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CROP WEATHER RELATIONSHIP IN PEANUT

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The heat unit or growing degree-days (GDD) concept assumes that there is a direct and linear relationship between growth of plants and temperature. The scientific way of assessing and quantifying the effect of temperature and photoperiod on plant growth, development and yield is by applying GDD theory which advocates that plants have a definite temperature requirement to pass through a certain growth portion or phenophase. The duration of specific stage of growth shows direct relationship with temperature and for particular species this duration may be predicted through the summation of mean daily air temperature (Wang 1960). Effect of environmental components such as photoperiod, temperature and irradiance are of considerable importance in understanding the growth, yield and phonological behavior of crop plants to a great extent. Increased yield of improved cultivars in several crop species have been related to change in partitioning rather than increased biomass (Duncan *et al.* 1978, Gay *et al.* 1980, Gifford and Evans 1981 and Evans 1983). Keeping this in view, a study on accumulated heat units, photo-thermal units and helio-thermal units in relation to dry-matter partitioning and phasic development of groundnut genotypes was undertaken. Groundnut has been introduced in Meghalaya recently and occupying an area of 3500 hectares of land under cultivation with an average yield of 1290 kg/ha (Anonymous, 1994). Keeping above in view, a field experiment was conducted at ICAR Research Complex For NEH Region, Barapani (Meghalaya), to study the crop weather relationship in peanut.

A field experiment was conducted to find out effect of weather parameters on different peanut (*Arachis hypogaea* L.) cultivars at different dates of sowing during kharif season of 1996 and 1997 under un-irrigated condition at ICAR Research Complex farm, Barapani (1180 m above msl.). The soil of the experimental site was sandy loam in texture, acidic in reaction (pH 5.1), having organic matter (2.57%), available phosphorus (52.3 ppm), available potash (192.5 ppm) and exchangeable calcium (5.2 meq/g), respectively. In both the years of experimentation, Peanut was sown in the month of May/June and harvested in the 2nd week of October maintaining a spacing of 20 × 5 cm apart from row to row and plant to plant. Uniform dose of 30 kg N, 40 kg P_2O_5 and 40 kg K_2O/ha was applied to the crop at the time of sowing. There were twelve treatments combinations comprises of four varieties viz., Girnar, JL-24, ICG-44 and ICG-76 and three dates of sowing during kharif season with a interval of 20 days (1st May, 20th May and 10th June) replicated thrice in randomized block design during both the year of experimentation. The crop observations at various phonological stages of growth were recorded and utilized in the present investigation. Maximum and minimum temperature data during crop growing season were collected from Automatic weather station of the Institute for calculating degree-day requirement of the crop.

The yield attributes like height of plant, number or branches, number and weight of pod per plant and straw yield influenced by the dates of sowing and the differences were significant in all the characters during both the years of experimentation. Crops sown on 1st May, highly influenced the yield attributing characters than preceding dates of sowing because higher accumulation of heat unit resulted in higher production. Crop sown on 20th May and 10th June resulted in reduction in all the characters as well as minimum accumulation of heat units, which finally reflected on yield of the crop. The

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differences among preceding dates were non-significant during both the year of experimentation. Similar result was observed by Brar *et al.* (1999).

Among the varieties maximum height of plant, number of branches/plant, number of pod/plant, weight of pod/plant, weight of pod/plant and straw yield was recorded in ICG-76 followed by ICG-44, JL-24 and Girnar and the differences were also significant during both the years of experimentation. The results are in conformity of Duncan *et al.* (1978).

Effect of temperature is pronounced at different dates of sowing. Heat unit accumulation was more at first dates of sowing followed by subsequent dates. Higher the accumulation of temperature resulted in more yield and vis-a versa. Maximum growing degree-day (1955 °C & 1480 °C) was accumulated at first date of sown crop and minimum at third date of sowing (1658 °C & 1239 °C). It is indicated that higher the temperature fastens the maturity and contributed to the yield of the crop. Among the genotypes, maximum heat unit was accumulated in ICG-76 (1870 °C & 1404 °C) and minimum in Girnar and JL-24 (1766 °C & 1808 °C during first year and 1332 °C & 1336 °C during second year of experimentation). It indicates that a variety, which are long duration, require more heat unit than short duration. Maximum grain was recorded in ICG-76 and found significantly superior over others varieties. There was little variation in degree day/heat unit accumulation among different varieties. ICG-76 and ICG-44 were accumulated more degree day/heat units during the total growing period than JL-24 and Girnar during both the year of experimentation. The results are with the agreement of Gay and Reicosky, 1980.

