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EFFECT of GIBBERELLINS on SEED GERMINATION OF *Tithonia rotundifolia* Blake

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ABSTRACT: Plant growth studies involve seed germination studies and this depends on storage viability and dormancy aspects besides essential requirements and factors for the same. Of the various factors regulations plant growth and developmental processes intrinsic factors play a significant role. Plant hormones are chemicals that regulate plant growth. These occur in extremely low concentrations and influence all developmental and physiological processes in plants. The effect of different concentrations of GA_3 on seed germination of *Tithonia rotundifolia* Blake was studied. The maximum percentage of seed germination was at 500 ppm GA_3.

KEYWORDS: Phytohormones, Gibberellins, *Tithonia rotundifolia* Blake.

I. INTRODUCTION

Plants maintain and expand their populations over time by the process of regeneration (Barnes *et al*., 1998 [1]). The probability of seedling survival is closely connected to the seasonal timing of germination. Since environmental conditions prevailing at the time of seed dispersal are frequently not suitable for seedling survival, many temperate species have mechanisms for preventing germination immediately after shedding. Seed dormancy is a particular form of cessation of growth and is a crypto biotic state as an adaptive mechanism of growth cessation, which often confers a selective advantage in distribution and abundance (Amen, 1966 [2]). Pre-sowing seed treatments with growth substances such as gibberellic acid have been found to improve the seedling growth of many species (Shanmungavelu 1970 [3], Singh *et al*., 1989 [4]). Using specialized techniques different hormones can now be extracted from the plant tissue and their individual identity, quantity, and quality determined. Thus, both the quantitative and qualitative hormone variation can be detected which may often appear to be correlated with particular pattern of growth and/or response to environmental conditions.

Gibberellins: The origin of research into Gibberellins can be traced to Japanese plant pathologists who were investigating the causes of the “bakane” (foolish seedling) disease that seriously lowered to the yield of rice crop in Japan, Taiwan and throughout the Asian continent. Kurosawa, 1926 [5] who was working in Formosa observed that the extract of the fungus could cause the same disease in rice seedlings.

Active Gibberellins show many physiological effects each depending on the type of Gibberellins present as well as the species of plant. It stimulates stem elongation, breaks seed dormancy in some plants and induce germination, stimulates enzyme production during germination of cereal grains for mobilization of seed reserves, induces maleness in dioecious flower, can cause parthenocarpic fruit development and can delay senescence in leaves and citrus fruits (Mauseth, 1991 [6]; Ravern, 1992 [7]; Salisbury and Ross, 1922 [8]).

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II. LITRATURE SURVEY

Seed germination and seedling establishment phase primarily was very sensitive to drought stress that is reduced the germination and establishment of seedling grown. Increase performance of seed thought the used of different method promoting can achieve the final goal the same increasing seed and forage proceeds is very effective. Gibberellic acid is a plant growth hormone that the most important role in the control of seed germination is facilitated. The discovery of phytohormones has proved to be a great boon to agriculture and allied fields. The exogenous application of phytohormones and various other mechanical, chemical and physiological method have helped to increase the production of flowers, fruits, and other agriculture commodities. Seed germination and seedling growth are known to be regulated by exogenous hormones (Khan 1975 [9], Verma & Tandon 1988 [10]). Today more than 126 different types of GA's have been isolated from a variety of plants and plant organs. Today more than 126 different types of GA's have been isolated from a variety of plants and plant organs.

Seedlings are the most vulnerable stage in the life cycle of plants and germination determines when and where seedling growth begins (Lianes et al. 2005 [11]). Gibberellic acid increased the rate of germination of barley and lettuce seeds under salt-stress treatment (Kabar 1989 [12], Kabar and Baltepe 1989 [13]). Phytohormone, in general, was found to regulate the transport of ions in plants (Karmoker 1984 [14]). Stimulatory effect of GA (10–4 M) on K^+ transport in excised cotyledons of cucumber was reported (Ezekiel et al. 1978 [15]). Kabar, 1989 [12] observed that NaCl-salinity stress, GA and Kn together increased the percentage of germination in lettuce seeds.

