



## **A Study on the Performance of Different Black Gram (*Vigna mungo* L. Hepper) Varieties under the Agro-Climatic Conditions of Andhra Pradesh**

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### **Abstract**

The research entitled “A study on the performance of different black gram (*Vigna mungo* L. Hepper) varieties under the agro-climatic conditions of Andhra Pradesh” was carried out during Rabi season of 2020-2021 in the farmer's field in the village of Chirumamilla, Nadendla (mandal), Guntur (district), Andhra Pradesh. The experiment was laid out in a Randomized Block Design (RBD) with eight treatments replicated thrice which sum up to a total of 24 plots. In this experiment, eight black gram varieties were used namely LBG-904, LBG-752, TBG-129, VBN-8, T-9, PU-31, IPU-2-43 and JU-3. The results revealed that there remained significant difference among the black gram varieties for all the growth attributes and yield attributes studied respectively. Among the eight black gram varieties, growth attributes were significantly higher in the variety T-9 followed by the variety LBG-904 and LBG-752. Yield attributes were significantly higher in the variety LBG-904 followed by TBG-129, PU-31, VBN-8 and T-9. In this experiment, eight black gram varieties were used namely LBG-904, LBG-752, TBG-129, VBN-8, T-9, PU-31, IPU-2-43 and JU-3. Similarly, LBG-904 also recorded the highest net return (43,525 Rs/ha) and B:C ratio (2.09) among all eight different black gram varieties under the agro climatic conditions of Andhra Pradesh.

**Keywords:** Black gram, Growth attributes, Rabi, Varieties and Yield attributes

### **Introduction**

Pulses have the ability to fix atmospheric nitrogen, which improves the soil fertility and soil health, growing pulses also promotes sustainable agriculture and decrease greenhouse gas emissions. Among pulses, black gram is one of the most important crops. It is a good source of dietary proteins and fibres, and significant contributors to a healthy diet in many parts of the world. Pulses has high rank in Indian Agriculture as they remain rich source of protein (17 to 25 %) as related to that of cereals (6 to 10 %), essentially compared with other most protein rich food crops, and the fat content of pulses is much lower, it also contains abundant in fibre, potassium, magnesium, zinc, iron etc. Pulses are in our daily diet will do good to maintaining good health, most of the health organisations around the world promotes

pulses consumption as part of healthy diets to reduce the risk of obesity, diabetes, heart diseases and cancer. blackgram is one of the most important pulse crops

Black gram (*Vigna mungo* L. Hepper) goes to family Fabaceae, sub family papilionaceae also popularly known as urd bean, mash etc. It is mainly grown for its dry beans and it is also one of the most significant short duration pulse crops grown in a wide range of agro-climatic conditions across in all the three seasons. Black gram grown-up in cropping systems as a mixed crop, 2 catch crop, sequential crop, and as per a solitary crop under residual soil moisture conditions after the harvest of rice and also before also after the harvest of other summer crops under semi irrigated and dryland conditions. Crop

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DOI: <http://dx.doi.org/10.21746/aps.2022.11.2.15>

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residues (haulms, leaves and pods) are used as fodder for cattle. It also acting a vital role in supporting soil fertility by enlightening soil physical characteristics and fixative atmospheric nitrogen (Reddy. *et al.*, 2017). In Andhra Pradesh, it is grown an area of 0.315 M ha with production of 0.298 Mt. The average output of black gram in Andhra Pradesh (946 kg/ha) it is higher than the productivity in India (604 kg/ha), (Anonymous. 2015). In Andhra Pradesh, it is cultivated in an area of around 3.81 lakh hectares with a production of 3.13 lakh tonnes with a yield of 902 kg/ha. (Anonymous. 2018). We know that India grows about 24million hectare pulse crops and produce nearly 15.9 MT of pulses grain which is still insufficient to meet current feeding demand. In India, the per capita daily availability of pulses has decreased considerably, from 51.1 grams per day in 1971 to about 42.00 grams in 2018- 2019, compared to the WHO recommendation of 80 grams per day per capita (Anonymous. 2018-19). In addition, the perusal of statistics of black gram 3 revealed that India is the world's largest producer of black gram. However, Government of India imported almost 0.57 million tonnes of black gram in 2017- 18 to feed the people of the nation (Anonymous. 2017). The review of these statistics clearly shows that the production, productivity, consumption levels are decreasing, which is indirectly affecting the nutrient status of people's, particularly protein, being a key component of the Indian diet, resulting in the malnutrition .selecting suitable varieties and timely sowing is critical in all crops and in all seasons as time of sowing that will influence the yield and growth of the crops to the most and the date of sowing determine time of flowering and dry matter accumulation, seed set and seed yield. However, in recent years, farmers have replaced many of conventional crops in late *Kharif* and *Rabi* with black gram since the returns are more as compared to traditional cereal crops and also the duration of black gram is shorter in nature. Since in recent years the crop has become susceptible to yellow mosaic virus, considerable number of tolerant varieties and suitable drought tolerant

