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P Prasanth Kumar
Department of Biological
Sciences, Sam Higginbottom
Institute of Agriculture
Technology and Sciences,
Allahabad, Uttar Pradesh, India

Dr. Suchit A John
Department of Biological
Sciences, Sam Higginbottom
Institute of Agriculture
Technology and Sciences,
Allahabad, Uttar Pradesh, India

Effect of plant growth promoters and growth retardants on growth parameters of mustard (*Brassica juncea* L.)

P Prasanth Kumar and Dr. Suchit A John

Abstract

A field experiment was conducted during *Rabi* 2015-2016 to study the effect of plant growth promoters and growth retardants on growth parameters of mustard (*Brassica juncea* L.) at the research field of Dept. of Biological Sciences, SHIATS, Deemed to be university, Allahabad. The experiment consisted of plant growth promoters and growth retardants i.e., GA₃, NAA, Cycocel and Ethrel. The growth promoters and growth retardants at concentrations of 100, 200 and 300ppm as foliar treatments. The experiment was laid out in RBD with three replications and the treatments were imposed at 30, 45, 60, 75 and 90 DAS. Among the all treatments application of NAA @ 100ppm has significantly increased plant height (cm), number of branches per plant, number of leaves per plant, total dry matter content (gm) per plant. Cycocel @ 300ppm was found beneficial in decreasing plant height (cm).

Keywords: mustard, GA₃, NAA, cycocel, ethrel, growth parameters

Introduction

Mustard crop belongs to genus *Brassica* and family Cruciferae and tribe Brassicaceae (Gomez-Campo, 1980) [7]. It was introduced from southern Europe to Asia and Africa (Downey and Robblelen, 1989) [4]. It is widely grown in Europe (rank first), China (rank second), Indian subcontinent (rank third) and Canada. (Yarnell, 1956). The four most widely cultivated species for oilseed and vegetable production are *B. rapa* (L.), *B. juncea* (L.), *B. napus* (L.), and *B. carinata*. (Raymer, 2002; Rakow, 1995; Sovero, 1993) [10, 9, 11]. The genus includes many economically important crops which provide edible roots, stems, leaves, flowers and seeds. Among the *Brassica* crops, oilseed has the highest economic value. (Raymer, 2002) [10]. Mustard is a major rabi crop in India. In India cultivation of mustard is between October-November and February-March. Major growing areas are Rajasthan, Uttar Pradesh, and Haryana. Rajasthan and Uttar Pradesh are the major mustard producing states in India. Broadly seven varieties of mustard and rapeseed are grown in India. Most popular varieties grown in Indian subcontinent are *Brassica juncea*, *Brassica rapa* and *Brassica napus*. (www.nmoop.gov.in). Indian mustard (*Brassica juncea* L.) is a fast growing plant which produces a high biomass even in heavy metal polluted soils. While increase in world population, demand for high quality oilseeds. Mustard are annually grown on about 36.15 million hectares in the world and provide 71.09 million tons of oilseed production and with an yield of 1970 kg/hectare. In India it occupies an area of 6.4 million hectares, production of 8.02 (million tons) and yield of 1262 kg/hectare, respectively during the year 2013-2014, (www.drmr.res.in). It is grown as vegetable, oil, fodder, condiment and green manure purposes. It is an important oil seed crop of the world after soya beans (FAO 2001) [5]. Plant growth promoters and growth retardants have great potential in increasing agricultural production and help in removing many of the barriers imposed by genetics and environment. They play an important role in mitigating stress, increasing flower set, yield and physiological efficiency of the crop.

Materials and Methods

The field experiment was conducted during *Rabi* season 2015-2016, Department of Biological Sciences, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Deemed-to-be University, (formerly known as Allahabad Agricultural Institute-AA-IDU). The experiment was laid out in randomized block design with thirteen treatments replicated thrice. The gross plot size for each treatment was 2×1m. Mustard seeds were sown at a spacing of 45×15m. The thirteen treatments are one is control remaining are GA₃ 100, 200, 300ppm, NAA 100, 200, 300ppm, Cycocel 100, 200, 300ppm and Ethrel 100, 200, 300ppm spray.

Correspondence
P Prasanth Kumar
Department of Biological
Sciences, Sam Higginbottom
Institute of Agriculture
Technology and Sciences,
Allahabad, U.P, India

All the treatments were given in the form of foliar spray at 30 days after sowing. The plants were sprayed by hand sprayer. The data on the growth parameters were recorded from a sample of five plants taken randomly at different intervals (30 before spraying, 45, 60, 75 and 90 DAS). The growth parameters were recorded in five plants randomly selected in each treatment. Significant differences were observed for growth parameters like plant height (cm), number of branches per plant, number of leaves per plant, total dry matter (gm) per plant.

