Pakistan J. Sci. Ind. Res., Vol. 28, No. 4, August 1985

OIL SEED PROCESSING TECHNOLOGY IN PAKISTAN
Part III. Village Level Technologies

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(Received, June 11th 1985)

Oil seed processing technologies as operative at village level in Pakistan have been identified. Comparative data/about their performance have also been compiled and discussed.

INTRODUCTION

In an earlier report it was mentioned that Kohlu and small expellers (3" and 4" size) constitute the main basis for the oil seed processing technology at rural level in Pakistan [1]. The Kohlu which is traditionally animal driven has undergone some modifications and is now also being mechanically driven. Two different types of this simple oil expelling machine, as available in the country, are the ordinary and Multan Kohlu, both animal driven and the mechanical Kohlu which is power driven. The performance and operation of these two technologies have been compared and studied in this report.

Kohlu. The ordinary kohlu is made from *Albizzia lebbek* wood and works on the principle of a rotary pestle and mortar. The shape of the mortar is like an inverted hollow cone in which fits the heavy pole that is called the pestle. Adjustable weights are attached to the pestle so that it presses all the time against the sides of the mortar when pulled around by a bullock (Fig. 1). The traditional oil seed processor is fairly satisfied with the performance of this wooden machine.

Normally the capacity of the wooden kohlu is 13 kg. seeds per batch for four hours operation. However, in the northern areas of Pakistan, particularly, Swat and Dir, the Kohlu size is small, 6-8 kg. seeds per batch for two hr. operation [2]. Large size wooden Kohlus are, however, operated in the Multan area and their capacity is large (30 kg. per 3 hr [3] as compared to the ordinary kohlu in other areas. This kohlu has an inner lining of *Acacia arabica* wood and it is replaced when worn out after about every three months. This variation is due to the inner wooden lining becoming wider with wear and the capacity increasing to 35 kg. Invariably all the operators stop the oil extraction when one-third weight of the seeds charged in the kohlu has been obtained as the oil.

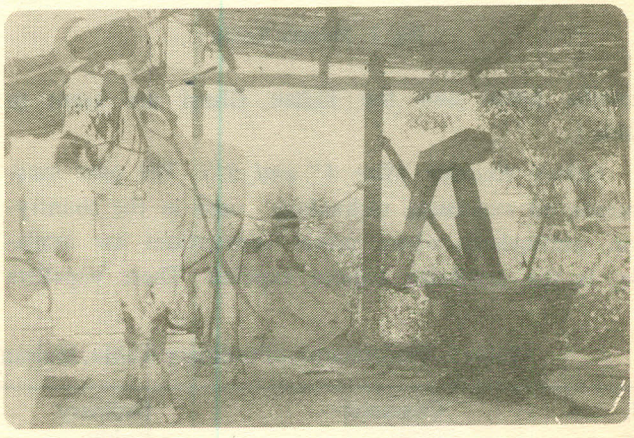

Fig. 1. Kohlu

An improvement in the wooden khohlu has also, however, been effected in the recent past. As a result of this improvement, the wooden parts have been substituted by metallic ones. A major difference in the metallic device is that here the mortar has been so designed as to rotate mechanically. Although this improvization gives better extraction rate than the wooden kohlu, yet it cannot be used for expressing hard seeds such as cotton seeds. A photograph of the metallic and mechanically driven kohlu is provided (Fig. 2) for comparison with the wooden and animal driven machines. The expressing capacity of a metallic kohlu has been determined to be 34 kg. per hr. (on rapeseeds). Another variation of the wooden Kohlu is what is called the "Indian Ghani". This machine is nothing but a power driven large kohlu with a capacity of 5 kg. per hour and is operative only in India.

