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COMPARATIVE STUDY ON THE EFFECT OF VEGETABLE BATCHING OIL EMULSION USING MONIDENT-B WITH CONVENTIONAL EMULSION USING MINERAL OIL ON YARN QUALITY

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ABSTRACT

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An emulsion making process has been developed for spinning hessian grade jute yarn by replacing mineral oil from the normal sequence of emulsion processing. A number of experiments were carried out with jute fibers and 258 tex yarn was spun through the hessian spinning frame. It was observed that the use of Monident-B oil (a vegetable oil) in emulsion for jute processing was able to maintain required yarn quality. In addition the vegetable-based oil was found to be cost effective due to its very low requirement in jute processing.

***Key words**: emulsion, yarn, machine, yarn quality*

INTRODUCTION

From the very inception of mechanical processing of jute, batching oil was proved to be an essential ingredient for processing jute into regular yarn (Amin 2001). The conventional jute batching oil is a mineral oil. From last decade, some jute goods importing countries have raised objections regarding the use of mineral oil (Atkinson 1964). As a result it has become inevitable to find out substitute oil for using in jute softening preferably from vegetable or other sources. Therefore, this work was aimed at identifying and finding a suitable substitute of mineral oil. Monident-B oil could be used effectively for jute processing and at the same time it might be acceptable to the importers (Ahmed 1979).

The idea is that if the splitting and breaking of fibers and their regular placement in the yarn are done in an efficient way at the spinning stage, the omission of mineral oil does not have any adverse effect on the yarn quality (Islam 1993). On the other hand, vegetable oil based jute batching oil has no adverse effect on environment and nature as well as human body. Moreover, production cost could be lower. This work was undertaken by considering the above points of view (Atkinson 1965).

MATERIALS AND METHODS

Six batches each of 100 lbs of jute fibers of Bangla White-C (BWC) were taken for the experiment. Three batches were softened in the softener machine with an application of 25% mineral oil emulsion (mineral oil-20%, nonidet-EL 0.3% and water 79.7%) by the weight of fibre. The rest three batches were softened in the softener machine with an application of 25% vegetable oil emulsion (Monident-B oil-10%, nonidet-EL 0.3% and water-89.7%) by the weight of fiber. Then the softened jute sample was kept in piling condition for 48 hours and processed through normal jute processing sequence i.e. breaker card, finisher card, 1^{st}, 2^{nd}, 3^{rd} draw frame and yarn of 258 tex (7.5lbs/spy) nominal count was spun in hessian type slip draft spinning frame. Actual count, tensile strength, CV% and quality ratio of yarns produced by using both emulsion in the softening stage were determined (Kundu 1958).

It was observed that during processing of jute sliver, moisture was released to some extent, which was observed during processing of jute with Monident-B oil. So, full spinning process should be done as early as possible for jute softened with Monident-B oil mixed emulsion (Kaul and Das, 1986).

RESULTS

Monident-B oil (a vegetable oil) was used for the preparation of jute batching emulsion in this investigation. Prior to preparation of emulsion, oil characteristics, emulsion ingredients such as oil, nonidet, and water were noted (Table 1). The oil was found to be stable for seven days at ambient temperature and it did not solidify at room temperature (Ranjan 1985). The oil was, therefore, considered to be suitable for preparation of jute batching emulsion with water. In normal sequence of emulsion processing of jute, the fiber is first softened by passing it through fluted rollers with an application of emulsion (oil, water and emulsifier). In this stage of emulsion making process, Monident-B oil was used instead of mineral oil.

Table 1. Ingredients percentage of different emulsions

Oil used in emulsion	Ingredients % by weight		Remarks
Mineral oil	Mineral oil Nonidet Water	20.0 0.3 79.7	Little oil droplet and odour was found on storage for 7 days
Monident-B oil	Monident-B Nonidet Water	10.0 0.3 89.7	No oil droplet was found on storage for 7 days and no odour

Table 2. Dust content (%) of breaker card and finisher card Dust content (%)

Sample description	Breaker card	Finisher card
Jute fibers processed with		
Batch – 1: Monident-B oil	1.61	0.61
Batch – 2: Mineral oil	1.57	0.57
Batch – 3: Monident-B oil	1.60	0.60
Batch – 4: Mineral oil	1.52	0.58
Batch – 5: Monident-B oil	1.63	0.65
Batch – 6: Mineral oil	1.55	0.58

Table 3. Comparative spinning performance of BWC jute yarns (7.5 lbs/spy) through different batching oil (trial-1)

Jute Fibre	Oil used in emulsion	Nominal Count lbs/spy (tex)	Actual Count lbs/spy (tex)	CV% of Count	Tensile Strength lbs (kg)			Quality Ratio %
					Mean	SD	CV% of Strength	
BWC	Monident-B oil	7.5 (258.37)	7.6 (261.82)	7.21	7.10 (3.22)	0.411	12.76	93.42
	Mineral oil		7.77 (267.67)	6.11	7.21 (3.27)	0.321	9.81	93.63

Table 4. Comparative spinning performance of BWC jute yarn (7.5 lbs/spy) through different batching oil (trial-2)

