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INFLUENCE OF SOWING DATE AND CROP VARIETY ON PHENOLOGY, GROWTH AND YIELD OF RAINFED GROUNDNUT (*ARACHIS HYPOGAEA* L.) IN SOUTHERN ZONE OF ANDHRA PRADESH, INDIA

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ABSTRACT : An experiment was conducted with four dates of sowing (Second fortnight of May, First fortnight of June, Second fortnight of June and First fortnight of July) and four Varieties (TMV-2, JL-24, Narayani and Abhaya). There was wide variation in the weather conditions that prevailed over the cropping periods between the two years of experimentation. During the first year (2006) a continuous dryspell of 51 days prevailed which coincided with different growth stages of groundnut under different dates of sowing. This dry spell has not favoured the growth and development of crop, instead, it has increased the crop duration of different varieties of groundnut studied under the present investigation. The crop duration was 139-146 days in early sown crop to 110-125 days in normal sown crop compared to normal duration of 105 to 120 days. However, the second year (2007) is normal with better temporal distribution of rains and the crop duration ranged from 104-120 days in early sown crop to 108-121 days under normal sown crop. The length of growth period in 2006 is due to receipt of continuous rains after dry spell of 51 days from seed development phase to physiological maturity. In 2007,the crop which received heavy rains (22 June sown crop) from 90 DAS to harvest was adversely affected resulting poor filling and low yields. The results revealed that Sowing during July first fortnight was found to be optimum time for groundnut during drought year, while during normal year advancing the sowing date by one month may also favour good crop provided there were good rains. The performance of Abhaya cultivar was better than the Narayani, TMV-2 and JL-24 under different kinds of environments like extreme moisture stress, stress free or even under moderate stress conditions. However, in normal year TMV-2 and JL-24 performance was also good compared to drought year.

Key words: Groundnut sowing dates, Phenology, Growth and Yield

INTRODUCTION

Groundnut is an important food legume and oil seed crop of rainfed areas of Andhra Pradesh. In Andhra Pradesh, the crop is grown in about 1.33 million hectares, mostly in Anantapur, Chittoor, Kurnool and Kadapa districts, and these areas are characterized by low rainfall (250 - 600 mm) and red sandy loam soils. Further, the crop suffers from severe moisture stress at different crop growth stages. Occurrence of drought stress during the crop growth period adversely affects photosynthesis (Bhagsari *et al*., 1976), water relations (Babu and Rao, 1983), phenology and crop growth (Suther and Patel, 1992). Lack of moisture during the crop growth period also reduces the pod yield significantly, by affecting the translocation of photosynthates into pods (Kulkarni *et al*., 1988).The crop is generally sown during first fortnight of july, depending on the normal onset of monsoon and commencement of sowing rains. However, the erratic onset of monsoon and commencement of rains, sometimes force the farmer to sow the crop early (or) late in the season which catch up the crop in severe moisture stress (or) excess rains resulting poor yields. Hence the purpose of this study was to investigate the optimum time of sowing and suitable groundnut variety for rainfed soils of southern zone of Andhrapradesh.

MATERIALS AND METHODS

The present experiment was carried out for two *kharif* seasons during 2006 and 2007 in Southern Agro climatic Zone of Andhra Pradesh at S.V. Agricultural college dryland farm, Tirupati, which is located at 13^0 N latitude, 79^0 E longitude and at an altitude of 182.9 meters above mean sea level. The experiment was conducted on Red sandy cloam soils, low in organic carbon(0.27%) and available N (240 kg ha^{-1}, medium in available P_2O_5 (22.7 kg ha^{-1}) and available K_2O (206 kg ha^{-1})). The experiment was laid out in a split-plot design and replicated thrice with different dates of sowing as main plot treatments (D1 : Second fortnight of May , D2:First fortnight of June , D3:Second fortnight of June and D4:First fortnight of July) and Sub plots with different varieties (V1-TMV -2 , V2-JL-24, V3-Narayani and V4-Abhaya). The gross plot size was 5 m x 4.2 m and net plot size was 5 m x 4.2 m .The seed was sown at row spacing of 30 cm x10 cm. The entire recommended dose of fertilizer (20 N, 40 P_2O_5, 50 K_2O kg ha^{-1}) was applied as basal at the time of sowing.

RESULTS

The results on effect of sowing date and variety on crop duration and growth characters of rainfed groundnut are presented in Tables 1-4

Influence of sowing time on crop Phenology of Groundnut

Crop phenology was influenced by various sowing times. The length of growth period increased (110-117 days) with normal sowing (125 days) to early (139-146) (18 May) sowing in 2006 (Table 1), Where as, in 2007, the crop duration extended from early (104-120 days) (18 May) sowing to 22 June sowing (112-125 days) under different varieties. The abnormal extension of growth period in 2006 is due to receipt of continuous rains after dry spell of 51 days from seed development phase to physiological maturity. Similarly in 2007 also, due to receipt of excess rains from 90 DAS to harvest, the crop duration extended from 112-125 days under different varieties.The crop took more number of days to complete the later phases due to continuous rainfall. These findings were in confirmity with Kristarao (1996).

Table1. Impact of dry spells on crop duration of different varieties sown at different dates

Date of Sowing	Total dry spell duration (Days)	Days to Maturity								
			TMV-2		JL-24		NARAYANI		ABHAYA	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
18-May	70	28	140	104	143	107	139	109	146	120
7-Jun	60	31	123	108	128	116	133	112	140	122
22-Jun	51	35	117	112	123	119	126	115	138	125
12-Jul	38	29	110	108	111	116	117	110	125	121
Average			**122.50**	**108.00**	**126.25**	**114.50**	**125.33**	**112.33**	**134.33**	**122.67**
Sd+			**12.82**	**3.27**	**13.25**	**5.20**	**8.02**	**2.52**	**8.14**	**2.06**

Effect of date of sowing and variety on plant height

Greater plant height was in general observed during 2007, compared to 2006 at all the growth stages studied (Table 2). Further, a gradual increase in plant height was observed with the growth stage from 15 DAS to harvest, during both the years of study. The increase in plant height however, varied with the growth stage, depending on the coincidence of moisture stress. A perusal of the results also revealed significant influence of sowing date and varieties on plant height of rainfed groundnut crop during both the years of investigation at all the growth stages studied. However, the interaction effect of sowing date and varieties was noticed to be non-significant at all the growth stages studied and during both the years of investigation.