The performance of ordinary kohlu, Multan kohlu,

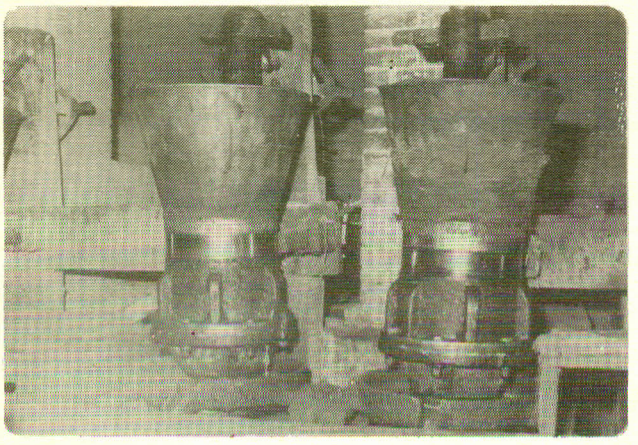

Fig. 2. Metallic Kohlu

Metallic kohlu and the Indian Ghani are given in Table 1.

Lahore Expeller (Size 4" and 3"). The next most popular oil expressing technology used in the countryside, particularly where power connections are available, is the small-size Lahore expeller. These expellers are locally fabricated and available in 4" and 3" sizes. They work on the principle of squeezing out the oil from the oil bearing seed materials under pressure. In this system a scroll made of mild steel runs inside a short cage lined with separators which are used to segregate the oil from the oil cake. An adjustable tapered cone is provided at the discharge end of the cage and is meant to abstruct the flow of the oil cake, thereby increasing the pressure for oil extraction. This cone is adjustable by rotating it on a thread section of the scroll shaft. Enough pressure is generated in the expeller to reduce the oil from the rapeseeds to about 12% residual oil in the cake. The capacities of the Lahore expeller 4" and 3" size are about 35 and 20 kg/hr. respectively. The oil extraction ratio on rapeseed by these expellers is about 33%. The 4" size expeller is derived with a 10 h.p. electric motor while the 3" size machine uses a 5 h.p. motor.

The rape seed processing performances of the 4" and 3" expellers are given in Table 2.

The performance parameters of the village level oil seed processing technologies for the recovery of oil from rapeseeds are compared in Table 3.

Table 1. Performance of ordinary Kohlu, Multan Kohlu, metallic Kohlu and Indian ghani on rape-seed

Sl. No.	Character-istics	Ordinary Kohlu	Multan Kohlu	Metallic Kohlu	Indian ghani
1.	Processing capacity (1 day = 8 hr. operation)	24 kg./ day	48 kg/ day	270kg/day	40 kg/day
2.	Oil extraction rate, (range, Average,	29-34%; 32%	30-35% 9.0%,33%	30-35% 33%	26-28% 27%
3.	Residual oil in cake range, Average	85-12%; 9.3%	8.2-11% 9%	8.2-11% 9%	13-15- 14%
4.	Quality of Oil (i) Colour	Good Y = 20 R = 2	Good Y = 20, R = 2	Good Y = 20, R = 2	Good Y = 20, R = 2
	(ii) F.F.A.	0.5-2%	0.5-2%	0.5-2%	0.5-2%
5.	Quality of cake	Good	Good	Good	Good
6.	Powder source	Animal (Ox)	(Animal Ox)	10 H.P.	2-3 H.P.
7.	Operational time	6-8 hr	6-8 hr.	6-8 hr.	6-8 hr.
8.	Labour	One operator	One operator	One operator	One operator

CONCLUSION

A study of the oil seed processing technologies indicates that there are two types of technologies, animal driven and power driven, operative at the village level in Pakistan. The animal driven technology can further be sub-divided into the ordinary wooden kohlu and the Multan Kohlu depending largely on capacity. The performance of these technologies is compared in Table 1. The data suggest that the Multan Kohlu, having twice the batch capacity (48 kg. per day) of an ordinary kohlu (24 kg. per day), is more suitable for general operation at village level. Because of the large capacity and better oil extraction rate this device can bring additional economic gains for the processor. In view of this it is strongly recommended that the Multan kohlu should be preferred over the ordinary kohlu at the village level oil seed processing where electricity is not available:

