

## Flowering Pattern and Reproductive Efficiency in Bunch Varieties of *Arachis hypogaea* L.

by

S. VARISAI MUHAMMAD<sup>1</sup> and M. STEPHEN DORAIRAJ<sup>2</sup>

The study on the flowering pattern and productive efficiency was undertaken to bring out the different patterns of flowering and their influence on reproductive efficiency by utilising the availability of large number of bunch varieties of groundnut at the Agricultural Research Station, Bhavanisagar.

**Materials and Methods:** Two hundred and six bunch varieties of groundnut were raised during August to December season of 1965-66 and 1967. The crop was raised as rainfed supplemented by irrigation. Based on the general pattern of flowering, the bunch varieties were classified into five groups with distinct variations and one typical variety in each was subjected to detailed studies with regard to the flowering pattern and reproductive efficiency. The varieties chosen for detailed studies were TMV 2 (Tindivanam), A. h. 811 (Corients-3), A. h. 6919 (A. K. 12-24 Kanpur), A. h. 7175 (C. P. I. 13775, A. h. 6481, India) and A. h. 7336 (Early Grain, Ling Ching Erect; China).

**Results:** *Commencement and flowering duration:* Flowering commenced between the 22nd and 31st day after sowing in the bunch varieties in general. The number of days taken for commencement of flowering in different seasons ranged from 3 to 9. Flowering that commenced during the fourth week after sowing continued upto the thirteenth week in most of bunch varieties and rarely extended upto the fourteenth week. The duration of flowering lasted for 34 to 75 days in different varieties. The days when there was no flower production during the period of flowering varied from 3 to 24.

*Flowering pattern in bunch groundnut:* The pattern of the flowering can be broadly summarised as follows:

**Group: I:** (1) Rapid increase immediately on commencement; (2) peak flowering reached in about a week, (3) sudden decline and maintenance of less flower production for about ten days; (4) a second spell of increased flower production of lesser intensity than the first; (5) gradual decrease until cessation.

**Group: II:** (1) Rapid increase immediately on commencement; (2) Peak flowering reached within a week; (3) Sudden decline and maintenance of

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1. Oilseeds Specialist, Agricultural College and Research Institute, Coimbatore.

2. Assistant Oilseeds Specialist, Castor Research Station, Salem.

low rate of flowering for about a fortnight; (4) A second spell of increased flower production of the same magnitude as the first; (5) Peak flowering reached by the third week after first flowering; (6) Gradual decline and cessation.

*Group: III:* (1) Rapid increase immediately on commencement; (2) Peak flowering reached in about a week; (3) Maintenance of flower production at the same level for about a fortnight; (4) A second spell of flowering of greater magnitude than the first, reaching the peak flowering in the eighth week; (5) Sudden decline until cessation.

*Group: IV:* (1) Increase in flower production in four stages of different magnitude; (2) Peak flowering reached by the end of seventh week after first flowering; (3) Sudden fall and cessation.

*Group: V:* (1) Increase in flowering immediately on commencement; (2) First peak reached in about a week; (3) Rapid fall; (4) A steady increase until the second peak of greater magnitude is reached in about three weeks after the first peak flowering; (5) Steady fall and cessation.

*Reproductive efficiency in bunch groundnut:* The particulars of the number of the flowers produced per plant, number of pegs, total of immature and mature pods and final production of mature pods are depicted. The data on fertility co-efficient and percentage between the components such as flowers, pegs, total pods and mature pods one with the other are presented in Table I.

TABLE I. *Reproductive efficiency in bunch groundnut*

	TMV. 2	A. h. 811	A. h. 6919	A. h. 7175	Ah. 7336
Fertility co-efficient (Flower to pods)	4.1	4.7	4.4	5.5	7.6
Flowers to pegs (%)	51.4	60.0	61.2	43.4	37.4
Flowers to mature and immature pods (%)	24.3	21.0	22.5	18.1	13.2
Flower to mature pods (%)	20.6	18.0	18.8	14.5	12.1
Pegs to mature and immature pods (%)	47.3	35.0	36.3	41.7	35.3
Pegs to mature pods (%)	40.0	30.0	30.6	33.3	32.3
Total pods to mature pods (%)	84.6	85.7	83.3	80.0	91.7

The ratio between total flower production and the pods set expressed as the fertility coefficient is a measure to determine the reproductive efficiency of a variety and the lesser the fertility coefficient, the greater the efficiency.

The greater reproductive efficiency of strain TMV 2 was reflected in the low fertility coefficient of 4.1. It possessed the highest percentage of flowers and pegs to total pods and mature pods. However the percentage of flowers to pegs was not as high as in A.h. 6918 and A.h. 811. A.h. 6919 with a fertility of coefficient of 4.4 stood second in efficiency, with the maximum percentage of flowers to pegs and a higher percentage of flowers to total pods as well as mature pods. A.h. 811 possessed a low fertility coefficient of 4.7 and a higher percentage of flowers to pegs and mature pods as well as total pods to mature pods. Though A.h. 7175 had a higher percentage of pegs to total pods and mature pods, its performance was poor with regard to the other components and consequently there was a high fertility coefficient of 5.5. In spite of the maximum value of total pods to mature pods, A.h. 7336 showed the least reproductive efficiency. In general, the five varieties can be ranked in the order of reproductive efficiency as follows: TMV. 2, A.h. 6919, A.h. 811, A.h. 7175 and A.h. 7336.