At 15 DAS, the plant height ranged from 8.43 (12 July) to 15.33 (18 May)) during 2006 and 13.42 (22 June) to 20.05 (18 May) during 2007. With regard to varieties, Abhaya was shortest (8.09 cm) while Narayani recorded the tallest (15.47 cm) during 2006. Similar trend was observed during 2007 with Narayani attaining plant height of 23.73 cm and Abhaya with shortest plants (10.75 cm). The plant height at 30 DAS varied from 11.80 (12 July) to 26.52 (7 June) during 2006 and 20.80 (22 June) to 40.59 (18 May) during 2007 among the different sowing dates, while it ranged from 14.13 (Abhaya) to 21.59 (Narayani) during 2006 and 24.52 (Abhaya) to 37.96 (Narayani) during 2007, among the different varieties. Further, the sowing dates during 2006 and 2007; and varieties during 2006 were noticed to be significantly different from each other. However, during 2007, the varieties, TMV-2 and JL-24 recorded on par plant height, while, Narayani and Abhaya varieties registered significantly different plant heights. However, the sowing date x variety interaction effect was non-significant during both the years of investigation.

At 45 DAS, the plant height ranged from 17.91 (22 June) to 32.86 (18 May) during 2006 and 39.38 (7 June) to 50.23 (18 May) during 2007 among the different sowing dates studied, while it ranged from 23.83 (Abhaya) to 31.34 (Narayani) during 2006 and 36.74 (Abhaya) to 41.91 (Narayani) during 2007, among the different varieties studied. A perusal of the results on statistical significance of the treatments during 2006 revealed 7 June and 12 July sowings and TMV-2 and JL-24 treatments to be on par with regard to plant height. During 2007, 18 May, 7 June and 12 July sowings; and Narayani and JL-24 had recorded on par plant height, among the different sowing dates and varieties studied, respectively. The interaction effect of sowing date x variety was found to be non-significant during both the years of study. During 2006, at 60 DAS, maximum plant height was recorded with 12 July sowings (42.22) followed by 18 May (33.79) and 7 June (30.48), while minimum plant height was recorded with 22 June sowings (20.91). However, during 2007, minimum plant height was recorded for 18 May sowings (47.16) and maximum was recorded for 7 June sowings (56.14). Further, among the varieties, Narayani had exhibited maximum and significantly greater plant height of 36.14 and 61.08 cm during 2006 and 2007, respectively, compared to other varieties studied. Similarly, Abhaya (27.13 and 45.64) had recorded minimum plant height during both the years of investigation. The sowing date x variety interaction effect was noticed to be non-significant during both the years of study.

At 75 DAS, the plant height ranged from 34.73 (18 May) to 50.92 (12 July) during 2006 and 55.46 (22 June) to 66.85 (18 May) during 2007 among the different sowing dates studied, while it ranged from 35.64 (Abhaya) to 45.15 (Narayani) during 2006 and 53.14 (Abhaya) to 72.33 (Narayani) during 2007, among the different varieties studied. Further, all the sowing dates studied during 2006 and 2007 and varieties during 2006, were noticed to be significantly different from each other, while during 2007, the varieties TMV-2 and JL-24 were at par with each other. The interaction effect between sowing date x variety was observed to be non-significant during both the years of investigation. The plant height, at 90 DAS, ranged from 36.37 (18May) to 56.48 (12 July) during 2006 and 59.21 (22 June) to 68.59 (18 May) during 2007, among the different sowing dates studied, while it varied from 38.65 (Abhaya) to 52.84 (Narayani) during 2006 and 55.08 (Abhaya) to 75.52 (Narayani) during 2007, among the different varieties studied. Further, the sowing dates studied during 2006 were noticed to be significantly different from each other, while in 2007, 18 May and 12 July; and 7 June and 22 June sowings were noticed to be on par with each other. The varieties, TMV-2 and JL-24 were also observed to be at par with each other in 2006, while in 2007, all the varieties differed significantly. The sowing date x variety interaction effect was observed to be non-significant during both the years of investigation.

At harvest, the plant height ranged from 41.65 (18 May) to 58.08 (12 July) during 2006 and 60.40 (22 June) to 70.78 (18 May) during 2007, among the different sowing dates studied, while it ranged from 41.48 (Abhaya) to 55.15 (Narayani) during 2006 and 56.95 (Abhaya) to 77.56 (Narayani) during 2007, among the different varieties studied. Further, the sowing dates studied during 2006 had exhibited significantly different plant height, while during 2007,18 May and 12 July and both June sowings were noticed to be on par with each other. Among the varieties, TMV-2 and JL-24 were noticed to be on par with each other during both the years of investigation. The sowing date x variety interaction effect was non-significant during both the years of investigation.

In general, maximum plant height was uniformly recorded for 12 July sowing during 2006 and 18 May sowing during 2007, among the different sowing dates at 60, 75, 90 DAS and harvest . Similarly, Abhaya and Narayani had recorded minimum and maximum plant heights, respectively, at all the growth stages studied, during both the years of investigation.

Table 2. Plant height (cm) of rainfed groundnut at different growth stages as influenced by date of sowing and variety

Date of sowing	Plant height (cm)													
	15 DAS		30 DAS		45 DAS		60 DAS		75 DAS		90 DAS		Harvest	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
18 May	15.33	20.05	17.07	40.59	32.86	50.23	33.79	52.44	34.73	66.85	36.37	68.59	41.65	70.78
7 June	10.24	17.99	26.52	33.14	29.18	39.38	30.48	56.14	37.22	59.72	46.99	62.08	48.22	64.14
22 June	12.65	13.42	15.65	20.80	17.91	41.36	20.91	47.16	40.06	55.46	49.95	59.21	51.53	60.40
12 July	8.43	15.38	11.80	27.74	29.76	40.01	42.22	55.62	50.92	64.40	56.48	66.59	58.08	68.43
SEm±	**0.18**	**0.70**	**0.18**	**0.70**	**0.42**	**0.86**	**0.50**	**0.76**	**0.36**	**0.51**	**0.74**	**0.98**	**0.44**	**0.76**
CD (P=0.05)	**0.63**	**2.43**	**0.63**	**2.43**	**1.45**	**2.98**	**1.72**	**2.63**	**1.24**	**1.76**	**2.56**	**3.39**	**1.54**	**2.63**
Varieties														
TMV-2	10.65	15.40	16.77	29.14	26.32	41.36	31.12	51.51	40.12	60.00	48.32	62.45	50.88	64.24
JL-24	12.43	16.92	18.55	30.65	28.22	42.97	33.02	53.12	42.03	60.97	49.97	63.41	51.97	65.00
Narayani	15.47	23.73	21.59	37.96	31.34	49.91	36.14	61.08	45.15	72.33	52.84	75.52	55.15	77.56
Abhaya	8.09	10.79	14.13	24.52	23.83	36.74	27.13	45.64	35.64	53.14	38.65	55.08	41.48	56.95
SEm+	0.31	0.50	0.31	0.50	0.85	0.70	0.54	0.85	0.52	0.81	0.57	0.94	0.63	0.96
CD(P=0.05)	0.91	1.46	0.91	1.46	2.48	2.05	1.56	2.48	1.51	2.36	1.66	2.74	1.84	2.80
Interaction	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS.	NS

