Effect of different sowing dates on the growth ofPigeonpea (*Cajanuscajan* L. Millsp.) varieties.

Abstract

The field investigation conducted during *kharif* season, aAt experimental farm, College of Agriculture, Badnapur, VNMKV, Parbhani. The experiment conducted with four sowing dates in main plot viz, D_1 : (15th June) , D_2: (30th June) , D_3 : (15th July), D_4 : (30th July) and five varieties in sub plot viz, V_1-BSMR-736, V_2-BSMR-853, V_3-BDN-711, V_4-BDN-708 and V_5-VIPULA.The soil was medium black, clayey in texture, alkaline in reaction and higher in total soluble salt concentration, low in nitrogen and phosphorus and rich in potassium and lime, alkaline in reaction with high base saturation. Sowing was done by dibbling method. From the result of experiment, it can be concluded that, among different sowing dates for pigeonpea, the sowing on 15thJune, was found optimum for achieving higher seed yield. The pigeonpea variety BSMR-736 was found to be highly productive as compared to rest of the varieties.

***Keywords*:** Genotype, Pigeonpea, Sowing dates, Varieties, Yield.

Introduction

Pulses constitute an important ingredient in predominantly vegetarian diet and are important source of protein that nutritionally balances the protein requirement of vegetarian population.

Pigeonpea also known as red gram, arhar and tur [*Cajanuscajan*(L.) Millsp.] is the most important *kharif* grain legume crop belongs to the family Leguminoseae, sub-family papilionaceae, originated from the Africa. It has the lowest harvest index of 19% but a rich source of protein (?)and amino acids like lycine, tryocene, cysteine and arginine and can be cultivated in the wide range from pH 5 to 8.

Comment [L1]: How much per cent?

Time of sowing, a non-monetary input, has a considerable influence on growth and yield of this crop. It ensures the complete harmony between vegetative and reproductive phases on one hand and climatic rhythm on the other hand. Sowing time also plays an important role in dry matter accumulation by the crop. Early sown crop may accumulate excessive dry matter and reduce podding, whereas late sown crop may reduce the biomass accumulation and consequently reduction in yield. Delayed sowings beyond the optimum period result in lower grain yields of pigeonpea (Kumar *et al.* 2005). Further, genotypes may vary in productivity (Egbe *et al.* 2013) and are equally important in realizing the potential yield of this crop. Long duration genotypes produce higher yield than early maturing genotypes, but they take more time to mature which may delay the sowing of succeeding crop such as wheat in a sequence cropping system. Keeping all these factors in mind, the present experiment was conducted during 2015 to study the optimum sowing time and to find out an appropriate variety of pigeonpea under rainfed condition.

Material and Methods

The aim of present experiment was to find out suitable sowing dates for pigeonpea varieties, to study the performance of pigeonpea varieties under different sowing dates and to study the interaction effect of sowing dates and varieties of pigeonpea.

The gross and net plot size of the experiment was 7.2 x 5.0 m and 5.4 x 4.6 m, respectively. Sowing was done by adopting dibbling method on 15th June, 30th June, 15th July and 30th July, 2015 for D_1, D_2, D_3 and D_4, respectively at a spacing 90 cm x 20cm and the varieties used were,BSMR-736, BSMR-853, BDN-711, BDN-708 and VIPULA. The recommended dose of fertilizer (RDF) 25:50:00 NPK kg ha^{-1} were applied at the time of sowing.

Comment [L2]: Provide the details about duration of each varieties

To evaluate the treatment effect, the various growth observations were recorded in the experiment from 30 DAS up to the harvest at an interval of 30 days, while the observations on yield attributing characters and post-harvest studies were recorded at respective stages. The crop was harvested at the maturity stage on 25th December 2015, 09th January 24th January and 09th February 2016 for D_1, D_2, D_3 and D_4 sowing dates, respectively.

