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VARIETAL AND HABITUAL VARIABILITY IN CARBOHYDRATE-NITROGEN RELATIONSHIP OF *Arachis hypogaea* L

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Evaluation of biochemical composition of plant namely, total nitrogen, protein nitrogen and total carbohydrate were made in twelve varieties of groundnut representing six in bunch three in each of semi-spreading and spreading growth habits. The two 'bimodal' peaks of nitrogen characteristic of bunch and a feeble nature of such a peak in semi-spreading and absence of such trend in spreading groups was evident from the investigation. The carbohydrate-nitrogen ratio was mainly governed by the carbohydrate status rather than total nitrogen. The single peak for total carbohydrate in all the habits was a unique feature, and earlier the peak was attained the yield was better.

The cultivars of *Arachis hypogaea* L. has taken a very important role in oil seed crop in India. Besides its local consumption it is also known to be earner of valuable foreign exchange. While a break-through in crop production has been realised in several cereal crops it has not been possible to realise similar goals in some of the pulses and oil seed crops. However the productivity can be increased to a possible extent by crop improvement and better crop management.

An understanding of the physiological nature of crop, its capacity in source-sink translocation and its metabolism would pay a way to utilize the most advantageous physiological characters for crop improvement programme by genetic manipulation. The groundnut is not an exceptional case in this regard. The term source-sink relationship comprises the efficiency of dry matter translocation from the vegetative parts of the plant which could be synthesised by carbon assimilation to the developing pods of the plant which determines the yielding potentiality of the plant apart from the initial source material used for propagation purposes which is also considered as one of the main governing factor for initial growth of plant as described by Blackman's Compound Interest Law (1919).

MATERIALS AND METHODS

The experiment was conducted in a red loamy soil at Millet Breeding Station of Tamil Nadu Agricultural University, Coimbatore during the year 1977. Twelve cultivated varieties of *Arachis hypogaea* L. representing six in bunch (TMV 2, TMV 9, B 131, *Ah* 8068, Ganagapuri and Pollachi Red), three in each of semi spreading (TMV 6, TMV 8 and TMV 10) and spreading (TMV 1, TMV 3 and TMV 4) respectively were used as the experimental material. The NPK fertilizer was applied by broadcast at the rate of 15: 30: 45 kg/ha before sowing. The trial was laid out in a randomized block design and the treatments (varieties) were replicated thrice.

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The plant samples were drawn at different physiological stages of crop growth for biochemical analysis. The total carbohydrate. (Somogyi, 1952) and total nitrogen (Humphries, 1956) were estimated by the respective methods. The values of protein nitrogen were calculated by substracting the non-protein nitrogen from total nitrogen.

RESULTS AND DISCUSSION

Chemical analysis of leaves the main seat of photosynthesis were made and the data are appended in tables 1, 2 Figure 1, 2.

The close examination of data showed that bunch varieties depicted a similarity in trend among themselves as regards total nitrogen. The trend for protein nitrogen was identical and it was parallel throughout the crop growth period. The curves showed two characteristic peaks one about 30 days, and the other about 80 days. The second peak was more prominent than the first. A comparative evaluation of trends of total nitrogen and protein nitrogen showed that protein synthesis was steady among the varieties. Though the trends were similar among the semi-spreading varieties, they were distinctly different from that of bunch. The first peak attained at 50th day was distinct but the second peak at 105 days was feebly noticeable and it was much less pronounced compared to the first peak. The closeness of these two trends at the later stages of crop growth suggested a better protein turnover. Spreading varieties also showed similarity in trends among themselves. But in this group the trends were different from both bunch and semi-spreading in that a slight increase appeared first at 50th day but a steady decline was noticed. The second peak appeared around 105 day was much more feebly noticeable in spreading varieties. The bimodal peaks of nitrogen obtained here in bunch group due to more uptake of nitrogen by the plant supported the study made by Smartt (1976) in groundnut.

The decline in values of nitrogen content with the increasing age of the crop presented in this experiment supported the results obtained by Paul and Saxena (1976) in soybean. Thus the closeness of trends of total nitrogen and protein nitrogen in spreading showed at final stages suggested that protein turnover was much more efficient than bunch and even semi-spreading groups.

