

## An Assessment of Gangapuri, A Valencia Groundnut (*Arachis hypogaea* Linn)\*

T. K. RAMACHANDRAN<sup>1</sup>, A. N. VENKETESWARAN<sup>2</sup>, R. S. VINAYA RAI<sup>3</sup> and  
G. SRINIVASAN

Gangapuri, a valencia groundnut maturing in 95 days, has a high yield potential, which, however, expresses itself only under a favourable soil moisture regime. It has a short flowering duration and nearly 50% of the flowers are produced within the first 20 days of flowering and 70% weight of the pods is realised from 3 to 4 seeded fruits. Its low shelling out-turn and low harvest index are undesirable features. The variability in yield, kernel weight and other plant characters of this variety are suitable for utilization in breeding programmes.

Among the three principal habits of cultivated groundnuts, bunch types are the earliest, maturing in about 105 days. The need for a variety maturing earlier than the existing bunch cultivars has been keenly felt in Tamil Nadu in the context of increasing productivity per unit time and meeting the requirements of multiple cropping in the rice fallows. Research carried out at the Tindivanam Centre, Tamil Nadu, under the All India Coordinated Research Project on oil-seeds has brought to light the potential of the valencia bunch groundnut, var. Gangapuri. It is an introduction from Madhya Pradesh, maturing in 95 days. Information on this cultivar collected in four seasons during 1973-1975 is presented in this paper.

### MATERIAL AND METHODS

To assess its yield performance, the variety, Gangapuri was evaluated with advanced cultivars, pure lines and derivatives of crosses for four seasons viz.,

*kharif* of 1973 and 1974 and *rabi* of 1974 and 1975, in randomised replicated trials. The details of the test entries are given in (Table I.)

To determine its earliness compared to other cultivars, days to flowering and Bartlett's index were worked out during *kharif* 1974 and *rabi* 1975 respectively (Table II). Variations in total flower production, percentage of early flowers (during the first 20 days) and flower production over successive five day periods from the initiation of flowering were worked out in Gangapuri along with four varieties, viz., 14-4, TG. 3, Ex. 1-1 and Ah. 8180 in *rabi* 1974 (Figs. II and III). To determine its superiority, if any, in the possession of many-seeded pods, the percentage of pods with varying number of seeds was determined in Gangapuri, TMV.7, TMV.9, POL. 1 and POL. 2 (Table III). Harvest index, which is the percentage of kernel weight to total plant weight, (Donold,

\* 1-4, School of Genetics, Tamil Nadu Agricultural University, Coimbatore.

1962; Singh and Stoskopf, 1971) and shelling percentage of Gangapuri in comparison with other cultivars were also determined (Table IV).

A row trial conducted with 125 pure lines of Gangapuri selected for high yield was taken advantage of to assess the variability in germination, height, pod yield/plant, pod weight and kernel weight. The response of this variety to the effect of seed source (season) on germination was studied in split-plot design with varieties in the main plot and season in the sub-plot with six replications during *kharif*, 1975.

## RUSULTS AND DISCUSSION

### (i) *Yield Performance :*

With a significant increase of 64% over the check, TMV, 9. Gangapuri ranked first in 1973 *kharif* (Table I). However, in *kharif*, 1974, the same yield performance was not repeated, the yield being less than that of TMV. 9 by 13%. The reason for this inconsistent behaviour is to be sought for in the pattern of rainfall of the two seasons (Fig. I) and the peculiar flowering pattern of this variety. The quantum and distribution of rainfall during *kharif*, 1973. was extremely favourable for the crop with periodical rains almost throughout the crop growth. On the contrary. during 1974, there were long dry spells during the critical phases of flowering and pod development. This apart, even the precipitation received prior to and after the dry spells was scanty in 1974 unlike in the previous year. The need for a more favourable soil moisture regime for this variety is reflected in the varietal yield

differences relating to *rabi* seasons of 1974 and 1975 compared to that of *kharif*, 1974 (Table I). The yield data obtained for the four seasons clearly bring forth the high yield potentiality of Gangapuri and the necessity of favourable soil moisture regime for its maximum expression.

