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PRODUCTION OF GUM ARABIC

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S. S. Okatahi and J. E. Onyibe

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Table of Contents

Contents **Page**

Introduction

Gum Arabic is one of the crops whose promotion by the Federal Government was initiated under the National Accelerated Industrial Crops Production Programme (NAICPP). The tree crop is not hitherto well known in the country except in Borno and Yobe States) yet it is a commodity of tremendous value and high economic potential. This bulletin is prepared therefore to provide information on Gum arabic tree (*Acacia senegal*): how and where it can be grown, tapping and grading of the gum and the marketing of the commodity.

Gum arabic is an organic adhesive produced from a tree called *Acacia senegal*. The gum has a wide range of industrial uses especially, in areas of feed, textiles and pharmaceutical industries. In food products, it serves as a stabilizer, emulsifier, and binding agent for chewing gums, ice creams and jams. In pharmaceuticals, the gum is a binder in iozenges, tablets, pills, throat pastilles and cough drops. In textile industry it is used for fabric stiffening and as a binder for textile printing gums; it is also used in the plastic industry. In miscellaneous industries it is used in producing ink, water colours, paints, carbon papers, pottery glaces etc. However, the main use of gum arabic remains in confectionery, hard gums, soft gum and gum pastilles.

Gum arabic provides income for farmers and merchants. A 50kg propylene bag of grade one gum arabic sold for N15,000.00 in Maiduguri, Borno State on 1996. The gum can also provide a good foreign exchange for the nation because there is a world demand for the commodity. Sudan earns over U.S. $41 million (about N3 billion) from gum exports every year.

Gum Arabic Tree

Gum arabic is obtained from a tree called (*Acacia senegal*) which is a leguminous tree, belonging to the family *Nimosaceae* and *genus* which has triple spines at the base of the node (Fig. 1) while the bark is fissured, flaky and whitish grew in colour. The leaves are pinnate and alternate with 3 – 6 pairs of pinnae. Flowers are cream – coloured, fragrant and arranged in spikes, while the fruits or pods are flattened with straight edges (or sometimes with slight constrictions between the seeds. They measure 8 – 10cm long, 2 – 3.5cm wide, and often carry 3 – 7 seeds. Seeds are brownish and fairly round in shape (Fig. 2). A matured seed is about 3mm in diameter with the cotyledon centrally placed. The plant, when matured is a scrabby shrublike tree with low branching and short bole. It grows between 4m and 6m high. Taller growth adversely affect the gum-producing capacity of the tree. Although there are other members of gum-producing Acacia species (like *A. seyal* and *A. albida*) the best gum is collected entirely from Acacia senegal, known also as Acacia verek.

Soil and Climatic Requirements

Acacia senegal grows best in sandy soils with 200 to 400mm of rain a year, and also in clay soils with 400 to 800mm of rainfall a year. In Nigeria, the average minimum and maximum temperature in which the plant thrives are 14°C and 40°C, respectively.

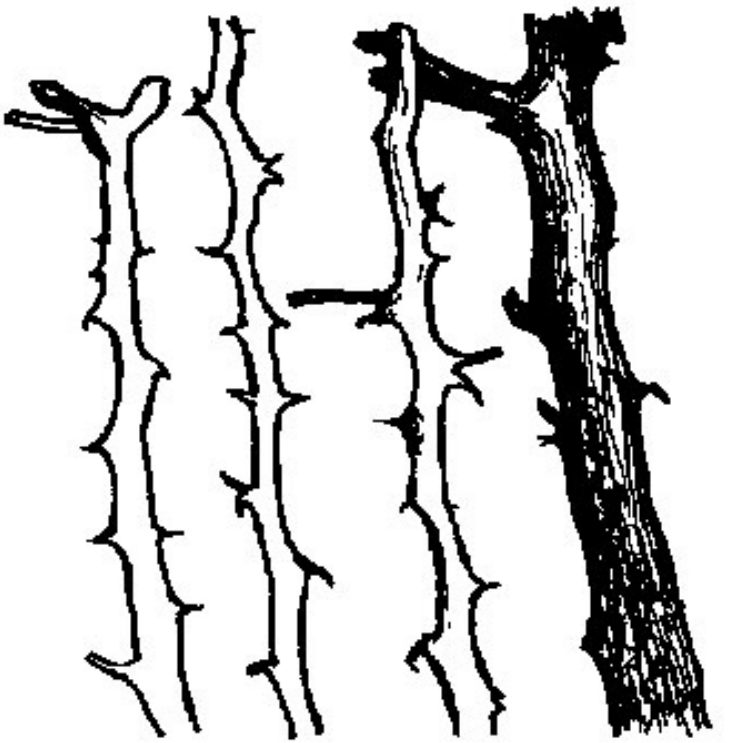

Fig. 1: A senegal stem showing short triple spines at the nodes.

