GAU Res. J. 2001 & 02. 27 (1 & 2) : 58-62

Groundnut Genotypes Identified for the Cultivation in the Summer Season with Fresh Seed Dormancy and Higher Yield Performance

Chetana Mandavia, I. U. Dhruj, B. C. Chatrabhuji and Jyotish Rajani**

Main Oilseeds Research Station, Gujarat Agricultural University,
Junagadh Campus, Junagadh-362 001

ABSTRACT

One hundred groundnut *(Arachis hypogaea* L.) germplasm accessions belonging to Spanish group were screened for fresh seed dormancy during three summer seasons (1995, 1996, 1997). Eleven genotypes were identified as having fresh seed dormancy with germination percentage <30%. These genotypes were also evaluated for yield performance during three summer seasons (1998, 1999 and 2000). Five genotypes were found to possess fresh seed dormancy with higher pod yield than the local checks (GG 5, TG 26 and ICGS 44). Hence, J 33, JB 811, J 28, JB 866 and R 9251 may effectively be utilized for incorporating fresh seed dormancy in future breeding programmes.

(Received on 26th April, 2002)

INTRODUCTION

In groundnut, yields are very high (2000 kg/ha) in the summer seasons as compared to the *kharif* season (900-1000 kg/ha) In Gujarat, about 1.25 lakh hectares is sown for the groundnut cultivation in summer season. In summer season cultivation under irrigated situations short duration groundnut cultivars belonging to Spanish group are preferred for example cv. GG 2. Mainly in cultivar GG 2 and mostly in all Spanish types lack of fresh seed dormancy is a serious problem (Nautiyal *et al.* 2001). As summer season crop is harvested in the month of May-June, this period coincides with the pre-monsoon showers, as a consequence a substantial number of pods get sprouted, either in the crop standing in the field or in harvested crop lying in the field for drying. Considerable yield losses about 20-50% have been reported due to *in situ* sprouting of seeds. (Nagarjun and Radder, 1983; Reddy *et al.*,1985). Attempts have been made to induce seed dormancy by foliar spray of maleic hydrazide (Nagarjun and Radder, 1983), but either dormancy failed to be induced or it is not stable and economic. Hence, there is a need to evolve a variety, which is having high yield with Fresh Seed Dormancy (FSD) of even few days. In view of this, present study was undertaken with an objective to select cultures with FSD by screening large number of germplasm and to evaluate yield performance of selected cultures in comparison with local checks (GG 5 and ICGS 44 and TG 26).

MATERIALS AND METHODS

100 Spanish germplasm accessions were screened for fresh seed dormancy during the summer season of 1995, 1996 and 1997 at main Oilseeds Research Station, Gujarat Agricultural

** Present address : Asso. Programme Executive, Directorate of Research, Gujarat Agricultural University, Ahmedabad-380 004.

University, Junagadh. Pods were picked up and shelled immediately after harvest for germination study. Seeds were surface sterilized with 1% $HgCl_2$. Three replicates, each of 50 seeds were kept for germination at seven days after harvest in an incubator at 30° C in rolled germination towels. After seven days of incubation, seeds were counted to calculate germination percentage following the ISTA 1993 protocol. Seeds were scored as having germinated if the axis had elongated and broken through the seed coat to the minimum length of 0.5 cm. The genotypes showing germination < 30% were considered to be dormat. 11 genotypes identified based on exhibiting consistently <30% germination in all the three years were selected for conducting field trials in summer season of the years 1997, 1998 and 2000. 11 selected genotypes along with three check varieties (ICGS 44, TG 26 with FSD and GG 5, without dormancy) were sown in a randomized block design (RBD) with three replicates at Main Oilseeds Research Station, GAU, Junagadh. Seeds were sown at a spacing of 30 cm (between rows) and 10 cm (between plants) in a plot size of 6 rows each of 5 m length. All the recommended agronomic and plant protection practices were followed. Pod and haulm yield were recorded at the final harvest.

RESULTS AND DISCUSSION

The degree of fresh seed dormancy recorded in the three years varied, but the relative performance of the genotypes for germination remained same. During the year 1998, 1999 and 2000, germination % varied between 10% to 70%; 10% to 96% and 10% to 90% respectively. In the mean germination percentage of the three years, the range varied from 09% to 72%. Percentage recorded by ICGS 44 and GG 5 respectively. 5 genotypes viz., J 33, JB 811, J 28, JB 866 and R 9251 consistently exhibited < 30% germination (Table 1) for all the three years.

TABLE 1

Germination percentage of various promising groundnut genotypes with fresh seed dormancy during the years 1998, 1999 and 2000 as well as mean of three years.

