

ANALYSIS OF GROWTH AND YIELD OF INDIAN MUSTARD IN RELATION TO PHYTOHORMONES APPLICATION UNDER LATE SOWN.

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INTRODUCTION

Indian mustard (Brassica juncea (L.) Czern and Coss) is one of the most popular edible oil seeds of North India. Productivity of late sown mustard is reduced due to adverse effect on growth (Kumar and Shastry, 1981). The metabolic processes within the plant affect the growth to a greater extent. It was found that phytohormones influenced the seed yield of different crops. Morgan et al. (1983) reported that application of hormones affected the number of pods per plant in oil seed rape. However, the information pertaining to the effect of phytohormones on mustard is lacking. Therefore, the present study was aimed to find out the effect of exogenous application of phytohormones on the growth, yield attributes and seed yield of mustard with a view to increase the productivity of late sown mustard.

MATERIALS AND METHODS

The experiment was conducted on a silty clay loam soil (p^H 7.2) during the winter seasons of 1985-86 and 1986-87 at the Crop Research Centre of G.B.Pant University of Agriculture and Technology, Pantnagar, Nainital. A split-plot design was adopted taking three stages of spray (Rosette, Bud-emergence and Flowering) in main-plots and six phytohormones levels (NAA-10 and 100 ppm, GA₃-1 and 10 ppm, Ethrel-50 and 500 ppm and water spray as control) in sub-plots with three replications. Sowing was done in 30 cm apart rows and uniform plant population of 0.22 million plants per hectare was maintained. Crop was fertilized with 120 kg N, 40 kg P₂O₅ and 20 kg K₂O per hectare. The phytohormone solutions were made as per treatment in one litre of deionised water for one plot adding 0.25 ml of sandovit as surfacetant. The spraying was done by hand sprayer and the plants were fully drenched with solution. Growth studies were made by randomly selecting five plants. Seed yield was recorded from a net plot of 2.4 m x 4.5 m size.

RESULTS AND DISCUSSIONEffect of phytohormones on growth

The stages of spray did not influence the growth parameters. Though, the spray done at bud emergence stage was superior (Table 1 and 2).

Ethrel-500 ppm and NAA 100 ppm had better crop growth rate as well as relative growth rate in comparison with lower concentrations of these hormones. Leaf area index at 60 and 90 days stage was maximum when GA₃-10 ppm was applied. The leaf area index is related with number of leaves and leaf area per plant.

Dry matter accumulation was also significantly higher with the application of Ethrel-500 ppm and NAA-100 ppm. Similar trend was also observed with respect to net assimilation rate between 30-60 and 60-90 days-stage (Table 2). The leaf area ratio was more with the application of GA₃-1 ppm and NAA-10 ppm.

Effect of phytohormones on yield attributes and seed yield

The number of branches per plant increased significantly when phytohormones were sprayed at bud emergence or flowering stage in comparison with rosette stage. The siliquae number, 1000-seed weight and seed yield did not differ significantly due to stage of spray.

Significantly higher number of branches per plant was noted where Ethrel-500 ppm was sprayed over water spray and GA₃ -1 ppm but was similar with other treatments (Table 3). The number of siliquae/plant as well as 1000-seed weight increased significantly due to NAA-100 ppm and Ethrel-500 ppm application in comparison with other treatments. Singh et al. (1988) observed that cycocel-50 mg/litre increased 1000-seed weight in mustard. Ethrel-500 ppm has been reported to cause significant increase in the number of pods/plant in Blackgram (Subbain and Chany, 1984). The percentage increase in number of siliquae/plant was 20.19 and 26.48 due to NAA-100 ppm and Ethrel-500 ppm, respectively over water spray. The seed yield increased significantly with the application of Ethrel-500 ppm but stage of spray did not influence the seed yield. Goel (1979) reported that application of Ethrel (50 and 500 ppm) as foliar spray in sunflower plants increased 1000-seed weight and seed yield/plant.

