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Short communication

Impact of drought on drymatter production and yield of groundnut (*Arachis hypogaea* L.) during *kharif* season

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Groundnut (*Arachis hypogaea* L.) is an important food and cash crop in the semi arid tropics. But, the average pod yield of groundnut (800 kg ha^{-1}) is low, which is mainly due to moisture stress. Drought during crop growth period has an adverse influence on photosynthesis (Bhagsari *et al,* 1976), water relations (Babu and Rao, 1983), growth and yield (Suther and Patel, 1992). Lack of moisture during the crop growth period reduces the pod yield by affecting the translocation of photosynthates into pods (Kulkarni *et al.,* 1988). Impact of drought on drymatter production and ultimate pod yield of rainy season in the drought prone Anantapur region of Andhra Pradesh is presented.

A field experiment was conducted at Agricultural Research Station, Anantapur during two *kharif* seasons of 1989 and 1990 in split - split plot design with three replications to study the impact of drought on total drymatter production, its partition into pod and ultimate pod yield. The soil of the experimental site was red sandy loam, well drained, neutral in reaction, medium both in available nitrogen and phosphorus and low in available potassium.

Two farming situations (rainfed and supplemental irrigation) were assigned to main plots, three dates of sowing (early, normal and late) to sub - plots and two varieties of groundnut (TMV-2 and Robut 33-1) to sub-sub plots. The crop was sown on the following three dates during 1989 and 1990 so as to take the chance of occurrence of drought stress situations coinciding with different phenophases of groundnut crop under rainfed conditions.

1989	1990
Early : 11, July	16, June
Normal : 11, August	4, August
Late : 3, September	3, September

Seeds were sown @ 100 kg ha^{-1}, keeping 30 cm distance in between rows and 10 cm within the row. The crop was fertilized at 20 N, 40 P_2O_5 and 40 K_2O kg ha^{-1}. Timely measures were taken against biological interferences.

Groundnut plants in 0.6 m^2 (0.6 m x 1.0 m) were collected at fortnightly interval commencing from 15 DAS till harvest for estimation of drymatter production and partitioning. However, the drymatter accumulation at harvest pertaining to variety 'TMV-2' popular in the region only is presented and the results are discussed. Pods were stripped after uprooting, sun dried to constant weight and expressed in kg ha^{-1}.

Here, the period is considered drought, when moisture in the top 30 cm soil fell below 50 per cent of its available moisture. During the period of investigation, the crop encountered drought stress (Table 1) during the different phenophases.

Table 1: Total drymatter production at harvest, its partition into pods and yield as influenced by drought at different phases of groundnut.

Phase at which drought occurred	Total drymatter production at harvest (g m^{-2})	Percentage of drymatter partitioned into pods	Pod yield (kg ha^{-1})
Rainfed			
Flowering and peggeing (normal sown, 1990)	459.7 (20.0)	44.7	2056 (16.6)
Flowering, pegging and late pod filling (early sown, 1989)	373.3 (27.8)	45.5	1967 (26.8)
Pegging through maturity (late sown, 1989)	204.2 (45.7)	9.5	195 (86.3)
Pod filling (normal sown, 1989)	343.5 (32.5)	31.6	1086 (45.6)
Mid pod filling (late sown, 1990)	429.9 (22.9)	44.6	1900 (23.5)
Initial hundred days barring 10 days during seed initiation (early sown, 1990)	273.7 (41.7)	35.4	969 (51.1)
Supplemental irrigation			
Flowering and peggeing (normal sown, 1990)	574.3 (3)*	42.9	2466
Flowering, pegging and late pod filling (early sown, 1989)	517.0 (5)*	44.8	2317
Pegging throughmaturity (late sown, 1989)	375.9 (5)*	37.8	1421
Pod filling (normal sown, 1989)	508.7 (4)*	39.3	1997
Mid pod filling (late sown, 1990)	555.1 (2)*	44.7	2483
Initial hundred days barring 10 days during seed initiation (early sown, 1990)	469.4 (5)*	42.2	1981

()* Indicate the number of protective irrigation (5 cm depth) given duringg drought period. Figures in parentheses shown percent reduction with respect to drought free treatments.

Drought during flowering and pegging reduced the drymatter accumulation (Table 1) at maturity to 20 per cent over drought free conditions however, partitioning of drymatter into pods remained more or less constant at 42.9 - 47.7 per cent. Pod yields were reduced by 16.6

per cent.

Early sown crop during 1989 was exposed to drought for 36 days coinciding with flowering and pegging stages, besides a second spell of 13 days towards the end of season before maturity. Drought during this period reduced the drymatter accumulation by 27.8 per cent at maturity and pod yields by 28.6 per cent.

Result indicated that the occurrence of drought during pegging to maturity resulted in drastic reduction in drymatter accumulation at maturity from 375.9 g m^{-2} to 204.2 g m^{-2}. Out of the accumulated photosynthates, only a small portion (9.5%) got partitioned into pods, leading to crop failure (195 kg ha^{-1}). Pod yield was reduced by 87 per cent.

The drymatter accumulation under drought was reduced to 67.5 per cent to that under drought free condition at maturity. Drought stress during pod filling period caused much of the accumulated drymatter to remain in the vegetative parts (68.4%) than get translocated to pod (31.6%). Reduction in pod yield was 45.6 per cent, indicating that pod filling phase in groundnut is a moisture sensitive stage.

Crop sown late during 1990 got exposed to drought for 12 days during mid pod filling phase (62-73 DAS) reducing the drymatter accumulation by 22.6 per cent as compared to the drought free condition. The drymatter partitioned into pods both under drought and drought free condition remained more or less similar (44.2 - 44.7%) and the loss in pod yield due to drought was 18.6 per cent.

Early sown groundnut during 1990 was exposed to drought for initial 100 days except for a short period of 10 days between 50 and 60 DAS, coinciding with seed initiation. There was no drought during last 35 days (crop duration was extended to 135 days. Due to continuous rains after 100 DAS, there was rejuvenation and quick completion of all the phases.

The prolonged and abnormal drought resulted in a drastic reduction of 41.5 per cent in drymatter. Pod yield was reduced by 49.9 per cent. From the results it could be inferred that drought during initial 100 days period in the crop, (except for 10 days at seed initiation) followed by no drought during last 35 days did not result in complete failure of the crop.

REFERENCES

Babu, V. R. and Rao, D. V. M. 1983. Water stress adaptations in groundnut (*Arachis hypogaea* L.) foliar characteristics and adaptations to moisture stress. *Plant physio. Biochem.*, 10 (1) : 64-80.

Bhagsari, A. S., Brown, R. H. and Schepers, J. S. 1976. Effect of moisture stress on photosynthesis and some related physiological characteristics in peanuts. *Crop Science*, 16 (4) : 712 - 715.

Kulkarni, J. H., Ravindra, V., Sojitra, V. K., and Bhatt, D. M. 1988. Growth, nodulation and N uptake of groundnut (*Arachis hypogaea* L.) as influenced by water deficits stress at different phenophases. *Oleagineux*, 43 (11) : 415-419.

Suther, D. M. and Patel, M. S. 1992. Yield and nutrient uptake by groundut and iron availability in soil as influenced by lime and soil water. *J. Indian Soc. Soil Sci.*, 40 (3) : 594 - 596.