### (ii) *Flowering pattern and pod development :*

A perusal of Table II will reveal that in Gangapuri, first flowering was significantly earlier than in the other varieties by 1.7 to 2.5 days. The earliness by about two days in flowering has been consistent in all the trials. Seshadri (1961) reported a definite correlation between first flowering and the duration of the crop. Commencement of flowering even one day earlier advances maturity by 5 to 7 days. This has actually been borne out in the case of Gangapuri which came to maturity 10 to 15 days earlier than the other bunch varieties in 1973 and 1974. The significantly high Bartlett's index of this variety (0.777) lends further support to its earliness (Table II). It is significant that Gangapuri recorded the lowest flower production (39.5) against the highest recorded by 14-4 (98.1) (Figs II and III). However, the percentage of early flowers was the highest in Gangapuri (78.4) and the lowest in 14-4 (55.9). It is interesting to note that in the varieties studied, the percentage of 'early flowers' follows a trend which is the reverse of total flower production. In this connection. it may be pointed out that in the bunch varieties, the total flower production bears no correlation

with yield (Venketeswaran, 1966). The enhancement in yield in spite of low flower production and the uniform maturity of pods appear to be associated with the high production of 'early flowers' produced basally and the short flowering duration. Production of the maximum number of pods at the basal nodes has been recognised as an important criterion in selection (Anon., 1973). The variety also shows a unique pattern of distribution of flowers attaining peak flowering in 11 days against 15 to 18 days from commencement of flowering in the other varieties. These are points in favour of this variety since the percentage of productive pegs decreases as the flowering period advances (Shear and Miller, 1955). But it is equally true that in view of the short flowering phase and early maturity of the variety, inadequate soil moisture during the critical phases of the crop, *viz.*, early flowering and pegging, would tell upon the ultimate yield, although abundant moisture becomes available in the later stages of the crop. This perhaps explains the poor performance of the variety in *kharif*, 1974.

Gangapuri abounds in 3 to 4 seeded pods (Plate I), as much as 61.4% by number and 69.8% by weight. It has also the lowest proportion of one-seeds pods (Table III). It has a tall plant type (Plate II) and is a low sheller. The harvest index was significantly lower than that in six other varieties with which it was compared in the *rabi*, 1975; the same was also true of the shelling outturn (Table IV.)

### (iii) Variability:

The population of Gangapuri presents heterogeneity. The variability is high for pod yield, germination percentage and kernel weight. Though variability was high for kernel weight, it was low for pod weight indicating thereby wide fluctuations in shelling outturn within the variety (Table V). The above data relate to pure lines developed for high yield. The variability among the pure lines would represent only a part of the total variability in the population. Hence, the variety in the unselected condition in bound to display a higher order of variability than what has been reported here. It is significant to note that some pure lines did not germinate at all while some gave even cent percent germination. It was found that only 52.8% of the lines recorded germination above 80%, while as much as 32% gave a germination of less than 40%. The latter included 9.6% of the lines which recorded no germination at all. This points to the existence of genotypes which vary in their seed viability. The fact that this variety also shows considerable variation in respect of other characters like pigmentation of the stem, size and colour of the leaf, size of pod and kernel and colour of testa would indicate the prevalence of residual heterozygosity in the variety.

### (iv) Effect of seed source on germination:

While the varieties, POL. 1, POL. 2 and TMV. 9 sustained significant reduction in germination by the use of *rabi*

(irrigated) seeds, seeds of Gangapuri remained unaffected (Table VI). It is clear from this Table, that the crop of Gangapuri raised from the produce of *rabi* season has given decidedly better stand due to the thick shell which protects the 'germ' when dried during the hot summer months prior to showing the *kharif* crop. This aspect points to the desirability of thick-shelled genotypes being suitable for multiplication during the *rabi* season.

From the foregoing, it becomes evident that the variety Gangapuri is unique in that (i) it is the earliest groundnut variety known, (ii) possesses a short flowering duration coupled with a high percentage of early-formed flowers, (iii) contains high percentage of 3 to 4 seeded pods and (iv) has the purple colouration of stem serving as a marker. These desirable characters are, however, offset by a number of attributes found deficient for good yield expression. Hence for improving Gangapuri,

mutation breeding can be resorted to; or its germplasm fruitfully exploited as a source material in breeding programmes aimed at augmentation of yield.

