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Effect of Date of Sowing on Development of Root Rot Complex Disease in Groundnut (*Arachis hypogaea* L.)

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A B S T R A C T

The objective of research was to evaluate the effect of different sowing dates on the development of root rot complex disease on the two cultivars of groundnut namely SG-99 and M-522. Effect of sowing date on the disease development was studied at three locations with seven sowing dates and three replications. The crop was sown at 15th March, 30th March, 15th April, 30th April, 15th May, 30th May and 15th July. The highest number of yield contributing characters and pod yield was recorded in early sown crop (15th and 30th March sown crop) because of less disease development. Due to unfavourable weather for disease development, early sown crop escaped from disease attack. Among the total seven sowing dates, 15th March was most suitable for SG-99 and 30th March for M-522. The early sowing of virginia type groundnut (M-522) was more sensitive to the temperature compared to spanish type (SG-99). Low temperature during germination adversely effected the germination of virginia type groundnut variety (M-522).

Introduction

Groundnut is one of the most important oilseed crops that occupy an area of 25.44 million hectares with production of 45.22 million tons in the world (Anonymous 2014). In India, groundnut is major oilseed crop with area of 4.7 million hectares with a total production of 7.4 million tons having productivity of 1552 kg/ha (Anonymous 2015). Growth and yield of a crop depend on a number of factors. However, biotic stresses play the most important role. Among the biotic stresses, role of diseases, insect and nematodes is important. The oilseed crops, particularly groundnut are very sensitive to

seed and soil borne diseases caused by different plant pathogenic fungi like *Aspergillus niger, A. flavus, Macrophomina phaseolina, Rhizoctonia solani* and *Sclerotium rolfsii* (Parvathi *et al.,* 1985). These pathogens attack the crop alone or in combination and produces symptoms in complex form with collar rot, dry root rot and stem rot symptoms. This root rot complex pose a major threat causing considerable damage to crop during any stage of its growth. Date of sowing of crop also have remarkable effect on root rot complex disease development in groundnut. Various scientists conducted field trials to study the effect of date of sowing on disease development and pod yield. In Egypt, May 1stis the best sowing date and disease was 44.6% as compared to other dates (Atta-Alla *et al.,* 2004). Late sowing of both semi spreading and bunch type varieties in month of June had resulted in declined in yield and less growth as compared to timely sowing in the month of May (Sardana *et al.,* 2008). Similarly, five sowing dates at Pune were studied and results revealed that the sowing groundnut on 6th July significantly influenced various growth contributing characters and pod yield which was found significantly superior over all the sowing date treatments (Kanade *et al.,* 2015). The present study was planned with objective to compare the effect of seven sowing times on disease development and pod yield of two groundnut cultivars grown under irrigated conditions in Punjab state.

Materials and Methods

The experiment on date of sowing was conducted during 2017 at three locations- 1) Oilseed research farm at Punjab Agricultural University, Ludhiana 2) Krishi Vigyan Kendra, Kheri, Sangrur 3) Punjab Agricultural University Regional Research Station, Ballowal Saunkhri. Two cultivars, SG-99 and M-522 were sown following the recommended cultivation practices like seed rate, spacing, irrigation and fertilizer application etc. mentioned in package of practices for cultivation of *kharif* crops in Punjab. Experiment on effect of date of sowing was sown in plots of 3 X 5 m^2 size. Total seven sowing dates15th March, 30th March, 15th April, 30th April, 15th May, 30th May and 15th July were taken. Observations on germination and mortality of plants due to root rot complex were recorded at weekly interval for two months. The percent disease incidence was calculated on the basis of mortality of plants. Observations on number of gynophores, pod yield and plant biomass were also recorded. The soil of the experimental field had adequate fertility and was suitable for a growth of the groundnut crop in Randomized Block Design (RBD). The groundnut crop was harvested when the colour of inner side of shell turned grayish. The maturity of pods was ensured by uprooting the border plants. The tabulated data were statistically processed by the standard method of analysis of variance for the Randomized Block Design and test of significance as given by Panse and Sukhatme (1985). The data were statistically analyzed as per randomized block design using computer programme SAS software.

Results and Discussion

The data on effect of sowing dates on the per cent germination, per cent disease incidence, pod yield and yield contributing traits were collected from all the locations and pooled.

