

INFLUENCE OF GROWTH HORMONES (IAA AND GA₃) ON MORPHOLOGICAL AND YIELD PARAMETERS OF SUNFLOWER (HELIANTHUS ANUS L.)

Mukundraj B. Patil

Department of Botany

Late Ramesh Warpudkar college, Sonpeth, Dist. Parbhani (MS)

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Abstract

Experiment was carried out during December 2013 to March 2014 to study effect of IAA and GA₃ on the growth and yield parameters of sunflower (SS-56). Sowing of seeds was carried out in eleven plots of 1m x 1m. (One for control and 10ppm, 20ppm, 30ppm, 40ppm and 50ppm concentrations of IAA and GA₃). Different concentrations of IAA and GA₃ were applied twice 30 and 60 days after sowing. Height of the plant, Root length, Diameter of head was measured with the help of measuring scale in centimeters while 100 seed weight was weighed with the help of electric balance. Size of the seed was determined by pouring seeds into the 25ml measuring cylinder while yield (kg/hectare) was estimated by multiplying weight of seeds (Kg) from 1m x 1m plot with 10000. Both the growth hormones were able to enhance height of the plant and root length while GA₃ was more effective to increase diameter of head, seed size, 100 seed weight and yield of sunflower as compared to IAA.

Keywords- IAA, GA₃, Morphological and yield parameters.

Introduction

India is a country where main profession is Agriculture. In India variety of crops are sown, oil seeds contribute about 14% of the total area under cultivation in India. India occupies prominent position both area under cultivation and production of oilseeds. India is the fourth largest edible oil economy in the world and contributes about 10% of the world oil seed production. Sunflower is one of the major nine oilseeds in India. Area under cultivation and production of Sunflower was decreased continuously after 2005-06. Compared to world scenario yield of sunflower is very less (GOI, 2015). Hence efforts should be made to increase yield to attract farmers towards the cultivation of Sunflower.

Auxins and GA₃ are important growth hormones in plants. Besides regulating growth plant hormones affect seed growth, time of flowering, sex of the flowers, senescence of leaves fruits etc. They also affect fruit development, fruit ripening, plant longevity, fruit quality and even plant health (Christodoulou, 1968; Morris, 1987; Horvitz, 2003). Most of the workers have studied effect of growth regulators on germination (Chauhan et al., 2009; Patil et al., 2012; Dhoran and Gudadhe, 2012; Patil and Bhosle, 2017) and morphological characters, recent workers (Emonger and Ndambole, 2011; Rastogi et al., 2013; Khairul mazed, 2015) have focused on impact of growth regulators on yield parameters hence it can increase the yield of the crop. Present work highlight

Materials and Methods

A Stock solution of 100 ppm GA₃ and IAA was prepared by dissolving 500mg into 500 ml of water (Before preparation of Stock solution GA₃ was dissolved in small quantity of alcohol). It was diluted to prepare different concentration of growth hormones using $N_1V_1=N_2V_2$ formula to prepare 10ppm, 20ppm, 30ppm, 40ppm and 50ppm IAA and GA₃.

To study effect of growth hormones on growth and yield parameters plots of 1meter X 1meter (Total 11 plots) were prepared. Sunflower (SS-56) seeds were sowed in these plots with recommended spacing on 21 December 2013. Application of growth hormones was carried out twice first 30 days after and second 60 days after date of sowing spraying of growth hormones was carried out early in the morning with hand spray.

Growth parameters like -Height of the plant and length of the root was measured physically with help of Scale in centimeter. Diameter of capitulum head was measured with the help of scale in centimeter.

Size of the seed- Size of the seed was determined by pouring seeds into the 25-ml measuring cylinder as number of seeds/25ml increases size of the seed decreases and vice-versa.

Weight of seeds- After harvesting 100 seeds were selected randomly from each plot and they were weighed using electronic balance and represented in gram.

Yield- At the end of the season crop from each plot of 1x1m was harvested and threshed separately and weighed using electronic balance in kilograms. It was multiplied by 10000 and converted into kg/hectare.

Statistical Analysis

The mean, standard deviation (SD) and coefficient of variation (CV) has been calculated as described by Mungikar (2003) SE was calculated as $S.D. / \sqrt{n}$ (n = number of observations), and Critical difference (CD) was calculated as S.E. multiplied with t value for n-1. (C.D.= S.E. x t value for n-1).

Results and Discussion

Different concentrations of the IAA and GA₃ has shown significant effect to increase height of the plant. Average height of plant in control was 167cm. Height of the plant was increased due to GA₃ as well as IAA. Increase in the height of plant due to application of 30ppm and 40ppm GA₃ was significant at p=0.05 while 50ppm GA₃ increased height of plant this increase was highly significant at p=0.01. All the concentrations of IAA were statistically significant (p=0.01) to increase height of plant except 10ppm IAA which is statistically significant at p=0.05.

Same results were found by Bora and Sarma (2006) Khan et al (2002) and Rahman et al (2004) to increase plant height due to application of plant growth hormones

Average length of sunflower root in control was 14cm. Application of 10ppm, 40ppm and 50ppm GA₃ increased length of roots it was highly significant at p=0.01.