Effect of date of sowing and variety on leaf area index

The results (Table 3) in general revealed that greater leaf area index was observed during 2007, compared to 2006, at all the growth stages. Further, a gradual increase in leaf area index was observed from 15 to 75 DAS and thereafter, a decline was observed up to harvest, during both years of study. The increase or decrease, however, varied with the growth stage, depending on coincidence of moisture stress with the growth stage.

A perusal of the results also revealed significant influence of sowing date and varieties on leaf area index of rainfed groundnut crop during both the years of investigation at all the growth stages studied. However, the interaction effect of sowing date and varieties was noticed to be non-significant at all the growth stages studied and during both the years of investigation.

At 15 DAS, the leaf area index ranged from 0.44 (12 July) to 0.71 (18 May) during 2006 and 0.50 (22 June) to 0.86 (7 June) during 2007, among the different sowing dates studied, while it ranged from 0.25 (TMV-2) to 0.91 (Abhaya) during 2006 and 0.47 (TMV-2) to 0.84 (Abhaya) during 2007, among the different varieties studied. Further, 18 May and 22 June; and 7 June and 12 July sowing dates were noticed to be on par with each other during 2006, whereas during 2007, all the sowing dates studied were observed to be significantly different from each other. Similarly, all varieties were noticed to be significantly different from each other during 2006. However, during 2007, the varieties, Narayani and Abhaya; and JL-24 and TMV-2, had recorded on par leaf area index with each other. Interaction effect of sowing date and variety was non-significant during both the years of investigation.

The leaf area index at 30 DAS, ranged from 0.98 (12 July) to 1.60 (7 June) during 2006 and 0.88 (22 June) to 1.82 (18 May) during 2007, among the different sowing dates studied; while it ranged from 0.91 (TMV-2) to 1.62 (Abhaya) during 2006 and 0.99 (TMV-2) to 1.42 (Abhaya) during 2007, among the different varieties studied. Further, during 2006, 18 May and 22 June date of sowings were noticed to be on par with each other, while during 2007 all the treatments were noticed to be significantly different from each other. Similarly, all varieties studied were noticed to be significantly different from each other during both the years of study. The sowing date x variety interaction effect was however, non-significant during both the years of investigation.

At 45 DAS, the leaf area index ranged from 1.82 (22 June) to 2.52 (18 May) during 2006 and 1.96 (7 June) to 3.00 (18 May) during 2007 among the different sowing dates studied, while it ranged from 1.75 (TMV-2) to 2.61 (Abhaya) during 2006 and 2.01 (TMV-2) to 2.60 (Abhaya) during 2007, among the different varieties studied. Further, all the sowing dates studied during 2006 and 2007 and varieties during 2006 were noticed to be significantly different from each other. However, during 2007, Narayani and Abhaya, and JL-24 and TMV-2 were noticed to be on par with each other. The interaction effect of sowing date and variety was however, observed to be non-significant during both the years of investigation.

The leaf area index at 60 DAS, was observed to range from 2.63 (22 June) to 3.30 (12 July) during 2006 and 2.74 (22 June) to 3.75 (12 July) during 2007, among the different sowing dates studied; while it ranged from 2.43 (TMV-2) to 3.45 (Abhaya) during 2006 and 2.95 (TMV-2) to 3.61 (Abhaya) during 2007, among the different varieties studied. . Further, all sowing dates studied during 2006 and 2007, and all the varieties studied during 2006, were observed to be significantly different from each other, whereas, during 2007, the varieties, Narayani and Abhaya, and JL-24 and TMV-2 were noticed to be on par with each other. The interaction effect of sowing date and variety was however, observed to be non-significant during both the years of investigation.

At 75 DAS, the leaf area index ranged from 3.28 (18 May) to 3.97 (12 July) during 2006 and 4.06 (22 June) to 4.86 (12 July) during 2007 among the different sowing dates studied; while it ranged from 3.09 (TMV-2) to 4.16 (Abhaya) during 2006 and 4.04 (TMV-2) to 4.77(Abhaya) during 2007, among the different varieties studied. Further, all the sowing dates and varieties studied during both the years of investigation were noticed to be significantly different from each other. The interaction effect of sowing date and variety was however, observed to be non-significant during both the years of investigation.

The leaf area index at 90 DAS, was observed to range from 2.87 (18 May) to 3.69 (12 July) during 2006 and 3.86 (22 June) to 4.25 (12 July) during 2007, among the different sowing dates studied; while it ranged from 2.78 (TMV-2) to 3.84 (Abhaya) during 2006 and 3.61 (TMV-2) to 4.39 (Abhaya) during 2007, among the different varieties studied. However, all the sowing dates and varieties studied were noticed to be significantly different from each other, during 2006, while in 2007, 18 May and 12 July among the dates of sowing, and Narayani and Abhaya among the varieties, were noticed to be at par with each other. The interaction effect of sowing date and variety was however, observed to be non-significant during both the years of investigation.

At harvest, the leaf area index ranged from 2.47 (18 May) to 3.51 (12 July) during 2006 and 3.32 (22 June) to 3.64 (18 May) during 2007 among the different sowing dates studied, while it ranged from 2.39 (TMV-2) to 3.52 (Abhaya) during 2006 and 3.05 (TMV-2) to 3.75 (Abhaya) during 2007, among the different varieties studied. Further, all the sowing dates and varieties studied during 2006 were noticed to be significantly different from each other, whereas 18 May and 7 June; and 22 June and 12 July sowings were noticed to be on par with each other, during 2007, among the different dates of sowing studied. Further, among the varieties, JL-24 and Narayani; and Narayani and Abhaya had recorded on par leaf area index during 2007. The interaction effect of sowing date and variety was however, observed to be non-significant during both the years of investigation.

