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Crop growth regulation and detopping in summer moong for contemporizing maturity

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ABSTRACT

A field study entitled "Crop growth regulation and detopping in summer green gram for contemporizing maturity" was conducted at GSSDGS Khalsa College, Patiala, Punjab during the summer season of 2017. The experiment was conducted in a randomized complete block design comprising of eight treatments with three replications. The treatments included MC (mepiquat chloride) @ 200 ppm (35 DAS), MC @ 200 ppm (35 and 45 DAS), MC @ 250 ppm (35 DAS), MC @ 250 ppm (35 and 45 DAS), MC @ 300 ppm (35 DAS), MC @ 350 ppm (35 and 45 DAS), detopping and control. Yield attributes such as plant height and dry weight, improved significantly with MC @ 250 ppm (35 and 45 DAS) followed by control. The highest harvest index (20.17%) was recorded in MC @ 250 ppm (35 and 45 DAS) along with the highest B: C ratio.

Keywords: Regulation, Detopping, Mepiquat chloride, Yield.

INTRODUCTION

Green gram (*Vigna radiata* L. Wilczek) is one of the most important crops in all pulses and is a good source of protein. Plant growth regulator applications help to modify the physiological processes in crops in the form of growth and development. The chemical 'Mepiquat chloride' is a plant growth retardant that helps to slow down the process of biosynthesis of gibberellic acid hormone in plants [1]. Mepiquat chloride reduces plant height and dry matter accumulation. It increases pod per plant, grain per pod, Grain yield, and protein content in Green gram. Detopping (removing apical bud) is another important agronomic practice that helps to overcome apical dominance and therefore increasing the number of lateral branches and pod setting. In summer green gram, detopping is known to alter the source-sink relationship by arresting the vegetative growth and hastening the reproductive phase. Therefore, improvement in yield and quality parameters in summer moong may be achieved through suitable application of growth regulators as well as appropriate agronomical practices.

MATERIAL AND METHOD

The experiment was undertaken at GSSDGS Khalsa College, Patiala, Punjab during the summer season of 2017 to study the effect of growth regulators on growth and yield of summer green gram (*Vigna radiata* L.). The experiment was laid out in a randomized complete block design with 8 treatments and 3 replications. The treatment were: (1) MC (mepiquat chloride) @ 200 ppm (35 DAS), (2) MC (mepiquat chloride) @ 200 ppm (35 and 45 DAS), (3) MC (mepiquat chloride) @ 250 ppm (35 DAS), (4) MC (mepiquat chloride) @ 250 ppm (35 and 45 DAS), (5) MC (mepiquat chloride) @ 300 ppm (35 DAS), (6) MC (mepiquat chloride) @ 350 ppm (35 and 45 DAS), (7) detopping and (8) control. The physicochemical properties of surface soil were: textural class clay, soil pH 7.8, organic carbon 0.62 percent, available nitrogen (350 kg ha⁻¹) with, available phosphorus (24 kg ha⁻¹) and available potassium (184 kg ha⁻¹). Spray operation was always carried out from lower to higher concentration of MC. The crop was sprayed thoroughly, in such a way so that all portions of the leaves and plant parts moistened with respective solution. Spraying was done at morning hours of bright sunny days. Observations on the growth characters and yield components and yield were taken and analyses were done.

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RESULT AND DISCUSSION

Plant height (cm)

Plant height (cm) is one of the indices for determining the plant stand. The data on plant height of green gram recorded at harvesting are presented in Table 1. The decrease in height may be because Mepiquat chloride being a growth retardant suppresses vegetative growth. At 60 DAS highest plant height recorded in the treatment T₈. The decrease in height may be because Mepiquat chloride being a growth retardant suppresses vegetative growth. Detopping means removal of the tip of the main vegetative shoot is useful in suppressing the apical dominance and thus promoting the lateral branching ultimately leading to a decrease in plant height. Brar *et al* [2] and Elkoca and Kantar [3] also reported similar results of growth regulators.

