

Influence of tapping dates and tapping directions on “*talih*” gum yield from *Acacia seyal* Del. var. *seyal*. in the Blue Nile State, Sudan

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ABSTRACT

Acacia seyal Del. var. *seyal* is an important multipurpose tree in the savanna zone of Blue Nile State. The tree produces “*talih*” gum, which is collected from the natural exudation. However, a little information is available about the tapping possibility of the tree. The objectives of the study were to determine the effect of tapping dates and tapping directions on *Acacia seyal* Del var. *seyal* “*talih*” gum yield. Therefore, a randomized complete block design was used, three tapping dates (1st November, 15th November and 1st December). Three treatments or directions of tapping were selected, the first direction (East-West), the second direction (North-South), and the third in all direction of tree circumference of stem as control. Diameter of tapped trees was >15 cm, 14 to 15 incisions were done per tree, the space between the incisions was 20 to 25 cm, axe was used for tapping. The results revealed that there were a significant differences between the means of gum yield at the first dates of tapping 1st November and the other two dates of tapping (15th November and 1st December), and also there were a significant differences between the means of gum yield at the directions of tapping, first direction of tapping (East-West) ranked a higher gum yield compared to the other two directions of tapping (North-South) and control.

Keywords: Tapping, *Acacia seyal*, “*talih*” gum, natural exudates, incisions.

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INTRODUCTION

Acacia seyal Del. var. *seyal* is locally known as “*talih*” (red “*talih*”), the tree is up to 9 m tall, sometimes reaching 17 m, and belongs to the family Mimosaceae, growing naturally in the clay plains in central and eastern Sudan; it is extensively managed for firewood and charcoal production in order to meet energy requirements (Vink, 1990). The species grows in areas where the annual rainfall ranges from 400 to 1000 mm and flourishes along seasonal water courses in areas where annual rainfall is less than 400 mm (Badi et al., 1989; Vogt, 1995).

The species is an important multipurpose tree for the rural population providing building material, fiber, fodder, fuel wood, gum, medicine, shade and timber (Wickens et al., 1995).

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 *Acacia senegal* (“*hashab*” gum) and *Acacia seyal* (“*talih*” gum) (Jamal and Huntsinger, 1993).

“*Talih*” gum is the dried natural exudate obtained from trees of *Acacia seyal* Del var. *seyal*. In Sudan, “*talih*” gum contributes to about 10% of the total gum production, and the mean annual production is about 3739 tons per year and between 3000 to 5000 tons are exported annually (GAC, 2007). Although gum from *Acacia seyal* is not quite as good as gum arabic from *Acacia senegal* (“*Hashab*”), it is still very useful and has many traditional and industrial uses and export potential (Hall and McAllan, 1993; FAO, 1995). Thus, the price of “*talih*” gum is about 33% that of gum arabic from *A. senegal* (Iqbal,

1993). Although, the species is reported to produce a significant amount of natural exudates “*talih*” gum, little information is known about the potential of the species to produce gum under different tapping dates and directions of tapping. Moreover, the amount of gum yields per tree per season is not known.

Blue Nile State is located in the south-eastern part of the Sudan, between Lat. 9° 30' to 12° 30' N, and Long. 33° 5' to 35° 3' E. The total area is about 38500 square km. It is characterized by mountain series of which *Ingassana* is the main geographical feature which extends about 72 km (BNSI, 2004).

The study experimental site was located in the Blue Nile State near Ed Damazin town (34° 23', 11°47', 470 m above sea level), The climate at the trial site is semi-arid with a mean annual rainfall (May to October) of 736 mm. The mean annual temperature is 28.1°C, and the length of the growing season for main agricultural crops is 82 days. The soil consists of dark cracking clay (Vertisol) which extends to at least 15 m in depth (Raddad, 2006). The natural vegetation is woodland savanna dominated by *Acacia seyal*, *A. polyacantha* Willd. *A. senegal*, *Balanites aegyptiaca* (L.) Del., *Combretum* spp., and *Dichrostachys cinerea* (L.) Wight & Arn. as characteristic tree species (Elamin, 1990).

