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Maximizing the yield of mung bean by foliar application of growt regulating chemicals and nutrients

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Abstract: The nutritional management for maximizing yield in pulses is the need of the day to overcome the malnutrition of the people in the developing countries. An attempt was made with different growth regulating chemicals and nutrients and in combination as foliar supplementary with a view to increase the yield in green gram (mungbean). The total dry matter production (TDMP) and yield components were related to the yield as influenced by the supplementation of the growth regulating chemicals and nutrients and their combination. The combination of 100 ppm salicylic acid, 2% DAP, 1% KCl and 40 ppm of NAA has influenced the TDMP to the level of 27.430 g plant^{-1} as against the control (20.242 g plant^{-1}). The high TDMP had also resulted in efficient translocation of assimilates which led to a higher grain yield (1443.38 kg ha^{-1}) by way of increased yield components.

Key Words: Mungbean, Foliar nutrition, TDMP, Yield.

Introduction

Contribution of pulses to Indian Agriculture and daily life has been tremendous besides being one of the important constituents of our diet. Greengram is the third important pulse crop in India, covering an area of 2.86 million hectares, accounting for 12 per cent of the total acreage, but constitutes only 8 per cent of the total pulse production of the country. This is due to the fact that average productivity of greengram is as low as 467 kg ha^{-1} in India, while the average productivity of other legumes was 778 kg ha^{-1}. The causes for such low yield were a number of physiological, biochemical as well as certain inherent factors associated with the crop. Apart from the genetic constitution, the physiological factors such as inefficient partitioning of assimilates, poor pod setting, excessive flower abscission and lack of nutrients during the critical stages of crop growth were found to be some of the yield barriers of mungbean (Alberta and Bower, 1983; Promila Kumari and Varma, 1983).

Nutrients play a pivotal role in increasing the seed yield in pulses. Foliar application of major nutrients like nitrogen and potassium was found to be as good as soil application (Subramanian and Palaniappan, 1981). According to Mitra *et al.* (1988), nitrogen is the major limiting factor for yield in mungbea Several reports (Hamid, 1991; Kalita *et a* 1994) suggested that supplementing urea at tl reproductive stage significantly enhanced tl seed yield by delaying leaf senescence in mungbea The objective of the study was to develc a suitable combination of nutrient and pla growth regulating chemicals for improving tl yield of the mungbean.

Materials and Methods

A field experiment was carried out durir *kharif* 2002, in the Department of Crop Physiolog Tamil Nadu Agricultural University, Coimbatoı using greengram variety CO 6. The treatmen comprised of T_1 - Control, T_2 - Salicylic aci 100 ppm; T_3 - Di-ammonium phosphate 29 T_4 - DAP 2% + Potassium chloride 1% Naphthalene acetic acid 40 ppm; T_5 - SA 1C ppm + DAP 2% + KCl 1% + NAA 40 ppn T_6 - Combined spray of DAP 2%, SA 100ppn NAA 40 ppm, KCl 1%, Ferrous sulphate 0.59 Zinc sulphate 0.5%, Sodium Molybdate 0.059 Boric acid 0.2%. The whole plant samples wer pulled out at regular intervals of 5 days froı 30th onwards till 65th day; shade dried initiall and then dried in hot air oven at 80°C an dry weights recorded. The number of pod per cluster was counted at harvest from fiv plants and mean arrived. The mean flowe ible 1. Effect of plant growth regulating chemicals and nutrients on total dry matter production of greengram (variety CO-6)

eatments	Total dry matter production (g. plant^{-1})						
	30th day	40th day	45th day	50th day	55th day	60th day	65th day
l – Control	9.28	10.17	13.52	14.20	15.85	18.08	20.24
2 – SA 100 ppm	9.26	10.40	16.18	16.97	18.98	22.20	24.78
3 – DAP 2%	9.27	10.89	17.43	18.80	20.82	24.29	26.46
4 – DAP 2% KCl 1% + NAA 40 ppm	9.28	10.21	15.71	17.12	18.76	21.96	24.08
5 – SA 100 ppm + DAP 2% + KCl 1% + NAA 40 ppm	9.28	11.18	18.39	19.81	22.85	25.32	27.44
6 – DAP + KCl + NAA + Bo + Fe + Zn + Mo	9.28	10.86	17.26	18.61	24.91	23.89	25.99
d	0.03	0.03	0.19	0.15	0.10	0.24	0.20
D (P=0.05)	0.06	0.07	0.41	0.32	0.22	0.50	0.45

Table 2. Effect of plant growth regulating chemicals and nutrients on seed yield and yield components of greengram (variety CO 6)