The tree can withstand long period of drought, and grows well on rocky hills, sand dunes, and lands where the soils so degraded that little else can grow (Fig. 3).

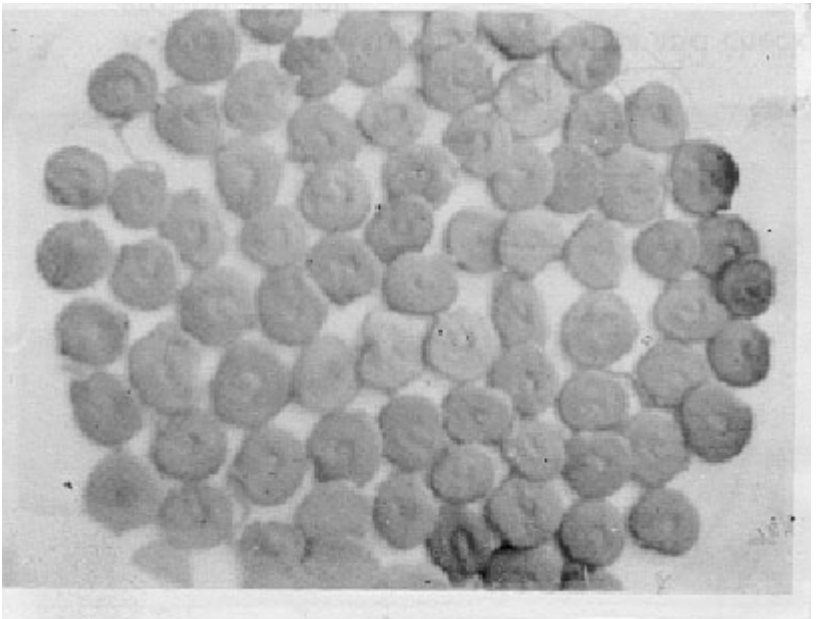

Fig: 2: A senegal seeds

Although Acacia senegal can grow in most ecological zones of the country, for the purpose of producing gum, it is best grown in Sudan Savannah and Sahellian vegetation zones. Hence the following states have been encouraged to go into massive Acacia senegal production: Adamawa, Bauchi, Borno, Gombe,

Jigawa, Kano, Katsina, Kebbi, Sokoto, Yobe and Zamfara and parts of Plateau States.

Fig. 3: A senegal growing in sand dune and checking erosion as well

The Uses of Acacia Senegal

Acacia senegal is a remarkable leguminous tree which has a wide range of usage. Among them are:

i. It can help make degraded land productive through inter-cropping with arable crops adds nutrients to the soil.

iii. Its root protects the land with its extensive rooting system.

iv. It can be planted as a windbrake or shelterbelt to reduce soil erosion and desertification (Fig. 3).

v. It can be used as fuel wood because the hard and heavy wood of *Acacia senegal* is considered the best fire-wood in the Sahelian countries.

The most important potential of Acacia senegal tree is the production of gum arabic – the uses of which are already stated. The tree can also be used in the production of charcoal which are of industrial value.

Growing Acacia senegal

Acacia senegal is normally raised from seeds. It is quite easy to mix up seeds with other Acacia plants at the beginning and end up with some wrong plants on the field. So it is important to source seeds directly from the right tree. Seed collection takes place between January and March. The seeds are cleaned up manually and preserved dry for sowing into polythene pots by April or May. Seedlings are raised in nurseries in polythene pots (Fig. 4). Small pots measuring 12cm x 26cm are adequate for Acacia senegal seedlings.

Fig. 4: Acacia senegal seedlings being raised in a nursery

Potting Mixtures

The polybags are filled with good potting mixtures. A good mixture can be made of 2 parts of river sand and 2 mixture top soil and cow dung in the ratio of 2:2:1 (i.e. 2 parts of river sand plus 2 parts of top soil and 1 part of farm yard manure) is

recommended. In Birnin Kebbi where a ratio of 2 parts of river sand to 1 part of farm yard manure is practised, the seedlings usually come out vigorously (Fig. 4).

