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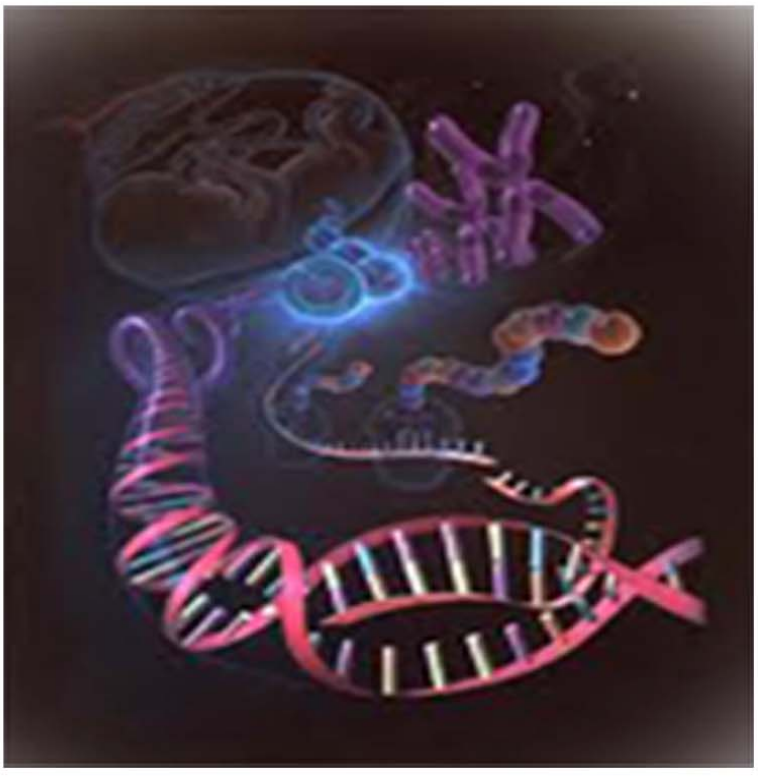

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Research Paper

EFFECT OF GIBBERELLIC ACID (GA_3) ON SEED GERMINATION OF *CELOSIA ARGENTEA* L.

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The effect of different concentrations of phytohormones on seed germination of *Celosia argentea* was studied. The average radicle growth was measured and compared. Different phytohormones as well as their concentrations had differential influence on the germination. Lower concentrations of the GA_3 were more effective on seed germination. Whereas IAA, IBA, NAA and Inosetol had no effect on seed germination of *Celosia argentea* L.

Keywords: *Celosia argentea* L., Gibberellic acid, Indole 3-Acetic acid, Indole Butyric acid, Naphthalene acetic acid, Inosetol

INTRODUCTION

The seeds of *Celosia argentea* L., usually fail to germinate under the slightest droughty conditions (Fawusi, 1980). Successful cultivation of the flower depends on quality of seeds such as viability, vigor and storage potential, etc. (Mumtaz Khan, 2003). Soil moisture requirements for germination of sorghum, millet, tomato and *Celosia* were studied by Fawusi and Agboola (1980). Chauhan and Johnson (2007) was studied the Effect of Light, burial depth and osmotic potential on germination and emergence of *C. agrentea* L. and Effect of seed humidification on germiniability, vigour and leakage in cockscomb (*C. argentea* var. *cristata* L.) was studied by Mumtaz Khan *et al*. (2003). Spermosphere microorganisms of *C. argentea* and its relationship with seed germination studies were carried out by Saritha (2008). Furthermore to these, the present investigation was undertaken.

MATERIALS AND METHODS

C. argentea seeds were collected from the cultivated fields of Chittoor district and tested with phytohormones (growth regulators) for germination (Figure 1). Different concentrations (10 ppm, 20 ppm, 30 ppm, 40 ppm, 50 ppm, 60 ppm, 70 ppm, 80 ppm, 90 ppm, 100 ppm, 250 ppm, 500 ppm,1,000 ppm) of Indole acetic acid, Indole Butyric acid, Gibberellic acid, Naphthalene acetic acid and Inosetol were prepared with distilled water. *C. argentea* seeds were soaked in different concentrations of growth regulators for 72 h.

