Indian J. Agric. Res., 52(5) 2018: 518-523
Print ISSN:0367-8245 / Online ISSN:0976-058X

AGRICULTURAL RESEARCH COMMUNICATION CENTRE
www.arccjournals.com/www.ijarjournal.com

Response of red gram cultivars to transplanting and planting geometry under rainfed conditions of Northern dry zone of Karnataka

Ashok S. Sajjan*

Department of Seed Science and Technology,
College of Agriculture, University of Agricultural Science, Dharwad-580 005, Karnataka, India.
Received: 08-03-2018 Accepted: 05-09-2018 DOI: 10.18805/IJARe.A-5007

ABSTARCT

The field experiments were conducted in the Dept. of Seed Science and Technology, College of Agriculture, Vijayapur during *kharif* 2013 and 2014. The treatments consisted of three planting geometry (22,222, 27,798 and 37,037 plants per ha) and transplanting of different aged seedlings (A_1- 21 day old seedlings, A_2- 28 day old seedlings, A_3- 35 day old seedlings and A_4- Direct seed dibbling). Seedlings of BSMR-736(V_1) and TS-3R (V_2) were raised by using a polythene bag of 6 X 4 cm size in nursery. The results of the investigations indicated that the transplanting of 35 days old seedling with planting geometry of 27,798 plants per ha in BSMR -736 (2501 kg /ha) which was on par with transplanting of 28 days old seedlings and lowest value was seen in seed dibbling at planting geometry of 37,037 in TS-3R(1862 kg / ha). The 34 per cent increased seed yield mainly attributed to seedlings transplanted in planting geometry of 27,798 plants per ha.

Key words: Cultivars, Dibbling, Geometry, Red gram, Transplanting.

INTRODUCTION

Red gram [*Cajanus cajan* (L.) Millsp.] is one of the major grain legume crops of the tropics and subtropics, endowed with several unique characteristics. It finds an important place in the cropping system adopted by small and marginal farmers in a number of developing countries. Although, globally red gram ranks sixth in an area and production in comparison to other grain legumes such as beans, peas and chickpeas. The yield of red gram is greatly influenced by a number of practices such as agronomic, pathological, entomological, genetic and their interaction with environment. In recent years *kharif* rains (monsoon) are generally becoming irregular and erratic due to which sowing in first week of June is delayed and many times happens to be in July, because of this optimum yield is not obtained and due to the late sowing the crop encompass many diseases and pest problems.

In order to ensure timely sowing due to late onset of monsoon, transplanting of red gram seedlings will be one of the agronomic measures to overcome delayed sowing. Red gram transplanting is such a strategy towards fulfilling this objective of maintaining a good initial plant stand during early in the season for improving its productivity wherein seedlings are raised in the polythene bags in nursery and transplanted in the main field after a certain age. As established seedlings will pick up growth quickly under field condition and can be more competitive. Moreover, raising red gram seedlings well in advance and transplanting in the main field later on receipt of good rains would help in reaping the benefits of early sowing with higher yield than direct sown or direct seeded red gram. This technique involves raising of seedlings in the polythene bags in the nursery for a period of one month and then transplanting those seedlings in the main field, immediately after soil wetting rains. The work on performance of transplanted red gram under different planting geometry particularly in redgram is very much lacking. Hence, an attempt has been made to assess response of red gram cultivars to seedling transplanting and planting geometry under rain fed situations of North dry zone of Karnataka.

MATERIALS AND METHODS

The field experiments were conducted in the Dept. of Seed Science and Technology, College of Agriculture, Vijayapur during *kharif* 2013 and 2014. The treatments consisting of of three planting geometry (S_1- 150 cm, S_2 - 120 cm and S_3-90 cm with 22,222, 27,798 and 37,037 plants per ha, respectively) and transplanting of different aged seedlings (A_1- 21 day old seedlings; A_2-28 day old seedlings; A_3- 35 day old seedlings and A_4- Direct seed dibbling).The Seedlings of BSMR-736(V_1) and TS-3R (V_2) were raised by using a polythene bag of 6 X 4 cm size, filled with sand, soil and compost in 1:1:1 ratio. The treated seeds were dibbled in polythene bags in three different dates so that at the end of 35 days all the three batches of different aged seedlings were ready for transplanting in main field on the first fortnight of June.

The seedlings were transplanted in the main field on the first fortnight of June with the onset of monsoon

*Corresponding author's e-mail: assajjan@gmail.com ; sajjanas@uasd.in

according to treatments of intra row spacing of 30 cm was maintained along with control (Direct seed dibbling), single healthy seedling per hill was maintained by thinning after seedlings establishment. Experiment was laid out in RBD design in factorial concept with three replications. All the recommended agronomic practices were carried out to raise the healthy crop. The crop was harvested only when it reaches field maturity. The growth, yield and yield attributing para meters were recorded.

