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Performance of foliar application of nutrients and growth regulators on growth and yield of greengram (*Vigna radiata* L.)

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Abstract

The experiment was conducted during the Zaid-2021, KVK farm of Sam Higginbottom University of agriculture, Technology and Sciences, Prayagraj (U.P). To study the performance of foliar application of nutrients and growth regulators on growth and yield of Green gram (*Vigna radiata* L). The result reported that significantly higher plant height (35.15cm) and significantly higher dry weight. Maximum number of pods/plant (16.68) and highest seed yield (871.40 kg/ha), highest Stover yield (1696.72kg/ha) and higher benefit cost ratio (1.48) were recorded with treatment 8 (2% urea + 2% DAP + 100ppm Salicylic acid).

Keywords: Greengram, urea, DAP, growth regulators, growth, yield attributes, yield and economics

Introduction

Greengram (*Vigna radiata* L.) is one of the important third most in pulse crops in India and main source of vegetable protein. In India, pulses are grown on 28.34 m h area with a production of 23.2mt and the productivity is 817kg/ha (GOI, 2020-21). Greengram is an important conventional pulse crop of India. Its grain contains 24.20%, 1.3% fat, 60.4% carbohydrates, calcium phosphorus are 118 and 340mg per 100g of seed. In India during 2020-21, greengram is grown in about 34.35 lakh ha with total production of 2.5 m t with a productivity of 548 kg/ha and contributing 10% to the total pulse production. In India during 2020-21, major production was recorded in the state of Rajasthan (11.20 lakh tonne), followed by Uttar Pradesh (0.30 lakh tonne). According to Government 2nd advance estimates, greengram production in 2020-21 is at 2.60 million tonnes.

Greengram crop maintaining the stable yields is depending upon availability of macro and micro nutrients during the crop period stage. According to Kumar *et al.* (2013) [3] the soil application of nutrients applied at the time of sowing or 35 days after sowing often results in lower fertilizer use efficiency of all concerned nutrients which ultimately affect the growth and yield of the crop. Under the summer season, application of nutrients (Urea and DAP) and growth regulator (Salicylic acid, sodium molybdate and Brassinolide) through foliar spray at 45 days after sowing helped to improve yield attributes like grains/pod, Pods/plant, Stover yield and grain yield. Foliar application of nutrients has been proved to be an important asset in fertilizer application increased uptake of nutrients from the soil and specific aim of increasing nutrient availability at the time of need especially in the later stage of plant growth (Kuepper, 2003) [2].

Keeping the points in view an experiment was conducted to study the performance of foliar application of nutrients and growth regulators on growth and yield of greengram.

Materials and Methods

The experiment was conducted during the Zaid 2021, at the KVK farm, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) The soil of the field constituting a part of central Gangetic alluvium is neutral and deep. The soil of experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.3), low in organic carbon (0.57%), available N (230kg/ha), available P (32.10kg/ha) and available K (235kg/ha). The treatments consist of 2% foliar spray of urea and DAP with combination of different growth regulators. The experiment was laid out in RBD with nine treatments each replicated thrice. T1: 2% urea + Sodium molybdate 0.05%, T2: 2% urea + Salicylic acid 100ppm, T3: 2% urea + Brassinolide 0.25ppm, T4: 2% DAP + Sodium molybdate 0.05%, T5: 2% DAP + Salicylic acid 100ppm, T6: 2% DAP + Brassinolide 0.25ppm, T7: 2% Urea + 2% DAP + Sodium

Molybdate 0.05%, T8: 2% Urea + 2% DAP + Salicylic acid 100ppm, T9: 2% Urea + 2% DAP + Brassinolide 0.25ppm. All agronomic practices are followed in order in the crop period. Data recorded on parameters were tabulated and subjected to statistical analysis as per Gomez and Gomez, 1976 [5].

Result and Discussion

Growth parameter

Plant height: The data revealed that significant and higher plant height (35.15cm) of greengram was observed in treatment 8 (2% urea + 2% DAP + 100ppm Salicylic acid). However treatment 9 (2% urea + 2% DAP + 0.25ppm Brassinolide) and treatment 7 (2% urea + 2% DAP + 0.05% Sodium molybdate) and treatment 3 (2% DAP + 0.25ppm Brassinolide) and treatment 5 (2% DAP + 100ppm Salicylic acid) and treatment 4 (2% DAP + 0.05% Sodium molybdate) were found to be statistically at par with the treatment 8 (2% Urea + 2% DAP + 100ppm Salicylic acid) (Table1). Significant increase of plant height might be due to the increased availability of nutrients without any harmful effect on plant through foliar application at 25 DAS and 45DAS. This might be due to supply of major and growth hormones through foliar spray. The application of promotive substances increased the plant height, similar findings also reported by Esther and Gautam (2020) and Sruthi, *et al.* (2020) [1, 8].

