Evaluation of Peanut Genetic Resources for Nodule Count

SK Bera
Out-reach Centre of National Research Centre for Groundnut, 38-Dharamvihar, Bhubaneswar-751030 (Orissa)

Six hundred and eighty groundnut germplasm accessions comprising four different habit groups were evaluated for nodule number per plant during rainy season. Rich variation was observed within the population as well as in each habit groups and would be an important gene pool for the breeder. While, the population was evaluated in two distinct environments, it showed two different types of distribution for nodule number per plant. Population registered higher mean nodule number per plant in post-rainy season under rice fallow in comparison to rainy season under red laterite soil. It seems that peddled soil of rice field would not be any constraint for nodulation in rice based groundnut crop and high nodule number per plant in post-rainy season in comparison to rainy season. This might be one reason for better productivity of rabi/summer groundnut under paddy fallow. Twenty five accessions out of 276 Spanish Bunch accessions showed promise as high nodulating genotypes in comparison to check variety, JL-24.

Key words : Augmented Design, Genetic Resources, Groundnut, Nodulation

Groundnut plays a vital role in edible oilseed production in India. Improvement of seed and oil yield in this crop to meet the increasing demand is foremost. There is a need to intensify efforts to search for appropriate new donors for different yield contributing traits to break yield plateau. In the present studies attempts have been made to evaluate the genetic resources of groundnut maintained at this centre to assess their potential use in developing high nodulating genotypes for rice based groundnut cropping system.

Materials and Methods

Working collections of 680 groundnut accessions comprising 416 Spanish Bunch (SB), 142 Valencia (VL), 86 Virginia Runner (VR) and 36 Virginia Bunch (VB) were evaluated in Augmented Design during rainy season at Out-reach Centre of National Research Centre for Groundnut, Bhubaneswar. The accessions were equally distributed in six different blocks having 113 test entries in each block along with six checks AK-12-24, JL-24, TAG-24, OG 52-1, Girnar-1 and ICGS-11. From these 680 accessions, 276 selected Spanish Bunch (SB) accessions out of 416 SB accessions, were re-evaluated again in Augmented Design during post-rainy season under residual moisture situation of paddy fallow. These accessions were distributed in six different blocks having 46 test entries in each block along with six checks as before.

Each accession was sown in three rows of five meter bed with plant to plant and row to row spacing of 10 x 5cm, respectively. N:P:K was applied @ 20:40:40 as basal dose at the time of sowing. Standard agronomic practices and plant protection measures were followed towards management of crop. Observations were recorded on 10 competitive randomly selected plants at 60 days after germination for scoring of nodule number per plant. Data was analyzed according to Agarwal and Sapra (1995).

Results and Discussion

Nodule number per plant was scored at 60 days after germination in 680 accessions of groundnut germplasm. Population distribution of four different habit groups (SB, VL, VR and VB) for nodule number per plant is shown in Fig. 1.

Spanish Bunch (SB) group

The 416 accessions of SB group distributed themselves in all five classes representing wide range of variation from 0 to 125 within the group. However, median class is II (26-50) since, nodule number per plant of majority SB accessions (more than 220) grouped in between 26-50. Frequency value of both class I and III are close to each other and is around 85, whereas frequency value of class IV and V are below 15.

Valencia (VL) group

Being the second largest group in the population (142 accessions), VL also revealed rich variation and distributed in all five classes. However, class III (51-75) showed highest frequency (around 50) for this group followed by class II and IV having frequency around 40 and 30 approximately. Class I and V have frequency value less than 15.

