The Pharma Innovation Journal 2024; 13(3): 242-245

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
TPI 2024; 13(3): 242-245

www.thepharmajournal.com
Received: 12-01-2024
Accepted: 03-02-2024

SP Thakare
M.Sc. Agri Scholar, Department of Agronomy, College of Agriculture, Latur, Maharashtra, India

YM Waghmare
Assistant Professor, Department of Agronomy, College of Agriculture, Ambajogai, Dist Beed, Maharashtra, India

SD Maindale
Ph.D. Scholar, Department of Botany, Science college, Nanded, Maharashtra, India

Corresponding Author:
SP Thakare
M.Sc. Agri Scholar, Department of Agronomy, College of Agriculture, Latur, Maharashtra, India

Studies on effect of foliar spray of nutrients and growth regulators in black gram (*Vigna mungo* L.)

SP Thakare, YM Waghmare and SD Maindale

Abstract
A field experiment was conducted at Agronomy Section, College of Agriculture, Latur during *kharif* season of 2022 to study the effect of foliar spray of nutrients and growth regulators in black gram (*Vigna mungo* L.). The soil of experimental plot was clayey loam. The experiment was laid out in a Randomized Block Design, with eight treatments and was replicated thrice. The treatments consist of T_1- Control, T_2- Foliar application of 22% seaweed extract at flower initiation, T_3- Foliar application of 0.2% micronutrient grade 2 at flower initiation, T_4- Foliar spray of 30 ppm GA_3 at flower initiation, T_5- Foliar application of 40 ppm NAA at flower initiation, T_6 - Foliar spray of 2% urea at flower initiation, T_7- Foliar application of 1% NPK (19:19:19) at flower initiation, T_8 - Foliar spray of 2% DAP at flower initiation. Among the different treatments, foliar application of 22% seaweed extract at flower initiation (T_2) recorded higher growth and yield attributes such as plant height (cm), number of branchesplant^{-1}, total dry matter production (g),seed yield (kg ha^{-1}) and straw yield (kg ha^{-1}). This was followed by foliar application of 1% NPK (19:19:19) at flower initiation (T_7) and foliar application of 30 ppm GA_3 at flower initiation (T_4). The lower values of growth and yield attributes of black gram were recorded in the treatment of Control (T_1). Therefore, it can be concluded that foliar application of 22% seaweed extract at flower initiation (T_2) is viable practice to enhance the growth and yield of irrigated black gram.