Dry weight per plant (g)

Dry weight (g plant⁻¹) is one of the indices for determining the growth and metabolic efficiency. The data on Dry weight of green gram recorded at 30, 45 and 60 DAS are presented in Table 1. MC significantly influenced the total dry weight at harvest stage. MC @ 250 ppm at 35 and 45 DAS higher dry weight as compared to control which is 22.60 g per plant at 60 DAS. The increase in Dry weight in the MC treated plots could be due to increased photosynthetic ability of leaves and thus assisting in the accumulation of more photosynthesis by plants and ultimately resulting in higher Dry weight per unit area. Similar observations earlier made by Saisankar [4]. The results are in line with the study by Singh [5] which showed that MC effectively increases dry matter accumulation over control in green gram.

Harvest Index (%)

Harvest index is one of the indices for determining the source-sink relation of the plant. The data on the Harvest index of green gram recorded at harvesting are presented in Table 1. Harvest index is the measure of how effectively the photosynthates were transferred from source to the sink. Two sprays of MC @ 250 ppm applied at 35 and 45 DAS recorded highest harvest index (20.17 percent) which was at par with a single spray of MC @ 300 ppm applied at 35 DAS (19.7 percent). An increase in harvest index may be accounted as a function of

mepiquat chloride which improved the source-sink relationship thus enhancing diversion of photosynthates towards vegetative parts to reproductive parts. Singh [5] also recorded a significant increase in the harvest index with the application of MC over the control treatment.

Nitrogen content in seed (%)

Nitrogen content in the seed is one of the indices for determining the quality characters of plants. Nitrogen content in seed also helps to find the protein content of the in the crop. The nitrogen content ranged from summer moong crop from 2.76- 3.24%. The maximum nitrogen of seed at treatment where apply two times of mepiquat chloride at 35 and 45 days after sowing at 250 ppm (3.24). The minimum value of the nitrogen is obtained at the control treatment (2.76). The Treatments were at par with the two times of apply mepiquet chloride @ 250 ppm expect the control and detopping treatment.

Protein content in seed (%)

Protein content in the seed is one of the indices for determining the quality characters of plants. The data on Protein content in the seed of green gram recorded at harvesting are presented in Table 1. Green gram is a good source of protein in all the legume crops. The mepiquat chloride and detopping not produce too much of the effect on the protein content in the seed. The maximum Protein in the seed at treatment where apply two times of mepiquat chloride @ 250 ppm (20.27). The minimum value of the protein in seed in the control treatment (17.25). The Treatments were at par with the two times of apply mepiquet chloride @ 250 ppm expect the control and detopping treatment.

B: C ratio

B:C ratio is one of the indices for determining the economic characters of the plant. The data on the B:C ratio of green gram recorded at harvesting are presented in Table 1. The maximum value of the net return was found with two times of application of mepiquat chloride @ 250 ppm (1.97) and mepiquat chloride @ 300 ppm (1.75) are at par value to the best treatment. The minimum value was found in control treatment.

Table 1: Effect of different growth regulators on summer moong

Treatments	Plant height (cm)			Dry weight per plant (g)			Harvest Index (%)	Nitrogen content (%)	Protein content (%)	B:C ratio
	30 DAS	45 DAS	60 DAS	30 DAS	45 DAS	60 DAS				
T1	15.12	32.02	50.35	4.42	7.62	19.77	15.70	2.98	18.65	1.18
T2	15.20	31.95	49.42	4.32	7.97	19.37	16.55	3.01	18.87	1.25
T3	15.42	31.82	49.82	5.62	8.72	21.27	17.20	3.07	19.22	1.31
T4	14.87	30.96	48.60	5.72	9.20	22.60	20.17	3.24	20.27	1.97
T5	15.40	31.42	48.17	6.47	8.07	18.25	19.70	3.13	19.57	1.75
T6	15.69	29.90	46.75	4.57	8.27	18.50	17.87	3.10	19.42	1.47
T7	15.70	30.22	45.62	5.05	7.40	17.62	16.25	2.83	17.75	1.03
T8	15.72	33.07	51.02	5.85	5.55	16.15	15.80	2.76	17.25	0.88
CD at 5% level	NS	1.32	1.08	NS	1.01	1.23	1.00	0.35	2.24	0.33

CONCLUSION

The growth regulator treatments showed a profound effect on morphological characters like plant height and dry weight per plant were significantly increased by MC @ 250 ppm (35 and 45 DAS) followed by control. Among the quality parameters, highest seed protein content (%) and highest nitrogen content values were recorded with growth retarding substance i.e. mepiquat chloride in green gram.

Conflict of interest

The authors declare no conflict of interest.

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