Table 3.Leaf area index of rainfed groundnut at different growth stages as influenced by date of sowing and variety

Date of sowing	Leaf Area Index (LAI)													
	15 DAS		30 DAS		45 DAS		60 DAS		75 DAS		90 DAS		Harvest	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
18 May	0.71	0.75	1.20	1.82	2.52	3.00	2.96	3.35	3.28	4.63	2.87	4.10	2.47	3.64
7 June	0.55	0.86	1.60	1.17	2.06	1.96	2.76	3.49	3.40	4.25	3.01	3.99	2.68	3.51
22 June	0.62	0.50	1.19	0.88	1.82	2.29	2.63	2.74	3.79	4.06	3.56	3.86	3.12	3.32
12 July	0.44	0.59	0.98	1.04	2.25	2.11	3.30	3.75	3.97	4.86	3.69	4.25	3.51	3.38
SEm±	**0.04**	**0.02**	**0.04**	**0.02**	**0.04**	**0.05**	**0.02**	**0.03**	**0.03**	**0.05**	**0.02**	**0.04**	**0.05**	**0.06**
CD (P=0.05)	**0.14**	**0.07**	**0.14**	**0.07**	**0.14**	**0.17**	**0.07**	**0.10**	**0.10**	**0.17**	**0.07**	**0.14**	**0.17**	**0.21**
Varieties														
TMV-2	0.25	0.47	0.91	0.99	1.75	2.01	2.43	2.95	3.09	4.04	2.78	3.61	2.39	3.05
JL-24	0.43	0.62	1.01	1.16	1.96	2.25	2.67	3.23	3.44	4.34	3.04	3.95	2.69	3.42
Narayani	0.72	0.75	1.42	1.33	2.35	2.50	3.10	3.53	3.76	4.66	3.48	4.24	3.17	3.63
Abhaya	0.91	0.84	1.62	1.42	2.61	2.60	3.45	3.61	4.16	4.77	3.84	4.39	3.52	3.75
SEm±	**0.06**	**0.03**	**0.06**	**0.03**	**0.06**	**0.07**	**0.03**	**0.05**	**0.02**	**0.03**	**0.04**	**0.06**	**0.06**	**0.08**
CD(P=0.05)	**0.18**	**0.09**	**0.18**	**0.09**	**0.18**	**0.20**	**0.09**	**0.15**	**0.06**	**0.09**	**0.12**	**0.18**	**0.18**	**0.23**
Interaction	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Effect date of sowing and variety on dry matter production at different growth stages and at harvest

The results are presented in Tables 4-7. Greater dry matter production was in general observed during 2007, compared to 2006 at all the growth stages studied. Further, a gradual increase in dry matter production was observed with the growth stage from 15 DAS to harvest, during both the years of study. The increase in dry matter production however, varied with the growth stage, depending on coincidence of moisture stress period.

A perusal of the results also revealed significant influence of sowing date and varieties on dry matter production of rainfed groundnut during both the years of investigation and at all the growth stages studied. However, the interaction effect of sowing date and varieties was noticed to be non-significant from 15 to 60 DAS, while significant interaction effects were recorded from 75 DAS to harvest, during both the years of investigation.

At 15 DAS, the dry matter production ranged from 13.85 (12 July) to 21.15 gm-2 (18 May) during 2006, and 15.52 (22 June) to 23.22 (7 June) during 2007, among the different sowing dates studied; while it ranged from 14.58gm-2 (TMV-2) to 20.03 (Abhaya) during 2006 and 18.17 (TMV-2) to 22.30 (Abhaya) during 2007, among the different varieties studied. Further, all the sowing dates were noticed to be significantly different from each other during 2006, while, during 2007, the sowing dates, 18 May and 7 June had recorded on par dry matter production. Among the varieties, TMV-2 and JL-24; TMV-2, Narayani and Abhaya, in addition to Narayani and Abhaya were observed to be on par with each other during 2006, while during 2007, Abhaya had recorded significantly higher drymatter than all other varieties. Further all the varieties significantly differed from each other. The sowing date x variety interaction effect was however, non-significant during both the years of investigation.

The dry matter production at 30 DAS varied from 48.47 (12 July) to 89.70 (7 June) during 2006, and 33.30 (22 June) to 114.27 (18 May) during 2007 among the different sowing dates studied; while it ranged from 60.53 (TMV-2) to 71.8 (Abhaya) during 2006 and 63.10 (TMV-2) to 108.15 (Abhaya) during 2007, among the different varieties studied.

Further, the sowing dates, 18 May and 22 June were observed to be on par with each other during 2006, while all dates of sowing were noticed to be significantly different during 2007. All the varieties during 2006 were significantly different from each other, where as TMV-2,JL-24 and Narayani, during 2007, were noticed to be on par with each other. The sowing date x variety interaction effect was observed to be non-significant during both the years of investigation.

At 45 DAS, the dry matter production ranged from 80.80 (22 June) to 210.50 (18 May) during 2006, and 104.70 (22 June) to 220.50 (18 May) during 2007, among the different sowing dates studied; while it ranged from 136.83 (TMV-2) to 152.33 (Abhaya) during 2006 and 125.20 (TMV-2) to 189.30 (Abhaya) during 2007, among the different varieties studied. A perusal of the results on statistical significance of the treatments during 2006 revealed that all the sowing dates differed significantly with each other, while in 2007 7 June and 12 July were observed to be on par with each other. Further, among the varieties, TMV-2, JL-24 and Narayani; Narayani and Abhaya during 2006; and TMV-2, JL-24 and Narayani, and Narayani and Abhaya during 2007 were observed to be on par with each other. The interaction effect of sowing date and variety was observed to be non-significant during both the years of investigation.

During 2006 and 2007, at 60 DAS, maximum dry matter production was recorded with 12 July sowing (280.50 and 373.25, respectively), while minimum dry matter production was recorded with 22 June sowing (146.50 and 179.50, respectively). Among the varieties, Abhaya had exhibited maximum and significantly greater drymatter production of 218 and 291.8 gm^{-2} during 2006 and 2007, respectively, compared to other varieties studied, whereas the variety, TMV-2 (201.50 and 240 gm^{-2}) had recorded minimum dry matter production both during 2006 and 2007. A perusal of the results on statistical significance revealed the existence of significant differences among all the sowing dates during 2006, while during 2007, 18 May and 7 June sowing had recorded drymatter production on par with each other. However, the varieties, TMV-2, JL-24 and Narayani; and Narayani and Abhaya during 2006; and TMV-2, JL-24 and Narayani; and JL-24, Narayani and Abhaya during 2007, were observed to be on par with each other. The sowing date x variety interaction effect was noticed to be non-significant during both the years of study.

