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# EFFECT OF SOME ORGANIC AND INORGANIC FERTILIZERS ON GROWTH OF COWPEA UNDER JAMUHAR, SASARAM (ROHTAS) BIHAR CONDITION

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**ABSTRACT**

A field experiment was conducted on cowpea cv. Kashi Kanchan at the, Horticultural Research Farm, Department of Horticulture, Narayan Institute of Agricultural Sciences, Gopal Narayan Singh University, Jamuhar Sasaram (Rohtas) Bihar. during summer season, 2022. The data clearly showed the both organic and inorganic fertilizers enhance vegetative as well as reproductive growth and yield in cowpea cv- Kashi Kanchan. The effect of combined fertilizers application showed the maximum number of seed germination percentage was recorded (94 percent) in 100% RDF + *Rhizobium* + PSB. The maximum plant height (82.33 cm) was recorded in 100% RDF + *Rhizobium* + PSB). The maximum number of leaves per plant was recorded under treatment 50% RDF + PSB) (72.33) followed by (100% RDF + PSB) (68.33), (100% RDF + *Rhizobium* + PSB) (68.00) and 75% RDF + *Rhizobium*) (66.33) followed by (2.13 g) 75% RDF + *Rhizobium* + PSB, (2.03 g.) 50% RDF + *Rhizobium* + PSB and (2.02 g.) under the treatment 50% RDF + *Rhizobium was* recorded. The maximum number of leaves per plant was recorded under treatment 50% RDF + PSB) (72.33) followed by (100% RDF + PSB) (68.33), (100% RDF + *Rhizobium* + PSB) (68.00) and 75% RDF + *Rhizobium*) (66.33)

***Key word*:** Cowpea, Organic and Inorganic fertilizer, Growth and Yield parameters.

## Introduction

Cowpea [*Vigna unguiculata* (L.)] is also known as black eye pea, southern pea and Crowder pea. It is an important legume vegetable crop. The crop is used for variety of ways, as vegetable it is grown for its long tender green pods which are used as a vegetable. Mature but green seeds are also used as a vegetable purpose. Commonly it is used for soil fertility improvement through biological nitrogen fixation, green manuring, forage yield, production of high quality hay and silage, synthesis of nutritional products, suppression of weeds, food, and a source of protein and income generation (Kimiti *et al.*, 2011). Cowpea is short duration, high yielding and quick growing crop and provided quick and thick cover on the ground thus helping in conservation of soil. It is grown as alternative crop in dry land farming. The basic concept of integrated nutrient management system is the maintenance of plant nutrients supply to achieve a given level of crop production by optimizing the benefits from all possible sources of plant nutrients in an integrated manner, appropriate to each cropping system and farming system (Mahajan and Sharma 2005).

Kashi Kanchan varieties of cowpea developed from ICAR- IIVR (Indian Institute of Vegetable Science) Varanasi, developed from backcrossing and pedigree selected early maturity, upright growth and bushy in nature and resistant from golden mosaic virus. The seed coat is smooth and the color of the seeds is white. Flowering occurs 45-50 days after sowing and the pods are harvested 10-20 days after harvest, the pods are 30-35 cm long.

