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PRELIMINARY STUDIES ON THE CHARACTERISTICS OF COIR TWINES

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Coir in the form of twines and ropes is a fishing gear material widely used, particularly in South India, for the fabrication of essential components of several types of fishing implements. Very little information is on record elucidating the essential dynamic characteristics of this important gear material. Miyamoto and Shariff (1958) in an earlier communication have presented certain details on the characteristics and rotting qualities of one variety of coir twine. The present study on the characteristics of different grades of coir twines was undertaken at the instance of Dr. Miyamoto with a view to evaluate the qualities of the different grades of coir twines and to facilitate determination of their utility as a fishing gear material.

Materials and Method

Five different grades of coir twines known to the industry as:

(1) Superior Anjengo,

(2) Ordinary Anjengo,

(3) Real Alapat,

(4) Imitation Alapat, and

(5) Special Mangaden were taken for study. All the grades are mainly produced in the erstwhile Travancore region of the Kerala State. Table I shows the important production centres, use and average market price.

Inner and outer twists, mass, diameter, breaking strength and stretch in both dry and wet conditions were recorded. The readings are based on averages of fifteen tests.

Results

The number of inner and outer twists of each variety per metre is shown in Table II.

Mass per metre, diameter, breaking strength and stretch when dry and wet are given in Table III.

TABLE I

	Production Centres	Main use	Price per cwt./ 50·8 kg.
			Rs.
1. Superior Anjengo ..	Quilon to Alleppey	Mats, fishing and agricultural purposes	46·66
2. Ordinary Anjengo ..	Quilon District	Mats	39·16
3. Real Alapat ..	Kayamkulam, Karthikapally	Agricultural purposes	43·33
4. Imitation Alapat ..	Quilon District	Agricultural purposes	36·66
5. Special Mangaden ..	Quilon District	Agricultural purposes	40·83

TABLE II

No. of inner and outer twists of coir twines of different varieties

		No. of Twists	
		Inner	Outer
Superior Anjengo ..	Average	113·3	97·8
	Maximum	173·3	140·0
	Minimum	66·6	73·3
Ordinary Anjengo ..	Average	81·0	91·8
	Maximum	140·0	100·0
	Minimum	60·0	73·3
Real Alapat ..	Average	59·3	59·3
	Maximum	73·3	67·7
	Minimum	46·7	53·3
Imitation Alapat ..	Average	44·8	60·7
	Maximum	73·3	77·7
	Minimum	26·7	46·7
Special Mangaden ..	Average	98·2	106·2
	Maximum	126·7	133·3
	Minimum	80·0	93·3

TABLE III

Mass per metre, diameter, breaking strength, breaking stretch, in dry and wet conditions of coir twines

		Mass (gm./ metre)	Dia-meter (mm.)	Dry		Wet	
				Breaking strength (Kg)	Breaking stretch (%)	Breaking strength (Kg.)	Breaking stretch (%)
Ordinary Anjengo ..	Average	6·248	4·12	24·0	37·4	22·0	43·5
	Maximum	7·792	7·72	29·5	46·7	29·5	52·7
	Minimum	5·640	3·35	17·0	16·7	17·5	32·7
Superior Anjengo ..	Average	4·080	3·41	18·1	34·7	15·4	39·3
	Maximum	4·512	4·41	24·0	50·7	21·0	46·7
	Minimum	3·484	2·68	15·5	13·3	7·0	26·0
Imitation Alapat ..	Average	7·318	4·42	40·1	32·3	30·3	32·5
	Maximum	8·372	5·81	50·5	39·7	38·0	39·0
	Minimum	6·560	3·63	28·5	25·7	22·5	30·0
Real Alapat ..	Average	5·440	4·41	30·9	29·8	24·6	33·9
	Maximum	5·876	5·41	40·0	42·3	34·5	40·0
	Minimum	4·772	3·63	19·0	20·7	17·0	22·7
Special Mangaden ..	Average	4·480	3·68	20·7	34·5	16·4	38·3
	Maximum	5·200	4·49	25·5	55·3	21·0	47·3
	Minimum	3·790	3·12	15·5	20·7	12·0	29·3

DISCUSSION

1. *Mass of twine.*—Mass of twine per unit length is proportional to the square of diameter of the twine if the material and hardness of twist are the same.