Among varieties maximum pod yield (29.16 q/ha 31.83 q/ha) was recorded in ICG-76 and found significantly superior over other varieties. The heat unit accumulation was more in ICG varieties (1834 °C and 1870 °C) and minimum in Ginnar and JL-24 (1766 °C and 1808 °C). The interaction effect between dates of sowing and varieties were also significant. The interaction effect of ICG-76 at all the dates was found significantly superior over other varieties.

Table 1. Effect of sowing dates and growing degree days on yield and yield attributing characters of peanut varieties

Treatments	Height of plant (cm)		Branches/plant (Nos)		Pod/plant (Nos)		Weight of pod/plant (g)		Straw yield (q/ha)		Grain Yield (q/ha)		Degree day (°C)	
Dates of sowing	1996	1997	1996	1997	1996	1997	1996	1997	1996	1997	1996	1997	1996	1997
1st May	43.97	52.81	10.14	7.73	18.08	15.59	15.97	24.12	29.70	33.1	26.50	33.49	1955	1480
20th May	39.07	50.18	7.90	6.36	16.93	10.28	13.22	23.81	27.42	27.09	25.53	27.29	1835	1372
10th June	35.68	47.43	7.59	6.00	9.64	9.11	11.31	21.21	25.4	21.6	23.91	23.42	1658	1239
C.D. at 5%	NS	1.84	1.74	0.66	5.61	1.65	2.07	4.70	3.2	3.3	0.83	2.70	-	-
Varieties														
Girnar	35.32	43.05	6.34	5.24	10.02	8.76	8.87	22.58	23.5	22.1	23.42	22.84	1766	1332
JL-24	43.15	51.32	8.66	5.38	15.00	9.10	13.15	26.00	23.0	23.0	24.30	23.59	1808	1336
ICG-44	50.34	52.85	9.41	7.15	15.54	14.36	13.65	30.05	27.4	24.04	24.38	26.01	1834	1382
ICG-76	52.38	53.34	9.77	9.03	18.94	14.41	14.60	39.79	32.7	39.8	29.16	31.83	1870	1404
C.D. at 5%	3.80	2.13	4.39	0.78	NS	1.93	1.75	5.49	2.5	3.9	0.96	3.12	-	-

Observations were also recorded on leaf spot disease of groundnut on 1-10 scale. Almost all varieties were found resistant against this disease on first and second dates of sowing but little damage was noticed on third dates of sowing particularly in JL-24 and Ginnar.

Results presented in Table 2 revealed that maximum pod yield (26.50 q/ha and 33.49 q/ha) was recorded at 1st May sown crop during first and second year followed by subsequent dates. There was significant variation among the different dates of sowing and the increase was to the tune of 25.50 and 32.49 %, respectively during first and second year of experimentation but first and second dates sown crops were found at par. It had been observed that during first year, yield was less than second year because there was infestation of leaf roller during maximum vegetative stage resulted in less yield. Among different varieties, the variation in pod yield was significant during both the years of experimentation. Maximum pod yield (29.16 & 31.83 q/ha) was recorded in ICG-76 and minimum in Girnar (23.42 & 22.84 q/ha) during first and second year of experimentation. Gay and Reicosky, 1980, observed similar result. It is also interesting to note that interaction effect between dates of sowing and different varieties were also significant. The variation among different varieties were non-significant at first and second dates of sowing but found significantly superior over third dates of sowing during both the years, respectively.

Table 2. Interaction effect of sowing dates and varieties on grain yield of peanut

Variety	Dates of sowing						Mean	
	1st May		20th May		10th June			
	1996	1997	1996	1997	1996	1997	1996	1997
Girnar	24.74	22.36	23.31	28.20	22.38	17.97	23.47	22.84
JL-24	25.16	22.10	24.41	31.47	23.35	17.15	24.30	23.57
ICG-44	25.88	23.24	23.82	34.99	23.43	19.79	24.38	26.01
ICG-76	30.22	41.41	30.77	39.31	26.49	14.78	29.16	31.83
Mean	26.50	27.29	25.53	33.49	23.91	17.42	25.33	26.06
Treatments								
CD at 5%	1996	1997						
Variety	0.93	3.12						
Date of sowing	0.80	2.70						
Interaction	1.61	5.41						

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