



# Effect of Organic Phytohormones on Yield and Economics of Rice Fallow Black Gram (*Vigna mungo* L.)

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## ABSTRACT

**Background:** Field experiment was conducted at the Experimental farm, Department of Agronomy, Bharath Institute of Higher Education and Research, School of Agriculture, Selaiyur, Chennai to trace on the effect of foliar spray of organic phytohormones on yield and economics of rice fallow black gram, during *Sornavari* (Apr-May) 2023.

**Methods:** The experiment was laid out in Randomized Block Design (RBD) with three replications and seven treatments. T<sub>1</sub> - Water spray T<sub>2</sub> -Foliar spray of 3% Panchagavya at 30 and 45 DAS T<sub>3</sub> - Foliar spray of 10% Jeevamruth at 30 and 45 DAS T<sub>4</sub> -Foliar Spray at 10% Vermiwash 30 and 45 DAS, T<sub>5</sub> - Foliar Spray of 10% cow urine at 30 and 45 DAS, T<sub>6</sub> - Foliar spray of 3% Panchagavya + 10% Vermiwash at 30 and 45 DAS T<sub>7</sub> - Foliar spray of 3% Panchagavya + 10% Cow urine at 30 and 45 DAS. All the treatments imposed significantly influenced the yield and economics of black gram.

**Result:** Among the treatments - foliar spray of 3% Panchagavya + 10% vermiwash (T<sub>6</sub>) recorded higher seed yield, haulm yield and economics was registered. In contrast, water spray (T<sub>1</sub>) recorded the least seed yield, haulm yield and economics.

**Key words:** Cow urine, Haulm yield, Jeevamruth, Panchagavya, Seed yield, Vermi wash.

## INTRODUCTION

Pulses are the primary source of protein in the diet. In India, black gram [*Vigna mungo* (L.) Hepper], commonly known as urdbean, is an important short-term pulse crop that is self-pollinating. (Ramaswamy and Vijaykumar, 2009). Black gram is a protein-rich meal, providing nearly three times the protein of cereals. It ranks fourth among the primary pulses grown in India. The protein demand of the country's vegetarian population is met in large part through black gram. It is consumed in the form of a split and whole pulse and it is an important addition to a cereal-based diet. It is a valuable pulse that is high in phosphoric acid. The protein content of black gram grain is approximately 25%, 56% carbohydrates, 2% fat, 4% minerals and 0.4% vitamins. Because black gram improves soil nitrogen status, it is employed as a dry-season intercrop in rice or wheat (Parashar, 2006). Black gram is widely used as a nutritious pulse. Its seeds can be consumed raw, roasted, parched, or cooked in split form. The yield potential of black gram is low because the crop is mostly cultivated in rainfed conditions with poor management practices, as well as physiological, biochemical and critical of varieties characteristics (Mudigora *et al.*, 2009).

Apart from genetic factors, physiological factors such as poor pod setting and nutrient deficiencies during the crucial stages of crop growth all have an important effect on reducing black gram production. The pulse crop production, especially black gram, is inadequate to meet the population's domestic needs. Therefore, effective agronomic practices have a lot of potential for increasing black gram yield and productivity. Several measures were implemented to

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increase black gram's production. Foliar application of both inorganic and organic fertilizers supplies nutrients to the plants and this technique maximizes the crop's genetic potential (Choudhary *et al.*, 2014). Foliar treatment has been

found to prevent the problem of leaching out in soils to cause a rapid reaction in the plant and aids in regulating nutrient intake by plants. This is regarded as an efficient and cost-effective approach to supplementing a portion of the nutrient requirements at important phases. Nutrients play an important role in improving the pulse seed yield (Ashraf *et al.*, 2023). The liquid formulations such as panchagavya and jeevamruth were ecofriendly organic preparations made from products of the cow. Among these, panchagavya is one of the widely used traditional liquid organic formulations, which is a fermented product made from five ingredients obtained from cow, such as milk, urine, dung, curd and clarified butter. In panchagavya, the number of beneficial microorganisms was found to be high under higher acidity. They have not only enhanced the microbes in the environment but also acted as a catalysts with a synergistic effect to promote all the useful microbes of the environment and these microorganisms secrete proteins, organic acids and antioxidants in the presence of organic matter and converted them into energy thereby the soil microflora and fauna changed a disease inducing soil to a disease suppressive soil (Ramesh *et al.*, 2020). Considering the above facts, the experiment was planned to effect of foliar spray organic Phytohormones on yield and economics of rice fallow black gram.

