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STUDIES ON GROWTH AND YIELD OF GROUNDNUT AS A POST-RAINY CROP IN NAGPUR REGION

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Climatic adaption of groundnut variety SB-XI as a post-rainy crop has been investigated considering the agroclimatic data of Nagpur region and the meteorological equivalents of the crop. The crop sown on 1, 15 and 29 October fortnightly interval during post rainy seasons of 1985-86 and 1986-87 exhibited a cold tolerance indicating its suitability for the Nagpur region as a post-rainy crop. The 15 October sowing alongwith other growth attributes recorded highest dry pod yield (21.24 q/ha) followed by 1 October sowing (18.36 q/ha) being lowest (16.85 q/ha) for the 29. October. From the various growth and yield parameters 15 October sowing was found to exhibit best performance enjoying favourable weather of the season forming optimum sowing time in the region for the post-rainy groundnut. The sub-optimal temperatures prevailed during the winter delayed maturity to 123 days in 1 October sowing, to 136 days in 15 October sowing and to 140 days in 29 October sowing. The low temperature and low evaporation reduced water demand of the crop the conserved soil moisture and post monsoom rains favoured better development and yield of groundnut.

Eventhough groundnut (*Arachis hypogaea* L.) is one of the most important oilseeds of the Semi Arid Tropics, its yield due to erratic nature of the monsoon during *kharif* is unassured. The yield of summer grown groundnut is higher (1400 kg/ha) but the problems are poor emergence in early sowing, the sprouting of nuts in late sowing at the incidence of early on set of monsoon (Kempanna and Bhatnagar, 1982, Reddy, 1982) and requiremont of large number (14 to 19) of irrigations. Post rainy groundnut is likely to be a possible alternative to the situation forming a potential source of increasing both production and productivity of groundnut in india.

The cultivation of groundnut during mid-september to mid-march is considered more profitable (Hamid, 1980 ; Tiwari, 1985). Pandya and Patel(1986) after testing 54 groundnut varieties have shown the possession of cold tolerance in groundnut allowing its germination during December-January. At ICRISAT centre, the yields of post-rainy groundnut were found to be higher than in rainy season (Anonymous 1977). Very recently, Chatterjee and Bhattacharyya (1986) stated that groundnut can be grown during Rabi (Oct. - Feb.) in region with mild winters. The crop at present in Maharastra is not grown in post-rainy season. Therefore the present studies were undertaken to investigate the possibility of having groundnut as post-rainy crop in the Nagpur region by studying its growth, development and yield performance and to decide optimum sowing time for favourable climatic conditions.

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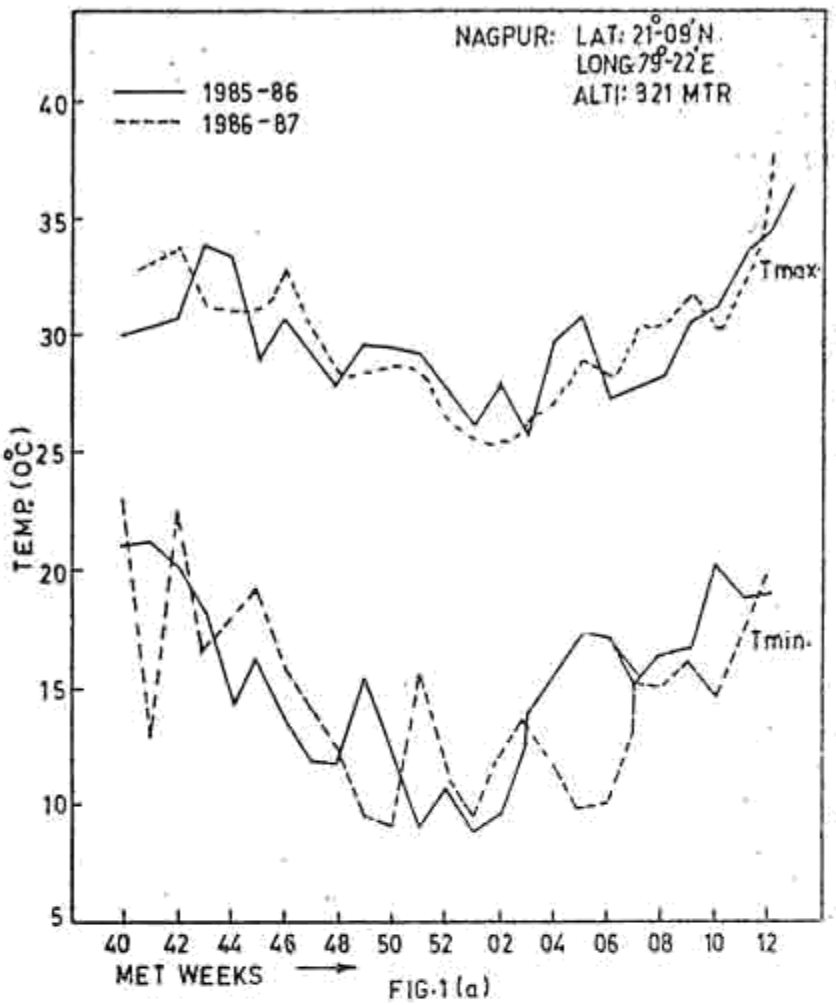