The total carbohydrate status also increased in the order of bunch, semi-spreading and spreading groups as showed in the same order for the total nitrogen content of habits respectively.

Considering the bunch varieties, the trend was one of rapid rise reaching a peak value at 50th day followed by a steep decline suggested that the increase was perhaps an important aspect associated with pod development. Even so semi-spreading varieties showed a slow but steady increase attaining the peak around 105 days and beyond this stage a declining trend was evident. TMV 6 recorded a high value and perhaps this would have been associated with high yielding potentiality. Among the spreading varieties also the trend was slow and steady and the peak values were attained at 105 days in all the varieties followed by a drop in later stages

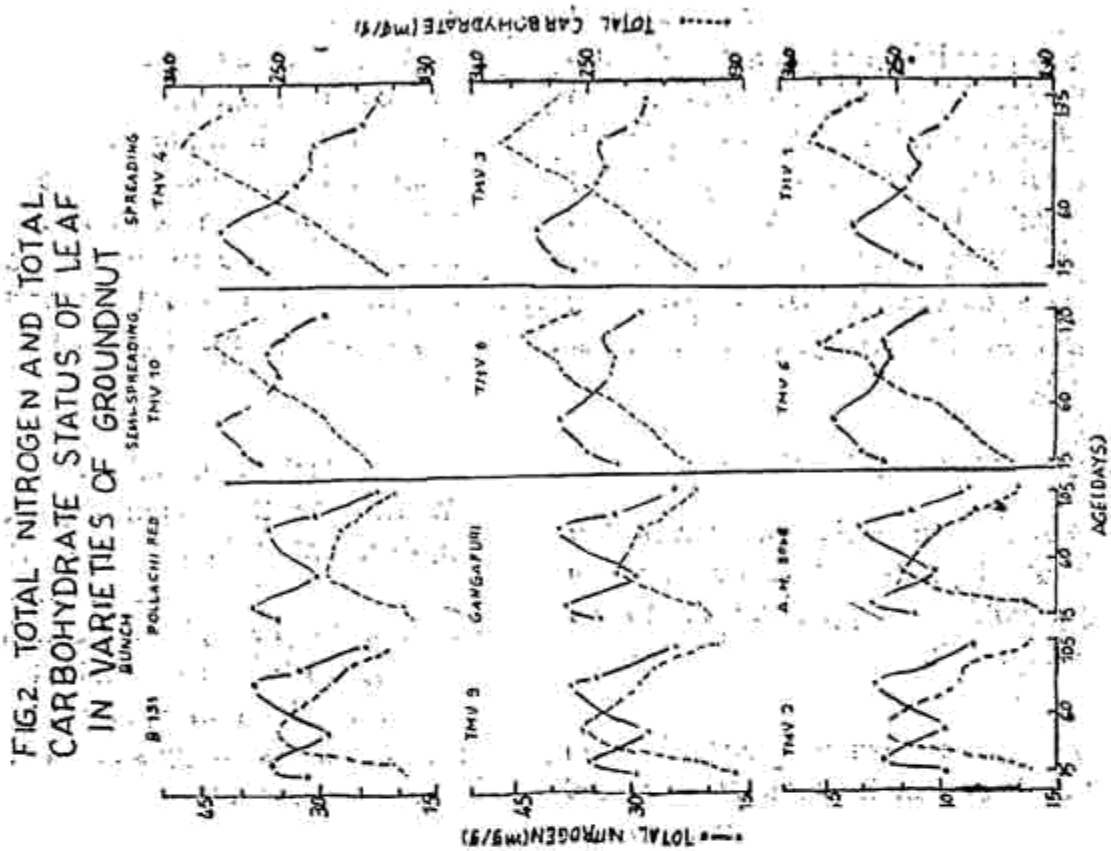

FIG.2. TOTAL NITROGEN AND TOTAL CARBOHYDRATE STATUS OF LEAF IN VARIETIES OF GROUNDNUT

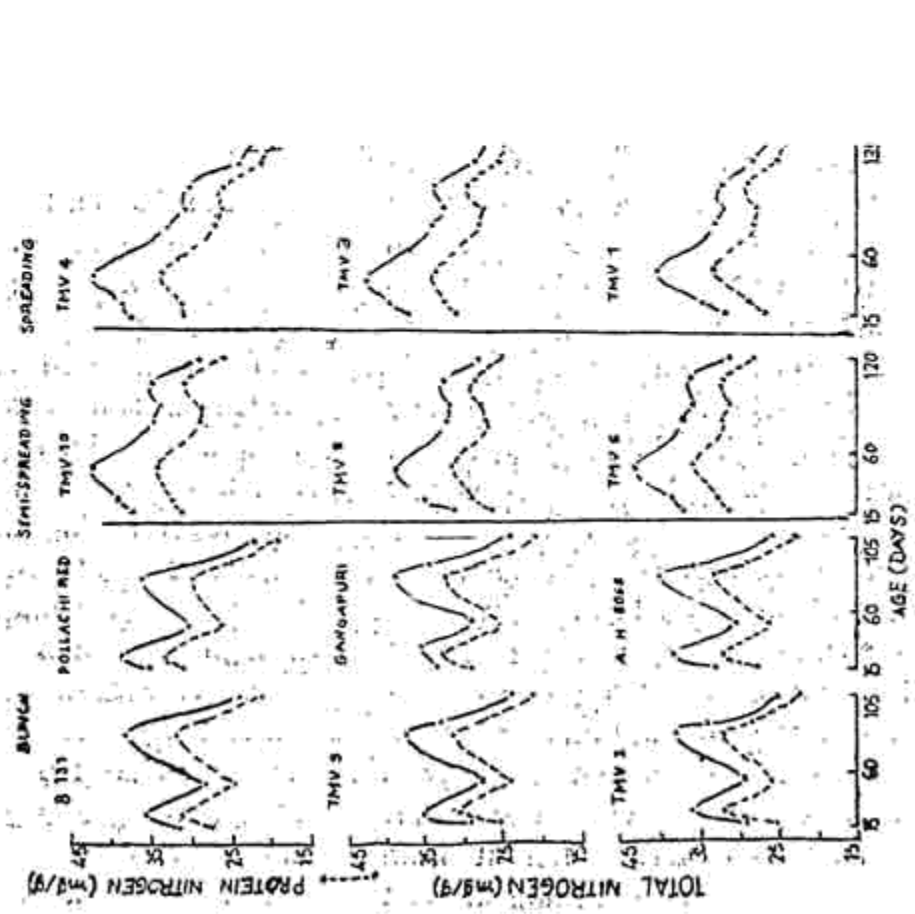

FIG1 TOTAL NITROGEN AND PROTEIN NITROGEN STATUS OF LEAF IN VARIETIES OF GROUNDNU

Table 1 : tal Nitrogen and Protein Nitrogen content of Leaf (mg/g) in varieties of groundnut

	Total Nitrogen								Protein Nitrogen							
	Days after sowing								Days after sowing							
