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Effect of different tapping tools and different tapping positions on 'talh gum' yield of *Acacia seyal* var. *seyal* in South Kordofan, Sudan

Kamal E. M. Fadl[1] and Jens Gebauer[2]

[1]Agricultural Research Corporation, El Obeid Research Station, P.O. Box 429, El Obeid, Sudan
[2]Agricultural Research Corporation, Gezira Research Station, P.O. Box 126, Wad Medani, Sudan,
E-mail: j_gebauer2000@yahoo.de (corresponding author)

Abstract

Acacia seyal var. *seyal* (talh) is a gum-yielding tree found in the savanna belt of the Sudan. In some areas of Kordofan, the gum is collected from natural exudation of the stem and the branches. However, no information is available about the tapping possibilities of *A. seyal* var. *seyal* for gum production. Therefore, two experiments were conducted at Umfakarin forest reserve (South Kordofan) to investigate the effect of different tapping tools (makmak, axe, mofar and sonkey) and tapping positions (low stem, middle stem, high stem and branches) on talh gum yield of *A. seyal* var. *seyal.* Both experimental designs adopted were randomised complete block designs with three replications. Trees were tapped on the 1st of November, and gum was collected four times (1st Dec., 1st Jan., 1st Feb. and 1st March). The results of the first experiment clearly indicate that the makmak is the best tapping tool. The total gum yield was 428 g/tree. In the second experiment, the middle stem tapping caused the highest gum yield with a total yield of 275 g/tree. The results indicate that tapping of *A. seyal* var. *seyal* is a promising technique for talh gum production.

Key words: agroforestry, livelihood, multipurpose trees, non-wood forest products, NWFPs, rural communities

Introduction

A. seyal var. *seyal* is a typical tree of African semiarid zones (Von Meydell 1990). In Sudan it is the most widespread *Acacia* species and mainly found in grass and woodland savannas (El Amin 1990). It is adapted to survive under harsh environmental conditions such as low and erratic rainfall, intense solar radiation and high

wind velocity and is a sustainable agrosilvopastoral component (Bukhari 1998). The specie is an important multipurpose tree for the rural population providing building material, fibre, fodder, fuelwood, gum, medicine, shade and timber (Wickens et al. 1995).

Worldwide, trees are found which produce useful plant exudates such as gum, resins or oleoresins (Ankarfjärd and Kegl 1998, Bhattacharya et al. 2003, Jantan et al. 1991). However, Sudan is the world's biggest producer of gum arabic, which is also the main source of gum in international trade (Coppen 1995). Of the 36 varieties of gum producing *Acacias* found in the Sudan, the major producers of marketable gum are *A. senegal* (hashab gum) and *A. seyal* (talh gum; Jamal and Huntsinger 1993). Within Sudan, gum from the Kordofan region has the highest reputation. Importing countries often refer to Kordofan gum when indicating their preferences (El Din and Zarroug 1996). In spite of increasing demand, the proportion of talh gum on the whole production of gum arabic is less then 10% (Gebauer 2004, personal communications with the Warm Seas Ltd. in El Obeid).

In some areas of Kordofan, talh gum is collected by the local people and sold on the market. The gum is obtained from natural exudation on the stems and the branches of the trees (El Din and Zarroug 1996). To our knowledge, no information is available about the tapping possibilities of *A. seyal* var. *seyal.* Therefore, two experiments were conducted to investigate the effect of different tapping tools and tapping positions on gum yield of *A. seyal* var. *seyal.*

Species Description

A. seyal var. *seyal* is locally known as talh and belongs to the family Mimosaceae. Under favourable conditions, the small to medium-sized tree reaches a height of 17 m, has a stem diameter of 60 cm, and develops a characteristic umbrella-shaped crown. The bright green bark is covered with either a pale grey-green or rust-red powdery coat. Twigs have paired, up to 7 cm long, straight pointed, and light grey thorns. The dark green leaves have 4 to 12 pairs of pinnae and 10 to 22 pairs of leaflets. Flowers have shiny yellow globose heads. Two or three are together at the leaf axils. Pods are slightly curved, light brown at maturation, and 10 to 15 cm long. The slash is bright red, mottled and exudes a yellowish gum. Further information about the talh tree has been completed by Hall and McAllan (1993).

Material and Methods

The study was conducted at Umfakarin forest reserve (latitude 12º 30' N, longitude 31º 15' E) in South Kordofan. The site is situated in the gum belt of Sudan. The forest reserve is characterised by loamy sand. The mean annual precipitation in this area ranges from 400 to 600 mm.