FIG.1 (a)

MATERIALS AND METHODS

The experiments were conducted in the two post-rainy seasons of 1985-86 and 1986-87 in Randomised Block Design with 6 replications. The groundnut variety SB-XI was sown on the vertisols by dibbling with a spacing of 30 x 15 cm on 1, 15 and 29 October in each year. After sowing, irrigations were applied as per need. All the standard agronomic practices and plant protection programme recommeded in the region were followed. All standard observations on the growth and yield attributes were recorded for biometric analysis. The weekly weather data recorded in the Agromet observatory, College of Agriculture, Nagpur situated in the Vicinity of the experimental field are presented in Fig. 1.

Climate of the Nagpur region is characterised as hot thermal regime having mean annual temperature of 27°C. There is no month with mean monthly temperature below 18°C and as such, the climate is designed as 'hot tropical Am'' on Koppens climatic scale with no winter in real sense. On the basis of Krishnan's climatic classification, the winter (Temp. > 20° C) is very mild. The December is the coldest month with mean monthly normal temperature 20.4° C followed by January with 20.7° C. The region lies in high rainfall zone with mean annual precipitation 1242.2 mm (65 rainy days) including a post rainy pre-

cipitation of 142.9 mm. The climate is hot and slightly moist with-20 as Thornthwaites moisture index (Krish nan. 1980).

RESULTS AND DISCUSSION

Agroclimatically, groundnut thrives well at mean temperatures, 21° C to 27° C (Ochase *et. al.*, 1961) requiring moisture about 500 mm to 600 mm (Kakade, 1985). It is very sensitive to stress and excessive moisture during flowering, pegging and pod formation stages. The seasonal and daily C. U. in post rainy groundnut were 334 to 460 mm / crop and 2.61 to 3.59 mm / day (Rao *et. al.*, 1976). Extreme tolerance limits are 4° to 44°C with lower lethal temperature at -0.5°C and upper lethal at 50°C (Mavi, 1985). The cardinal ranges are 10° to 15°C (minimum), 22° to 32°C (optimum) and 38° to 44°C (maximum) (Kakade, 1985). Its photoperiodic response is not much clear but it does well under short and long days.

The crop sown on 1 October, (40th Met. Week max/min. temp. 32.9/22.1°C) emerged in 4 days that of 15 October (42 nd Met week, 32.6/19.9°C) in 5 days while that sown on 29th October. (44th Met week, 31.4/16.8°C) emerged in 6 days. Thus emergence in October was rapid though falling temperatures delayed it slightly. First flowering in the first sowing occurred 26 days after sowing (in Oct.) while in the second and third sowing the same occured 32 days (in Nov.) and 36 days after sowing (in Dec.) respectively. Similarly, in both the years of experiment 50% flowering in the first, second and third sowing occurred respectively 33, 41 and 45 days after sowing. Temperature is the Chief determinant of flower production while low temperature favoured flower formation (Wood, 1968). As the ground nut plant is day neutral, progressively increased photoduration (Fig.1) did not affect flower initiation though the light intensity and quality would have some effect on flower development (Rachie and Roberts, 1974). The increase in duration of germination, vegetative growth and flowering with decrease in temperature are the results similar to Cambell (1980).

Early pod development occurred in 71 (Dec.), 74 (Dec.) and 76 (Jan.) days after sowing in the first, second and third sowings respectively. Maturity occurred after 123, (Jan), 136 (Feb.) and 140 (March) days after sowing in the first, second and third sowings while the same variety in *Kharif* matures in 90 to 105 days.