The general objective of this study was to make available silvicultural and management tools for better understanding of using it for optimum and sustainable production of “*talih gum*”, and the specific objectives were to determine the effect of tapping dates and tapping directions on *Acacia seyal* Del var. *seyal* “*talih*” gum yield.

MATERIALS AND METHODS

Experiment was conducted at two seasons (2013 to 2014) and (2014 to 2015), the experimental materials were factorial combinations, a randomized complete blocks design was used, with four replications, three tapping dates after stooped of rainfall, 1st November, 15th November and 1st December, three treatments or directions of tapping were selected, the first direction (East-West), the second direction (North-South), and the third in all directions of tree (circumference of stem) as control. Diameter of tapped trees was >15 cm, tapping level of trees started >0.5 0 to 1.50 m (tapped stem diameter), 14 to 16 incisions were done per tree, the space between the incisions was 20 to 25 cm, axe was used for tapping. Numbers of trees should be fixed on one replication were 27 trees; the total trees for experiments were 108 trees (3 tapping dates × 3 tapping directions × 4 replications × 3 trees). Collection of gum was started after 45 days from incisions done with interval periods of 20 to 25 days between the pickings.

Data was analyzed using the MSTATC statistical program. The means were separated according to LSD.

RESULTS

Influence of tapping date on gum yield

Results showed a significant difference between the

means of gum yield in the first tapping date (1st November) and the other two tapping dates (15th November to 1st December). The average of gum yield per tree in the first tapping date (1st November) in the first season was 421 g per tree, while the other two tapping dates gave an average gum yield per tree of about 340 and 298 g per tree, respectively (Figure 1 and Table 1).

In the second season also there were a significant differences between the means of gum yield in the three dates of tapping, and the first date (1st November) gave a higher average gum yield per tree amounting to 667.5 g per tree, while the other two dates of tapping (15th November to 1st December) gave an average gum yield 609.8 and 541.6 g per tree, respectively (Figure 1 and Table 2).

Gum yield in relation to directions of tapping

There was a highly significant difference between the means of gum yield in the three treatments (directions), trees that were tapped on the direction (East–West) rank higher gum yield as compared to the other remaining treatments followed by treatment (North-South and the control). That was also true in the second season. The means gum yield in relation to the first direction (East–West) of tapping was 386 to 724.3 g per tree at the two seasons respectively, while the other two directions (North-South and control) gave an average gum yield 296 to 507.9 g and 372 to 586.9 g per tree at the two seasons, respectively (Figure 2, Tables 3 and 4).

A significant difference was recorded between the means of gum yield g/tree in the picking in the three tapping dates and also in the three tapping direction over the two seasons. The data suggest that these gum pickings seem to be used as a measure for the prediction of total gum yield in the subsequent years (Tables 1, 2, 3 and 4).

DISCUSSION

According to this study the maximum average of gum yield was 724.3 g per tree per season, which was obtained by tapped trees in the second season at East-West direction; this average was higher compared to the data obtained by Fadl and Gebauer (2004) reported an average of 428.44 g/tree per year.

Tapping in 1st November rank a higher average gum yield, this result corresponding to Ali (2006) reports for trees that were tapped on the first day of November ranked a higher average gum yield. This indicates that the yield of “*talih*” gum is influenced by tapping date. However, Fadl and Gebauer (2004) investigated the effect of tapping tools on the productivity of “*talih*” gum and revealed that tapping had a positive influence on gum yields.

