Vol.9 No. 2, 64–67 (2020)

Received: September, 2020; Accepted: November, 2020

Evaluation of Seven Cowpea Varieties for Enhancing Productivity in North Eastern Region of India

Dinesh Sah
Department of Agronomy, College of Agriculture,
Banda University of Agriculture and Technology, Banda 210001, Uttar Pradesh, India
Email: dr.d.sah@gmail.com

Abstract

A field experiment was carried out in East Siang District of Arunachal Pradesh to evaluate the performance of seven cowpea varieties during growing season of 2016 and 2017. The data of two years experiment revealed that the phenological characters, yield attributing characters and seed yield of cowpea varieties varied significantly during both the year of experimentation. Among the seven cowpea varieties studied, PL-3 produced highest mean seed yield (8.27 q ha^{-1}) by accounting higher yield attributing characters viz more number of seeds pod^{-1} and higher seed index was closely associated with PL-5 and PL-2. Cowpea variety PL-5 took 59 days was early maturing type while RC-101 (91 days) was late maturing type. On the basis of yield, yield attributing characters and phenological characters, variety PL-3 of cowpea was found to be promising for cultivation in foot hill conditions of Arunachal Pradesh.

Key words: *cowpea, yield attributes, yield, phenology,*

Introduction

The North East Region (NER) of India covering about 8.3% geographical areas with approximately 4% populations of the country. Communities in NER are predominately agrarian and practice subsistence agriculture. Development of sustainable farming systems is the key to prosperity of this region and requires crop diversification by involving pulses. The region has more than 80% area under acid soils and hence, the importance of legumes is better understood than in other parts of the country. Pulses, long considered "the poor man's meat" because of their protein profile, occupy a unique place in Indian diet. Pulses are consumed equally by India's rich and poor as it is one of the less expensive sources of protein[2].

Pulses play a key role in improving of soil fertility through biological nitrogen fixation with the help of Rhizobium bacteria in their root nodules. Thus, they play an important role to enhance soil fertility which benefits component and subsequent crops. Cultivation of pulses are also an effective means of restoring degraded soils and can contribute significantly to achieving the twin objectives of increasing productivity as well as improving the sustainability of cereal-based cropping systems[4]. Even as the traditional cropping pattern almost always included a pulse crop either as a mixed crop or in rotation, the commercialization of agriculture has encouraged the practice of sole-cropping. Out of 23.55 million ha area under pulses in the country, the NER has only 257.4 thousand ha. This region contributes only 228.1 thousand tonnes (1.19%) to the country's total pulse production (2014-15) of 17.15 million tonnes (mt). With this production level, the per caput pulse availability in NER is hardly 12.5 g against 43.3 g at national level. Considering the recommended per head

dietary pulse intake of 50 g, the pulse production in this region needs to be increased by almost 10 times to make this region self-sufficient in pulses[1].

The fact that the productivity of the pulses in this region (886 kg/ha) is higher than that of country's (728 kg/ha) indicated that this region suits well to pulse production (Annual Report 2016). Though rabi/pre-kharif season is good for pulse cultivation, lack of irrigation facilities forces farmers to leave their land fallow. Fallow lands can be effectively utilized for cultivation of rabi pulses like lentil, field pea and kharif pulses like greegram, blackgram and cowpea with an improved technology package. These crops have definite higher productivity potentials in this region. Keeping this in view, there is a need for concerted and sustained efforts to promote the cultivation of pulses on large scale through adoption of suitable varieties through evaluation trials following matching agro-technologies.

Materials and Methods

A field experiment was conducted at agronomy block of College of Horticulture & Forestry, Pasighat, Arunachal Pradesh, India during kharif season of 2016 and 2017. The soils of the experimental field are sandy loam with soil pH of 5.1. Soil sample had 285.0 mg kg-1 available nitrogen (N), 8.9 mg kg-1 available phosphorus (P) and 289.5 mg kg-1 available potassium (K).

The experiment consisted of seven varieties of cowpea collected from IIPR Kanpur, Uttar Pradesh under promotion of pulses in north east hill region of India. Varieties of cowpea were tested in complete randomized block design (CRBD) and replicated thrice. A recommended dose of 20 kg N, 60 kg P_2O_5 and 40 kg K_2O/ha were applied in furrows before sowing of seeds of cowpea and covered the seed with soil to give a good seed-soil contact. The cowpea varieties were raised under rainfed condition.

