International Journal of Research Studies in Agricultural Sciences (IJRSAS)
Volume 1, Issue 2, June 2015, PP 7-9
ISSN 2454–6224
www.arcjournals.org

Response of *Acacia Senegal* L. to Ethephon for Gum Production

D.R. Kanzaria[1], N. D. Polara, H. N. Patel, H. J. Senjaliya

Department of Horticulture, College of Agriculture, Junagadh Agricultural University
Junagadh (Gujarat), India

Abstract: *The gum-inducing chemical and Ethephon (2-Chloroethyl phosphonic acid) 100-ppm solution were injected, 5 ml each, in the stem of Acacia Senegal plants. With the help of manually operated drill, 5 mm diameter and approximately 4-5 cm deep transverse hole was made. Treatments were given by using syringe and hole was sealed immediately after the injection. Gum tears appeared (may be eccrine, granulocrine and holocrine) after couple of weeks. The maximum number of gum tears per plant (9.66) was observed in the plants treated with the gum-inducing chemical. The plants given Ethephon 100 ppm treatment (8.66) followed this. In control, the least number of gum tears i.e. 1 (one) was observed. The maximum production (142.33 g/plant) was recorded in the plants treated with the gum inducing chemical, while the plants given Ethephon 100 ppm treatment stood second (124.00 g/plant). Control could produce the least (41.33 g/plant) gum. Gum inducing chemical and Ethephon 100 ppm gave 244.37% and 200.37 % more gum production over control, respectively.*

Keywords: *Acacia senegal, ethephon, gum tears, eccrine, granulocrine and holocrine.*

1. INTRODUCTION

Acacia Senegal L. Willd, family Leguminosae is locally known as *Gorad* in Gujarat and *Kumata* in Rajasthan. The *Acacia Senegal* is nitrogen fixing legume tree and is 4-7m tall with a taproot up to 30m depth and a life span of about 25-30 years. It survives in many adverse conditions and seems to be favoured by low rainfall even with 100 to 250mm. It is drought resistant and tolerates prolonged dry spell. Of 10-11 months, with maximum temperature reaching 50^0C with strong winds, but susceptible to frost. It occurs mostly on poor, sandy reddish and skeletal soils with pH of 5.0-7.7 and widely distributed in western Rajasthan and Gujarat. Egyptians started, the uses of Gum Acacia date back about 5000 years (Davison, 1980). Country people use these plants for fencing, fuel wood, poles, crafts, medicine, intercropping, fiber and extraction of tannin. Its unique properties employ it in meat products, pie and pastry fillings, instant and cooked pudding, cheese products, low calorie mild shake, hard gummy candies, soft drinks, diary product, beverages, bakery products, dietetic food, confectionery, flavor fixation, food industry, cosmetics, pharmaceuticals, petroleum and gas industry, textile industry and paper industry. It is a favourite binder for artists in water colour paint, photography, gum painting and even in mummification process.

2. MATERIALS AND METHODS

The experiment was conducted on 18, February 2009 at the Grassland Research Station, Junagadh Agricultural University, Dhari in three replications, where more than 10000 naturally grown *Acacia Senegal* plants of different ages are available. Trees of around 10 years of age were selected for the experiment. Thorny branches and twigs near the stem were cut to reach the stem for the injection. With the help of manually operated drill, a transverse hole of 5 mm diameter and 4-5 cm depth, at one meter height from the ground level, reach to the sapwood of the plant, was made.

A syringe was used to inject 5 ml of treatment solution to the stem of Acacia plants. The injected hole was sealed immediately with moist soil to avoid evaporation and other losses. Observations were recorded on the number of gum tears and total weight of gum produced by the individual plant. The wound was found healed after 70 days of tapping.

Viscous liquid and/or tiny thick tissues (gum tears) started oozing at the place where it was injected and on many branches after couple of weeks. Observations were recorded regularly up to the maturity/harvesting of gum tears. Gum tears were harvested when they produced mild metallic sound on knocking or shining and found hardened on pressing. It was noticed that the gum tears were either colour less or light brown to dark in colour.

3. RESULT AND DISCUSSION

The data pertaining to the number of gum tears per plant, gum production per plant (g) and percentage increase over control are presented in table-1. From the table it is clearly seen that the maximum number of gum tears per plant (9.66) were observed in the plants, treated with the gum-inducing chemical, followed by Ethephon 100ppm treatment (8.66). In control, the least number of gum tears i.e. 1 (one) was observed. The same trend was found in the production of gum per plant. The maximum production (142.33g/plant) was recorded in the plants treated with the gum inducing chemical, while the plants given Ethephon 100ppm treatment stood second (124.00g/plant). Control could produce the least (41.33g/plant) gum.

