EFFECT OF ETHEPHON APPLICATION ON GUM PRODUCTION FROM *Acacia Senegal* L.

***GARASIYA, V. R., VAGHELA, P. O., ANSODARIYA, V. V., RAMDEVPUTRA, M.V AND MADARIYA, R.B.**

GRASSLAND RESEARCH STATION
JUNAGADH AGRICULTURAL UNIVERSITY
DHARI, DIST: AMRELI – 365 640 (GUJARAT), INDIA

****E-mail: garasiya9763@gmail.com***

ABSTRACT

The effect of ethephon application on gum production from Acacia Senegal L. was studied during summer 2012 at Grassland Research Station, Junagadh Agricultural University, Dhari. Total 10 treatments with different concentrations of ethephon (100 to 900 ppm) along with control (water spray) were injected in plants of Acacia through a hole. Total 30 trees were selected for these purpose to completer the study in Randomized Block Design with three replication. The result revealed that the minimum days (13.33 days) taken for first oozing was observed in T_{10} (900 ppm ethephon). Similarly, the length (186.33 mm) and width (67.33) of harvested gum as well as gum yield per plant (386 gm) at harvest was recorded maximum in T_{10} (900 ppm ethephon).

KEY WORDS: Acacia senegal, ethephon, gum exudation.

INTRODUCTION

Acacia senegal is a tree with multiple uses that occurs naturally in the barren, arid and semi-arid tracts of India. It is the main species producing the internationally traded gum arabic. *Acacia senegal* produces the only acacia gum evaluated toxicologically as a safe food additive (Anderson, 1989). Gum Arabic is a natural polysaccharide exuding from the trees either spontaneously or following manual taping (Verbeken *et al.*, 2003). Gum Arabic is highly soluble in water and is a good emulsifier with low viscosity. Odourless, tasteless and translucent, it is an excellent natural emulsifier widely used in the food, pharmaceutical and cosmetic industries (Williams and Phillios, 2000). Extensive stands of *Acacia Senegal* trees, both wild and planted, occur in the arid and semi-arid regions of Gujarat (Kutch and West Saurastra) and Rajasthan. Trees begin to produce gum between 4–18 years of age. *Acacia senegal* is important for desertification control through sand dune stabilization and wind breaks. Gum synthesis process and gum exudation occur only in dry condition, i.e. in arid climates and during the dry season (Vassal, 1991; Dione and Vassal, 1998; Ballal *et al.*, 2005). Traditionally *Acacia Senegal* trees are tapped when they have lost their foliage, which is believed to indicate a necessary threshold of water stress (Dione and Vassal, 1998).

The most promising compound seems to be ethephon (2-chloroethylphosphonic acid), which releases ethylene inside plant tissues. As ethylene is often synthesized when plants encounter stress and then triggers stress reactions (Apelbaum and Yang, 1981; Beltrano *et al.*, 1999), its use could mimic the water stress believed to trigger gummosis. This use would be particularly relevant in the wetter areas of Northern Cameroon or with

plant material introduced from drier areas. Ethephon has been successfully tested in several gum or resin producing species (Greenwood and Morey, 1979; Nair *et al.*, 1995; Miyamoto *et al.*, 2010). However, there so far has been only one study with *A. senegal*. The results of Bhatt and Ram (1990) in India were positive, although the trees were not properly tapped, as only holes and 'bruises' were performed. The authors found an increasing gum production (up to 800 g per tree) with increasing ethephon concentration.

Therefore, the purpose of the present field study was to test whether the application of ethephon can increase gum producing by *Acacia Senegal.*

MATERIAL AND METHODS

The present investigation was carried out at Grassland Research Station, Junagadh Agricultural University, Dhari during summer 2012. Total 30 trees were selected with comparable similar size and vigour. The experiment was conducted in Randomized block design (RBD) with ten treatments and three replications. The treatment consisted of T_1 (Control), T_2 (Ethephon 100 ppm), T_3 (Ethephon 200 ppm), T_4 (Ethephon 300 ppm), T_5 (Ethephon 400 ppm), T_6 (Ethephon 500 ppm), T_7 (Ethephon 600 ppm), T_8 (Ethephon 700 ppm), T_9 (Ethephon 800 ppm) and T_{10} (Ethephon 900 ppm). In Control treatment, only distilled water was injected in plants and in other treatments aqueous solution of ethephon were injected in plant through a hole of 5 cm deep and 2.5 cm wide, slanting downwards, which was made using a hammer and chisel at 1.0-1.5 m above ground on 1st march. The injected ethephon solution was covered with wet soil.

RESULTS AND DISCUSSION

The effect of ethephon application on gum production in *Acacia senegal* L is presented in Table 1. The results indicated that the minimum days (13.33 days) taken for first oozing of gum with T_{10} (900 ppm), while maximum days (39.67 days) required for gum exudation with T_1 (control). These results are supported by Bhatt and Ram (1990) in A. senegal.

The length and width of harvested gum ball was significantly higher with T_{10} (900 ppm ethephon) with a value of 186.33 mm and 67.33 mm, respectively, whereas it was minimum with T_1 (Control) with a value of 6.33 mm and 5.00 mm in that order. These results are in accordance with the findings of Baqui *et al.* (1984) in *Acacia auriculiformis* and William and Martin (1982) in sour cherry. The exuded gum presents a variety of forms globular, tear-shaped or irregular masses, which is also reported by Bhatt and Ram (1990).

The gum yield harvested per plant (386 gm) was significantly highest with T_{10} (900 ppm ethephon), and it was at par with T_9 (800 ppm ethephon) (379 gm). The lowest gum yield per plant (80.33 gm) was harvested in T_1 (Control). These results are in agreement with the findings of Peter *et al.* (1978) in pines, Nair *et al.* (1985) in *Azadirachta indica*, Bhatt (1987) in *Anogeissus latifolia*, and Bhatt and Ram (1990) and Abib *et al.* (2013) in *Acacia Senegal*.

CONCLUSION

The optimum concentration of ethephon for maximum yield of the exudates without visible adverse effects on the plant was observed with T_{10} (900 ppm ethephon).

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Table 1: Effect of ethephon application on gum production from *Acacia senegal* L.

Treatment	Time of First Oozing of Gum (Days)	Length of Harvested Gum (mm)	Width of Harvested Gum (mm)	Yield of Harvested Gum (gm/plant)
T_1	39.67	6.33	5.00	80.33
T_2	23.00	17.67	14.00	212.00
T_3	26.33	26.33	34.67	244.00
T_4	21.00	53.00	39.67	246.67
T_5	22.67	44.67	23.00	279.33
T_6	20.00	87.33	42.00	301.33
T_7	18.00	127.67	48.33	311.67
T_8	18.33	132.67	56.00	327.67
T_9	14.00	136.67	61.67	379.00
T_{10}	13.33	186.33	67.33	386.00
S.Em.±	0.87	13.1107	3.3391	18.31
C.D. at 5 %	2.59	38.9553	9.9213	54.40
C.V. %	6.97	27.74	14.77	11.46

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