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Studies on integrated nutrient management on yield of blackgram (*Vigna mungo* L.) in Chhattisgarh plain

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Abstract
A field experiment was conducted at the Instructional farm, BTC CARS, Bilaspur (C.G.) university of Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh). During kharif, season of 2021 with a view to study the "Studies on integrated nutrient management on yield of blackgram (*Vigna mungo* L.) In Chhattisgarh plain". The Blackgram (urdbean) used to grown and treatment was replicated three times in randomized block design. The soil of experimental site was alfisol belonging to textural clay loam. The investigation has recommended dose of fertilizer (RDF) *i.e.,* 20:40:20 kg N, P_2O_5, K_2O ha^{-1} which were applied at different concentrations in blackgram in seven treatments *viz.*, T_1: - 20:40:20 RDF, T_2: - 125%RDF, T_3:- 150% RDF, T_4:- RDF + FYM@5t ha^{-1}, T_5:- 125% of RDF + FYM@5t ha^{-1}, T_6:- 150% of RDF + FYM@5t ha^{-1} and T_7: - Control(NPK). The yield parameters *i.e.,* number of pods $plant^{-1}$, number of seeds pod^{-1}, pod length (cm), 1000 seed weight (g), seed yield q ha^{-1}, straw yield q ha^{-1} and harvest index (%) were significantly superior in the treatment T_6 (150% of RDF + FYM@5t ha^{-1}). On the basis of above findings, treatment T_6 (150% of RDF + FYM@5t ha^{-1}) stand could be better performance first in position and T_5 (125% of RDF + FYM@5t ha^{-1}) stand in second order of preference. However, treatment T_3 (150% RDF) comes in next in order. Therefore, it may be concluded that treatment T_6 (150% of RDF + FYM@5t ha^{-1}) may be prefer for higher yield in blackgram.

Keywords: Yield parameter, nutrient management, blackgram, alfisol, clay loam, RDF, N, P_2O_5, K_2O, FYM, seeds, pods

1. Introduction
Blackgram [*Vigna mungo* (L.) Hepper], is one of the most important pulse crops among the various grain legumes. According to Vavilov (1951) [21] it is native to India, belongs to the family Leguminaceae. It is consumed in the form of 'dal' (whole or split, husked and un-husked) or perched. It is used as nutritive fodder specially for milch animals. It fits well in various multiple cropping and intercropping systems. After picking of pods, blackgram plants may be used as green fodder for livestock or green manuring to increase fertility of soil. Besides these, the black gram crop also enriches soil by fixing the atmospheric nitrogen.
Blackgram is spread in Indian subcontinent and popularly known as "Urad dal". It is cultivated in Bangladesh, Afghanistan, Myanmar and Pakistan. Most suitable climate for blackgram is 27-30 ^{0}C, moderate rainfall and loamy soil with high water holding capability. Blackgram is third most important pulse crop grown under rainfed, rice fallow, irrigated conditions and during *kharif*, *rabi* and summer seasons, which matures in 90-100 days and it, enriches soil with nitrogen. India is major producer and consumer of blackgram (Raju, 2019) [13]. It is used for preparation of different food preparations like *Idli*, *Dosa*and non-fermented foods (Sivasubramanian *et al.*, 2015) [19], Black gram is a self-pollinated leguminous crop which is grown during *kharif* as well as summer in seasons in arid and semi-arid regions of India. It is tolerant to drought and can be grown successfully on all types ofsoils. (Krishnaprabhu *et al.* 2018) [7].
Black gram is the most important legume crop and India alone produce more than two- third of the world's production (Saini and Jaiwal, 2002) [16] as food, feed and industrial raw material and ranks as the third important pulse crop in India (Selvakumar *et al.*, 2012) [17]. Total black gram production was 3280 thousand tonnes; of which percentage share in 13.48% during 2017-18 (Anonymous, 2018) [1].The total blackgram production in India was 2.89 million tonnes from an area of 3.56 million hectare (Ministry of Agriculture and Farmer's welfare annual report 2016-17).In Chhattisgarh during 2019-2020 total area has 134.13 thousand hectare and productivity of 371 kg ha^{-1}. In Madhya Pradesh, total areawas9.32 lakh hectare with total production of 515 million tonnes and productivity of 553kgha^{-1}.