Sowing

Filling of the pots should be completed by April ending. Pots are filled right to the brim, arranged in line, watered for few days for soil to soak and stabilize before sowing. Sowing is done early in May in order to ensure adequate development of the seedling before transplanting in July. Seeds are sown about 2cm deep. Two seeds per polythene pot is advisable to begin with; although one ends up transplanting just one plant; the other serves as a filler if and when necessary. To quicken germination, seeds may be soaked overnight or soaked in boiled water for 2 minutes before planting. Seeds so treated will germinate within two weeks in the nursery. However, fresh seed can germinate without any such treatments though might take a longer period. To prevent termite attack, treat the soil with chemicals before setting up the polythene pots for planting. Use Chloropyriphos at a concentration of 1:15mls of water. The same dilution applies to the plantation trees.

Nursery Maintenance

Watering of pot is continued after sowing on daily basis usually in the morning, using watering can of fine rose. Where available, sprinkler irrigation technique is used. Weeds may emerge in the pots which can suppress growth of seedlings. These should constantly be removed. As the top soil cracks up after some time, keep it loose for easy percolation of air and water.

Transplanting

Seedlings are ready for transplanting after about three months in the nursery (Fig. 5). Root prunning may be necessary if transplanting is delayed and seedling roots start emerging from the pots. Prunning should be done after heavy watering. The planting is carried out on a 4m x 4m or 5m x 5m spacing, giving a plant population of over 600 trees per hectare. The best period of transplanting is in July or August, that is, after the initial weeding with the tractors before the plants are fully established. Seedlings are transplanted into the prepared holes 30cm deep and 15cm wide. If the soil is wet, no watering is required immediately after transplanting, otherwise some watering may be necessary. Water or irrigation is also needed in September to October if the rain suddenly stops before the young plants have had chance to establish.

Fig. 5: *Acacia senegal* seedlings at 3 months ready for planting.

Plantation Maintenance

Filling up of missing stands should be completed within two months of plantation establishment. Weeding is necessary to keep the plant ahead of its competitors. The young plantation should also be saved from he hazard of bush fire by

clearing fire traces round it. Fencing with corn stalk, or cuttings from thorny acacia trees may be necessary to keep away grazing livestocks for at least three years.

Acacia senegal tends to branch profusely during the first two years of establishment, Prunning of lower branches that allows a trunk height of about 1 metre from the ground is advisable.

Gestation Period

Gum arabic tree is ready for tapping 4 – 7 years after its establishment. Tapping can then continue every year for at least ten to twelve years. During these time, the soil regains its fertility – aided by the fertilizing powers of *Acacia senegal*. When the trees are about 15 years old they are coppiced for fire-wood and charcoal; and crops can be planted on the enriched land. It will take another four years for the trees to regenerate to maturity.

Intercropping

Arable crops can be intergrated into Acacia senegal plantation in a practise commonly referred to as "taungya" system. Short season millet and sorghum varieties can be cropped in between rows of the tree seedlings. As the tree matures, the soil is allowed to lie fallow and regain its fertility. Note that *Acacia senegal* fertilizes the soil to the benefit of the integrated food crops.

Pest Problem

The Gum arabic plant is not free from pest and disease problems. It is vulnerable to termite attack both at the seedling stage and as a developed crop. Termites can reach the seedlings by penetrating the polythene pots from the soil. They can also attack the bole and branches of the tree by building soil shell around those parts thereby disrupting the physiological function of the plant.

At about three years from establishment, it is attacked by numerous insects and finally finished off by white ants. It is attacked through wounds by longhorn beetles and borers. Locuts (Acridium melanorhodon) and grasshoppers defoliate large areas now and again. Goats and Camels are probably its greatest enemies as the leaves are highly palatable and nutritional to animals. Fires kill off seedlings and damage the trees considerably. A good deal of damage is also caused to trees through cutting off large branches to use as fences or barricades for livestock on account of their thorny nature.

Control Measures

Control of termites can be done by drenching the polybags of soil in Chloropyriphos solution. Mixed at dose rate of 5mls of Chloropyripos per litre of water. For grasshoppers and locust, spray with Selvin/Vetox 85 at the rate of 12g per litre of water. The goats and camels can be kept off nursery or plantation by fencing with barb wire or chain link – if affordable; otherwise fencing with cuttings from other acacia senegal species is good enough.