Higest dry matter production per plant (19.41) and (19.21 g) in first and second year was recorded in the 15 October sowing followed by the 1 Oct. sowing being 15.70 g/plant and 15.84 g/plant for the first and second years (Table 1). However, the lowest dry matter of 12.47 g/ plant and 13.37 g/plant was produced by the third sowing. Maximum height *viz.* 28.1 cm (1985) and 28.5 cm (1986) was recorded by the 1 October sowing followed by the 15 October sowing being 27.91 cm (I year) and 28.1 cm (II year). However, the lowest height with 26.2 cm (I year) and 26.1 cm (II year) was recorded by the last sowing. One Peculiarity observed was the highest *number of*

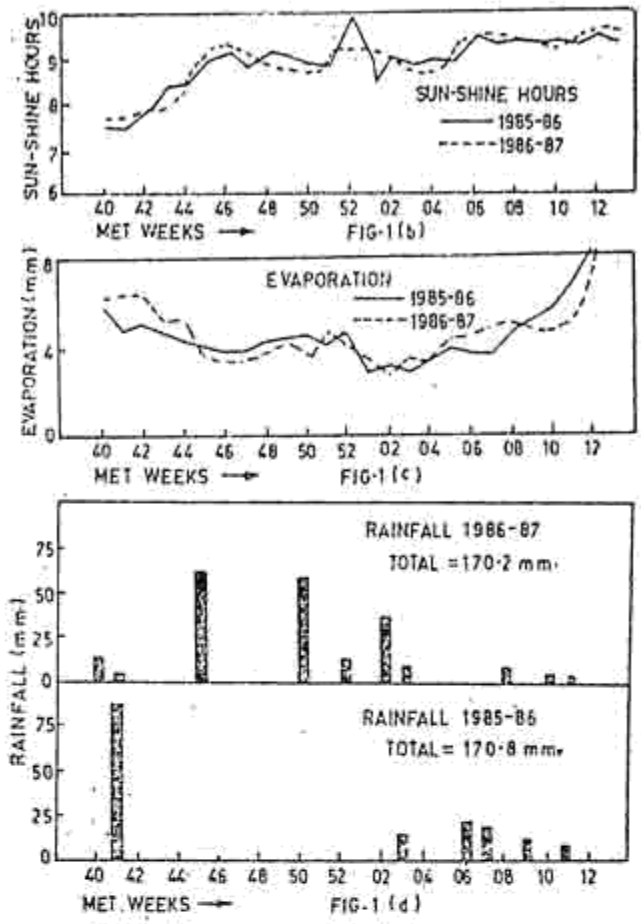

FIG-1 [a,b,c,d]:-WEATHERGRAM SHOWING WEEKLY MAXIMUM AND MINIMUM TEMPERATURES, SUN-SHINE HOURS, EVAPORATION AND RAINFALL DURING 1985-86 AND 1986-87.

secondary branches in both the years in case of second sowing eventhough the primary branches remained roughly the same in all the sowings. This has resulted in highest dry matter production (19.31 g/plant) and highest number of functional leaves (123 Leaves). The rate of dry matter production per plant was also highest in the second sowing followed by first and last sowing (Fig.2). Thus it is seen that the second sowing exhibited the best growth performance indicating the most favourable weather conditions suited for the crop followed by the first and last sowing in order.

There were significant differences in the yield (Table 2) recorded by the three sowings. The 15 October sowing significantly recorded highest yields of 21.05 q/ha and 21.10 q/ha in the first and second years respectively followed by Ist October sowing (18.06 q/ha and 18.66 q/ha). However, the lowest yields (16.05 (q/ha and 17.22 q/ha) were recorded by 29 October sowing indicating unfavourable weather conditions experienced by the crop. Number of pods/plant (21.15) was highest in case of 15 October sowing followed by 1 October sowing 18.94) and by 29 October (15.01). Second sowing also recorded highest yields of dry haulms 43.33 q/ha followed by 1 Oct. sowing (36.1 q/ha) and 29 October sowing (32.92 q/ha). Biological yield was also highest in the 15 October sowing (64.02 q/ha) followed by 1 October

Table 1 : Influence of various sowing dates on the different characters in postrainy groundnut during 1985-86 and 1936-87

Character	1 October sowing			15 October sowing			29 October sowing		
	1985-87	1986-87	Pooled averge.	1986-86	1986-87	Pooled averge.	1985-36	1986-87	Pooled averge.
Height of plant (cm)	28.1	28.5	28.3	27.91	28.51	28.01	26.2	26.1	26.15
No. of branches/plant (primary + Secondary)	7+11	7+12	7+11.5	7+19	7+19	7+19	7+10	7+12	7+11
No. of functional leaves/plant	106	105	105.50	126	123	123	103	101.0	102.0
Dry matter/plant (g)	17.50	15.84	15.77	19.41	19.21	19.31	12.47	13.37	12,92
No. of pods/plant	18,41	19.47	18.94	21.01	21.29	21.15	14.50	15.52	16.01
Pod yield (q/h)	18.06	18.66	18.36	21.40	21.09	21.24	16.50	17.21	16.85
Yield of dry haulms (q/h)	35.78	36.42	36.1	42.34	43.33	43.33	32.40	33.44	32.92
Biological yield (q/h)	53.84	55.08	54.46	63.74	64.42	64.02	48.90	50.65	49.77
Harvest index	0.335	0.336	0.336	0.335	0.327	0.330	0.337	0.339	0.338
Wt. of 100 dry pods (g)	85	90	87.5	86	85	85.50	78	80	79
Wt. of 100 seeds (g)	39	39	39	40	39	39.5	36	37	36 50
Shelling percentage	83.60	83.67	83.63	80.0	80.43	80.21	78.0	79.16	78 58
Oil content%	50.05	50.03	50.04	50.19	50.19	50.19	49.98	49.78	49.88