2. Materials and Methods

The field experiment was conducted at the Instructional farm, BTC CARS, Bilaspur (C.G.) university of Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh). The Research Farm is situated at 22.09˚N latitude, 82.15˚E longitude and at an altitude of 292.3 m above mean sea level. The region falls under the Eastern plateau and hill region (Agro-climatic zone-VII) of India. Chhattisgarh state is classified into three agro-climatic zones, in which Bilaspur falls under the Chhattisgarh plains zone of the state. The experimental field was well drained with uniform topography. And the soil of experimental site was alfisol belonging to textural clay loam.

The full dose of fertilizers was applied according to the treatments by manually in previously open furrows before sowing the seeds. The uniform dose of 20 kg N_2, 40 kg P_2O_5 and 20 kg K_2O were applied through Urea, SSP and MOP, respectively in all the treatments. These were drilled by hand in the open furrows during sowing of seed in all the treatments. Five plants of each plot were randomly selected and tagged for recording the observations at different stages of growth. The observations on growth and yield parameters were recorded at an interval of 20, 40, 60 DAS and at harvest.

3. Results and Discussion

Data pertaining to yield attributes influenced by various treatment has been given in table 1 and fig 1, 2, 3, 4, 5, 6 and 7. Regarding number of pods plant^{-1}, clearly shows that, significant highest number of pods (30.03) was noted in treatment T_6 (150% of RDF + FYM@5t ha^{-1}), followed by treatment, T_5 (125% of RDF + FYM@5t ha^{-1}) (29.00) and T_3 (150% RDF) (27.02). Significant lowest number of pods plant^{-1}(18.10) was noted in treatment T_7 (Control (NPK)). The results obtained in the present studies are also supported by Lakshmi and Lakshmi (2004) [10], Ghanshyam *et al*. (2010) [3] and Hussain *et al.* (2011).

Number of seeds pod^{-1}, was observed significant highest (6.60) in treatment T_6 (150% of RDF + FYM@5t ha^{-1}), followed by treatment, T_5 (125% of RDF + FYM@5t ha^{-1}) (6.30) and T_3 (150% RDF) (6.02). Significant lowest number of seeds pod^{-1}(4.50) was noted in treatment T_7 (Control (NPK)). The results are also supported by Hussain *et al.* (2011) [5], Vairavan (2011) [22] and Sheikh *et al.* (2012) [15].

The pod length (cm), clearly shows that, significant highest pod length (6.01 cm) was noted in treatment T_6 (150% of RDF + FYM@5t ha^{-1}), followed by treatment, T_5 (125% of RDF + FYM@5t ha^{-1}) (5.90 cm) and T_3 (150% RDF) (5.60cm). Significant lowest pod length (4.50 cm) was noted in treatment T_7 (Control (NPK)). The results obtained in the present study are supported by the works of Tomar *et al*. (2013) [20] and Saravanan *et al*. (2013) [14] observed that maximum number of pods and pod length of blackgram in treatment, which received FYM + 10% RDF of NPK. They also reported that the integrated approach of nutrient management recorded better availability of phosphorus and potassium in fresh and dry seeds of blackgram than the individual application.

1000 seed weight (g) was observed significant highest (45.00 g) in treatment T_6 (150% of RDF + FYM@5t ha^{-1}), followed by treatment, T_5 (125% of RDF + FYM@5t ha^{-1}) (44.00 g) and T_3 (150% RDF) (42.00 g). Significant lowest 1000 seed weight (30.13 g) was noted in treatment T_7 (Control (NPK)). Also similar results were reported by Hussain *et al.* (2011) [5] and Gupta *et al*. (2006) [4].