Phenology (50 per cent flowering and 80 per cent maturity), yield attributes (pods/plant, seeds/pod and 100 seed weight) and seed yield of cowpea were measured at harvest. Yield of cowpea was estimated from weight of sun dried seeds obtained from each net plot after threshing winnowing at proper moisture level.

The experimental data pertaining to each parameter of study were subjected to statistical analysis by using the technique of analysis of variance and their significance was tested by "F" test. Standard error of means (SEm+) and critical difference (CD) at 5% probability ($p = 0.05$) were worked out for each parameter studied to evaluate differences between treatment means.

Results and Discussion

Crop Phenology

The seed of cowpea varieties were sown on last $2^{nd}/3^{rd}$ of July month during kharif 2016 and 2017. All the varieties took 38-52 days for 50% flowering (Table 1). Among the varieties, Pant Lobia -5 took minimum number of days (38-39 days), however, RC -101 took maximum number of days (44-52 days) for 50% flowering. Eighty percent pod maturation was observed between 54 to 92 DAS. Variety RC -101 was matured 90-92 days after sowing, while PL-5 required minimum number of days (54-64 DAS) for 80% pod maturity (Table 2).

Yield attributes

The significant differences were found in yield attributing parameters due

to varietal characteristics. Among the varieties, PL-1 exhibited the highest number of pods per plant (25.2-27.2) while highest number of seeds per pod, that is, 16.7-18.83 pod^{-1} was recorded in case of variety PL-4 (Table-1). It was further noted that among the varieties PL-2 produced the bolder seed (Table 2) and gave highest weight of 100 seeds (12.9 to 13.6g) while the variety PL-4 had the lowest weight of 100 seeds (7.4 to 8.8g). Variation in the above parameters is bound to occur due to difference in genetic makeup and inherited characters in different varieties. The results corroborate with the findings of many others[3].

Table 1 Phenology and yield attributes of cowpea varieties during *kharif* 2016 and 2017

Varieties	Days to 50% flowering		Number of pods plant^{-1}		Number of seeds pod^{-1}	
	2016	2017	2016	2017	2016	2017
RC 19	39.67	40.7	26.4	25.1	14.27	12.7
RC 101	52.00	44	7.73	16.6	11.2	10.9
PL 1	39.67	40.3	27.17	25.2	12.8	11.9
PL 2	38.33	41.7	18.67	21.5	11.67	10.3
PL 3	45.00	42.7	18.9	17.4	14.2	14
PL 4	41.67	40	25.5	23.8	16.83	16.7
PL 5	39.33	38.7	25.47	23.7	10	10.1
SEm	0.51	0.96	3.52	2.1	1.73	1.2
CD (P=0.05)	1.30	2.42	8.87	5.3	4.36	2.9

Seed yield

Yield ha^{-1} as influenced by variety is presented in Table 2. Variety PL-3 consistently produced the highest seed yield (8.94 and 7.6 qha^{-1}) followed by PL-5 and PL-2, while RC-101 (3.59 and 2.8 qha^{-1}) had the least. Crop yielded more seed during first year in comparison to second year. The reason could be attributed to higher rainfall experienced during the production season.

Table 2 Days to maturity, test weight and seed yield of cowpea varieties during *kharif* 2016 and 2017

Varieties	Days to 80% maturity		100 seed wt (g)		Seed yield q ha^{-1}	
	2016	2017	2016	2017	2016	2017
RC 19	58.7	76.3	13.04	10.3	7.45	5.4
RC 101	89.7	92.3	11.24	9.1	3.59	2.8
PL 1	54.3	68.3	10.6	10.0	7.05	4.7
PL 2	59.0	72.3	13.56	12.9	8.28	5.9
PL 3	70.3	75.3	14.2	15.0	8.94	7.6
PL 4	55.0	65.7	8.77	7.4	7.82	6.2
PL 5	54.3	64.3	10.2	8.7	8.35	6.7
SEm	0.74	0.36	0.82	0.5	0.55	0.43
CD (P=0.05)	1.87	0.9	2.06	1.2	1.39	1.08

Conclusion

Variety PL-3 had the best agronomic performance for seed yield while variety RC-101 had the least. Cowpea variety PL-5 took least days to mature and produced almost similar seed yield to PL-3, hence variety PL-3 and PL-5 may be preferred for cultivation under unpredicted weather conditions of Arunachal Pradesh.

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