FIBER QUALITY AND RECOVERY OF THREE ABACA VARIETIES AS AFFECTED BY TUXY GROUP AND SETTING POSITION IN SPINDLE STRIPPING

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ABSTRACT

Three abaca varieties (Linawaan, Inosa and Laylay) were evaluated for fiber quality and recovery. Except for stretch percentage, Linawaan variety showed the highest recovery and tensile strength, and the heaviest tuxies and dry fiber recovered per stalk. However, Laylay variety produced more fiber of higher grade than the others. The outer group of leafsheaths produced stronger fibers than the middle and inner groups, in that order. Middle, inner and outer groups ranked first, second and third, respectively, in weight of dry fiber per 15 stalks and average weight of tuxies stripped in 5 min. The downward position with the tips of tuxies stripped first produced the highest weight of dry fiber per 15 stalks, while the downward position with butts stripped first appeared to have better quality fiber compared to the rest of the treatments. No significant interaction between group of leafsheaths and different positions of setting tuxies into the spindle was observed.

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KEY WORDS: Abaca. Linawaan. Inosa. Laylay. Tuxy. Spindle stripping. Tuxy setting positions. Leafsheaths. Fiber recovery. Fiber quality. Weight.

INTRODUCTION

Fiber extraction in abaca consists of hand-stripping, spindle-stripping and decortication. A spindle-stripped fiber tends to be whiter and more lustrous than a corresponding grade of hand-stripped fiber. In terms of physical properties, a spindle-stripped fiber has greater tensile strength, longer flex life and greater abrasion resistance than when it is either hand-stripped or decorticated (PCARR, 1977).

Reduction in the quality and yield of fiber may be due to the inherent characteristics of the variety utilized and to the position of

the tuxies as they are fed into the spindle-stripping machine. The improper placement of tuxies in the spindle-stripping machine during the extraction process is directly associated with low fiber recovery leading to considerable fiber loss. Some abaca varieties and hybrids may also have desirable agronomic characteristics but with very low tensile strength resulting in low fiber recovery.

This study presents the effects of various positions of setting the tuxy into the spindle-stripping machine on the recovery and quality of abaca fibers, the relationship of groups of tuxies and the different positions of setting the tuxy to fiber yield and tensile strength.

MATERIALS AND METHODS

Experimental Design.— The variables considered were variety (Linawaan, Inosa and Laylay), group of tuxy, and positions of feeding the tuxy into the spindle. The completely randomized design was used in computing the data for parameters involving variety, and factorial in completely randomized design for parameters involving group of tuxy and different positions of feeding the tuxy into the spindle. Treatments were replicated 3 times using 5 abaca stalks in each treatment per replication. The different feeding positions were as follows:

T1 - upward position (inner portion of tuxies facing up) with butts of tuxies stripped first
T2 - upward position, with tips of tuxies stripped first
T3 - downward position (inner portion of tuxies facing down) with butts of tuxies stripped first
T4 - downward position, with tips of tuxies stripped first

Harvesting.— Fifteen abaca stalks for each treatment, or a total of 180 stalks for the 3 varieties, were harvested at the same time in the ViSCA abaca gene bank, ViSCA, Leyte. Only those stalks with the flagleaf coming out were harvested.

Tuxying.— This was done shortly after harvesting of stalks. Tuxies were grouped as follows: outer sheaths, composed of colored sheaths; middle sheaths, composed of the whitish sheaths with drying petiole; and inner sheaths, composed of the rest of the tuxies.

Weighing and Stripping.— Before stripping, weighing of the different groups of tuxies was done to determine fiber recovery based on weight of tuxies. Stripping followed using a waterwheel-operated spindle-stripping machine. Extracted fibers from the different varieties, group of leafsheaths and setting positions were separated accordingly. In the stripping process, 4 tuxies were fed at a time. After extraction, the fibers were sundried on horizontal bamboo poles.