At 75 DAS,(Table 5) the drymatter production ranged from 234 g m^{-2} in TMV-2 sown during 7 June to 472 g m^{-2} in Abhaya sown during 12 July during 2006, and 317 g m^{-2} in 22 June sown crop of TMV-2 to 572 gm^{-2} in May sown crop of Abhaya during 2007. The results also revealed significant differences for sowing date, variety and their interaction during both the years of investigation. Among the sowing dates studied during 2006, 12 July sowing (458.25 gm^{-2}) had recorded significantly superior drymatter production, while 7 June sowing (246.75) had recorded significantly lower drymatter production, compared to other sowing dates. However, during 2007, 18 May sowing (526.75) had recorded maximum and significantly greater drymatter production, while 7 June (361.5) and 22 June (352.75) had registered significantly lower drymatter production. Among the varieties, maximum dry matter production was recorded for Abhaya (347.75), which was observed to be on par with JL-24 and Narayani (340.50) during 2006. Similarly, during 2007, maximum drymatter production was recorded for Abhaya (457.75). The variety, Narayani (439.25) had also recorded on par dry matter production with the Abhaya variety during 2007. Further, the interaction effect of sowing date and variety was also observed to be significant. A perusal of the interaction effects revealed maximum drymatter production for July sown Abhaya (472) during 2006, which was noticed to be on par with July sown TMV-2, JL-24, and Narayani; while 18 May sown Abhaya (572) had recorded maximum drymatter production during 2007, and was observed to be on par with 18 May sown JL-24 and Narayani.

The results on drymatter production at 90 DAS revealed significant differences for sowing date, variety and their interaction during both the years of investigation, (Table 6). Among the sowing dates studied during 2006, 12 July (586.5 gm^{-2}) had recorded significantly superior drymatter production, while 18 May (320.5) had recorded significantly lower drymatter production, compared to other sowing dates.

However, during 2007,18 May (579.25) had recorded maximum and significantly greater drymatter production, while 22 June (499.75) had registered significantly lower drymatter production, which was noticed to be on par with 7 June (515.75). Among the varieties, maximum dry matter production was recorded for Abhaya (605), which was observed to be on par with Narayani (596) and JL-24 (582), during 2006. Similarly, during 2007, maximum drymatter production was recorded for Abhaya (564.5). The variety, Narayani (539.5) had also recorded on par dry matter production with the Abhaya variety. Further, the interaction effect of sowing date and variety was also observed to be significant and a perusal of the interaction effects revealed maximum drymatter production for 12 July sown Abhaya (605) during 2006, which was noticed to be on par with 12 July sown Narayani (596) and 12 July sown JL-24 (582) ; while 18 May sown Abhaya (626) had recorded maximum drymatter production which is on par with 18 May sown Narayani (591) during 2007.

At harvest, the drymatter production was observed to range from 336 (gm^{-2}) (18 May TMV-2) to 651 (gm^{-2}) (12 July Abhaya) during 2006, and 478 (gm^{-2}) (22 June TMV-2) to 732 (gm^{-2}) (18 May Abhaya) during 2007, among the different treatments studied,(Table 7). The results also revealed existance of significant differences for sowing date, variety and their interaction effects. Among the different sowing dates studied, 12 July (635.5) had recorded maximum and significantly greater drymatter production, while significantly lower drymatter production was recorded for 18 May sowing (350.75) treatment, during 2006. However, during 2007, 18 May sowing (680.35) had recorded maximum and significantly higher drymatter production, while 22 June sowing (517.5) had recorded minimum drymatter production, which was also observed to be on par with 12 July (55.7) treatment. Among the varieties, Abhaya had recorded maximum drymatter production during both 2006 (651) and 2007 (579), which was also noticed to be on par with JL-24 and Narayani during both the years of investigation. Further, the results on the interaction effect of sowing dates and varieties revealed maximum drymatter production for 12 July Abhaya (651) during 2006, which was noticed to be on par with 12 July Narayani (644), 12 July JL-24 (635) and 12 July TMV-2 (612) treatments. However, during 2007, 18 May Abhaya sowing had recorded maximum drymatter production (732), which was observed to be on par with 18 May sown Narayani (699) and 18 May sown JL-24 (672) treatme

Table 4. Drymatter production of rainfed groundnut at different growth stages as influenced by date of sowing and variety

Date of sowing	15 DAS		30 DAS		45 DAS		60 DAS	
	2006	2007	2006	2007	2006	2007	2006	2007
18 May	21.15	22.90	63.85	114.27	210.50	220.50	244.30	266.25
7 June	16.70	23.22	89.70	75.35	131.70	140.26	166.50	282.00
22 June	18.65	15.52	61.45	33.30	80.80	104.70	146.50	179.50
12 July	13.85	19.67	48.47	94.90	153.00	152.80	280.50	373.25
SEm±	**0.50**	**0.76**	**1.50**	**3.75**	**5.70**	**9.50**	**5.30**	**9.70**
CD (P=0.05)	**1.75**	**2.50**	**5.30**	**13.20**	**20.00**	**33.00**	**18.30**	**33.80**
Varieties								
TMV-2	14.58	18.17	60.53	63.10	136.83	125.20	201.50	240.00
JL-24	17.10	19.47	63.66	71.36	140.70	145.90	206.50	253.25
Narayani	18.65	21.40	67.58	75.22	146.20	157.75	210.75	266.00
Abhaya	20.03	22.30	71.80	108.15	152.33	189.30	218.00	291.80
Sem±	**0.75**	**1.00**	**1.00**	**4.26**	**6.25**	**13.50**	**6.75**	**17.22**
CD(P=0.05)	**2.26**	**3.00**	**3.00**	**12.7**	**18.2**	**39.60**	**19.70**	**50.25**
Interaction	NS	NS	NS	NS	NS	NS	NS	NS

Table 5. Dry matter production (gm-^{2}) at 75 DAS as influenced by date of sowing and variety at different growth stages