Keywords: Black gram, growth, yield, foliar spray, foliar application

Introduction

Pulses are wonderful gift of nature with unique ability of biological nitrogen fixation, deep root system, mobilization of insoluble soil nutrients and bringing qualitative changes in soil properties which restores fertility of soil. Among pulses, black gram [*Vigna mungo* (L.) Hepper] is one of the most chief pulse crop of rainfed areas grown throughout the country. This crop is grown in diverse cropping system as a mixed crop, catch crop and sequential crop in the country. Black gram (*Vigna mungo* L.) belongs to family Leguminoceae. The plant attains a height of 30 to 100 cm. The leaves are large, trifoliate and are also hairy, generally with a purplish tinge. The pods are long and cylindrical and about 4 to 6 cm in length. This crop is itself a mini-fertilizer factory as it has unique characteristics of maintaining and restoring soil fertility through fixing atmospheric nitrogen in symbiotic association with rhizobium bacteria present in the root nodules. Black gram (*Vigna mungo* L.) is also known as black matpe bean, urid, urd beanor urad. It is widely grown in southern Asia as a grain legume and assumes considerable importance with respect to it's nutritional value. It contains 24% protein, 60% carbohydrate, 1.3% fat, 3.2% minerals, 0.9% fiber, 154 mg calcium, 385 mg phosphorus, 9.1 mg iron and small amount of vitamin B-complex. It is popularly grown as short durational (75-80 days) pulse crop as it thrives better in all seasons either as sole, inter, mixed or fallow crop. As India is its primary origin and is mainly cultivated in Asian countries including parts of southern Asia. India is the world's largest producer as well as consumer of black gram. Black gram producing major states in India are Andhra Pradesh, Madhya Pradesh, Rajasthan, Uttar Pradesh, Tamil Nadu and Maharashtra. In *kharif* 2021-22, black gram production in India was 20.5 lakh tonnes (1st advance estimates) in an area of 39.43 lakh hectares (Anonymous, 2021) [3]. In Maharashtra, it is grown on area 5.54 lakh ha with production of 3.72 lakh ha and productivity 672 kg ha^{-1} (Anonymous, 2021) [3]. The major black gram producing districts in Marathwada region are Parbhani, Nanded, Latur, Hingoli, Beed, Chhatrapati Sambhajinagar and Dharashiv. The area under black gram in Latur district is about 1,017.13 hundred ha^{-1} with production of 497.84 hundred tonnes and productivity of 489.46 kg ha^{-1} (Anonymous, 2021) [3]. Foliar nutrition is found to have an important method of fertilizer application since foliar nutrients easily penetrate the leaf cuticle or stomata and enters the cells facilitating easy and rapid consumption of nutrients. It has an advantage of quick and efficient utilization of nutrients, elimination of losses through leaching, fixation and regulating the uptake of nutrients by plants (Manonmani & Srimathi, 2009) [11]. It increases the photosynthetic rate, better nutrient translocation from leaves to the developing seeds. It is most economical way of fertilization to achieve quality production and yield while nutrient uptake from the soil is restricted (Thakur *et al*. 2017) [15]. Therefore, it is hypothesized that foliar nutrition in addition to soil application in commensuration with prevailing weather particularly rainfall will go a long way in meeting the crop nutrient need and thereby help in enhancing the productivity. Moreover, foliar feeding practice of nutrients and biostimulants would be more useful in early maturing of crops which could be combined with regular plant protection programme (Jadhav & Kulkarni, 2016) [10]. The water soluble fertilizers such as urea, DAP, 19:19:19 (NPK) and micronutrient grade 2 get readily dissolved in water. If scarce situation occurs and deficiency of nutrients observed in the field at that time foliar application through water soluble fertilizers can be used directly in the form of foliar spray for better consumption and easy nutrient uptake by plants. Urea, DAP and 19:19:19 contains macronutrients N, P, K at a fixed ratioout of which nitrogen promotes growth of a plant and facilitates maximum yield. Phosphorous promotes flowering and root development while, potassium controls movement of stomata and maintains electroneutrality of plant cells. Hence, they are found significant to enhance growth and eventually yield of crop. Foliar application is effective for the application of major micronutrients like iron, zinc, boron, copper, manganese and molybdenum. This is considered to be an efficient and economic method of supplementing part of nutrients requirement at critical stages. Naphthalene Acetic Acid (NAA) is a synthetic plant hormone in the auxin. It reduces flower drop and eventually yield increases. Gibberellic acids are diterpene plant growth regulators that are biosynthesized from geranyl diphosphate, a common C_{20} precursor for diterpenoids, which control miscellaneous aspects of growth and development including seed germination, stem elongation, flowering and pod development. Urea is a diamide of carbonic acid $[CO(NH_2)_2]$ which contains 46% (N), Foliar spray of urea improves the photosynthetic rate, vegetative growth, leaf area index and yield of crop. Pulse crops particularly black gram gives well response to foliar spray of urea. Diammonium phosphate (DAP) is the world's most widely used phoshphate fertilizer which contains 46% (P) and 18% (N). The foliar spray of 2% DAP twice at flower initiation and pod formation stages of crop growth results in higher number of pods, number of seed, seed index and higher seed yield. Foliar application of water soluble fertilizer 19:19:19 (NPK) may be a good option which enhances yield of pulse crop and reduces the cost of cultivation. In foliar application of nutrients another best option being used by farmers is the use of seaweed extract as plant nutrient bearing fertilizer. Seaweed extracts are rich in major and minor nutrients, amino acid, vitamins, cytokinins, enzymes and auxin like growth promoting substances thus fulfil the basic requirement of crops and have been reported to stimulate the growth and yield of pulses (Pramanick *et al.* 2013) [13]. As the productivity of black gram in our country is very low, there is need for enhancement of its productivity with proper agronomic practices. One among them is foliar application of nutrient source for maximizing yield potential of the crop. Foliar application has been open up to be favourable in short durational crops where the soil moisture is a limiting factor and the soil-applied fertilizer may not fulfil the basic requirement of nutrients before maturity of the crop. Considering the above facts, the experiment was entitled "Effect of foliar spray of nutrients and growth regulators in black gram (*Vigna mungo* L.)" was planned.

Materials and Methods

A field experiment was carried out during *kharif* season of 2022 Agronomy Section, College of Agriculture, Latur (Maharashtra) to study the effect of foliar spray of nutrients and growth regulators in black gram (*Vigna mungo* L.). The soil of experimental plot was clayey in texture with chemical composition such as low in available nitrogen (125.3 kg ha^{-1}), very low in available phosphorous (18.2 kg ha^{-1}) and very high in available potassium (498.58 kg ha^{-1}). The soil was slightly alkaline in reaction having pH (7.8). A field experiment was laid out in a Randomized Block Design (RBD) with eight treatments and was replicated thrice. The treatments were T_1 - Control, T_2- Foliar application of 22% seaweed extract at flower initiation, T_3- Foliar application of 0.2% micronutrient grade 2 at flower initiation,T_4- Foliar spray of 30 ppm GA_3 at flower initiation, T_5- Foliar application of 40 ppm NAA at flower initiation, T_6 - Foliar spray of 2% urea at flower initiation, T_7- Foliar application of 1% NPK (19:19:19) at flower initiation, T_8 - Foliar spray of 2% DAP at flower initiation. The gross plot size of each experimental unit was 5.4 m x 4.5 m and net plot size was 4.5 m x 3.9 m. The recommended dose of fertilizer (RDF) was 25:50:00 NPK kg ha^{-1}.

