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Seed Quality Attributes in Bitter Gourd (*Momordica charantia* L.)

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ABSTRACT Thirty-six genotypes (eight parental lines and 28 F_1 hybrids) of bitter gourd were subjected to seed quality assessment under laboratory conditions utilizing standard germination test. The genotypic differences were highly significant in both the seasons for number of seeds per fruit, seed yield/fruit and seed vigour index. The genotypic difference for seed germination was highly significant only in the rainy season experiment.

Keywords: Bittergourd, seed germination, vigour.

Among the cultivated cucurbits, bittergourd (*Momordica charantia* L., 2n=2x=22) is one of the most important vegetable crop grown throughout the country for its nutritive value and medicinal properties. Along with an optimum combination of desirable horticultural traits in a cultivar of bitter gourd, the evaluation of seed quality in terms of seed germination and vigour is equaly important as bittergourd having hard seed coat is known for poor seed germinability at low temperatures [1]. The seed germination and vigour are assessed to predict some aspects of potential and performance, crop yield and storability. Germination test is considered as the most important quality test in evaluating the planting value of a seed lot. The laboratory germination of seed lots has been shown to be indicative of their ability to emerge in the field in cases where the seed lot used differed markedly in their laboratory germination. It is perhaps not surprising that a seed lot having a laboratory germination of, for example 65 per cent emergence less well than one with a germination of 90 per cent [2]. There are also however many reports where seed lot having similar high laboratory germinations reveals large differences in their ability to emerge in the field [3, 4]. Thus, laboratory germination is not indicative of field emergence potential. This led to the development of the concept of seed vigour, whereby seed lots with high laboratory germinations, which emerge poorly in the field, are referred to as low vigour lots, while high vigour lots emerge well. The present study was, therefore, undertaken to evaluate the seed quality of bitter gourd under laboratory conditions.

MATERIALS AND METHODS

The experimental materials consist of 36 genotypes including eight parental lines and twenty-eight F_1 hybrids. Number of seeds was counted in five random fruits and their weight was recorded in grams and mean seed weight and number of seeds per fruit was calculated.

Standard germination test was conducted as per the ISTA rules [5]. Three replication consist of hundred seeds each were kept between two layers of moist paper towels, which are then rolled carefully ensuring no excess pressure is placed on seeds, wrapped in a sheet of butter paper to reduce surface evaporation and placed in a germination chamber in a upright position at 25 ^{0}C temperature for 14 days. The germination per cent was calculated by mean of

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Table 1. Analysis of variance for various horticultural and seed quality traits in bitter gourd (rainy season, 2001 and summer season, 2002)

Source of variation	Degree of freedom	Mean square							
		Seeds per fruit		Seed yield/fruit (g)		Germination (%)		Vigour index	
		Rainy	Summer	Rainy	Summer	Rainy	Summer	Rainy	Summer
Replication	2	11.67	23.59	0.31	1.11	77.57	145.95	24032.00	19142.20
Genotype	35	148.98**	47.84**	3.89**	1.45**	14.08**	14.32	234901.9**	84413.70**
Error	70	2.06	5.27	0.071	0.17	4.44	13.86	9799.77	10258.79

* and ** Significant at 0.05 and 0.01 level respectively

three replications. Seed vigour index was calculated by determining the germination percentage and seedling length (including root and shoot both) of the seed lot. While determining germination at the time of final count, the length of five random seedlings was also measured. Seed vigour was calculated by multiplying germination percentage and seedling length in cm. The seed lot showing the higher seed vigour index is considered to be more vigorous [6]. The statistical analysis was done according to randomized block design [7].

RESULTS AND DISCUSSION

Analysis of variance for various seed quality traits for both the seasons is given in (Table 1). The genotypic differences were significant, consistently over both the seasons for number of seeds per fruit, seed yield/fruit (g), and seed vigour index. The genotypic difference for seed germination per cent was significant in rainy season experiment only.