#### REFERENCES

- ANON., 1973. Pest control in groundnuts. PANS Manual No. 2 Centre for Overseas Pest Research, Pans Office, London.
- DONOLD, C. M. 1962. In search of yield, *J. Aust. Inst. agric. Sci.*, 28: 171-78.
- SESHADRI, C. R. 1962, *Groundnut*. Indian Central Oilseeds Committee, pp. 274.
- SHEAR, G. M. and L. I. MILLER, 1955. Factors affecting fruit development of the Jumbo Runner peanut. *Agron. J.*, 47: 354-57.
- SING, I. D. and N. C. STOSKOPF 1971. Harvest index in cereals. *Agron. J.*, 63: 224-26.
- VENKETESWARAN, A. N. 1966. *Biometric studies in groundnut (Arachis hypogaea Linn) with reference to indices of selection for yield*. M. Sc. (Ag) Dissertation, Madras Univ.



TABLE I. Pod yields of varieties tested (kg/ha)

Variety	<i>Kharif</i>				<i>rabi</i>			
	1973	% on check	1974	% on check	1974	% on check	1975	% on check
1. Gangapuri	2282	164	618	87	3327	121	1018	107
2. TMV. 7	1524	110	707	99	*		*	
3. TMV. 9 (check)	1391	100	714	100	2760	100	948	100
4. POL. 1	1677	121	*		2897	105	1085	114
5. POL. 2	1623	117	*		3140	114	1005	106
6. TNG. 1	1463	105	*		*		*	
7. TNG. 3	1524	109	*		*		*	
8. TNG. 5	1763	127	*		*		*	
9. Ah. 8253	*		878	123	*		1293	136
10. Ah. 8254	*		794	111	*		1263	133
11. Ah. 7901	*		623	87	*		*	
12. Ah. 8180	*		*		3016	109	*	
13. TG. 3	*		*		3309	120	*	
14. 14-4	*		*		3181	115	*	
15. OG.1133	*		*		3007	109	*	
SE <sub>m</sub>	79.6		51.9		64.0		117.3	
CD (5%)	228.4		152.1		256.0		NS	

\* Variety not tried

NS Not significant.

TABLE II Days to first flowering and Bartlett's Index

Variety	Days to first flowering (Kharif, 1974)	Variety	Bartlett's Index (rabi 1975)
Gangapuri	20.8	Gangapuri	0.777
TMV 7	23.3	TMV 9	0.721
TMV 9	22.7	POL 1	0.730
Ah 8253	22.5	POL 2	0.610
Ah 8254	22.7	Ah 8253	0.691
Ah 7901	22.5	Ah 8254	0.699
		NG 386	0.701
SE <sub>m</sub>	0.30		0.009
CD (5%)	1.16		0.028

TABLE III Frequency of pods with varying number of kernels (%)

Variety	By number of seeds				By weight of seeds			
	4S	3S	2S	1S	4S	3S	2S	1S
Gangapuri	2.6	58.8	31.7	6.9	3.8	66.0	26.5	3.7
TMV 7	—	—	87.6	12.4	—	—	92.3	7.7
TMV 9	—	—	89.8	10.2	—	—	93.5	6.5
POL 1	—	1.8	88.3	9.9	—	2.7	90.8	6.5
POL 2	—	—	86.3	13.7	—	—	92.5	7.5

TABLE IV Harvest Index and shelling percentage (*rabi*, 1976)

Variety	Harvest index (%)	Shelling percentage
Gangapur	35.2	68.2
TMV 9	46.0	76.3
POL 1	47.7	73.7
POL 2	44.4	74.8
Ah 8253	47.1	76.7
Ah 8254	50.1	76.7
NG 386	51.9	76.5
SE <sub>m</sub>	0.33	0.37
CD(5%)	1.25	1.14