## MATERIALS AND METHODS

A field experiment was conducted at the Experimental farm, Department of Agronomy, Bharath Institute of Higher Education and Research, School of Agriculture, Selaiyur, Chennai during *Somavari* (Apr-May) 2023. The weather of Selaiyur is moderately warm with hot summer months, while the maximum temperature ranges from 27.8°C | 82.1°F with an average temperature of 31.4°C | 88.5°F, May is the hottest month of the year. At 24.1°C | 75.4°F on average, January is the coldest month of the year.

The experiment was laid out in randomized block design (RBD) with three replications and seven treatments. The fertilizers were applied to the experimental field as per the recommended manurial schedule of 25:50:25 and 20 kg of N:P:K and S kg/ha with urea (46% N) Diammonium

phosphate (60% N) and (46% P<sub>2</sub>O<sub>5</sub>) and Muriate of Potash (60% K<sub>2</sub>O) fertilizers are being used to supply N, P, K and S nutrients respectively. Full doses of nitrogen were applied as two splits on 30 and 45 days after sowing and nitrogen dose was increased or decreased as per the treatment schedule. In addition, as per the treatment schedule, the prescribed quantities of foliar spray of 3% Panchagavya, 10% Jeevamruth, 10% Vermiwash and 10% Cow urine at 30 and 45 DAS was tried to trace the total potential of the nutrients towards crop performance.

### Treatment details

- T<sub>1</sub> - Water spray.
- T<sub>2</sub> - Foliar spray of 3% Panchagavya at 30 and 45 DAS.
- T<sub>3</sub> - Foliar spray of 10% Jeevamruth at 30 and 45 DAS.
- T<sub>4</sub> - Foliar Spray at 10% Vermiwash 30 and 45 DAS .
- T<sub>5</sub> - Foliar Spray of 10% Cow urine at 30 and 45 DAS.
- T<sub>6</sub> - Foliar spray of 3% Panchagavya + 10% Vermiwash at 30 and 45 DAS.
- T<sub>7</sub> - Foliar spray of 3% Panchagavya +10% Cow urine at 30 and 45 DAS.

## RESULT AND DISCUSSION

### Yield (Table 1)

#### Seed yield (kg ha<sup>-1</sup>)

Among the treatments, foliar spray of 3% panchagavya at 10% vermi wash (T<sub>6</sub>) significantly registered higher seed yield of 974 kg ha<sup>-1</sup>. This was followed by T<sub>7</sub> - Foliar spray of 3% panchagavya + 10 % cow urine at 30 and 45 DAS. Development in the yield might have resulted panchagavya act as a medium for the growth of beneficial microbes and cow urine provides nitrogen which is essential for crop growth upon fermentation with other ingredients in panchagavya has proved beneficial effect on growth, yield attributes and yield of crops. The present results closely resembled with those of Yadav and Tripathi (2013). The least seed yield of 450 kg ha<sup>-1</sup> was recorded in the Water spray (T<sub>1</sub>). The combined application of panchagavya and organic manures significantly enhanced the crop performance due to presence of naturally occurring beneficial and effective microorganisms, plant growth promoters and nutrients in

**Table 1:** Effect of foliar nutrient on yield and economics of black gram.

Treatments	Seed yield (kg ha <sup>-1</sup> )	Haulm yield (kg ha <sup>-1</sup> )	Net income	BCR
T <sub>1</sub> - Water spray	450	1795	998	1.05
T <sub>2</sub> - Foliar spray of 3% panchagavya at 30 and 45 DAS	558	1927	5796	1.29
T <sub>3</sub> - Foliar spray of 10% jeevamruth at 30 and 45 DAS	542	1893	5072	1.25
T <sub>4</sub> - Foliar spray at 10% vermiwash 30 and 45 DAS	678	2119	11172	1.55
T <sub>5</sub> - Foliar spray of 10% cow urine at 30 and 45 DAS	665	2092	10760	1.53
T <sub>6</sub> - Foliar spray of 3% panchagavya + 10% vermi wash at 30 and 45 DAS	974	2360	24529	2.20
T <sub>7</sub> - Foliar spray of 3% panchagavya +10% Cow urine at 30 and 45 DAS	857	2230	19327	1.95
S.Ed	41.18	50.6	-	-
CD (= 0.05)	89.35	109.85	-	-