Rhizobium inoculation increased the root nodulation

**Table 1:** Effect of some organic and inorganic fertilizers on growth and yield of cowpea.

| S. No. | Treatment | SGP | PH | NLPP | DFF | GPL | PB | NSPP | ISWPF | IGPW | GPYPP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | (Control) | 85.00 | 65.00 | 50.33 | 46.00 | 23.00 | 6.44 | 11.10 | 1.17 | 9.39 | 105.64 |
| 2. | (100% RDF) | 87.00 | 71.33 | 51.00 | 47.00 | 21.67 | 6.70 | 12.67 | 1.67 | 11.15 | 105.64 |
| 3. | (75% RDF) | 88.67 | 71.00 | 62.67 | 48.33 | 24.33 | 7.10 | 12.17 | 1.43 | 12.23 | 117.57 |
| 4. | (50% RDF) | 85.00 | 66.00 | 55.00 | 48.67 | 24.67 | 7.85 | 12.33 | 1.90 | 10.69 | 117.17 |
| 5. | (100% RDF + *Rhizobium*) | 87.67 | 68.33 | 58.00 | 50.67 | 24.00 | 7.42 | 12.67 | 1.40 | 12.92 | 109.90 |
| 6. | (100% RDF + PSB) | 88.00 | 65.67 | 68.33 | 49.67 | 23.07 | 6.97 | 11.33 | 1.67 | 12.26 | 122.36 |
| 7. | (100% RDF + *Rhizobium* + PSB) | 94.00 | 82.33 | 68.00 | 46.00 | 30.93 | 8.97 | 13.27 | 2.17 | 15.23 | 160.15 |
| 8. | (75% RDF + *Rhizobium*) | 88.67 | 68.00 | 63.33 | 48.67 | 23.33 | 7.47 | 11.33 | 1.73 | 9.46 | 119.93 |
| 9. | (75% RDF + PSB) | 90.33 | 65.67 | 61.33 | 46.00 | 25.17 | 7.22 | 12.33 | 1.83 | 11.63 | 119.56 |
| 10. | (75% RDF + *Rhizobium* + PSB) | 91.00 | 80.00 | 56.00 | 47.00 | 30.73 | 8.77 | 12.57 | 2.13 | 14.87 | 124.44 |
| 11. | (50% RDF + *Rhizobium*) | 91.00 | 67.00 | 64.67 | 48.00 | 27.53 | 7.91 | 12.00 | 2.02 | 13.68 | 127.13 |
| 12. | (50% RDF + PSB) | 89.67 | 74.00 | 72.33 | 48.33 | 27.23 | 7.29 | 11.10 | 1.63 | 14.56 | 130.40 |
| 13. | (50% RDF + *Rhizobium* + PSB) | 91.67 | 76.67 | 59.67 | 47.33 | 29.50 | 8.57 | 12.46 | 2.03 | 15.13 | 111.08 |
| | General Mean | 89.05 | 70.85 | 60.82 | 48.46 | 25.78 | 7.59 | 12.12 | 1.75 | 12.55 | 122.04 |
| | S.Em (±) | 0.96 | 2.07 | 1.49 | 0.63 | 0.80 | 0.16 | 0.32 | 0.04 | 0.37 | 3.20 |
| | C.D. at 5% | 2.80 | 6.05 | 4.35 | 1.83 | 2.34 | 0.45 | 0.95 | 0.13 | 1.07 | 9.34 |
| | Range Lowest | 85.00 | 65.00 | 50.33 | 46.00 | 21.67 | 6.44 | 11.10 | 1.17 | 9.39 | 105.64 |
| | Range Highest | 94.00 | 82.33 | 72.33 | 52.00 | 30.93 | 8.97 | 13.27 | 2.17 | 15.23 | 160.15 |

**SGP:** Seed germination percentage; **PH:** Plant height (cm); **NLPP:** No. of leaves per plant; **DFF:** Days to first flowering; **GPL:** Green pod length (cm); **PB:** Pod breadth (mm); **NSPP:** No. of seed per pod; **ISWPF:** Immature seed weight per fruit (gram); **IGPW:** Individual green pod weight (g); **GPYPP:** Green pod yield per plant (g)

through better root development and more nutrient availability, resulting in vigorous plant growth and dry matter production which resulted in better flowering, fruiting and pod formation and ultimately there was beneficial effect on seed yield (Sardana *et al.,* 2006*)*.

The use of organic fertilizers has become more important to improve the efficiency of fertilizer use. Indian soils have poor to moderate nutrient status in terms of available nitrogen and phosphorus. The purpose of rhizobia inoculation is to increase the number of rhizobia in the rhizosphere. According to (Vaisya *et al.,* 1983). seed treatment with rhizobium cultures increased green pod production and seed yield compared to uninaculated control treatments.