Gum inducing chemical and Ethephon 100ppm produced 244.37% and 200.02% more production over control, respectively. This might happen because natural gum ducts are available (Shah and Setia 1976) in the sapwood of the *Acacia Senegal* plants and trees exude gums only when they are in an unhealthy condition. The treatment with Ethephon, a plant growth regulator, has induced formation of gum ducts and cavities in the sapwood. Bhatt and Mohan Ram (1990) support this, they stated that in India *Acacia Senegal* trees does not yield more gum naturally due to unknown reasons. They reported the 0.8 to 0.9kg of gum could be obtained per tree by introducing 4ml of Ethephon containing 960mg of the active substance through hole in the sapwood in April/May.

Table1. *Effect of gum inducing chemical and Ethephon 100ppm solution on numbers of gum tears, production of gum/plant (g) and % increase over control.*

Treatment	No. of gum tears/ plant			Mean	Gum production (g/ plant)			Mean	% increase over control
	R-I	R-II	R-III		R-I	R-II	R-III		
T_1: gum inducing chemical	12	8	9	9.66	180	122	125	142.33	244.37
T_2:Ethephon 100 ppm	7	9	10	8.66	90	112	170	124.00	200.02
T_3 : control	2	3	1	2	45	32	47	41.33	-

Gum Arabic is harvested from the exterior of Acacia trees in the form of dry, hard nodules up to 50 mm in diameter and ranging from almost colour less to brown. Natural gums either are present in the intercellular space (ducts or cavities) of the plant parts or as exudates produced due to injury known as traumatic ducts/cavities (Janice and Vito, 1985). The causes of gum formation and its biosynthesis are not fully understood but poor soil, drought and other hostile environmental conditions promote their production. The secretion may be eccrine, granulocrine and holocrine (Janice and Vito, 1985).

Ethephon, when injected to the stem, enhances exudation of gum and gum resin in certain hardwood species (Nair *et. al.* 1985; Bhatt and Shah, 1985; Bhatt *et. al., 1989; Bhatt & Mohan Ram, 1990; Nair et. al.,* 1995). Ethephon (2-chloroethyl phosphonic acid) and paraquat (1,1 dimethyle 4,4' bipyridium chloride) or other herbicides when injected either alone or in combination into the stem, induces multifold oleoresin soaking within the stem of pines (Roberts, 1973). Administration of Ethephon and paraquat (1,1'-dimethyle 4,4; bipyridium salt) into the sapwood of Neem mediated copious gum exudation (Nair *et. al.*, 1985).The treatment induced formation of gum ducts and cavities in the sapwood (Nair *et. al*, 1995). Gum Arabic is a complex mixture of saccharides and glycoprotein, which makes it perfectly edible (Mantel, 1949).

REFERENCES

[1] Bhatt, J.R., Nair, M.N.B. and Mohan Ram, H.Y. (1989). Enhancement of oleo-gumresin production in *Commiphora wightii* by improved tapping technique. Current Science 58:349-357.

[2] Bhatt, J.R. and Mohan Ram, H.Y. (1990). Ethephon induced gum production in *Acacia Senegal* and its potential value in the semi-arid regions of India. Current Science 59:1247-1250.

[3] Bhatt, J.R. and Shah, J.J. (1985). Ethephon (2-chloroethyl phosphonic acid) enhanced gum resinosis in mango, *Mangifera indica* L. Indian Journal of Experimental Biology 23:330-339.

[4] Davison, R.L. (1980). Handbook of water-soluble gums and resins. McGrow Hill Book Company, New York.

[5] Janice, C.M. and Vito, S.P. (1985). Gum ducts development in Almond fruit, Prunus dulcis (Mill.) D.A. Webb. Bot. Gaz. 146(1):15-25.

[6] Mantel, C.L. (1949). The water-soluble gums: their botany source and utilization. Economic Botany 3:3-31.

[7] Nair, M.N.B., Bhatt, J.R. and Shah, J.J. (1985). Inductin of traumatic gum cavities in sapwood of Neem (*Azadirachta indica* A. Juss) by Ethephon and paraquat. Indian Journal of Experimental Biology 23:60-62.

[8] Nair, M.N.B., Patel, K.R., Shah, J.J., Pandalai, R.C. (1980). Effect of Ethphon)2-chloroethyl phosphonic acid) on gummosis in the bark of Azadirachta indica. Indian Journal of Experimental Biology 18:500-503.

[9] Nair, M.N.B., Shivanna, K.R. and Mohan Ram, H.Y. (1995). Ethephon enhances karaya gum yield and wound healing response: A preliminary report. Current Science 69:809-810.

[10] Roberts, D.R. (1973). Inducing lightwood in pine trees by paraquat treatment. USDA Forest Research Notes SE-191.

[11] Shah, J.J. and Setia, R.C. (1976). Histological and histochemical changes during the development of gum canals in Sterculia urens. Phytomorphology 26:151-158.

Gum tears observed on treated Acacia senegal plants

Gum tears observed on treated Acacia senegal plants

AUTHORS' BIOGRAPHY

Dr.D R Kanzaria: Assistant Research Scientist, Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat), India

Dr. Polara N. D: Associate Professor, Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat), India

Mr. Patel H N and Senjaliya H J: Agriculture Officer, Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat), India