**Discussion:** Flowering pattern in groundnut has been studied in the past by many workers in India and abroad (Ali Mohammad *et al.*, 1932; Shibuya, 1935; Gregory, 1936; Bouffil, 1947; Smith, 1950 and Seshadri, 1962).

In the bunch varieties considered in the present study, flowering commenced between the 22nd and 31st day after sowing thus showing the possibility of delayed commencement even beyond the 25th day as recorded by Seshadri (1962) depending probably upon varieties as well as the seasonal factors obtained during the pre-flowering period. The duration of flowering varied from 34 to 75 days in the varieties studied and this was within the range of 69 to 73 days recorded by Shibuya, 51 to 58 days by Bouffil and 70 to 75 days by Smith; but the flowering duration of 20 to 36 days observed by Seshadri (1962) seems to be far less than that recorded by other workers as well as in the present study.

Studies in the past on the pattern of flowering in bunch groundnut revealed a more or less unitary pattern. Smith (1956) found a gradual onset with flower production beginning to accelerate after two to three weeks, peak flowering reached four to six weeks after the first flowers appeared and then, flowering decreased approximately at the same rates as the increases occur. Seshadri (1962) described that flowering started early in 20 to 24 days in the bunch type, progressed rapidly, attained the peak within 20 to 30 days after first flowering and then the decline was rapid. The present studies indicated five distinctly different patterns of flowering in the bunch varieties.

The first two groups represented by TMV 2 and A.h. 811 possessed more or less similar flowering patterns with the peak flowering reaching almost immediately on commencement in both, but the second spell of flowering was

of a lesser magnitude than the first in the group represented by TMV 2, while it was almost of the same magnitude as the first in the group that included A.h. 811. The other three groups were similar in that they attained peak flowering in the later half of the flowering period; but after maintenance of a particular level of flower production, there was a sudden increase leading to the production of more flowers at the eighth week after sowing in group three represented by A.h. 6919. In the fourth group represented by A.h. 7175, the increase in flowering occurred in stages from its commencement till the peak flower production in the eleventh week. There were two periods of peak flowering in group five that included A.h. 7336, the second peak being of greater magnitude than the first, with an intervening period of low flower production.

The influence of the flowering pattern on the production of pods is obvious. The groundnut flower requires a minimum of sixty days from the time of fertilization for complete development of pod (Patel and Seshadri, 1934). Hence if the flower production is more during the first four weeks from flower commencement, there is a possibility for increased production of mature pods at the time of harvest. In the present study, the first three groups exhibited such a promise. This could be assessed by considering their productive efficiency.

The fertility coefficient of groundnut was established as 4.5 to 8.4 in "Line 24-11" by Bouffil (1947) and 7.5 in "Virginia bunch" by Smith (1950). In the varieties now studied, it ranged from 4.1 to 7.6, varieties TMV 2, A.h. 6919 and A.h. 811 recording greater efficiency than the rest. The percentage of flowers produced to pegs formed was determined to be about 70% by Shibuya (1935) and 63.5% by Smith (1950) while it was between 37.4 to 61.2% in the varieties now studied. The proportion of flowers to pods (both immature and mature) was 23.0 and 21.4% as recorded by Shibuya (1935) and Smith, (1950), respectively, while it was between 13.2 and 24.3% in the present study. Smith (1950) found that 13.5% of the flowers turned out to be mature pods, while the proportion was from 12.1 to 20.6 in the varieties now considered. Thus, the reproductive efficiency of the bunch groundnut varieties studied by previous workers and those now studied was more or less similar in magnitude.

While effecting selection for purposes of increased yield, it is desirable that varieties that fall within the first three groups in the flowering pattern are chosen, in view of their higher flower production during the period of flowering and their greater reproductive efficiency.

**Summary:** Studies on flowering pattern and reproductive efficiency were undertaken in five representative bunch varieties maintained at Agricultural



Research Station, Bhavanisagar. Unlike the unitary pattern in flowering recorded by previous workers, five distinctly different patterns were distinguished in the bunch type. In the first two groups, peak flowering was reached in about a week after commencement and the second spell of flowering was of a lesser magnitude than the first in the one represented by strain TMV. 2, while it was almost of the same magnitude as the first in the group that included A. h. 811, (Corientes-3). The other three groups were characteristic in producing peak flowering in the later half of the flowering period; but in the one represented by A. h. 6919 (Kanpur), after maintaining a particular level of flower production, there was a sudden increase while the increases occurred in stages even from initiation in the group that included A. h. 7175 (India). There were two periods of peak flowering, the second peak being of greater magnitude than the first in the group that was represented by the Chinese variety A. h. 7336.

The fertility coefficient was low, exhibiting high reproductive efficiency in the first three groups. The percentage of flowers produced to other component factors such as pegs, total pods and mature pods revealed the superiority of TMV. 2, A. h. 6919 and A. h. 811 over others. Based on the relationship established between the flowering pattern and reproductive efficiency in the varieties, it is inferred that varieties that fall within the first three flowering pattern groups can be advantageously utilised in the breeding programme in view of their greater reproductive efficiency.

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