varieties are released by state agricultural universities and pulses research institute Therefore, keeping in mind the importance of Black gram for improving the productivity of black gram and knowing the feasibility of cultivation in the agro climatic conditions of Andhra Pradesh the present experiment.

### Materials and Methods

The climate of the Chirumamilla village lies in the semi-arid region with moderate rainfall. The farm is situated at an elevation of 59 metres above mean sea level with the geographical location at 16° 10' 30" North latitude and 80° 11' 19" East longitude. The mean temperature ranges from 24°C to 38°C during summer and rarely it goes below 18°C in winter season. The pH of the soil is alkaline. The experiment has been done with the following treatments as follows LBG-904, LBG-752, TBG-129, VBN-8, T-9, PU-31, IPU-2-43 and JU-3. These varieties were collected from research institutions. The cultivation practices are same to all the treatments Observation to be recorded on 8 blackgram varieties *Viz.*, growth and yield attributes. The growth attributes are Plant height (cm), Plant population, Number of branches per plant at harvest and No. of leaves per plant, Leaf area index, Crop growth rate, Relative growth rate and Phenological parameters are days to 50 % flowering and days to maturity. Yield attributes are Number of pods per plant, Pod length (cm), Number of seeds per pod, Test weight (1000 seeds weight), Seed yield (kg/ha), Stover yield (kg/ha) and Harvest Index (%). Economic analysis for Cost of cultivation (Rs/ha), Gross return (Rs/ha), Net return (Rs/ha), Benefit:Cost ratio and statistical analysis. Determination of nutrient status of the soil before sowing the crop and after harvesting the crop observed and recorded from all the 24 plots.

### Results and Discussion

The results of various parameters are discussed in this chapter. The periodical observations on the plant growth, phenological parameters, yield attributes. The data noted for progressive of black gram plant height (cm) at harvesting stage. Presented in

the Table 1 and also depicted in Fig 1. The cultivar T-9 reached knowingly tallest plants over all the remaining cultivars at crop harvest (62.33 cm). Second tallest variety recorded that LBG-752 at crop Harvest (56.95 cm). The lowest plant height recorded for PU-31 at harvest stage (41.65cm). However, there were significant variations in their height at different stages of observations were recorded. The differences in plant population/m<sup>2</sup> were found in different varieties. Maximum plants were found in T-9 recorded 33.67 plants/m<sup>2</sup> at harvest followed by LBG-904 and TBG129 (33.33), Minimum plants were found in PU-31, VBN-8 recorded 30.33, 30.67 plants/m<sup>2</sup> at harvest. The highest leaves were recorded in black gram varieties LBG-904 and TBG-129 similar numbers of leaves per plant (6.70) and JU-3 variety recorded the lowest number of leaves (6.03). The branches at harvest are highest in recorded branches is T-9 (7.90), second highest branches are reported in VBN-8 (7.83) and lowest branches were recorded in the variety are JU-3 (6.53). Leaf area index differed significantly due to varietal effect at 60DAS the highest LAI was recorded in the variety LBG-904 (3.13) and the lowest LAI recorded in the variety JU-3(2.33). The crop growth rate is detected across all 8 varieties, the variety that highest recorded in T-9 variety (1.78 g m<sup>-2</sup> day<sup>-1</sup>), While the lowest crop growth rate at 30-60DAS was recorded in the variety PU-31 (1.29 g m<sup>-2</sup> day<sup>-1</sup>), indicating that this is the treatment that demonstrates significant and replication was non-significant. The remaining varieties recorded average values. The relative growth rate was recorded highest in the varieties LBG-904 and T-9 result (0.062 g g<sup>-1</sup> day<sup>-1</sup>) and lower values recorded in the varieties PU-31 & IPU-2-43 (0.057 g g<sup>-1</sup> day<sup>-1</sup>), The treatments were found to be significant, whereas the replications were found to be nonsignificant. The T-9 took longer duration (52.67 days) over all other varieties. For 50% flowering, closely followed by VBN8 and PU-31 (52 days) and the earliest days observed in the variety LBG-752 (47.67 days). Significantly the highest duration for maturity was observed in the variety T-9 (73.33 days) followed by LBG-904 (71.00 days)