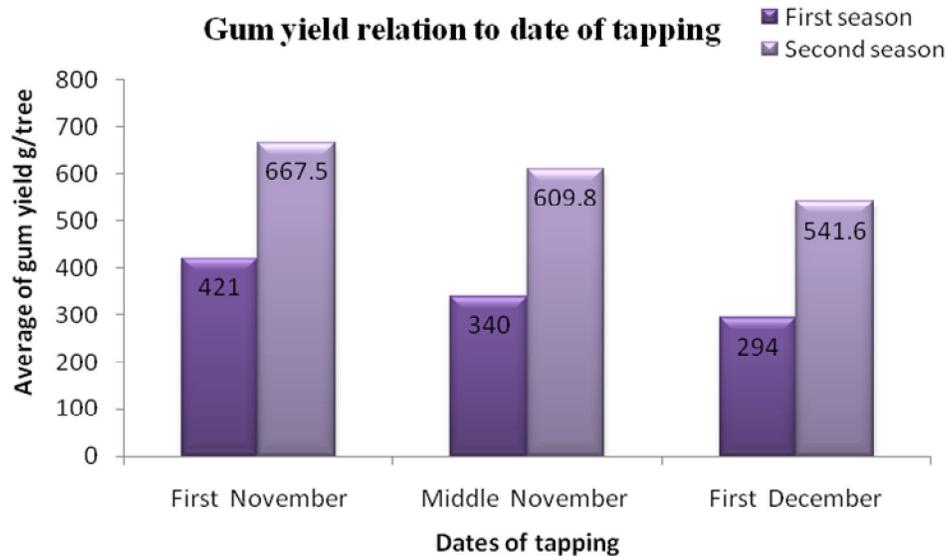


Figure 1. Effect of tapping dates on gum yield (g/tree) of *Acacia seyal* Del var *seyal* in the Blue Nile, State, (seasons 2013/2014 and 2014/2015).

Table 1. Influence of tapping dates on gum yield (g/ tree) of *Acacia seyal* Del var *seyal*. First season 2013/2014.

Date of tapping	Picking						Total/g/tree
	1	2	3	4	5	6	
1/11	137	110	49	49	28	48	421
15/11	70	85	47	40	29	69	340
1/12	90	83	29	29	24	39	294
SE ±	9	7	4	3	2	4	
Sign	***	*	**	***	Ns	***	

Ns: no significant difference at $p < 0.05$.

Table 2. Influence of tapping dates on gum yield (g/ tree) of *Acacia seyal* Del var *seyal*. Second season 2014/2015.

Date of tapping	Picking						Total/g/tree
	1	2	3	4	5	6	
1/11	171.9	199.4	106.5	58.5	64.9	66.3	667.5
15/11	157.6	148.0	114.4	58.3	70.1	61.4	609.8
1/12	109.9	128.7	82.2	98.4	69.3	53.1	541.6
SE ±	13.2	13.9	9	6.7	4.4	5.5	
Sign	**	**	*	***	**	Ns	

Ns: no significant difference at $p > 0.05$.

Kamal et al. (2004) investigated the effect of tapping tools and different tapping positions on “*talih*” gum yield and reported average of 428 and 275 g/tree for *Makmak* (one of tapping tools) and tapping in middle stem of tree respectively.

Tapping of the tree in relation to directions showed significant results. Tapping the tree in the East-West

direction gave a high gum yield compared to the other two tapping directions, that is, North-South and tapping in all directions (control). The high yield in the East-West direction could be attributed to the effect of sun light which seems to boost the temperature at the side of the incisions. Sunlight enhances gum arabic exudation process and affects the purity of gum (Adam et al., 2009).

