

Effect of Gum collected from *Acacia* spp. on Seed Germination

K.V. Badar*, B.T. Pawar and A.M. Chavan**

Dept. of Botany, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

*Dept. of Botany, Yeshwantrao Chavan College, Sillod, Dist. Aurangabad

**Dept. of Botany, Shri Muktanand College, Gangapur, Dist. Aurangabad

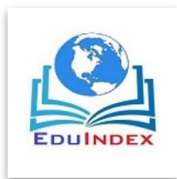
ABSTRACT

Gum is naturally occurring chemical substance in the plant. Gum is a substance which exudates naturally from the stem or from the wounds of trees. Gums are colloidal in nature soluble in water but completely insoluble in alcohol and ether. Impact of gum collected from *Acacia arabica* and *A. chundra* was studied for different time period of 1% gum concentration on the germination of cereals, pulses and oil seeds like wheat, jowar, cowpea, gram, safflower and soybean. Percent germination or percent inhibition of germination, root and shoot length of seedlings was measured after 7 days of incubation at room temperature. It was concluded from the present investigation that 1% concentration of *Acacia Arabica* and *A. chundra* gum was found to promote the germination of wheat, jowar, cowpea and soybean at 10 hour treatment.

Key Words: Gum, *Acacia*, Seed Germination.

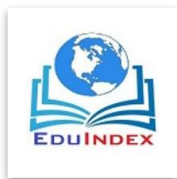
INTRODUCTION

Gum is a group of plant products resembling carbohydrates. Gums are characterized by ability to dissolve in water forming viscid solution by absorbing water to form gelatinous paste. In



some cases the production of gum has been attributed to fungi attacking the plant, these fungi being responsible for enzymes that penetrate the tissues and transform the celluloses and hemicelluloses of the cell wall into gum. Malcolm (1936) concluded that the production of gum in Sudan gum Arabic trees is due to bacterial agency. The real cause of production of gum in many trees is uncertain. The best use of gum is to prepare sticky substance for pasting the paper and other things. Treatment of gums to seeds has positive effect on seed germination. During the present investigation effect of gum collected from *Acacia* spp. on seed germination was studied through various experiments.

Acacia gum is usually referred as Gum Arabic (GA). It is an edible biopolymer obtained as exudates of mature trees of *Acacia* spp. The exudate is a non-viscous liquid, rich in soluble fibers, and its emanation from the stems and branches usually occurs under stress conditions such as drought, poor soil fertility, and injury (Williams and Phillips, 1990). *Acacia* gum is being widely used as an experimental vehicle for drugs in physiological and pharmacological experiments, and it is supposed to be an inert substance, recent reports have confirmed that it has some biological properties as an antioxidant (Trommer and Neubert, 2005; Ali and Al Moundhri, 2006, Hinson *et al.*, 2004) on the metabolism of lipids (Tiss *et al.*, 2001, Evans *et al.*, 1992), positive contribution in treating kidney, (Matsumoto *et al.*, 2006; Bliss *et al.*, 1996, Ali *et al.*, 2008), cardiovascular (Glover *et al.*, 2009) and gastrointestinal diseases (Wapnir *et al.*, 2008, Rehman *et al.*, 2003).

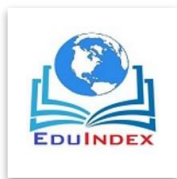


MATERIAL AND METHODS

01) Collection of Gum samples: Plant gums were regularly collected in all the seasons. It was done by using axe, sterilized blade. Fine cut was made at different parts of the plant, like root, stem, leaves, flower and fruits. Later on at 30, 45 and 60 days exudates gums were collected in presterilized plastic bags, kept in laboratory condition until it was used (Badar, 2011).

02) Preparation of fine powder of Gum: The fine powder of collected dry gums was prepared by using mixer grinder and kept in clean glass pots at 4-6°C temperature.

03) Application of gum on seed germination: The effect of different time period (1 hr, 3 hr, 5hr, 10hr) of plant gum on seed germination and the impact of different concentration like 1%, 2%, 3% and 4% on cereal, pulses and oil seeds of seed mycoflora have been studied. The impact of different time period of percent gum concentration of *Acacia* spp. were studied on the germination of cereals, pulses and oil seeds like wheat, jowar, cowpea, gram, safflower, soybean and the results are summarized in Table 01 and Table 02. *Acacia arabica* and *A. chundragum* was applied on germinating seeds for 1 to 10 hour treatments. The results were recorded at different time intervals by measuring shoot length and root length.

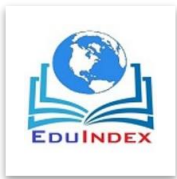


RESULTS AND DISCUSSION

It was observed from the Table 01 that 1% concentration of *Acacia arabica* gum was found to promote the germination of wheat, jowar, cowpea and soybean at 10 hour treatment. 1 hour treatment was found to promote the germination of wheat, cowpea, safflower and soybean. It was also found to promote the shoot length, root length of wheat, cowpea, gram whereas it was found to retard the growth of shoot and root length of jowar and soybean. Similar type of results were recorded for 3 hour 5 hour treatment. Whereas, at 10 hour treatment the shoot and root length of all treated seeds except jowar were found to be increased as compared to control.

In Table 02 the result of 1% concentration of *Acacia chundra* gum on seed germination. The percent seed germination of wheat, jowar, cowpea, gram and soybean were found to be increased. The shoot length and root length of wheat, jowar, cowpea and soybean were found to be increased. The % concentration of gum did not affect % germination of soybean. Near about similar type of results were recorded for 3 hour, 5 hour, 10 hour treatment.