Tapping

After four to five years, the trees are matured enough to be tapped for Gum arabic. Tapping is usually done during the cool season of the year starting in October or November. A special tool or knife is used to tape the trees for the gum (Fig. 6). The knife is "r" shaped. It has a sharp blade at the tip to cut through the bark, then the sharp hook-like portion is used to used to tear the bark. Usually the knife head is attached to a long wooden handle so that even the highest branches of the tree can be reached.

1. Wooden handle
2. Metalic hold
3. Sharp hook portion for peeling of the bark strips vertically upward.

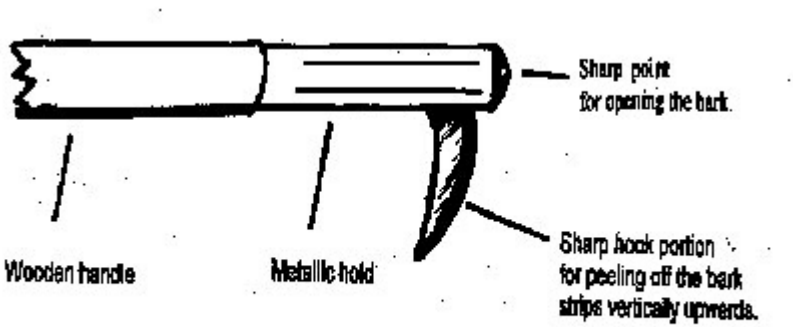

Fig. 6: Tapping knife

Before going into work, the tapper clears the obstructive branches to allow him have access to the bole and other matured branches of the tree. Any branch averaged 3cm diameter can be tapped. Tapping then commences with the following procedure (Fig. 7 a – c):

i. place the tip of the straight edge of the knife against the bark of the branch;

ii. push the blade to cut through the bark to separate it from the wood. Some people call this step "slashing".

iii. With the hook – like portion of the knife, twist the blade away from the branch so that the hook can hold the bark;

iv. Pull vertically upwards, hooking the bark, so that the bark torn 1 – 3cm wide (depending on the thickness of the branch) – is pulled for a distance of 40 to 50cm. This job is (should be) without such damage to the wood of the tree;

v. Repeat the process above on the same branch in several places, and on as many branches as possible to obtain the maximum yield of gum from the tree;

vi. Leave the tree for a recession period of 30 to 40 days. During this period, the plant oozes out some water sap (latex) that coagulates to form large waxy crystalline balls (fig. 8).

vii. It is advisable to tap on one side of the branch each year and alternate with the opposite side the following year to enhance sustained yield from the tree.

Note: that the best time to tap a tree for high output is about 9 a.m. in the morning and 5 p.m. in the evening.

Fig. 7a: Tip of tapping knife is placed against the bark.

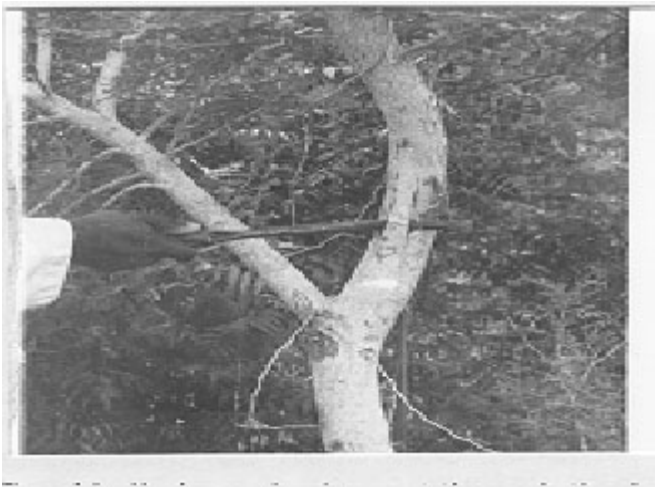

Fig. 7b: Tip of knife is pushed to cut through the bark.