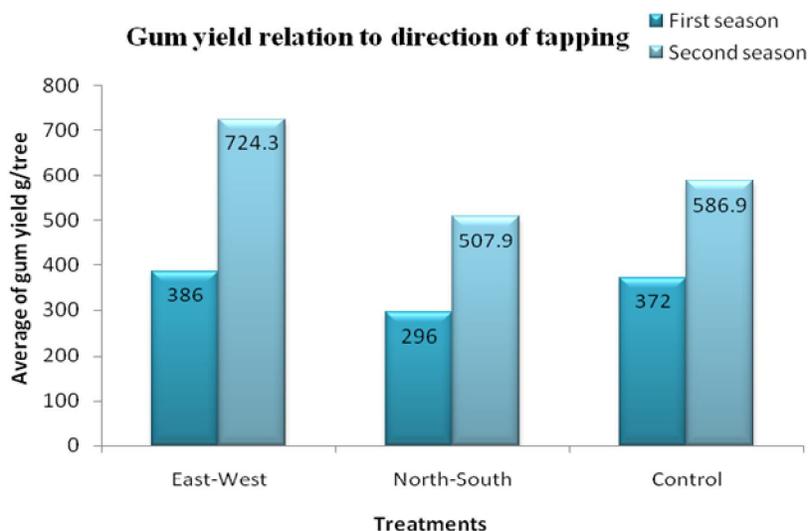


Figure 2. Effect of tapping directions on gum yield (g/tree) of *Acacia seyal* Del var *seyal* in the Blue Nile State (seasons 2013/2014 and 2014/2015).

Table 3. Influence of tapping direction on gum yield (g/ tree) of *Acacia seyal* Del var *seyal*. First season 2013/2014.

Direction of tapping	Picking						Total/g/tree
	1	2	3	4	5	6	
East-West	106	106	43	41	30	60	386
North-South	85	78	35	35	19	44	296
Control	106	94	47	41	32	52	372
SE ±	9	7	4	3	2	4	
Sign	Ns	*	Ns	Ns	***	*	

Ns: no significant difference at $p > 0.05$.

Table 4. Influence of tapping direction on gum yield (g/ tree) of *Acacia seyal* Del var *seyal*. Second season 2014/2015.

Direction of tapping	Picking						Total/g/tree
	1	2	3	4	5	6	
East-West	176.2	181.2	127.0	82.7	80.8	76.4	724.3
North-South	113.8	130.9	83.3	67.7	63.9	48.3	507.9
Control	149.8	163.8	92.8	64.9	59.6	56.0	586.9
SE ±	13.2	13.9	9	6.7	4.4	5.5	
Sign	*	Ns	**	Ns	Ns	**	

Ns: no significant difference at $p < 0.05$. *significant difference $p < 0.05$, **high significant difference $p < 0.005$, ***very high significant difference $p < 0.0002$.

The reduction in “*talih*” gum yield due to tapping direction could be related to the effect of sunlight which increases the temperature in the morning and later in the afternoon on east and west sides, respectively. That would probably have increased the yield positively (Adam et al., 2009).

In this study, gum yield process in *A. seyal* seems to be highly affected by the date of tapping. Early tapping after the rains stopped had strong effect on “*talih*” gum yield;

this result corresponds to Ali (2006) and Gessmalla (2011), in *Bosweellia papyrifera* resin yield and also in tapping direction.

Conclusions

1. Tapping in 1st November resulted in a high gum yield when compared to tapping in 15th November and 1st

December. Therefore, tapping of *Acacia seyal* Del var *seyal* in early November is recommended to obtain high gum yield.

2. The direction of tapping showed a significant positive impact on gum yield and especially tapping towards sunlight (East and West) directions. It is therefore recommended to obtain high gum yield.

3. There is a significant difference between the gum yield (g/tree) in the picking of the three tapping dates and also in the three tapping directions over the two seasons. The data suggest that these gum picking seem to be used as a measure for the prediction of total gum yield in the subsequent years.

4. The study recommends that local communities should be aware of the valuable services and benefits of *Acacia seyal* Del var *seyal*.

5. Extra silvicultural and management efforts should be directed towards protection of the tree and regulation of tapping for sustainable production of gum in the future.

6. Further researches are needed to estimate the yield of gum per tree, per unit area using other parameters with tapping dates such as height classes of tree and/or girth and the total production of the Blue Nile State.

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