



INFLUENCE OF TAPPING DATES ON THE YIELD OF *ACACIA SENEGAL* (L) WILD AT TWO DIFFERENT LOCATIONS IN JIGAWA STATE, NIGERIA

*¹Ilu, K. J., ¹Salami, K. D., ¹Mohammed, K. Y., ³Jahun, B. M. and ²Aujara, Y. I.

¹Department of Forestry and Wildlife Management, Federal University Dutse, Jigawa State, Nigeria

²Binyaminu Usman Polytechnic, Hadejia, Jigawa State, Nigeria

³Jahun Model Primary School, Jigawa State, Nigeria

Corresponding authors' email: foristsalam@yahoo.com, ilukawuwa@gmail.com, +2348178584783

ABSTRACT

Knowledge of tapping date is inevitable and it assists foresters and farmers (tappers) to know yield dates of tree resources. This enables tappers to have better plan and spend less during harvesting period. This study examined the influence of tapping date on the yield of gum Arabic (*Acacia senegal*) in Jigawa State, Nigeria. Experimental sites which were (Kadoma and Kwanar-duhuwam plantation) were selected for this study. Complete Randomized Design (CRD) was employed with three (3) samples, examined at six (6) levels in six different tapping periods. Data were subjected to Analysis of Variance (ANOVA) at 0.05 probability level and Duncan Multiple Range Test was used to separate the mean yields of gum Arabic gram per tree. From the results, it was revealed that gum Arabic tapping at the three weeks of rain stoppage gave higher yield (172.25 and 163.9). Therefore, it is concluded that gum Arabic trees at three (3) weeks after rain stoppage for maximum gum yield.

Keywords: *Acacia senegal*, Tapping date, Locations, Yield and Farmers.

INTRODUCTION

The term gum Arabic (*Acacia senegal*) is used with varying definitions by different groups of people. It acquired its name because the early traders were Arabs (Maydell, 1991). In the context of its use as a food additive, the most current international specification published by FAO (1995), describe gum Arabic as the “dried exudation obtained from the stems and branches of *Acacia senegal* L. (Wild) or closely related species. This important plant is naturally well adapted to the semi-arid zones of Sudan and Sahel regions (Odo, 2003). Okatahi (1999) studied the characteristics and reported that the average minimum and maximum temperature that make *Acacia* tree thrive are 14°C and 40°C, respectively. Such regions with these temperatures are generally characterized by low rainfall, which support moderately tall plants that produce large quantity of gum exudate while high rainfall and high humidity support taller trees that yield very little amount of gum. The plant is adapted to various soil types ranging from sandy loam to clay loam soil (Jibo *et al.*, 2018). *Acacia senegal* performs best when soil is well drained. It belongs to the plant family Fabaceae (Jibo *et al.*, 2018). In Nigeria, high concentrations of cultivated and natural stands of grade one gum Arabic are predominantly found in the north-eastern states (Borno and Yobe State) around latitude 10° 30' N and above (Fakuta *et al.*, 2013). The production of gum Arabic within Nigeria is largely obtained from wild trees (Umar and Samuel, 2009) and not much effort has been made for the

genetic conservation of the species despite the fact that it is a source of livelihood for many people in areas where it grows naturally. A distinct short season rainfall (3 to 4 months) and a prolonged dry season (8 to 9 months) yield greater gum exudate. Locations with prolonged rainfall are unsuitable because gum tapping is best done during dry season. Jibo *et al.* (2018), revealed that the tree takes 5 to 7 years before it can produce gum Arabic and 15 to 20 years for its productivity to start declining. *Acacia senegal* trees are tapped in three weeks of rain stoppage by removing pieces of bark to form wounds on the trunk, and in December and January in the wetted clay zones (Policy note, 2007). The plant is naturally adapted to the harsh arid environment where other plants could fail to thrive. There is inadequate knowledge on the right time of tapping gum Arabic tree for highest gum production, thus these research is intended to serve as a reference in assisting gum Arabic farmers to make the best out of their investment. The objective of this study is to understand the influence of tapping dates on the yield of *Acacia Senegal* (L) Wild at two different locations in Jigawa State, Nigeria

MATERIALS AND METHODS

Description of the study area

The investigation was carried out in two locations (Kadoma and Kwanar-duhuwa) plantation which were purposively selected.