Treatments	No.of pods / cluster	No.of flowers / plant	Fertility co-efficient (%)	Trans-location efficiency(%)	Seed yield (kg ha^{-1})	C:B ratio
T1 – Control	13.20	47.40	27.89	64.23	1162.41	3.01
T2 – SA 100 ppm	14.37	42.30	33.97	65.16	1250.59	3.09
T3 – DAP 2%	16.55	43.30	38.19	67.30	1371.79	3.47
T4 – DAP 2% + KCl 1% + NAA 40 ppm	14.90	45.82	32.54	64.31	1195.00	2.58
T5 – DAP 2% + SA 100 ppm + KCl 1% + NAA 40 ppm	19.45	48.12	40.41	68.65	1443.38	3.15
T6 – SA + DAP + KCl + NAA + Bo (0.2%) + Fe (0.5%) + Zn (0.5%) + Mo (0.05%)	15.22	42.77	35.59	73.88	1285.31	2.77
SEd	0.75	1.06	-	-	40.3	-
CD (P=0.05)	1.61	2.27	-	-	85.9	-

number per plant was assessed from the total number of flowers produced from the commencement to the end of flowering period. Co-efficient of fertility was also assessed from the relationship between number of flowers produced per plant and number of pods produced per plant. The translocation efficiency was derived from relationship between the total pods plus seed weight and the seed weight alone. The translocation efficiency is a measure of the translocated dry weight from the pod walls to the seed. The design adopted was RBD with four replications. The plot size was 5 x 4 m. The statistical procedure developed by Panse and Sukhatme (1995) was adopted for analyzing the data.

Results and Discussion

Total dry matter production

Initially, the dry matter production was not significantly different among the treatments (Table 1). After the foliar application (30th and 45th day), the dry matter started increasing and the maximum dry matter production was recorded on the 50th day in T_5 (19.81 g.pl^{-1}) followed by T_3 (18.80 g.pl^{-1}). The T_5 treatment (SA 100 ppm + DAP 2% + KCl 1% + NAA 40 ppm) recorded the maximum TDMP at all the stages of development. The results of Vinay Singh and Tomar (1993) who recorded higher TDMP by foliar application of 60 ppm K, was confirmed in this experiment. The increase in stem weight due to the application of NAA was reported by Ankaiah and Madhusudhana Rao (1993).

Yield and its components

Number of pods per cluster

Maximum pods per cluster were registered in T_5 treatment (SA 100 ppm + DAP 2% + KCl 1% + NAA 40 ppm) (19.45) which was highly significant over other treatments. The treatment T_3 (DAP 2%) recorded the next highest number of pods per cluster (16.55). However the treatment T_6 (DAP 2%, SA 100 ppm, NAA 40 ppm, KCl 1%, Ferrous sulphate 0.5%, Zinc sulphate 0.5%, Sodium Molybdate 0.05%, Boric acid 0.2%) was on par with T_2, T_3, and T_4 which were comparable with each other (Table 2). The results of the present study were supported by Gosh *et al.* 1985 and Majumdar *et al.* 1989 who reported that K nutrition increased pods per cluster in mustard and rape. Mishra and Mahatim Singh (1991) opined that foliar application of NAA improved the pod number in pigeonpea.

Number of flowers per plant

The T_5 treatment produced more numbers of flowers per plant (48.12) and was on par with T_1 control (47.40). The T_4 treatment recorded 45.82 flowers per plant. T_2, T_3 and T_6 recorded the flowers within a narrow range of 42 to 43 flowers per plant and were comparable. Jenson and Tophoj (1985) obtained more numb of flowers by NAA application. Potassium nutritio improved the flower number in mungbean whe K was applied as KH_2PO_4 than KCl.

Fertility coefficient

The highest coefficient of fertility wa observed [illegible] treatment (40.41%) followe by T_3 ([illegible]). The lowest fertility coefficier (FC) [illegible] recorded in T_1 (27.89%). Th mic[illegible]nents in the foliar spray solution, howeve did [illegible]t influence the FC as noticed in T treatr[illegible]ent, which recorde[illegible] a FC of 35.59% Kar[illegible] Singh (1989) reported that 25 ppm c NAA enhanced the FC in chickpea by wa of increased pod set. The growth regulato NAA had influenced the fertility of flower significantly.

Grain yield

The maximum grain yield was recorde in T_5 treatment followed by T_3 treatment (DA 2% spray). T_2 and T_6 registered grain yield of 1250.59 kg ha^{-1} and 1285.31 kg ha^{-1} respectivel and were comparable (Table 2). Foliar ap plication of SA, DAP, NAA and KCl at dose tried had significantly improved the seed yiel of greengram. The highest yield was recorde in T_5. The increase in yield was due to th increase in the number of flowers per plar and higher fertility coefficint imparted by th foliar application of nutrient chemicals and plar growth regulators. Mungbean, though produce more number of flowers, most of them ge abscised without forming pods. The retentio of flowers and pods can be increased by eithe foliar application of nutrients or plant growt regulators as reported by Sharma and Dey (1986 in soybean and by application of NAA an KCl for increasing the flower number in mungbea (Rajendran, 1991). The next best yield of 1371.7 kg ha^{-1} was recorded in T_3 signifying tha the DAP spray alone could be the next alternativ to the combined application of nutrient chemi cals and plant growth regulating chemicals. Th T_6 treatment recorded only 1285.31kg ha^{-1} wit a yield increase of 10.57 per cent over control