Virginia Runner (VR) group

Eighty six VB accessions also categorized in all five

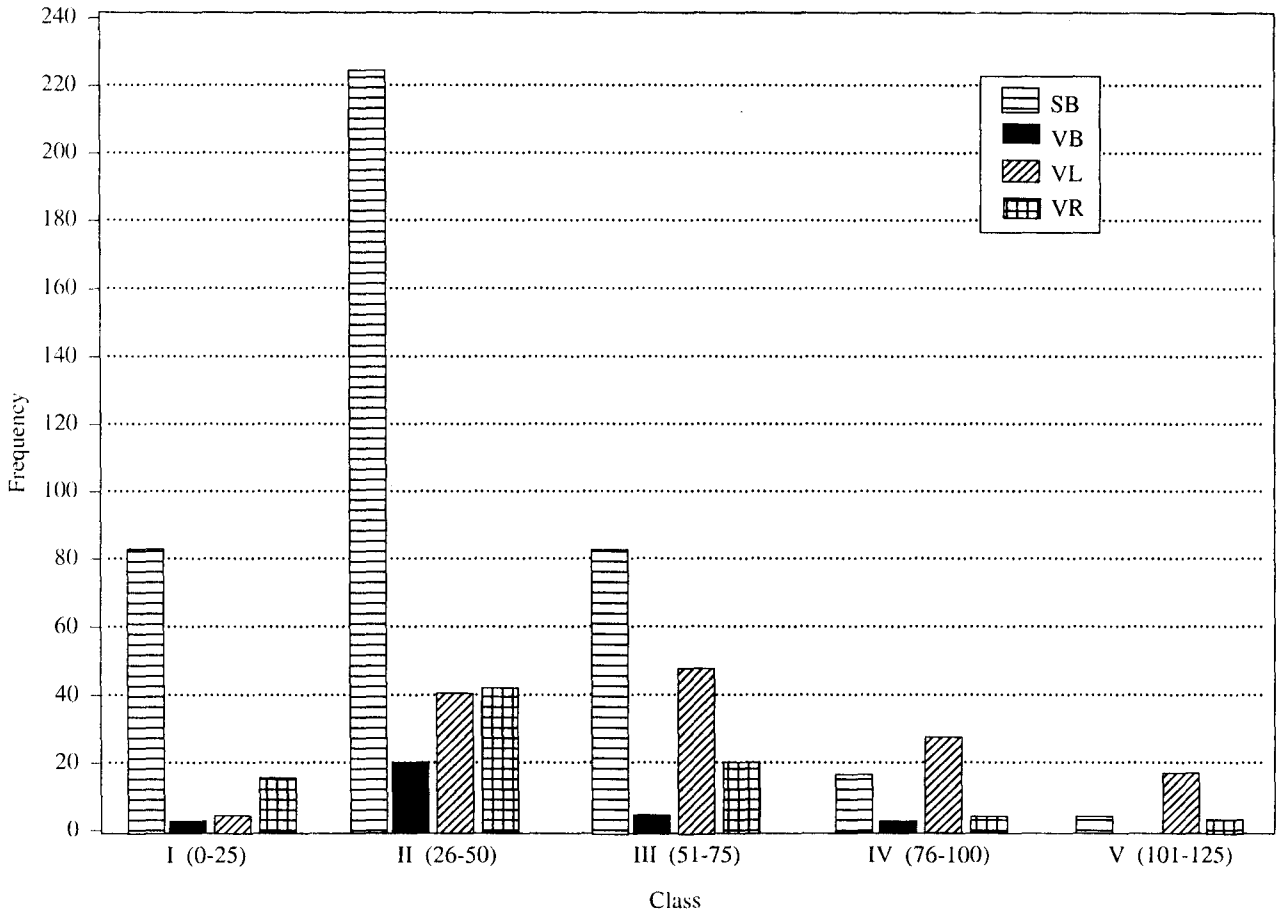

Fig. 1. Population distribution of 680 groundnut germplasm under four different habit groups for nodule number/plant during rainy season

classes. Maximum frequency value (approximate 40) was observed in class II. While other classes showed very less frequency value.

Virginia Bunch (VB) group

Thirty six VB accessions showed variation from 0 to 100, with class II the median class for this group having highest frequency value.

