

# Location suitability of Pigeon pea cultivars in Uttarakhand- an analysis.

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## ABSTRACT

Location testing of 11 Pigeon pea [*Cajanus cajan*(L.) Millspaugh] entries was conducted with desirable grain and fodder quality traits. These lines were supplied by ICRISAT, and most of the lines had known desirable traits for quality fodder. The location testing trial conducted at Kalsi farm, Vikasnagar and farmer fields trial at Nainbagh and Thaeli (district Tehri) and Tharali (district Chamoli) of Uttarakhand in India. The design was included randomized controlled block design. Plant to plant distance (40 cm) and row to row(75cm) were maintained. Results indicated ICPL 88034 as promising variety at plain region of 650m above mean seal level , while only cultivar HPL24 withstood frost rest eleven cultivars failed at 1250m above mean seal level. With the presumption that ICPL 88034 could yield better grain and fodder the variety tested in farmer fields at higher location failed. Lesson drawn for extension professionals was only promising varieties are to be taken at farmers fields.

**Keywords:** dual purpose, location trial, Pigeon pea, Uttarakhand.

## INTRODUCTION

Pigeon pea [*Cajanus cajan*(L.) Millspaugh] , Red gram or Tur is a short-lived perennial shrub that is traditionally cultivated as an annual crop in developing countries. It is an important legume crop mostly produced in Asia, Africa, Latin America, and the Caribbean region. Pigeon pea is a hardy, widely adapted and drought tolerant crop with a large temporal variation (90–300 days) for maturity. These traits allow its cultivation in a range of environments and cropping systems (Saxena, 2008). It is consumed as a major source of protein (21%) to the human population in many developing countries. In India, it is the second important food legume contributing to 80% of the global production (Krishna et.al,2010).Recognized as the second most important pulse crop in India. Realizing the significance of genetic resources, large number of germplasm lines have been collected, conserved, characterized and evaluated for various morpho-agronomical traits using the minimal descriptors by the National Bureau of Plant Genetic Resources New Delhi, India (Singh et al 2014). The pigeon pea production in India varied dramatically over the last five decades, in terms of its spread, productivity and its importance as an intercrop (Kumar et al, 2018). Apart from grains, Pigeon pea plants have been used as fodder by farmers for

centuries. According to Blümmel and Saxena(2005) “considerable differences exist among pigeon pea cultivars in fodder traits such as leaf protein content and in vitro digestibility”.

Pigeon pea is a crop which is grown in the plains and hills of Uttarakhand. Uttarakhand is the north Indian state consisting 13 districts, in which four are in the plains, whereas the other nine comprise the hill region. Crop-Livestock husbandry plays an important for rural population. In order explore for a better cultivar which could provide grain as well as considerable fodder quantity 11 entries of pigeon pea were tested for location.

## MATERIALS AND METHODS

The trial with 11 lines ( HPL 24, ICPL 84023, ICPL 8501, ICPL 85063, ICPL 86005, ICPL 87119, ICPL 88034, ICPL 88039, ICPL 8863, ICPL 92016, ICPL 96058) was conducted at Kalsi farm with altitude of 650 meters above mean sea level) and three villages at altitude 1250 meters above mean sea level were conducted for location specificity. These lines were supplied by ICRISAT, and most of the lines had known desirable traits for quality fodder with concentration of condensed and hydrolysable tannins, and alkaloids. The trials were conducted by International Livestock research Institute in Uttarakhand. Date of sowing of trial comprising 23<sup>rd</sup> July 2009 at the Kalsi farm of Uttarakhand Livestock Development Board (about 60 km from Dehradun), situated in Bhabhar valley at an altitude of 650m above mean sea level. The design used was randomized complete block design having two replications 2, spacing row to row and plant to plant (75X40 cm). The seeds of 11 cultivars were sown on 30<sup>th</sup> July 2009 at Nainbagh (Magadiya village district Tehri – about 100 km from Dehradun – 1200 m above msl. Thaeli (district Tehri,) and Tharali (district Chamoli) of Uttarakhand which had same altitude as that of Nainbagh village with 30 farmers. Data was collected on non-destructive and destructive observations like - plant height, widest spread of canopy, no of primary branches, no of branches, stem width 10 cm above ground surface, no. of pods, no of seeds, total weight of plant, weight of leaves, weight of pods, stem and branches, weight of seed and weight of bhusa were also recorded later. Data analysis used ANOVA in Genstat software.

## RESULTS AND DISCUSSION

**Non -Destructive Observations:** In Kalsi farm out of the 11 lines sown, four (ICPL 92016, 96058, 85063, HPL 24) appeared promising based on visual observation : The general vigor and plant stand of the trial was good, except for ICPL 20092 and HPL 24. In both replications the plant stand was nil for ICPL 20092, while a few plant are seen for HPL 24.