while IPU-2-43 variety recorded the shortest duration to mature (69.33 day). Among 8 varieties LBG-904, LBG-752, TBG-129, VBN-8, T-9, PU-31, IPU-2-43 and JU-3. The treatments were found to be significant, whereas the replications were found to be non-significant are presented in the Table1. Yield attributes presented in the Table 2 and also depicted in Fig. 2 the no of pods plant<sup>-1</sup> differed significantly due to varietal affects Among the 8 black gram varieties LBG-904 recorded the highest number of pods per plant (47.60) followed by TBG-129(44.50) and lowest was recorded in the variety IPU-2-43 (32.33). Pod length differed significantly. No of seeds per plant is very important parameter in yield attributes and the black gram varieties under testing differ significantly in respect of number of seeds/pods the variety LBG-752 recorded the highest pod length (5.46 cm) closely followed by T9(5.40 cm) and LBG-904(5.39 cm). The lowest pod length was recorded in the variety PU-31(4.37cm). The highest number of seeds/pods was reported in the variety VBN-8 (6.97), closely followed by T-9, LBG-904, TBG-129 and PU-31 recorded the lowest number of seeds/pods (6.30). Test weight (1000 Seed weight) of grains differed significantly due to the effects of variety The highest test weight of grains was observed in the variety T9(41.20g) followed by JU-3(40.47g) and the lowest was recorded in the variety LBG-752(38.63g). Seed yield of different black gram varieties differed significantly. The seed yield was recorded higher in some varieties and some of the varieties showed lower seed yield among 8 black gram varieties. In LBG-904 the seed yield is recorded 1064.33 kg/ha followed by TBG-129 recorded 1047.67 kg/ha and the varieties PU-31, T-9 and VBN-8 recorded the seed yield is 1035.00 kg/ha, 1061.67 kg/ha and 1015.33 kg/ha respectively. The lower seed yield reported in some varieties they are IPU-2-43(980.67kg/ha), LBG752 (971.67 kg/ha) and JU-3 (944.00 kg/ha). The highest stover yield was recorded in LBG-904 (2836.67 kg/ha) and equally in TBG-129 stover yield is (2637.67 kg/ha), closely followed by LBG-752 (2346.67 kg/ha). Whereas lowest stover yield recorded in JU3 (2323.33kg/ha). The