Result and Discussion

The beneficial effect due to different sowing dates on plant height, number of functional leaves, leaf area, number of branches, number of pods per plant and total dry matter of pigeonpea were evident during active growth and maturity. The early sowing on 15th June produced more vegetative growth in early period of crop growth. It was observed from the data that the height was increased progressively at every stage of crop growth. The increase in height was rapid during 30-90 DAS and there after it increases marginally till maturity. The effect of different sowing dates on plant height was found to be significant and the taller plant was observed with the early sowing date (15th June) as compared to other dates of sowing (Table 1). Similar results were obtained by Malik and Yadav (2014) and Chih *et al.* (2014). The varieties selected for the present investigation were BSMR-736, BSMR-853, BDN-711, BDN-708 and VIPULA. Pigeonpea varieties viz, BSMR-736 and BSMR-853 recorded more or less similar height in early stage. During later stage comparatively taller plant height was observed in respect of variety BSMR-736 which might be due to its genetic makeup (Table 1). These findings are in line with earlier findings by Akinola and Oyejola (1994) and Sonwane*et al.* (2015).

From the data on mean number of branches, it was revealed that the number of branches increased up to 90 to150 days and remained constant thereafter up to harvest. Mean number of branches were influenced significantly by various treatments under study (Table 1). The sowing on 15^{th}June found to be significantly superior over rest of all sowing dates. Similar results were obtained by Prasad *et al.* (2014).

Data on mean number of trifoliate functional leaves per plant revealed that the functional leaves increased rapidly up to 150 DAS and between 90-120 DAS, whereas moderately between 61-90 days and decreased there after towards maturity due to senescence of leaves (Table 1). The sowing on 15^{th} June recorded higher mean number of functional leaves (257). Similar result was obtained by Singh *et al.* (2010). More number of leaves and (Table 1) were noticed in variety BSMR-736 as compared to BSMR-853, BDN-711, VIPULA and BDN-708 during all crop growth stages. The probable reason for this may be the genetically potential of the genotype that has helped in producing a greater number of leaves. These findings are in line with earlier findings by Zote *et al.* (2011).

Total dry matter accumulation per plant was found to be increased continuously with advancement in age of the crop till maturity. The rate of increase in dry matter accumulation was slow up to 30 days and faster between 90 to 150 DAS (Table 1). The sowing on 15^{th} June recorded higher dry matter accumulation plant^{-1} (118.52 g) followed by the sowing on 30^{th}June (109.69 g plant^{-1}) followed by the sowing on 15^{th}July (101.40 g plant^{-1}) and sowing on 30^{th}July (93.39 g plant^{-1}) at all the crop growth stages. Similar result was reported by Hari *et al.* (2011). The mean total dry matter plant^{-1} (Table 1) was influenced due to pigeonpea varieties. Variety BSMR-736 produce significantly more dry matter as compared to BSMR-853, BDN-711, VIPULA and BDN-708 at all growth stages. This might be due to higher biomass potential of the variety such differential dry matter production in different pigeonpea varieties. BSMR-736 produced significantly more dry matter as compared to BSMR-853, BDN-711, VIPULA and BDN-708 at all growth stages.

It was observed from the data on mean number of pods per plant increased progressively from 150 days onwards to the harvest (Table 1). The sowing on 15^{th} June recorded higher mean number of pods per plant (172.54) followed by sowing on 30^{th}June was (141.13) and sowing on 15^{th}July was (122.57) and sowing on 30^{th} July was (99.93). Similar result was reported by Mishra *etal.* (2008).This might be due to higher biomass

Comment [L3]: It was not clear? Kindly check.

Comment [L4]: What is the reason behind this? Explain in one line

Formatted: Not Superscript/ Subscript potential of the variety such differential dry matter production in different pigeonpea varieties were reported by Zote*etal.* (2011) and NadafA. A. (2014).