Two experiments were conducted at the forest reserve. In the first experiment, the four different tapping tools makmak, axe, mofar and sonkey were used (figure 1). All trees were tapped at the middle stem position.

Fig. 1: Makmak, axe, mohfar, and sonkey (from left to right).

In the second experiment, the trees were tapped on four different positions (low stem: 50 cm, middle stem: 150 cm, high stem: 200 cm and three branches) using the makmak. The yield of each tree in both experiments was determined by weighing the gum directly after every collection with a sensitive balance.

Both experimental designs adopted were randomised complete block designs with three replications. Each block was divided into four sub-plots, and each sub-plot represented an experimental unit. Unit size was 10 x 10 m with an average of five trees (500 trees/ha). The average tree age was 25 years. In both experiments trees were tapped on the 1st of November, and gum was collected four times (1st Dec., 1st Jan., 1st Feb. and 1st March).

Data were analysed by using the *MSTAT-C statistical package* (version 2.10) developed by Michigan State University. For the parameters showing significant differences, the means were compared by the least significant differences (LSD at 0.05).

Results

The removal of bark to expose the wood surface stimulated gum excretion on *A. seyal* var. *seyal* in both experiments. The results of the first experiment clearly show that the tapping tool had a great influence on the amount of talh gum production of *A. seyal* var. *seyal* (table 1). Over the season the trees produced the most gum when they were tapped with the makmak and the lowest when tapped with the sonkey. In comparison to trees tapped with makmak, trees tapped with axe, mohfar or sonkey produced 58, 59, 75% less gum, respectively. Yields per season expressed in kg/ha are shown in figure 2.

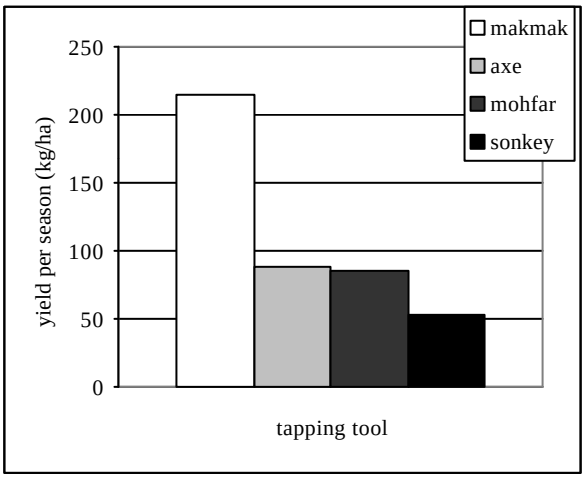

Fig. 2: Effect of different tapping tools on the average talh gum yield of *A. seyal* var. *seyal.*

Table 1: Influence of tapping tool and tapping position on the average 'talh gum' yield of *A. seyal* var. *seyal.*

	Yield per picking (g/tree)				Yield per season (g/tree)
	Dec.	Jan.	Feb.	March	
Tool					
Makmak	144.84a	130.70a	132.02a	20.88a	428.44
Axe	55.64b	40.66b	35.68b	45.17b	177.15
Mohfar	44.42bc	40.78b	25.77b	58.64b	169.61
Sonkey	29.83c	23.61c	21.37b	30.16a	104.97
Position					
Low stem	66.86a	52.18a	28.60ab	56.36ab	204.00
Middle stem	84.55b	98.42b	31.78a	60.76a	275.51
High stem	31.08c	35.36a	18.96c	32.45c	117.85
Branches	66.78a	37.08a	22.14b	36.04b	162.04

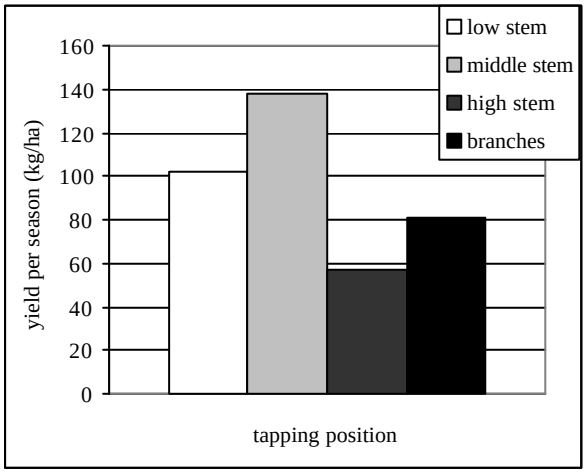

Fig. 3: Effect of different tapping positions on the average 'talh gum' yield of *A. seyal* var. *seyal.*

In the second experiment, the different tapping positions on *A. seyal* var. *seyal* lead to different gum yields (table 1). The middle stem tapping caused the highest gum secretion with a total yield of 275 g/tree. With the low stem tapping, the high stem tapping and the branch tapping the gum yield was reduced by 26, 57 and 41%, respectively. Yields per season expressed in kg/ha are shown in figure 3. In both experiments there were variations in the amount of gum secretion from different trees within the treatments.