The salient features of the variety are as follows

BSMR 736: It is resistant to wilt and sterility mosaic disease, high yielding suitable to medium to deep black soils with having 1-2 irrigations and matures in 190-200 Days

TS - 3R. It is an early medium duration variety which matures in 145 – 155 days. It is resistant to wilt and seeds are bold and red in colour with a yield potentiality of 14 - 15 q ha^{-1} during *kharif* season.

RESULTS AND DISCUSSION

The results of the present investigation are discussed here under following heads

Age of seedling: The growth and yield parameters are significantly influenced by seedling age while transplanting. The two year pooled analysis of seed yield data differed significantly due to age of seedling (Table 1- 4). The higher seed yield produced by transplanting of 35 days old seedling (2188 kg / ha) and on par with transplanting of 28 day old seedlings gave (2177 kg/ha) as compared to the transplanting of 21 days old seedling(2047 kg/ha) and lower seed yield was obtained in direct seed dibbling(1943 kg /ha). The higher seed yield could be attributed to higher plant height, more number of primary, secondary branches, reduced days to 50 per cent flowering, maturity. This might be due to early planting of red gram seedlings and also utilization of natural resources very effectively *viz.*, solar radiation, soil moisture, space, and nutrients. These results are in accordance with the findings of Pavan *et al.* (2009), in Potdar *et al.* (2010) . Similarly transplanting of 30 day old red gram seedlings during 1st week of July on black cotton soils at Lam Farm and recorded the highest seed yield of 2564kg has compared to 1896 kg than direct seeding (Reddy *et al.*, 2009). Similarly Anilkumar *et al.* (2011) also studied the response of red gram

Table 1: Effect of seedling age and geometry on Plant height and days to 50% flowering in Red gram [*Cajanus cajan* (L) Millsp].

Spacing/Planting Geometry/ha	Variety	Pooled Means of Days to 50 Per cent flowering (2013 & 2014)				Over all mean or days to 50% fflowering	Pooled Means of for plant height in cm(2013 & 2014)				Pooled mean for plant height
		A1	A2	A3	A4		A1	A2	A3	A4	
S_1(22,222)	V_1	123	119	115	130	122	177	187	187	172	181
	V_2	108	107	100	109	108	157	161	159	150	157
	Mean	115	113	108	123	**115**	167	174	173	161	**169**
S_2(27,798)	V_1	116	115	110	107	113	181	191	189	181	186
	V_2	121	101	99	97	102	153	161	161	151	157
	Mean	109	107	103	115	**107**	167	177	175	166	**171**
S_3(37037)	V1	111	107	107	103	109	179	185	182	169	179
	V2	103	95	95	107	139	155	163	163	154	159
	Mean	106	101	99	111	**123**	167	175	172	162	**169**
Mean of S1+S2+S3	V_1	116	112	108	122	114.	180	188	186	174	182
	V_2	104	101	97	111	116	155	162	161	152	158
	Mean	110	106	102	116	115	167	175	174	163	170

Interactions	Pooled for days to 50% flowering		Pooled for plant height	
Comparing the means of	S. Em±	CD(P=0.05)	S. Em±	CD(P=0.05)
Year	8.66	NS	0.4	0.78
Spacing	10.6	NS	0.49	0.96
Y x S	15	NS	0.7	1.37
Variety	8.6	NS	0.4	0.78
Y x V	12.2	NS	0.5	1.11
S x V	15	NS	0.7	1.37
Y x S x V	21.2	NS	0.99	1.94
Age	12	NS	0.57	1.11
Yx A	17	NS	0.81	1.58
S x A	21	NS	0.99	NS
Y x S x A	30	NS	1.40	2.74
V x A	17	NS	0.81	NS
Y x V x A	24.5	NS	1.14	2.23
S x V x A	30	NS	1.40	2.74
Y x S x V x A	42.4	NS	1.98	NS

Table 2: Effect of seedling age and geometry on days to maturity and primary branches in Red gram [*Cajanus cajan* (L) Millsp].