Dry weight: The data recorded that significant and highest plant dry weight (4.14g/plant) of greengram was found in treatment 8 (2% urea + 2% DAP + 100ppm Salicylic acid). However treatment 7 (2% urea + 2% DAP + 0.05% Sodium molybdate) and treatment 9 (2% urea + 2% DAP + 0.25ppm Brassinolide) and treatment 6 (2% DAP + 0.25ppm Brassinolide) and treatment 5 (2% DAP + 100ppm Salicylic acid) which was observed statistically at par with the treatment 8 (2% Urea+2%DAP+100ppm salicylic acid) (Table1). The increase in dry weight due to the twice application of urea and DAP, which helped in acceleration of various metabolic process viz. photosynthesis, energy transfer reaction and symbiotic biological N-fixation process. More number of branches and plant height might be due to the more availability of nitrogen and phosphorus, ultimately dry matter production was increased reported by Mandre *et al.* (2020) [4] and Kunjammal *et al.* (2019).

Yield parameters

Pods/plant: The data revealed that significant highest number

of pods/plant (16.68) was recorded in treatment 8 (2% urea + 2% DAP + 100ppm Salicylic acid). However treatment 9 (2% urea + 2% DAP + 0.25ppm Brassinolide) and treatment 7 (2% urea + 2% DAP + 0.05% Sodium molybdate) and treatment 6 (2% DAP + 0.25ppm Brassinolide), (Table-2). Which was found to be statistically at par treatment 8 (2% Urea + 2% DAP + 100ppm salicylic acid)

Number of pods per plant was increased with foliar application of [2% urea + 2% DAP (Foliar spray) + 100ppm Salicylic acid] in greengram. It may be decreased the flower drop due to prolonged assimilatory activity of leaves might be another possible reason for higher number of pods/plant. Further, the foliage applied nitrogen and phosphorus at the initial stages might have been effectively absorbed and Trans located to the pods resulting in more number of pods plant. The results obtained from Mandre (2020) [4].

Seed yield: Significant and highest seed yield (871.40kg/ha) was observed in treatment 8 (2% urea + 2% DAP + 100ppm Salicylic acid). However treatment 7 (2% urea + 2% DAP + 0.05% Sodium molybdate) and treatment 9 (2% urea + 2% DAP + 0.25ppm Brassinolide) (Table2). Which was found to be statistically at par treatment 8(2%Urea+2%DAP+100ppm salicylic acid)

This might be because nitrogen and phosphorus are responsible in influencing the yield attributing characters like pods/plant and seeds/pod, which ultimately influenced the grain yield. Similarly reported by Suhathiya *et al.* (2018) [9].

Stover yield: The significant and highest stover yield (1696.72 kg/ha) was observed in treatment 8 (2% urea + 2% DAP + 100ppm Salicylic acid). However treatment 9 (2% urea + 2% DAP + 0.25ppm Brassinolide) and treatment 7 (2% urea + 2% DAP + 0.05% Sodium molybdate) and treatment 6 (2% DAP + 0.25ppm Brassinolide) (Table2). Which was to be statistically at par treatment 9 (2% Urea+2%DAP+0.25ppm Brassinolide).

The increase in straw yield is directly related mainly to increase in the vegetative growth, Reported by Mandre *et al.* (2020) [4].

Economics: The maximum gross return (63,612.44), net return (38,043.44), B:C (1.48) ratio highest was found in treatment 8 with the application of (2% urea + 2% DAP + 100ppm Salicylic acid), (Table3).