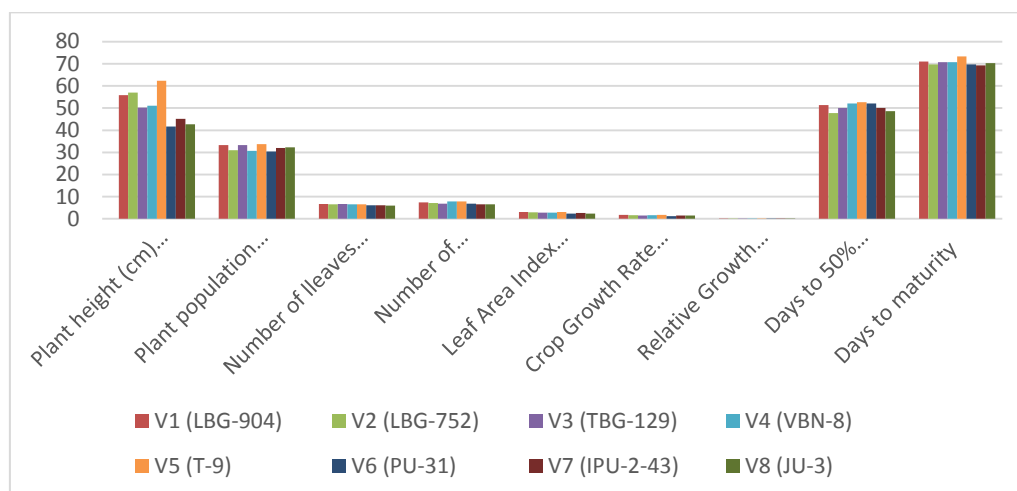
remaining varieties recorded intermediate range they are T-9 (2,615.33kg/ha), PU-31 (2,583.33 kg/ha), VBN-8 (2,419.33kg/ha) & IPU-243(2,359.33 kg/ha). Recorded highest harvest index in LBG-752 (29.00%) and equally in VBN-8 harvest index is (29.00%). Whereas lowest harvest index recorded in LBG-904(26.67%). The remaining varieties recorded intermediate range they are T-9 (27.67%), PU-31 (27.67%), TBG-129 (28.00%), IPU-243(28.67%) and JU-3(28.67%). are presented in the Table 2. The data collected regarding the economics on 8 black gram varieties is presented in the Table 3 and also depicted in Fig. 3 In this the common cost of cultivation for all the treatment was considered as Rs 20,672 /ha, in some varieties they are VBN-8, PU-31, IPU-243 and JU-3, whereas highest cost of cultivation was recorded in LBG-904, LBG-752, TBG129 and T-9 varieties Rs 20,872 /ha. The gross return among all 8 varieties of black gram is reported highest in the variety LBG-904 is Rs 64,397 /ha, and secondly recorded in the TBG-129 variety Rs 63,360 /ha. The lowest gross return was recorded in the variety JU-3 Rs 57,081/ha. The remaining varieties were

reported intermediate values PU-31 (Rs 62,590/ha), T-9 (Rs 61,496 /ha), VBN-8 (Rs 61,378 /ha), IPU-2-43 (Rs 59,288 /ha) and LBG-752 (Rs 58,745 /ha). Among all the 8 varieties net return is recorded highest in the LBG-904 (Rs 43,525/ha) followed by TBG-129 (Rs 42,488 /ha), and some varieties recorded lower net return they are JU-3 (Rs 36,409 /ha), LBG-752(Rs 37,873/ha). Whereas the remaining varieties has recorded intermediate values they are PU-31 (Rs 41,918/ha), VBN-8(Rs 40,706/ha), T-9(Rs 40,624 /ha) and IPU-243 (Rs 38,616 /ha). Finally, we recorded the B:C ratio in all 8 varieties, some varieties were recorded high and some are low results. The variety LBG-904 the highest B:C ratio has recorded (2.09), JU-3 recorded the lowest (1.76) B:C ratio among all varieties tested. The remaining varieties recorded the B:C ratio as TBG129 (2.03), PU-31 (2.02), VBN-8 (1.96), T-9 (1.94), IPU-2-43 (1.86), and LBG-752 (1.81). Similar work was also done by some researchers (Yadahalli. *et al.*, 2006; Jat. *et al.*, 2011; Kumawat. *et al.*, 2013; Phajage. *et al.*, 2015; Jangir. *et al.*, 2016; and Navjot. *et al.*, 2017).

**Table 1:** Growth attributes and phenological parameters of different blackgram varieties

Treatments	Plant height (cm) at harvest	Plant population m <sup>-2</sup> at harvest	Number of leaves plant <sup>-1</sup> at harvest	Number of branches plant <sup>-1</sup> at harvest	Leaf Area Index (LAI) 60 DAS	Crop Growth Rate (g m <sup>-2</sup> day <sup>-1</sup> ) 30-60DAS	Relative Growth Rate (g g <sup>-1</sup> day <sup>-1</sup> ) 30-60DAS	Days to 50% flowering	Days to maturity
V <sub>1</sub> (LBG-904)	55.81	33.33	6.70	7.37	3.13	1.74	0.062	51.33	71.00
V <sub>2</sub> (LBG-752)	56.95	31.00	6.50	7.20	3.00	1.68	0.061	47.67	69.67
V <sub>3</sub> (TBG129)	50.17	33.33	6.70	6.83	2.80	1.47	0.059	50.00	70.67
V <sub>4</sub> (VBN-8)	51.10	30.67	6.63	7.83	2.80	1.65	0.060	52.00	70.67
V <sub>5</sub> (T-9)	62.33	33.67	6.53	7.90	3.10	1.78	0.062	52.67	73.33
V <sub>6</sub> (PU-31)	41.65	30.33	6.17	6.87	2.37	1.29	0.057	52.00	69.67
V <sub>7</sub> (IPU-2-43)	45.19	32.00	6.10	6.60	2.67	1.49	0.057	50.00	69.33
V <sub>8</sub> (JU-3)	42.67	32.33	6.03	6.53	2.33	1.52	0.059	48.67	70.33

