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Production of pigeon pea varieties under varied weather conditions

Gaikwad SV, Mahude SV and Jadhav SS

Abstract
A field trial "Production of pigeon pea varieties under varied weather conditions" was conducted at Farm of AICRP on Agrometeorology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani during *kharif* season 2021 to find out the effects of dates of sowing on pigeon pea varieties, effects of weather parameters on growth, development and yield of pigeon pea and effect of varied weather condition on phenological aspects of Pigeon pea. The research field was laid out in split-plot design with three replications and four dates of sowing and three varieties sown with the spacing of 90 x 20 cm^2 using 12 treatments and 36 plots to study the crop weather relationship. The best sowing window of pigeon pea was observed during 25th SMW (18th to 24th June). Among the three varieties, BSMR-736 performed better throughout the crop growth phases and recorded higher yield. The meteorological variables rainfall, rainy days, minimum temperature, RH-I, RH-II and wind speed only exhibited significant positive link with seed yield during branching to 50% flowering (P_4) stage of variety BDN-711 and BSMR-736. The meteorological variables maximum temperature, minimum temperature and RH-I exhibited significant correlation with seed yield during branching to 50% flowering (P_4) stage of variety BDN-716.

Keywords: Production, pigeon pea, varied, weather conditions

Introduction
Pigeonpea [*Cajanus cajan* (L.) Mill sp.] also known as arhar or tur or Redgram, is the second most significant pulse crop of India after chickpea. Pigeon pea crop widely cultivated in tropical and subtropical climates. Pulses provide significant nutritional and health benefits, and are known to reduce several non-communicable diseases such as colon cancer and cardiovascular diseases (Yude *et al.*, 1993; Jukanti *et al.*, 2012) [8, 2]. Pulses have significant influence in Indian agriculture as they are hidden supply of protein, which is cost effective than other protein rich food like meat, dairy products. They are most used up in finding a solution for protein malnutrition and also used as fodder and concentrates in cattle feeds.
The optimum range of temperature for proper growth and development of pigeon pea is 18 - 38 °C (Van der Maesen, 1989) [7]. Whereas, in the controlled environmental studies, Pigeon pea showed that warm (>28 °C) and cool (<20 °C) temperatures delay flower initiation and that the optimal temperature for flowering for early maturing type is close to 24 °C (Turnbull *et al.*, 1981). The duration of particular stage of growth is directly related to temperature and this duration for particular species could be predicted using the mean sum of daily air temperatures. The timing of biological events of growth is studied in phenology, particularly in relation to climate factors. For calculating the occurrence of Phenological stages and maturity dates of various crops, the heat unit system was chosen. Through the accumulated heat units method and the Growing Degree Days, the effect of temperature on the phenology and yield of crop plants may be examined in the field (Bisnoi *et al.* 1995) [1].

Materials and Methods
A field trial "Production of pigeon pea varieties under varied weather conditions" was conducted at Farm of AICRP on Agrometeorology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani during *kharif* season 2021. The research field was laid out in split-plot design with three replications and four dates of sowing *viz.* D_1 (25th MW), D_2 (26th MW), D_3 (27thMW), D_4 (28th MW) and varieties V_1 (BDN-711), V_2 (BSMR-736) and V_3 (BDN-716) sown with the spacing of 90 x 20 cm^2 using 12 treatments and 36 plots. Five plants selected in each plot for biometric observations.

