Productivity of semi-spreading and bunch type varieties of groundnut as influenced by sowing dates

Virender Sardana* and **SS Kandhola**
Department of Plant Breeding, Genetics and Biotechnology, Punjab Agricultural University (PAU), Ludhiana 141 004, Punjab, India
*Corresponding author: virsardana@yahoo.co.in

Groundnut (*Arachis hypogaea*) is not only a rich source of polyunsaturated fatty acids (oleic and linoleic acids), but also possesses good quality protein, minerals and vitamins. While higher oleic acid content provides thermal stability and makes it suitable for deep frying, higher linoleic acid is good for health. Being rich in fat and protein, it is considered as a cheap source of nutritive food for the under-nourished, poverty-stricken population to overcome protein-energy malnutrition. Thus groundnut production offers opportunities to bridge the demand-supply gap of edible oils in India and to tap its vast export potential in the form of confectionery products, peanut butter, etc.

In the pre-Green Revolution era, groundnut was the principal oilseed crop of Punjab, India occupying more than 60% of the total area under oilseeds. At present, rice (*Oryza sativa*) is the major *kharif* (rainy season) crop and paddy-wheat (*Triticum aestivum*) is the predominant cropping sequence of the state. Paddy is grown even on coarse-textured soils during May–June to September–October. Paddy requires about 200 cm water in about 20–25 irrigations for puddling, transplanting, seedling establishment and to meet higher demand of crop during summer/*kharif* months when temperature normally exceeds 40°C, thus causing over-exploitation of groundwater resources as paddy is transplanted much before rainy season (July to mid-September) and is heavily dependent on tubewell irrigation. The water table in paddy growing areas in the state is declining by about 75 cm per annum. The cost of pumping water is increasing, as the centrifuge pumps are not able to draw water from deeper depths and are being replaced by submersibles. Because of over-exploitation of groundwater and increasing cost of cultivation, widespread multiple nutrient deficiencies and deteriorating soil structure due to paddy-wheat monoculture for more than three decades, there is a need to reduce area under paddy to sustain farming in Punjab. Groundnut is considered as a potential crop, which can replace substantial area under paddy, provided it offers comparable income. Groundnut and paddy are grown during similar seasons and have similar growth duration. While groundnut is sown in end of April to early May as summer crop and from end of May to early June as *kharif* crop, paddy is transplanted in June though early transplanting in May is not uncommon. However, groundnut requires only 2–3 irrigations of 6–7 cm depth each for summer crop and only 1–2 irrigations for *kharif* crop in comparison to about 200 cm water consumed by paddy. There is, however, a need to evolve high-yielding varieties of groundnut to replace sizeable area under paddy with groundnut.

Semi-spreading (*A. hypogaea* subsp *hypogaea* var *hypogaea*) and bunch type (*A. hypogaea* subsp *fastigiata* var *vulgaris*) varieties of groundnut differ in their potential productivity, which is further influenced by sowing time (Patel et al. 1998). A bunch type variety, SG 99, has been recently recommended for cultivation in Punjab during summer season. Its yield potential vis-à-vis SG 84 during *kharif* season is not known. A study was, therefore, conducted to assess the productivity of different varieties of groundnut at different sowing dates under agroclimatic conditions of Punjab.

A field experiment was conducted at Punjab Agricultural University (PAU), Ludhiana in 2006 on loamy sand soils testing low in organic carbon and medium in available phosphorus. The treatments were replicated four times in split plot design with 6 sowing dates (30 April, 10, 20 and 30 May, 10 and 20 June) in the main plots and 3 varieties (SG 99, SG 84 and M 522) in the sub-plots. Groundnut was grown under irrigated conditions. The crop was sown on scheduled dates after pre-sowing irrigation. Two to three post-sowing irrigations of 6–7 cm depth each were applied depending upon sowing time and rainfall. Interrow spacing was 30 cm and plant spacing within rows was 22.5 cm for semi-spreading variety M 522 and 15 cm for bunch type varieties SG 84 and SG 99. The crop was fertilized with 15 kg N and 20 kg P_2O_5 ha^{-1} applied as basal dose in the form of urea and single super

phosphate, respectively. All other recommended agronomic practices were adopted. The gross plot size was 4.5 m × 3.6 m.

Pod yield of groundnut sown on 10 May (2710 kg ha^{-1}) was significantly higher (8.4%) than yield of crop sown on 30 April (Table 1). However, it was similar to yield of crop sown on 20 May (2603 kg ha^{-1}). There was consistent reduction in pod yield with further delay in sowing from 20 May up to 20 June. Sowing on 10 May resulted in 4.1, 9.8, 17.7 and 20.2% higher pod yield over crop sown on 20 May, 30 May, 10 June and 20 June, respectively. Several workers have reported similar influence of sowing time on groundnut yield from different parts of the country (Patel et al. 1991, Pathi 1994, Karanjikar et al. 2004). Higher pod yield in early sowing dates accrued mainly from increased number of pods per plant and 100-seed weight. Shelling outturn of crop sown on 30 May was significantly higher than that obtained in all other dates of sowing.

The main reason for higher productivity of crop sown on 30 April and in May may be favorable temperature, sunshine hours and humidity conditions during crop growth period (Table 2). Being a tropical crop, high temperature and long sunshine hours might have had beneficial effect in accumulating vegetative biomass and resource utilization whereas increasing relative humidity in the later part must have resulted in better development of sink. Rains in July–August seem to have added advantage for the early-sown crop in its post-anthesis period. Incidence of *Cerocspora* leaf spot/tikka disease starts in July and increases in August–September. At this stage, early-sown crop was in the reproductive phase and thus was not affected; whereas late-sown crop, particularly that sown in June, was affected to a great extent. Late-sown crop is also caught up in the low temperature and dry weather conditions for considerable period after cessation of monsoon rains in mid-September (Table 2). Frequent rains at the vegetative stage of end May/June-sown crop may also have an adverse effect on reproductive growth due to proportionately more vegetative growth and poor development of sink.