Combined

Maximum number of frequency was observed in class II for all habit groups except Valencia group. Though high frequency for Valencia comes under class III however, it is very close to the frequency of class II. Thus, nodule number per plant of the present population has been observed within the range from 26-50.

A total of 276 selected SB accessions were re-evaluated during *rabi*/summer season under paddy fallow. Population distribution of 276 SB accessions for nodule number/plant at 60 days after germination in rainy and post-rainy has been compared in Fig. 2. It is evident from the diagram that same population showed two different type of distribution for rainy and post-rainy seasons. Nodule number per plant during rainy season showed wide range of variation ranging from 0 to 125. However, highest number of frequency (225) was observed in class II with class value 25-50 followed by class III and I having frequency around 120, 70 and 60 respectively. These three classes represent the nodule number per plant of rainy season for majority genotypes of the population. However, picture is remarkably different in post-rainy season for the same population. In post-rainy season, nodule number per plant also exhibited rich variation starting from 0 to 150. Maximum frequency has been recorded in class IV with class value 76-100 followed by class III and V having frequency around 110, 75 and 50, respectively. Hence classes III, IV and V represent nodule number per plant of post-rainy season for majority accessions of the population.

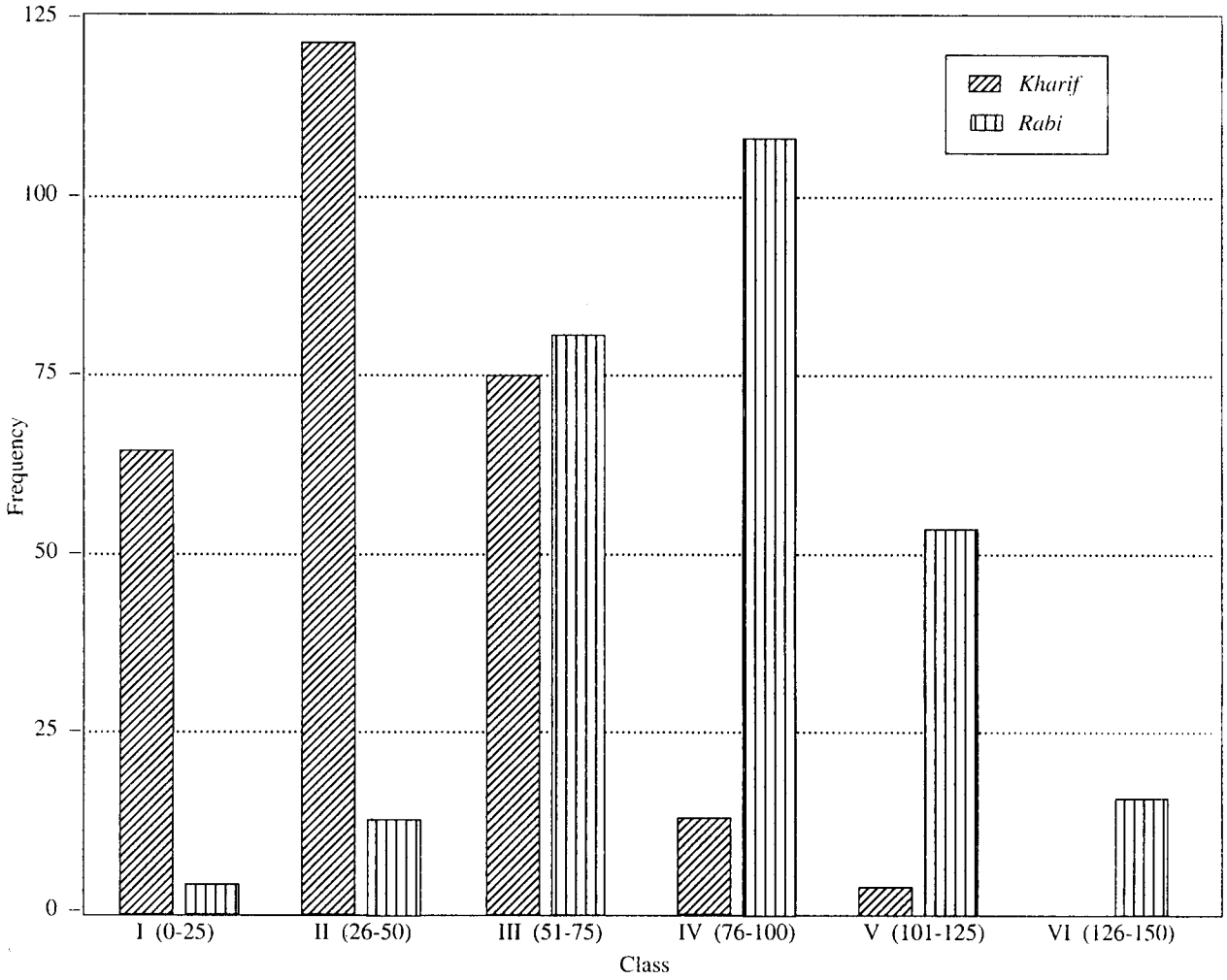

