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EFFECT OF PLANT GROWTH REGULATORS ON SEED GERMINATION AND SEEDLING VIGOUR INDEX OF *OROXYLUM INDICUM* (L.) VENT. : AN ENDANGERED MEDICINAL PLANT

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Abstract

The present study was undertaken because of poor seed set and low seed viability. The TTZ (Triphenyl tetrazolium chloride) test showed 100% of seeds were viable. The present investigation was carried out to study the influence of different growth regulators on seed germination, shoot length, root length, fresh and dry weight and vigour index. The seeds were soaked in different hormone like GA_3, BAP, Kn, Zeatin to evaluate their effect on germination. Direct seed germination in petridish and soil showed very low result compare to *in vitro* seed germination. It was found that GA_3 at 50 ppm had a significant effect on germination. The surface sterilized pre-treated seeds were cultured *in vitro* on MS Media.

Key words : *Oroxylum indicum*, seed germination, seedling vigour.

Introduction

Oroxylum indicum (L.) Vent. Belongs to the family Bignoniaceae described as a medium sized, deciduous tree. This plant is widely found in India, shri lanka, china, Philippines and Malaysia (Bennet *et al*.,1992). This plant possesses a flavonoid *viz*. Baicalein used to check proliferation of human breast cancer cell line MDA - MB–435 (Lambertini *et al*., 2004). This plant possesses antioxidant, antifungal, antimicrobial, anti-inflammatory, antibacterial, antiarthritic, anti-cancer property (Warrier *et al*., 1995). Root extract of this plant has been used in Ayurvedic preparations like Dashmularisht and Chyawanprash (Yasodha *et al*., 2004). It is also used in other important ayurvedic formulation such as Amartarista, Dantyadyarista, Narayana taila, Dhanawantara ghrita, Brahma rasayana, Awalwha (Anonymous, 1998). This plant are repored to contain flavonoids namely, Chrysin, oroxylin- A, scutellarin, baicalein (Sankara and Nair, 1972). Because of its indiscriminate collection and over exploitation for medicinal purpose has pushed this plant to the list of endangered plant species of India (Darshan and Ved, 2003).

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Materials and Methods

Seed source and seed viability test

The seeds of *Oroxylum indicum* were collected from botanical garden, Hemchandracharya North Gujarat University. Seed viability was tested by using TTC (2, 3, 5-triphenyl tetrazolium chloride) test (Waes, 1986). 10 ml of 1% TTC solution with the pH 7.0 was taken in petri dish with the seeds. Then the solution was kept in dark room at 20 ± 2^0C for overnight. After 24 hrs, the solution was drained and the seeds were washed with sterile distilled water for 3 times. Red stained viable seeds and yellowish unstained seeds were counted under a light microscope with Several samples to get the percentage.

Culture media and culture conditions

Aqueous solutions (50 ppm) of different growth regulators like Gibberellic acid (GA_3), Kinetin (Kn), 6-Benzylaminopurine (BAP) and Zeatin were prepared separately. The seeds were soaked in different growth regulators for overnight and only double distilled water used for the control set. The seeds were surface sterilized in 0.01% (v/v) Tween – 20 for 2 minutes. Followed by 0.1% (w/v) $HgCl_2$ for 2 minutes. Each treatment was followed by repeated washing minimum of 3 times in autoclaved distilled water.

Surface sterilized seeds were inoculated in glass tubes

Table 1 : Effect of various treatments of growth hormones on *Oroxylum indicum* (L.) Vent. seeds.

Conc. in 50 ppm	Germination duration (days)	Shoot length (cm)	Root length (cm)	Shoot fresh weight (gm)	Root fresh weight (gm)	Shoot dry weight (gm)	Root dry weight (gm)
Control	20	2.75± 0.09	5.0±1.1	0.3±0.1	0.1±0.01	0.08±0.034	0.04±0.017
Kinetin	15	5.8±0.79	9.2±1.29	0.5±0.05	0.1±0.01	0.12±0.014	0.05±0.008
GA_3	10	7.35±0.87	11.9 ± 2.3	0.645±0.08	0.137±0.03	0.15±0.03	0.06±0.01
Zeatin	15	8.4±1.01	12.55±2.01	0.7±0.04	0.12±0.02	0.19±0.02	0.09±0.01
BPA	15	-	-	-	-	-	-

(Data presented in the table are Mean±S.D, '-'indicates no result)

Table 2 : Effect of various concentration of GA_3 on *Oroxylum indicum* (L.) Vent.seeds.