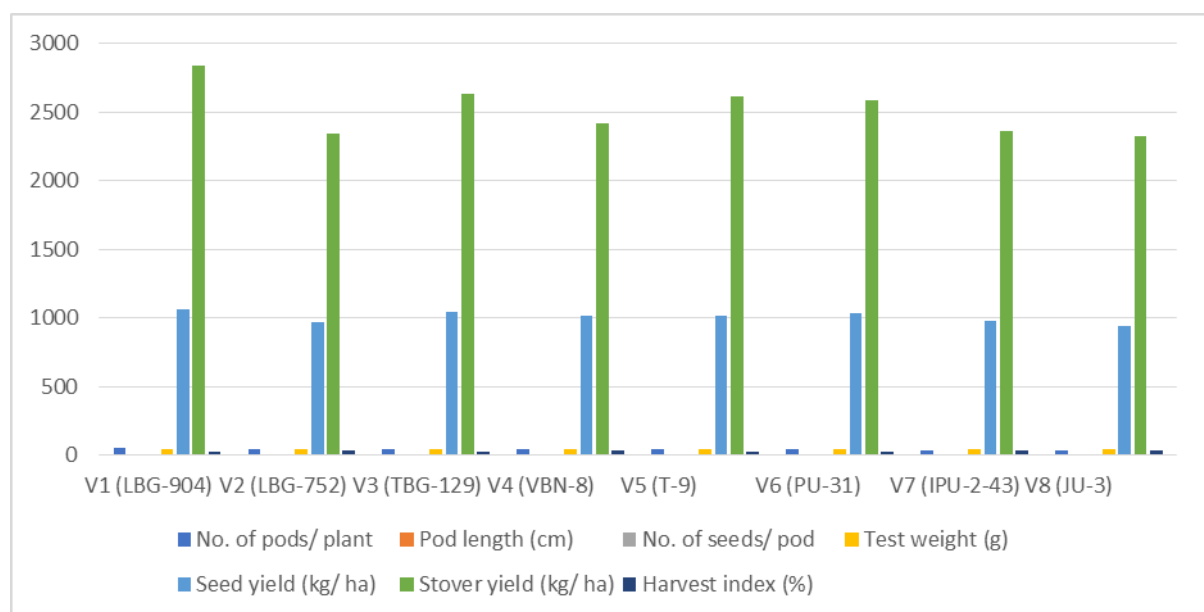
SE m $\pm$	0.925	0.544	0.167	0.090	0.173	0.083	0.001	0.647	0.445
C.D (P=0.05)	2.805	1.649	0.505	0.272	0.526	0.252	0.002	1.963	1.351