Fig. 2. Comparative population distribution of 276 Spanish Bunch groundnut germplasm for nodule number/plant over two seasons

It is evident from above that average nodule number per plant in groundnut during post-rainy season under paddy fallow situation is higher than rainy season under red lateritic soil. This maybe one reason for higher productivity of *rabi*/summer groundnut under paddy fallow in comparison to *kharif* groundnut.

Nodule number per plant of 276 SB accessions have been analyzed according to Agarwal and Sapra (1995).

Table 1. Mean nodule count per plant in six check varieties over blocks

Sl. No.	Check	No. of nodules/plant
1	AK-12-24	97
2	JL-24	112
3	TAG- 24	81
4	OG-52-1	110
5	GIRNAR-1	87
6	ICGS-11	89

Mean nodule number per plant of six checks varieties has been given has been given in Table 1. Variety, JL-24 produced highest mean nodule number per plant (112) followed by OG 52-1 (110) & AK 12-24 (97). ANOVA for nodule number per plant of six checks (Table 2) varieties revealed that both check and block showed significant variation at 5% and 1% level. Block effect was calculated due to significant variation among the blocks. Adjusted nodule number per plant of 276 SB test entries and different standard errors are presented in Table 3 and 4 to facilitate comparison among test

Table 2. ANOVA for check varieties

Source	D.F.	S.S.	M.S.S.	F Value
Block	5	3147.81	629.6	33.32**
Variety	5	4869.14	973.8	51.55**
Error	25	472.36	18.89	
Total	35	8489.31		

Table 3. Adjusted nodule number per plant of 276 test entries in six different blocks

