



# Evaluation of Yield, Yield Attributing Characters and Economics of Different Pigeonpea (*Cajanus cajan*) Varieties Under Rainfed Condition

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## ABSTRACT

A field experiment was conducted during *kharif* seasons of 2016-17 and 2017-18 at Krishi Vigyan Kendra East Singhbhum to investigate the performance of different pigeon pea (*cajanus cajan*) varieties viz., ICPL 8863 ( Maruti), IPA 203, Birsa Arhar1 and LRG 41 with respect to yield, yield attributing characters and economics under rainfed condition. The result revealed that the grain yield ( 12.40 q/ha ) and straw yield ( 49.75 q/ha) and yield attributing characters viz., plant height (241.37cm), number of branches/plant(7.95), pods/plant(191.25), grain/pod(3.80), 100 seed weight (9.53g), biological yield ( 62.15 q/ha), harvest index (19.98%) and economics viz net return ( Rs 58375 /ha) and B:C ratio ( 3.77) were found maximum in case of pigeonpea cultivar LRG41 as compared to grain yield of cultivar IPA 203 (11.40q/ha), ICPL 8863 ( 10.56 q/ha) and Birsa Arhar1 (10.03 q/hq). It was observed that the long duration variety LRG41 suitable for the fallow and uncultivable land to increase the total cultivable land area and soil productivity as well under rainfed condition of farming.

**Key Words:** Cultivars, Economics, Rainfed, Redgram, Rhizobium culture, Yield, Yield attributing characters.

## INTRODUCTION

Pigeon pea (*Cajanus cajan*) is the second most important pulse crop in India after chickpea. It has multiple uses and occupies an important place in the prevailing farming system in the country. It plays an important role in sustainable agriculture by enriching the soil nutrients through biological nitrogen fixation. In addition, because of its deep root system it is a boon for the farmers to grow under rainfed condition. Jharkhand is one of the major pigeonpea growing states in the country with an average productivity of 812 kg/ha. In Jharkhand, east singhbhum district is one of the major pigeonpea producing districts with an average productivity of 796 kg /ha which is lower

than the state average productivity. Thilagam and Gopikrishnan (2020) clearly revealed that IPM module will bring significant increase in the yield of pigeonpea with IPM interventions viz., growing podborer tolerant variety, two rows of maize as a border crop, installation of pheromone traps and bird perches with the application of botanical based insecticide azadirachtin 1% at vegetative stage as a oviposition deterrence, application of chlorantraniliprole and flubendiamide at critical stages of pod borer appearance during bud initiation and flowering stages.

Though pigeonpea is grown in east singhbhum district, various factor influences potential yield of the crop such as faulty sowing practices, lack

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**Table 1. Pigeonpea Varieties Suitable for Cultivation in Different States Of India.**

State	Recommended Varieties For Cultivation
Andhra Pradesh	ICPL 87119, ICPL 87, LRG 30, ICPL 8863
Assam	Bahar, Pusa 9
Bihar	Bahar, Pusa 9, DA 11, Birsa Arhar 1, Laxmi
Gujarat	BDN 2, GT 100, ICPL 8863, ICPL 87, ICPL 87119, ICPH 8
Haryana	Manak, Paras, Upas 120, ICPL 88039, Pusa 855
Karnataka	ICPL 87119, ICPL 8863, ICPL 8, ICPL 84301
Punjab	Manak, Paras, ICPL 151, PPH 4, (Hybrid), UPAS 120, AL 201, AL 15
Rajasthan	Manak, UPAS 120, Pusa 33, Pusa 855
Tamilnadu	ICPL 87119, ICPL 8863, ICPL 87, CO 6, Durga, COH 2, Vamban 1
Uttar Pradesh	UPAS 120, Type 21, ICPL 151, ICPL 88039, Narendra Arhar 1, Azad, Type 7, Pusa 855
Madhya Pradesh	JA 4, UPAS 120, ICPL 87119, BDN 2, KM 7, NPWR 15, BSMR730
Maharashtra	ICPL 87119, BSMR 736, BSNR175, ICPL 87, ICPL8863, AKPH4101
Orrisa	ICPL 87119, ICPL 87, UPAS 120,
West Bengal	Bahar, Pusa 9, Sweta, B 517, S20,
North East	Bahar, Pusa 9,
Jharkhand	Birsa Arhar 1, Bahar, UPAS 120, IPA 203