The seed yield q ha^{-1}, clearly shows that significant highest seed yield (13.30 q ha^{-1}) was noted in treatment T_6 (150% of RDF + FYM@5t ha^{-1}), followed by treatment, T_5 (125% of RDF + FYM@5t ha^{-1}) (12.80 q ha^{-1}) and T_3 (150% RDF) (12.30 q ha^{-1}). Significant lowest seed yield (8.00 q ha^{-1}) was noted in treatment T_7 (Control (NPK)). The results obtained in the present study are in accordance with the results of Singh *et al.* (2008) [18], Kumpawat (2010) [9] and Kokani *et al*. (2014) [6]. The combined dose of chemical and organic fertilizer was more beneficial in enhancing all the above parameters due to increased solubility of phosphorus and higher nitrogen fixation in nodules leading to increased availability of nitrogen and phosphorus. FYM also increased yield and yield attributing characters as well as nodulation and yield parameters.

Stover yield q ha^{-1} was noticed, significant highest (30.50 q ha^{-1}) in treatment T_6 (150% of RDF + FYM@5t ha^{-1}), followed by treatment, T_5 (125% of RDF + FYM@5t ha^{-1}) (30.20 q ha^{-1}) and T_3 (150% RDF) (29.80 q ha^{-1}). Significant lowest stover yield (18.00 q ha^{-1}) was noted in treatment T_7 (Control (NPK)). Similar results were also observed by Kurhade *et al*., (2015) [8] and Gupta *et al*. (2006) [4].

Harvest index (%), was observed that, highest harvest index (43.44%) was noted in treatment T_7 (Control (NPK)) followed by treatment, T_6 (150% of RDF + FYM@5t ha^{-1}) (43.61%) and T_5 (125% of RDF + FYM@5t ha^{-1}) (42.38%). Lowest harvest index (37.50%) was noted in treatment T_1 (20:40:20) RDF. Similar result was also reported by Kokani *et al*. (2014) [6] and Tomar *et al*. (2013) [20].

Table 1.1: Effect of integrated nutrient management on yield parameters of blackgram

Tr. No.	Treatment details	Number of pods plant^{-1}	Number of seeds pod^{-1}	Pod length (cm)	1000 seed weight (g)	Seed yield q ha^{-1}	Stover yield q ha^{-1}	Harvest index (%)
T_1	20:40:20 RDF	22.06	5.04	5.01	35.00	10.50	28.00	37.50
T_2	125%RDF	24.00	5.20	5.20	37.50	11.00	28.75	38.26
T_3	150% RDF	27.02	6.02	5.60	42.00	12.30	29.80	41.28
T_4	RDF + FYM@5t ha^{-1}	26.01	5.60	5.40	40.10	11.60	29.25	39.66
T_5	125% of RDF + FYM@5t ha^{-1}	29.00	6.30	5.90	44.00	12.80	30.20	42.38
T_6	150% of RDF + FYM@5t ha^{-1}	30.03	6.60	6.01	45.00	13.30	30.50	43.61
T_7	Control (NPK)	18.10	4.50	4.50	30.13	8.00	18.00	44.44
S.Em (±)		2.19	0.34	0.14	2.57	0.61	0.72	1.70
CD (P=0.05)		6.75	1.07	0.45	7.94	1.90	2.23	NS
CV (%)		15.06	10.75	4.69	11.41	9.24	4.32	7.42