RESULTS AND DISCUSSION

Effect of Variety on Fiber Quality

and Recovery.

Tuxies stripped per unit time from Linawaan and Inosa were significantly heavier than that of Laylay (Table 1). Laylay had shorter sheaths which offered difficulty in winding tuxies around the spindle. Thus, lighter weight of tuxies of Laylay variety had been stripped per unit time than with the other 2 varieties.

Linawaan had the highest fiber recovery followed by Inosa and Laylay. Differences in percentage of fiber recovered among the varieties were significant. This variation could be due to some differences in their morphological characteristics.

No significant differences were noted on weight of dry fiber per stalk. This indicated that the 3 varieties had more or less the same fiber yield, although they differed in their fiber recovery. The lower percentage of fiber recovery in Inosa and Laylay was compensated by the bigger stalks they produced, hence they equalled the fiber yield per stalk of Linawaan.

Fibers obtained from the 3 varieties differed significantly in their stretchability. Inosa had a higher stretchability than Linawaan and Laylay. Differences in stretchability were attributed to variations in varietal characteristics.

The tensile strength of Linawaan and Laylay did not differ significantly from each other, while Inosa was found to be significantly inferior to the 2 varieties. This means that Linawaan and Laylay had stronger fibers than Inosa.

It may be noted that Linawaan and Laylay had lower fiber stretch but had higher tensile strength than Inosa. However, it could not be generalized that fibers with high percentage stretch have low tensile strength.

Effect of Tuxy Setting Position in Spindle on Fiber Recovery.

Stripping tuxies with the inner portion facing down and butts stripped first (T3) gave the highest

Table 1. Average weight of tuxies stripped per unit time, fiber recovery, weight of dry fiber recovered, fiber stretch and tensile strength of fiber of the three abaca varieties.

Variety	Wt. of tuxies stripped in 5 minutes (kg)	Fiber Recovery (%)	Wt. of dry fiber recovered per stalk (kg)	Fiber Stretch (%)	Tensile strength (kg/g-m)
Linawaan	5.19a	1.44a	0.116	0.724b	15.69a
Inosa	4.72a	1.18b	0.109	0.872a	12.76b
Laylay	4.19b	1.04c	0.100	0.754b	15.06a
C.V. (%)	12.17	3.56	12.10	5.82	2.64

Means followed by a common letter are not significantly different at 5% level using DMRT.

fiber recovery with an average of 1.27%. However, analysis of variance showed no significant differences among the different positions of feeding the tuxies into the spindle on the percentage of fiber recovery of abaca. This suggested that tuxies (mixture of outer, middle and inner) could be stripped in any of the different positions used in this study without altering the amount of fibers produced.

Effects of Tuxy Grouping and Feeding Position in Spindle on Fiber Quality and Quantity.

Tensile Strength.— Significant differences were observed on the tensile strength of fibers extracted from the different groups of leafsheaths (Table 2). Fibers from the outer and middle leafsheaths were stronger than those derived from the inner group of leafsheaths. This may be due to the physiological age which varies among the leafsheaths in a stalk. Leafsheaths from the inner group are always younger than the outer groups regardless of the age of the plant. This observation was in agreement with the findings of Tabora and Ragat (1968) who claimed that the nearer the sheath is to the core, the weaker are the fibers.

This fiber property, however, was not influenced by the different positions of setting tuxies into the spindle. This indicated that tuxies could be set into the machine in any of the 4 positions without reducing the strength of fiber. Interaction effect was also not significant.

Fiber Stretch (%). — Fibers from the outer and middle leafsheaths had significantly higher

Table 2. Tensile strength (kg/g-m) as affected by setting positions and group of leafsheaths (average for the 3 varieties).