III. MATERIAL AND METHOD

Mature flowers were collected during May to June from the experimental plot of botanical garden of Department of Botany, Gujarat University, Ahmedabad. Seeds were separated from the flower and air dried at room temperature.

The *Tithonia rotundifolia* Blake seeds freshly harvested were germinated in distilled water, 100 ppm, GA_3, 300ppm GA_3, 500ppm GA_3 with three replicates each. This treatment was given at room temperature. The seeds were germinated in sterilized petridishes lined with Whatman filter paper for 4 days. Germinated seeds were counted every day. The whole experiment was repeated thrice.

Shoot length was taken after 72 hours and 96 hours. Seedling vigour index I was derived by multiplying percent germination with total seedling length in centimeter (Abdul-Baki and Anderson 1973 [16]).

IV. RESULT AND DISCUSSION

Growth regulators play an important role in regulating germination and vigour. Seed germination and seedling vigour as influenced by different concentration of GA_3 are presented in Table 1. It is revealed that the highest germination (94%) was recorded for GA_3 500 ppm concentration after 96 hrs followed by 92% in D.W. and 91% in GA_3 300 ppm.

Treatment with high concentrations of GA_3 is effective in overcoming dormancy and causing rapid germination of seed. The germination substratum may be moistened with 500 ppm solution of GA_3 and infact when the dormancy is weaker, 200 ppm may be enough, while when it is stronger upto 1000 ppm solution may be used. (Agrawal 1994 [17]). Several workers have reported that many types of seed dormancies are overcome by dry storage for varying period of time (Krishna, A. and Tyagi, 1976 [18], Mukherjie, S.M., 1966 [19]). GA comprise of the class of hormones that are most directly implicated in the control and promotion of seed germination (Hsigo and Vidaver, 1984 [20]; Singh, 1979 [21]; Sharma and Chakraborty, 1976 [22]). Applied Gibberellins can function in relieving many types of dormancy. GA_3 increase germination percentage of *Anemone coronaria* seeds at supra optimum (25°C) but not at optimum temperature 10°-20°C temperature. (Bullowa *et.al*., 1975 [23]).

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Chaudhuri and Wiebe, 1968 [24] reported in wheat, that GA_3 improved salt resistance by increasing the germination percentage. Scott, 1984 [25] the observed great influence of GA_3 treatment on seedling length increase in all the aromatic crops studied which could be attributed to the inherent potential of gibberellic acid in promoting cell division and cell elongation. Gibberellic acid alleviated the negative effect of NaCl on seedling length growth in seven of the aromatic crops (mint, oregano, coriander, parsley, dill, anise and lavender). This is in agreement with the reports of Kabar and Baltepe, 1990 [12] and Ungar, 1991 [26] who suggested that high salt concentration could be alleviated by the presence of GA_3. Gibberellins (GA_3, GA_4, and GA_7) have been shown to break dormancy in numerous genera of seeds (Bewley and Black, 1982 [27], 1985 [28]), including *Penstemon* (Atwater, 1980 [7]). Plants in the Scrophulariaceae family to which *Penstemon* have seeds in which the endosperm surrounds the embryo and occupies up to half of the seed. According to Baskin and Baskin, 1998 [29], Bradbeer, 1988 [30], Raghavan, 2000 [19], if there is dormancy, it is probably a physiological one, endodormancy , that could be released by a gibberellin soak. Of the natural hormones, Gibberellic acid is the most potent germination promoter and is capable of breaking seed dormancy in a wide range of crop species; beans and peas (Sharma 1982 [32]), potato (Utheib *et al*., 1982 [32]), lettuce (Bewley, 1980 [33]; Kojimaa and Oota, 1980 [34]; Sharma and Barooah, 1986 [35]), onion (Lopper and Waller, 1982 [36]), radish (Pawar *et al*., 1977 [37]), tomato (Adlakha and Verma, 1965 [38]; Bose, 1968 [39]; Shrivastava, 1960 [40]) , and rare vegetables (Pulevitch *et al*., 1977 [41]). Ram *et al*., 1970 [42] found that spraying of GA_3 on *Antirrhinum majus* in the concentration range of 5 to 25 ppm resulted in early blooming. Thus, GA_3 application has resulted in increased percentage of germination in seeds and early flowering in many species.