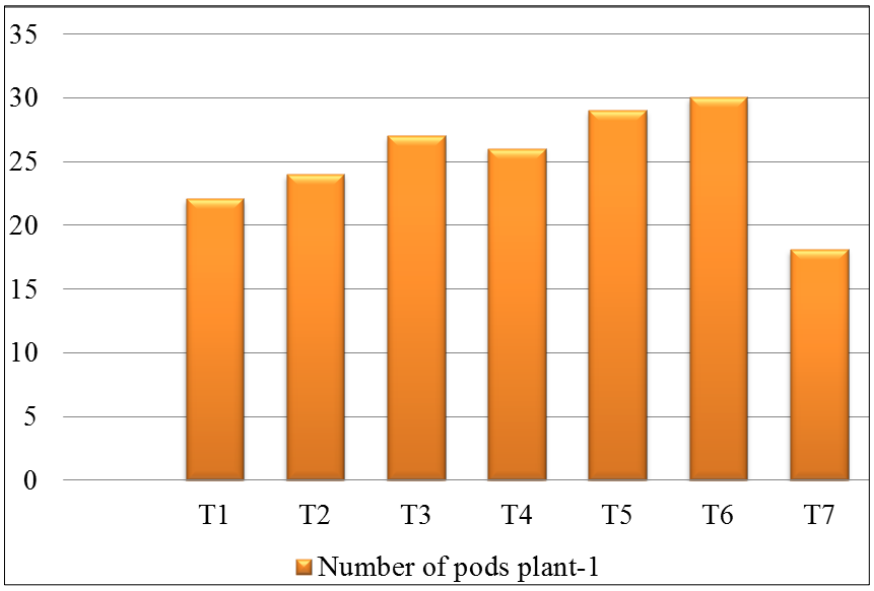

Fig 1: Number of pods plant-1

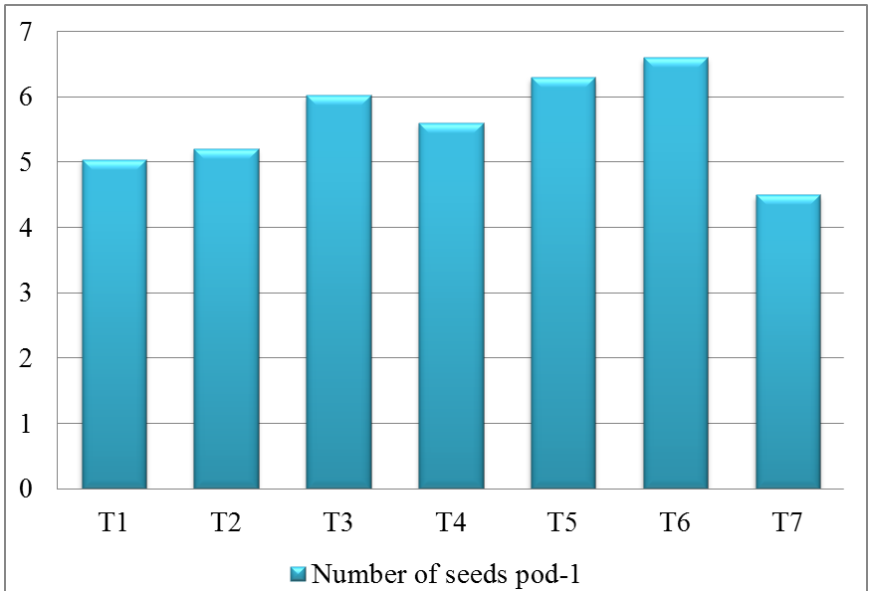

Fig 2: Number of seeds pod-1

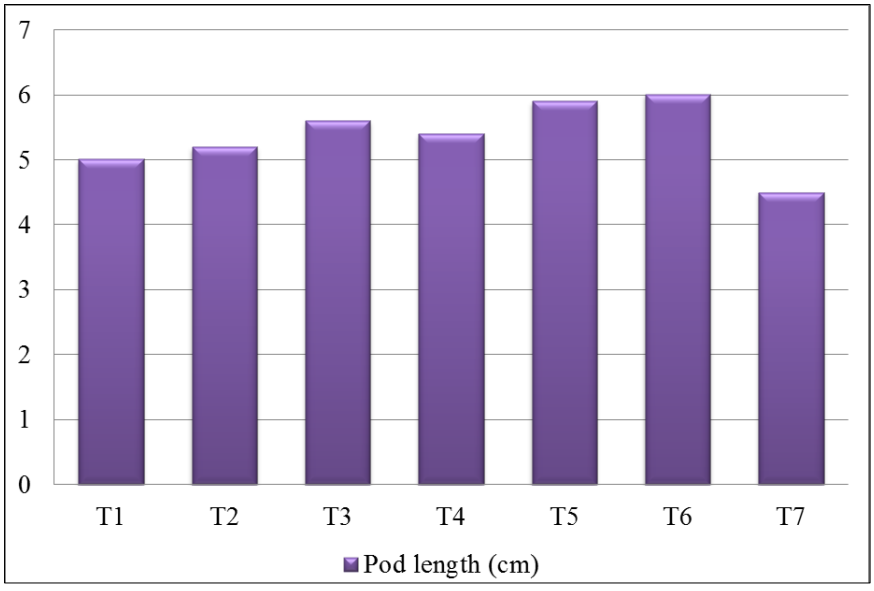

Fig 3: Pod length (cm)