Germination percentage

As far germination is concerned, both variety and location behaved differently. The results presented in Table 1 were obtained from the trials conducted at all three locations and data is also pooled. The pooled data (Table 1) revealed that the maximum germination

percentage was observed in the 30th May sown crop in both varieties (88.24% in SG-99 and 86.23 % in M-522). On the other hand, minimum germination was observed in 15th March sown crop in both cultivars (73.83% in SG-99 and 50.54% in M-522). The present results concluded that the germination percentage for both the varieties was increased with subsequent sowing dates starting from 15th March upto 30th May and again decreased in 15th June sown crop. Between varieties, the germination of SG-99 was better than M-522 in all sowing dates. The low germination in 15th March sown crop in both varieties especially in M-522 was due to the low temperature which was around 16-17 ºC. It had been revealed that early sowing of Virginia type groundnut (M-522) was more sensitive to the temperature whereas spanish type (SG-99) was less sensitive to the temperature. Hence, we can conclude that the sowing of M-522 should not be done under low temperature conditions particularly less than 20ºC otherwise seed requirement need to be recalculated.

While the SG-99 could be sown early as it gave good germination even under low temperature conditions. The results are in line with findings of Salmasi *et al.,* (2006) in dil who reported maximum germination was observed in the seeds of 3 April (92.0%) sowing date. Likewise, Sharma *et al.,* (2013) reported the maximum germination (92.30%) in seeds obtained from early sowing dates. They also reported that the germination of SG-99 was significantly higher than M-522 in all sowing dates.

Disease Incidence

As far disease incidence is concerned, the per cent disease incidence was recorded from three locations and in two varieties and then whole data was pooled. The pooled data (Table 1) showed that the minimum disease incidence of 7.61 per cent and 9.78 per cent for varieties SG-99 and M-522 respectively was recorded in spring crop sown during 15th March.

There was a non-significant difference in disease incidence in both varieties for 15th March and 30th March sown crop. However, the maximum disease incidence of 33.54 per cent (SG-99) and 35.17 per cent (M-522) was observed in the 15th June sown crop. Results showed that early sowing of groundnut escaped the disease attack and there was progressive increase in the disease incidence with delay in date of sowing. There was increase in disease incidence (Figure 1) with subsequent sowing dates starting from 15th March upto 15th June.

The both varieties also showed significant difference of disease incidence between them. The Spanish type variety (SG-99) showed more tolerance to the root rot complex disease than virginia type (M-522) over all the locations and in all the sowing dates. Both varieties showed same behaviour for disease score as 15th and 30th March sown crop showed escape from disease while 15th June sown crop showed maximum disease incidence (Plate 1) because the agrometerological conditions were congenial for disease development.

These results justify the findings of Helal *et al.,* (1994) and Atta-Alla *et al.,* (2004) in Egypt who reported least percentage of pre- and post- emergence damping-off and pod rots in early sown groundnut crop compared to all other dates of sowing. Likewise, Craufurd *et al.,* (2006) found that infection of *Aspergillus* was ranged from 19-81 per cent and increased with late sowing of groundnut. The results also corroborate the findings of Kumar M and Kudada (2018) who reported that the early sowing in French beans decreases the *Rhizoctonia* root rot disease incidence.

Table.1 Effect of date of sowing on germination and root rot complex incidence in groundnut

