4. REPAIR AND MAINTENANCE COST (IN RUPEES) PER YEAR OF TRADITIONAL AND MODIFIED EXPELLER (4").

S. No.	Parts	Frequency of repair/ replacement/yr.	Unmodified	Modified
1.	Worm/discharge	12	1200	1200
2.	Cone	2	250	250
3.	Iron bars (replacement)	2	700	700
4.	Cone ring	2	40	40
5	Small gear	–	250	250
6.	Misc. cost	–	500	500
Total:			2940	2940

These data are the annual average and provided by the processors.

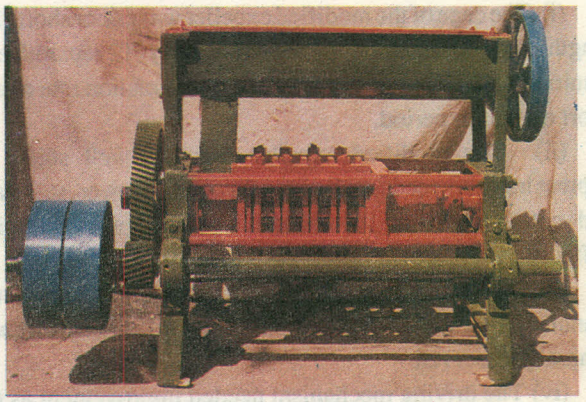
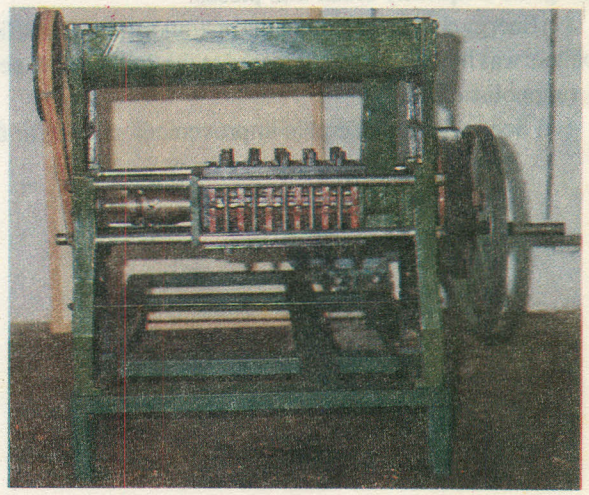


Fig. 1. Modified Expeller 4" or Model-1 (Chamber length 11")



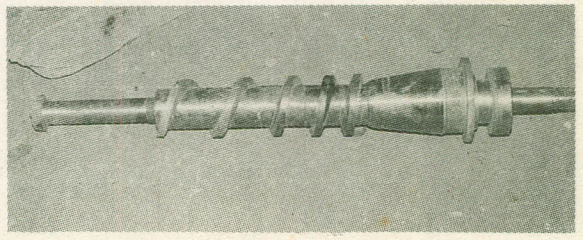


Fig. 2. Traditional Lahore Expeller 4" or Model-2 (Chamber length 16") and its screw configuration.

their threads after processing about 8-10 tonnes of seeds. The annual repair and maintenance cost on both the expellers are equal but the modified expeller processes 52% more oilseeds than the traditional expeller. There is thus substantial saving in energy consumption, wear and tear of the equipment, labour, time and maintenance costs of the modified expeller.

The modified oil expellers were operated continuously for over two years to observe their performance. However, the technical data for one week (seven days) was used for comparison purposes, because it was considered better than overgaging the experimental data for one year. Some other relevant observations, also shared by the processors and manufacturers, were also made and are summarized below for further improving the design of the small size (4") expeller.

(i) The cage of the modified expeller was rather short (11" length) and consequently rubbed off quickly (12 repairs/year) resulting in decrease of capacity and oil extraction rate after a short operation period.

(ii) The modified expeller was not well suited to express hard oil seeds such as sunflower, safflower, soybeans and cotton seeds at the village level because of design deffects.

(iii) In the absence of any standard specifications the manufacturers were producing sub-standard expellers as was generally observed.

(iv) The driving mechanism needed improvement as the small gears frequently break into pieces.

(v) Energy consumption, for the operation of the modified expellers was higher when compared to the imported expellers (unpublished data).

(vi) Scope for considerable improvement existed for the case hardening to avoid too frequent repairs needed as a result of wear and tear.

It is, therefore, obvious that considerable scope for further R&D work exists to improve this village/town level technology. In fact practical steps have already been taken to produce standard small size (4") expeller free from the above stated defects. Such an equipment's design and performance has, however, been considered and the details are appearing in the next papers in the series.

In conclusion it is observed that this follow-up activity has helped in better understanding the problems of the field operation of the technology and its improvement parameters have also been identified for incorporation in a standardized, trouble free and efficient oil expeller.

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