Spacing/Planting Geometry/ha	Variety	Pooled Means of for days to maturity(2013 & 2014)				Over all mean for days to maturity	Pooled means for primary branches per plant(2013 & 2014)				Over all mean for primary branches
		A1	**A2**	**A3**	**A4**		**A1**	**A2**	**A3**	**A4**	
S_1(22,222)	V_1	178	173	169	183	176	3	3.1	3.4	3	3.2
	V_2	155	152	147	160	153	2.6	2.9	3	2.6	2.8
	Mean	160	162	158	171	**165**	2.8	3	3.2	2.8	**3.0**
S_2(27,798)	V_1	178	177	172	181	177	2.9	3.1	3.1	2.9	3
	V_2	153	149	146	155	151	2.5	2.9	2.8	2.5	2.7
	Mean	165	163	159	169	**164**	2.7	3	3	2.7	**2.9**
S_3(37037)	V1	170	168	167	175	170	2.6	2.8	2.9	2.6	2.7
	V2	146	141	139	150	144	2	2.4	2.4	2.1	2.2
	Mean	158	155	163	163	**158**	2.3	2.6	2.6	2.3	**2.5**
Mean of S1+S2+S3	V_1	175	172	169	180	175	2.8	3.1	3.1	2.8	3
	V_2	151	148	145	155	150	2.4	2.7	2.7	2.4	3
	Mean	163	160	157	167	162	2.6	2.9	3	2.6	2.8

Interactions	Pooled for days to maturity		Pooled for primary branches	
Comparing the means of	S. Em±	CD(P=0.05)	S. Em±	CD(P=0.05)
Year	0.29	0.56	0.02	0.03
Spacing	0.36	0.70	0.02	0.03
Y x S	0.51	0.99	0.03	NS
Variety	0.29	0.56	0.02	0.03
Y x V	0.42	0.82	0.02	NS
S x V	0.51	0.99	0.03	0.05
Y x S x V	0.72	1.41	0.04	0.07
Age	0.42	0.82	0.02	0.03
Yx A	0.59	1.15	0.04	0.07
S x A	0.72	1.41	0.04	NS
Y x S x A	1.03	NS	0.06	NS
V x A	0.54	NS	0.04	NS
Y x V x A	0.84	NS	0.05	NS
S x V x A	1.03	NS	0.06	NS
Y x S x V x A	1.45	NS	0.09	NS

to different methods of establishment on a black soil during *kharif* season at Agricultural College Farm, Raichur and revealed that transplanted red gram with 33 day old seedlings recorded significantly higher plant height, number of leaves, dry matter production and leaf area per plant at all the stages of crop growth due to wider spacing which resulted in higher leaf area. Transplanted red gram took significantly less number of days to reach 50 per cent flowering which was attributed to early sowing of transplanted red gram.

Planting geometry: The planting geometry was significantly influenced the seed yield . Among the planting geometry of 27,798 per hectare (120 cm) recorded higher seed yield (2256 kg/ha) followed by planting geometry of 22,222 plants per hectare (150 cm) was 2026 kg per ha and minimum seed yield was seen in the plant geometry of 37,037(90 cm) was 2009 kg seed yield per ha. The higher seed yield could be ascribed to higher plant height, although less number of primary, secondary branches per plant but per ha is more and reduced days to 50 per cent flowering and maturity. These results are in agreement with the findings of Padmalatha and Gurunath rao, (1997) in pigeon pea. Significantly higher dry matter production per plant was observed at lesser plant population level and this may be due to well developed root system resulting in efficient absorption of moisture and nutrients and utilization of nutrients at wider spacing (Padmalatha and Gurunath rao, 1997). The seedlings transplanted in optimum inter row spacing had the advantage of both wider row spacing and large population. Similarly, Parameshwari *et al.* (2003) was also recorded the higher seed yield in 120 x 30 cm spacing was due to optimum plant population per unit area which could not be compensated by increase in yield attributes like plant height number of branches, number of pods and seed per plant under wider spacing (150 x 30 cm). Similarly Sharanya *et al* (2018) higher yield and ascribed to the better growth of plants under broader spacing and it exhibited better vegetative growth due to less plant population density and competition which resulted in more horizontal growth and plant canopy

Table 3: Effect of seedling age and geometry on secondary branches and no of pods plant^{-1} in Red gram [*Cajanus cajan* (L) Millsp].