Kadoma Plantation

Kadoma village which is three (3) km from Jahun town, the plantation which covers 20.63 hectares was established in 2003 with the spacing distances of 4x4m. The coordinate of the plantation is placed at Latitude 12°06' N and Longitude 09° 39' E with altitude of 372m. Soil type of the area is sandy loamy and clay and the mean annual rainfall varies from 250.7 to 1001.1mm while temperature is between 17.57°C and 37.13°C respectively (JSSYB, 2008).

Kwanar-duhuwa plantation

The plantation covers up to 83.26ha was established in the year 2004 at a 4x4m spacing distance. The coordinate of the site is Latitude 12° 34' N, Longitude 09° 24' E while maintain altitude of 374m. The soil is loamy sand while the mean annual rainfall varies from 336.8mm to 890.5mm. The plantation is six (6) km from Gumel town (JSSYB, 2008).

Data collection and sampling design

The first gum picking took place 45 days after tapping and each consecutive picking was collected after 15 days from harvest of the previous one. Tapping was carried out by specially designed tool, called a "sunki". This has a metal head fixed to a long wooden handle. The pointed end of the head was pushed tangentially into the stem so as to penetrate just below the bark, and then pulled up so as to strip a small length of bark longitudinally from the wood which involves tapping of gum Arabic trees three weeks of rain stoppage. Damage to the wood was minimal as it was tested 6 periodic levels (1st and 15th of Sept., 1st and 15th of Oct. and 1st and 15th of November), in each,

three (3) trees were tapped making a total number of thirty-two (32) for the season, such that eighteen trees (18) were tapped at each of the locations, namely Kadoma and Kwanar-duhuwa. The gum from each picking was weighed after drying using sensitive balance. Complete Randomized Design (CRD) was used for this study with three (3) treatments and six (6) levels making eighteen (18) samples in each plantation.

Data analysis

Data were analysed using Analysis of Variance (ANOVA) with Statistical Analysis System (SAS, 2003) computer package at 5% level of significance to determine differences in the treatment effect. The Duncan's Multiple Range Test (Duncan, 1955) according to Gomez and Gomez was used to separate means of differences among the treatments where significant treatment effects were obtained from the analysis of variance.

RESULTS

The result showed in (Tables 1 and 2) that tapping date was significantly ($P < 0.05$) difference in *Acacia senegal* gum yield (g/picking) realizing higher gum yields of (172.2 and 163.9g/picking) when the trees were tapped in 15th October and least gum yields of (4.05 and 2.16g/pickings) were noticed when the trees were tapped on the 1st September at Kadoma and Kwanar-Duhuwa respectively. Interestingly, ecological indicators in the two study sites such as climate condition, soil composition, age of the forests are the same. This implied that the forests in these regions produced gum at the high rate in the same period.

Table 1: Average Gum Arabic Yield (G/Picking) as Affected by Tapping Date at Kadoma Plantation

Dates	Gum Arabic yield g/picking					Total Yield	Average yield
	1 st picking	2 nd picking	3 rd picking	4 th picking	5 th picking		
1 st Sept.	0.00 ^c	0.00 ^c	0.83 ^c	1.68 ^d	1.58 ^c	4.09	0.82
15 th Sept	0.00 ^c	0.42 ^c	2.52 ^c	4.75 ^d	4.77 ^c	12.46	2.49
1 st Oct.	18.33 ^b	21.10 ^b	20.03 ^b	23.70 ^{bc}	20.63 ^b	103.79	20.76
15 th Oct	29.67 ^a	31.50 ^a	36.50 ^a	36.77 ^a	37.80 ^a	172.24	34.45
1 st Nov	21.37 ^{ab}	20.43 ^b	23.87 ^b	27.37 ^{bc}	22.70 ^b	115.74	23.15
15 th Nov	15.27 ^b	16.50 ^b	15.97 ^b	16.43 ^c	18.67 ^b	82.84	16.57
Means	14.1	15	16.6	16.6	17.69		
SE±	3.240	3.630	3.790	3.760	3.760		

