THE USE AND ECONOMIC BENEFITS OF FIBRES FROM SISAL HEMP (AGAVE SISALANA) LEAVES AS SUPPORTING ROPES FOR FISHING-GEAR

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ABSTRACT

Sisal hemp (*Agave sisalana*) leaves were harvested and processed using the beating and decomposition methods. The fibres obtained were washed, dried and finally spurned into cordage of about 4mm diameter 39 pieces of ropes, each measuring 2 meters were altogether spurned. 30 pieces of these ropes were immersed in water for a period of 24 weeks, 6 were placed in a shaded and airly place and 3 were used for the head and footling of gillnet, sinkerline of cast net and the main line of long line. Every other week, the ropes in water and air were tested for its breaking strength using an improvised 50kg spring balance.

At the end of the experiment, it was found the immersed ropes maintained a tensile strength of over 50kg/F for the first 18 weeks, thereafter, there was a gradual weekly reduction in the strength until the 23rd week when the tensile strength was less than 1kg/F.

The cost benefit analysis showed that about 5,3146 tons processed fibres could be obtained from 1ha. capable of being spenced into 528300m of 4mm diamter cordage.

This paper finally recommendeds the growing of sisal hemp plants by fisherfolks so that there will be constant stock for intermittent harvesting for rope spurning.

INTRODUCTION

Ropes and lines are obviously essential accessories in the construction of fishing gear. They are known to provide the frame on which netting materials are mounted before they become a fishing gear. Ropes served as main line and snoods which fishing hooks are fastened to produce line fishing gear.

Generally, ropes are produced from fibres which can be natural in origin or synthetic (that is man made). Although the basic materials for making fishing gear these days are product of synthetic as a result of their high breaking strength, resistance against abrasion and low level of decay (Nomura 1976), however, availability of these materials entails importation of either the finished product or the raw mateirals. In the past, Nigeria economy could sustain the importation and distribution of these materials to the fisherfolks as subsidized rate. But the economy right now cannot provide such service. Hence, there is absolute need to look inward especially on locally available materials that can be used to construct fishing gear.

In as much as netting materials cannot be substituted for the locally available product presently, some of the materials used for the gear construction can be substituted. What readily come to mind is the rope which are necessary accessories. Vegetable fibres are known to be very suitable for rope spurnage. And many of the plants grow well in tropical Africa (Leslie, 1976).

Of these fibre producing plants, the sisal hemp (*Agave* spp.) is known to strife well in all part of tropical Africa including Nigeria. Fibres obtained from this plant are being used for rope spurnage and bag weaving. However the suitability of the ropes spurned from the fibres for fishing gear have not been fully documented. With this in mind the aim of this project is to:

1. Find out the suitability of sisal hemp fibres for ropes spurnage for the line accessories of some fishing gear.

2. Evaluate the quality of ropes spurned from sisal hemp in terms of breaking strength and durability.

3. Document the above findings for extension service to the artisanal fisherfolks in the country.

MATERIALS AND METHODS

Two hundred fresh leaves of sisal hemp plants were obtained from their parent plants. They were weighed at fresh state individually, clubbed to pulp state and soaked in water for nine days for the tissue to decompose.

After decomposition they were retrieved from water, thoroughly washed and dried in cool environment (i.e. under shade). The clean fibres obtained were weighed individually to know the total and average weight after processing. The fibres were finally apurned into ropes of about 2m long using a combination of S and Z twists and of about 4mm diameter.

30 pieces of the spurned ropes were immersed in water for 24 weeks, 6 placed in shaded and airy place, while 3 were used for the construction of gill net (head and foot rope), cast net (sinker line) asnd longline (main line).

At every other week, the tensile strength of the ropes in water and airy place were tested. This was done by using a 50kg hand spring balance in place of a tensile strength guage and machine.

Also, the suitability of the 3 spurned ropes for gear construction were compared with that of kuralone rope No. 10 in terms .of flexibility and ease of mounting or/and knotting.

The relationship between the fresh weight of the sisal leaves and the quantity of fibre obtained were also tested using a regression and correlation equation.
Finally, 10 sisal hemp plants were randomly selected and the total number of leaves on them were noted.