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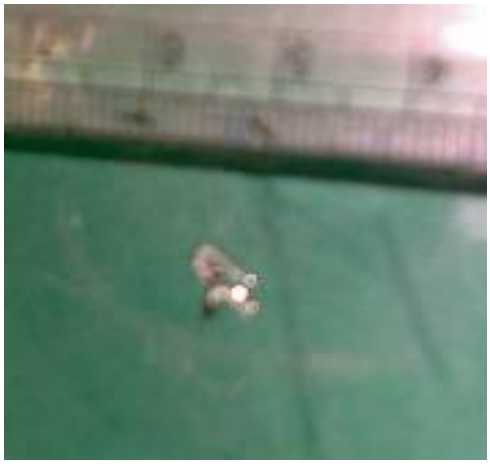
Figure 1: The Effect of Gibberellic Acid (GA_3) on *C.argentea* Seed Germination



30 ppm

50 ppm

60 ppm

80 ppm

90 ppm

250 ppm

RESULTS

The effect of different phytohormones Gibberellic acid (GA_3), Indole-3-Acetic acid (IAA), and Indole Butyric acid (IBA) Naphthalene acetic acid (NAA) and Inosetol in 14 concentrations (10 ppm, 20 ppm, 30 ppm, 40 ppm, 50 ppm, 60 ppm, 70 ppm, 80 ppm, 90 ppm, 100 ppm, 250 ppm, 500 ppm, 1,000 ppm and 1,500 ppm) on the germination of *C. argentea* has been tested (Table 1). Different phytohormones as well as their concentrations had differential influence on the germination. As regards IAA, IBA, NAA and Inosetol, there is increased percentage of germination with increased concentration up to 50ppm which showed a peak (Figure 2) lower concentrations of GA_3 were more effective on germination. GA_3 showed a steady decrease in the percentage of germination with increased concentration, whereas no germination was found in case IAA, IBA. NAA and Inosetol.

The effect of various phytohormones in different concentrations on the percentage of germination (mean value) of *C. argentea* was presented in table. The variation in the percentage of germination is greatest when the effect of phyto hormones, concentrations and their interaction (combined effect) were highly significant at 1% level.

There was a significance difference among different concentration of gibberellic acid (GA_3) from 10ppm to 1000 ppm. It was very much clear that the phytohormones tested independently and

Table 1: Effect of Gibberellic Acid (GA_3) Concentration on Seed Germination of *Celosia argentea* L.

S. No.	Treatment/ Concentration (PPM)	Average Radicle Growth	Variance	Percentage of Radicle Growth
1	10	0.2	8.56E-34	16.09
2	20	0.3	0.011111	24.13
3	30	0.466667	0.170373	37.54
4	40	0.73333	0.372596	59.00
5	50	1.242857	2.097462	100
6	60	0.8	1.37E-32	64.36
7	70	0.7	0.002222	56.32
8	80	0.386667	0.006818	31.11
9	90	0.38714	0.012068	31.14
10	100	0.316667	0.034472	25.47
11	250	0.233333	0.002966	18.77
12	500	0.106667	0.000366	8.58
13	1000	0.1	2.14E-34	8.0

Figure 2: The Effect of (GA_3) on Seed Germination of *Celosia argentea* L.