Spacing/Planting Geometry/ha	Variety	Pooled Means of for number of secondary branches (2013 & 2014)				Over all mean for number of secondary branches	Pooled Means of for number of pods per plant (2013 & 2014)				Over all mean for number of pods per plant
		A1	A2	A3	A4		A1	A2	A3	A4	
S_1(22,222)	V_1	29.5	30.1	30.8	27.8	29.5	266	287	290	265	277
	V_2	19.3	23.1	23	20	21.4	189	202	216	192	200
	Mean	24.4	26.6	26.9	24	**25.5**	227	244	253	228	**238**
S_2(27,798)	V_1	24.1	27.5	27.3	23.1	25.5	248	260	261	233	250
	V_2	16	18.5	19.1	17.3	17.7	178	188	199	191	189
	Mean	20	23	23.2	20.2	**21.6**	213	224	230	212	**220**
S_3(37037)	V1	19.16	22.8	22.5	19.8	21	168	197	194	148	176
	V2	13.6	16.1	16.8	14	15.1	143	152	156	131	145
	Mean	16.4	19.5	19.6	17	**18.1**	155	174	175	139	**161**
Mean of S1+S2+S3	V_1	24.2	26.8	26.8	23.6	25.4	227	248	248	215	**234**
	V_2	16.3	19.2	19.6	17.2	18.1	170	181	191	171	**178**
	Mean	20.3	23	23.2	20.4	21.7	198	214	219	193	206

Interactions	Pooled for number of secondary branches		Pooled for number of pods per plant	
Comparing the means of	S. Em±	CD(P=0.05)	S. Em±	CD(P=0.05)
Year	0.17	0.33	1.08	2.11
Spacing	0.21	0.41	1.33	2.60
Y x S	0.30	0.58	1.88	3.68
Variety	0.17	0.33	1.08	2.11
Y x V	0.24	NS	1.54	0.01
S x V	0.30	0.58	1.88	3.68
Y x S x V	0.42	NS	2.66	3.68
Age	0.24	0.47	1.5	5.21
Yx A	0.34	0.66	2.1	4.11
S x A	0.42	NS	2.6	5.09
Y x S x A	0.60	NS	3.7	NS
V x A	0.34	NS	2.1	4.11
Y x V x A	0.49	0.96	3.0	5.88
S x V x A	0.60	NS	3.7	NS
Y x S x V x A	0.85	NS	5.3	10.38

area compared to those under narrow spacing. So the branch bearing capacity increased.

Cultivars: The results of pooled analysis of data two years indicated that the cultivars were significantly influences growth and seed yield. The cultivar BSMR-736 produced higher seed yield (2209 kg/ha) as compared to TS-3R (1985 kg /ha).The higher seed yield was due to genotypic differ ences such as higher plant height, more number of primary and secondary branches per plant less number of days to 50 per cent flowering and maturity. This result is in confor mity with that of Ramanjaneyulu *et al* (2017) Byregowda and Mahadevu (2007) reported that red gram variety TTB-7 had more plant height with more days to 50% flowering and maturity over BRG-2 variety at UAS, GKVK campus, Bangalore which indicated that there was genotypic difference.

Interactions: The interactions due to row geometry, cultivars, and age of the seedling found to be significant Whereas other interactions did not differ significantly. However, the transplanting of 35 day old seedling with planting geometry of 27,798 plants per ha in BSMR -736 (2501 kg /ha) which was on par with the transplanting of 28 days old seedling and lowest yield was obtained in seed dibbling at planting geometry of 37,037 in TS-3R(1862 kg per ha). The 34 percent increased seed yield mainly attributed to seedlings transplanted with a planting geometry of 27,798 plants per ha grew luxuriously by utilizing sufficient light, moisture and soil nutrients and produce higher quality seeds but beneficial effect of wider spacing on individual plant growth could not augment with the seed yield per ha because of lower plant population (Jamadar 2009).Whereas in closer inter row spacing there are sufficient number of plants per unit area but those plants have to compete among each other for basic inputs and that is resulted in the lower seed yield. These results are in agreement with the findings of Pandiselvi *et al.* (2010) that plant height, dry matter production and length of finger were

Table 4: Effect of seedling age and geometry on seed yield in Red gram [*Cajanus cajan* (L) Millsp].

Spacing/Planting Geometry/ha	Variety	Pooled Means of for seed yield (2013 & 2014)				Over all mean for seed yield (Kg/ha)
		A1	A2	A3	A4	
S_1(22,222)	V_1	2118	2203	2268	2034	2156
	V_2	1877	1949	1982	1982	1897
	Mean	1997	2076	2125	1908	**2026**
S_2(27,798)	V_1	2255	2494	2501	2210	2392
	V_2	2274	2209	2182	2013	2119
	Mean	2215	2352	2342	2116	**2256**
S_3(37037)	V1	2000	2161	2175	1985	2079
	V2	1855	2011	2025	1862	1938
	Mean	1928	2086	2098	1923	**2009**
Mean ofS1+S2+S3	V_1	2158	2286	2313	2080	2209
	V_2	1936	2056	2063	1885	1985
	Mean	2047	2171	2188	1983	2097
Interactions			Pooled for seed yield			
Comparing the means of			S. Em±	CD (P=0.05)		
Year			11	NS		
Spacing			14	27		
Y x S			19	NS		
Variety			11	21		
Y x V			16	NS		
S x V			19	37		
Y x S x V			27	53		
Age			16	31		
Yx A			22	43		
S x A			27	NS		
Y x S x A			38	NS		
V x A			22	NS		
Y x V x A			31	NS		
S x V x A			38	NS		
Y x S x V x A			54	NS		

higher in CO 13 finger millet variety planted on May17th at Pandit Jawaharlal Nehru College of Agriculture and Research Institute compared to other varieties (TRY^{-1} and CO 14) and transplanting dates(May 24th, May 31st, June 14th and June 21st). Similar results also reported by Jamadar and Sajjan (2014) in pigeon pea.

