The Pharma Innovation Journal 2022; 11(11): 905-907

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(11): 905-907

www.thepharmajournal.com
Received: 10-09-2022
Accepted: 15-10-2022

Dr. Ganesh K Gaikwad
Assistant Professor of SSAC, Department of SSAC, Collage of Agriculture, Badnapur, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani Maharashtra, India

Akash P Gawade
Assistant Professor of SSAC, Department of SSAC, Collage of Agriculture, Khandala, under Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani Maharashtra, India

Kishor A Kavar
Assistant Professor, Department of Extension Education, Collage of Agriculture, Khandala, under Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani Maharashtra, India.

Corresponding Author:
Dr. Ganesh K Gaikwad
Assistant Professor of SSAC, Department of SSAC, Collage of Agriculture, Badnapur, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani Maharashtra, India

Effect of foliar nutrition of water soluble fertilizer and growth regulator on yield and quality of black gram (*Vigna mungo* L. Hepper)

Dr. Ganesh K Gaikwad, Akash P Gawade and Kishor A Kavar

Abstract
A field experiment was conducted to study the "Effect of water soluble fertilizer with growth regulator on growth, yield and quality of black gram grown on Vertisol" at the farm of Department of Soil Science and Agril. Chemistry, College of Agriculture, Badnapur during *kharif* 2019-2020. The experiment comprised of ten treatments with three replication which included the foliar spray of water soluble fertilizer and growth regulator and RDF application through soil at the time of sowing. The experimental soil was clay texture, moderately calcareous in nature and slightly alkaline in reaction and normal in salt content. The results emerged out clearly indicated that grain yield was significantly influenced by different water soluble fertilizer and growth regulator. The significantly highest grain yield (972.09 kg ha^{-1}) was observed in treatment T_9 RDF + 00:52:34 @ 0.5% + GA + SA @ 50 ppm each 27 DAS.

Keywords: Black gram, water soluble fertilizer, growth regulator, vertisol

Introduction
Black gram (*Vigna mungo* L. Hepper) is one of the most important pulse crop grown throughout the India. Black gram is excellent source of protein as well as carbohydrates. Black gram (*Vigna mungo* L. Hepper) belong to the family "Leguminosae" and sub-family "Papilionaceae" having chromosomes number 2n = 24. It also known as "Mash bean and urd bean". Black gram is probably native of India as is seen from the Vedic literature. Black gram is third important pulse crop of India which is cultivated all over a wide range of agro-climatic zones of the country. It is mainly grown in semi-arid to sub-humid low land tropics and sub-tropics. In India, black gram traditionally grown in *Kharif* season, but in south it also grown as *Rabi* crop. Potential of black gram is very low because the fact that the crop is mainly grown as subsidiary crop on residual soil moisture in rain fed condition with poor management practices. Black gram producing major states in India are Madhya Pradesh, Rajasthan, Uttar Pradesh, Andhra Pradesh, Tamilnadu and Maharashtra (Anonymous, 2017) [2]. Black gram protein content is more than twice that of cereals reported by Thesiya *et al*. 2013 [9]. The crop improves soil fertility by symbiotic fixation of atmospheric nitrogen in root nodules.

Foliar application is regarded as preferred solution when quick supply of nutrient is hindered or the soil condition is not conductive for the absorption of nutrient (Salisbury and Ross (1985) [6]. Apart from the genetic makeup, the physiological factor *viz*., insufficient portioning assimilates, poor pod setting due to the flower abscission and lack of nutrients during critical stage of crop growth, coupled with a number of disease and pest constitute the major constraints for the poor yield. Foliar nitrogen nutrition may induce drought tolerance in crop. Increase in plant height was due to availability of nitrogen and potassium to plants through foliar spray. Potassium regulates the osmotic turgor of cells and water balance which is driving force for cell division and elongation. Potassium nitrate (KNO_3) be consider the best option because it also provide potassium which influence water economy and crop growth, through its effect on water uptake, root growth, maintenance of turgor pressure, transpiration and stomata behavior.

The productivity of black gram in our country is very low. Hence, there is need for enhancement of the productivity of black gram by proper agronomic and nutrient management practices. One among them is foliar application of organic and inorganic sources of nutrients for exploiting genetic potential of the crop. This is considered to be an efficient and economic method of supplementing part of nutrients requirements at critical stages. Foliar application is credited with the advantage of quick and efficient utilization of nutrients, elimination of losses through leaching, fixation and regulating the uptake of nutrients by plant (Manonmani and Srimathi 2009) [5].