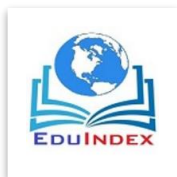
Acacia gum is being widely used for industrial purposes such as a stabilizer, a thickener, an emulsifier and an encapsulating in the food industry, and to a lesser extent in textiles, ceramics, lithography, cosmetic and pharmaceutical industry (Verbeken *et al.*, 2003). Randall *et al.*, 1998, reported that the AGP complex is the main component responsible for *Acacia* gum ability to stabilize emulsions, by the association of the AGP amphiphilic protein component with



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the surface of oil droplets, while the hydrophilic carbohydrate fraction is oriented toward the aqueous phase, preventing aggregation of the droplets by electrostatic repulsion. Hence, the *Acacia* gum can be useful for promoting seed germination in various ways.

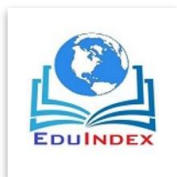


**Table 01: Effect of different time period of *Acacia arabica* gum on seed germination
 (1% gum concentration)**

| Sr. No. | Seed plant Name | 1 hr | | | 3 hrs | | | 5 hrs | | | 10 hrs | | | Control | | |
|---------|-----------------|--------|-------------------|------------------|--------|-------------------|------------------|--------|-------------------|------------------|--------|-------------------|------------------|---------|-------------------|------------------|
| | | % germ | Shoot length (mm) | Root length (mm) | % germ | Shoot length (mm) | Root length (mm) | % germ | Shoot length (mm) | Root length (mm) | % germ | Shoot length (mm) | Root length (mm) | % germ | Shoot length (mm) | Root length (mm) |
| 1. | Wheat | 80 | 4.2 | 2.2 | 70 | 4.0 | 3.1 | 80 | 5.3 | 2.2 | 90 | 6.0 | 5.4 | 70 | 3.9 | 2.1 |
| 2. | Jowar | 80 | 6.4 | 6.3 | 80 | 4.7 | 3.7 | 70 | 6.2 | 6.3 | 90 | 5.3 | 4.2 | 80 | 6.7 | 6.4 |
| 3. | Cowpea | 70 | 3.2 | 3.1 | 70 | 4.3 | 3.0 | 80 | 5.4 | 3.5 | 70 | 4.5 | 3.9 | 60 | 2.4 | 3.0 |
| 4. | Gram | 80 | 3.4 | 2.2 | 80 | 4.2 | 3.3 | 70 | 4.3 | 3.6 | 70 | 4.3 | 3.8 | 80 | 1.6 | 2.1 |
| 5. | Safflower | 80 | 3.6 | 2.6 | 80 | 4.9 | 3.6 | 70 | 4.7 | 3.0 | 60 | 4.5 | 3.8 | 70 | 3.1 | 2.7 |
| 6. | Soyabean | 70 | 3.5 | 2.9 | 70 | 3.5 | 2.6 | 70 | 4.2 | 2.6 | 80 | 5.5 | 3.6 | 70 | 3.7 | 3.1 |

**Table 02: Effect of different time period of *Acacia chundra* gum on seed germination
 (1% gum concentration)**

| Sr. | Seed plant | 1 hr | 3 hrs | 5 hrs | 10 hrs | Control |
|-----|------------|------|-------|-------|--------|---------|
|-----|------------|------|-------|-------|--------|---------|

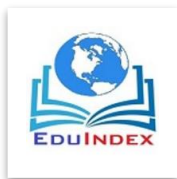


| No. | Name | % germ | Shoot length (mm) | Root length (mm) | % germ | Shoot length (mm) | Root length (mm) | % germ | Shoot length (mm) | Root length (mm) | % germ | Shoot length (mm) | Root length (mm) | % germ | Shoot length (mm) | Root length (mm) |
|-----|-----------|--------|-------------------|------------------|--------|-------------------|------------------|--------|-------------------|------------------|--------|-------------------|------------------|--------|-------------------|------------------|
| 1. | Wheat | 90 | 4.2 | 2.2 | 70 | 4.1 | 3.2 | 80 | 5.5 | 2.7 | 90 | 5.9 | 5.0 | 70 | 3.3 | 2.2 |
| 2. | Jowar | 80 | 7.2 | 6.4 | 80 | 4.5 | 3.8 | 70 | 6.1 | 6.5 | 80 | 5.7 | 4.3 | 70 | 6.5 | 6.3 |
| 3. | Cowpea | 80 | 3.4 | 2.9 | 70 | 4.5 | 2.7 | 90 | 3.4 | 3.4 | 60 | 4.3 | 3.7 | 60 | 3.0 | 3.3 |
| 4. | Gram | 70 | 3.5 | 2.1 | 70 | 4.2 | 3.2 | 80 | 3.9 | 3.7 | 70 | 4.8 | 3.5 | 60 | 1.8 | 2.5 |
| 5. | Safflower | 70 | 3.5 | 2.8 | 80 | 4.7 | 3.8 | 70 | 3.1 | 3.2 | 70 | 4.4 | 3.7 | 70 | 3.1 | 2.8 |
| 6. | Soyabean | 80 | 3.6 | 3.1` | 70 | 3.6 | 2.5 | 70 | 4.8 | 2.8 | 80 | 5.7 | 3.6 | 70 | 3.4 | 3.0 |

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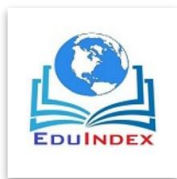
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