Let W denote the mass of twine per metre (in gm.) and D the diameter of the twine in mm., then

$W = KD^2$ where K is a constant.

From Table III, the value of K in each variety is calculated as below:—

Superior Anjengo	.. 0·351
Ordinary Anjengo	.. 0·367
Real Alapat	.. 0·280
Imitation Alapat	.. 0·375
Special Mangaden	.. 0·331

Excepting for Real Alapat variety, the value of K for the different grades of twines do not show any conspicuous variation. The average value for the constant K for the five varieties is 0·34. In case of sunhemp twine, the value of K is 0·55 (Miyamoto and Shariff, 1958). Coir twine is therefore 38% lighter than Sunhemp twine.

Breaking strength.—From Table III, it is evident that the breaking strength of the different varieties decreases in the wet condition. In almost all the twines of vegetable origin, the breaking strength in the wet condition has been observed to increase. In sunhemp, the breaking strength in the wet condition increases by 12% (Miyamoto and Shariff, 1958; George and Radhalakshmy, 1958), and in cotton also it has been observed to increase by 12–23% (Kuriyan and Cecily, 1959). Coir twine lose 5–24% of its original breaking strength when wet. This observation is interesting, since breaking strength in wet condition is an important factor that regulates the choice of materials for fabrication of fishing gear.

The breaking strength of twine is proportional to the mass of twine per unit length if the material used and the hardness of twist are the same.

Let S denote the breaking strength of twine in kg. and W the mass of twine per metre in gm., then

$S = K_1 W$. where K_1 is a constant.

From Table III, the values of K_1 are deduced as follows:—

	Value of K_1		Ratio of $\frac{K_1 \text{ in dry}}{K_1 \text{ in wet}}$
	In dry	In wet	
Superior Anjengo ..	4·43	3·77	0·85
Ordinary Anjengo ..	3·71	3·52	0·95
Real Alapat ..	5·69	4·52	0·80
Imitation Alapat ..	5·47	4·14	0·76
Special Mangaden ..	4·63	3·67	0·79

From the table, it is clear that Alapat is stronger than Anjengo, and Real Alapat is stronger than Imitation Alapat and Superior Anjengo is stronger than Ordinary Anjengo.

In the case of sunhemp having the same weight per unit length, the value of the constant K_1 is 11·25 in the dry condition and 12·6 in the wet condition (Miyamoto and Shariff, 1958). The breaking strength of coir twine is 33–51% of the strength of sunhemp twine in the dry condition and 28–36% in the wet condition.

The breaking strength is also proportional to the square of diameter of the twine. Therefore,

$S = K_2D^2$, where K_2 is a constant and

S is measured in kg. and D in mm. The value of the constant K_2 for the different twines is as follows:—

	Value of K_2		K_2 in wet
	In dry	In wet	K_2 in dry
Superior Anjengo ..	1·55	1·32	0·95
Ordinary Anjengo ..	1·42	1·29	0·92
Real Alapat ..	1·59	1·26	0·79
Imitation Alapat ..	2·05	1·55	0·77
Special Mangaden ..	1·53	1·21	0·79

In the case of sunhemp, the value of the constant K_2 is 6·2 in the dry condition and 6·94 in the wet condition (Miyamoto and Shariff, 1958). Hence the breaking strength of coir twine is 23 to 33% of the strength of sunhemp in dry condition and 17·4–22·4% in wet condition.

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Summary

The weight per metre, number of twists and breaking strength and breaking stretch (in dry and wet condition) of five different grades of coir twines have been studied.

The weight of twine per square mm. diameter of the various twines do not fluctuate widely except for Real Alapat variety.

Unlike other fibres of vegetable origin, the coir twines lose breaking strength by 5–24% in the wet condition.

Alapat variety is stronger than Anjengo, Real Alapat variety stronger than Imitation Alapat and Superior Anjengo stronger than Ordinary Anjengo and Special Mangaden stronger than Ordinary and Superior Anjengo.

The breaking strength of coir twines in dry and wet condition is lower than that of sunhemp twine.

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