Table 1: Mean non -destructive observations of pigeon pea accessions

Traits	Plant height (cm)	Widest Canopy spread (cm)	No. of primary branches	Stem width (10cm above ground surface)	No. of branches	No. of pods
Sl	145.11(mean)	160.72(mean)	18.67*(mean)	1.35(mean)	30.14(mean)	184.76*(mean)
HPL24	146.95	216.36	13.83	1.51	35.45	82.50*
ICPL84023	147.00	142.08	14.50	1.25	19.72	132.44
ICPL8501	132.50	100.00	12.25	1.17	29.47	333.66*
ICPL85063	132.33	178.53	25.48*	1.44	29.29	205.07
ICPL86005	163.50	183.28	15.30	1.47	19.10	257.06
ICPL87119	151.79	155.41	24.50*	1.45	72.08	207.00*
ICPL88034	147.35	156.25	16.48*	1.27	17.55	243.02

ICPL88039	118.43	127.72	17.35*	1.17	16.61	180.75*
ICPL8863	152.88	166.10	18.39*	1.26	23.60	105.32*
ICPL92016	130.45	168.70	19.09*	1.36	37.26	212.96*
ICPL96058	1173.04	173.50	28.26*	1.50	34.95	140.66*

\*Significant (p<0.05)

For multiple fodder harvest (and possibly grain), ICPL 92016 appeared promising. This line had vigorous canopy with profuse primary and secondary branches, and good foliage load. Other promising lines in the order of merit are: ICPL 85063, ICPL 86005, ICPL 96058, ICP 8863 and ICPL 88034. ICPL 88039 and 88034 are at flowering stage. The promising multi-cut line ICPL 20092 and high protein line HPL 24 need to be evaluated again due to nil/poor plant stand in the present trial. In Nainbagh, Tharali and Thaeli also though all the 11 lines (ICPL 88034, 92016, ICPL 8501, HPL 24, ICPL 86005,8863, 86005, 96058, 85063, 88039, 87119, and 84023) looked healthy, in general were not as vigorous as that of Kalsi trial. This may be due to late sowing (photo/thermo sensitivity) and/or soil type differences. Still, on the basis of visual observation four lines appeared promising viz., ICPL 92016, ICPL 96058, HPL 24, ICPL 85063 and ICPL 92016 were observed. They had comparable expression with vigorous canopy and good foliage. Observations in Nainbagh, Tharali and Thaeli were not complete because of frost in November and December, the observations from Kalsi farm were only subjected to analysis.

**Destructive Observations:** At 650 meters above mean sea level promising fodder varieties were ranked from highest to lowest as ICPL 8501 > ICPL 87119 > HPL 24 > ICPL8863 > ICPL 92016 > ICPL 86005 > ICPL 85063 > ICPL 84023 > ICPL 88039 > ICPL 88034 > ICPL 96058 > ICPL 20092. Promising seed yield ranking varieties ranking were : ICPL 85063 > ICPL 86005 > ICPL 8501 > ICPL 88034 > ICPL 84023 > ICPL 88039 > ICPL 92016 > ICPL 96058 > ICPL8863 > HPL 24 > ICPL 87119 > ICPL 20092

Table 2: Mean destructive observations of pigeon pea accessions

Traits	No. of seed(gm)	Total weight of plant (gm)	Weight of leaves (gm)	Weight of pods(gm)	Stem and branches weight(gm)	Weight of seed(gm)	Weight of bhusa(gm)
	636.52*	747.93*	166.19*	171.94*	414*	69.10*	56.68*
HPL24	258.50	1359.64*	281.00* <sup>b</sup>	69.00	1015.83*	16.04*	10.40*
ICPL84023	485.83	460.46*	89.06* <sup>d</sup>	198.17	173.43*	77.91*	54.94*
ICPL8501	1154.42	1709.64	506.00*	194.00	1015.83*	104.54*	72.90*
ICPL85063	790.60	1002.85*	270.78* <sup>b</sup>	59.56	666.30*	34.64*	40.17*
ICPL86005	924.28*	713.09	115.20* <sup>d</sup>	268.33	344.37*	112.08*	00
ICPL87119	463.09*	1045.19*	300.44* <sup>b</sup>	76.78	674.16	00	85.20*
ICPL88034	880.17	520.00*	67.50* <sup>d</sup>	233.03	244.46*	99.56*	79.94*
ICPL88039	665.81*	452.24*	88.19* <sup>d</sup>	194.61	169.09*	77.50*	48.337*
ICPL8863	318.90	723.75*	183.75* <sup>c</sup>	82.50	460.00*	35.35*	37.50*
ICPL92016	780.51	826.38	170.83* <sup>c</sup>	241.66	413.88*	63.54*	66.94*
ICPL96058	391.42*	309.64	56.00* <sup>d</sup>	144.00	115.83*	48.54*	47.90*

\*Significant (p<0.05) T test =means with same letter are not significantly different.

Assuming, farmers lay 60% weightage for seed yield and 40% for fodder: then preferred varieties may be: ICPL 85063 with 157 g seed yield and 89 g of leaf yield followed by ICPL 86005 with 112 g seed yield and 115 g of leaf yield, then ICPL 8501 with 106 g seed yield and 500 g of leaf yield and lastly ICPL 88034 with 100 g seed yield and 78 g of leaf

yield. ICPL 85063 variety was chosen for its 100% preference for grain yield in other plain locations such as Hyderabad. Based on the above analysis, ICPL 85063 came first as the most promising pigeon pea line in the Kalsi region (650m above msl) on account of fodder yield and seed yield. However, under Nainbagh, Thaeli and Tharali HPL24 was the only pigeon pea variety which could withstand cold and produce grain but the seed of this specific variety was unavailable. Seeds were not available of HPL 24 for higher altitude, so it was assumed that even at higher altitudes (1000-1500m above msl) ICPL 85063 could be a promising line. However, this can be tested further in future trials. To offset the impact of frost at above 1000m msl, the sowing time can be adjusted between mid -March to end March so that the crop can be harvested by November.

## CONCLUSION

To address the needs of better cultivars in pigeon pea for hills of Uttarakhand more efforts are required in terms of location specific on farm testing. Also at the farmers' level, there is a need for proper intervention in cropping through proven innovative crop varieties, information dissemination to farmers, and service support in reducing various costs of farmers so as to increase the profitability from pigeon pea cultivation.

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