Results and discussion

The present study entitled "Effect of plant growth promoters and growth retardants on growth parameters of mustard (*Brassica juncea* L.)." was conducted in the department of Biological sciences, Sam Higginbottom Institute of agriculture technology and Sciences, (Deemed – to – be University) Allahabad, India.

The growth parameters were recorded from 30 to 90 DAS at 15 days intervals. The effect of plant growth promoters and growth retardants such as GA₃, NAA, Cycocel and Ethrel at different concentrations on mustard. The maximum plant height (cm) was recorded at 90 DAS in T₅:100ppm (137.99) compared to other treatments and control. The present study was supported by the findings of Adam *et al.* (2011)^[3] who observed increased the crop plant height by application of

NAA respectively after 60 days after sowing of the crop. The minimum plant height (cm) was recorded at 90 DAS T₁₀: Cycocel 300ppm (100.47) compared to control. The present study was supported to the finding of Georgia *et al.* (2010)^[6] who observed that the application of Cycocel at 90 days after transplanting on (*Capsicum Annum*) had not increased the plant height. The maximum number of branches per plant was recorded at 90 DAS in T₅: NAA 100ppm (22.93) when compared to the other treatments and control. The present study was supported by the findings of Yugandhar *et al.* (2016)^[13] who observed increased the number of branches per plant by application of NAA respectively after 60 to 70 days after sowing of the crop. The maximum number of leaves per plant was recorded at 90 DAS in T₅: NAA 100ppm (32.13) when compared to the other treatments and control. The present study was supported by the finding of Subhash *et al.* (2014)^[12] who observed increased the number of leaves per plant by application of NAA respectively after 60 to 70 days after sowing of the crop. The maximum total dry matter (gm) per plant was recorded at 90 DAS in T₅: NAA 100ppm (17.45) when compared to the other treatments and control. The present study was supported by the findings of Kokare *et al.* (2006)^[8] who observed increased the total dry matter (gm) per plant by application of NAA respectively after 60 days after sowing of the crop.

Table 1: Effect of plant growth promoters and growth retardants on growth parameter of mustard.

Treatments	Plant height (cm)		Number of branches / plant		Number of leaves / plant		Total dry matter content (gm) /plant	
	45 Das	90 Das	45 Das	90 Das	45 Das	90 Das	45 Das	90 Das
T ₁ : Control	19.83	103.97	1.20	9.20	8.73	15.27	2.67	11.16
T ₂ : GA ₃ 100ppm	29.73	120.83	1.47	12.93	15.40	20.87	2.97	13.30
T ₃ : GA ₃ 200ppm	29.81	120.87	1.73	13.47	15.33	20.80	2.88	12.58
T ₄ : GA ₃ 300ppm	35.48	132.02	2.67	20.93	16.00	29.13	3.65	16.67
T ₅ : NAA 100ppm	36.67	137.99	3.27	22.93	18.27	32.13	3.75	17.45
T ₆ : NAA 200ppm	28.52	125.64	2.13	11.87	15.20	22.13	3.02	13.02
T ₇ : NAA 300ppm	29.60	122.71	2.00	14.07	13.53	21.40	3.03	13.28
T ₈ : Cycocel 100ppm	26.00	112.63	2.13	15.87	13.00	20.93	3.08	13.46
T ₉ : Cycocel 200ppm	28.36	108.13	2.07	13.20	14.93	19.27	3.14	13.74
T ₁₀ : Cycocel 300ppm	19.66	100.47	2.00	16.87	14.20	18.67	3.29	14.27
T ₁₁ : Ethrel 100 ppm	28.95	120.85	2.20	13.47	14.07	22.13	3.34	14.64
T ₁₂ : Ethrel 200 ppm	30.23	120.42	2.20	13.80	13.93	21.20	2.84	12.51
T ₁₃ : Ethrel 300ppm	29.83	120.25	1.93	13.80	12.33	20.53	2.97	12.97
F- test	S	S	S	S	S	S	S	S
SE. d (±)	0.20	1.77	0.14	0.77	0.70	1.10	0.02	0.11
C.D. (5%)	0.42	3.66	0.29	1.58	1.44	2.28	0.03	0.22

Conclusion

From the present investigation it is concluded that, the application of NAA @ 100ppm has recorded the highest growth rate. It could be used as a effective plant growth promoter for the growth and development. The application of growth retardants i.e., Cycocel @ 300ppm has shown decline in plant height (cm) compared to control. Cycocel @ 100, 200, 300ppm has shown higher number of branches per plant, number of leaves per plant, total dry matter content (gm) per plant compare to control. The application of Ethrel @ 100, 200 and 300ppm has recorded higher growth rate compared to control.

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