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1) Environmental impact on different characteristics of soybean.

The leguminous protein and oil rich crop soybean requires specific environment for its successful growth and yield. The variation in yield levels and restricted adaptation are mostly due to photoperiodic requirements (Weber and Moorthy, 1952) and probably due to thermal sensitivity (Leng, 1968). The nature and magnitude of variability present in an individual or a population is due to both genetic and nongenetic causes. The environment itself represents the nongenetic influence for the expression of different characteristics of an individual. Thus, to identify the suitable genotypes and the proper sowing time, it is of utmost necessity to grow a number of genotypes in a series of environments.

Soybean is still a new commercial crop in northeastern India and a number of exotic genotypes have been introduced from different places. Hence, the present investigation has been designed to identify the suitable genotypes and sowing time for these genotypes.

Materials and methods. The investigation comprised ten soybean genotypes. Bragg, JS 2, PK 369, Kalitur, JS 72-1, PK 71-21, PK 327, JS 72-375, PK 409, and DS 73-16 were grown in 6 environments: 3 in the spring and 3 in the summer season, and the environments were the sowing dates, viz., E1 (28.12.81), E2 (28.1.82), E3 (3.3.82), E4 (17.7.82), E5 (18.8.82) and E6 (20.9.82).

The whole experiment was carried out in the Instructional cum Research Farm of the Department of Plant Breeding and Genetics, Assam Agricultural University, Jorhat, Assam, India, with 3 replications in each environment. The genotypes were allotted randomly in the 10 plots of each replication. Five rows were made in each plot measuring 2 m length, the plant-to-plant distance was 10 cm and row-to-row 45 cm. Observations were recorded from 10 randomly selected plants of each plot, leaving the border rows and plants on yield and other morphophysiological characters. The data were analyzed in each environment to determine the environmental mean; the environmental indices were analyzed following the method given by Eberhart and Russell (1966).

Results and discussion. The environmental mean, i.e., the mean of all the genotypes at a particular environment, and the environmental index, i.e., the difference between the environmental mean and grand mean of the genotypes over all the environments (Eberhart and Russell, 1966), and the genotypes permit the assessment of the best and the poorest performing environments for various characters.

Out of the six environments, E3 (3.3.82) was observed to cause decided improvement in number of primary branches, pod length, plant height at 50% flowering, and the seed yield per plant as inferred by the environmental mean and indices. The environment E2 was also found to be superior due to the high environmental mean and index for number of secondary branches, number of pods per plant, number of pods per cluster, number of seeds per pod, and days from flowering to maturity. The E1 (28.12.81) also exhibited high environmental mean and index for number of pods per plant and seed yield per plant. This environment also caused decided improvement in number of clusters per plant. However, the environment was observed to cause delayed flowering and maturity, as indicated by the highest environmental mean and environmental index for days to flowering and days to maturity. For days to flowering and maturity, the minimum duration was expressed in E6 (20.9.82), which was in the summer season. For spring season E3 (3.3.82) followed by E2 (28.1.82) exhibited moderate duration for flowering to maturity. All the results were suggestive of better environmental condition for soybean growing during spring rather than summer season. It appeared that sowing in between the last week of January and first week of March provides the most ideal environment for the best performance of soybean crop with an optimum crop duration. However, it is necessary to conduct multilocation trial involving sowing during spring season in order to identify and recommend the suitable sowing time of soybean in northeast India.

In this investigation, the genotypes were observed to possess a tendency to have more or less reduced flowering and maturity duration from E1 to E6. This might be due to the combined influence of temperature, humidity, and day length on flowering and maturity duration of the crop.

Summary. Spring sowing of soybean was found to be more congenial than that of summer sowing, which is the normal cultivation season in northeastern India. It appeared that sowing between last week of January and first week

Table 1. Environmental mean (m) and environmental index (I) for the characters under study in all environments

Environmental mean (m) and Index (I)	Environments					
	E1	E2	E3	E4	E5	E6
Days to flowering						
m	60.50	48.64	48.88	35.54	32.86	27.78
I	18.13	6.27	6.51	-6.83	-9.51	-14.59
Plant height at 50% flowering (cm)						
m	25.10	34.58	42.10	48.50	21.04	13.81
I	-5.75	3.73	11.25	17.65	-9.81	-17.04
Number of primary branches						
m	4.80	4.63	4.89	3.93	2.00	2.13
I	1.07	0.90	1.16	0.20	-1.73	-1.60
Number of secondary branches						
m	1.27	1.86	1.62	0.76	0.62	0.87
I	0.10	0.69	0.45	-0.41	-0.55	-0.30
Number of pods per plant						
m	58.83	59.01	43.14	33.03	11.33	9.78
I	22.98	23.16	7.29	-2.82	-24.52	-26.07
Number of clusters per plant						
m	19.97	18.94	11.63	10.98	4.32	3.57
I	8.40	7.37	-0.06	-0.59	-7.26	-8.00
Number of pods per cluster						
m	3.00	3.34	2.20	3.23	2.82	2.76
I	0.11	0.45	-0.69	0.34	-0.07	-0.13
Number of seeds per pod						
m	2.93	3.20	2.83	2.44	2.42	2.42
I	0.22	0.49	0.12	-0.29	-0.29	-0.29
Pod length (cm)						
m	3.97	3.99	4.51	3.44	2.93	2.76
I	0.37	0.39	0.91	-0.16	-0.67	-0.84
Leaf area (sq cm)						
m	10.36	16.03	35.43	41.34	21.66	16.25
I	-13.15	-7.48	11.92	17.83	-1.85	-7.26

Table 1. Continued

Environmental mean (m) and Index (I)	Environments					
	E1	E2	E3	E4	E5	E6
Days of maturity						
m	104.84	95.76	97.36	97.41	91.63	85.63
I	9.41	0.33	1.93	1.98	-3.80	-9.80
Days from flowering to maturity						
m	56.67	65.69	48.00	64.26	51.40	52.12
I	0.31	9.33	-8.36	7.90	-4.96	-4.24
Plant height at 50% maturity (cm)						
m	29.86	44.08	67.84	56.85	21.38	13.87
I	-9.12	5.10	28.86	17.87	-17.60	-25.11
100-seed weight (g)						
m	13.75	11.50	13.95	14.63	13.31	12.54
I	0.47	-1.78	0.67	1.35	0.03	-0.74
Seed yield per plant (g)						
m	10.86	8.32	11.85	8.38	4.60	5.28
I	2.64	0.10	3.63	0.16	-3.62	-2.94

of March provides the most suitable environment for the better performance of soybean with an optimum crop duration. However, multilocational trial is necessary to determine and recommend the spring sowing of soybean in this region of India.

References

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