Block1		Block 2		Block 3		Block 4		Block 5		Block 6	
ICG No	Nodule no.	ICG No	Nodule no.	ICG No	Nodule no.	ICG No	Nodule no.	ICG No	Nodule no.	ICG No	Nodule no.
45	106	1449	60	2028	53	3317	106	3723	97	4518	106
183	84	1451	73	2038	74	3327	100	3727	87	4549	108
317	105	1480	85	2055	64	3336	99	3740	104	4551	120
372	104	1487	57	2061	70	3345	96	3746	85	4563	98
387	122	1489	95	2067	110	3354	111	3755	113	4565	101
1064	107	1491	86	2077	86	3369	102	3762	113	4570	86
1102	89	1496	100	2080	67	3380	89	3765	71	4571	90
1103	157	1507	68	2081	70	3383	69	3772	124	4588	157
1135	81	1509	113	2087	71	3388	149	3773	109	4593	71
1204	125	1510	94	2089	70	3409	121	3774	47	4594	82
1212	80	1511	85	2099	64	3438	102	3785	71	4600	118
1214	89	1512	94	2107	54	3463	77	3823	73	4603	66
1125	116	1513	68	2119	79	3469	86	4038	86	4604	95
1235	76	1517	60	2132	51	3491	66	4043	90	4606	73
1259	104	1537	110	2152	74	3495	81	4044	109	4607	71
1315	79	1538	61	2176	85	3500	61	4069	97	4612	77
1330	78	1571	118	2179	92	3537	31	4071	99	4626	69
1331	90	1572	117	2193	76	3555	111	4075	86	4635	94
1338	101	1750	82	2194	41	3569	37	4078	82	4636	139
1347	84	1785	100	2196	88	3572	83	4083	120	4637	50
1353	71	1826	81	2210	107	3575	72	4084	85	4642	87
1354	77	1834	61	2220	108	3606	107	4086	101	4660	95
1335	83	1837	78	2221	57	3613	89	4091	75	4661	83
1358	89	1839	98	2395	45	3616	159	4102	60	4674	101
1361	67	1856	80	2499	64	3617	91	4004	94	4686	79
1365	107	1859	57	3028	57	3618	111	4107	61	4690	103
1391	81	1873	76	3098	69	3661	132	4112	84	4691	119
1404	105	1880	98	3100	52	3622	107	4114	89	4702	117
1407	63	1912	121	3106	58	3625	116	4117	63	4708	74
1424	75	1916	112	3158	79	3627	98	4118	83	4710	67
1427	71	1917	137	3242	87	3630	70	4226	89	12305	116
1437	92	1922	106	3260	115	3653	75	407	78	12312	95
4893	49	1923	104	3264	40	3660	88	7015	102	2044	99
6027	150	1930	86	3272	94	3674	146	7022	98	2112	79
6028	112	1931	70	3273	75	3698	113	7029	97	6497	109
6030	58	1967	42	3283	57	3721	71	7036	81	6499	111
6035	121	1982	85	3287	44	6617	61	7037	106	6529	89
6038	86	6069	39	3298	24	6625	78	7141	76	6540	37
6039	90	6104	60	6320	16	6630	61	7044	60	6545	70
6040	11	6105	63	6362	67	6667	88	11618	97	6573	36
6042	76	6166	71	6380	5	6677	61	11645	77	6595	37
6058	77	6168	56	6473	92	6679	63	11663	120	6658	86
6178	66	6172	65	6474	52	6710	49	11684	68	11953	28
6217	92	6174	64	6486	57	6769	66	11748	32	12115	73
6238	97	6176	69	6503	26	6823	121	11749	75	12121	70
6270	48	7177	42	6508	41	6906	95	11948	65	12126	199

Table 4. Standard error between components

Sl. No.	Components	S.E. Value
1	Between two check means	1.17
2	Between variety yield and check mean	2.36
3	Between yield of two varieties	2.87

Table 5. Promising genotypes against best check (JL – 24)

Sl. No.	ICG No.	Nodule no.
1	387	122
2	1103	157
3	1204	125
4	1571	118
5	1572	117
6	1912	121
7	1917	137
8	3388	149
9	3409	121
10	3616	159
11	3621	132
12	3674	146
13	3772	124
14	4083	120
15	4551	120
16	4588	157
17	4600	118
18	4636	139
19	4691	119
20	4702	117
21	6027	150
22	6035	121
23	6823	121
24	11663	120
25	12126	199
Best check	JL-24	112 ± 5.07

entries within a particular block, among entries between blocks and between checks and test entries. Accordingly, promising genotypes against best check variety (JL-24) have been identified and listed in Table 5. As many as 25 five test entries from six different blocks registered higher nodule number per plant than best check, JL-24. These high nodulating promising genotypes may be used as parents in breeding programme.

Acknowledgements

The author is thankful to MM Dash, TO, SP Singh and P Dash, TA's for their constant help for conducting experiments and recording of observations.

References

Agarwal, RC and RL Sapra (1995) Augmented I: A micro computer based programme to analyze Randomized Complete Block Design *Indian J. Plant Genetic Resources* **8:** 63-69.