

Effect of Varying Concentrations of Synthetic Fertilizer in Combination with Vermiwash on Growth and Yield of Black gram (*Vigna mungo* L.) Cultivar Pant Urd-31 under Dehradun Region of Uttarakhand

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ABSTRACT

In order to investigate the response of Vermiwash+RDF on growth, yield, and economics of black gram a field experiment was carried out during the Kharif season of 2019 at Experimental Research Block of SGRR University, Dehradun, Uttarakhand. The layout of the experimental field was laid out in a completely randomized block design with 10 treatments and 3 replications. The results indicated that among all the treatments, T₁₀ (Vermiwash 4.5%+RDF 25%) was overall found best for farmer's point of view concerning plant height (58.67 cm), number of pods per plant (69), grain yield (15.023 q per ha), straw yield (80.88 q per ha) and harvest index 918.27% at harvest. Results also indicated that the net return of T₁₀ was (88215.65 Rs per ha) also good from the farmer's point of view. Based on the present investigation, it was concluded that Vermiwash 4.5%+RDF 25% improves the growth and yield of black gram crops under present agro-climatic conditions.

INTRODUCTION

Black gram (*Vigna mungo* L.) belongs to the family *Fabaceae* is being grown as one of the principal crops for ages in the country. It is one of the major warm-season annual pulse grown mostly in Zaid and Kharif as an opportunity crop in rotation with cereals. Black gram was most probably domesticated in India from its wild ancestral type, at present black gram cultivation is of major importance in India only, but it is also grown to some extent throughout tropical Asia, Pakistan, and Bangladesh, and in Sri Lanka, it is grown as a pulse crop. Black gram needs a hot and humid growing season. It is generally raised during the rainy season and summer season in northern India. It is raised in both the main seasons of Kharif and rabi in the eastern and southern parts of the country. It is grown from sea level to an altitude of 1,800 m. It is drought and heat tolerant, but susceptible to frost. It is normally grown in areas with an average temperature of 25 °C-35 °C and an annual rainfall of 600 mm to 1000 mm. In higher rainfall areas it may be grown in the dry season on residual moisture, heavy rains during the flowering stage harmful and adversely affect the production. Black gram is one of the important pulse crops raised throughout India. It is consumed in the form of dal or parched. In north India, it is the chief constituent of papad and also bari which makes a delicious curry. It is also used as a green manure crop. It is used as nutritive fodder, especially for mulch cattle.

We all know the importance of pulses in our diet but due to poor knowledge of the cultivation of black gram farmer doesn't grow in well amount especially in Dehradun region, that's why the market rate of pulses is always higher so that our university decided to work in this crop and observe the growth and yield by applying different concentrations of Vermiwash.

MATERIALS AND METHODS

The present study was carried out during the Kharif season of 2019 at Research Block of S.G.R.R. University, Dehradun, Uttarakhand, India. Field experiments were conducted under sandy loam soil and laid out in a completely randomized block design with 10 treatments and 3 replications. The recommended dose of fertilizers i.e., 20:40:40 kg per ha were applied according to the farmer's practice. The different concentrations of Vermiwash+RDF were applied according to the experiment into two times, 1st after 20 days after sowing and 2nd 40 days after sowing (DAS). The experiment included treatments T₁ (Control), T₂ (Recommended Dose of Fertilizer), T₃ (Vermiwash 1%+RDF 50%), T₄ (Vermiwash 1.5%+RDF 50%), T₅ (Vermiwash 2%+RDF 50%), T₆ (Vermiwash

2.5%+RDF 50%), T₇ (Vermiwash 3%+RDF 25%), T₈ (Vermiwash 3.5%+RDF 25%), T₉ (Vermiwash 4%+RDF 25%), T₁₀ (Vermiwash 4.5%+RDF 25%). Seeds were sown during the second week of August with spacing 30 × 10 cm. The crop was harvested during the first week of November. The growth parameters viz.; plant height, number of pods per plant, number of seed per pod and yield parameters viz.; grain yield, straw yield was observed after harvesting of the crop with the following procedures: The height of the five tagged plants was recorded from the ground level to the tip of the plant and then average height was computed. Five plants were randomly selected from each experimental plot to take readings. Sun-dried tagged plants were dried also in an oven at 65°C temperature. The dry weight of the plant was recorded according to experimental treatments on weighing balance. Count the number of pods of five tagged plants from each experimental plot and after threshing recorded the average grain yield of each experimental plot then converted into quintals per hectare.

RESULTS AND DISCUSSION

The findings that were obtained from the execution of the experiment were recorded and are thoroughly discussed below:

Growth Parameters

Plant height (cm)

Plant height is an important yield contributing factor and directly relative to the production of straw yield. Analysis of variance showed significant variation at 5 percent on plant height where treatment, T₇ (Vermiwash 3%+RDF 25%) recorded the tallest plant (62.33 cm) at harvest which was statistically different from other levels of Vermiwash+RDF. At these stages, the shortest plant (56 cm) was noticed from the treatment T₃ (**Table 1**). Results indicated that at Vermiwash 3%+RDF 25% under rainfed condition showed maximum plant height which might be the positive effect of Vermiwash 3%+RDF 25% as it increased the vegetative growth with proper root development over the other treatments. The plant height may be increased under treatment T₇ because of a proper supply of soluble nutrients. These findings were supported by the results of a research by Kasarla Chaithanya et al. and Rathore et al. ^(1,2).

Table 1: Effect of Vermiwash+RDF on growth attributes of black gram.