Results and Discussion

Effect of sowing dates and varieties on seed index

Table 1. provides information on mean seed index (i.e., 100 seed weight) recorded during harvest. The D_1 (25th SMW) sowing date showed considerably higher mean seed index (11.59 g) over other date of sowings and was found at par with D_2 (26th SMW) date of sowing with seed index 10.96 g. The influence of different date of sowing on seed index (g) was determined to be significant However, the D_4 (28th SMW) sowing had the lowest mean seed index (9.86 g). Ram *et al.* (2011) [4] found similar findings. Higher seed yield was produced by D_1 (25th SMW) sowing date and found significantly superior over D_3 and D_4 date of sowings but at par with D_2. Results are presented in a similar manner by Nagamani *et al.* (2015) [3]. In comparison to the other treatments (i.e. D_3 and D_4), the 25th SMW sowing date had the significantly highest straw yield (2425.11 kg ha^{-1}) and found at par with 26th SMW (2293.67 kg ha^{-1}) sowing date while 28th SMW had the lowest (2138.89 kg ha^{-1}) among the sowing dates. The 25th SMW sowing had found highest biological yield (3376.00 kg ha^{-1}) which was significantly superior over D_3 and D_4 sowing dates but found at par with 26th SMW (3163.78 kg ha^{-1}) and 28th SMW had the lowest (2667.78 kg ha^{-1}) among the sowing dates. Results was in line with Singh *et al.* (2016) [5].

Table 1: Seed yield (Kg ha^{-1}), Straw yield (Kg ha^{-1}) and biological yield of Pigeon pea as influenced by different treatments

Treatment	Seed Index (g)	Seed yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Biological yield (kg ha^{-1})
Date of Sowing				
D1 (25th SMW)	11.59	950.89	2,425.11	3,376.00
D2 (26th SMW)	10.96	870.11	2,293.67	3,163.78
D3 (27th SMW)	9.57	733.89	2140.89	2874.77
D4 (28th SMW)	9.50	732.89	2138.89	2871.77
S.E. ±	0.18	24.13	80.09	75.22
C. D. at 5%	0.65	85.12	282.54	265.34
Variety				
V1 (BDN-711)	10.70	849.58	2,269.00	3,118.58
V2 (BSMR-736)	10.78	882.25	2,340.50	3,222.75
V3 (BDN-716)	9.73	734.00	2,139.42	2,873.42
S.E. ±	0.15	39.55	48.00	50.24
C. D. at 5%	0.44	119.6	145.14	151.92
Interaction (D x V)				
S.E. ±	0.30	68.95	112.07	111.31
C. D. at 5%	NS	212.74	367.71	362.18
G. mean	10.41	821.94	2249.64	3071.58

The variety BSMR-736 was found to have a mean seed index that was higher (10.78 g), than other kinds and found at par with BDN-711 with seed index 10.70 g. whereas BDN- 716 had the lowest mean seed index (9.73 g). Variety BSMR-736 had significantly highest (882.25 kg ha^{-1}) seed yield and found at par with BDN-711 (849.58 kg ha^{-1}) and variety BDN-716 had the lowest (734 kg ha^{-1}). Variety BSMR-736 (2340.50 kg ha^{-1}) had the highest straw yield and variety BDN-716 had the lowest (2139.42 kg ha^{-1}). The BSMR-736 variety outperformed all other kinds in terms of yield and it was found at par with BDN-711 variety. Significantly highest biological yield was produced with BSMR-736 (V_1) variety over rest of the variety BDN-716 but it was at par with BDN-711 variety.

Table 2: Mean, Critical Difference and Standard Error between different dates of sowing and varieties of Seed Yield (Kg ha^{-1})

Treatment	V_1	V_2	V_3	Mean
D_1	1,094.67	1,146.33	611.667	950.889
D_2	849.333	934	827	870.111
D_3	680.333	688.333	833	733.889
D_4	774	760.333	664.333	732.889
Mean	849.583	882.25	734	
Factors	C.D.	SE(d)	SE(m)	
D X V	212.736	97.505	68.947	

Table 3: Mean, Critical Difference and Standard Error between different dates of sowing and varieties of Straw Yield (Kg ha^{-1})

Treatment	V_1	V_2	V_3	Mean
D_1	2,617.00	2,696.67	1961.667	2425.111
D_2	2014.667	2516	2350.333	2293.667
D_3	2206	2061.333	2155.333	2140.889
D_4	2238.333	2088	2090.333	2138.889
Mean	2269	2340.5	2139.417	
Factors	C.D.	SE(d)	SE(m)	
D X V	367.707	158.483	112.065	

Table 4: Mean, Critical Difference and Standard Error between different dates of sowing and varieties of Biological Yield (Kg ha^{-1})

