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Effect of dates of sowing on Pigeon pea varieties under varied weather conditions

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Abstract
A research trial named "Effect of dates of sowing on 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 and development of pigeon pea and effect of varied weather condition on phenological aspects of Pigeon pea. 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.

Keywords: Pigeon pea, Sowing window, BDN-711, BDN-716 and BSMR-736

Introduction
Pigeon pea (*Cajanus cajan* (L.) Millsp.) is cultivated in the semi-arid areas of tropics and subtropics. It is commonly known as red gram or tur or arhar. Vavilov (1951) [8] concluded that the pigeon pea originated in India based on the wide genetic variety of the crop in that country. Climate and weather may affect crop production in multiple ways. If a weather event which may be fatal to crops takes place during the crop growth period, is an indicator of the impact of the fatal event may be more relevant than that of growing-season mean climate to explain variations in crop production in that year (Toshichika lizumi, and Navin Ramankutt, 2015) [2]. One GIS measure of area-level greenness, the Normalized Difference Vegetation Index (NDVI), shows promise for use in epidemiologic studies. This measure has been widely used to assess levels of vegetation in agriculture and forestry research (Rhew *et al*. 2011) [6]. The length of each phenophase affects how quickly dry matter accumulates and is distributed throughout the plant, as well as how the crop reacts to external and environmental influences (Dalton, 1967) [1].

Materials and Methods
Field experiment 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 and development of pigeon pea and effect of varied weather condition. The research field was laid out in split-plot design with three replications and four varieties *viz*. dates of sowing 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 to study the crop weather relationship. The Gross plot size was 5.4 x 5.0 m^2 with a net plot size of one treatment was 4.5 x 4.2 m^2. Five plants in plot was selected for biometric observations.

NDVI is calculated in accordance with the formula:
NDVI = (NIR-RED / NIR+RED)

Where,
NIR – reflection in the near-infrared spectrum RED – reflection in the red range of the spectrum

Results and Discussion

Plant height: Data pertaining to plant height shown in Table 1. The height of the crop was measured to find out the influence of different dates of sowing and different varieties on the plant height (cm). At harvest, the mean plant height was 180.8 cm, which was the highest.

Effect of sowing dates

Plant heights was significantly highest in the first date of sowing, D_1 (25th SMW), upto harvest which was at par with D_2 (26th SMW) than other dates of sowing. Plant heights during all growth stages of the crop were lowest in D_4 (28th SMW) date of sowing.

Effect of varieties

The variety V_2 (BSMR-736) was observed to grow noticeably taller plants up to harvest than other kinds. The mean plant height of variety BSMR-736 was significantly greater which was at par with BDN-711 variety over rest of the varieties.

Interaction effect

The interaction effect of planting dates of sowing and varieties did not significantly affect the mean plant height.

Number of Branches

Effect of sowing dates: Based on a practical analysis of data, number of branches plant^{-1} was significantly affected by sowing dates. D_1 (25th SMW) recorded maximum number of branches plant^{-1} which was significantly superior over rest of the sowing dates but at par with D_2 (26th SMW). Number of branches plant^{-1} during all growth stages of the crop were lowest in D_4 (28th SMW) date of sowing**.** Similar results were reported by Islam *et al.* (2008) [3].

Table 1: Effect of date of sowing on plant height, Number of branches plant^{-1} and Dry matter plant^{-1} (g) of pigeon pea varieties

Treatment	Plant Height	Number of branches plant^{-1}	Dry matter plant^{-1} (g)
Date of Sowing			
D1 (25th SMW)	206.7	18.02	195.31
D2 (26th SMW)	189.0	17.73	185.10
D3 (27th SMW)	168.1	16.42	168.07
D4 (28th SMW)	159.6	15.60	167.02
S.E. ±	5.1	0.37	3.16
C. D. at 5%	17.8	1.3	11.15
Variety			
V1 (BDN-711)	183.5	17.00	184.01
V2 (BSMR -736)	188.7	17.93	185.36
V3 (BDN – 716)	170.4	15.90	167.26
S.E. ±	2.4	0.33	2.49
C. D. at 5%	7.3	1.00	7.53
Interaction (D x V)			
S.E. ±	6.4	0.65	5.15
C. D. at 5%	NS	NS	NS
G. mean	180.8	16.94	178.88

Effect of varieties

The impact of varieties on mean number of branches plant^{-1} was significant. The variety BSMR-736 was observed significantly superior in number of branches plant^{-1} which was at par with BDN-711 over rest of the varieties. Similar trend was observed from 75 DAS upto harvest. It could be due to variety V_2 (BSMR-736) genetic makeup.