Treatment		Plant height (cm)	Number of pods/plant
Symbol	Dose		
T ₁	Control	61.67	59.67
T ₂	RDF (20:40:40)	60.67	43.00
T ₃	Vermiwash 1%+RDF 50%	56.00	53.33
T ₄	Vermiwash 1.5%+RDF 50%	61.00	75.67
T ₅	Vermiwash 2%+RDF 50%	58.33	46.00
T ₆	Vermiwash 2.5%+RDF 50%	61.33	56.33
T ₇	Vermiwash 3%+RDF 25%	62.33	49.67
T ₈	Vermiwash 3.5%+RDF 25%	57.67	48.00
T ₉	Vermiwash 4%+RDF 25%	61.67	49.67
T ₁₀	Vermiwash 4.5%+RDF 25%	58.67	69.00
	Sem ±	2.99	1.20
	CD (0.05%)	5.17	2.07

Number of pods plant-1

The number of grains per plant is the most potent factor in pulses crop and it is directly related to yield. A significant data variation was found on the number of pods per plant due to the effect of different levels of Vermiwash+RDF. The maximum no. of pods per plant (75.67 and 69) were showed under treatment T₄, (Vermiwash 1.5%+RDF 50%) and T₁₀ (Vermiwash 4.5%+RDF 25%), whereas lowest number (43) was observed in T₂ (RDF (20:40:40)).

It may be due to the accumulation effect and the dilution effect. These findings were similar to the study by Wagadre et al. and Kacchave et al. ^(3,4).

Yield Parameters

Number of seed pods-1

The number of seeds per pod was recorded after harvest. Data revealed that the variable concentration of Vermiwash+RDF had a significant effect on the number of seeds per plant. The maximum number of seed per pod (7) was recorded under Treatment T₇ (Vermiwash 3%+RDF 25%) is significantly higher T compared to other treatments. T₂, T₅, T₈ and T₉ (RDF(20:40:40 kg/ha)), Vermiwash 2%+RDF 50%, Vermiwash 3.5%+RDF 25% and Vermiwash 4%+RDF 25% (6.67) also gives significant number of seed per pod as compare to other treatment except T₇, while the minimum number of seed per plot (6) was recorded under Treatment T₁, T₃, T₆ (Control, Vermiwash 1%+RDF 50% and Vermiwash 2.5%+RDF 50%).

Grain yield (q ha⁻¹)

A significant variation was found on grain yield of black gram with different levels of Vermiwash+RDF. Grain yield (15.02 q/ha) was the highest in treatment T₁₀ (Vermiwash 4.5%+RDF 25%). Similarly, T₅ (Vermiwash 2%+RDF 50%) gave a comparatively lower grain yield (8.460 q/ha) which was also statistically different from other treatments (**Table 1**). It might be told that the T₁₀ plant showed a critical limit at which it gave the best yield. These observations were similar to the results of the study by Kumari et al. and Annadurai et al. ^(5,6).

Straw yield (q ha⁻¹)

The straw yield was affected significantly due to the effect of different doses of Vermiwash+RDF. Among the Vermiwash+RDF doses, the highest straw yield (125.10 q/ha) obtained from the application of (Vermiwash 1.5%+RDF 50%) in T₄ at par with Treatment T₁ control (86.436 q/ha) and T₂ (RDF (20:40:40) (86.174 q/ha)). Whereas the minimum straw yield per ha (60.03 q) was recorded under Treatment T₇, (Vermiwash 3%+RDF 25%). It might be showed that vegetative growth influences the different levels of the soluble nutrient. These results were similar to the observations of Meena et al. and Singh et al. ^(7,8).

Harvesting index (%)

The maximum HI (18.27%) was obtained from the application of (Vermiwash 4.5%+RDF 25%) in T₁₀ which was statistically identical with the application of (Vermiwash 4%+RDF 25%) and RDF (20:40:40) (15.87% and 15.06%) respectively. Treatment, T₄ (Vermiwash 1.5%+RDF 50%) gave the lowest HI (11.18%). The result suggested that all the treatments of Vermiwash+RDF were efficient to produced significantly (**Table 2**). This might be due to the contribution of Vermiwash+RDF to produce higher vegetative growth ^(9,10).

Table 2: Effect of Vermiwash+RDF on yield attributes of black gram.

TREATMENT		Grain yield (q/ha)	Straw yield (q/ha)	Harvesting Index (%)
Symbol	Dose			
T ₁	Control	11.410	86.436	13.93
T ₂	RDF (20:40:40)	11.580	86.174	15.06
T ₃	Vermiwash 1%+RDF 50%	10.222	79.60	13.18
T ₄	Vermiwash 1.5%+RDF 50%	11.642	125.106	11.18
T ₅	Vermiwash 2%+RDF 50%	8.460	64.977	13.13
T ₆	Vermiwash 2.5%+RDF 50%	9.662	80.465	13.37
T ₇	Vermiwash 3%+RDF 25%	8.853	60.034	14.63
T ₈	Vermiwash 3.5%+RDF 25%	9.071	68.371	13.63
T ₉	Vermiwash 4%+RDF 25%	12.469	84.80	15.87
T ₁₀	Vermiwash 4.5%+RDF 25%	15.023	80.885	18.27
	SEm ±	1.03	1.36	1.19
	CD (0.05%)	1.78	2.35	2.05

CONCLUSION

From the present study, it was revealed that based on farmer living status the application of (Vermiwash 4.5%+RDF 25%) was found best dose for achieving the higher return from the black gram. We are also advising the farmers to use Vermiwash+RDF in the hand of solid nutrient form to decrease the cost of cultivation and earn more net return.

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