panchagavya (Somasundaram and Singaram, 2006). Higher plant height obtained might be due to increase in protein synthesis, cell growth and assimilation of readily available nutrients especially nitrogen. In addition, the essential macro nutrients such as N, P, K and beneficial micro nutrients present in Panchagavya may increase the biosynthesis of growth promoting hormones and formation of chlorophyll which may lead to better photosynthesis and increased plant height. This result coincides with the observation recorded by Sreenivasa *et al.* (2010). The yield increase with Panchagavya foliar spray might have been due to the contribution from enhanced absorption of the nutrients and influence of plant growth regulators. This result is in line with Choudhary *et al.* (2014).

#### Haulm yield (kg ha<sup>-1</sup>)

Among the treatments T<sub>6</sub> - Foliar spray of 3% panchagavya at 10% + vermi wash 2360 kg ha<sup>-1</sup> at 30 and 45 DAS and followed by the treatment, T<sub>7</sub> - Foliar spray of 3% panchagavya +10% cow urine at 30 and 45 DAS. The increase in haulm yield might be due to availability and uptake of nutrients (N, P, K, S, Zn and Fe) during the growth phases of blackgram, as well as improved carbohydrate synthesis and effective translocation of photosynthates to the growing sink (Ashraf *et al.*, 2023). Panchagavya helps to boost the production of growth-promoting chemicals, which resulted in a higher haulm yield. The present results closely resembled with those of Somasundaram *et al.*, 2003. The least haulm yield of 1795 kg ha<sup>-1</sup> was recorded in the control (T<sub>1</sub>). Biochemical properties of panchagavya revealed that it contains almost all the major nutrients like N, P, K and micronutrients necessary for plant and growth hormones like Indole acetic acid (IAA) and Gibberalic acid (GA) required for crop growth as well as the predominance of fermentative microorganisms like yeast, azotobacter, Phosphobacteria and lactobacillus (Selvaraj, 2003). The higher seed yield on field pea crop by applied with 75% of recommended dose (20:40:0 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O) per hectare along with foliar spray of either panchgavya @ 4% or vermiwash @ 10% at 30 days after sowing (Keya Prajapati *et al.*, 2022).

#### Economics

The treatment T<sub>6</sub> - Foliar spray of 3% panchagavya + 10% vermi wash significantly registered the highest net income of Rs. 24529 and benefit cost ratio invested of Rs. 2.20. Due to the reason, that higher seed yield and haulm yield recorded gross and net return might be increased. The highest gross returns might be because of better nutrition to the crop due to steady application of organic sprays resulting in higher grain and haulm yield. Similar findings were reported by Rao *et al.* (2013). The lowest net income Rs. 998 and benefit cost ratio invested Rs. 1.05 was obtained with the treatment Water spray (T<sub>1</sub>).

#### CONCLUSION

Based on the result of the field experiment, it may be inferred that the application of T<sub>6</sub>-Foliar spray of 3% panchagavya

+ 10% vermiwash had a remarkable effect on the seed yield, haulm yield and economics of Black gram. It is an efficient method for increasing the yield of black gram. Hence the combined efforts of panchagavya and vermiwash application generated remarkable results by improving the yield and quality of crops while being less expensive as well as more eco-friendly without any negative effects. In addition, panchagavya and vermiwash are environmentally friendly substitutes that improve growth during the vegetative and reproductive phases, providing a synergistic impact on black gram productivity. Improved growth and yield performance due to the combined effect of vermiwash and panchagavya successfully in rice fallow black gram production.

#### Conflict of interest

This is to clarify that the authors have no conflict of interest to declare. All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report. We certify that the submission is original work and is not under review at any other publication.

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