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Influence of weather on pod yield and growth attributes in bunch groundnut.

Resumen. Este experimento se realizó en la Estación Experimental Agrícola Bhavanisagar, Tamil Nadu, Sur de la India, durante cuatro estaciones consecutivas desde 1976 hasta 1978. Se estudió el efecto del clima sobre el crecimiento y rendimiento de maní bajo irrigación. La mayor humedad relativa durante el monsón, favoreció el crecimiento y la altura de las plantas. La duración solar no afectó la producción de flores. El mayor rendimiento de vainas durante el verano se atribuye a la alta temperatura, bajo humedad relativa, poca precipitación y elevada radiación solar en especial durante el período de llenado de la vaina.

Climatic components, especially temperature and rainfall, exercise a profound influence on crop growth and yield (10). Among eight field crops studied, groundnut was the least vulnerable to fluctuations in weather (6), virtually no association could be established between monthly precipitation and total and groundnut yields for thirteen years (4). Low temperature depresses flower and peg formation (5), but according to Wood (11), high temperature is deleterious to pod formation. In view of these contradictory reports, a study was instituted to alucidate the effect of weather on groundnut yield and growth and the results are reported herein.

Materials and methods

The experiment was conducted at the Agricultural Research Station, Bhavanisagar, Tamil Nadu on a red sandy loam soil for four consecutive seasons comprising two each of monsoon and summer during 1976-1978 in a split plot design with plant density (29.6 and 44.4/m^2) and phosphorus levels (0, 40 and 80 kg/ha) in the main plot and herbicides (alachlor, nitrofen, penoxalin, hand weeding) in the sub-plot. Seeds of POL 2 were dibbled in plots measuring 3.6 x 3.6 m. A basal dose of 20 kg N, 40 kg P_2O_5 and 60 kg K_2O per ha was incorporated in the soil at the time of sowing. Besides total number of flowers produced at maturity the following growth and yield attributes were recorded on five random plants: (a) plant height (b) dry matter production (DMP) (c) uptake of nitrogen, phosphorus and potash (d) number of mature pods/plant (e) 100 kernel weight. Pod yield per plot was recorded and expressed as kg/ha after moisture correlations.

Weather parameters like minimum and maximum temperature, rainfall, sunshine hours and relative humidity were recorded twice daily in conformity with India Meteorological Department Specifications for the reproductive phase of the crop.

Results and discussion

Data on pod yield and growth attributes are presented in Table 1. Weather parameters for the flowering and pod formation stages are given in Table 2.

Plant height was consistently higher during the monsoon than in the summer season. The increased height during monsoon is attributed to higher relative humidity (RH) during the season since according to Fortanier (3), with increasing RH, vegetative growth also registers an increment. Dry weight of shoot also was comparatively more in monsoon, lending support to this relationship.

Flowering in plants with less photoperiods is less than in those with high photoperiods (1). In the

Table 1. Growth attributes and pod yield in 'POL 2' during four seasons.

Growth attributes and pod yield	Monsoon		Summer	
	1976	1977	1977	1978
Plant height (cm)	49.1	48.5	42.7	42.9
No. of flowers/plant	45.8	55.3	52.8	54.2
Dry weight of shoot (kg/ha)	4027	4191	3657	4170
N uptake (kg/ha)	160.1	163.1	168.9	183.9
P uptake (kg/ha)	8.2	8.4	8.6	9.2
K uptake (kg/ha)	84.1	85.9	89.1	96.9
No. of mature pods/plant	20.3	20.8	22.3	21.9
100 kernel weight (g)	28.7	28.4	33.0	31.4
Pod yield (kg/ha)	2371	2330	2930	3003

Table 2. Weather parameters during flowering and pod filling phases during four seasons.

Weather Parameters	Flowering phase				Pod-filling phase			
	Monsoon		Summer		Monsoon		Summer	
	1976	1977	1977	1978	1976	1977	1977	1978
Maximum temperature °C								
Mean	33.6	30.5	32.4	31.8	30.3	29.4	35.3	36.2
Range	30.7–34.8	28.6–32.4	31.3–33.5	31.0–32.0	28.7–31.5	28.2–30.3	34.4–36.0	35.1–37.0
Minimum temperature °C								
Mean	23.5	23.7	21.7	21.2	21.7	20.5	25.2	24.5
Range	22.9–24.5	23.4–24.0	19.2–23.6	19.8–22.8	21.0–22.1	18.6–22.1	14.2–26.0	24.1–24.0
Rainfall (mm)								
Precipitation	81.0	329.8	49.6	32.6	336.8	76.2	42.4	72.0
Rainy days	10	27	1	1	11	6	4	4
Sunshine hours								
Daily mean	7.0	6.6	9.2	8.7	5.6	7.6	7.9	9.0
Total	353	328	459	437	225	302	314	361
Relative humidity %								
Morning 0722 hrs	77.6	91.6	86.0	93.0	91.0	90.3	81.3	81.0
Evening 1422 hrs	46.4	63.2	38.0	55.0	60.0	56.3	45.3	40.5

present investigation however, though sunshine hours were markedly less in monsoon than in summer, no appreciable variation in flower production was discernible between the two seasons. Thus, light quantity appears to have no bearing on flower production. Similar finding has earlier been documented (9).

Summer recorded more pod yield than monsoon. The weather factors that were instrumental for this enhanced yield are (i) high temperature (ii) low RH (iii) low rainfall and (iv) high solar radiation during the pod filling phase.

Under low temperature, flowers formed do not develop pegs (5). This is borne out in the present study, where a parallelism is evident between temperature and pod number. Thus monsoon which gave low pod number was characterised by low night temperature during the pod formation stage. This accounts for the low pod yield. A high RH is accompanied by increased vegetative growth (3), especially during the monsoon season.

Proliferation of vegetative growth leads to depletion of carbohydrates by their utilisation for synthesis of organic nitrogen (7); this explains the poor kernel weight in monsoon which had depressed pod yield. Pod yield was found to be a function of the radiation received during the ripening period (8). In the present investigation sunshine hours were more in

summer probably contributing to the higher pod yield.

It is seen that in monsoon 1977 precipitation during flowering phase was as high as 329.8 mm, the corresponding figure for summer was only 50 mm. Similarly the rainfall during monsoon 1976 was nearly five times as much as in summer. This high precipitation might have considerably lowered the nutrient status of the soil and this is reflected in the comparatively low plant uptake of nutrients. The high rainfall might have also interfered with the development of flowers into pegs by washing of the pollen (2).

Summary

An experiment was conducted at Agricultural Research Station, Bhavanisagar, Tamil Nadu, South India, for four consecutive seasons during 1976- 78 to assess the effect of weather on growth and yield of bunch groundnut under irrigated conditions. Higher relative humidity during monsoon season enhanced the plant height and vegetative growth. Sunshine hours had no bearing on flower production. Increased pod yield in summer season was attributed to high temperature, low relative humidity, low rainfall and high solar radiation that prevailed during pod filling phase of the crop.

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