Results and Discussions

Growth attributes

Growth attributing characters *viz.*, plant height (cm), number of branches $plant^{-1}$, number of functional leaves, leaf area $plant^{-1}$ (dm^2), dry matter $plant^{-1}$ (g) were influenced significantly due to different treatments (Table1). Foliar application of 22% seaweed extract at flower initiation (T_8) recorded significantly higher plant height(45.35 cm),number of branches (7.28), number of functional leaves (35.33), leaf areaplant^{-1} (4.64 dm^2), dry matter $plant^{-1}$ (18.34 g) at all growth stages of crop except 30 and 45 DAS which was at par with foliar application of 1% NPK (19:19:19) at flower initiation (T_7) and foliar spray of 30 ppm GA_3 at flower initiation (T_4) and also found significantly superior over rest of the treatments. Increase in dry matter production in the treatments were attributed to higher photosynthetic rate of plants, which depends upon number of functional leaves, plant height, and dry matter accumulation in plants. Similar results were also found by similar with Dwivedi *et al.* (2014) [5], Akhila *et al.* (2017) [1], Iswarya *et al.* (2019) [9], Gawade *et al.* (2022) [6], Arutkumaran *et al.* (2023) [4].

Yield and yield attributes

The yield attributing characters of black gram *viz.*, weight of grains $plant^{-1}$ (g), test weight (g), seed yield (kg ha^{-1}) and straw yield (kg ha^{-1}) were influenced significantly by different treatments (Table 2). weight of pods $plant^{-1}$ (7.20 g), seed yield $plant^{-1}$ (5.04 g), test weight (44.18 g), seed yield (1435 kg ha^{-1}) and straw yield (3023 kg ha^{-1}) was recorded with foliar application of 22% seaweed extract at flower initiation

(T_2) which was at par with foliar application of 1% NPK (19:19:19) at flower initiation (T_7) and foliar spray of 30 ppm GA_3 at flower initiation (T_4) and also found significantly superior over rest of the treatments. The control treatment (T_1) showed lowest weight of pods $plant^{-1}$ (4.85 g), seed yield $plant^{-1}$ (3.95 g), test weight (43.23 g), seed yield (1117 kg ha^{-1}) and straw yield (2020 kg ha^{-1}). Increase in weight of pods $plant^{-1}$, seed yield $plant^{-1}$, test weight, seed yield and straw yield might be due to increase in translocation of assimilates from source to sink. The similar results were also found Raja & Geetha (2010) [14], Pramanick *et al.* (2013) [13], Ghosh *et al.* (2020) [7], Merhej *et al.* (2021) [12], Huda *et al.* (2023) [8].

Table 1: Effect of different treatments on growth attributing characters of black gram

Treatments	Plant height(cm) at harvest	No. of functional leaves at 60 DAS	No. of branches at harvest	Leaf area $plant^{-1}$ (dm^2) at 45 DAS	Dry matter $plant^{-1}$ (g) at harvest
T_1: Control	37.71	36.25	4.86	4.59	11.90
T_2: Foliar application of 22% seaweed extract at flower initiation	45.35	42.89	7.28	4.64	18.34
T_3: Foliar application of 0.2% micronutrient grade 2 at flower initiation	39.57	38.98	5.50	4.16	12.23
T_4: Foliar spray of 30 ppm GA_3 at flower initiation	43.94	41.43	7.06	5.09	17.57
T_5: Foliar application of 40 ppm NAA at flower initiation	40.65	39.24	5.92	4.42	15.63
T_6: Foliar spray of 2% urea at flower initiation	40.09	38.29	5.89	5.24	13.41
T_7: Foliar application of 1% NPK(19:19:19) at flower initiation	44.38	42.40	7.04	5.26	17.92
T_8: Foliar spray of 2% DAP at flower initiation	39.69	39.17	6.36	4.37	14.33
SE (m) ±	1.31	3.58	0.34	0.36	0.73
CD @ 5%	3.83	1.23	0.98	NS	2.15
General mean	41.42	39.83	6.24	4.72	15.17

Table 2: Effect of different treatments on yield attributing characters and yield of black gram