Variety / Date	Kharif 2006					Kharif 2007				
	May 18	Jun 7	Jun 22	Jul 12	Mean	May 18	Jun 7	Jul 22	Jul 12	Mean
TMV-2	284	234	334	447	324.75	497	339	317	473	406.5
JL-24	288	244	346	451	332.25	505	368	334	485	423
Narayani	296	251	352	463	340.50	533	374	361	489	439.25
Abhaya	299	258	362	472	347.75	572	365	399	495	457.75
Mean	291.75	246.75	348.5	458.25	336.31	526.75	361.5	352.75	485.5	431.625
		SEm±		**CD(P=0.05)**		**SEm±**		**CD(P=0.05)**		
Date of sowing		5.8		20.0		7.2		25.00		
Variety		7.7		22.52		8.5		24.7		
D at V		14.4		43.72		16.2		49.0		
V at D		15.6		45.0		17.0		49.5		

Table 6. Dry matter production (gm-^{2}) at 90 DAS as influenced by date of sowing and variety at different growth stages

Variety / Date	Kharif 2006					Kharif 2007				
	May 18	Jun 7	Jun 22	Jul 12	Mean	May 18	Jun 7	Jul 22	Jul 12	Mean
TMV-2	307	364	457	563	422.75	544	493	460	509	501.5
JL-24	318	374	477	582	437.75	556	521	489	538	526
Narayani	327	379	486	596	447.00	591	522	501	544	539.5
Abhaya	330	382	492	605	452.25	626	527	549	556	564.5
Mean	320.5	374.75	478	586.5	439.94	579.25	515.75	499.75	536.75	532.875
		SEm±		**CD(P=0.05)**		**SEm±**		**CD(P=0.05)**		
Date of sowing		3.2		11.2		5.2		18.3		
Variety		5.3		15.2		8.7		26.0		
D at V		9.5		28.7		16.0		48.0		
V at D		10.5		30.5		17.5		50.8		

Table 7. Dry matter production (gm-^{2}) at harvest as influenced by date of sowing and variety

Variety / Date	Kharif 2006					Kharif 2007				
	May 18	Jun 7	Jun 22	Jul 12	Mean	May 18	Jun 7	Jul 22	Jul 12	Mean
TMV-2	336	410	504	612	465.50	631	570	478	526	551.25
JL-24	349	426	528	635	484.50	672	579	507	556	578.5
Narayani	355	437	539	644	493.75	699	590	518	562	592.25
Abhaya	363	446	545	651	501.25	732	621	567	579	624.75
Mean	350.75	429.75	529	635.5	486.25	683.5	590	517.5	555.75	586.6875
		SEm±		**CD(P=0.05)**		**SEm±**		**CD(P=0.05)**		
Date of sowing		8.7		30.3		12.75		44.0		
Variety		11.0		32.0		16.8		49.0		
D at V		21.0		63.0		31.5		95.0		
V at D		22.0		64.0		33.3		97.2		

Effect date of sowing and variety on yield and yield attributes

The results on effect of sowing date, variety and their interaction on yield and yield attributes of rainfed groundnut are presented in Tables 8-11.

Filled pods per plant

The number of filled pods per plant ranged from 7.96 (18 May TMV-2) to 17.22 (12 July Abhaya) during 2006, and 7.16 (22 June TMV-2) to 12.50 (7 June Abhaya) during 2007 (Table 8). The results also revealed existence of significant differences for sowing date, variety and their interaction effects. Among the different sowing dates, 12 July sowing had recorded maximum and significantly greater filled pods per plant (13.36), while significantly higher number of filled pods per plant (9.12) were recorded for 18 May sowing, during 2006. However, during 2007, 7 June sowing had recorded maximum and significantly higher number of filled pods per plant (11.75) while 22 June had recorded minimum and significantly lower number of filled pods per plant (7.64).

Among the varieties, Abhaya had recorded maximum and significantly higher number of filled pods per plant during both 2006 (13.51) and 2007 (10.37). Further, Abhaya was observed to be on par with TMV-2 (9.25), JL-24 (9.63) and Narayani (10.08) varieties during 2007. However, TMV-2 variety was observed to record minimum number of filled pods per plant during 2006 (9.70) and 2007 (9.25). The variety, JL-24 (10.15) had also recorded on par number of filled pods per plant, compared to TMV-2 variety during 2006. A perusal of the results on interaction effect of sowing date and variety also revealed maximum and significantly greater number of filled pods per plant (17.22) for 12 July sown Abhaya during 2006. However, during 2007, 7 June sown Abhaya (12.50) had recorded maximum number of filled pods per plant, and was observed to be on par with 18 May sown Abhaya (11.13), 7 June sown TMV-2 (10.70), 7 June sown JL-24 (11.56) and 22 June sown JL-24 (12.23).

Table 8. Filled pods (per plant) of groundnut at harvest as influenced by date of sowing and variety

Variety / Date	Kharif 2006					Kharif 2007				
	May 18	Jun 7	Jun 22	Jul 12	Mean	May 18	Jun 7	Jul 22	Jul 12	Mean
TMV-2	7.96	9.53	10.40	10.91	**9.70**	10.70	7.16	8.98	**9.25**	10.70
JL-24	8.27	10.02	10.87	11.42	**10.15**	11.ss56	7.33	9.19	**9.63**	11.ss56
Narayani	10.05	10.20	12.33	13.87	**11.61**	12.23	7.86	9.46	**10.08**	12.23
Abhaya	10.18	11.59	15.03	17.22	**13.51**	12.50	8.20	9.66	**10.37**	12.50
Mean	**9.12**	**10.34**	**12.16**	**13.36**	**11.24**	**11.75**	**7.64**	**9.32**	**9.83**	**11.75**
		SEm±		CD(P=0.05)		SEm±		CD(P=0.05)		
Date of sowing		0.26		0.90		0.28		0.97		
Variety		0.34		0.99		0.42		1.23		
D at V		0.55		1.64		0.78		2.32		
V at D		0.68		1.98		0.84		2.44		

Total pods per plant

The results on influence of sowing date, variety and their interaction on total pods per plant are presented in Table 9. The results revealed that the total number of pods per plant ranged from 13.40 with TMV-2 soon on May 18 to 21.83 (Abhaya sown on July 12) during 2006, and 10.89 (22 June sown TMV-2) to 17.23 (7 June sown Abhaya) during 2007. Further, significant differences were also observed for sowing date, variety and their interaction during both the years of investigation. Among the sowing dates, 12 July sowing had recorded significantly greater number of total pods per plant (18.38) than all other earlier sowings during 2006. During 2007, 7 June sowing had recorded significantly higher number of total pods per plant (16.85) than all other varieties. Among the varieties, significantly higher number of total pods per plant (19.06) were recorded by Abhaya while significantly lower number of total pods per plant (14.82) was observed with TMV-2, during 2006. However, during 2007, significantly higher number of total pods per plant was observed with Abhaya (14.56), which was noticed to be on par with Narayani (14.29) while significantly lower number of total pods per plant (13.65)were recorded for TMV-2. A perusal of the interaction effects revealed significantly higher number of total pods per plant (21.83) with Abhaya sown in 12 July 2006. During 2007, Abhaya sown in June 7 recorded significantly higher number of total pods per plant (17.23) which was noticed to be on par with 7 June sown JL-24 (16.80) and June 22 Narayani (17.02).