of knowledge about high yielding and diseases resistant varieties ( Fusarium wilt and sterility mosaic diseases are severe in the district), lack of awareness about seed treatment with biofertilizer *viz.*, Rhizobium culture and phosphorus solubilizing bacteria, improper management of pod borer and lack of knowledge about timely intercultural operation. Above all these in the district, predominantly noticed problems for pigeonpea cultivation are high incidence of wilt and uneven distribution of rainfall with low fertility and water holding capacity of the soil. With this background on farm trials on different pigeonpea varieties were conducted to show the worth of high yielding variety of pigeonpea.

### MATERIALS AND METHODS

A field experiment was conducted during *kharif* seasons of 2016-17 and 2017-18 at Krishi Vigyan Kendra. The soils was sandy loam with pH 5.3 to 6.5, organic carbon 2.2 to 5.3 g, available N 122.3 to 147.6 kg/ ha, available P 3.4 to 6.2 kg/ ha and available K 58.1 to 312.4 kg/ ha . The Treatment consisted of T<sub>1</sub>, ICPL 8863; T<sub>2</sub>, Birsa Arhar 1; T<sub>3</sub>, LRG 41

and T<sub>4</sub>, IPA 203. In all four treatments were tested in randomized block design with eight replications. The plot size was 500 mt<sup>2</sup> for each treatment with a seed rate of 20kg/ha and plant geometry of 75 x 20cm. The recommended dose of fertilizer *viz.*, N P K S: @ 25:50:25:25 kg/ha were applied in all the treatment and replication. The sources of NPK and S were Urea, single superphosphate and muriate of potash. All recommended agronomic and cultural practices for raising the crop was adopted. Observation on plant height and branches/plant were taken at 155 days after sowing and at harvest 100 plants were observed for the data analysis. The data on pods/plant, growth and yield parameters observation were taken at the time of harvest from randomly selected 10 plants in each treatment and replication and average was worked out. Grain yield, straw yield, yield attributing character and economics were recorded. Harvest index per cent was calculated based on the formula

$$\text{Harvest Index (\%)} = \frac{\text{Grain Yield}}{\text{Biological yield}} \times 100$$

## Economics of Different Pigeonpea ( *Cajanus cajan*) Varieties

**Table 2. Yield contributing factors of different Pigeon pea cultivars.**

Treatment	Plant height (cm) at 155 days	Branches/ plant	Pods/ Plant	Grain/ pod)	100 grain weight (g)
ICPL 8863	196.75	7.52	184.75	3.77	9.46
BIRSA ARHAR 1	194.87	7.41	182.0	3.76	9.47
LRG 41	214.37	7.95	191.25	3.80	9.53
IPA 203	212.0	7.85	188.75	3.76	9.38
CD (P=0.05)	8.105		NS		
SEM ±	2.73		6.05		
C V (%)	3.78		9.16		

## RESULTS AND DISCUSSION

### Growth And Yield Attributing Characters

High yielding long duration cultivar LRG 41 exerted significant effect on plant height and yield indices of pigeon pea viz., plant height (214.37 cm) branches /plant (7.95), pods/plant (191.25), grains /pod (3.80) and 100 grain weight (9.53 gm) followed by cultivar IPA203 plant height (212cm), branches/ plant (7.85), pods/plant (188.75), grains/pod (3.76) and 100 grain weight (9.38g). The performance of cultivar ICPL 8863 and Birsa Arhar1 was lowest as compared to LRG 41.

### Grain yield, stalk yield and harvest index (%)

Cultivar LRG 41 produced significantly higher grain yield (12.40q/ha), stalk yield (49.75 q/ha) and harvest index (19.98%) over cultivar IPA203, ICPL8863 and Birsa Arhar1. It might be owing to climate, soil moisture and maturity duration

resulting in favorable increase in plant height, yield attributing character and finally grains and stalk yields. It was reported that higher grain yield of pigeonpea at 18:46:20:20 kg NPK and S/ha in long duration variety. The result showed that the higher grain yield by 17.42, 8.77 and 23.62 per cent received in case of cultivar LRG41 as compared to cultivar ICPL 8863, IPA 203, and Birsa Arhar1, respectively. It was also observed that straw yield found maximum in case of cultivar LRG 41 as compared to IPA203, ICPL8863 and Birsa Arhar 1.