Table 1: Influence of foliar applications of nutrients and growth regulators on Growth parameters of greengram

	Treatment	Plant height (cm) At 60 DAS	Number of branches / plant At 60 DAS	Dry weight (g/plant) at 60 DAS	Root nodules At 60 DAS
T1	2% urea (Foliar spray) + 0.05% Sodium molybdate	34.23	3.28	3.91	4.30
T2	2% urea (Foliar spray) + 100ppm Salicylic acid	34.69	3.30	3.92	4.85
T3	2% urea (Foliar spray) + 0.25ppm Brassinolide	34.63	3.29	3.93	5.01
T4	2% DAP (Foliar spray) + 0.05% Sodium molybdate	34.74	3.31	4.04	5.00
T5	2% DAP (Foliar spray) + 100ppm Salicylic acid	35.17	3.29	4.08	5.02
T6	2% DAP (Foliar spray) + 0.25ppm Brassinolide	34.87	3.29	4.10	5.04
T7	2% urea + 2% DAP (Foliar spray) + 0.05% Sodium molybdate	35.11	3.38	4.13	5.05
T8	2% urea + 2% DAP (Foliar spray) + 100ppm Salicylic acid	35.15	3.46	4.14	5.11
T9	2% urea + 2% DAP (Foliar spray) + 0.25ppm Brassinolide	35.14	3.35	4.13	4.98
SEm (±)		0.13	0.02	0.02	0.20
CD (5%)		0.40	-	0.07	-

Table 2: Influence of foliar applications of nutrients and growth regulators on yield and yield parameters of greengram

	Treatment	Number of pods/plant	Test weight (g)	Seed yield (kg/ha)	Stover yield (kg/ha)	Harvest Index (%)
T1	2% urea (Foliar spray) + 0.05% Sodium molybdate	14.58	35.17	831.70	1630.63	33.77
T2	2% urea (Foliar spray) + 100ppm Salicylic acid	14.95	35.22	840.38	1633.06	33.94
T3	2% urea (Foliar spray) + 0.25ppm Brassinolide	15.35	35.23	849.43	1648.47	33.97
T4	2% DAP (Foliar spray) + 0.05% Sodium molybdate	15.95	35.25	854.11	1661.23	33.95
T5	2% DAP (Foliar spray) + 100ppm Salicylic acid	16.10	35.24	858.40	1666.99	33.99
T6	2% DAP (Foliar spray) + 0.25ppm Brassinolide	16.34	35.23	862.96	1685.65	33.85
T7	2% urea + 2% DAP (Foliar spray) + 0.05% Sodium molybdate	16.46	35.24	869.83	1694.58	33.91
T8	2% urea + 2% DAP (Foliar spray) + 100ppm Salicylic acid	16.68	35.26	871.40	1696.72	33.93
T9	2% urea + 2% DAP (Foliar spray) + 0.25ppm Brassinolide	16.61	35.23	868.19	1695.64	33.86
SEm (±)		0.14	0.03	2.23	3.93	0.08
CD (5%)		0.42	-	6.69	11.79	-

Table 3: Influence of foliar spray of nutrients and growth regulators on economics (INR) of greengram

Treatment		Cost of cultivation (INR/ha)	Gross return (INR/ha)	Net return (INR/ha)	B:C Ratio
T1	2% urea (Foliar spray) + 0.05% Sodium molybdate	25,327	60,714.34	35,387.34	1.39
T2	2% urea (Foliar spray) + 100ppm Salicylic acid	25,377	61,347.74	35,970.74	1.41
T3	2% urea (Foliar spray) + 0.25ppm Brassinolide	25,477	62,008.39	36,531.39	1.43
T4	2% DAP (Foliar spray) + 0.05% Sodium molybdate	25,471	62,350.27	36,879.27	1.44
T5	2% DAP (Foliar spray) + 100ppm Salicylic acid	25,521	62,662.96	37,141.96	1.45
T6	2% DAP (Foliar spray) + 0.25ppm Brassinolide	25,621	62,996.32	37,375.32	1.45
T7	2% urea + 2% DAP (Foliar spray) + 0.05% Sodium molybdate	25,519	63,497.83	37,978.83	1.47
T8	2% urea + 2% DAP (Foliar spray) + 100ppm Salicylic acid	25,569	63,612.44	38,043.44	1.48
T9	2% urea + 2% DAP (Foliar spray) + 0.25ppm Brassinolide	25,669	63,378.11	37,709.11	1.46

Conclusion

Under the summer season, application of 2% urea + 2% DAP (Foliar spray) + 100ppm Salicylic acid recorded significantly higher seed yield and Stover yield. With respect to nutrient up take, combined application of nutrient spray was observed higher performance when compared to individual nutrient say. Hence, experiment proved that combined application of nutrient (Urea, DAP) and growth regulators through foliar spray recorded enhanced growth and yield of greengram. It might be due to the increased rate of cell division, cell elongation dry matter partitioning in the plant. These findings are based one season; therefore, further trails may be required for further confirmation.

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