

African Wild Silk and Its Use

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Although African wild silk has many important advantages over Asiatic wild silk (tusah oak silk moth), as has been indubitably proved by many tests carried out by theorists and by practical men, still it has not been possible hitherto to introduce African wild silk regularly in any quantity to the textile industry.

About fifty years ago German and English explorers sent home to Europe nests of African wild silk for investigation of its technical possibilities in the textile industry, but all these trials were unsuccessful because the proper de-gumming process had not been found.

After a successful method of de-gumming African wild silk had been introduced a few years before the war, an Anglo-German company undertook for the first time to exploit wild silk in Africa on a large scale. This company, which had a capital of £150,000, was founded by a number of leading persons in Switzerland, Alsace, and England who were interested in the textile industry and in the development of the colonies. It had from fifteen to twenty factories in German East Africa and Uganda which collected and sorted the wild silk, and had small model plantations which served to instruct the natives in its cultivation. The company had found by experience that the laying out of large estates for this purpose promised less success than the formation of small plantations of not more than 50 hectares (120 acres) owing to the difficulty of combating insect pests. The model plantations in the neighborhood of the factories served to demonstrate to the negroes how a farm for the cultivation of the silk

could be equipped most profitably. Such a plantation needs hardly any attention at all and it is not even necessary to keep the farm clean once the *Bridelia micrantha* bushes (upon which the moth feeds) were sizable enough, and all that had to be done was to collect the abandoned nests. Besides all this a farm can be laid out on almost any kind of soil or in marshy ground. It was comparatively easy under these circumstances to induce the negroes to take up the cultivation of the wild silk. It should be mentioned that the cultivation of African wild silk is made much simpler than that of real silk (*Bombyx mori*) by the fact that the worms do not need to be killed before leaving the cocoons. African wild silk cannot be wound and can be used only in the schappe silk industry, for which purpose it is a matter of indifference whether the cocoons have been bored through by the moth. Accordingly each generation of the worms is at entire disposal for further cultivation.

The Anglo-German company was supported very extensively by the German and English colonial authorities, because it afforded the negroes a favorable opportunity for work, and it was remarkably successful up to the outbreak of war. It had sent also considerable quantities of the silk to Europe which were at once taken up by the schappe industry.

The promising work of the company was put to an end at the outbreak of war; for the directors as well as the managers of practically all the factories were Germans. Owing mainly to the changed political situation it was found to be impossible to revive the company after the war.

The unfortunate fate of the company in

consequence of the war is the reason why it has not been possible up to the present to introduce such a valuable material as African wild silk in the textile industry, although tussah silk, the quality of which is much inferior to that of the African silk, has occupied an important position on the textile market for more than half a century.

Some time after the war an English company shipped about forty tons of African wild silk from Nigeria to Europe, which consisted almost entirely of the inferior inner cocoons, the negroes having retained the valuable outer coverings for their own use. The negroes mix the silk with wild-growing cotton and spin them together, using the yarn to make cloth for themselves (Hausa garments). They also shred the wild silk to form wadding for stanching the flow of blood. The silk that the English company sent to Europe had suffered also through having been too long stored while exposed to the influence of the weather, besides which it had been very unscientifically packed, so that it arrived in Europe in a very damaged condition. Nevertheless the consignment had the good effect of inducing a number of textile industrialists to take up thoroughly the problem of African wild silk. Although the material reached Europe in such a bad condition, the trials made with it came out very favorably. It was recognized, however, that it would be necessary to form companies on a broad basis for the exploitation of African wild silk since these must be under expert management, if regular shipments of good material are to be assured. The textile industry must be able to rely upon regularity, if it to take up the article with any profit to itself.

As a result of these considerations a company was formed in Lyons a few years ago by a number of silk manufacturers to study the problem. This company has a share capital of 10,000,000 francs and plans to take up the cultivation of African wild silk in the French Congo. The company already has a large concession there and several large estates have been formed. In addition, an undertaking has been founded in Brussels by colonial interests together with a number of textile indus-

trialists with a capital of 10,000,000 francs which intends to exploit the cultivation of wild silk in the Belgian Congo. These two companies expect to receive considerable shipments in the course of 1930, so that large quantities of African wild silk can be reckoned with from this date which will be at the disposal of the textile industry. After their provisional program has been carried through completely, the two companies estimate an annual production of about 3,000,000 kilos each (about 3,000 tons).

Quite a number of wild silk moths are to be found also in Central America and in South America, but exhaustive trials which have been carried out with various types of these wild silks with a view to their use in the textile industry have not led to a favorable result. These wild silks either cannot be de-gummed at all, or the labor and expense required to de-gum them are out of all proportion to the result. This is much to be regretted and particularly so as regards the Argentine wild silk moth (*bicho-canasto* or *bicho-decesto*), which occurs in enormous numbers. An article upon this silk moth by Rossmann will be found in *Melliand Textilberichte*, November 1926. The Argentine moth appears as a much feared insect pest which the Ministry of Agriculture is fighting at great expense and with every means at its disposal. The moth is an individual spinner and the cocoons consist of a very hard parchment-like skin which encloses a small tuft of very fine, pure white silk filaments, which would be well adapted for spinning. Unfortunately the whole of the cocoon is so mixed with bits of wood, leaves, dung, and so on that it would cost more to clean and de-gum the silk than the material is worth. Apart from this it would be difficult to import the raw material into Europe owing to import regulations, for the insect is an extremely dangerous pest which, wherever it appears, eats bare every green tree. These difficulties could, however, be overcome by first boiling the material before shipment.