Interaction effect

The interaction effect of planting dates of sowing and varieties did not significantly affect the number of branches plant^{-1}.

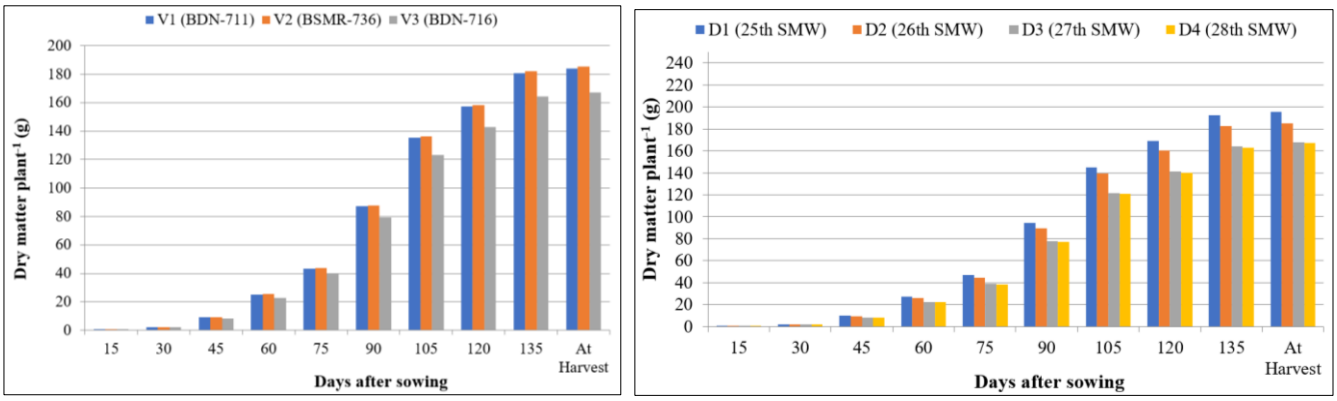

Fig 1: Dry matter production plant^{-1} of Pigeon pea (g) as influenced by different treatments

Dry Matter Production plant^{-1} (g)

Data on the average total dry matter plant^{-1} (g) that accumulates over time among the various plant sections as a result of various treatments are shown visually in Fig. 1. and tabulated in Table 1.

Effect of sowing dates

The planting date D_4 (28th SMW) provided the lowest dry matter plant^{-1}. Crop sown at 25th SMW date of sowing recorded highest dry matter plant^{-1} which was significantly superior over D_3 and D_4 date of sowings but at par with D_2 (26th SMW). This could be as a result of moisture stress and moisture variation, temperature variation that predominated during various treatments at various phenophases, as well as variation in growth. Because the production of biomass, such as straw and seeds, fluctuates, so does the dry matter. In a similar way, Singh *et al.* (2016) [7] and Nagamani *et al.* (2015) [4] both indicated that variations in growth and yield attributes were seen over time as a result of various weather conditions.

Effect of varieties

Varieties at various phases of crop growth had a substantial impact on the mean total dry matter accumulation plant^{-1}. Variety BSMR-736 found superior against the varieties BDN-711 and BDN-716 and produced significantly higher dry matter production. Variety BSMR-736 found at par with BDN-711 than remaining varieties.

Interaction effect

It was found that the sowing date and variety had no statistically significant interactions regarding dry matter accumulation plant^{-1}.

Normalised Difference Vegetation Index (NDVI)

Effect of sowing dates

The analysis of the data in Table 2. and exhibited in Fig. 2. Showed Normalised Difference Vegetation Index (NDVI) of sowing dates at various phases of crop growth. The NDVI was found significantly highest in the D_1 (25th SMW) date of sowing at various phases of the crop growth and was found at par with D_2. In D_1 date of sowing NDVI was highest (0.860) at the P_6 (50% pod formation to grain formation) and lowest (0.408) at the P_2 (Germination to seedling) stage. Similar measurements were shown by Purushothaman *et al*. (2017) [5] at pod filling stage in Pigeon pea.