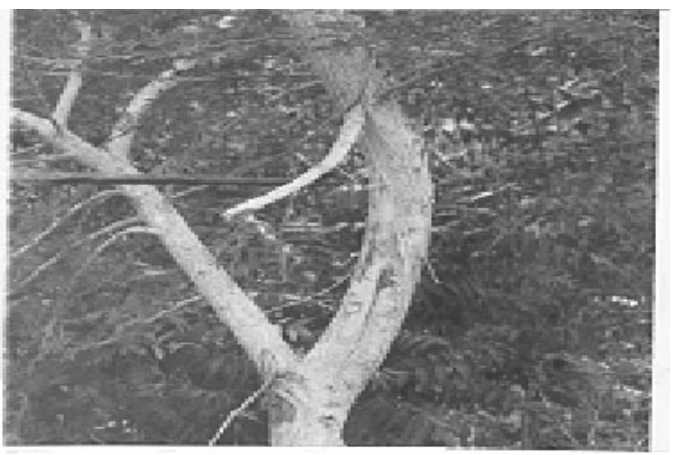

Fig. 7c: The hook portion of the knife is used to tear the bark vertically upward.

Acacia gum which exudes from natural cracks on the stem or any crack created by borers should be collected. Such gums are easily distinguishable from other gum as they are of the best quality being free of bark cuts during formal tapping.

Harvesting and Yield

The first harvest of the gum takes place 30 to 40 days after the tapping or slashing of the bark. The gum balls formed are picked many times during warm periods. Collection continues every one or two weeks, depending on the hardening state of the gum – until the on-set of the rain in June. Gum picking should be done in the morning as the gum tends to melt with the rise in temperature. During picking ensure that every gum particle is collected from the tree.

A gum arabic tree is capable of producing 400 – 600gm of gum per tapping season. So in a plantation of 5m x 5m spacing, an average yield of 200kg per hectare is expected.

Bagging

All gum for export must be packed in double ***Bagco*** type bags. The outer bag should be new and sound. Used bag may serve as inner bag, but it must be clean, dry and strong.

Fig. 8: Crystal balls of the gum arabic

Storage

Gum arabic should be in clean, cool dry place. It does not deteriorate due to long storage under such favorable condition. However, if stored where rain can affect it, the gum becomes hardened and darkened in colour, and this can affect its quality.

Marketing Outlets

The Overseas Buyers of Nigerian gum arabic are the United Kingdom, and U.S.A. Other buyers include China, Italy, Portugal, Holland, India,

Bangladesh, Australia, Sweden Germany and Japan. Nigerian gum arabic Merchants include Messrs. G. N. Memzer G.B. Olivant, Borno Marchants, Dangote Group companies, Mel Agro Export Ltd, U.A.C. and John Holt Companies. Efforts are being made in some States to collaborate with the Export Promotion Council to handle the purchasing and marketing of the commodity. Meanwhile there is a Gum Arabic Association of Nigeria that sees to the welfare of its members. The association is planning a steady market for the gum arabic farmers to encourage higher productivity.

However, ready help on export of quality gum arabic can be obtained from the office of the Nigerian Export Promotion Council (NEPC) nearest to you.

NEPC Offices in the country are:

Headquarters
Block 312 Kumba Street,
Zone 2, Wuse
P. M. 133,
Garki – Abuja.
Tel: 09-5230933,
5230981-3

Lagos Zonal Office
15 A A&B Oladipo Oluwole
Road,
P.M.B. 12776,
Apapa, Lagos.
Tel: 01-873816,
80320-4

Kano Zonal Office
No. 1 Zaria Road,
P. M. 3498,
Kano.

Tel: 064-66711

Jos Zonal Office
14, Langtang Street,
P.M.B. 2729,
Jos.

Tel: 073 – 57093.

Source of Gum Arabic Seedlings

State	Where obtainable
Adamawa	MANR Yola
Bauchi	MANR, Bauchi
Borno	MANR, Department of Forestry Wild Life, and Federal Department of Forestry Field Office Maidugiri
Gombe	MANR, Gombe
Jigawa	MANR, Dutse
Kano	MANR, Technology Training School, Kano
Katsina	MANR, Katsina
Kebbi	MANR, and Department of Afforestation Prog. Birnin Kebbi
Sokoto	MANR, and Department of Afforestation Prog. Sokoto
Yobe	MANR, Technology Training School Gashua, Rubber Research institute of Nigeria Substation on Research and Development of Gum arabic, Yobe.
Zamfara	MANR, Gusau

*MANR Stands for Ministry of Agriculture and Natural Resources.

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