Table 9. Total pods (per plant) of groundnut at harvest as influenced by date of sowing and variety

Variety / Date	Kharif 2006					Kharif 2007				
	May 18	Jun 7	Jun 22	Jul 12	Mean	May 18	Jun 7	Jul 22	Jul 12	Mean
TMV-2	13.40	14.03	15.48	16.37	**14.82**	14.97	16.33	10.89	12.40	**13.65**
JL-24	13.68	14.12	16.07	17.00	**15.22**	15.37	16.80	11.12	12.79	**14.02**
Narayani	14.38	15.66	16.91	18.33	**16.32**	15.61	17.02	11.36	13.18	**14.29**
Abhaya	16.47	17.82	20.10	21.83	**19.06**	15.89	17.23	11.73	13.40	**14.56**
Mean	**14.48**	**15.41**	**17.14**	**18.38**	**16.35**	**15.46**	**16.85**	**11.28**	**12.94**	**14.13**
		SEm±		CD(P=0.05)		SEm±		CD(P=0.05)		
Date of sowing		0.05		0.17		0.07		0.24		
Variety		0.09		0.26		0.11		0.32		
D at V		0.16		0.48		0.20		0.60		
V at D		0.18		0.52		0.22		0.64		

Hundred pod weight and Shelling percentage

A perusal of the results revealed significant differences in 100 pod weight among sowing dates and varieties studied during 2006 and 2007 (Table 10). However, the interaction effect between sowing dates and varieties was observed to be non-significant during both the years of investigation. Among the different sowing dates, 12 July sowing had recorded significantly greater 100 pod weight(91.84) during 2006; while during 2007, 7 June sowing had recorded significantly higher 100 pod weight (90.15) . May 18 sowing during 2006, and 22 June sowing during 2007 had recorded significantly lower 100 pod weight compared to other sowing dates. Among the different varieties, Narayani had recorded maximum 100 pod weight during 2006 (92.30) and 2007 (90.19). Further, it was noticed to be on par with Abhaya during 2006 (90.93) and 2007 (87.59). The interaction effect of sowing dates and varieties was however, found to be non-significant during both the years of study.

The results on influence of sowing date, variety and their interaction on shelling percentage revealed higher shelling percentage for 12 July sowing (75.64), which was also noticed to be on par with 22 June sowing (74.10) during 2006 (Table 10); whereas during 2007, 7 June sowing (75.25) had recorded significantly higher shelling percentage compared to all other sowing dates studied. Among the varieties, Abhaya had recorded maximum shelling percentage during 2006 (75.14) and 2007 (76.10). Further, it was noticed to be on par with Narayani during 2006 (73.86). The interaction effect of sowing dates and varieties was however, found to be non-significant.

Table 10. Hundred pod weight and shelling percentage as influenced by date of sowing and variety

	Hundred pod weight		Shelling percentage	
Date of sowing	**2006**	**2007**	**2006**	**2007**
18 May	80.53	84.27	68.46	72.48
7 June	85.84	90.15	70.48	75.25
22 June	89.07	75.94	74.10	70.52
12 July	91.84	82.01	75.64	71.52
SEm±	**0.77**	**0.84**	**0.49**	**0.63**
CD(P=0.05)	**2.66**	**2.91**	**1.70**	**2.18**
Varieties				
TMV-2	75.30	70.17	69.30	69.84
JL -24	88.75	84.42	70.39	70.81
Narayani	92.30	90.19	73.86	73.02
Abhaya	90.93	87.59	75.14	76.10
SEm±	**1.14**	**1.26**	**0.56**	**0.65**
CD(P=0.05)	**3.33**	**3.68**	**1.63**	**1.90**
Interaction	NS	NS	NS	NS

The influence of sowing date, variety and their interaction on pod yield (Table 11) revealed the existence of significant differences among sowing dates, varieties and their interaction during both the years of investigation. Pod yield was noticed to range from 631(18 May sown TMV-2) to 1627(12 July sown Abhaya) during 2006, and from 690 (22 June sown TMV-2) to 2146 (7 June sown Abhaya) during 2007. Among the sowing dates, 12 July sowing (1491) had recorded maximum and significantly greater pod yield followed by 22 June sowing (1329) and 7 June sowing (1238) during 2006, while during 2007, 7 June sowing (1977) had recorded maximum and significantly higher pod yield, compared to other sowing dates. Among the varieties, Abhaya had recorded maximum pod yield during 2006 (1306) and 2007 (1674). However, it was also noticed to be on par with Narayani during 2006 (1252) and 2007 (1618). Further, the varieties, TMV-2 (1099) and JL-24 (1154); and JL-24 and Narayani varieties were observed to be on par with each other during 2006. During 2007 also, the varieties JL-24 (1479) and Narayani (1618) were noticed to be on par with each other.

The results on interaction effect of sowing dates and varieties revealed that maximum pod yield was recorded with Abhaya sown on July 12 (1627), which was also noticed to be on par with 12 July sown Narayani (1567), 12 July sown JL-24 (1411) and 22 June sown Abhaya (1394) varieties, during 2006. However, during 2007, 7 June sown Abhaya (2146) had recorded maximum pod yield, which was also noticed to be on par with 7 June sown Narayani (2026), 18 May sown Abhaya (1928) and Narayani (1914).