The mean pod yield (g) per plant was significantly influenced by the various treatments. The crop sowing on 15th June was recorded significantly higher pod yield per plant (74.20g) followed by the sowing at 30th June (60.51g), 15th July (52.70g) and 30th July (43.05g) (Table 1). Similar result was obtained by Mishra *et al.* (2008). The effect of different sowing dates on mean seed yield (g plant^{-1}) was found to be significant. The sowing on 15th June was recorded significantly higher mean seed yield (41.67g plant^{-1}) followed by the sowing on 30th June (38.83g plant^{-1}) sowing on 15th July (34.73g plant^{-1}) and 30th July (29.77g). Similar result was reported by Dialoke*et al.* (2014). The effect of different sowing dates on test~~s~~ weight (100 seeds) was found to be non-significant. But the maximum test weight was observed ~~due to~~in the sowing on 15th June (11.51 g) followed by sowing date 30th June (11.15 g), 15th July (10.66 g) and 30th July (10.11 g) (Table 1). Similar results were reported by Reddy *etal.* (2015) and Singh *etal.* (2006). The performance of variety BSMR-736 as regard to yield attributing characters viz, number of pods plant, pod weight per plant seed yield per plant and test weight (Table 1) were~~as~~ significantly superior as compared to BSMR-853, BDN-711, VIPULA and BDN-708. The probable reason for this may be the genetic makeup of the variety that has helped in improving the photosynthetic activity due to increased source capacity and efficient translocation of photosynthates to the sink (seed). Tripathi *et al.* (1975) and Singh *et al.* (2014) observed improvement in pigeonpea varieties having different genetic makeup.

Data on mean seed yield kg ha^{-1} as influenced by different sowing dates is presented in table 2. The data showed that the sowing on 15th June recorded significantly higher mean seed yield (1456 kg ha^{-1}) over rest of the sowing dates. The sowing on 30th June (1324 kg ha^{-1}) was next best followed by sowing on 15th July (1165 kg ha^{-1}) and 30th July (987 kg ha^{-1}). Similar results were reported by Chauhan *et al.* (1987) and Patel and Mehta (2001). The performance of pigeonpea varieties in respect of seed yield (Table 2) was very encouraging and followed a similar trend that of yield attributes. The pigeonpea variety BSMR-736 recorded higher seed yield of (930 kg ha^{-1}) which was significantly superior over varieties BSMR-853, BDN-711, VIPULA and BDN-708. This increase in seed yield of BSMR-736 genotype might be due to the higher production efficiency that has been reflected through improvement in different yield attributing characters. Similar findings were reported by Saxena *et al.* (1989), Parmeshwarappa (2002), Tuppad*et al.* (2012), Saxena *et al.* (2014).

Comment [L5]: Give the reference in perfect journal format

Straw yield kg ha^{-1}as influenced by different sowing dates was found to be significant. The sowing on 15th June recorded highest mean straw yield kg ha^{-1}(5161 kg ha^{-1}) which was significantly higher over rest of treatments. The sowing on 30th June (4986 kg ha^{-1}) was second best date which was followed by sowing on 15th July (4672 kg ha^{-1}),30th July (4211 kg ha^{-1}) (Table 2). Chauhan *et al.* (1987) reported similar results. Data on biological yield kg ha^{-1}as influenced by different sowing dates was found to be significant. The sowing on 15th June recorded higher mean biological yield (6617 kg ha^{-1}) which was significantly higher over rest of the treatments. Sowing on 30th June (6310 kg ha^{-1}) was next best date for sowing followed by 15th July (5837 kg ha^{-1}) and 30th July (5198 kg ha^{-1}). Similar results were reported by Prasad *et al.* (2014). Data on harvest index showed that there was no ~~any~~ significant effect of sowing dates on harvest index. The highest harvest index was observed (22.04) by the sowing on 15th June (Table 2). Same result was reported by Singh (2006).The performance of pigeonpea genotype BSMR-736 produced biological yield of (2912 kg ha^{-1}) which was found significantly superior over BDN-711, VIPULA, BDN-708 and found at par with variety BSMR-853. The higher biological yield of BSMR-736 as compared to BSMR-853, BDN-711, VIPULA and BDN-708 might be due to accumulation of more dry matter and higher biomass potential. These findings are in conformity with the findings of Nadaf and Mansur~~.~~ (2014) and Sonwane*et al.* (2015). The performance of pigeonpea varieties differed significantly in harvest index (Table 2). The genotype BSMR-736 recorded higher harvest index as compared to BSMR-853, BDN-711, VIPULA and BDN-708 which might be due to its higher production efficiency similar trend was observed by Sonwane *et al.* (2015).