**Fig 1:** Growth attributes and phenological parameters of different blackgram varieties

**Table 2:** Yield attributes of different blackgram varieties

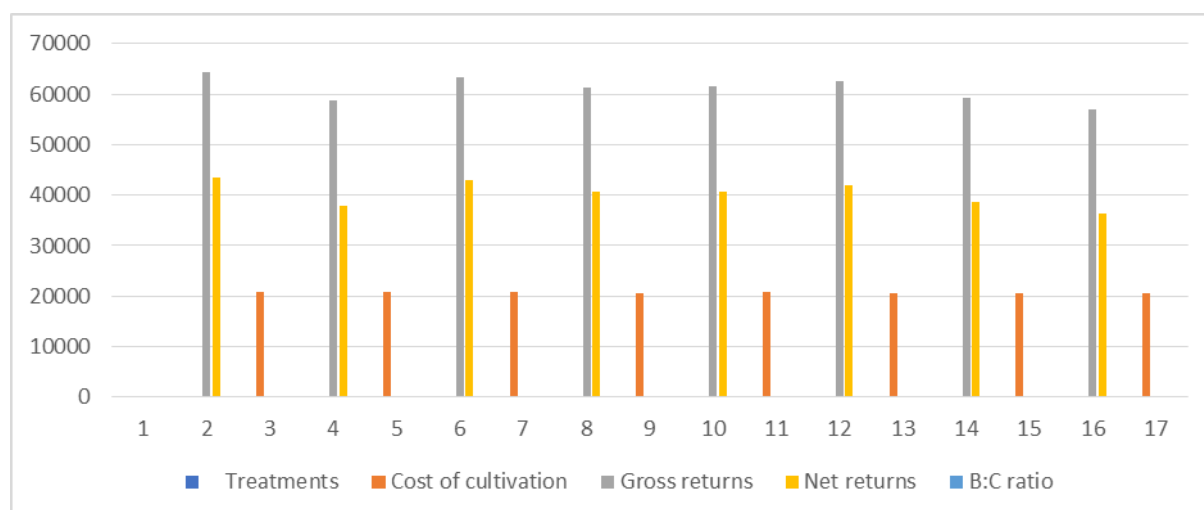
Treatments	No. of pods/plant	Pod length (cm)	No. of seeds/pod	Test weight (g)	Seed yield (kg/ ha)	Stover yield (kg/ ha)	Harvest index (%)
V <sub>1</sub> (LBG-904)	47.60	5.39	6.80	38.87	1064.33	2836.67	26.67
V <sub>2</sub> (LBG-752)	39.13	5.46	6.50	38.63	971.67	2346.67	29.00
V <sub>3</sub> (TBG-129)	44.50	4.87	6.73	38.93	1047.67	2637.67	28.00
V <sub>4</sub> (VBN-8)	42.57	4.94	6.97	39.90	1015.33	2419.33	29.00
V <sub>5</sub> (T-9)	43.37	5.40	6.87	41.20	1016.67	2615.33	27.67
V <sub>6</sub> (PU-31)	39.20	4.37	6.30	39.90	1035.00	2583.33	27.67
V <sub>7</sub> (IPU-2-43)	32.33	4.63	6.50	38.73	980.67	2359.33	28.67
V <sub>8</sub> (JU-3)	32.67	4.85	6.67	40.47	944.00	2323.33	28.67
SE m $\pm$	1.013	0.040	0.102	0.195	16.721	67.051	0.436
C.D (P=0.05)	3.025	0.121	0.311	0.590	51.717	203.377	1.324



**Fig 2:** Yield attributes of different blackgram varieties

**Table 3:** Economic analysis of different treatments

Treatments	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
V <sub>1</sub> (LBG-904)	20872	64397	43525	2.09
V <sub>2</sub> (LBG-752)	20872	58745	37873	1.81
V <sub>3</sub> (TBG-129)	20872	63360	42,885	2.03
V <sub>4</sub> (VBN-8)	20672	61378	40706	1.96
V <sub>5</sub> (T-9)	20872	61496	40624	1.94
V <sub>6</sub> (PU-31)	20672	62590	41918	2.02
V <sub>7</sub> (IPU-2-43)	20672	59288	38616	1.86
V <sub>8</sub> (JU-3)	20672	57081	36409	1.76



**Fig 3:** Economic analysis of different treatments

## Conclusion

Among all the varieties maximum growth attributes were found in the variety T-9 followed by LBG-904 and LBG-752. Whereas highest yield attributes were recorded in the

variety LBG-904 followed by TBG-129 and PU-31. As per the performance of economic yield of the varieties LBG-904, TBG-129, PU-31, VBN-8 and T-9 was found to be suitable for Andhra Pradesh farmers. Based on the

economic yield variety LBG-904 was found to be the best under the soil and climatic conditions of Andhra Pradesh. However, at the present experiment was conducted for only one season, further research is needed to desire a valid conclusion for recommendation.

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**Source of support:** Nil; **Conflict of interest:** Nil.

## Cite this article as:

Reddy, G.R., T. Gohain and Khrawbor, D. "A Study on the Performance of Different Black Gram (*Vigna Mungo* L. Hepper) Varieties under the Agro-Climatic Conditions of Andhra Pradesh." *Annals of Plant Sciences*.11.02 (2022): pp. 4827-4833.

DOI: <http://dx.doi.org/10.21746/aps.2022.11.2.15>