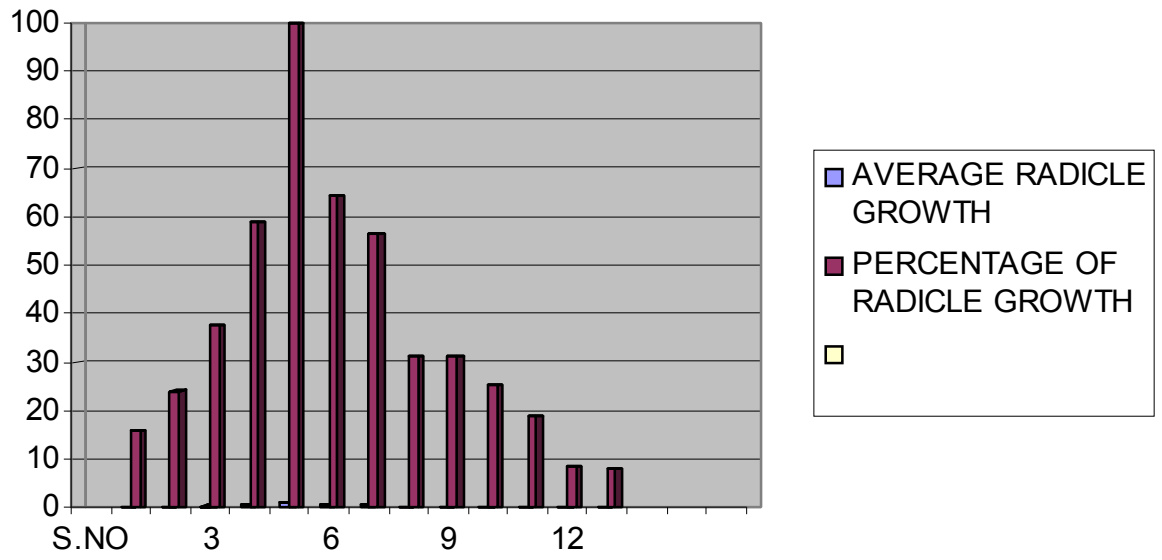


Table 2: ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	12.88747	12	1.073956	5.150956	7.14E-07	1.835813
Within Groups	24.39408	117	0.208496			
Total	37.28155	129				

with different concentrations of its interaction affected the germination of *C. argentea* profoundly.

DISCUSSION

As observed the seeds of *C. argentea* are dormant and in general they will not germinate earlier than 12 months of dry storage. Germination may be delayed for days, weeks, months or even years (Aravind Kumar and Purohit, 1996). Mechanical as well as chemical scarification with concentrated sulphuric acid could not break the seed dormancy. If it would have been only due to seed coat dormancy, they should have germinated under mechanical scarification. Even under the continuous washing with water for 24 h there was no germination, which is an Indication for the probable absence of water soluble inhibitors.

In the present investigation IAA, IBA, NAA and Inosetol did not show any effect on the seed germination of *C.argentea*. But significant percentage of germination was recorded in the seeds treated with GA_3, under laboratory conditions (Table 1 and Figure 1). The possible significance of gibberellic acid as a natural factor in germination has been indicated by the detection of gibberellin like substance in a number of seeds.

Several bacteria, actinomycets and fungi are known to produce gibberellins or gibberellin-like

substances. The bacterial genera are *Arthrobacter, Azospirillum, Azatobacter, Bacillus, Brevibacterium, Flavobacterium, Pseudomonas* and *Rhizobium.* The fungal genera "Capable of Producing the Plant growth regulators are *Alternaria, Aspergillus, Fusarium, Gibberella, Penicillium, Rhizopogon, Rhizopus* and *Sphaceloma* (Subba Rao,1977). GA_3 is extracted from fungal cultures. (Hapkins, 2004). *Aspergillus niger, Fusarium solani, Penicillium notatum* from the spermosphere (Saritha, 2008) and *Alternaria alternata* was isolated from the phylloplane of *Celosia argentea* L. (Saritha, 2012). So they might be release the gibberellins or gibberellin-like substances into the soil for germination.

A role of Gibberellins induce synthesis of hydrolytic enzymes such as amylase and protease during germination of seeds. During germinations of seed, the gibberellins are released from the embryo from a bound state. The embryo obtains its nourishment from endosperm which contains insoluble starch and protein. The degradation and solubilization of starch and proteins is due to hydrolyzing activity of enzymes amylase and protease. When the seed imbibes water, the free gibberellins move to aleuron cells of endosperm from the embryo and induce synthesis of amylase. The enzyme hydrolyses insoluble starch into sugar. If the embryo is excited, the amylolytic activity fails to develop in the endosperm.

CONCLUSION

In the present investigation it can be concluded that the lower concentrations of the GA_3, were more effective on seed germination of *Celosia argentea* L.

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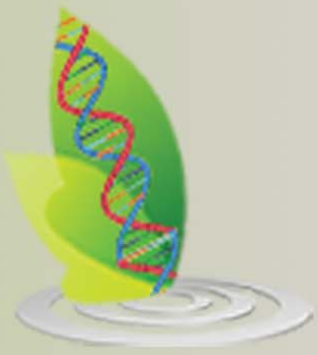

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