Effect of varieties

Data tabulated in Table 2. Shown the highest values of NDVI in BSMR-736 variety as compared to BDN-711 and BDN-716 varieties in various crop growth stages. The variety BSMR-736 was found significantly superior and at par with BDN- 711 than other varieties.

Interaction effect

It was found that the sowing date and variety had no statistically significant interactions regarding Normalised Difference Vegetation Index.

Table 2: Normalised Difference Vegetation Index (NDVI)

Treatment	NDVI					
	P_2	P_3	P_4	P_5	P_6	P_7
Date of Sowing						
D1 (25th SMW)	0.408	0.624	0.701	0.826	0.860	0.443
D2 (26th SMW)	0.398	0.599	0.682	0.815	0.851	0.427
D3 (27th SMW)	0.385	0.589	0.660	0.762	0.818	0.414
D4 (28th SMW)	0.379	0.58	0.606	0.735	0.810	0.410
S.E. ±	0.006	0.010	0.011	0.015	0.011	0.007
C. D. at 5%	0.019	0.034	0.039	0.051	0.037	0.025
Variety						
V1 (BDN-711)	0.409	0.615	0.676	0.823	0.841	0.428
V2 (BSMR -736)	0.417	0.638	0.702	0.858	0.878	0.464
V3 (BDN – 716)	0.352	0.649	0.609	0.672	0.786	0.379
S.E. ±	0.005	0.008	0.012	0.013	0.011	0.006
C. D. at 5%	0.014	0.024	0.035	0.038	0.032	0.019
Interaction (D x V)						
S.E. ±	0.01	0.016	0.023	0.025	0.021	0.013
C. D. at 5%	NS	NS	NS	NS	NS	NS
G. mean	0.393	0.598	0.662	0.785	0.835	0.423

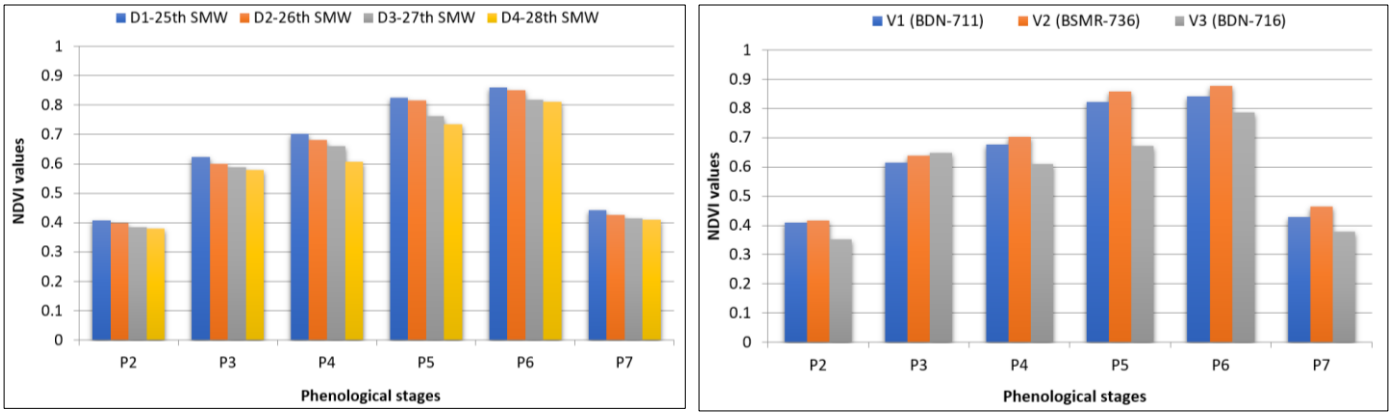

Fig 2: Normalised Difference Vegetation Index (NDVI) of Pigeon pea as influenced by different treatments

Conclusion

Based on the results of the current season-long field experiment, it can be concluded that: 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.

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