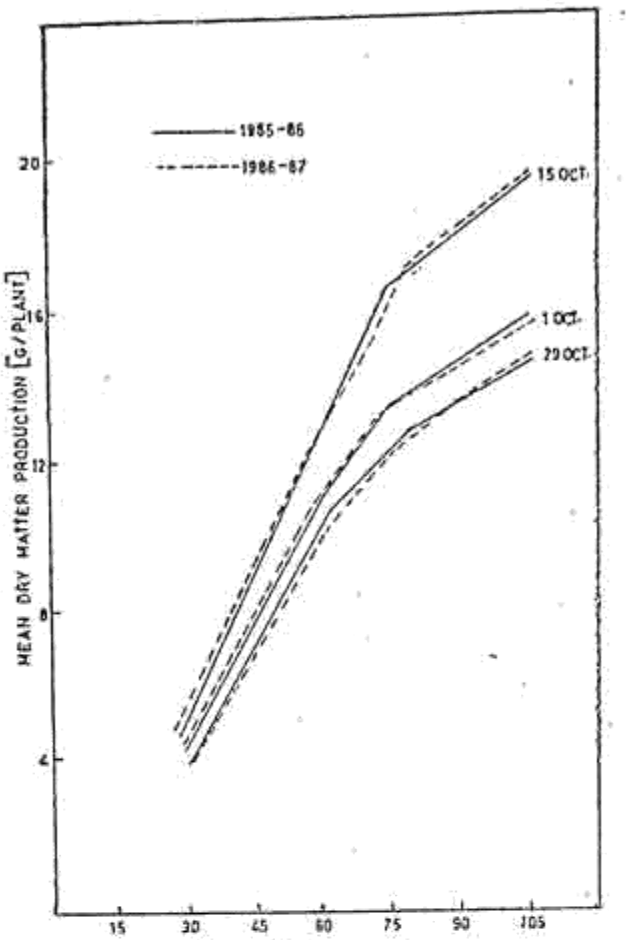

FIG. 2 : MEAN DRY MATTER ACCUMULATION (G/PLANT) PER PLANT AS INFLUENCED BY SOWING DATES IN POST RAINY GROUNDNUT.

sowing (54.46 q/ha) while the 29 october sowing recorded the poor value of only 49.77 q/ha However, the harvest index was highest (0.338) in the case of the last sowing being nearly similar in the first and the second sowings.

The weight of 100 dry pods and 100 kands was highest in the second sowing followed by the first sowing but was lowest in the last sowing (Table-1). Shelling percentage was highest (83.63%) in the first sowing followed by second sowing (80.21%) and the last sowing (78.58%). Oil content was highest in the second sowing being least in the last sowing.

Progressively increasing photoperiods (8-10 h) are definitely favouable (Fig.1) for vegetative growth, dry matter accumulation and reproductive growth (Ketellapper, 1969, Wynne *et al.*, 1973). The climatic water demand from evaporation was very less during the growing season of 1985-86 (399.52 mm) and was (416.52 mm) during 1986-87 while the rainfall received was 134.7 mm during the first year and 170.5 mm during the second year which enriched the residual conserved moisture. The sub - optimal temperatures (Fig. 1) prevailed during the mild winter seasons in both the years did not interfere with any of the physiological stages except delaying the growing period and prolonging maturity.

Table 2: Dry pod yield (q/h) as influenced by sowing dates in post rainy groundnut during 1985-86 and 1986-87

Date of sowing	Yield of dry pod in q/h	
	1985-86	1986-87
1 October	18.06	18.66
15 October	21.04	21.10
29 October	16.05	17.22
S. Em ±	0.292	0.311
CD at 5%	0.921	0.981

These studies clearly revealed that there exists a required cold tolerance in the groundnut variety SB-XI suited to the mild winters of the region and could be adapted. The consistently significant growth and yield results of the two seasons have clearly confirmed that the best sowing date in the region for post rainy groundnut is 15 October followed by 1 October i.e. first fortnight of October. However, sowings later (*viz.*, 29 October) than this, experienced unfavourable climatic conditions giving poor growth and yields and therefore must be avoided. These studies showed that the yields of post rainy groundnut were higher than that in *kharif* and *summer*. Similarly, the water demand of the post rainy crop was also lower than in *Kharif* and summer seasons.

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