RESULTS AND DISCUSSION

The total weight of the 200 sisal hemp leaves harvested was 74.59kg and their individual weight ranged from 0.198kg (minimum) to 0.913kg (maximum) with 0.373kg as average, (Table 1). After processing, the pure fibres weight per leave ranged from 0.00235kg (minimum) to 0.009kg (maximum) with 0.0059kg as average weight. These fibres were spourned into ropes of 4mm diameter and length of 0.378m to 0.84m and 0.586m respectively. Proportionally therefore, about 63kg at the fresh leaves are capable of producing 1kg of the processed fibres which can be spurned into about 100m long rope of 4mm diameter.

Table 2 showed that the breaking strength of the spurned rope was over 50kgF gradual decrease in the weight until the 23rd week when an average force of 0.8kg was able to break the ropes. The spurned ropes that were kept in airy and shaded room maintain a breaking strength of over 50kgF throughout the experimental period.

It can be seen that the moment the fibre quality started to degenerate in the 20th week, the rate became so rapid that within three weeks, the ropes had completely lost their strength. It is usual to see fibres of vegetable origin deteriorating so rapidly as a result of various bacterialogical actions degradating the fibres (Honda 1969). But if vegetable fibres are immersed in water for a few days, removed and dried accordingly, effect of bacterial action will be very minimal thereby increasing the lifespan of the fibres in terms of breakiang strength.

Physical examination and comparison of the spurned rope with kuralon rope No. 10 (a synthetic rope produce from polyvindylene chloride PVC) revealed the two ropes to be of equal flexibility which is a necessary factor for selecting head and foot ropes of entangling nets. One other advantage of the spurned sisal rope is
that it is produced in steple form which is good for knots and hitches formation, a criteria for good and staple mounting.

Nets constructed with the spurned rope (Gill net and Cast net) were also operated and were found to have the right opening and shape similar to those

constructed with kuralon rope. However the rope diameter appeared to be too large for the main line of a longline. Hence, if the spurned rope is used for longline there is need to reduce the diameter.

Each sisal hemp plant selected for leave counting were having leaves ranging from 185 to 240 per plant and Leslie (1976), documented that the plant can be sown at 5000 plant per hectare which can be harvested between 2-4 years after planting. It was also recommended that about 20 leaves should be left on the plant after harvesting.

If 212 leaves are taken as the mean that a plant can bear, it therefore followed that 190 fresh leaves weighing 70.87kg can be harvested from a plant in a season. Consequently, in one hectare, 354350kg can be harvested. A total of 534.6kg of processed fibres can be obtained which can be spurned into 528.3km of rope of 4mm diameter. About 10,566 hanks of kuralon rope of 50 metre long can be obtained from this length. At a conservative market cost of #150/hank of kuralon rope, #1,584,900 million can be conserved by substituting sisal hemp rope for kuralon rope.

Table 1 **Relationship between the weight of fresh leaves processed fibres and the spurned ropes of sisal hemp**

Range	Fresh Leaves (kg)	Processed fibre (kg)	Length of spurned Rope (cm)
Minimum	0.198	0.00235	37.8
Maximum	0.914	0.009	84.0
Mean	0.373	0.0059	58.69

TABLE 2: RATE OF DETERIORATION OF SISAL HEAP FIBRE IMMERSED IN WATER

	Immersed Rope		Open Air Rope		
	Breaking strength (kg/F) A	B	C	Mean kg/F	A B C
Week 2	>50	>50	>50	>50	All samples tested maintained a breaking strength of over 50kg/F throughout the testing period.
Week 4	>50	>50	>50	>50	
Week 6	>50	>50	>50	>50	
Week 8	>50	>50	>50	>50	
Week 10	>50	>50	>50	>50	
Week 12	>50	>50	>50	>50	
Week 14	>50	>50	>50	>50	
Week 16	>50	>50	>50	>50	
Week 20	48	45	45	46	
Week 21	31	35	33	33	
Week 22	11	13	9	10	
Week 23	0.6	0.9	0.9	0.8	

CONCLUSION

The cost of fishing gear materials are progressively getting out of the reach of the local fisherfolks. It is a common thing to find some fishermen not able to continue with fishing operation as a result of the exhorbitant price of fishing materials. In order to reduce expenditure on fishing gear, there is need to incorporate locally available materials that are equally suitable. Spurned sisal twine is a very good alternative to synthetic kuralon rope as a supporting rope for fishing gear such as gill net, trammel net, cast net and longline.

The sisal hemp plant can grow in every part of the country, hence the production should be encouraged. Also the method of processing the plant in order to obtain the fibre is equally simple.

Spurning at the yarn can be done in the night while the family is relaxing without necessarily wasting an hour in day time. At the end, fisherfolks will have a good quality rope which can be used for their various fishing gear.

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