Table 11. Pod yield (kg ha^{-1}) as influenced by date of sowing and variety

Variety / Date	Kharif 2006					Kharif 2007				
	May 18	Jun 7	Jun 22	Jul 12	Mean	May 18	Jun 7	Jul 22	Jul 12	Mean
TMV-2	632	1130	1275	1360	**1099**	1441	1770	690	1115	**1254**
JL-24	693	1204	1308	1411	**1154**	1816	1966	735	1399	**1479**
Narayani	817	1287	1338	1567	**1252**	1914	2026	930	1601	**1618**
Abhaya	873	1331	1394	1627	**1306**	1928	2146	973	1649	**1674**
Mean	**754**	**1238**	**1329**	**1491**	**1203**	**1775**	**1977**	**832**	**1441**	**1506**
		SEm±		**CD(P=0.05)**		**SEm±**		**CD(P=0.05)**		
Date of sowing		31		109		33		114		
Variety		44		129		48		140		
D at V		83		248		89		266		
V at D		88		258		95		278		

DISCUSSION

PHENOLOGY

Crop phenology was influenced by various sowing times. The length of growth period increased (110-117 days) with normal sowing (July first fortnight) to early (139-146) (Second fortnight of May) sowing in 2006. Where as, in 2007, the crop duration extended from early (104-120 days) (18 May) sowing to 22 June sowing (112-125 days) under different varieties. The abnormal extension of growth period in 2006 is due to receipt of continuous rains after dry spell of 51 days from seed development phase to physiological maturity. Similarly in 2007 also, due to receipt of excess rains from 90 DAS to harvest, the crop duration extended from 112-125 days under different varieties.

The crop took more number of days to complete the later phases due to continuous rainfall. These findings were in confirmity with Kristarao (1996).

Plant growth

Significant differences in leaf area index, plant height, and total drymatter due to sowing dates and varieties were observed. Growth of crop as influenced by Plant height increased continuously throughout out the crop growth even upto the harvest.(Table 2). Growth of crop especially measured in plant height was influenced by date of sowing and variety but interaction was not significant. Plant height at different dates of sowing was mainly influenced by dry spell. Significantly taller plants (15.33 cm) was recorded in May 18 sown crop and lowest (8.43 cm) was recorded in July 12 sown crop as there was prolonged dry spell from June 29 to August 19.

Plant height

Maximum plant height was obtained with Narayani during both the years of study. Maximum plant height under 12 July sowing during 2006 is due to the reason that the crop did not experienced moisture stress at critical stages. The crop was exposed to favourable temperatures and high relative humidity. The similar findings were reported by several workers (Reddy *et al,* 1984, Kulaindavelu and Morchan (1983).

Leaf area index

The LAI gradually increased upto pod formation stage, then declined due to leaf shading at maturity. Highest LAI was obtained at 75 DAS during both the years. During drought year (2006) 12 July sowing recorded highest LAI. This is due to the fact that there were dry spells and the crop received well distributed rainfall during the crop period. The effects manifested clearly from 30 days onwards and continued upto harvest. Similarly during normal year (2007) 18 May and 7 June sowings recorded maximum LAI. over the rest of the treatments. This indicates that irrespective of sowing date moisture stress reduced LAI due to reduced rates of leaf initiation and leaf expansion. Further, functional radiation interception was reduced by folding of leaves with little decrease in LAI. Similar effects of moisture stress on LAI was observed by Ramesh babu *et al.,* (1989) and Mattews I (1988). Among the varieties studied Abhaya had the greater LAI during both the years followed by Narayani, JL-24 and TMV-2. This might be due to differences existed in cultivars to respond differently to moisture stress. Further ,in TMV-2, JL-24 and Narayani due to short duration, soil water deficit during early stages is greater than later stages. The results are in confirmity with Billaz and Ochs (1961), Stansell (1 979).

Dry matter

Drymatter production increased progressively with the advancement of crop growth from emergence to maturity (Table 4-7). Further the results also showed greater drymatter production during 2007 due to well distributed rains. Normal sowing (12 July) in 2006 showed higher drymatter production due to reduced effect of moisture stress at different growth stages. These results find support of Murthy and Rao (1986), Basu and Reddy (1989), Chandrika *et al.* (2008). In general water stress reduces the assimilates of photosynthates and there by decreases the crop growth.

Yield and yield attributes

The yield attributes viz., number of filled pods, hundred pod weight and shelling percentage were higher during 2007. 12 July and 22 July sowings during 2006 (Table 8-11) while 18 May and 7 June sowings recorded higher filled pods,100 pod weight and shelling percentage due to favourable distribution of rainfall at critical stages. Further in 18 May sowing(2007) due to coincidence of moisture stress that prevailed during pod filling and maturity though favoured the drymatter production but affected the yield attributes like filler pods, 100 pod weight shelling percentage and yield. Similarly 12 July sowing during 2006 and 7 June sowing during 2007 recorded higher pod yields compared to other sowing dates. This in turn reflected in other growth parameters like high LAI and drymatter production. In May sowing (2006) the crop suffered severely due to moisture stress at pod filling period which drastically reduced the pod yields.

INFLUENCE OF VARIETIES

The relative performance of varieties viz., TMV-2, JL-24, Narayani and Abhaya varieties under different dates of sowing revealed that the range of yield among varieties in different environments is 632 kg/ha^{-1} to 2146kg ha^{-1} variety. Abhaya performed well followed by Narayani under moisture stress conditions (2006). The performance of TMV-2 and JL-24 were inferior under moisture stress resulting poor yields. The yield range of TMV-2 in the 6 rainfed environments is 632 kg ha^{-1} to 1770 kg ha^{-1}. The yield range of Abhaya in eight environments is 873 kg ha-1 to 2146 kg ha^{-1} . It is observed that environment played major influence on yield level of variety than varieties themselves. The main reason for variation is drought stress. Highest yield was obtained in 7 June, 2007 environment. The important character of this environment is less dry spell, no wet spell, high sunshine hours and moderate temperature.

Though the crop experienced 70 days dry spell Abhaya could able to give 873 kg ha^{-1} followed by Narayani (817 kg ha^{-1}). Similarly the same variety Abhaya also suited to normal date of sowing in 2007 and could produce 1649 kg ha^{-1} to 2146 kg ha^{-1} in different sowing dates.

However 22 June crop adversely affected with heavy rains from 90 DAS to harvest resulting poor filling and low yields (972 kg ha^{-1}). All the varieties in the same date of sowing got affected with excess moisture at pod filling to harvest. It is interesting that in 2007 TMV-2 and JL-24 could also produce 1100-1966 kg ha^{-1} under different dates of sowing. Similarly other growth characters like plant height, LAI, and drymatter also followed the same trend as in pod yield.

Taking all the agronomic conclusions under the study, it is revealed that as the dates of sowing are not consistent in both the years, it can be conclude that under drought years July first fortnight can be taken as suitable time for rainfed groundnut sowing at Tirupathi and if monsoon is normal with good distribution of rains accompanied with summer rains sowing can also be taken up one month prior to normal date of sowing. The second conclusion may pertain only to the present study, but in general the July first fortnight sowing passes its pod filling phase with good probability of getting good rainfall with existing climate with better scope for getting good crop rather than to fail.

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