	15	30	50	80	90	105	120	135	15	30	50	80	90	105	120	135
							BUNCH									
TMV 2	29.3	36.9	29.5	38.4	31.7	25.1	—	—	25.4	32.2	26.1	32.4	27.9	22.5	—	—
TMV 9	29.4	35.7	27.6	37.7	30.9	24.0	—	—	25.5	30.9	24.1	31.7	26.9	21.4	—	—
B 131	31.6	36.2	28.6	38 6	32.5	24.1	—	—	27.5	31.1	24.8	32.1	21.2	21.2	—	—
Ah 8068	32.8	38 5	30.2	40.1	33.0	25.9	—	—	28.2	32 6	26.1	33.0	28.1	22.9	—	—
Gangapuri	33.8	38.4	29.1	39.2	31.9	24.0	—	—	29.2	32.9	25.0	32.4	27.2	20.8	—	—
Pollachi Re	35.5	38 9	30.4	36.5	30.6	22.2	—	—	31.3	33.5	26.3	29.6	25.9	19.3	—	—
							SEMI-SPREADING									
TMV 6	36.9	39.3	43.2	37.2	35.9	36.3	31.4	—	31.3	32.7	35.6	32.1	32.3	32.3	28.2	—
TMV 8	31.3	35.0	38.7	32.4	31.9	32.8	28.2	—	26.4	28.9	31.6	27.3	27.6	28.8	25.0	—
TMV 10	37.7	39.7	42.7	35.3	34.2	35.4	29.4	—	31.8	32.8	34.8	29.6	29.2	31.2	26.1	—
							SPREADING									
TMV 1	31.9	34.9	40.5	33.0	31.9	32.6	28.4	25.9	26.8	28.8	33.5	28.0	27.8	28.9	25.4	23.0
TMV 3	37.1	37.8	41.9	34.0	32.6	33.8	28.9	27 7	30.9	32.5	33.8	28.4	27.7	29.8	25.7	24.7
TMV 4	37.9	38.9	42.6	33.1	31.0	30.8	24 4	22.1	31.1	31.1	34.1	27.4	26.3	26.6	21.2	19.2
SED :	0.35	0.24	0.40	0.84	0.41	0.42	—	—	0.39	0.67	0.53	0.17	0.31	0.27	—	—
CD :	0.72	0.49	0.82	1.74	0.85	0.87	—	—	0.80	1.38	1.09	0.35	0.64	0.55	—	—