TABLE V Variability in plant characters of Gangapuri

Characters	Range	Mean	S. D	C. V
Germination (%)	0.0 to 100.0	63.4	33.6	52.9
Pod yield/plant (g)	1.0 to 130.0	61.9	34.1	55.0
100 pod weight (g)	50.0 to 117.4	95.9	12.2	12.7
100 kernel weight (g)	20.2 to 57.2	36.0	11.9	33.0
Height (cm)	20.6 to 31.1	26.6	3.1	11.6

TABLE VI Germination of seeds drawn from the Different seasons. (Sown in *kharif*, 1975) (%)

Variety	Seed source	
	<i>Kharif</i>	<i>rabi</i>
Gangapuri	93.6	75.4
TMV 9	87.8	30.5
POL 1	88.2	42.6
POL 2	87.6	24.3
SE <sub>m</sub> (interaction)	8.7	
CD (5%)	25.8	

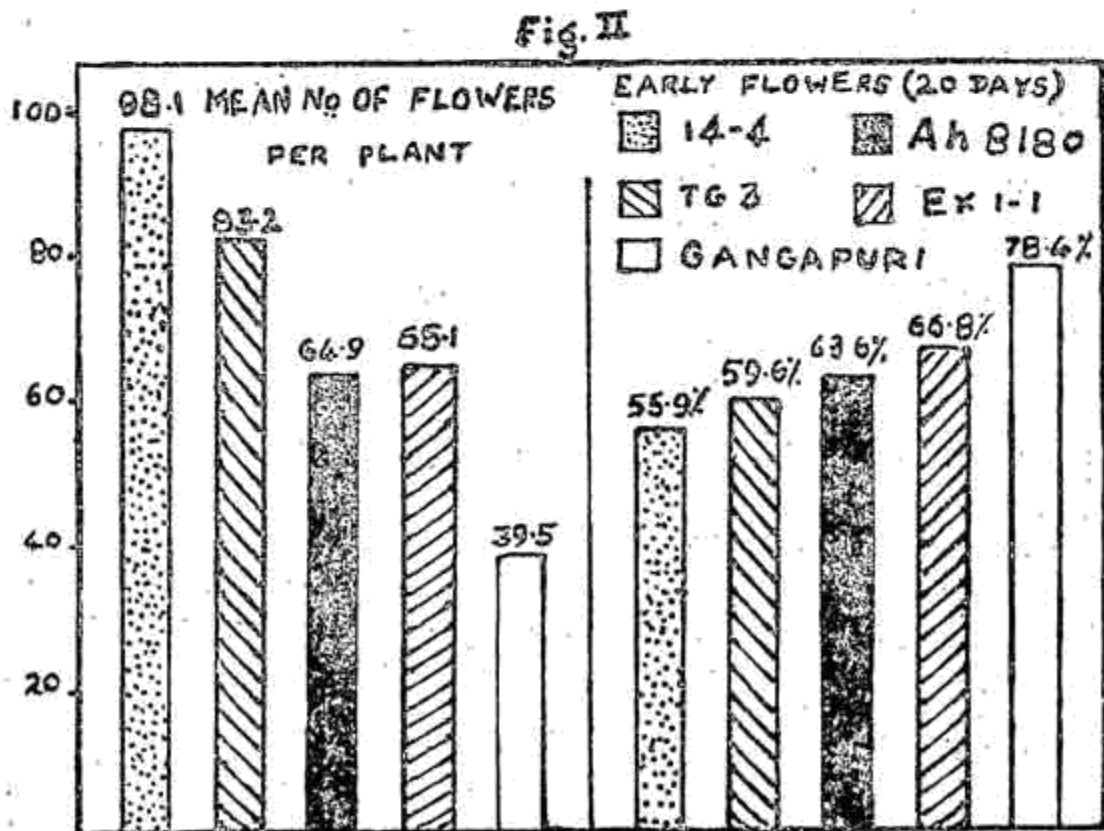
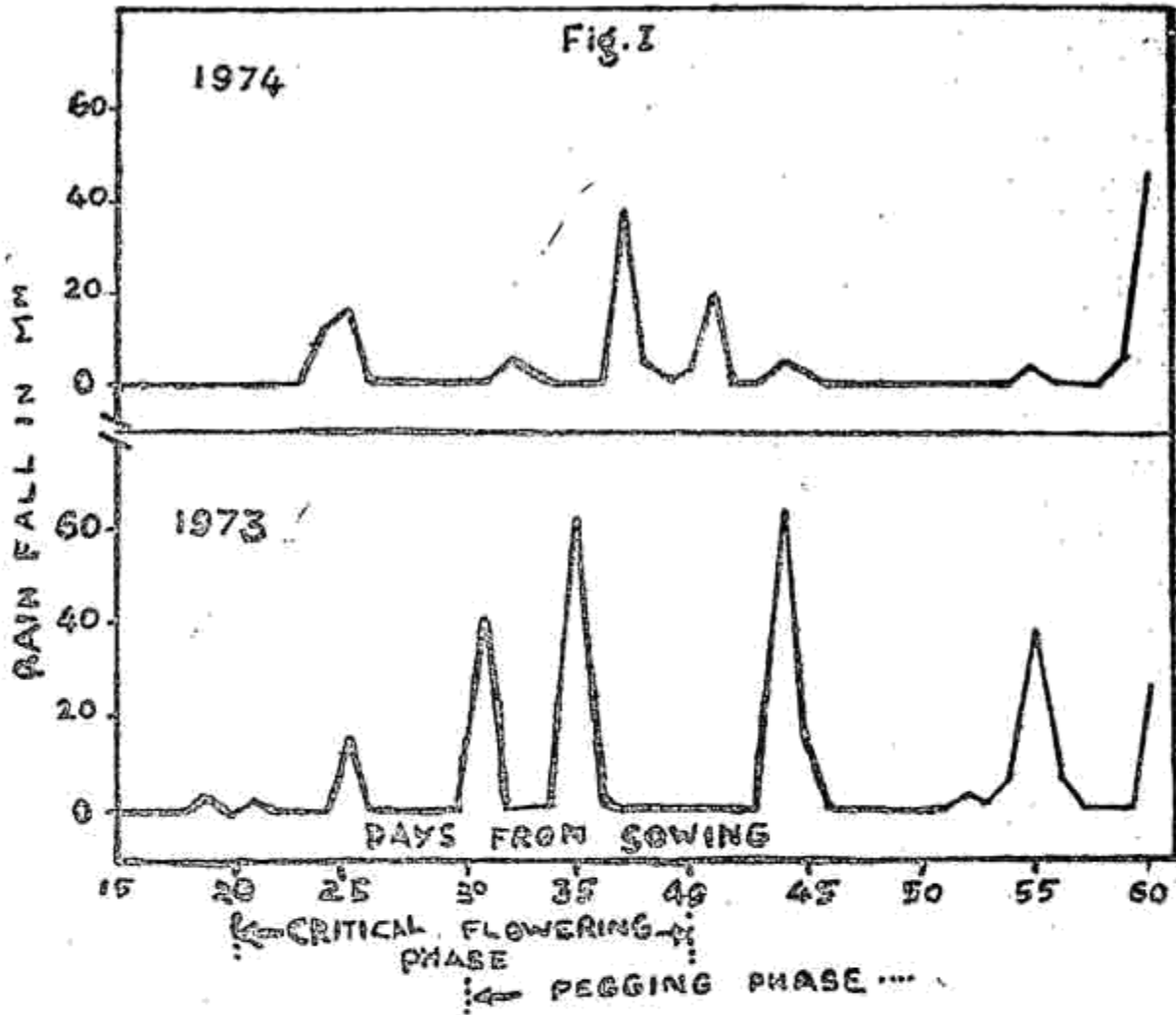