Feeding Position	Tuxy Grouping			Treatment	
	Outer	Middle	Inner	Total	Mean
Upward-butt first	15.74	15.34	13.27	44.35	14.78a
Upward-tip first	15.46	14.81	13.85	44.12	14.71a
Downward-butt first	15.62	14.45	12.75	42.82	14.27a
Downward-tip first	14.75	14.69	13.01	42.45	14.15a
Group of leafsheaths					
Total	61.57	59.25	52.88		
Mean	15.39a	14.82a	13.22b		
C.V. = 7.39%					

Means followed by a common letter are not significantly different at 5% level using DMRT.

fiber stretch than those obtained from the inner leafsheaths (Table 3). The outer and middle groups did not vary significantly from each other. It may be noted that fiber stretch declined as the position of leaf-sheaths advanced to the inner core of the abaca stalk.

No significant effect of the different positions of feeding tuxies into the spindle on the stretchability of fiber was noted. Likewise, inter-action effect was not observed between different positions and different groups of leafsheaths.

Weight of Tuxies from the Different Tuxy Groups.— The mid-dle group had the heaviest weight of tuxies stripped in 5 min with an average of 4.79 kg, followed by the inner and outer groups with averages of 4.75 and 4.52 kg, respectively. Nevertheless, the analysis of variance showed no significant differences among groups of tuxies as far as this parameter was concerned. Results indicated that in terms of weight, the amount of tuxies that could be stripped per unit time will not vary significantly among outer, middle and inner groups of leafsheaths. The slight differences, however, could be due to the differences in length of leafsheaths. Outer leaf-sheaths were generally shorter than those from middle and inner groups. Most likely, the shortness of the outer sheaths offered less difficulty in the stripping process. Espino (1978) explained that the difficulty in stripping out fibers from the outside leafsheaths was probably due to the developed parenchyma cells attach-ed to the fibers and the presence of stigmata which made the surface of fibers rough, hence, causing more

Table 3. Fiber stretch (%) as affected by setting position of tuxy and group of leafsheaths (average for the 3 varieties).

Feeding Position	Tuxy Grouping			Treatment	
	Outer	Middle	Inner	Total	Mean
Upward-butt first	0.800	0.787	0.725	2.31	0.77
Upward-tip first	0.817	0.810	0.744	2.37	0.79
Downward-butt first	0.775	0.882	0.773	2.36	0.78
Downward-tip first	0.827	0.795	0.725	2.45	0.78
Group of leafsheaths					
Total	3.217	3.214	2.967		
Mean	0.804a	0.803a	0.742b		
C.V. = 8.03%					

Means followed by a common letter are not significantly different at 5% level using DMRT.

friction in stripping.

The effect of the different positions of setting tuxies into the spindle on this parameter was not significant.

Weight of Dry Fiber.— The middle leafsheaths produced significantly heavier dry fiber per 15 stalks than the outer and inner leafsheaths (Table 4). Similarly, the same parameter was found to be significantly influenced by the position of setting the tuxy into the spindle. However, no significant interaction between the above 2 variables was noted.

It was observed that fibers extracted from the middle leafsheaths were significantly heavier than those derived from the inner and outer leafsheaths. The latter 2 groups did not differ significantly from each other. This observation could be attributed to the variation in size and number of leafsheaths from the different groups. The middle leafsheaths were longer and greater in number than the other groups. On the other hand, the inner and outer groups were composed of almost equal number of sheaths. Although the inner sheaths were longer, they were smaller in size compared to the outer sheaths.

The weight of dry fibers obtained in downward position with tips stripped first was 1.98 kg, which differed significantly from the fibers produced from the other setting positions. This result indicated that more fibers can be recovered from an abaca stalk if prior to stripping, tuxies are categorized into outer, middle and inner groups, and the tips of tuxies are stripped first. As mentioned earlier, position of set-

Table 4. Weight of dry fiber per 15 stalks (kg) obtained from the different groups of leafsheaths as affected by different positions of setting tuxies into the spindle (average for the 3 varieties).