Date of Sowing	Variety	Germination Percentage				Disease Incidence (%)			
		Ludhiana	Ballowal Saunkhri	Kheri	Pooled	Ludhiana	Ballowal Saunkhri	Kheri	Pooled
15-March	SG-99	75.83 (60.53)	74.20 (59.45)	71.46 (57.69)	73.83 (59.21)	7.45 (15.83)	8.11 (16.54)	7.28 (15.65)	7.61 (16.01)
	M-522	48.81 (44.30)	45.33 (42.30)	57.50 (49.29)	50.54 (45.29)	8.92 (17.37)	10.78 (19.16)	9.64 (18.08)	9.78 (18.22)
30-March	SG-99	82.50 (65.24)	81.96 (64.84)	75.10 (60.04)	80.85 (64.02)	8.34 (16.78)	9.23 (17.68)	8.54 (16.98)	8.70 (18.15)
	M-522	74.13 (59.40)	74.53 (59.67)	72.70 (58.07)	78.24 (62.17)	9.46 (17.91)	11.34 (19.67)	10.73 (19.12)	10.40 (18.81)
15-April	SG-99	87.00 (68.84)	86.30 (68.25)	78.35 (62.25)	84.66 (66.91)	15.28 (23.00)	16.93 (24.29)	15.87 (23.46)	16.03 (23.59)
	M-522	80.63 (63.86)	81.50 (64.50)	77.83 (61.89)	80.83 (64.01)	17.11 (24.43)	19.30 (26.05)	17.94 (25.05)	18.12 (25.18)
30-April	SG-99	88.33 (70.00)	87.96 (69.67)	81.36 (64.40)	83.32 (65.87)	21.96 (27.93)	24.74 (29.81)	22.65 (28.41)	23.12 (28.73)
	M-522	86.50 (68.42)	84.96 (67.15)	80.23 (63.57)	77.89 (61.93)	23.21 (28.79)	25.30 (30.18)	23.94 (29.28)	24.15 (29.42)
15-May	SG-99	89.33 (70.91)	88.20 (69.88)	82.53 (65.27)	79.91 (63.34)	26.54 (31.00)	27.94 (31.90)	27.14 (31.38)	27.21 (31.43)
	M-522	87.20 (69.01)	87.00 (68.84)	82.03 (64.89)	81.23 (64.30)	26.23 (30.79)	28.17 (32.04)	26.65 (31.07)	27.02 (31.30)
30-May	SG-99	90.50 (72.02)	90.33 (71.85)	84.90 (67.11)	88.24 (69.92)	27.23 (31.44)	28.82 (32.46)	27.45 (31.58)	27.83 (31.83)
	M-522	88.63 (70.27)	87.16 (68.97)	80.53 (63.79)	86.23 (68.19)	29.87(33.11)	32.15 (34.53)	30.25 (33.35)	30.76 (33.67)
15-June	SG-99	87.33 (69.12)	83.33 (65.88)	82.26 (65.06)	82.97 (65.61)	32.45 (34.71)	34.94 (36.22)	33.24 (35.19)	33.54 (35.38)
	M-522	85.43 (67.53)	83.83 (66.26)	79.30 (62.91)	82.32 (65.11)	34.15 (35.74)	36.31 (37.04)	35.04 (36.28)	35.17 (36.36)
CD at 5 % (Variety)	-	1.43	3.09	2.75	1.41	0.59	0.54	0.62	0.33
CD at 5 % (Date)	-	2.68	5.78	5.15	2.64	1.11	1.01	1.15	0.61
CD at 5 % (Location)	-	-	-	-	1.73	-	-	-	0.40
CD at 5 % (Variety× Date)	-	3.78	8.18	7.28	3.74	1.57	1.43	1.63	0.86
CD at 5 % (Location × Date)	-	-	-	-	4.58	-	-	-	1.06
CD at 5 % (Location × Variety)	-	-	-	-	2.45	-	-	-	0.57
CD at 5 % (Location × Variety × Date)	-	-	-	-	0.99	-	-	-	1.50
CV at 5%	-	2.74	6.00	5.76	5.00	3.56	3.08	3.63	3.43