The interaction effect of sowing dates and varieties of pigeonpea were found non-significant with respect which parameter?.

Conclusion

On the basis of the field experimentation for a season, a~~A~~mong different sowing dates for pigeonpea, the early sowing on 15th June was found optimum for achieving higher seed yield. The pigeonpea variety BSMR-736 was found highly productive as compared to BSMR-853, BDN-711, VIPULA and BDN-708. However, the results are based on one year experimentation and require further confirmation to draw sound conclusion.

Table no. 1. Effect of sowing dates on growth and yield attributes of pigeonpea varieties

Comment [L6]: Growth attributes at which stage?

Treatment	Plant Height (cm)	Number of functional leaves	Number of branches	Dry matter production	Number of pods plant^{-1}	Ppod yield plant^{-1} (g)	Grain yield plant^{-1} (g)	Seed index (g)
Sowing dates (D)								
D_1 : 15th June	168.89	257.00	13.18	118.52	162.54	59.20	31.67	11.51
D_2 : 30th June	163.13	244.60	12.36	109.69	151.13	46.51	28.83	11.15
D_3 : 15th July	152.86	235.60	9.38	101.40	122.57	39.70	24.73	10.66
D_4 : 30th July	133.85	224.25	8.67	93.39	99.93	31.05	19.77	10.11
SE ±	3.21	2.55	0.18	1.24	2.38	0.80	0.53	0.33
CD at 5 %	8.88	7.06	0.52	3.43	6.61	2.23	1.46	NS
Varieties (V)								
V_1 : BSMR-736	169.57	251.47	12.65	116.78	156.09	52.11	30.66	11.64
V_2 : BSMR-853	158.37	245.10	11.57	109.89	142.18	47.13	28.24	11.14
V_3: BDN-711	151.99	239.12	11.19	102.70	136.14	45.32	25.86	10.60
V_4: BDN-708	145.36	227.94	9.29	97.67	111.16	36.79	22.11	10.37
V_5: VIPULA	148.12	238.18	9.79	101.70	124.66	41.72	24.39	10.54
SE ±	5.09	7.24	0.33	2.11	3.88	1.29	1.23	0.41
CD at 5 %	14.09	20.06	0.92	5.84	10.75	3.57	3.42	NS
Interaction (D x V)								
SE ±	10.18	14.50	0.66	4.22	7.76	2.58	2.47	0.83
CD at 5 %	NS	NS	NS	NS	NS	NS	NS	NS
General Mean	**154.68**	**240.36**	**10.90**	**105.75**	**134.05**	**44.11**	**26.25**	**10.86**

Table 2: Mean seed yield, straw yield, biological yield (kg ha^{-1}) and harvest index as influenced by various treatments.

Treatments	Seed yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Biologicalyield (kg ha^{-1})	Harvest index (%)
Sowing dates (D)				
D_1 : 15th June	1456	5111	6567	22.17
D_2 : 30th June	1324	5036	6360	20.81
D_3 : 15th July	1165	4672	5837	19.98
D_4 : 30th July	987	4211	5198	19.01
SE ±	22.77	50.63	56.45	-
CD at 5 %	63.02	140.12	156.24	-
Varieties (V)				
V_1 : BSMR-736	1433	5189	6623	21.62
V_2 : BSMR-853	1305	4805	6110	21.31
V_3: BDN-711	1207	4750	5958	20.21
V_4: BDN-708	1065	4453	5518	19.30
V_5: VIPULA	1154	4590	5744	20.08
SE ±	47.32	130.91	136.87	-
CD at 5 %	130.96	362.29	378.80	-
Interaction (D x V)				
SE ±	94.64	261.81	273.75	-
CD at 5 %	NS	NS	NS	-
General Mean	**1233**	**4757**	**5991**	**20.51**

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