*Treatment means followed by the same letters in the same columns are not significantly different at $P < 0.05$

Table 2: Average Gum Arabic Yield of (G/Picking) as Affected By Tapping Dates at Kwanar-Dahuwaa Plantation
Gum Arabic yield gram/picking

Dates	1 st picking	2 nd picking	3 rd picking	4 th picking	5 th picking	Total yield	Average yield
1 st Sept.	0.00 ^c	0.08 ^c	0.08 ^c	0.83 ^c	1.25 ^d	2.16	0.43
15 th Sept	0.00 ^c	0.17 ^c	0.17 ^c	2.50 ^c	3.08 ^d	5.92	1.18
1 st Oct.	19.67 ^b	23.20 ^b	23.20 ^b	22.17 ^b	23.60 ^{bc}	111.84	22.37
15 th Oct	31.80 ^a	31.33 ^a	31.33 ^a	34.70 ^a	34.43 ^a	163.9	32.78
1 st Nov.	24.93 ^{ab}	23.33 ^b	23.33 ^b	24.60 ^b	26.70 ^b	122.89	24.58
15 th Nov.	17.97 ^b	17.83 ^b	17.83 ^b	18.10 ^c	18.70 ^c	90.43	18.09
Means	15.7	15.99	15.99	17.15	17.96		
SE±	4.02	2.03	2.87	3.22	2.57		

*Treatment means followed by the same letters in the same columns are not significantly different at $p < 0.05$

DISCUSSION

The study had been conducted on the influence of tapping dates on the yield of *Acacia senegal* at two different locations in Jigawa State. Recognizing the need to enhance the capacities of the gum tappers and to increase the gum Arabic production this research investigated the influence of tapping date on the yield of gum Arabic at two different locations (Kadoma and Kwanar-duhuwa) in (2018). The findings showed that tapping dates had profound effect on the yield of gum Arabic as higher gum Arabic yields were obtained when the trees were tapped on the 15th October, as against 1st September and 15th November where low gum Arabic yields were realized. The gross variations of the gum yield noticed of 15th October tapping could be linked to the stoppage of rainfall three weeks to the commencement of tapping and the shedding of fifty percent (50%) of the gum Arabic tree leaves which could be the factor behind the exudation of more gum when the trees were tapped on the 15th October. The findings of this study is in line with the findings of Idris and Kamal (2011) who noticed that 12th October date of tapping showed slight increase in gum yield. However, the finding was also in agreement with Fadl and Gebauer (2006) they investigated the effect of date of tapping and tapping intensity on the gum yield of *A. seyal* and found that the date of tapping had significant effect on the amount of gum production. Moreover, the variations observed in the gum yield from tree to tree and from pick to pick may not be unconnected to variation on the climatic factors and the management practices. This observation agreed with the results of Ballal (1991) who also attributed the variation in *A. senegal* gum yield TO climatic factors and management practices.

Dione (1996) and Sene (2011) observed that trees had lost about 50% of their foliage when they were tapped for the first time (October, 17th), whereas the second tapping (November, 10th) resulting in less production corresponded to 80% defoliation. Consequently, the phenological stage could constitute a good indicator for the choice of the tapping date. Considering the low accuracy of the visual estimation of the degree of defoliation, the level of 50% defoliation is in accordance with FAO (1995) mentioned that in Senegal, higher gum exudations were obtained after tapping trees at two thirds of their defoliation.

Low gum yield may similarly be related to too early (October, 1st) or too late (December, 18th) tapping.

CONCLUSION

Date of tapping and stoppage of rainfall had profound effects on gum Arabic production. Therefore, gum Arabic tappers are advised to tap gum Arabic trees at three (3) weeks of rain stoppage for maximum yield.

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