Figures in parentheses are angular transformed values

Table.2 Effect of date of sowing on pod yield of groundnut

Date of Sowing	Variety	Ludhiana		Ballowal Saunkhri		Kheri		Pooled	
		Fresh pod yield (kg/ha)	Dry pod yield (kg/ha)	Fresh pod yield (kg/ha)	Dry pod yield (kg/ha)	Fresh pod yield (kg/ha)	Dry pod yield (kg/ha)	Fresh pod yield (kg/ha)	Dry pod yield (kg/ha)
15-March	SG-99	8811	5400	8422	5211	7978	4889	8422	5211
	M-522	7189	3733	7522	3900	6856	3578	7189	3867
30-March	SG-99	8567	5156	8933	5489	8633	5200	8722	5489
	M-522	9633	4778	9078	4778	9333	4800	9356	4878
15-April	SG-99	7044	4422	6500	4000	6778	4000	6778	4067
	M-522	6489	3456	6111	3144	6867	3633	6489	3567
30-April	SG-99	5322	3311	5489	3367	5656	3489	5489	3311
	M-522	4822	2500	5078	2689	4944	2556	4944	2800
15-May	SG-99	4700	2889	4456	2744	4944	3056	4700	2811
	M-522	4667	2433	4422	2311	4178	2167	4422	2344
30-May	SG-99	4022	2556	3778	2344	3433	2144	3744	2356
	M-522	3844	2000	3267	1733	3556	1867	3556	1956
15-June	SG-99	2933	1867	3100	1922	2822	1744	2956	1778
	M-522	2522	1322	2600	1511	2656	1389	2589	1467
CD at 5 % (Variety)	-	211	156	144	89	200	100	100	67
CD at 5 % (Date)	-	400	300	278	167	356	189	189	122
CD at 5 % (Location)	-	-	-	-	-	-	-	122	78
CD at 5 % (Variety× Date)	-	567	422	389	244	522	278	267	178
CD at 5 % (Location × Date)	-	-	-	-	-	-	-	333	222
CD at 5 % (Location × Variety)	-	-	-	-	-	-	-	178	122
CD at 5 % (Location × Variety × Date)	-	-	-	-	-	-	-	467	311
CV at 5%	-	5.91	7.78	4.13	4.43	4.92	5.12	5.05	5.98

Table.3 Effect of date of sowing on plant biomass of groundnut

Date of Sowing	Variety	Ludhiana		Ballowal Saunkhri		Kheri		Pooled	
		Fresh plant biomass (000'kg/ha)	Dry plant biomass (000'kg/ha)	Fresh plant biomass (000'kg/ha)	Dry plant biomass (000'kg/ha)	Fresh plant biomass (000'kg/ha)	Dry plant biomass (000'kg/ha)	Fresh plant biomass (000'kg/ha)	Dry plant biomass (000'kg/ha)
15-March	SG-99	28.33	8.24	49.91	14.88	28.68	13.66	32.31	11.88
	M-522	28.89	8.28	54.09	15.46	25.46	10.33	32.81	11.36
30-March	SG-99	28.89	12.48	38.63	11.09	31.59	12.97	33.03	12.18
	M-522	29.07	12.78	62.32	17.72	32.59	13.16	41.33	14.56
15-April	SG-99	26.11	10.00	36.19	12.08	29.26	12.89	30.52	11.66
	M-522	26.18	10.37	48.09	14.23	28.14	12.41	34.14	12.33
30-April	SG-99	22.67	8.89	29.57	9.71	31.86	13.42	28.03	10.68
	M-522	23.11	8.67	29.03	9.34	33.33	14.00	28.49	10.67
15-May	SG-99	14.44	8.06	26.29	9.12	26.11	11.11	22.28	9.43
	M-522	18.89	7.96	31.39	10.54	31.86	13.58	27.38	10.69
30-May	SG-99	4.56	3.59	24.56	78.11	30.14	14.59	19.76	8.67
	M-522	5.84	3.29	37.46	11.16	28.03	13.53	23.78	9.33
15-June	SG-99	4.44	1.89	25.81	8.87	17.78	7.92	16.01	6.23
	M-522	6.40	3.24	30.96	9.58	16.11	7.33	17.82	6.91
CD at 5 % (Variety)	-	0.97	0.56	2.00	0.60	2.04	0.90	0.98	0.39
CD at 5 % (Date)	-	1.8	1.04	3.74	1.12	3.82	1.69	1.82	0.73
CD at 5 % (Location)	-	-	-	-	-	-	-	1.19	0.48
CD at 5 % (Variety× Date)	-	2.56	1.47	5.29	1.59	5.41	2.38	2.58	1.04
CD at 5 % (Location × Date)	-	-	-	-	-	-	-	3.16	1.28
CD at 5 % (Location × Variety)	-	-	-	-	-	-	-	1.69	0.68
CD at 5 % (Location × Variety × Date)	-	-	-	-	-	-	-	4.47	1.80
CV at 5%	-	8.32	10.62	8.42	8.18	11.56	11.61	9.86	10.37

Table.4 Effect of date of sowing on number of gynophores and pods per plant in groundnut