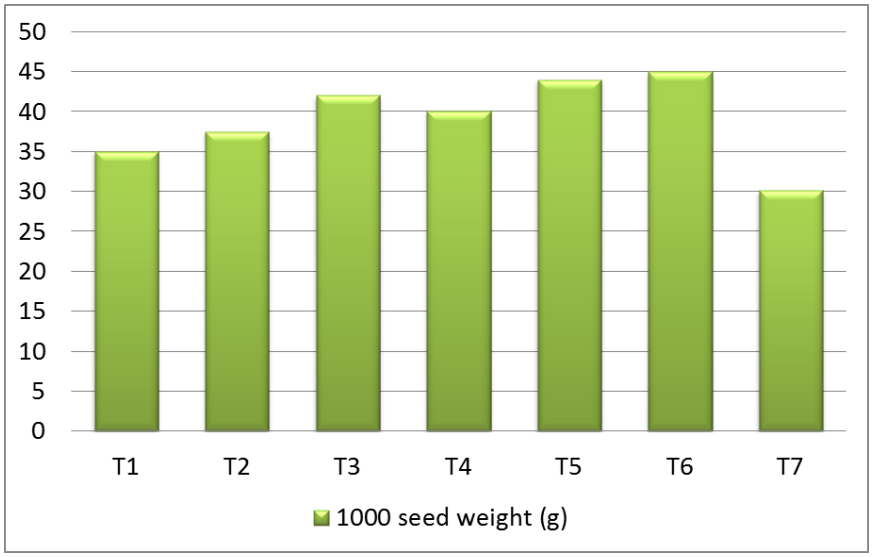

Fig 4: 1000 seed weight (g)

