



# Effect of Irrigation and Foliar Nutrition on Yield and Economics of Rice Fallow Blackgram

**V. Jai Ganesh<sup>a++\*</sup>, P. Amarajyothi<sup>b#</sup>, M.M.V Srinivasa Rao<sup>c#</sup>  
and G. Mohan Naidu<sup>dt</sup>**

<sup>a</sup> Department of Agronomy, Agricultural College, Naira, ANGRAU, India.

<sup>b</sup> Department of Agronomy, IWMU, RARS, LAM, GUNTUR, ANGRAU, India.

<sup>c</sup> Department of Agronomy, Crop Production, DAATTC, Vizianagaram, ANGRAU, India.

<sup>d</sup> Department of Statistics and Computer Applications, IABM, Agricultural College, Tirupathi, ANGRAU, India.

## Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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## ABSTRACT

The present investigation, entitled "Effect of Irrigation and Foliar Nutrition on Yield and Economics of rice fallow blackgram" was carried out at the Agricultural College Farm, Naira, during the *rabi* season of 2023-24. The experiment was laid out in Strip-plot design with 3 main plots viz., M<sub>1</sub>- No Irrigation; M<sub>2</sub>-Irrigation at flower initiation and M<sub>3</sub>-Two irrigations one at flower initiation one at early

<sup>++</sup>M. Sc (Ag) Scholar;

<sup>#</sup>Senior Scientist;

<sup>†</sup>Professor;

<sup>\*</sup>Corresponding author: E-mail: [jaiganeshviswanadhapalli@gmail.com](mailto:jaiganeshviswanadhapalli@gmail.com);

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pod development and 4 Sub Plots viz., S<sub>1</sub>- water spray; S<sub>2</sub>- 1%19:19:19(NPK); S<sub>3</sub>-2% Urea; S<sub>4</sub>-2% DAP; S<sub>5</sub>-4 ml Nano urea; S<sub>6</sub>-3ml Nano DAP with two replications for each treatment. The results showed that irrigation at flower initiation and early pod development stage and foliar spray of 2% DAP at flower initiation and early pod development stage recorded maximum seed yield, haulm yield and economics.

**Keywords:** Irrigation; foliar spray; flower initiation; early pod development; seed yield and haulm yield.

## 1. INTRODUCTION

“Blackgram (*Vigna mungo* L.) is one of the important pulse crop grown throughout the country. It is popularly known as ‘Urd bean’. Blackgram needs hot and humid climate for its proper growth and development, hence, grown mainly in kharif season. Black gram is having perfect combination of all nutrients, which includes protein (25-26%), carbohydrate (60%), fat (1.5%), minerals, amino acids as well as vitamins” (Jadhav et al., 2017). It is used as nutritive fodder especially for milch cattle. It is also used as a green manuring crop.

India is the world's largest producer and consumer of blackgram by contributing 70 per cent to the global production. Blackgram area accounts for about 15.7 per cent of India's total pulse acreage and contributes 9.09 per cent of total pulse production. India produces approximately 20.5 lakh tonnes of blackgram from 39.43 lakh hectares of land during *kharif* 2021-2022 (Ministry of Agriculture and farmers welfare). The extent of black gram cultivation in Andhra Pradesh 3.45 lakh hectares area with 4.31 lakh tonnes production and the productivity is 1249 kg ha<sup>-1</sup> in 2022-2023 (Directorate of Economics and Statistics, 2022-2023).

When compared to other regions of Andhra Pradesh, the North Coastal Zone's productivity is extremely low. This is primarily because of inadequate management techniques, which include inadequate supplemental irrigation, weed and nutrient control, and low soil fertility combined with limited water retention capacity. In this case, adjusting the production methods is essential to investigating the yield potential and closing the blackgram yield gap. Providing need-based irrigations and supplying nutrients are proven to be essential instruments to increase production in rice fallow blackgram in north coastal Andhra Pradesh, among other crop management strategies. As a result, the yield and economics of the NC zone are the main subjects of this study.

## 2. MATERIAL AND METHODS

The present field experiment entitled “effect of irrigation and foliar nutrition on rice fallow blackgram” was conducted during *rabi*, 2023-24 was laid out in field No.157 of Agricultural College Farm, Naira, campus of Acharya N.G. Ranga Agricultural University, Andhra Pradesh, which is geographically situated at 18.24° N latitude, 83.84° E longitudes and with an altitude of 27 m above mean sea level in the North Coastal Zone of Andhra Pradesh. The experimental field was homogeneously fertile with even topography and uniform textural make up and was attached to the main irrigation channel connecting the farm tube well for irrigation. Proper drainage facility was also provided to remove excess water during experimental period.

The experiment was laid out in Strip-plot design with 3 main plots viz., M<sub>1</sub>- No Irrigation; M<sub>2</sub>- Irrigation at flower initiation and M<sub>3</sub>-Two irrigations one at flower initiation one at early pod development and 4 Sub Plots viz., S<sub>1</sub>- water spray; S<sub>2</sub>- 1%19:19:19(NPK); S<sub>3</sub>-2% Urea; S<sub>4</sub>-2% DAP; S<sub>5</sub>-4 ml Nano urea; S<sub>6</sub>-3ml Nano DAP with two replications for each treatment. Thinning and gap filling were done as needed and weeding & hoeing were carried out depending on weed intensity at critical stages of crop weed competition.