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Table 1. Leaf area index, crop growth rate, relative growth rate of Indian mustard as influenced by stage of spray and phytohormones (Pooled data of 1985-86 and 1986-87)

Treatments	Leaf area index		Crop growth rate (g day ⁻¹ x 10 ⁻¹)		Relative growth rater (g g ⁻¹ day ⁻¹ x 10 ⁻²)	
	60 days	90 days	30-60 days	60-90 days	30-60 days	60-90 days
<u>Stage of spray</u>						
Rosette	3.0	0.8	3.8	2.3	6.5	1.4
Bud emergence	3.2	0.8	4.0	2.4	6.6	1.4
Flowering	2.8	0.7	3.8	2.3	6.4	1.3
C.D. at 5%	NS	NS	NS	NS	NS	NS
<u>Phytohormones</u>						
NAA-10 ppm	3.3	0.8	3.5	2.2	6.4	1.4
NAA-100 ppm	2.9	0.8	4.7	2.8	6.8	1.4
GA ₃ -1 ppm	3.2	0.9	3.4	2.0	6.2	1.4
GA ₃ - 10 ppm	3.4	1.0	3.9	2.3	6.5	1.3
Ethrel-50 ppm	2.6	0.6	4.2	2.4	6.7	1.3
Ethrel-500 ppm	2.6	0.6	4.6	2.8	6.9	1.4
Water spray	2.7	0.6	3.4	2.7	5.9	1.3
C.D. at 5%	0.3	0.1	0.3	0.4	0.5	NS

Table 2. Dry matter accumulation, net assimilation rate and leaf area ratio of Indian mustard as influenced by stage of spray and phytohormones (Pooled data of 1985-86 and 1986-87)

Stage of spray	Dry matter (g)/plant, at harvest	Net assimilation rate		Leaf area ratio		
		(g cm ⁻² day ⁻¹ x 10 ⁻⁴)	30-60 days	60-90 days	30-60 days	60-90 days
Rosette	31.2	4.6	3.2	146.0	47.8	
Bud emergence	31.6	4.7	3.2	154.0	47.4	
Flowering	31.0	4.5	3.0	145.4	46.9	
C.D. at 5%	NS	NS	NS	NS	NS	
<u>Phytohormones</u>						
NAA-10 ppm	18.8	3.9	2.7	167.4	53.4	
NAA-100 ppm	24.2	5.7	3.7	124.0	39.7	
GA ₃ -1 ppm	18.0	3.7	2.5	170.6	58.0	
GA ₃ -10 ppm	20.8	4.8	2.7	162.3	53.9	
Ethrel-50 ppm	21.4	5.4	3.8	127.7	37.0	
Ethrel-500 ppm	23.8	5.6	4.8	129.4	36.9	
Water spray	15.7	3.8	2.7	158.6	51.0	
C.D. at 5%	1.4	0.6	0.6	15.7	5.5	

Table 3. Yield attributes and seed yield of Indian mustard as influenced by stage of spray and phytohormones (Pooled data of 1985-86 and 1986-87)

Treatments	Branches/plant	Siliqueae/plant	1000-seed weight	(g) Seed yield (kg/ha)
<u>Stage of spray</u>				
Rosette	19.4	406.2	4.2	1403
Bud emergence	24.8	424.8	4.8	1478
Fowering	25.6	419.3	4.8	1463
C.D. at 5%	3.3	NS	NS	NS
<u>Phytohormones</u>				
NAA-10 ppm	24.2	415.8	4.6	1375
NAA-100 ppm	25.8	434.4	5.3	1572
GA ₃ -1 ppm	19.8	361.6	4.1	1361
GA ₃ -10 ppm	23.2	388.9	4.2	1384
Ethrel-50 ppm	25.3	429.3	4.3	1445
Ethrel-500 ppm	26.0	457.1	5.4	1631
Water spray	20.0	361.4	4.2	1358
C.D. at 5%	2.9	23.0	0.8	169