Feeding Position	Tuxy Grouping			Treatment	
	Outer	Middle	Inner	Total	Mean
Upward-butt first	0.923	2.227	0.931	4.081	1.36c
Upward-tip first	1.093	2.603	1.446	5.142	1.71b
Downward-butt first	1.058	2.195	1.100	4.353	1.45c
Downward-tip first	1.186	3.351	1.400	5.937	1.98a
Group of leafsheaths					
Total	4.26	10.37	4.87		
Mean	1.065b	2.594a	1.21b		
C.V. = 24.19%					

Means followed by a common letter are not significantly different at 5% level using DMRT.

ting tuxy into the spindle did not affect fiber recovery when composite feeding of tuxies was done, i.e., tuxies were not grouped into outer, middle and inner tuxies before stripping. This particular observation confirmed the report of Navallo, Guero and Marcos (1974) which indicated that fiber recovery of abaca was not affected by different feeding positions of tuxies in the spindle. In their study, only one variety was used and group of tuxy was not considered.

Fiber Quality.— Under the Bureau of Fiber Development and Inspection Service regulations, quality of fiber includes color, cleanness, fineness, texture and length of fibers.

There was no statistical analysis performed on this parameter but it could be noted that tuxies stripped in upward position with butts stripped first produced fibers with higher grades in Linawaan, and downward position with butts stripped first produced high grades of fibers in both Inosa and Laylay (Table 5). It can be gleaned from the results that the downward position (inner portion of the tuxies facing down) with the butts of tuxies stripped first was the best suited feeding position for Inosa and Laylay varieties, while upward with butts stripped first was best suited for Linawaan. However, these positions of setting tuxies into the spindle showed good effects only on the abovementioned parameter.

Likewise, differences in fiber grades could be also observed among varieties. It appeared that Laylay produced fibers of best quality among the three. This could be due to varietal differences. Tabora (1970) reported that Inosa contains coarse fiber and therefore is hard to strip, while Linawaan produces fiber which is whiter, more lustrous and finer than Inosa. Laylay was not mentioned in his report.

Additionally, differences in fiber grades were observed between the different groups of leafsheaths. Fibers from the outer sheaths gave the darkest color, followed by the middle, and then the inner leafsheaths which had the whitest fibers. These results confirmed the report of Espino (1978).

Table 5. Grades of fiber[1] from different groups of leafsheaths of three abaca varieties as affected by different positions of setting tuxies into the spindle.

Treatment (Positions)		Percentage of Fiber in Various Grades					
		S-EF	S-S2	S-S3	S-I	S-G	S-H
	Group	**Linawaan Variety**					
Upward-butt first	Outer			25			75
	Middle	20	80				
	Inner	20	20	50	10		
Upward-tip first	Outer			50			50
	Middle	10	50		40		
	Inner		50		50		
Downward-butt first	Outer			25			75
	Middle		35		65		
	Inner		75		25		
Downward-tip first	Outer			30			70
	Middle	10	40		50		
	Inner	70	10	20			
		Inosa Variety					
Upward-butt first	Outer			75			25
	Middle	35	30		35		
	Inner	40	10	40	10		
Upward-tip first	Outer			50			50
	Middle		50		50		
	Inner	25	50		25		
Downward-butt first	Outer			20			80
	Middle		90		10		
	Inner	10	80		10		
Downward-tip first	Outer			50			50
	Middle		35		65		
	Inner	10	20		70		
		Laylay Variety					
Upward-butt first	Outer			30			70
	Middle		70		30		
	Inner	15	65	20			
Upward-tip first	Outer			75			25
	Middle		100				
	Inner	10	90				
Downard-butt first	Outer			50			50
	Middle	15	85				
	Inner		100				
Downward-tip first	Outer			50			50
	Middle	5	95				
	Inner		100				

1 Fiber quality decreased from left to right, e.g., S-EF is second to the best while S-H is the poorest. The best is S-AD but this study yielded no S-AD fibers.

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