Date of Sowing	Variety	No. of gynophores/ plant				No. of pods/ plant			
		Ludhiana	Ballowal Saunkhri	Kheri	Pooled	Ludhiana	Ballowal Saunkhri	Kheri	Pooled
15-March	SG-99	123.66	80.43	123.13	109.07	103.60	68.06	71.13	80.93
	M-522	137.06	79.13	167.33	127.84	83.46	81.26	100.20	88.30
30-March	SG-99	149.30	63.03	124.26	112.19	68.33	66.60	72.73	69.22
	M-522	104.66	74.83	115.06	98.18	57.86	53.40	57.73	56.33
15-April	SG-99	115.46	75.70	117.73	102.96	53.53	53.33	87.66	64.84
	M-522	105.73	54.43	112.60	90.92	53.13	44.13	54.53	55.62
30-April	SG-99	104.86	54.56	96.46	85.29	59.80	58.46	48.13	55.46
	M-522	69.33	60.73	100.53	76.86	39.53	59.20	68.26	49.15
15-May	SG-99	69.93	58.60	101.20	76.58	49.06	51.06	54.80	51.64
	M-522	63.26	63.33	93.00	73.19	39.86	39.66	51.33	45.10
30-May	SG-99	51.46	55.53	81.26	62.75	33.33	37.73	50.73	45.93
	M-522	46.26	55.03	70.80	57.36	31.80	35.26	42.00	36.35
15-June	SG-99	36.20	50.30	35.06	40.52	21.46	30.00	20.26	23.90
	M-522	37.93	51.93	36.06	41.97	26.00	33.53	32.60	30.71
CD at 5 % (Variety)	-	5.68	2.48	6.95	3.01	3.71	4.11	5.69	2.56
CD at 5 % (Date)	-	10.62	4.65	13.01	5.63	6.94	7.69	10.63	4.80
CD at 5 % (Location)	-	-	-	-	3.68	-	-	-	3.14
CD at 5 % (Variety× Date)	-	15.03	6.57	18.41	7.96	9.81	10.88	15.08	6.79
CD at 5 % (Location × Date)	-	-	-	-	9.75	-	-	-	8.31
CD at 5 % (Location × Variety)	-	-	-	-	5.21	-	-	-	4.44
CD at 5 % (Location × Variety × Date)	-	-	-	-	13.79	-	-	-	11.75
CV at 5%	-	10.42	6.25	11.17	10.31	11.50	12.75	15.48	13.58

Table.5 Effect of date of sowing on number of ripened and immature pods per plant in groundnut

Date of Sowing	Variety	No. of ripened pods/ plant				No. of immature pods/ plant			
		Ludhiana	Ballowal Saunkhri	Kheri	Pooled	Ludhiana	Ballowal Saunkhri	Kheri	Pooled
15-March	SG-99	42.20	43.60	34.33	40.04	24.06	23.46	21.80	23.11
	M-522	46.46	44.26	44.46	45.06	27.06	27.40	37.66	30.71
30-March	SG-99	41.00	40.46	32.93	38.13	20.66	22.06	20.93	21.22
	M-522	33.40	31.40	25.80	30.20	24.20	24.20	18.90	22.44
15-April	SG-99	35.40	28.80	49.73	37.97	21.20	21.99	14.40	19.22
	M-522	22.06	22.40	42.86	29.10	19.33	18.93	17.26	18.51
30-April	SG-99	26.26	28.46	42.06	32.26	16.53	16.80	20.40	17.91
	M-522	19.86	24.60	32.00	25.48	29.20	10.80	14.60	18.20
15-May	SG-99	29.73	34.20	28.33	30.76	11.26	11.46	11.33	11.35
	M-522	21.53	25.20	32.06	26.26	11.60	11.13	16.60	13.11
30-May	SG-99	21.53	24.00	28.93	24.82	4.86	5.80	23.00	11.22
	M-522	19.66	22.66	27.00	23.10	7.80	5.46	10.33	7.86
15-June	SG-99	17.66	21.20	18.13	19.06	4.66	5.40	4.40	4.82
	M-522	19.53	21.93	19.66	20.37	4.66	5.60	5.40	5.22
CD at 5 % (Variety)	-	2.51	2.35	2.42	1.36	1.05	1.20	1.49	0.71
CD at 5 % (Date)	-	4.69	4.39	4.53	2.54	1.96	2.25	2.80	1.32
CD at 5 % (Location)	-	-	-	-	1.66	-	-	-	0.86
CD at 5 % (Variety× Date)	-	6.63	6.21	6.41	3.59	2.77	3.18	2.40	1.87
CD at 5 % (Location × Date)	-	-	-	-	4.40	-	-	-	2.29
CD at 5 % (Location × Variety)	-	-	-	-	2.35	-	-	-	1.22
CD at 5 % (Location × Variety × Date)	-	-	-	-	6.22	-	-	-	3.24
CV at 5%	-	13.85	12.54	11.45	12.55	11.10	12.63	13.92	12.75