Arun *et al.*,1994 [43] reported beneficial effect of GA_3 on number of seeds per flower and seed yield per plant which might be due to increased plant growth and increased concentration of carbohydrates, resulting in efficient translocation from leaves and flowers to seeds.

TABLE:I GERMINATION PERCENTAGE, SEEDLING LENGTH AND VIGOUR INDEX OF *TITHONIA ROTUNDIFOLIA* BLAKE AFTER GA_3 AND D.W. TREATMENT

Treatment	Germination%	Seedling Length (cm)	Vigour Index
GA_3 100 ppm 72 Hour	74 %	0.6	44.4
GA_3 100 ppm 96 Hour	87 %	1.4	121.8
GA_3 300 ppm 72 Hour	70%	0.7	49
GA_3 300 ppm 96 Hour	91%	1.6	145.6
GA_3 500 ppm 72 Hour	85%	0.7	59.5
GA_3 500 ppm 96 Hour	**94%**	**1.9**	**178.6**
D.W. 72 Hour	78%	0.6	46.8
D.W. 96 Hour	92%	1.8	165.6

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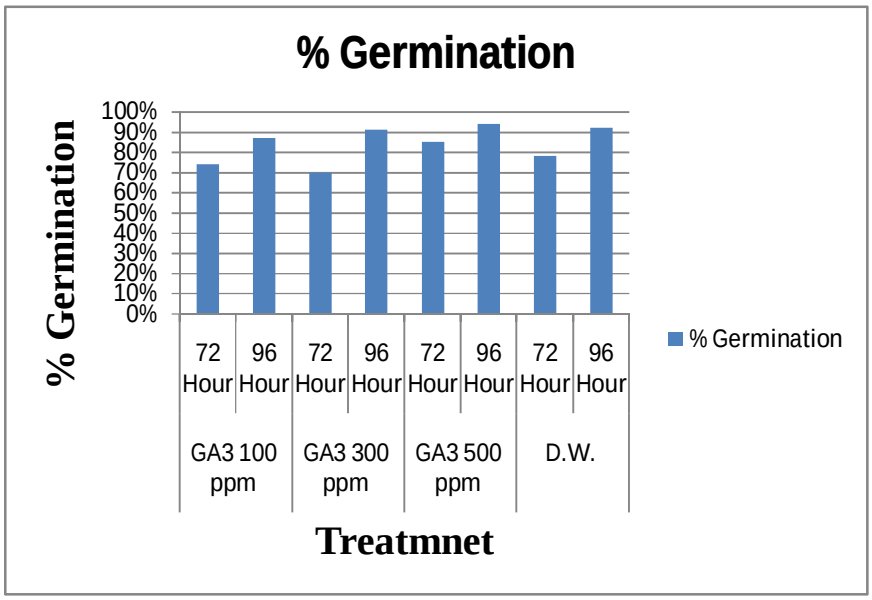

Figure-1: Germination Percentage of *Tithonia rotundifolia* Blake after GA_3 and D.W. treatment.

V. CONCLUSION

The present study was undertaken to assess the effect of different concentrations of Gibberellic acid treatment on germination and seedling growth behavior was studied on *Tithonia rotundifolia* Blake. The results of the study clearly indicated that the seed germination and growth rate hastened to maximum by the application of 500ppm GA3 for 96hrs.

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