Conc. of GA in ppm	Germination duration (days)	Shoot length (cm)	Root length (cm)	Shoot fresh weight (gm)	Root fresh weight (gm)	Shoot dry weight (gm)	Root dry weight (gm)
30	14	5.13±0.79	8.8±1.08	0.56±0.057	0.11±0.031	0.11±0.02	0.05±0.01
60	10	7.9±1.3	12.38±1.79	0.67±0.06	0.12±0.01	0.17±0.02	0.06±0.09
90	14	5.4±0.5	9.78±1.29	0.55± 0.046	0.10±0.02	0.10±0.012	0.05±0.005

(Data presented in the table are Mean± S.D)

containg MS Media supplemented with 30 gl^{-1} and 0.8% agar. Three replicates of 10 seeds were used for each treatment and maintained at 25±2^{0}C, 60±10 relative humidity in a germinator chamber. Observations were recorded daily for the seed germination. Shoot length, root length and germination percentage were calculated. The seedling vigour index was calculated by following the formula.

Seedling vigor index (SVI) was calculated as per the recommendations of ISTA (1976)

SVI= germination percent × shoot length

Root length and shoot length of the seedling were recorded. All the observations were recorded after 6 weeks of incubation.

Results and Discussion

Out of four growth regulators GA_3 and Zeatin had significant effect on germination. Low germination was observed in control compare to other growth regulators. 0 % seed germination was observed in BAP Treatment. Pre-treated seeds with BAP, seeds and media turned in to black or brownish (fig. 5). GA_3, Kinetin and Zeatin gave better result than control and BAP. GA_3 was found to be the best for seed germination, whereas highest shoot length was observed in Zeatin (8.4 cm) and root length (12.55 cm). Highest shoot fresh weight (0.7 gm) and root fresh weight (012 gm) were also obtained from Zeatin. Highest dry weight also observed in Zeatin. There was no significant difference between GA_3 and Zeatin in vigour index. The highest shoot fresh weight, root fresh weight, shoot dry weight and root dry weight were observed in Zeatin (table 1). Germination percentage, vigour index, fresh weight of shoot and root, dry weigth of shoot and root as influenced by different concentration of GA_3 are presented in table 2. The highest concentration of GA_3 (90 ppm) showed the least germination percentage (45%), at 30 ppm 65%, at 60 ppm 70%, at 90 ppm 45%. Germination percentage as well as vigour index was decrease as the concentration was increased. Shoot length and root length, fresh and dry weight of shoot and root also decreases as the concentration was high.

It has been reported that, the higher concentration of IAA and GA_3 had significant effect on seed germination of *Asparagus sprengeri* Regelin in dark condition (Dhoran and Gudadhe, 2012). Pre-treated seeds with growth regulators such as GA_3 have been found to improve the seedling growth of many species (Shnmungavelu, 1970 and Singh *et al*., 1989). The higer concentration of IAA showed very least elongation of plumule, whereas GA_3 showed highest germination percentage as well as highest radical and plumule length in black gram and horse gram reported by Chauhan *et al*. (2009). IBA showed maximum length of shoot and root of *Asparagus racemosus*, this observation was reported by Vijay and Kumar (2004).

Conclusion

From the above discussion, it can be concluded that Gibberellic acid (GA_3) showed higher germination

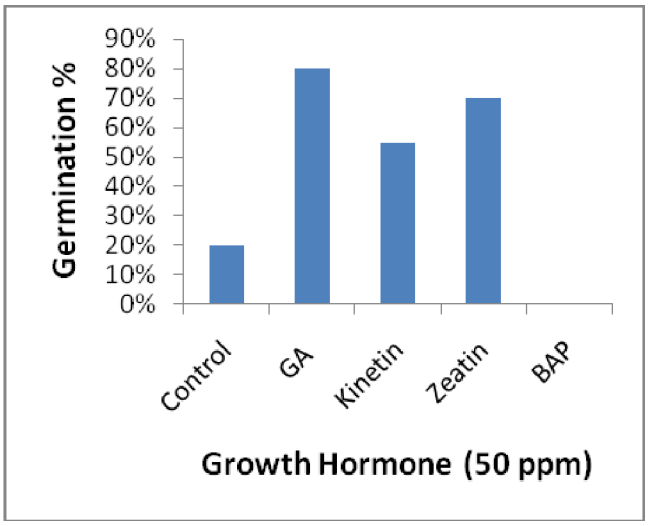

Fig. 1 : Effect of growth hormone on germination percentage.

