

A REVIEW OF TAPPING TECHNIQUES OF GUM ARABIC (*ACACIA SENEGAL* (L) WILD) IN THE SAHEL REGION OF NORTH-EASTERN NIGERIA

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Abstract

Gum arabic tree is an important tree crop valued for its high quality gum. The gum has many uses and it is a foreign exchange spinner. It has attracted between NO.96 and NI.Ob per annum between 1968 and 1979. The gum is obtained from tree branches and stem as dry exudates when they are tapped. Three tapping techniques are discussed. Tapping increases gum yield five folds. During tapping, care is taken to protect the tree cambium layer from destruction so as to promote bark regeneration of tapped trees and consequently improve quality of gum yield.

Introduction

Gum arabic (*Acacia Senegal* (L) Wild), is an environmental protector with its pod, seeds and leaves serving as excellent browse and fodder for livestock (Aghughu et al., 2006). The crop is valued for its high quality gum adjudged best (FAO, 1995), which is used in confectionery products as emulsifier and to fix flavour. The gum is also useful in pharmaceutical industry, brewery, cosmetics, etc. It is a foreign exchange earner. For example, about US \$11.25m or between W0.96b - NI.Ob/annum was earned as average foreign exchange from gum arabic between 1968 and 1979, (Aghughu, 1998). As a result of this huge income, many farmers, middlemen as well as big merchants are more involved in this gum trade.

Also, the gum arabic tree being an environmental protector has extensive and network of root system holding soil particles together and protecting soil from being eroded and degraded (Aghughu et al., 2006). This tree could be planted as wood lot to generate wood as fuel for cooking, or as wind break or as a plantation crop to yield gum. The pods, seeds and leaves being excellent browse and fodder for livestock have high protein content (Scholte, 1992 and Gohl, 1981).

However, gum from Nigeria suffers discounting due to impurities associated with Nigerian gum. The gum is obtained as dry exudates from the branches and stem of *Acacia Senegal* when the plant is injured. Blunt (1926), reported that gum yield increased five fold if the tree was tapped as compared to natural exudation.

This paper relates our experiences at the Rubber Research Institute of Nigeria, Iyanomo near Benin City (RRIN) and focuses on tapping techniques and other practices that would enhance the quality of Nigerian gum sold at the international market.

The Gum Arabic Tree

The gum arabic tree is well described (Howes, 1949; Brenan, 1983; Keay, 1989).

It has erect, rigid and strong stems and can be up to 13m in height. It is commonly more than a shrub. The nodes and internodes are not very distinct. It has three short sharp spines with broad bases. The lateral pairs curve upwards while the central one curves downwards. It has low branching character. The bark is greyish. But a slash through the bark reveals a bright green, very thin under bark, mottled red and white beneath and fibrous oozing gum.

Problems Associated with the Tree

The gum arabic tree is very thorny and low branching. Self pruning is not known in this crop. Therefore, moderate pruning of lower branches must be carried out from the main stem up to 150cm above ground level to gain access to the stem for tapping. This must be completed during rains to allow for proper healing of the wounds to take place before the onset of dry season. This is both labour and capital intensive and serves as disincentive to the farmers. However, moderate pruning of matured or growing trees is invigorating as pruning allows more of the tree's energy to be channeled into foliage and shoot production (Pirone et al, 1988). Aghughu et al, (2005) reported that the consequences of pruning in gum arabic are the increase in girth size of the main stem and the few remaining branches. This may lead to increase in gum cell formation in both the stem and branches, hence increased gum yield when tapped.

Tapping

Tapping of *Acacia Senegal* for gum depends on "tappable girth" (Aghughu et al, 2005). "Tappable

girth" size depends on the age and most often, on the vigorous rate of growth of the plant. Tappable girth size in gum arabic lies between 25cm and 50cm at about 100cm above ground level (Aghughu, 2001). The average age of tapped tree is five years (Yakasshi, 1998).

Time of Tapping

The actual signal for tapping after the rains are over is when about 50% of the leaves are shed when the trees is shaken. This continues up to the first rains in the next year being approximately from October in one year till May in the next year. Statistics have shown that the rains are local i.e. the trees may be green in one area whereas in others the leaves may be off. Therefore, leaves shedding is an important indicator for tapping.

Temperature for Tapping

The temperature has a considerable influence on tapping. If the weather is hot directly after the rains, the leaves will wilt leading to leaves shedding and tapping. However, the temperature is also local. If the weather is cold, the leaves are not shed. This will delay time of tapping.

Exploitation Techniques

1. Natural Exudation: This method predates organized plantation establishment and collection of gum was from the wild grooves. In this method, the farmers wait patiently for gum to exude naturally from cracks on the stem and branches of the tree before collection. There is therefore no reference to age of trees on which gum can be collected. These cracks may be created by longicorn beetles, stem borers (which attack trees), snapped branches or stem due to wind damage or any other means on the tree. This method does not yield large quantities of gum as it is not determined by the farmers. The other disadvantage is that, such trees that exude gum during the season are prone to damage by the insects in addition to white ants which subsequently lead to the death of the trees.