Among the numerous African wild silk moths the one that comes chiefly into consideration for the textile industry is the *anaphe* species belonging to the family of the *Noto-*

dontides. This nesting or family spinner lives in large families or societies and changes into a chrysalis in a common nest (*cf.* the Figure). The normal length of these family nests is from 10—50 cm (4—20 inches) with a width of from 10—20 cm (4—8 in.), and a thickness of from 5—12 cm (2—5 in.). The whole

The average titer of the anaphe fiber is 1.1 denier.

Professor Lehmann carried out investigations upon the strength and elongation of the schappe made from African wild silk compared with that made from the *Bombyx mori* silk and arrived at the following results:

NUMBER	AFRICAN SCHAPPE		BOMBYX MORI SCHAPPE	
	Strength grams	Elongation Percent	Strength grams	Elongation Percent
120/2	486	8.72
140/2	409	8.30	389	8.21
160/2	330	8.12	294	8.08
200/2	276	7.96	254	7.90
220/2	236	7.62
250/2	199	7.38	175	7.36

nest with its living contents may weigh up to 7 pounds and may contain as many as 800 individuals, if not more.

The fiber of this silk is brownish in color, very fine, and particularly strong and elastic.

The anaphe silk can be bleached completely by means of oxygen carriers without injuring the fiber. It can be dyed in any manner with basic and direct dyes, as well as with Indanthrene dyes. It can be impregnated also without difficulty.

Owing to its great fineness the anaphe silk can be spun to a finer denier than *Bombyx mori* schappe and much finer than tussah. It can be spun as fine as No. 300/2 (metric system) or even 400/2 without difficulty.

The fiber of this silk has a peculiar structure and a cross-section shows a roundish fiber with regular knot-like formations, while real silk (*Bombyx mori*) appears under the microscope as a smooth cylindrical filament, and tussah has the appearance of a ribbon. The fiber owes its great strength and its high power of adhesion to this peculiar structure. According to the investigations of Professor Lehmann, Director of the Prussian Higher Technical School for the Textile Industry in Crefeld, these knot-like thickenings appear at intervals of 200 microns (a micron is one thousandth of a millimetre = 0.00004 inch).

It will be seen from this table that the African wild silk schappe is superior to the *Bombyx mori* schappe both in regard to strength as well as elongation.

Another advantage of anaphe silk over *bombyx mori* schappe is that it is very much softer, and velvet or other cloth made of the African silk has a wonderfully soft handle such as no cloth made of any other textile fiber can show. It is just in this connection that the African silk meets the present fashionable trend to the very utmost. This fineness of the anaphe silk fiber is advantageous particularly for the production of velvet, since the pile is given thereby an excellent upright position and a very good cover. For the same reason anaphe silk yarn should be adapted admirably for the production of cloths in imitation of furs.

The greater strength of the African silk as compared with the *Bombyx mori* silk also recommends its use for the production of anaphe silk cordonnets for the manufacture of sewing silk.

The anaphe silk has one drawback, and that is the poor luster, but attempts to improve it by better working methods have been successful.

In their original state the nests contain much wood, leaves, remains of pupae, dung, and so on, which represents a dead loss in the way of freight. In order to avoid this unnecessary



Nest of Anaphe silk moths

expense and also because labor is much cheaper in Africa, the two companies mentioned have decided to de-gum the silk in Africa. In this way it is possible also to make better use of the inferior internal cocoons. African wild silk, therefore, will be shipped later on after de-gumming.

The de-gummed wild silk is worked up by the schappe industry in the same way as silk waste.

As already mentioned, large quantities of African wild silk were worked up by the spun silk industry with complete success even before the war.

Since then only the inferior consignment of African wild silk referred to has reached Europe, but even this material has been spun by a French firm into very handsome schappe yarn, the only unfavorable point being the high price owing to the poor yield from the raw material.

Interesting trials were made also with this inferior material by mixing it with other textile fibers.

Thus it was mixed with staple fiber in order to raise the strength of the staple fiber and at the same time improve the luster of the wild silk. This mixture was spun also by the schappe process and the yarn obtained met all expectations.

A woolen spinning mill also has made interesting trials in the way of mixing the wild silk with wool. Since the African silk has an extraordinarily low specific weight, good elasticity, and great power of adhesion, due to the peculiar structure of the fiber described above, which in turn makes it most excellently adapted for spinning, it is also very well suited for mixing with wool. The trials were carried out with a mixture of wool and African silk in the ratio of two to one, which gave a most remarkable increase in the volume of the yarn, a pure woolen yarn No. 18 (metric) having about the volume of a mixed yarn No. 32 (metric). Although the price of the mixed yarn is slightly higher, this difference is more than made good by the higher output. The experience of the woolen spinning mill showed that the best results were obtained by mixing the silk with C wool, the use of finer A/AA mixtures makes the yarn too soft. The best mixing proportion is probably 37% wild silk and 63% C wool.

The trials have remained in the experimental stage since no considerable quantities of African wild silk of good quality are available for the present. It is to be expected that it will be used widely in many branches of the textile industry when the two companies can supply it regularly in large quantities.