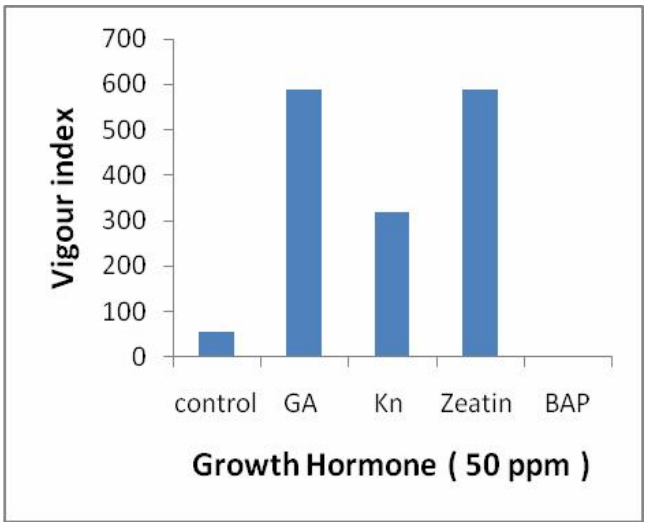

Fig. 2 : Effect of growth hormone on vigour index.

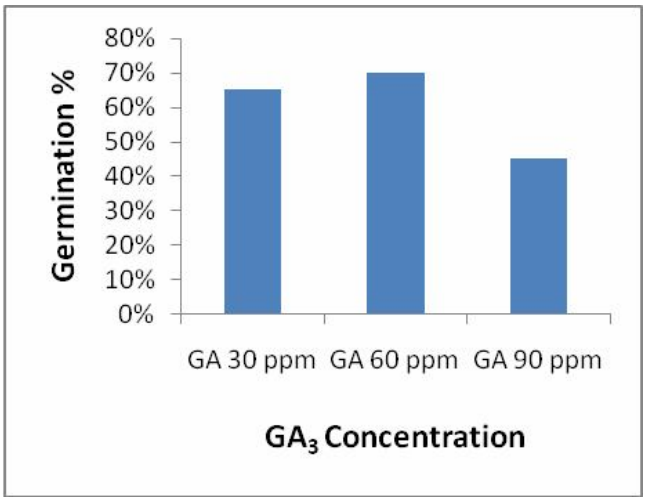

Fig. 3 : Effect of various concentration of GA_3 on germination percentage.

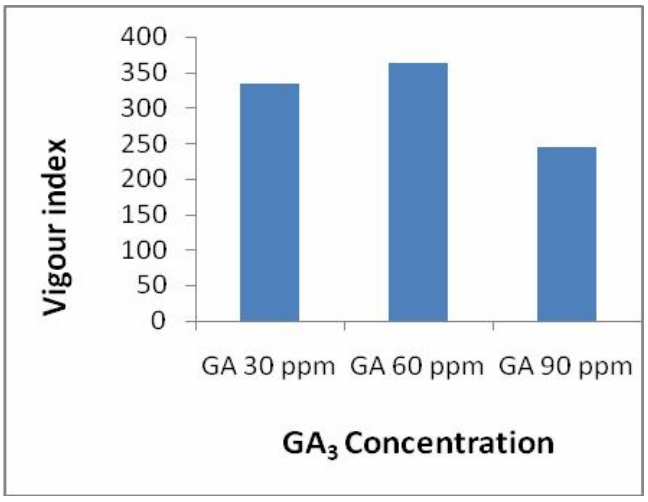

Fig. 4 : Effect of various concentration of GA_3 on vigour index.

Fig. 5

Fig. 6

(Fig. 5 : seeds with BAP treatment, Fig. 6 : germinated seeds with GA_3)

percentage in *Oroxylum indicum* (L.) Vent. GA_3 decrease germination percentage as increased concentration. Zeatin gives good result for shoot length and root length and also fresh and dry weight. So, the treatment with GA_3 was used to break the seed dormancy.

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