2. Use of Small Axe: This method came into force when the need for more gum from the tree arose; It started at about 1896, in the Sudan and 1899, in Nigeria (Howes, 1949). In this method a small axe with a short wooden handle is used to peel off a sizeable bark of the tree. The amount of demarking is not regulated as it was believed that the larger the peeled bark, the more gum that would exude. However, it was reported by Blunt (1926), although the data is not available, that this method increased gum yield five folds over the natural exudation from cracks. Although there was a reported five fold gum collection over the natural exudation, there are a number of disadvantages associated with this method. For example, a lot of damage is done to the wood of the tree and bark regeneration is very slow if it does take place. This is because; the regenerating cambium layer of the bark was removed during the tapping (debarking). It exposes the trees to fire hazards which are prevalent during the gum season. Insects such as stem borers, longicorn, beetles and white ants easily attack the exposed 'unhealed' tapped trees before the next gum season. This is particularly so for years with little or no rain when 'healing' of wounds is disturbed.

3. Use of Tapping Knife: With more knowledge on the botany of the crop, tapping is done on the stem and branches Of tree that is on the average five years and above with a tapping knife. The knife is a sickle - like instrument mounted on a wooden shaft, used to remove the bark in such a way that the regenerating cambium layer is not removed. From 19 *Acacia Senegal* provenance trial experiments conducted in RRIN, Omokhafa and Aghughu (2005), reported that bark thickness ranges from 0.44cm - 0.58cm with a mean of 0.51cm. Therefore, during tapping, careful removal of about 0.43cm of bark will allow for gum flow and prevent cambium layer destruction. This ensures that the mottled red bark layer which changes the colour of the gum into mottled red is removed. This colour acts as impurity to gum and enhances discounting at the gum market.

There is dearth of information on the length of bark to be removed during tapping. However, from experience, a strip of about 3cm in width and 30cm in length is ideal. This is because wound healing is faster in smaller strips than in larger ones. There is also dearth of information on the angle of cut, number of strips to be removed/plant and direction of debarking.

Preliminary results from 19- provenance of *Acacia Senegal* trial at RRIN experimental station indicate that no particular angle or direction is preferred as long as the debarking can cut through as many gum cells as possible. The results also indicate that more gum exuded from the stem than the branches. The

number of strips to be removed at any particular tapping could be as few as three depending on the overall size of the tree. In some cases, the number may be increased to about five with increased plant size and with the consideration that fewer "bark wounds" may regenerate faster than large bark wounds.

Gum Exudation

If the weather has been hot after the tapping, the gum starts exuding almost at once, but very slowly and mostly during the hottest time of the day. After about 15-25 days, the exudate may be 'hard' enough to allow for collection. Conversely, if the weather is cold after the tapping, the gum does not exude well. This will affect the effective days of waiting to collect the gum. If the weather is very cold for some time after tapping, the wound dries up and no gum exudes, making it necessary to tap a second time. On exudation in the heat, the gum crystallizes and usually forms large crystals and does not fall to the ground. The reported yield range of gum arabic is between 94.5g/tree and 634.5g/tree in Sudan, whereas in Nigeria a preliminary yield result obtained in our experimental trial ranged between 17.4g/tree and 77.6g/tree for some unselected provenance materials,

Gum Collection

Gum collection is an important aspect that can enhance the quality of garri, free from sand particles, tree bark and dead leaves. Well dried gum must be collected from the tree stem and branches with clean hands or wooden device with long handle in cases of taller trees and branches. These are kept in clean dry bowls. After the first collection, other collections can be in every ten days till the end of the gum season. Gum should not be allowed to drop from the harvester to the ground so as to prevent contamination with sand particles and other impurities. This is particularly so for gum crystals that are not well dried. It may be noted that the ecological zone that supports growth of gum arabic has little or no vegetation during gum season. Also the area is swept by powerful North - East harmattan wind during this period. This could blow up sand particles that may stick to wet gum surfaces on the tree bark and is a source of contamination of farm gate gum which the farmer can do little or nothing about. Although women may not take part in tapping, they usually assist in collection of gum. This gum collection can provide employment for our rural women. One other problem with gum collection is the fact that camels, cattle and other small ruminants feed on this gum while on the tree, thereby depriving the plantation owners the desired revenue. This is in addition to other local thieves who pilfer on the gum in the plantation. Usually watch day/guards are employed to curtail this ugly trend.

Low Gum Collection in Nigeria

There is a low gum collection in Nigeria as compared to the Sudan. The reasons are that average inhabitants in Nigeria are better off than their Sudanese counterparts. Nigerians are more occupied with other things such as taking care of their livestock, hides, etc and very poor prices for gum in Nigeria. In both countries, poor harvest resulting from crop failure in any cropping season leads more people to tap and collect gum to earn money. Similarly, if the harvest is rich, farmers will pay less attention to tapping hence there will be poor collection particularly due to the thorny nature and low branching habit of the tree.

Grading and Sale

Gum is collected, cleaned, graded and then taken to the market for sale.

Conclusion

Tapping increases gum yields five folds. Precautionary measures outlined such as debarking about 0.43cm of any tapped stem or branch will protect cambium layer destruction and promote bark regeneration. This will ensure tree survival for the next gum season. The other measure of tapping tree of an average age of five years and above will prevent a situation where tapped trees in one gum season becomes moribund by the next season. Gum quality will also be enhanced if tapping is properly done to avoid colouration of the gum, and well dried gum free from sand particles and other debris are collected. The use of tapping knife is therefore, preferred to the other two methods as it takes into account the safety of the tapped trees and the quality of the gum.

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