Madras Agric. J., **2018**, *105 (7-9)(2)*: 368-369; doi: 10.29321/MAJ.2018.000162

Effect of Pre Flowering Drought on Flowering Behaviour of Yield in Groundnut

P. Maheswari[1*], M.K. Kalarani[2], A. Senthil[1] and M. Umapathi[1]
[1]Department of Crop Physiology, Tamil Nadu Agricultural University, Coimbatore.
[2]Tapioca and Castor Research Station, Tamil Nadu Agricultural University, Yethapur.

The groundnut is one of the important legume crops of tropical and semiarid tropical countries. Drought is the one of the major constraints to groundnut production as it is rainfed crop. Drought at flowering or pod formation can substantially reduce yield of ground but pre-flowering or vegetative stage is not detrimental and actually increases yield. Pot culture study was undertaken to study the effect of pre flowering drought on groundnut yield. Four groundnut genotypes were taken for this study namely CO 7, COGn 4, TMV 7 and TMV 13. Drought was imposed at three stages viz., Pre flowering drought (PFD) between 15- 30 DAS, flowering drought (FD) between 35-50 DAS and post flowering drought between 75-90 DAS (PoFD) by withholding water and control maintained with irrigation to field capacity for comparison. Among four genotypes, CO 7 performed better when compared to other genotypes under pre-flowering drought which produced more flowers (134), pegs (38), pods per plant (26) than control, flowering and post flowering drought. The results revealed that 21.18 per cent of increased pod yield was obtained compared to control under PFD in CO 7. Higher reproductive efficiency of groundnut is higher conversion rates of flowers to pegs, pegs to pods and of total pods to mature pods.

Key words: Groundnut, Pre flowering drought, Flowers, Pegs, Pod yield

Groundnut (*Arachis hypogaea* L.) is an important oil seed crop which is severely affected by moisture stress. The crop suffers by dry spells during critical pheno-phases like flowering and post flowering stages. Prolonged dry spell due to uneven and erratic monsoon particularly under rainfed condition will lead to rapid depletion in soil moisture. Drought affects membrane lipids, photosynthetic responses and yield in peanuts (Suther and Patel, 1992). Water deficit affects thylakoid electron transport, phosphorylation, carboxylation and photosynthesis. Severity of drought depends on the stage of crop development, the duration of stress period and the magnitude of drought. Rucker *et al*. (1995) proofed that the limited water availability flowering and pod filling stages affected growth, yield and agronomic characters. Several researchers have revealed that drought in the early season or pre-flowering drought can increase yield (Puangbut *et al*., 2010). Although variation in reproductive parts greatly affected pod yield under drought conditions (Awal and Ikeda, 2002). Drought during flowering or pod formation and prolonged drought can substantially reduce yield of peanut. Therefore the present investigation was taken up with the objective of studying the pre-flowering drought on yield of groundnut.

Material and Methods

Pot culture study was conducted with four genotypes namely CO 7, COGn 4, TMV 7, TMVGn 13. Drought was imposed by withholding irrigation between 15-30 days for PFD, 35-50 days for FD, 75-90 days after sowing (DAS) for PoFD. Observations on flower number, number of pegs, number of pods were studied after stress recovery *viz*., PFD (40-45 DAS), FD (60-65 DAS) and PoFD (100-105 DAS). Flowers were counted every morning. Daily flowering data were averaged for three day intervals and expressed as the number of flowers produced per plant. Number of pegs per plant was counted in the five plants in each retreatment and the mean value was expressed as pegs plant^{-1}. Number of pods per plant was counted in the five plants in each treatment and the mean value was expressed as pods plant^{-1}. Pod yield was determined by taking pod weight of two plants randomly selected from each treatment and replication and mean value was expressed as g plant^{-1}.

Results and Discussion

The present investigation was conducted to find out the effect of pre-flowering water deficit on groundnut yield. In groundnut, the basic reproductive units constitute the flowers, flowering and flowers play an important role in all seed crops, yield is dependant largely upon the basic reproductive units available. Drought is the major factor to reduce the flower numbers but under PFD after re-watering plants produced more flowers. Janamatti *et al*. (1986) reported that, drought is imposed at vegetative stage between 15-30 DAS will not affect the flower production and after re-watering, more number of first flushed flowers produced at early stage itself and formed more pegs. In this study, the total flower

*Corresponding author's email: mahes43.tnau@gmail.com

Table 1. Effect of water stress on total number of flowers of groundnut genotypes

Genotypes	Number of flowers plant $^{-1}$				
	Control	PFD	FD	PoFD	Mean
CO7	144	134	106	142	132
COGn 4	147	139	77	147	128
TMV 7	146	143	102	145	134
TMVGn 13	145	140	84	144	129
Mean	146	139	93	145	131
	G		S		GxS
SEd	1.403		1.403		2.806
CD (0.05)	2.858		2.858		5.716

number decreases more when drought stress is experienced during FD than PFD. These findings were supported the present investigation in such way that, more early formed flowers decides best flowering pattern even though which recorded less total number of flowers under PFD (Table 1). But FD fails to produce flowers during drought period. PoFD produced more flowers but drought was imposed at the time of pod maturation so PoFD fail to produce mature pods while harvesting.