## Materials and Methods

A field experiment was conducted on cowpea cv. Kashi Kanchan at the, Horticultural Research Farm, Department of Horticulture, Narayan Institute of Agricultural Sciences, Gopal Narayan Singh University, Jamuhar Sasaram (Rohtas) Bihar. during summer season, 2022. The land topography of the experimental site was almost uniform with an adequate surface drainage. The internal drainage of the experimental site is medium. The experiment work used a randomized block design with thirteen treatments that were three replications. The treatment was that $T_1$ (Control), $T_2$ (100% RDF) $T_3$ (75% RDF) $T_4$ (50% RDF) $T_5$ (100% RDF + *Rhizobium*) $T_6$ (100% RDF + PSB) $T_7$ (100% RDF + *Rhizobium* + PSB) $T_8$ (75% RDF + *Rhizobium*) $T_9$(75% RDF + PSB) $T_{10}$ (75% RDF + *Rhizobium* + PSB) $T_{11}$ (50% RDF + *Rhizobium*) $T_{12}$ (50% RDF + PSB) $T_{13}$ (50% RDF + *Rhizobium* + PSB). Where RDF is recommended dose of fertilizers. To achieve a well tilth, state the land was prepared by ploughing and tillage operations. Each plot was (3 Meter$^2$) in size, with a planting distance of 30 x 30 cm. Irrigation channel and bunds were also installed in accordance with the plan. The seed were manually sown in the field and cover with fine soil at a depth of 2-3 cm. To ensure proper germination, a mild watering is used shortly after seedling. During crop growing phases, all cultural operations and plant protection measure were carried out on the regular basis. The observation was recorded on growth characters like Seed germination percentage, Plant height (cm), Number of leaves per plant, Days to first flowering, green pod length (cm), Pod breadth (mm), Number of seeds per pod, Immature seed weight (g) and Individual green pod weight (g). Observations with respect to following characters were recorded on five plants selected at randomly and tagged in each plot excluding the border plant and their means were worked out for statistical analysis through RBD. The maximum immature seed weight per fruit (2.17 g) compare to others.

## Result and Discussion

The yield obtained growth and yield parameters are presented in (Table 1 Fig. 1) The maximum number of

seed germination percentage was recorded (94 percent) in 100% RDF + *Rhizobium* + PSB followed by (91.67) in (50% RDF + *Rhizobium* + PSB), (91 and 91 percentage) under treatment 75% RDF + *Rhizobium* + PSB) and (50% RDF + *Rhizobium*) respectively. Significantly maximum seed germination percentage in 100% RDF along with Rhizobium and PSB. might be due to increased availability and rate of absorption nutrients to plants. Similar findings in terms of significant increase germination percentage compared to untreated plants were observed with integrated use of different inorganic and bio-fertilizers showed given by Senthilkumar and Sivagurunathan (2012) in cowpea, Dar *et al*., (2010) in okra, Mishra and Jain (2013) in Kalmegh plant. The maximum plant height (82.33 cm) was recorded in 100% RDF + *Rhizobium* + PSB) followed by (75% RDF + *Rhizobium* + PSB) (80 cm ) (50% RDF + *Rhizobium* + PSB) (76.67 cm) and (50% RDF + PSB) (74. cm) This can be due to moisture and nutrient ability from the soil. Nitrogen plays a major role in plant growth and development. Also increased supplies of available phosphorus are an important role play in plant metabolism and energy transformations affecting plant growth. Plant growth activity increased due to increased photosynthesis and photosynthate metabolism as suggested by Saxena *et al*., (1996) in moogbean, Choudhary and Yadav (2011) and Mishra and Solanki (1996) in vegetable cowpea. Singh *et al.*, (2007) suggested that the increase in plant height might be due to treating seeds with Rhizobium and PSB which subsequently resulting in increased root growth. The maximum number of leaves per plant was recored under treatment 50% RDF + PSB) (72.33) followed by (100% RDF + PSB) (68.33), (100% RDF + *Rhizobium* + PSB) (68.00) and 75% RDF + *Rhizobium*) (66.33) Kishan *et al.,* 2001 in vegetable cowpea reported that with application of 50% RDF along with Pu SB, the number of leaves per plant was significantly highest. The enhancement in number of leaves / plants might be due to the cowpea seed inoculation with PSB resulting in increased root growth and enhanced uptake of nutrients.