Treatments	Weight of pods $plant^{-1}$ (g)	Seed Yield $plant^{-1}$ (g)	Test weight (g)	Seed Yield (kg ha^{-1})	Straw Yield (kg ha^{-1})
T_1: Control	4.85	3.95	43.23	1117	2020
T_2: Foliar application of 22% seaweed extract at flower initiation	7.20	5.04	44.18	1435	3023
T_3: Foliar application of 0.2% micronutrient grade 2 at flower initiation	5.47	4.03	42.17	1133	2059
T_4: Foliar spray of 30 ppm GA_3 at flower initiation	6.70	4.72	44.23	1321	2643
T_5: Foliar application of 40 ppm NAA at flower initiation	6.40	4.58	43.12	1270	2360
T_6: Foliar spray of 2% urea at flower initiation	5.65	4.17	42.20	1169	2112
T_7: Foliar application of 1% NPK(19:19:19) at flower initiation	6.88	4.88	42.59	1392	2816
T_8: Foliar spray of 2% DAP at flower initiation	6.00	4.32	43.56	1174	2167
SE (m) ±	0.26	0.16	NS	52.91	157.21
CD @ 5%	0.75	0.45	3.91	154.80	459.92
General mean	6.14	4.46	42.79	1251	2400

References

1. Akhila K, Kaswala AR, Priyanka DP. Effect of liquid fertilizers on growth yield and economics of the green gram (*Vigna radiata* L.) crop under organic farming. International Journal of Chemical Studies. 2017;5(6):809-12.
2. Ammitte H, Singh S, Tiwari D, Reddy CM. Effect of nutrient levels and sea effect of nutrient levels and seaweed sap on growth and yield of black gram (*Vigna mungo* L.). The Bioscan. 2021;16(1):95-99.
3. Anonymous, 2021. http://agricoop.nic.in.
4. Arutkumaran M, Suseendran K, Kalaiyarasan C, Sriramachandrasekharan MV, Jawahar S, Thiruppathi M. Effect of foliar nutrition on growth and yield of irrigated green gram (*Vigna radiata*) cv. Vamban 4. The Pharma Innovation Journal. 2023;12(3):3584-3588.
5. Dwivedi SK, Meshram MR, Pal A, Pandey N, Ghosh A. Impact of natural organic fertilizer (seaweed saps) on productivity and nutrient status of black gram (*Phaseolus mungo* L.). The bioscan. 2014;9(4):1535-1539.
6. Gawade AP, Gaikwad GK, Kavar KA. Effect of foliar nutrition of water soluble fertilizer and growth regulator on growth attributing characters of black gram (*Vigna mungo* L. Hepper). The Pharma Innovation Journal. 2022;11(11):901-904.
7. Ghosh A, Shankar T, Malik GC, Banerjee M, Ghosh A. Effect of seaweed extracts on the growth, yield and nutrient uptake of black gram (*Vigna mungo* L.) in the red and lateritic belt of West Bengal. International Journal of Chemical Studies. 2020;8(3):799-802.
8. Huda MN, Mannan MA, Bari MN, Rafiquzzaman SM, Higuchi H. Red seaweed liquid fertilizer increases growth, chlorophyll and yield of mung bean (*Vigna radiata* L.). Agronomy Research. 2023.
9. Iswarya S, Latha KR, Srinivasan K. Evaluation of seaweed extract on growth determinants, yield and biochemical parameters of green gram (*Vigna radiata*). Journal of Pharmacognosy and Phytochemistry. 2019;8(3):1861-1864.
10. Jadhav RL, Kulkarni S. Green gram productivity

enhancement through foliar spray of nutrients. Legume Research-An International Journal. 2016;39(5):814-816.
11. Manonmani V, Srimathi P. Influence of mother crop nutrition on seed yield and quality of black gram. Madras Agricultural Journal. 2009;96(1/6):125-128.
12. Merhej MY, Hanoon MB, Atab HA, Jasim AH. Response of mung bean to urea application, spraying times of foliar fertilizers and seaweed extract. Plant Cell Biotechnology and Molecular Biology. 2021, 466-472.
13. Pramanick B, Brahmachari K, Ghosh A. Effect of seaweed saps on growth and yield improvement of green gram. African Journal of Agricultural Research. 2013;8(13):1180-1186.
14. Raja K, Geetha R. Herbal and seaweed extracts on seed yield improvement in blackgram (*Vigna mungo* (L.)) Hepper. International Journal of Plant Sciences (Muzaffarnagar), 2010;5(2):513-514.
15. Thakur V, Patil RP, Patil JR, Suma TC, Umesh MR. Influence of foliar nutrition on growth and yield of black gram under rainfed condition. Journal of Pharmacognosy and Phytochemistry. 2017;6(6):33-37.