Discussion

The experiments clearly show the possibility of talh gum production by tapping *A. seyal* var. *seyal.* The use of four different tapping tools in the first experiment indicates that the makmak was the best tapping tool for high gum

production. The reasons can be seen in the wide edge on the top of the tool (figure 1), which allows one to remove a big piece of the bark. The lowest gum yield was obtained from trees which were tapped with the sonkey. The sonkey was originally developed by the Agricultural Research Corporation in Sudan for tapping *A. senegal.* Today it is commonly used by tappers in Kordofan for hashab gum production. However, due to the different bark of *A. seyal* var. *seyal* compared to *A. senegal*, the sonkey is not suitable for tapping *A. seyal* var. *seyal.*

In the second experiment, the middle stem tapping caused the highest gum exudation. It also was a suitable height for easy gum collection. Tapping the branches gave the lowest gum yield per tree and is not recommended for talh gum production. In contrast, *A. senegal* is often tapped on its branches due to the small tree size and its highly branched stem. Reasons for the monthly variation in gum production in both experiments can be seen in the different metabolic activities of the trees during the season (Harsh et al. 2003).

The present investigations are the first record on tapping *A. seyal* var. *seyal* and will serve as an impetus for further research in the extraction of talh gum. Some other aspects of the studies which should be looked into are:

- the influence of time and intensity of tapping
- the effect of tree age and size
- the effect of different edapho-climatic conditions
- the influence of understory crop production
- the use of chemical stimulants such as sulphuric acid

If tapping of *A. seyal* var. *seyal* for gum production can be successfully implemented in Kordofan, it could provide an additional income for the sedentary agriculturist population, especially in the dry season when agricultural crop production is difficult. However, talh gum production on a sustainable level is important to avoid serious stress to the trees due to overexploitation.

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References

Ankarfjärd R. and Kegl M. (1998): Tapping oleoresin from *Dipterocarpus alatus* (Dipterocarpaceae) in a Lao Village. Economic Botany 52, 7-14.

Bhattacharya P., Joshi B. and Hayat S. F. (2003): An improved method of tapping gum from Kullu *Sterculia urens*. Forests, Trees and Livelihoods 13, 187-196.

Bukhari Y. M. (1998): Tree-root influence on soil physical conditions, seedling establishment and natural thinning of *Acacia seyal* var. *seyal* on clays of Central Sudan. Agroforestry Systems 42, 33-43.

Coppen J. J. W. (1995): Gums, resins and latexes of plant origin. FAO Non-Wood Forest Products, number 6, Italy.

El Amin H. M. (1990): Trees and Shrubs of the Sudan. Ithaca Press, UK.

El Din A. G. S. and Zarroug (1996): Production and commercialization of gum arabic in Sudan. In: Domestication and commercialisation of non-timber forest products in agroforestry systems, FAO Non-Wood Forest Products, number 9, Edited by Leakey R. R. B., Temu A. B., Melnyk M. and Vantomme P., Italy.

Hall J. B. and McAllan A. (1993): *Acacia seyal*: a Monograph. School of Agricultural and Forest Sciences, University of Wales, Bangor, AB Academic Publishers, UK.

Harsh L. N., Khan H. A., Bohra M. D. and Tewari J. C. (2003): Growth performance and gum production of *Acacia senegal* in different land forms in hot arid zone of India. Journal of Non-Timber Forest Products 10, 1-7.

Jamal A. and Huntsinger L. (1993): Deterioration of a sustainable agro-silvo-pastoral system in the Sudan: the gum gardens of Kordofan. Agroforestry Systems 23, 23-38.

Jantan I., Ahmad A. S. and Ahmad A. R. (1991): Tapping of oleo-resin form *Dipterocarpus kerrii*. Journal of Tropical Forest Science 3, 348-355.

Von Meydell H.-J. (1990): Trees and Shrubs of the Sahel: Their Characteristics and Uses. Verlag Josef Margraf, Germany.

Wickens G. E., Seif-El-Din A. G., Sita G. and Nahal I. (1995): Role of *Acacia* species in the rural economy of dry Africa and the Near East. FAO Conservation Guide, number 27, Italy.