Table 2 : Total Carbohydrate and Carbohydrate-Nitrogen Ratio of Leaf (mg/g) in Varieties of Groundnut

	Total Carbohydrate								Carbohydrate - Nitrogen Ratio							
	Days after sowing								Days after sowing							
	15	30	50	80	90	105	120	135	15	30	50	80	90	105	120	130
						BUNCH										
TMV 2	150	178	263	204	199	143	—	—	5.1	4.8	8.9	5.3	6.3	5.7	—	—
TMV 9	139	169	256	251	202	153	—	—	4.7	4.8	9.3	5.7	6.5	6.4	—	—
B 131	152	163	251	212	198	162	—	—	4.8	4.5	8.8	5.5	6.1	6.7	—	—
Ah 8068	141	153	246	220	192	159	—	—	4.3	3.9	8.1	5.5	5.8	6.1	—	—
Gangapuri	156	163	226	208	191	168	—	—	4.6	4.2	7.8	5.3	5.9	7.0	—	—
Pollachi Red	149	156	215	207	189	162	—	—	4.2	4.0	7.1	5.7	6.2	7.3	—	—
						SEMI-SPREADING										
TMV 6	162	178	285	266	274	312	262	—	4.4	4.5	4.8	7.1	7.6	8.3	8.3	—
TMV 8	173	184	212	269	279	302	258	—	5.5	5.3	5.5	8.3	8.8	9.2	9.2	—
TMV 10	179	186	211	266	281	304	263	—	4.7	4.7	4.9	7.5	8.2	8.6	8.9	—
						SPREADING										
TMV 1	169	189	213	257	282	317	303	270	5.3	5.4	5.2	7.8	8.8	9.7	10.7	10.4
TMV 3	166	179	211	260	289	318	307	272	4.5	4.5	5.0	7.6	8.9	9.4	10.6	9.8
TMV 4	169	187	216	272	299	327	310	279	4.5	4.7	5.0	8.2	9.6	10.6	12.7	12.3
SED	2.99	4.49	0.86	1.55	2.16	2.19	—	—	—	—	—	—	—	—	—	—
CD :	6.20	9.31	1.78	3.70	4.47	4.54	—	—	—	—	—	—	—	—	—	—

showed an association with pod development.

A comparative analysis of total nitrogen and total carbohydrate trends in varieties showed that the presence the two peak values of total nitrogen in bunch group, the depression occuring in between two crests and the single peak value stage for total carbohydrate which had a synchrony with total nitrogen was considered to be associated with high yielding potentiality of the varieties. This amply support the view made by Kollman *et al.*, (1974) in soybean Semi-spreading and spreading varieties were characterised by lack of two distinct peaks in total nitrogen and the shift if any in 'synchrony' did not provide any significance. From the present investigation it showed that bimodal peaks applicable only for bunch varieties and not for semi-spreading and spreading. Carbohydrate-Nitrogen ratio was examined for an association with varietal characters and habits.

In bunch, semi-spreading and spreading varieties it was quite significant that carbohydrate-nitrogen ratio was governed by carbohydrate status rather than nitrogen. The study of carbohydrate-nitrogen ratio trend revealed that the more carbohydrate content at the earlier stages of pod development and more nitrogen at the flowering stage associated with high yielding potentiality of the varieties irrespective of habit.

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