Fig.1 Percent disease incidence of groundnut varieties SG-99 and M-522 on different dates of sowing

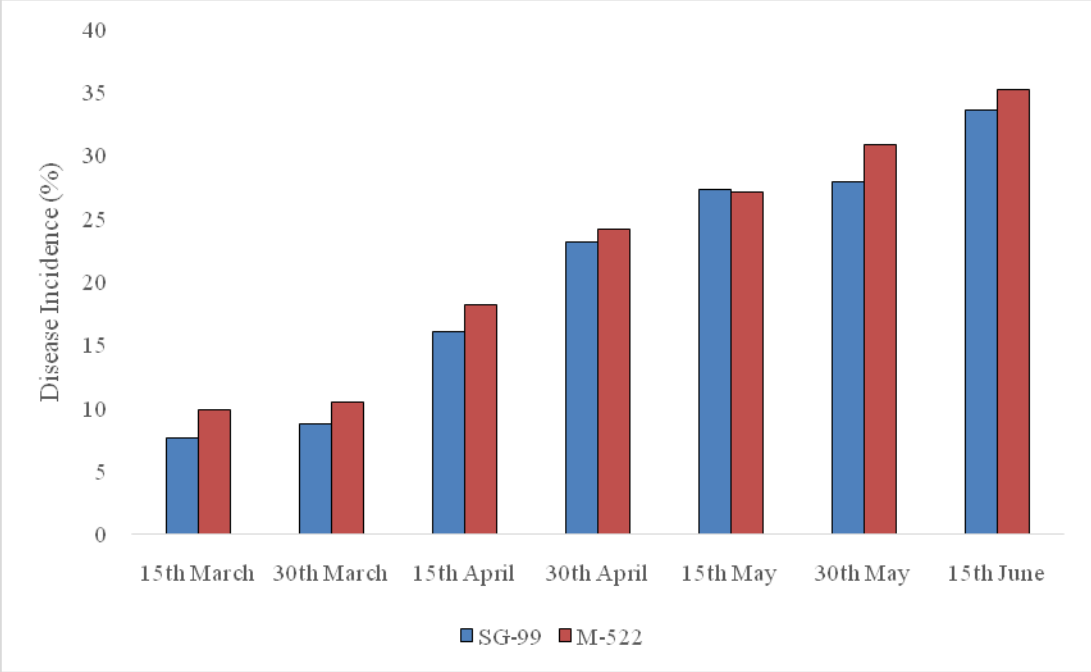

Fig.2 Dry pod yield of groundnut varieties SG-99 and M-522 during different dates of sowing