Foliar application of nutrient and growth regulator at pre flowering and post flowering stage was seen on reduction in flower drop percentage in black gram. Foliar spray of nutrients mixture with salicylic acid 100 ppm at 20, 30 and 40 DAS proved to be the best treatment to improve Leaf area index, Leaf area duration, specific leaf weight, total dry matter accumulation and seed yield of urd bean. (Amutha *et al*. 2012) [1].

Materials and Methods

A field experiment was conducted during *Kharif*, 2019-2020 in Vertisol at departmental farm of Soil Science and Agril. Chemistry, College of Agriculture, Badnapur. The experimental soil was clay texture, moderately calcareous in nature and slightly alkaline in reaction and normal in salt content. At sowing of experiment the soil exhibit pH 7.86 (slightly alkaline in reaction), electrical conductance 0.23 dSm^{-1}, organic carbon content 0.75% (moderately high) and free $CaCO_3$ content was 5.22% respectively. The soil sample was low in available nitrogen (180.36 kg ha^{-1}), moderate in available phosphorus (14.36 kg ha^{-1}), high in available potassium (460.59 kg ha^{-1}). The experimental design used was Randomized Block design (RBD) with three replications consisting ten different treatments *viz*. T_1 = Control, T_2 = RDF, T_3 = RDF + 00:52:34 @ 0.5% +GA @ 50 ppm 27 DAS, T_4 = RDF + 00:52:34 @ 0.5% + SA @ 50 ppm 27 DAS, T_5 = RDF + 00:52:34 @ 0.5% + GA @ 50 ppm 45 DAS, T_6 = RDF + 00:52:34 @ 0.5% + SA @ 50 ppm 45 DAS, T_7 = RDF + 13:00:45 @ 0.5% + GA @ 50 ppm 27 DAS, T_8 = RDF + 13:00:45 @ 0.5% + SA @ 50 ppm 27 DAS, T_9 = RDF + 00:52:34 @ 0.5% + GA + SA @ 50 ppm each 27 DAS and treatment T_{10} = RDF + 13:00:45 @ 0.5%+ GA + SA @ 50 ppm each 45 DAS.

Result and Discussion

Grain yield

Data on grain yield in kg ha^{-1} as influenced by different water soluble fertilizer and growth regulator are presented in table 1. Grain yield was significantly influenced by different water soluble fertilizer and growth regulator. The significantly highest grain yield (972.09 kg ha^{-1}) was observed in treatment T_9 RDF + 00:52:34 @ 0.5% + GA + SA @ 50 ppm each 27 DAS which was at par with treatment T_3 RDF + 00:52:34 @ 0.5% +GA @ 50 ppm 27 DAS (955.43 kg ha^{-1}), treatment T_4 RDF + 00:52:34 @ 0.5% + SA @ 50 ppm 27 DAS (952.31 kg ha^{-1}) and with treatment T_7 RDF + 13:00:45 @ 0.5% + GA @ 50 ppm 27 DAS (952.14 kg ha^{-1}). The treatment T_9 RDF + 00:52:34 @ 0.5%+ GA + SA @ 50 ppm each 27 DAS was significantly superior over the treatments T_1 Control (598.38 kg ha^{-1}), T_2 RDF (712.13 kg ha^{-1}), T_5 RDF + 00:52:34 @ 0.5% + GA @ 50 ppm 45 DAS (752.29 kg ha^{-1}), T_6 RDF + 00:52:34 @ 0.5% + SA @ 50 ppm 45 DAS (720.36 kg ha^{-1}), T_8 RDF + 13:00:45 @ 0.5% + SA @ 50 ppm 27 DAS (828.43 kg ha^{-1}) and treatment T_{10} RDF + 13:00:45 @ 0.5% + GA + SA @ 50 ppm each 45 DAS (782.42 kg ha^{-1}). The lowest grain yield (598.38 kg ha^{-1}) was observed in treatment T_1 control.

Yield is the culmination of several comprehensive phases which starts at germination and end at harvest, encompassing through shoot growth, leaf development, photosynthesis, flowering, pollination and seed set. Better vegetative growth of a crop is largely responsible for higher seed yield because number of photosynthesizing sites *i.e*. number of vegetative branches is affected by initial growth stage. Two sequential steps are necessary for a black gram plant to produce pods, a sink of pollination pods capable of further development must be created and this must be supplied with photosynthesis over subsequent period of development.