Five plants were randomly chosen from each replication, and observations were made on them. Replication-wise averages of the readings from these five plants were obtained, and statistical analysis was performed using the mean data. A range of characteristics were measured, including the number of branches per plant, the amount of dry matter accumulated (kg ha<sup>-1</sup>), the number of pods per plant, the test weight (g), the seed production (kg ha<sup>-1</sup>), and the haulm yield (kg ha<sup>-1</sup>). During the growing season, measurements of yield characteristics were made at harvest, while the number of branches per plant and dry matter production were noted at 30-day intervals.

### 3. RESULTS AND DISCUSSION

#### 3.1 Yield

Irrigation at flower initiation and early pod development recorded highest number of pods plant<sup>-1</sup> (19.88) number of seeds pod<sup>-1</sup> (6.90). among foliar spray recorded highest number of pods plant<sup>-1</sup> (20.83), number of seeds pod<sup>-1</sup> (7.38) were recorded in 2% DAP which was statically on par with 1% 19:19:19 (NPK). Irrigation during critical stages improved the crop growth, reduced the flower dropping and favoured more number of pods plant<sup>-1</sup> and better grain filling. This is in line with the findings of Rahman et al. (2000) reported similar results in chickpea and Nilanthi et al. (2014) in blackgram and Rathika and Ramesh (2016). "The increased in yield might be due to enhanced yield attributes like number of pods plant<sup>-1</sup>, number of seeds pod<sup>-1</sup>. It might be due to increased uptake of nutrients by blackgram by effective translocation of nutrients from sink to reproductive area of crop. These findings are in agreement" with Subramani and Solaimalai (2000) and Sundari and Sureshkumar (2004).

Seed and haulm yield were remarkably influenced by the irrigation and foliar nutrition (Table 1). Among the main plots irrigation at flower initiation and early pod development stage recorded maximum seed (941 kg ha<sup>-1</sup>) and haulm yield (1927 kg ha<sup>-1</sup>). Among subplots foliar spray of 2% DAP recorded maximum seed

(954.6 kg ha<sup>-1</sup>) and haulm yield (1880 kg ha<sup>-1</sup>) followed by 1% 19:19:19 (NPK) which was statically on par with Nano DAP @ 2 ml/lit. "The Higher yield of mungbean might be owing to the availability of optimum moisture in the root zone of crops through small and repeated irrigation. Optimum moisture condition in the root zone of soil influences the nodulation and availability of different nutrients and helps in achieving better plant growth and yield. The results are in close conformity with the findings" of Karande et al. (2019).

In comparison to the other treatments, foliar application of 2% DAP increased the number of floral buds and inhibited floral shedding by preserving the plants' ideal bio-physiological conditions. This led to a significant rise in yield parameters, such as the number of pods per plant and test weight. The results of this investigation agree with those of Dayana et al. (2021) and Ramesh T and Rathika S (2013).

#### 3.2 Economics

"The data on economics for different foliar sprays under imposed under irrigation presented in table.2. Higher gross returns (Rs.65877), net returns (Rs. 39177), benefit cost ratio (2.46) were realized with irrigation at flower initiation and early pod development. Among foliar spray Higher gross returns (Rs. 63308), net returns (Rs. 39208), benefit cost ratio (2.62) were recorded at 2% DAP. The gross returns, net

**Table 1. Yield as influenced by irrigation and foliar nutrition on blackgram**

Treatments	Seed yield (kg ha <sup>-1</sup> )	Halum yield (kg ha <sup>-1</sup> )
<b>Irrigation</b>		
M <sub>1</sub>	640.0	1358
M <sub>2</sub>	804.1	1605
M <sub>3</sub>	941.0	1927
SEm+	23.76	38.59
CD (p=0.05)	144.5	234.8
CV (%)	10.35	8.20
<b>Foliar nutrition</b>		
S <sub>1</sub>	647.9	1476
S <sub>2</sub>	914.3	1717
S <sub>3</sub>	727.3	1581
S <sub>4</sub>	954.6	1880
S <sub>5</sub>	705.0	1513
S <sub>6</sub>	816.1	1613
SEm+	27.91	34.59
CD (p=0.05)	101.1	125.75
CV (%)	8.60	5.20

**Table 2. Economics as influenced by irrigation and foliar nutrition on blackgram**

Treatments	Economics		
	Gross returns	Net returns	B:C ratio
Irrigation			
M <sub>1</sub>	44800	20900	1.87
M <sub>2</sub>	56168	31368	2.26
M <sub>3</sub>	65877	39177	2.46
Foliar nutrition			
S <sub>1</sub>	45843	22243	1.90
S <sub>2</sub>	62433	38433	2.60
S <sub>3</sub>	51142	27042	2.22
S <sub>4</sub>	63308	39208	2.62
S <sub>5</sub>	49336	25586	2.07
S <sub>6</sub>	61845	37745	2.56

returns, benefit cost ratio are higher from higher seed yield with foliar nutrition because of greater availability of essential nutrients to plant, better translocation of photosynthates leads to higher haulm and grain yield. The similar results were reported” by Martin Stanley (2013).

#### 4. CONCLUSION

Irrigation at flower initiation and early pod development and Foliar spraying of 2%DAP recorded higher growth and yield attributing parameters of blackgram leading to significant increase in seed and haulm yield.

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Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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