Treatment	V_1	V_2	V_3	Mean
D_1	3,711.67	3,843.00	2,573.33	3,376.00
D_2	2,864.00	3,450.00	3,177.33	3,163.78
D_3	2886.33	2749.67	2988.33	2874.77
D_4	3012.33	2848.33	2754.67	2871.77
Mean	3,118.58	3,222.75	2,873.42	
Factors	C.D.	SE(d)	SE(m)	
D X V	362.18	157.41	111.31	

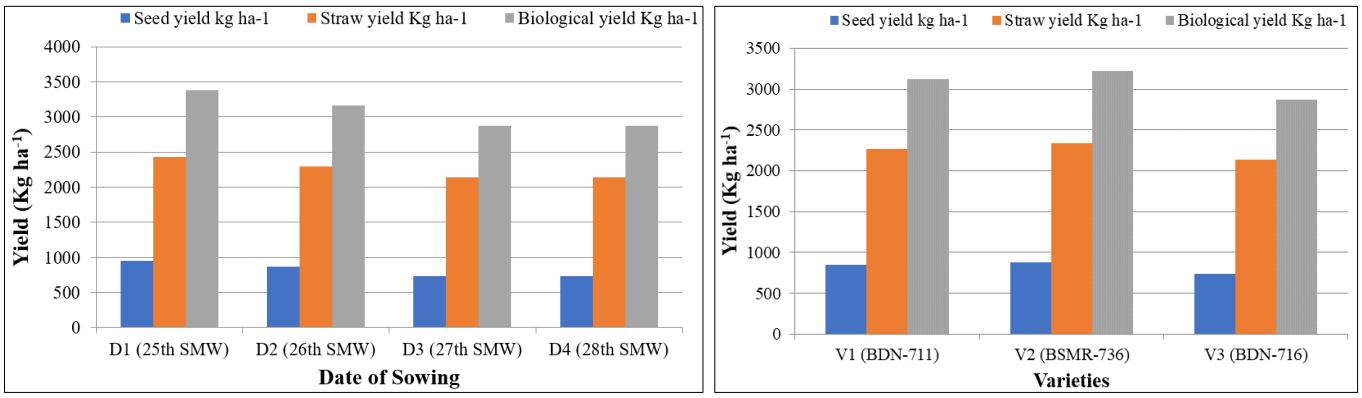

Fig 1: Seed yield (Kg ha^{-1}), Straw yield (Kg ha^{-1}) and biological yield of Pigeon pea as influenced by different treatments

Dates of sowing and cultivars were shown to have no significant interaction effect with respect to seed index. For seed yield, it was revealed that the interaction impact between types and dates of sowing was significant. The interaction between D_1 and V_2 exhibited maximum seed yield (1146.33 Kg ha^{-1}) and found at par with treatment combination of D_2 with varieties combination V_1 while it was significantly superior over rest of the treatment combination. For straw yield, it was revealed that the interaction impact between types and dates of sowing was significant. Interaction between different dates of sowing and varieties. V_2 (BSMR-736) variety of D_1 (25th SMW) date of sowing found to be superior over other varieties and dates of sowing combination and found at par with treatment combination of D_2 date of sowing with variety V_1. It was shown that there was a significant interaction effect between dates of sowing and varieties on biological yield. The V_2 (BSMR-736) variety of the D_1 (25th SMW) date of sowing was preferred above other varieties and found at par with V_1 variety of D_2 date of sowing treatment combination.

Conclusion

The best sowing window of pigeon pea was observed during 25th SMW (18th to 24th June). Among the three varieties, BSMR-736 performed better throughout the crop growth phases and recorded higher yield.

The meteorological variables rainfall, rainy days, minimum temperature, RH-I, RH-II and wind speed only exhibited significant positive link with seed yield during branching to 50% flowering (P_4) stage of variety BDN-711 and BSMR-736.

The meteorological variables maximum temperature, minimum temperature and RH-I exhibited significant correlation with seed yield during branching to 50% flowering (P_4) stage of variety BDN-716.

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