Translocation efficiency

Higher translocation efficiency was observe in T_6 treatment (Table 2), which recorded a ficiency of 73.88%. However, the yield in is treatment was not comparable to the inslocation efficiency. The translocation efficiency other treatments ranged from 64% to 68%. hough T_5 treatment recorded a translocation ficiency of 68.65%. This treatment recorded e highest grain yield among the treatment ied.

ost benefit ratio

The highest cost benefit ratio was re...ered the T_3 treatment DAP 2% foliar spray (3.47) hich signifies that the DAP foliar spray is e cheapest cultural practice in achieving good ain yield with minimum production cost. Though treatment recorded the highest seed yield, e increased yield over that of T_3 treatment is not commensurate with the cost of additional put incurred in T_5 resulting in lower cost nefit ratio of 3.15 as compared to that of (3.47).

onclusions

The study has revealed that foliar application growth regulating chemicals and nutrients combination of 100 ppm salicylic acid, 2% AP, 1% KCl and 40 ppm of NAA had given gher grain yield in greengram under irrigated nditions. The causes for the increase in yield e the increased dry matter production and efficient assimilate translocation to the developing sink leading to increased number of clusters and flowers per plant that ultimately resulted n higher grain yield.

References

Alberta, T.H. and Bower, J.M.W. (1983). Distribution of dry matter and nitrogen between different plant parts in intact and depodded soybean plants after flowering. *Netherlands J. Agric. Sci.* **31**: 171-179.

Ankaiah, R. and Madhusudhana Rao, D.V. (1993). Effect of NAA on yield and yield attributes in chilli. *J.Res. APAU*, **21**: 167-169.

Gosh, D.C., Majumdar, S.K., Bagdi, P.R. and Bera, P. (1985). Growth and yied of rape and mustard as influenced by potassium nutrition. *Potash Review. 12. Intl. Potash Inst. Berne. Switzerland*, pp.2-3.

Hamid, A. (1991). Foliar application of nitrogen in mungbean. I. Influence of rate and frequency of application. *Ann. Bang. Agric.* **1**: 33-39.

Jenson, C.R. and Tophoj, H. (1985). Potassium induced improvement of yield response in barely exposed to soil water stress. *Potash Rev. Intl. Potash Inst. Berne Switzerland.* pp.1-3.

Kalita, P., Dey, S.C., Chandra, K. and Upadhyaya, L.P. (1994). Effect of foliar application of nitrogen on morpho-physiological traits of pea (*Pisum sativum*). *Indian J. Agric. Sci.* **64**: 850-852.

Karan Singh (1989). Hormonal regulation of reproductive phenomena and yield of chickpea. *Ann. Plant Physiol.* **3**: 105-115.

Majumdar, S.K., Gosh, D.C. and Mukkerjee, M.N. (1989). Response of rapeseed and mustard to rate and time of potash application. *J. Potash Res.* **5**: 82-86.

Mishra, M.K. and Mahatim Singh (1991). Potassium nutrition of pigeonpea. *J. Potash Res.* **7**: 132-149.

Mitra, R., Pawar, S.E. and Bhatia, C.R. (1988). Nitrogen: The major limiting factor for mungbean yield. In: Shanmugasundaram, S. and B.T. Mclean (eds.) Mungbean. *Second Intl. Symp.* Bangkok. **16-20**: 245-251.

Panse, V.S. and Sukhatme, P.V. (1995). Statistical methods for agricultural workers. ICAR, New Delhi.

Promila Kumari and Varma, S.K. (1983). Genotypic differences in flower production, shedding and yield in mungbean (*Vigna radiata*). *Indian J. Plant Physiol.* **27**: 402-405.

Rajendran, R. (1991). Effect of soil and foliar nutrition on growth and yield of mungbean. *Andhra Agric. J.* **38**: 15-18.

Sharma, S.C. and Dey, S.C. (1986). Response of soybean to foliar application of some growth regulators in combination with urea and potash. *Soybean Genetic News Letter,* **13**: 71-74.

Subramanian, A. and Palaniappan, S.P. (1981). Effect of methods of planting, plant density and fertilization on yield of blackgram in irrigated system. *Madras Agric. J.* **68**: 96-99.

Vinay Singh and Tomar, J.S. (1993). Effect of K and lime application on yield and uptake of nutrients by wheat. *J. Potash Res.* **9**: 151-156.

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