Sr. No.	*Name of Entry*	*Germination (%)*			*Germination (%) mean of three years*
		1998	*1999*	*2000*	
1.	ICGS-44	15	03	10	09
2.	R-9251	10	10	20	13
3.	J-33	25	22	20	22
4.	JB-811	30	27	25	27
5.	J-28	35	28	24	29
6.	JB-866	60	19	10	30
7.	JB-940	20	68	55	31
8.	PBNG-26	10	52	59	39
9.	TG-26	42	46	51	46
10.	PBNG-8	10	65	66	47
11.	JB-646	40	69	70	60
12.	JB-(FDR)-62	70	96	91	86
13.	GG-5	70	76	71	72
14.	ICGS-86143	40	93	90	74

Pod yield of various genotypes differed significantly (Table-2). During the year 1998, the yield of J 33 was significantly higher than the check GG 5. However, it was at par with genotypes ICGS 86143, JB 646, PBNG 26, JB 811 and JB (FDR) 62. R 9251 exhibited the lowest yield, but statistically it was at par with GG 5. During the year 199 the numerically highest pod yield was recorded by ICGS 86143, however, all the genotypes were statistically at par. In the year 2000, again the genotype ICGS 86143 stood first with respect to pod yield and it was at par with J 33, JB 646, PBNG 8, PBNG 26, J 28 and JB 940. When the data were pooled and analyzed it showed that pod yield was the highest (2540 kg/ha) in ICGS 86143 followed by J 33, JB 646 and PBNG 8. Also, they were statistically at par with each other and performed better than the local checks.

TABLE 2

Pod yield of various promising groundnut genotypes with fresh seed dormancy during the years 1998, 1999 and 2000 as well as pooled data.

Sr. No.	Name of Entry	Pod yield (kg/ha)			Pod yield pooled (kg/ha)
		1998	1999	2000	
1.	ICGS-86143	2098	2419	3102	2540
2.	J-33	2268	2257	2865	2469
3.	JB-646	1910	2251	3068	2409
4.	PBNG-8	1736	2373	3073	2394
5.	PBNG-26	2097	2118	2737	2318
6.	J-28	1620	2263	2836	2240
7.	JB-866	1997	1852	2633	2161
8.	JB-811	1866	1973	2552	2131
9.	JB-(FDR)-62	1895	2072	2315	2094
10.	R-9251	1273	2199	2263	1912
11.	JB-940	1317	1800	2859	1992
12.	GG-5	1606	2106	2240	1984
13.	TG-26	1548	1979	2315	1947
14.	ICGS-44	1563	2425	2216	2068
	S.Em.±	173.86	158.27	144.76	136.40
	C.D. at 5%	505.51	NS	421.00	396.00
	C.V.%	10.99	12.76	09.47	12.61

Haulm yield varied significantly during the individual years i.e. in 1998, 1999 and 2000 (table 3). In the year 1998, J 33 and JB 940 recorded significantly highest yield, and were better than GG 5. The magnitude of haulm yield was comparatively low in 1999 and no entry could record significantly higher haulm yield than the check varieties. In the year 2000, ICGS 44 topped, followed by JB 811, R 9251, JB (FDR) 62 and J 33. However, in pooled analysis all the genotypes remained statistically at par with each other, but the numerically highest haulm yield was recorded in ICGS 44.

The performance of genotypes viz. J 33, JB 811, J 28, R 9251 and JB 866 over the seasons showed that they could be better susbstitue as varieties in the areas where *in situ* germination is

TABLE 3

Haulm yield of various promising groundnut genotypes with fresh seed dormancy during the years 1998, 1999 and 2000 as well as pooled data.

Sr. No.	*Name of Entry*	*Haulm yield (kg/ha)*			*Haulm yield pooled (kg/ha)*
		1998	*1999*	*2000*	
1.	ICGS-86143	4398	3883	6424	4902
2.	J-33	7118	6481	7350	6983
3.	JB-(FDR)-62	5903	6366	8218	6829
4.	JB-940	7060	5440	7059	6520
5.	J-28	3993	5208	7060	5421
6.	JB-811	4225	6076	8623	6308
7.	R-9251	3704	6713	8449	6289
8.	JB-646	4688	5845	8160	6231
9.	PBNG-26	6308	4977	6944	6076
10.	PBNG-8	5845	4919	7176	5980
11.	JB-866	5440	4514	7176	5710
12.	GG-5	5093	5729	8102	6308
13.	TG-26	4456	5035	6771	5421
14.	ICGS-44	5729	6366	9375	7157
	S.Em.±	443.06	365.54	403.26	843.25
	C.D. at 5%	1288.23	1062.84	1172.53	NS
	C.V.%	14.53	11.43	09.50	11.41

a serious problem due to lack of fresh seed dormancy at maturity. The importance of development of Spanish bunch varieties of groundnut with dormancy has been reported by various workers (Ramchandran *et al.*, 1967; Varisai *et al.* 1969; Gautreau 1984; Pandya and Patel, 1986; Wadia *et al.*, 1987 and Khalfaoui, 1991). However, very few Spanish bunch varieties with the fresh seed dormancy have been developed., Studies have also been made to understand the nature of dormancy in peanut (Upadhyay and Nigam, 1999) and Nautiyal, *et al.* (1993) which has revealed that defining dormancy characteristics of groundnut cultivars might be difficult, and that is the reason that genotypes with a short FSD should be identified through screening. Mathur *et al.* (2000) have identified two cultures with fresh seed dormancy by screening the advanced breeding material in groundnut.

Thus, these genotypes viz. J 33, JB 811, J 28, R 9251 and JB 866 possessed fresh seed dormancy with higher pod yield over the seasons, hence, they may be tested at multi location for their yielding ability. In addition these genotypes may be used as donor parents for incorporation of fresh seed dormancy in future breeding programme.

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