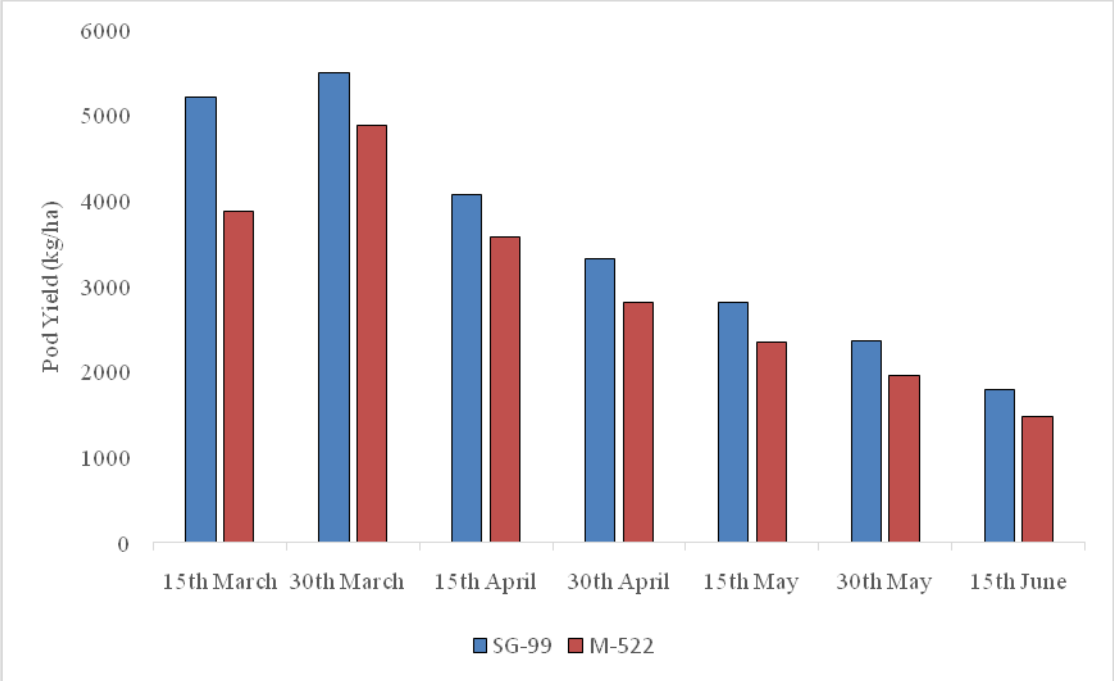

Fig.3 Yield contributing parameters of variety SG-99 sown during different dates of sowing

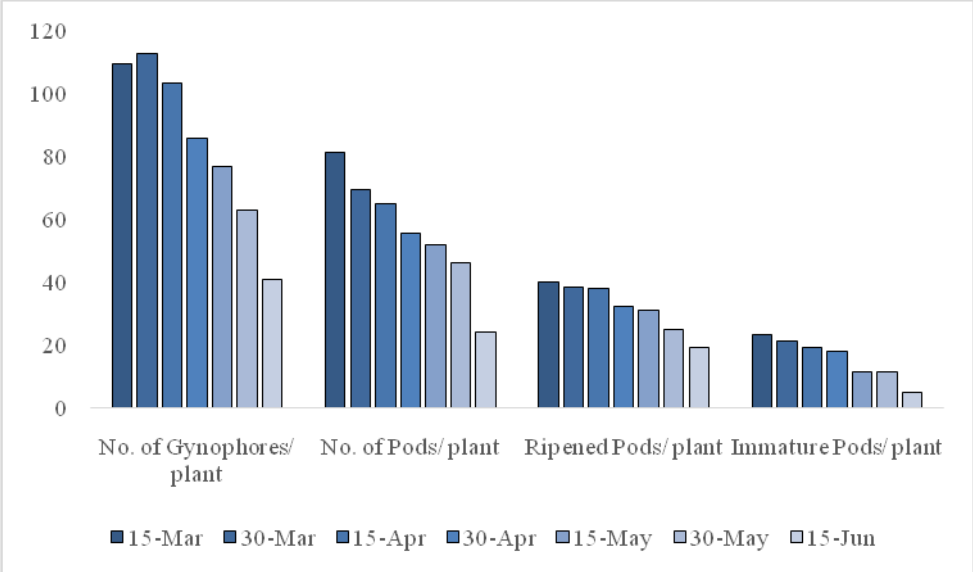

Fig.4 Yield contributing parameters of variety M-522 sown during different dates of sowing