Table 1: Effect of water soluble fertilizer and growth regulator on grain yield and straw yield (kg ha^{-1})

Treatments	Grain yield	Straw yield
T_1: Control	598.38	893.43
T_2: RDF	712.13	1068.12
T_3: RDF + 00:52:34 @ 0.5% +GA @ 50 ppm 27DAS	955.43	1441.95
T_4:RDF + 00:52:34 @ 0.5% + SA @ 50 ppm 27 DAS	952.31	1441.40
T_5: RDF + 00:52:34 @ 0.5% + GA @ 50 ppm 45DAS	752.29	1128.43
T_6: RDF + 00:52:34 @ 0.5% + SA @ 50 ppm 45 DAS	720.36	1082.07
T_7: RDF + 13:00:45 @ 0.5% + GA @ 50 ppm 27 DAS	952.14	1434.35
T_8: RDF + 13:00:45 @ 0.5% + SA @ 50 ppm 27 DAS	828.43	1237.10
T_9: RDF + 00:52:34 @ 0.5% + GA + SA @ 50 ppm each 27 DAS	972.09	1457.92
T_{10}: RDF + 13:00:45 @ 0.5% + GA + SA @ 50 ppm each 45 DAS	782.42	1174.76
SEm±	6.78	10.15
C.D. @ 5%	20.16	30.17

The above higher yield attributes obtained with foliar spray of salicylic acid 50 ppm which may be due to maximum net photosynthetic rate in leaves and better translocation of photosynthetic and metabolites (nutrients etc.). Though, the way of various physiological mechanisms involves in the plant with foliar spray of GA_3 50 ppm also played a significant role in enhancing above yield attributes up to some extent. The results also confirmed with the findings of Kumar *et al*. (2018) [3] in mungbean. Similar findings were obtained by Vekaria *et al*. (2013) [10] in green gram, Suradkar *et al*. (2022) [8] in pigeon pea.

Straw yield

Straw yield was also significantly influenced by different water soluble fertilizer and growth regulator. Data on straw yield as influenced by different water soluble fertilizer and growth regulator are presented in table 1. The highest straw yield was observed due to different concentration foliar spray of water soluble fertilizer and growth regulator. The significantly highest straw yield (1457.92 kg ha^{-1}) was observed in treatment T_9 (RDF + 00:52:34 @ 0.5%+ GA + SA @ 50 ppm each 27 DAS) which was at par with treatment T_3 (1441.95 kg ha^{-1}) (RDF + 00:52:34 @ 0.5% +GA @ 50 ppm 27 DAS), treatment T_4 (1441.40 kg ha^{-1}) (RDF + 00:52:34 @

0.5% + SA @ 50 ppm 27 DAS) and with treatmentT7 (1434.35 kg ha^{-1}) (RDF + 13:00:45 @ 0.5% + GA @ 50 ppm 27 DAS). The treatment T_9 (RDF + 00:52:34 @ 0.5% + GA + SA @ 50 ppm each 27 DAS) was significantly superior over the treatments T_1 (893.43 kg ha^{-1}) (Control), T_2 (1068.12 kg ha^{-1}) (RDF), T_5 (1128.43 kg ha^{-1}) (RDF + 00:52:34 @ 0.5% + GA @ 50 ppm 45 DAS), T_6 (1082.07 kg ha^{-1}) (RDF + 00:52:34 @ 0.5% + SA @ 50 ppm 45 DAS), T_8(1237.10 kg ha^{-1}) (RDF + 13:00:45 @ 0.5% + SA @ 50 ppm 27 DAS) and treatment T_{10} (1174.76 kg ha^{-1}) (RDF + 13:00:45 @ 0.5%+ GA + SA @ 50 ppm each 45 DAS). The lowest grain yield was observed in treatment T_1 (893.43 kg ha^{-1}) (Control). The results also confirmed with the findings of Manjri *et al*. (2018) [4] in black gram, Suradkar *et al*. (2022) [4] in pigeon pea.

Table 2: Effect of foliar application of water soluble fertilizer and growth regulator on protein content of Black gram

Treatments	Protein (%)
T_1: Control	25.50
T_2: RDF	26.37
T_3: RDF + 00:52:34 @ 0.5% +GA @ 50 ppm 27 DAS	27.18
T_4: RDF + 00:52:34 @ 0.5% + SA @ 50 ppm 27 DAS	27.31
T_5: RDF + 00:52:34 @ 0.5% + GA @ 50 ppm 45 DAS	27.12
T_6: RDF + 00:52:34 @ 0.5% + SA @ 50 ppm 45 DAS	28.06
T_7: RDF + 13:00:45 @ 0.5% + GA @ 50 ppm 27 DAS	28.18
T_8: RDF + 13:00:45 @ 0.5% + SA @ 50 ppm 27 DAS	28.18
T_9: RDF + 00:52:34 @ 0.5%+ GA + SA @ 50 ppm each 27 DAS	27.81
T_{10}: RDF + 13:00:45 @ 0.5%+ GA + SA @ 50 ppm each 45 DAS	28.25
SEm±	2.23
C.D.@5%	NS