Water stress is an important factor limiting the yield. The reproductive efficiency was higher at PFD than under fully irrigated conditions for many genotypes (Jongrungklang *et al.,* 2013). The higher reproductive efficiency of these plants was demonstrated by the higher conversion rates of flowers to pegs, pegs to pods and total pods to mature pods. Likewise, Nautiyal *et al.* (1999) suggested

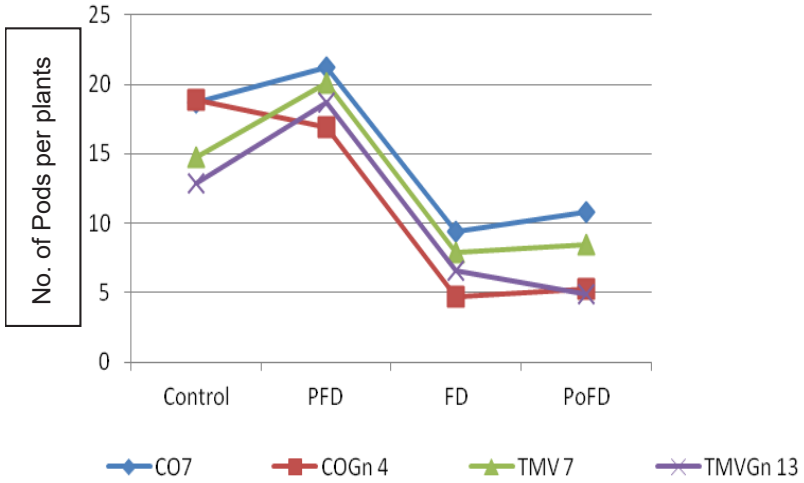

Fig. 1. Effect of water stress on pod yield (g plant^{-1}) of groundnut genotypes

that, the conversion of flowers to pegs and pegs to pods was higher in plants which experienced stress in the vegetative phase. Several researchers have revealed that drought in the early season or pre-flowering drought can increases yield (Puangbut *et al.,* 2010, Nuatiyal *et al.,* 1999, Nageswara Rao *et al.,* 1985). Irrespective of the genotypes, PFD recorded more peg to pod ratio and pod to matured pod ratio compared to control. These early formed flowers received adequate moisture at pod zone could be contributed for the production of many pegs and more number of matured pods which is supported by earlier findings. But, FD recorded lower yield and drastic reduction was observed in PoFD. Among the stress treatments, FD recorded minimum pegs per plant followed by PoFD and PFD. Among the genotypes, irrespective of the stress treatments, CO 7 recorded more pod yield.

References

Awal, M.A. and Ikeda, T. 2002. Recovery strategy following the imposition of episodic soil moisture deficit in stands of peanut (*Arachis hypogea* L.). *Journal of Agronomy and Crop Science,* **188:** 185-192.

Janamatti, V.S., Sashidhar, V.R., Prasad, I.G. and Sastry, K.S.K. 1986. Effect of cycles of moisture stress on flowering pattern, flower production, gynophore length and their relationship to pod yield in bunch types of groundnut. *Narendradeva. J. Agriculture Research*, **1:** 136-142.

Jongrungklang, N., Toomsan, B., Vorasoot, N., Jogloy, S., Boote, K.J., Hoogenboom, G. and Patanothai, T. 2013. Drought tolerance mechanisms for yield responses to pre-flowering drought stress of diverse peanut genotypes. *Field Crops Research,* **144:** 34-42.

Nageswara Rao, Singh Sardar, R.C., Sivakumar, M.V.K, Srivastava, K.L. and Williams, J.H. 1985. Effect of water deficit at different growth phases of peanut. Yield responses. *Agronomy Journal,* **77:** 782-786.

Nautiyal, P.C., Ravindra, V., Zala, P.V. and Joshi, Y.C. 1999. Enhancement of yield in groundnut following the imposition of transient soil-moisture stress during the vegetative phase. *Experimental Agriculture,* **35:** 371-385.

Puangbut, D., Jogloy, S., Toomsan, B., Vorasoot, N., Akkasaeng, C., Kesmala, T., Rachaputi, R.C.N., Wright, G.C. and Patanothai, A. 2010. Physiological basis for genotypic variation in tolerance to and recovery from pre-flowering drought in peanut. *Journal of Agronomy and Crop Science,* **196:** 358-367.

Rucker, K.S., Kvien, C.K., Holbrook, C.C. and Hook, J.E. 1995. Identification of peanut genotypes with improved drought avoidance traits. *Peanut Science,* **22:** 14-18.

Suther, D.M. and Patel, M.S. 1992. Yield and nutrient absorption by groundnut and iron availability in soil as influenced by lime and soil water. *Journal of Indian Society of Soil Science,* **40:** 594-596.