### Economics

Results revealed that cultivation of cultivar LRG41 fetched higher net return (Rs 58375/ha) and benefit cost ratio (3.77) over cultivar IPA 203, ICPL 8863 and Birsa Arhar1. It was also reported that the maximum net returns and benefit cost ratio under combined inoculation of rhizobium + PSB together with P<sub>2</sub> O<sub>5</sub>@ 60Kg/ha.

**Table 3. Grain Yield , Stalk Yield , Harvest Index and Economics of different Pigeon pea Cultivars.**

Treatment	Grain Yield (q/ha)	Stalk Yield (q/ha)	Harvest Index(%)	Gross Return (Rs/ha)	Net Return (Rs/ha)	Benefit: Cost ratio
ICPL 8863	10.56	43.37	19.59	67712.50	46712.50	3.22
BIRSA ARHAR 1	10.03	42.50	19.59	64475	43475	3.07
LRG 41	12.40	49.75	19.98	79375	58375	3.77
IPA 203	11.40	46.87	19.54	73087.50	52087.50	3.77
CD ( P = 0.05)	0.991	4.481			NS	NS
SEM ±	0.335	1.513			2091.59	0.099
CV (%)	8.530	9.382			10.72	7.74

## CONCLUSION

The results showed that the cultivar LRG 41 gave maximum grain yield (12.40 q/ha) with highest net return (Rs 58375 /ha) compared to cultivar viz IPA203, ICPL 8863 and Birsa Arhar1 under the rainfed condition. Therefore, it was clear that suitable variety can be better option for the profit maximization and area expansion of pigeon pea for the fallow upland as well as to make the uncultivable land suitable for the cultivation by increasing the organic matter through the biomass and nitrogen fixing ability of pigeon pea

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## REFERENCES

- Mokidue I, Mohanty A K and Sanjay K (2011). Correlating growth yield and adoption of Urd bean technology. *Indian J Ext Edu* **11**(2): 2024
- Raj A D, Yadav V and Rathod J H (2013). Impact of front line demonstration on the yield of pulses. *Int J Sci Res Public* **3**(9), 2250-2254
- Raju G T, Patil D H, Naik A, Zaheer Ahmed B and Patil M C (2015). Impact of frontline demonstration on the yield and economics of pigeon pea in kalburghi district in Karnataka State. *Int J Sci Nature* **6**: 224-227.
- Thilagam P and Gopikrishnan A (2020). Integrated Pest Management Module against Pod borer Complex in Pigeon pea (*Cajanus cajan* L.). *J Krishi Vigyan* **9** (1): 180-183
- Vidyalkshmi N, Virmani S M and Harmsen K (1992). Agroclimatology of short duration pigeonpeas in the Indian semi – arid tropics; a system approach. Presented at the International symposium on pulse research and development 26 Apr 1992, New Delhi, India.
- Chauhan Y S (1990). *Pigeonpea optimum agronomic management*. Pages 257-278. In the Pigeon pea (Nene, Y.L, Hall, S.D and Sheila, V.K etal). Wallingford, U.K; CAB International.
- Gupta S C, Johansen C, and Laxman Singh (1989). Uniformity of nomenclature in short duration pigeonpea. *Int Pigeon pea News letter* **10**:36.
- Singh R S and Yadav M K (2008). Effect of Phosphorus and biofertilizers on growth, yield and nutrient uptake of long duration pigeonpea under rainfed condition. *J Food Legumes* **21** (1) : 46-48.
- Singh A K and Singh R S (2012). Effect of Phosphorus levels and bio - inoculants on growth and yield of long duration pigeonpea (*Cajanus cajan* L. Millsp). *J Food Legumes* **25** (1) : 73-75
- Goud V V and Kale H B (2010). Productivity and profitability of pigeonpea under different sources of nutrients in rainfed condition of central India. *J Food Legumes* **23** (3 and 4) : 212-17.
- Venkateswarlu S, Reddy A R, Singh R M and Singh R B (1980) Reaction of Pigeon pea varieties to wilt and mosaic virus (SMV). *Trop Grain Legume Bull* 17/18 : 25-28.

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