Irrespective of the sowing dates, emergence started on 5th day and complete germination was achieved within 2–3 days. Flowering initiation was at about 25–28 days after sowing. Emergence rate was slightly faster in SG 99 and SG 84 compared to M 522. Similar was the trend for flowering and maturity. The crop took about 122–125 days to mature for sowing dates of 30 April up to mid May. However, in June sowing, time to maturity was reduced to about 115–118 days in SG 99 and SG 84. Time to maturity of M 522 was about one week earlier than other two varieties. The oil content in treatments of later sowing dates, viz, 10 and 20 June (51.1–51.2%), was significantly lower than 30 May sowing (52.5%), which in turn registered significantly lower oil content than 10 and 20 May sowings (53.7–53.8%).

SG 99 out-yielded SG 84 and M 522 by significant margin with pod yield increase of 24.1 and 26.0%, respectively (Table 1). Similar trend was observed for shelling outturn and oil content. The highest 100-seed

Table 1. Influence of sowing dates and varieties of groundnut on yield attributes, pod yield and oil content.

Treatment	Pod yield (kg ha^{-1})	Branches per plant		Pods per plant	100-seed weight (g)	Shelling outturn (%)	Oil content (%)
		Primary	Secondary				
Sowing date							
30 April	2500	5.9	6.6	28.7	67.8	53.6	52.9
10 May	2710	5.8	6.2	27.5	67.7	54.9	53.7
20 May	2603	6.1	6.1	27.0	65.3	57.4	53.8
30 May	2467	6.1	6.6	26.4	65.3	65.6	52.5
10 June	2302	5.7	7.1	25.0	64.9	63.2	51.1
20 June	2254	5.5	6.4	24.1	61.6	63.0	51.2
CD (P = 0.05)	198	NS[1]	NS	NS	2.2	2.4	0.8
Varieties							
SG 99	2855	4.8	2.6	25.1	65.9	62.3	53.1
SG 84	2300	6.2	6.5	26.2	54.5	60.2	52.6
M 522	2263	6.6	10.4	28.1	76.5	56.3	51.8
CD (P = 0.05)	176	0.4	0.9	NS	1.6	1.7	0.8

1. NS = Not significant.

Table 2. Mean monthly data of important weather parameters for groundnut crop growing period.

Month	Temperature (°C)			Relative humidity (%)			Sunshine hours	Rainfall (mm)
	Max	Min	Mean	Morning	Evening	Mean		
May	39.0	26.0	32.5	63.0	37.0	50.0	9.4	28.0
June	37.4	25.6	31.5	64.0	42.0	53.0	8.0	40.9
July	34.2	27.2	30.7	85.0	67.0	76.0	6.0	209.2
August	33.8	26.2	30.0	86.0	68.0	77.0	7.2	142.7
September	33.0	23.1	28.0	92.0	61.0	76.0	8.0	103.6
October	32.0	18.5	25.3	89.0	46.0	66.0	7.4	6.8

Table 3. Pod yield (kg ha^{-1}) of groundnut varieties as influenced by sowing date.

Sowing date	SG 99	SG 84	M 522
30 April	2981	2257	2262
10 May	3162	2440	2529
20 May	2952	2380	2476
30 May	2902	2411	2088
10 June	2609	2202	2095
20 June	2525	2108	2128
CD (P = 0.05)	NS[1]		

1. NS = Not significant.

weight and number of primary and secondary branches per plant were registered in semi-spreading variety M 522 but it produced significantly lowest pod yield (Table 1) mainly due to higher plant population (sown at narrow spacing) in bunch type varieties owing to their erect growth nature. In SG 84, 100-seed weight was the lowest and shelling outturn was also significantly lower than SG 99 resulting in its conspicuously lower yield compared to SG 99.

Though the interaction of sowing dates with varieties was non-conspicuous (Table 3), pod yield in all the varieties was highest when sown on 10 May and showed decreasing trend with delayed sowing. In all sowing dates, SG 99 produced highest pod yield. The maximum pod yield was obtained with SG 99 sown on 10 May (3162 kg ha^{-1}) closely followed by SG 99 sown on 30 April (2981 kg ha^{-1}), 20 May (2952 kg ha^{-1}) and 30 May (2902 kg ha^{-1}). Thus for higher productivity, SG 99 variety should be preferred and sowing be done in May preferably between 10 and 20 May.

References

Karanjikar PN, Jadhav GS and **Wakle PK.** 2004. Eco-physiology of yield expression in groundnut, *Arachis hypogaea* L. genotypes during post-monsoon season. Journal of Oilseeds Research 21:39–41.

Patel LR, Patel RH and **Patel JK.** 1991. Response of groundnut varieties to different dates of sowing and row spacing. Journal of Oilseeds Research 8:263–266.

Patel SR, Thakur DS and **Pandya KS.** 1998. Influence of sowing time on the performance of groundnut (*Arachis hypogaea* L.) varieties. Journal of Oilseeds Research 15:293–296.

Pathi AK. 1994. Response of groundnut (*Arachis hypogaea* L.) varieties to time of sowing under rainfed conditions. Journal of Oilseeds Research 11:132–133.

Citation: Virender Sardana and SS Kandhola. (2007) Productivity of semi-spreading and bunch type varieties of groundnut as influenced by sowing dates. Journal of SAT Agricultural Research 5(1).