Power operated technologies, inclusive of mechanised kohlu and small size oil expellers, are used only at places where electric power is available. Compared to the ordinary kohlu the power driven machines are costly not only to purchase but also to operate. The performance of the technologies is compared in Table 3 along with their prices and maintenance expenses. These data indicate that the mechanical kohlu, when compared to the expellers, is uneconomical on many counts. It is therefore, inferred that the expellers will gain favour with small processers where electricity is available in the countryside.

As a result of this study it is inferred that there is a considerable scope for the small size oil expellers for economical oil seed processing at village level. These small size expellers can further be so modified as to perform better than at present. In fact some such modifications have already been brought about and the details published [4]. A comparative study of the existing and the modified technology will be the topic of the next study in this series.

Table 2. Peformances of the Lahore expeller (4" and 3" size)

Sr. No.	Characteristics	Lahore expeller-4"	Lahore expeller-3"
1.	Processing capacity	240° – 304 kg. per day	144 – 176 kg/day
2.	Oil extraction rate (range average,	30 – 34% 32%)	30 – 34% 32%
3.	Residual oil in cake (range, Average,	11.3 – 12.7% 12.5%	11.5 – 13% 12.5%
4.	Quality of oil (i) Colour (ii) F.F.A.	Y = 20, R = 2 0.5 – 2%	Y = 20, R = 2 0.5 – 2%
5.	Quality	Good	Good
6.	Power source	Electricity	Electricity
7.	Power consumption	4.8 units	2.8 units
8.	Operation time	6 – 8 hr.	6 – 8 hr.
9.	Labour	One operator	One operator
10.	Unit price	Rs. 4500/–	Rs. 250/–
11.	Repair and maintenance	Rs. 110/month	Rs. 100/month

Table 3. Comparison of the existing village level oilseed processing technology on rapeseed

S.No.	Characteristics	Ordinary kohlu	Multan kohlu	Indian ghani	Metallic kohlu	Lahore expeller 3"	Lahore expeller 4"
1.	Capacity (Range) per day (1 day = 8 hr).	24 kg.	48 kg.	40 kg.	216-328 kg.	144-176 kg.	240-304 kg.
	(Average–)	24 kg	48 kg.	40 kg.	270 kg.	156 kg.	296 kg.
2.	Oil Extraction rate (Range)	29-34%	30-35%	26-28%	31-35%	30-34%	30-34%
	Average)	32%	33%	27%	33.4%	32%	32%
3.	Residual (Range) oil in cake.	8.5-12%	8.2-11%	13-16%	8.2-11%	11.5-13%	11.3-12.7%
	(Average)	9.3%	9%	14%	9%	12%	12%
4.	Quality of oil						
	(i) Colour	Y = 20, R = 2	Y = 20, R = 2	Y = 20, R = 2	Y = 20, R = 2	Y = 20, R = 2	Y = 20, R = 2
	(ii) F.F.A.	0.5-2%	0.5-2%	0.5-2%	0.5-2%	0.5-2%	0.5-2%
5.	Quality of cake	Good	Good	Good	Good	Good	Good
6.	Power source	Animal (Ox)	Animal (Ox)	2-3 h.p.	10 h.p.	5 h.p.	10 h.p.
7.	Power consumption	Animal power	Animal power	1.2 units	4 units	2.8 units	4.8 units
8.	Labour/operator	One	One	One	One	One	One
9.	Price of the unit.	Rs. 2000/–	Rs. 2500/–	Rs. 6000/–	Rs. 8000/–	Rs. 2500/–	Rs. 4000/–
10.	Repair and maintenance:	Rs. 50/– month	Rs. 50/– per month	Rs. 100/– month	Rs. 150/– month	Rs. 100/– month	Rs. 150/– month

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