Quality

The highest protein content in seed/grain was observed due to different concentration foliar spray of water soluble fertilizer and growth regulator. The data presented in table no. 2 indicates non-significant impact of foliar spray of water soluble fertilizer and growth regulator on protein content. The highest protein content in seed/grain (28.25%) was observed in treatment T_{10} RDF + 13:00:45 @ 0.5% + GA + SA @ 50 ppm each 45 DAS. Among the different treatments, the highest seed protein (28.25%) was observed in treatment T_{10} RDF + 13:00:45 @ 0.5%+ GA + SA @ 50 ppm each 45 DAS followed by the treatment T_8 RDF + 13:00:45 @ 0.5% + SA @ 50 ppm 27 DAS and T_7 RDF + 13:00:45 @ 0.5% + GA @ 50 ppm 27 DAS (28.18%), followed by T_6 RDF + 00:52:34 @ 0.5% + SA @ 50 ppm 45 DAS (28.06%), T_9 RDF + 00:52:34 @ 0.5%+ GA + SA @ 50 ppm each 27 DAS (27.81%), T_4 RDF + 00:52:34 @ 0.5% + SA @ 50 ppm 27 DAS (27.31%), T_3 RDF + 00:52:34 @ 0.5% +GA @ 50 ppm 27 DAS (27.18%), T_5 RDF + 00:52:34 @ 0.5% + GA @ 50 ppm 45 DAS (27.12%), T_2 RDF (26.37%) and T_1 Control (25.50%) respectively. The lowest protein content (25.50%) was observed in treatment control. Stimulated growth by application of potassium nitrate might be enhanced absorption of nitrogen by plant and increased nitrogen concentration in plant with leads to the higher protein content in black gram. Similar result was reported by Sarkar and Pal (2006) [7] in chickpea crop, Suradkar *et al*. (2022) [4] in pigeon pea.

Conclusion

Application of RDF + 00:52:34 @ 0.5% + GA + SA @ 50 ppm each 27 DAS significantly increases growth and growth parameters and also yield and yield parameters, such as number of pods plant^{-1}, grain and straw yield of black gram (Due to overcome of water / nutrient stress during early growth and flowering stage). The application of foliar nutrition helps to overcome the specific occurrence of stress and as a result of maximum vegetative growth due to optimized nutrition of the plant.

References

1. Amutha R, Nithila S, Kumar ST. Management of source limitation by foliar spray of nutrients and growth regulators in black gram. Internet J Plant Sci. 2012;7(1):65-68.
2. Anonymous. Annual Research Report, ARS Badnapur, 2017. Report on pigeon pea research, ARS, Badnapur; c2017. p. 55.
3. Kumar S, Sakthive N, Subramanian E, Kalpana R, Janaki P, Rajesh P. Influence of foliar spray of nutrients and plant growth regulators on physiological attributes and yield of black gram. International Journal of Chemical Studies. 2018;6(3):2876-2879.
4. Manjri DV, Singh A, Gupta Sarita Devi, Bahadur Raj, Singh AK. Responses of Black gram (*Vigna mungo*) to foliar applied plant growth regulators. International Journal of Current Microbiology and Applied Sciences ISSN: 2319-7706. 2018;7:4058-4064.
5. Manonmani V, Srimathi P. Influence of mother crop nutrition on seed and quality of black gram. Madras Agric. J. 2009;96(16):125-128.
6. Salisbury FB, Ross CW. Plant Physiology. 3rd ed. Wadsworth, Belmont, CA; c1985. p. 540.
7. Sarkar RK, Pal PK. Effect of pre-sowing seed treatment and foliar spray of nitrate salts on growth and yield of green gram (*Vigna radiata*). Indian Journal of Agricultural Sciences. 2006;76(1):62-65.
8. Suradkar Sudarshan V, Ganesh K Gaikwad, Chandrakant B Patil, Sayali Kshirsagar. Effect of foliar nutrition of water soluble fertilizer and micronutrient on yield and yield attributing characters of pigeon pea (*Cajanus Cajan* (L) Millsp). Multilogic in Science. 2022;12(41):185-187. (ISSN 2277-7601).
9. Thesiya MN, Chovatia PK, Kikani VL. Effect of potassium and sulphur on growth and yield of black gram [*Vigna mungo* (L.) hepper] under rain fed condition. Leg. Res. 2013;36(3):255-258.
10. Vekaria GB, Talpada MM, Sutaria GS, Akbari KN. Effect of foliar nutrition of potassium nitrate on the growth and yield of green gram. Legume Res. 2013;36(2):162-164.