Fig. III

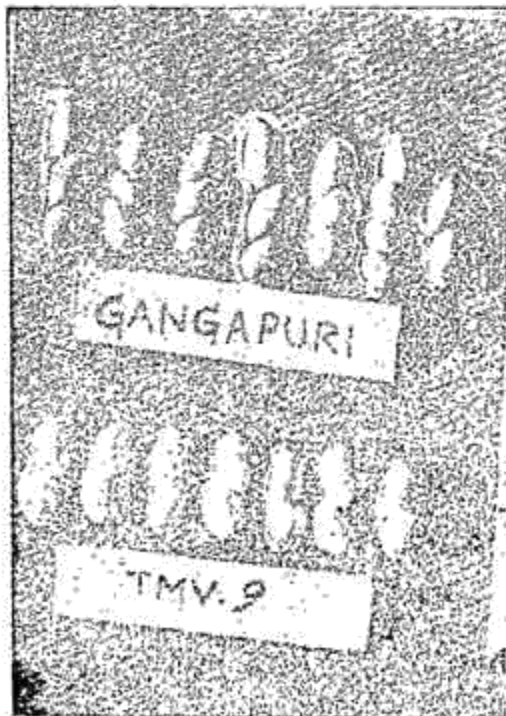
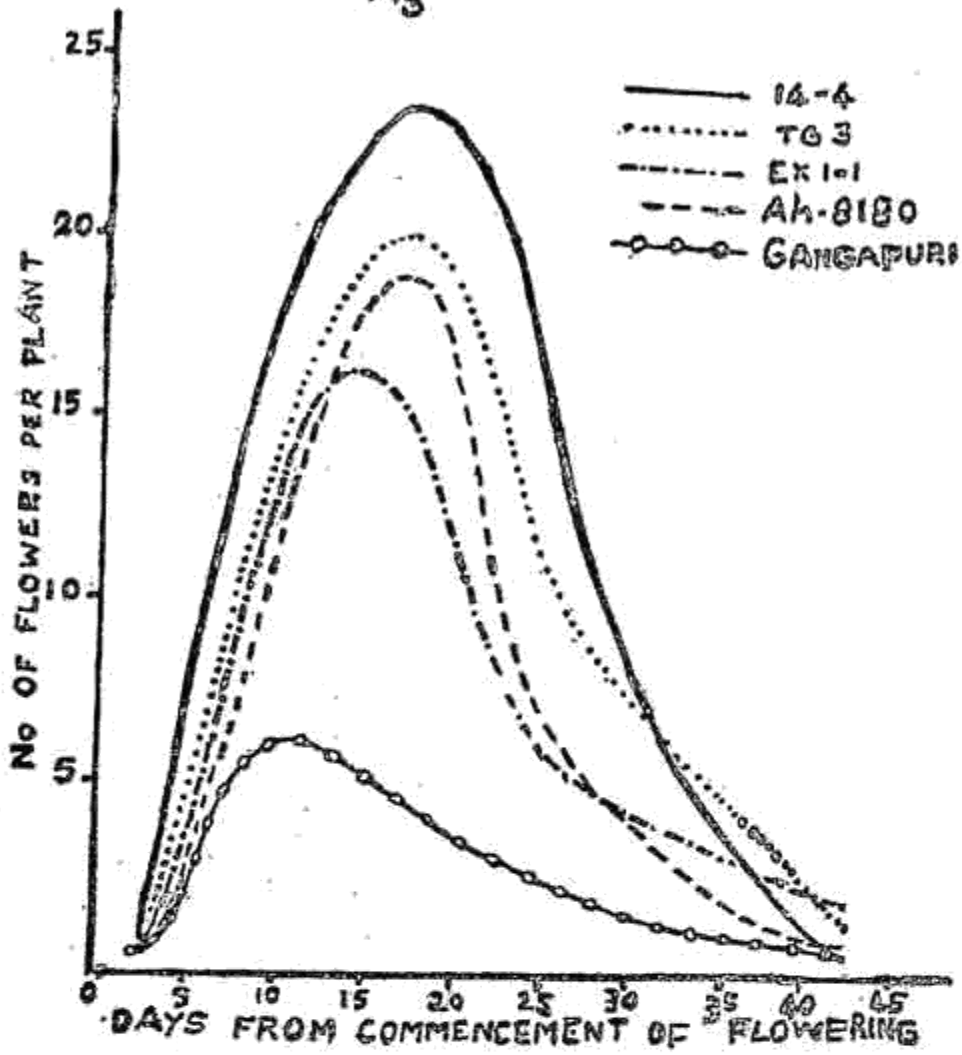


PLATE. I  
COMPARISON OF POD CHARACTERS



PLATE. II  
COMPARISON OF PLANT TYPE