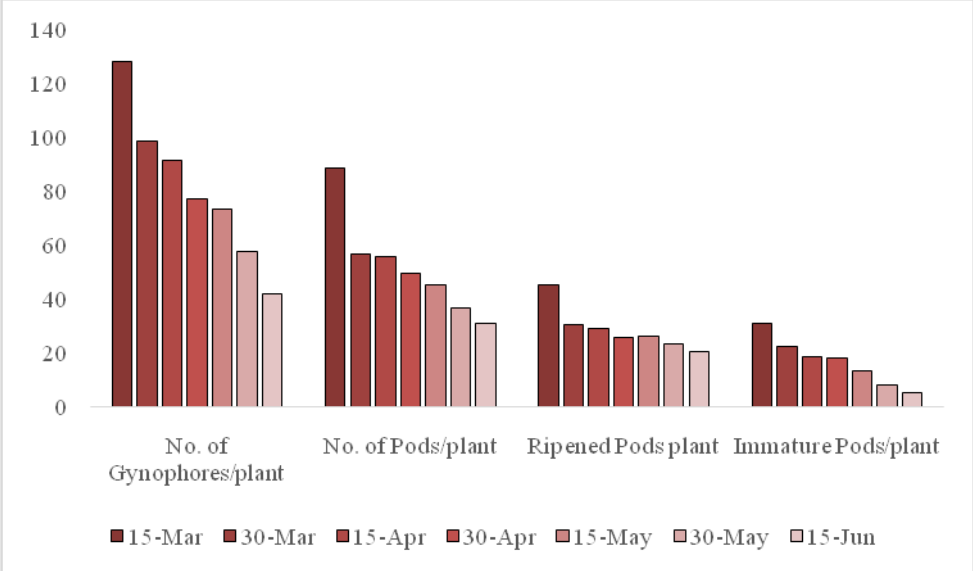

Plate.1 Effect of date of sowing on crop stand due to disease in (a) 30 March sowing date and (b) 15 June sowing date

Dry pod yield

Pod yield of groundnut crop sown at different dates were recorded. The pooled data (Table 2) revealed that the highest pod yield for both varieties was recorded in 30 March sown crop (5489 kg/ ha in SG-99 and 4878 kg/ ha in M-522) and the lowest pod yield was recorded in crop sown during 15 June (1778 kg/ ha in SG-99 and 1467 kg/ ha in M-522). The pod yield was decreased (Figure 2) with subsequent dates starting from 15 March to 15 June due to increase in the disease incidence during the same period. Both the varieties showed significant difference among them for pod yield. The highest pod yield was recorded in variety SG-99 and the other variety M-522 gave lower yield in all dates of sowing all over the locations. The maximum yield was recorded on the 30th March sown crop but in the prevailing scenario of Punjab and fitting the crop in Potato-Rice system it is desirable to sow the crop early (15-March) because it vacate the field for sowing of next crop (Rice) with very nominal decrease in the yield of SG-99 variety. However, the maximum pod yield was recorded in 30thMarch sown crop but sowing of this crop delays the sowing of the preceding crop (Rice). So, if we go for sowing a crop during 15th March, there was a nominal decrease in the yield from 15th March sown crop but it fits best in the cropping system.

For virginia type groundnut (M- 522) the desirable date of sowing is 30th March and after that there is a decrease in yield potential. Hence, we concluded that early sowing in both varieties escaped the disease attack and give maximum yield potential. These results were in accordance with earlier findings of Abd El-Halem *et al.,* (1986), Reddy and Reddy (2000), Sukbok *et al.,* (2002) and Sardana *et al.,* (2008). Similarly, Canavar and Kaynak (2008) in Turkey, reported that pod yield of peanut was effected by sowing time, with early sowing resulting in high yield.

Dry plant biomass

The pooled data (Table 3) showed that the maximum dry plant biomass production was recorded in 15 March sowing date for SG -99 (11.88 thousand kg/ha) and 30 March sowing date for M-522 (14.56 thousand kg/ha). On the other hand, the minimum dry plant biomass production was observed in 15th June sown crop (6.23 thousand kg/ha for SG-99 and 6.91 thousand kg/ha for M-522). The plant biomass production was recorded to decrease from 15th March to 15th June sown crop in both the varieties. These results corroborate the earlier findings of Ali *et al.,* (1994) and Bala *et al.,* (2011).

Yield contributing parameters

The data on four yield contributing parameters namely number of gynophores/plant, number of pods/plant, ripened pods/plant and immature pods/plant were also recorded (Figure 3 and 4). The pooled data (Table 4 and 5) showed that the maximum number of gynophores/plant in variety SG-99 was observed during 15th March (109.07) and 30th March (112.19) sown crop with non-significant difference between them, however in variety M-522 it is observed only in 15th March (127.84) sown crop. On the other side, the minimum number of gynophores was recorded in 15th June sown crop in both the varieties. Our results are in line with those reported by Park *et al.,* (1986) and Reddy and Reddy (2000).

The total number of pods/plant, number of ripened pods/plant and number of immature pods/ plant was higher in 15th March sown crop in both of the test varieties and number decreased with subsequent delay in dates of sowing. Similar results have been reported by Abd El-Halem *et al.,* (1986), Park *et al.,* (1986), Reddy and Reddy (2000), Canavar and Kaynak (2008) and Kanade *et al.,* (2015) in

groundnut, they concluded that number of pods per plant was higher for early and middle planting dates than late planting dates.

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