

Influence of GA₃ and IAA and their frequency of application on seed germination and seedling quality characters

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ABSTRACT

Effect of plant growth regulators on seed germination and seedling characters in terms of root length and shoot length. The seeds of sesame variety TVM – 1 were treated with different concentration of gibberlic acid (1.0, 2.0, 3.0 and 4.0 mg/l) and indole acetic acid (1.0, 2.0, 3.0 and 4.0 mg/l). From the results, it was observed that the GA₃ and IAA at 2.0mg/l had regulatory effect on seed germination and seedling characters. Maximum germination, root length and shoot length was observed at 2.0mg/l in GA₃ and 2.0mg/l in IAA than control. And GA₃ at 2.0gm/l was found to be more efficient to modify seed germination and seedling characters when compared to IAA and control.

Keywords: GA₃, IAA, Germination and seedling characters

1. INTRODUCTION

Sesame (*Sesamum indicum*) is well known as one of the oldest oil seed crops used for consumption (Weiss, 2000). On average, seeds contain about 50% of oil has better quality than other oil seed crop, is mostly utilized for making ghee (Yermonas et al., 1972). Sesame produces a unique chemical component that enables sesame oil to resist oxidative degradation and thus contributes to its reputation of having high quality oil (Al – Yemeni, 2000). Although sesame has good drought tolerance compared with many other crops, it is particularly susceptible to drought during both the germination and seedling stages (Orruno and Morgan, 2007).

Indole acetic acid (IAA) and gibberlic acid (GA₃) can manipulate a variety of growth and developmental phenomena in various crops. IAA has been found to increase the plant height, number of leaves per plant with consequent enhancement in seed yield in g round nut (Lee, 1990) and Cotton (Kapgate et al., 1989). It also increases the flowering, fruit set, the total dry matter of crops (Gurudev and Saxena, 1991). Likewise, GA₃ stimulated stem elongation (Harrington et al., 1996), increases dry matter accumulation (Hore et al., 1988) and enhance total yield (Deotale et al., 1998). The experiment was conducted to study the effect of IAA and GA₃ in modifying the germination and morphological characters of Sesame, Fig. 1.



Figure 1. Sesame (*Sesamum indicum*).

2. MATERIALS AND METHODS

Genetically pure seeds of *Sesamum indicum* var. TVM – 1 obtained from Oil seed Research Center, Tindivanam formed the base material for the study. The field experiment was conducted at Botanical garden, Department of Botany, Annamalai University, Annamalai nagar. The seeds were treated with different concentrations of Gibberlic Acid (1.0, 2.0, 3.0 and 4.0 mg/l) and Indole Acetic Acid (1.0, 2.0, 3.0 and 4.0 mg/l). Three replicates of fifty seeds were sown in sand medium. The two factorial experiments comprised of the growth regulators was laid out in randomized complete block design (RCBD). After the periods of seven days the normal seedlings were conducted and the mean values were expressed as percentage.

2. 1. Germination percentage

Germination percentage was calculated on the basis of number of seeds germinated and expressed as in percentage.

2. 2. Root length (cm)

At the time of germination count, ten normal seedlings were taken at random. The length between the collar and tip of the primary root was measured as root length and the mean length expressed in centimeter.

2. 3. Shoot length (cm)

From ten seedlings, the length between collar and tip of the primary shoot was measured as shoot length and the mean value expressed in centimeter.

3. RESULTS AND DISCUSSIONS

A highly significant difference was noticed due to hormones treatments for all the evaluated seed and seedling morphology characters (Table 1).

Table 1. Effect of IAA and GA₃ in seed germination and seedling growth characters of Sesame.

Treatments	Concentration	Germination (%)	Root length (cm)	Shoot length (cm)
Control	-	84	4.65 ±0.17	5.21 ±0.15
IAA	1.0 mg/l	83	4.41 ±0.10	6.76 ±0.20
	2.0 mg/l	86	5.20 ±0.13	7.83 ±0.11
	3.0 mg/l	80	4.28 ±0.08	5.41 ±0.15
	4.0 mg/l	79	3.86 ±0.11	4.89 ±0.14
GA ₃	1.0 mg/l	82	4.76 ±0.14	7.21 ±0.05
	2.0 mg/l	88	6.81 ±0.06	8.76 ±0.20
	3.0 mg/l	79	3.82 ±0.09	6.23 ±0.08
	4.0 mg/l	75	3.24 ±0.11	4.93 ±0.07

The seed germination was observed on 7th day after the emergence of radical and thereafter plumule. The percentage of seed germination varied among the various concentrations of growth regulators. However, the use of various hormones at different concentrations enhanced germination percentage compared to control. Seed germination was observed maximum at 2.0 mg/l (86 %) in GA₃ and 2.0 mg/l (88 %) in IAA. The germination percentage of control was 84 per cent. The increased germination per cent of GA₃ is also reported earlier works done by Chauhan et al., (2009). Seed germination status depends on embryo growth potential or inhibitors (Koorneef et al., 2002). This potential depends on the seed structure, especially embryo structure and affective factors on embryo (Mares, 2005).

All the treated plants showed a stimulatory effect on root length of sesame over control. The maximum root length was observed 2.0 mg/l (6.81 cm) in GA₃ and 2.0 mg/l (5.20 cm) in IAA. A significant variation was evident in the shoot length due to the application of growth regulators. Shoot length increased gradually with the advancement of the growth of the plant in all treatments. The growth regulators had stimulatory affected at plant height. Maximum shoot length was observed at 2.0 mg/l (8.26 cm) in GA₃ and 2.0 mg/l (6.76 cm) in IAA. GA₃ was found to be more efficient in stem elongation than IAA. This result supports earlier works

of Sontakey et al., (1991) in sesame, Lee (1990) in ground nut, Kumer et al., (1996) in Okra and Deotale et al., (1998) in soyabean.

Growth and development of higher plants are complex phenomena that are regulated by the concerted action of a crucial role, being able to induce both quantitative changes in growth and differentiation of cells and organs (Jones, 1992). GA₃ is regarded as the prime regulator of stem height in plants (Reid, 1987) and IAA is known to be active in promoting the growth of isolated stem segments.

4. CONCLUSION

Experiment results revealed that the germination percent and seedling characters could be modified by plant growth regulators brought about an improvement in growth and further developments of sesame.

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