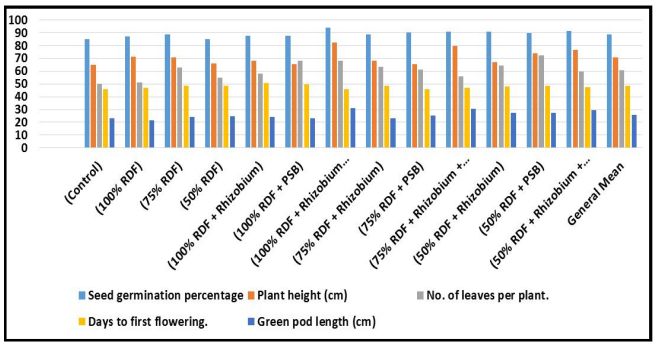


**Fig. 1:** Effect of some organic and inorganic fertilizers on growth of cowpea.

The minimum days to first flowering was obtaining (46 days) under the treatment 100% RDF + *Rhizobium* + PSB), 75% RDF + PSB) and control) respectively

Followed by (100% RDF) (47 days) and 50% RDF + *Rhizobium* + PSB (47.33 days) Application of organic and chemical fertilizers as well as seed treatment with Rhizobium and PSB culture might have increased availability of essential and beneficial nutrients like N and P subsequently resulting in lowest number of days to first flowering. Similar results were found by Okeleye and Okelana (1997) in vegetable cowpea. Kannaujia *et al.*, (1997) also reported that days to first flowering was significantly affected by Rhizobium culture seed treatment. Phosphorus induced early flowering and fruiting might be due to the fact that it plays major role in metabolic activity and cell division resulting in increased vegetative growth in cowpea. (Mishra, 1999). The maximum green pod length (8.97 cm) was recorded in 100% RDF + *Rhizobium* + PSB) followed by (8.77 cm), 50% RDF + *Rhizobium* + PSB) (8.57 cm) and 50% RDF + *Rhizobium*) (7.91 cm) the nutrient availability and mineral uptake of crops, pollen germination and promotion of hormonal regulation, increased pollen tube growth and increased the pod length of plant. This study was found to be similar with that of Mal *et al*., (2014) in okra and Patil *et al.*, (2012) in cowpea.

The yield obtained yield parameters are presented in (Table 1 and Fig. 2) The maximum number of seed per pod was (12.67) was recorded in (100% RDF + *Rhizobium and* 100% RDF respectively) followed by (12.67) in 75% RDF + *Rhizobium* + PSB) and (12.46) 50% RDF + *Rhizobium* + PSB. Singh and Rajput (1991) also reported enhanced number of seeds per pod in vegetable cowpea with application of phosphorus with

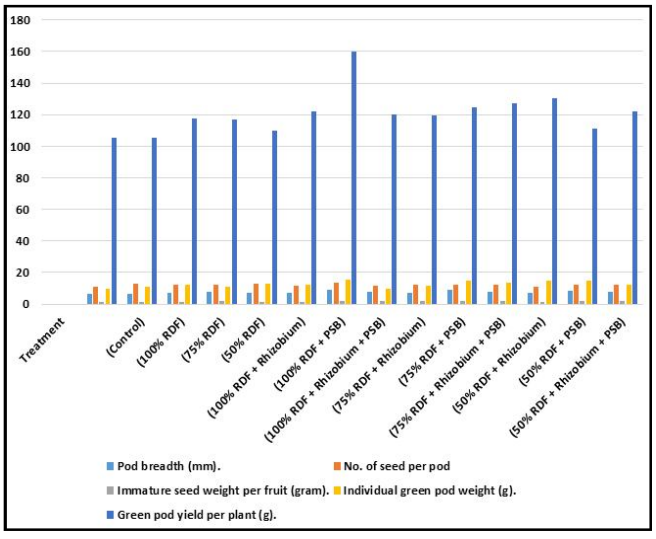


**Fig. 2:** Effect of some organic and inorganic fertilizers on yield of cowpea.

Rhizobium and PSB seed treatment. The improved physiological processes lead to increased growth and yield attributes subsequently resulting in increased pod yield per plant and per hectare.

Application of phosphorus along with Rhizobium and PSB seed treatment is helpful to increase nitrogen fixation, root nodulation and better photosynthesis resulting in significantly increased number of seeds per pod in cowpea (Kishan *et al.*, 2001). The maximum immature seed weight per fruit (2.17 g) followed by (2.13 g) 75% RDF + *Rhizobium* + PSB, (2.03 g.) 50% RDF + *Rhizobium* + PSB and (2.02 g.) under the treatment 50% RDF + *Rhizobium was recarded.* Increased pod breadth might be due to enhanced uptake of nitrogenous and phosphorus fertilizers stimulating the rate of physiological process in tissues of plant and resulting into increased pod breadth. Similar findings are observed by Abdel-Ati (2000) in cowpea.

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