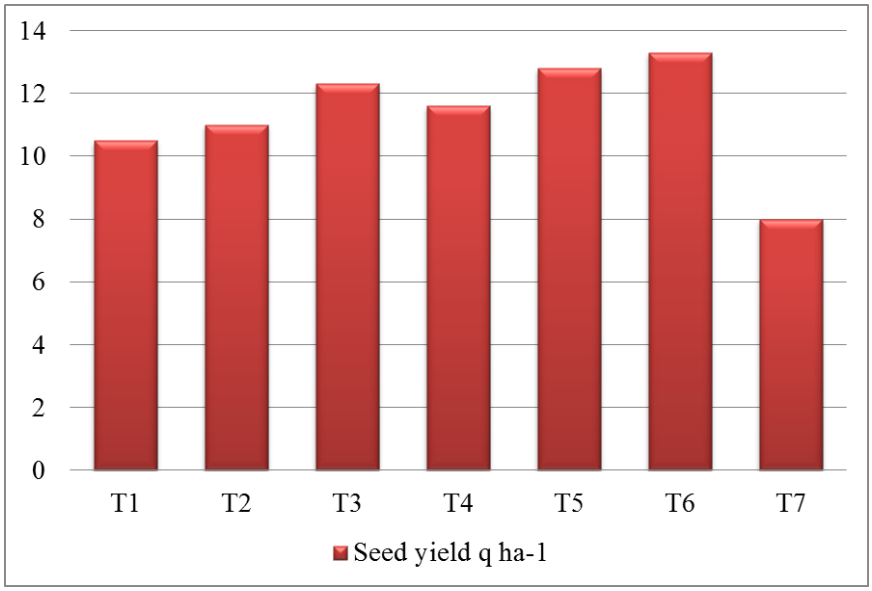

Fig 5: Seed yield q ha-1

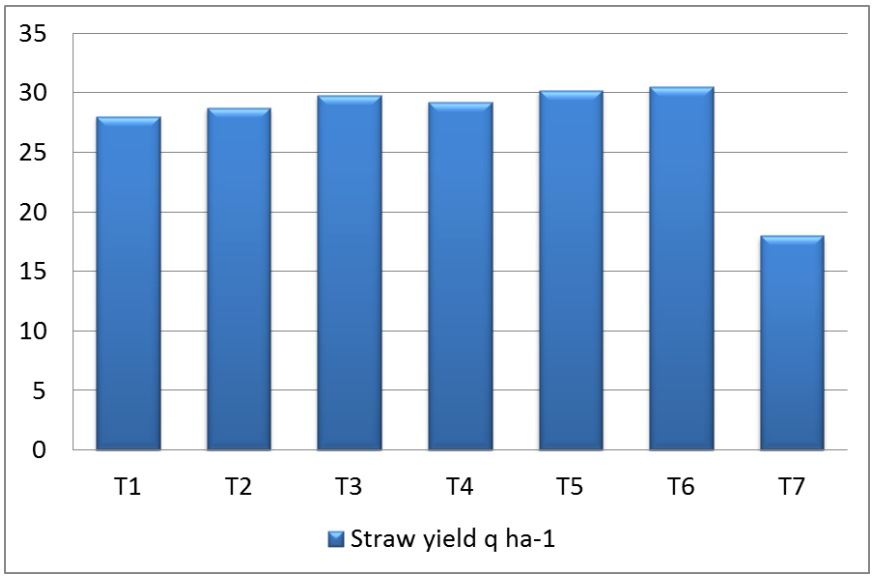

Fig 6: Stover yield q ha-1

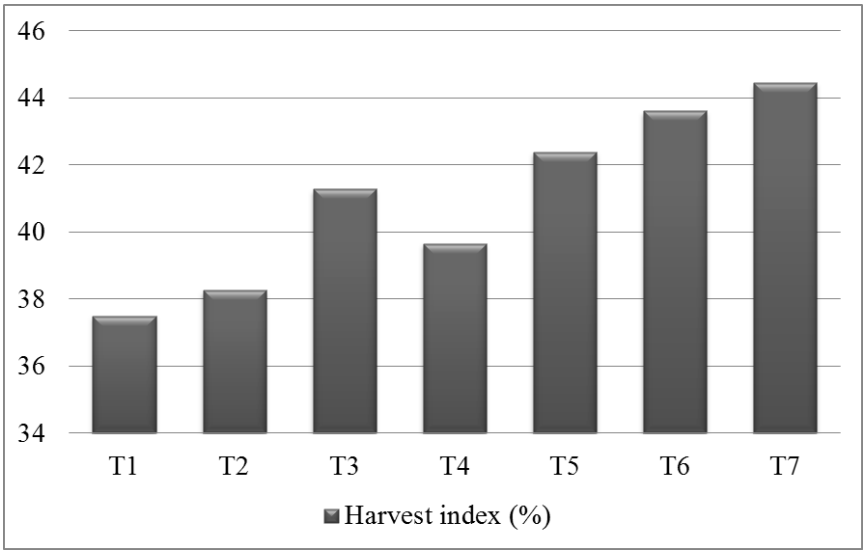

Fig 7: Harvest index (%)

4. Conclusion

The yield parameters *i.e.*, number of pods plant^{-1}, number of seeds pod^{-1}, pod length (cm), 1000 seed weight (g), seed yield q ha^{-1}, straw yield q ha^{-1} and harvest index (%) were significantly superior in the treatment T_6 (150% of RDF + FYM@5t ha^{-1}).

On the basis of above findings, treatment T_6 (150% of RDF + FYM@5t ha^{-1}) stand could be better performance first in position and T_5 (125% of RDF + FYM@5t ha^{-1}) stand in second order of preference. However, treatment T_3 (150% RDF) comes in next in order. Therefore, it may be concluded that treatment T_6 (150% of RDF + FYM@5t ha^{-1}) may be prefer for higher yield in blackgram.

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