All the concentrations of IAA were statistically significant (p=0.01) to increase root length. Maximum root length was recorded in plants treated in plants treated with 30ppm IAA which was 23.3cm it was followed by 40ppm IAA where 20.7cm root length was recorded.

Khairul Mazed et al. (2015) found such type of increase in the length of root due to the 70 and 90ppm GA₃ in Cabbage Similarly Moyazzama (2008) reported that the maximum length of root was obtained from 85 ppm GA₃.

Diameter of the sunflower head in control was 13.1cm. Application of GA₃ and IAA individually shown that there was an increase in the diameter of sunflower head but this increase in the diameter of sunflower head was statistically significant only in GA₃ having more than 20ppm concentration, increase in the diameter of head is non-significant in plants treated with 10ppm GA₃. Maximum diameter of capitulum head was recorded in the plants applied with 50ppm GA₃ that was 17.2cm. Increase in the diameter of head is due to application of different concentrations of IAA was non-significant.

Kamaraj et al. (1999) showed similar results they found increased diameter of sunflower head with the treatment of plant with IBA + K and GA₃ + K treatment. Vasudevan et al. (1996) also noticed an



increase in sunflower head diameter with the treatment of TIBA and NAA.

When plants were treated with different concentrations of GA₃ and IAA individually all the treatments has shown significant increase in the seed weight. Maximum seed weight was found in the plants applied with 50ppm GA₃ that was 3.8gm followed by 3.7gm in the plants applied with 40ppm GA₃. In IAA most effective concentration was 30ppm which has 3.1gm weight of 100 seeds this increase in the seed weight was statistically significant at p=0.01.

Same results were found by Sarkar et al. (2002) and Azizi et al. (2012) in Soyabean Ghodrati et al. (2012) in *Zea mays*, Emonger V (2007) in Tswana Cow pea.

When sunflower was treated with different concentrations of GA₃ and IAA individually it was found that GA₃ is most effective to enhance size of the sunflower seeds. In sunflower number of seeds in 25ml were 349 which were decreased up to 249 seeds in 50ppm GA₃. This increase in the size of sunflower seeds was statistically significant at p=0.01. As far as IAA is concerned application of 10ppm, 20ppm and 50ppm IAA has resulted large size of seeds which was statistically significant while in 30ppm and 40ppm IAA there was no significant change in the size of the seeds.

GA₃ was able to enhance the Yield of sunflower while IAA has no significant role to increase yield of sunflower. Maximum Yield was recorded in plants treated with 50ppm GA₃ that was 2280kg/hectare followed by 2100kg/hectare in 40ppm GA₃ and 1920kg/hectare in the plants treated with 30ppm GA₃. All these treatments were able to increase Yield of sunflower which were statistically significant at p=0.005 as well as p=0.01 while in 20ppm GA₃ treated plants Yield was statistically significant at p=0.05 only. Tahsin and Kolev (2005), Ernst et al. (2016) has also recorded increase in the sunflower yield due to application of Gibberellic acid.

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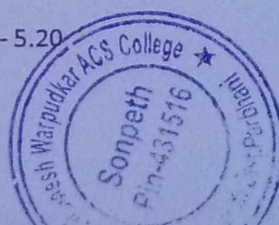


Table 1. Influence of different concentrations of growth hormones (IAA and GA₃) on Morphological and Yield Parameters of Sunflower.

TREATMENT	HEIGHT OF PLANT (Cm)	LENGTH OF ROOT (Cm)	SIZE OF THE SEED (Seeds/25ml)	DIAMETER OF HEAD (Cm)	100 SEEDS WEIGHT (Gm)	YIELD (Kg/hectare)
Control	167	14.0	349.0	13.1	2.5	1730.0
GA 10ppm	167.1	18.7**	266.0**	13.5	2.9**	1760.0
GA 20PPM	168.2	14.0	313.0**	14.4**	3.1**	1870.0*
GA 30PPM	168.9*	15.7	297.0**	14.6**	3.1**	1920.0**
GA 40PPM	169.3*	17.3**	259.0**	15.3**	3.7**	2100.0**
GA 50PPM	171.3**	20.0**	249.0**	17.2**	3.8**	2280.0**
IAA 10PPM	169.3*	17.7**	280.0**	13.2	2.9**	1750.0
IAA20PPM	169.7**	19.7**	322.0*	13.5	2.8**	1760.0
IAA30PPM	172.5**	23.3**	329.0	13.4	3.1**	1780.0
IAA40PPM	173.5**	20.7**	354.0	13.5	2.9**	1820.0
IAA50PPM	174.7**	16.3*	304.0**	13.8	2.9**	1790.0
Mean	170.1	18	302.0	14.1	3.1	1869.1
S.D.	2.5	2.8	33.9	1.2	0.4	164.8
C.V.	3.8	15.4	11.2	8.2	11.5	8.8
S.E.	0.76	0.8	10.2	0.4	0.1	49.7
C.D. 5 %	1.7	2.0	22.8	0.8	0.2	110.8
C.D. 1 %	2.4	2.8	32.4	1.1	0.3	157.5

(* Significant at p=0.05; ** Significant at p=0.01)



PRINCIPAL
Late Ramesh Warpudkar (ACS)
College, Sonpeth Dist. Parbhani