CONCLUSION

The higher yield in red gram crop per unit area per unit time can be enhanced by introducing newly evolved crop varieties/hybrids with high yielding potential under improved agronomic management practices. Transplanting of red gram crop is a new agronomic practice wherein the seedlings are grown in small polythene bags during pre-monsoonmonths and transplanted soon after the onset of monsoon in the main field. The transplanting of 35 days old seedling with theplanting geometry of 27,798 plants per ha in BSMR-736 (2501 kg /ha) which is on par with trans plan ting of 28 daysold seedlings and lowest was seen in seed dibbling at planting geometry of 37,037 in TS-3R (1862 kg / ha).

REFERENCES

Anil kumar, S. N., Pujari, B. T., Viswanatha, S., Kopalkar, B. G., Desai, B. K and Veeresh. (2011). Influence of different methods of establishment on the growth characteristics of pigeon pea during *kharif* season. *Research Journal of Agricultural Sciences*.**2** (2): 234-236.

Byregowda, M and Mahadevu, P. (2007). BRG-2: A high yielding and early maturing pigeon pea variety suitable for delayed monsoon conditions in Karnataka. *Mysore Journal of Agricultural Sciences*. **41**(2): 286-287.

Jamadar, M. I (2009). Effect of nursery techniques, seedling age and spacing on seed yield and quality in transplanted redgram. *M.Sc (Ag.) Thesis* submitted to UAS, Dharwad.

Jamadar M. I. and Sajjan A. S. (2014). Effect of transplanting on yield and quality of pigeonpea [*Cajanus cajan* (L.) millsp.] *Bioinfolet*, **11** (2a): 319 – 322.

Padmalatha, Y. and Gurunatha rao, (1997), Drymatter accumulation and its partitioning of winter pigeon pea as affected by varieties, plant densities and fertility levels. *Indian J. Agron.,* **38**(4):665-667.

Pandeselvi, T., Narayanan, A. L and Karthikeyan, R. (2010). Evaluation of optimum time of sowing of finger millet (*Elusine coracana* G.) varieties in Karaikal region. *International Journal of Agricultural Sciences*. **6** (1): 94-96.

Parameswari, K., Vanangamudi, K. and Kavitha, S., (2003). Effect of spacing on hybrid seed yield of pigeonpea hybrid CoPH2. *Madras Agric. J*., **90** (10-12):691-696.

Pavan, A.S., Nagalikar, V.P., Halepyati, A.S. and Pujari, B.T. (2009).Effect of planting on the yield,yield components andeconomics of transplanted pigeon pea. *Karnataka J. Agric. Sci.,* **22**(2) :433-434.

Potdar, M.P., Chittapur, B.M., Salakinkoppa, S.R., Sharma,Arjun and Dharmraj, P.S. (2010).

Response of transplantedpigeon pea [*Cajanus cajana* L.] to planting geometry under rainfed conditions of North Eastern dry zone of Karnataka. Nation. Symp on "Resource Management Approaches towards Livelihood Security", 2-4 December, Bengaluru, KARNATAKA (INDIA).

Ramanjaneyulu A.V., Indudhar Reddy K. Spandana Bhatt,P, Neelima T.L. and Srinivas, A.(2017). Influence of pigeonpea varieties, N levels and planting methods on yield and economics under rainfed conditions. *Legume Research*, **40**(5): 911-915.

Reddy, T. Y., Reddy, P. M., Reddy, J. B., Rami Reddy, S and Sankar Reddy, G. H. (2009). Studies on suitable varieties of groundnut for normal and delayed sowing under rainfed conditions. *Indian Journal of Agronomy*. **29** (1): 55-60.

Sharanya, B.R;Naruka. I.S. Shaktawat, R.P.S, Kushwah, S.S. ;Singh O.P; and. Singh, D (2018). Effect of plant geometry on growth, yield and quality of different varieties of fenugreek *Trigonella foenum-graecum* L.). *Indian J. Agric. Res.*, **52** (3) : 323-326