Jute Fibre	Oil used in emulsion	Nominal Count lbs/spy (tex)	Actual Count lbs/ spy (tex)	CV% of Count	Tensile Strength lbs (kg)			Quality Ratio %
					Mean	SD	CV% of Strength	
BWC	Monident-B oil	7.5 (258.37)	7.41 (255.27)	3.11	6.56 (2.97)	0.336	11.31	88.52
	Mineral oil		7.62 (262.50)	3.21	7.37 (3.34)	0.106	3.17	96.71

Table 5. Comparative spinning performance of BWC jute yarn (7.5 lbs/spy) through different batching oil (trial-3)

Jute Fibre	Oil used in emulsion	Nominal Count lbs/spy (tex)	Actual Count lbs/spy (tex)	CV% of Count	Tensile Strength lbs (kg)			Quality Ratio %
					Mean	SD	CV% of Strength	
BWC	Monident-B oil	7.5 (258.37)	7.71 (265.60)	5.13	7.11 (3.22)	0.322	10.0	92.21
	Mineral oil		7.75 (266.98)	6.28	7.41 (3.36)	0.302	9.0	95.61

Table 6. Average spinning performance of BWC jute yarn (7.5 lbs/spy) through different batching oil

Jute Fibre	Oil used in emulsion	Nominal Count lbs/spy (tex)	Actual Count lbs/spy (tex)	CV% of Count	Tensile Strength lbs (kg)			Quality Ratio %
					Mean	SD	CV% of Strength	
BWC	Monident-B oil	7.5 (258.37)	7.57 (260)	5.15	6.92 (3.14)	0.356	11.36	91.38
	Mineral oil		7.71 (265)	5.20	7.33 (3.32)	0.243	7.32	95.31

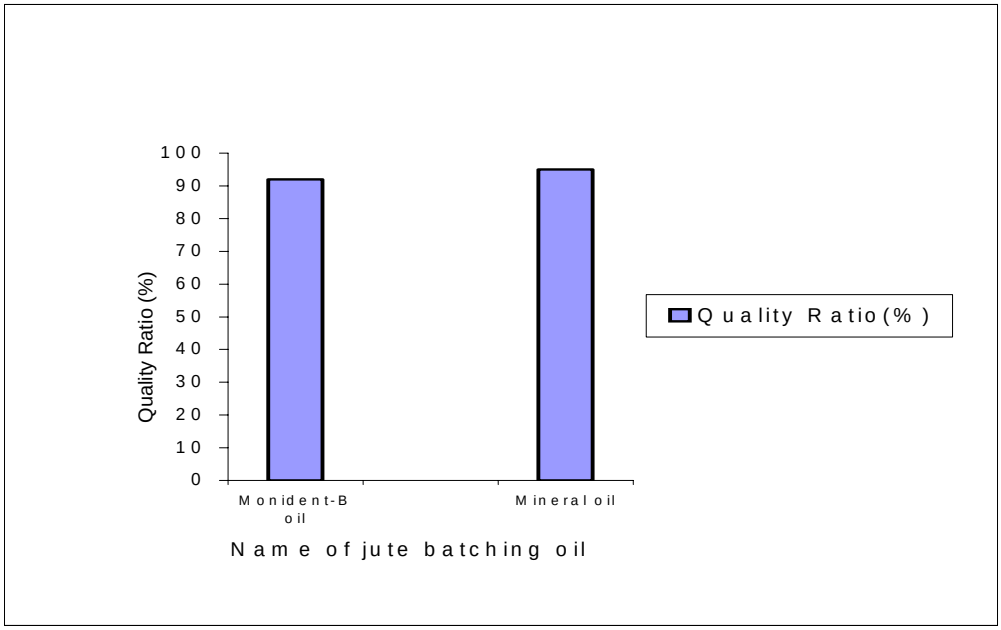

Fig. 1. Quality ratio of yarns produced through Monident-B oil and mineral oil

DISCUSSION

From mechanical consideration, jute fibers were spun into yarns of 258.37 tex (7.5lbs/spy) by the application of emulsion with mineral oil and Monident-B oil respectively. The spinning operation was smooth and minor weight losses of jute fiber were found through processing in the breaker card and finisher card machine (Table 2). In the spinning process the wastage of jute sliver was almost same for both the slivers i.e. using Monident-B oil and mineral oil. Referring to Table 6, the quality of yarns that were produced through Monident–B oil mixed emulsion and conventional mineral oil mixed emulsion were found nearly same. It may be noted that in both the cases the use of less Monident-B oil than mineral oil, had no any adverse effect during spinning process. Moreover, it was encouraging to note that the quality ratio (Fig. 1) and percentage of coefficient of variation (CV%) of yarns were found up to standard. By using only 10% Monident-B oil in the emulsion in place of 20% mineral oil, it is possible to produce cost-effective jute yarns (Salam 1995).

CONCLUSION

In addition Monident-B oil mixed emulsion has the comparable advantages. It has no odour at all and no difficulty in processing and spinning jute yarns in the jute spinning frame. Droppings percent in the breaker card and finisher cards are slightly higher which is expected when producing good quality yarn. Physical properties of produced yarns were tested in Bangladesh Jute Research Institute under standard atmospheric condition, 65%, RH and 20ºC temperatures. The results appear to provide a new outlet for the utilization of Monident-B oil to be used as a substitute of conventional mineral oil for spinning of the jute fiber.

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