Mean values for various seed quality traits measured on parental lines and the F_1 generation are summarized in (Table 2). The cv values were below 25 per cent for all the characters studied. This indicated that the precision of the experiment was within the accepted normal limit of coefficient of variation. The genotype PBIG 90 x PBIG 4 had the highest number of seeds per fruit (40) in rainy season followed by PBIG 2 x PBIG 3 and PBIG 2 x Kalyanpur Baramasi (35 each) and PBIG 86 x PBIG 3 (32). During summer season the highest seed producer was PBIG 4 x PBIG 56 (32) followed by PBIG 4 x PBIG 3 (29), PBIG4 x Kalyanpur Baramasi (28) and PBIG 2 x PBIG 3 and PBIG 2 x PBIG 56 (26 each). For weight of seed per fruit, the genotype PBIG 90 x PBIG 4 (6.6 g) recorded as the highest in rainy season, followed by PBIG 2 x PBIG 3 (6.4 g), PBIG 2 x Kalyanpur Baramasi (5.3 g) and PBIG 2 x PBIG 4 (5.0 g). During summer season PBIG 4 x PBIG 56 (6.0 g) had the highest seed weight, followed by PBIG 2 x PBIG 3 (5.2 g), PBIG 56 x Kalyanpur Baramasi (4.9 g) and PBIG 86 x PBIG 3 (4.8 g). Seed germination ranged from 87 per cent (Kalyanpur Baramasi) to 97 per cent (Kalyanpur sona, PBIG 4, PBIG 3, PBIG 56, Kalyanpur Sona x PBIG 90, Kalyanpur Sona x PBIG 4, Kalyanpur Sona x PBIG 3, Kalyanpur Sona x PBIG 56, PBIG 86 x Kalyanpur Baramasi, PBIG 2 x PBIG 4, PBIG 2 x PBIG 3, PBIG 2 x PBIG 56, PBIG 90 x PBIG 4, PBIG 90 x Kalyanpur Baramasi, PBIG 4 x PBIG 56 and PBIG 4 x Kalyanpur Baramasi) in the rainy season experiment. However in summer season the range was 88 per cent to 98 per cent. The highest value for seed germination 98 per cent was recorded from the genotype PBIG 86 and PBIG 56. The lowest seed germination was recorded from Kalyanpur Sona x PBIG 56, it was 88 per cent. On an average from both season experiment the highest seed germination was recorded from PBIG 56 (97 %), and the lowest seed germination from the genotype Kalyanpur Baramasi (89 %). On the average value for both season germination per cent indicated that the parents have better germination than their crosses.

The highest seed vigour index in rainy season and summer season was in Kalyanpur Sona (2281) PBIG 2 x Kalyanpur Baramasi (1966). The lowest seed vigour (1147) was recorded in genotype PBIG 90 x PBIG 3 respectively during rainy season and in summer season, the lowest seed vigour index (1211) was recorded in PBIG 86 x PBIG 2. On an average of both season, the highest seed vigour index (1872) was recorded in PBIG 56 and the lowest seed vigour index (1238) was recorded in PBIG 86 x PBIG 3. These results are also indicated that the parents have higher seed vigour index than their hybrids.

Table 2. Mean values of parents and crosses for various horticultural and seed quality traits in bittergourd (rainy season, 2001 and summer season, 2002)

S.No.	Parents and crosses	Number of seeds per fruit			Seed yield / fruit (g)			Seed germination (%)			Seed vigour index		
		Rainy	Summer	Average	Rainy	Summer	Average	Rainy	Summer	Average	Rainy	Summer	Average
1.	K.S.	19	24	21	2.5	3.3	2.9	97	95	96	2281	1377	1829
2.	PBIG 86	24	30	27	3.5	4.1	3.8	95	98	96	1805	1468	1637
3.	PBIG 2	15	20	17	2.6	3.6	3.1	95	95	95	1539	1634	1587
4.	PBIG 90	30	15	22	4.0	2.7	3.4	95	93	94	1577	1596	1587
5.	PBIG 4	15	21	18	2.2	3.3	2.8	97	95	96	1677	1611	1644
6.	PBIG 3	16	22	19	2.6	3.7	3.2	97	93	95	1794	1591	1693
7.	PBIG 56	21	20	21	3.1	3.8	3.5	97	98	97	2067	1677	1872
8.	K.B.	21	20	20	4.0	3.8	3.9	87	90	89	1365	1467	1416
9.	K.S. X PBIG 86	16	26	21	2.9	4.5	3.7	95	93	94	1396	1692	1544
10.	K.S. X PBIG 2	14	22	18	2.1	3.4	2.8	92	93	92	1211	1692	1452
11.	K.S. X PBIG 90	23	21	22	3.0	3.8	3.4	97	90	94	1686	1350	1518
12.	K.S. X PBIG 4	14	18	16	2.8	3.1	3.0	97	95	96	2086	1577	1832
13.	K.S. X PBIG 3	29	18	24	4.4	3.3	3.9	97	93	95	1374	1361	1368
14.	K.S. X PBIG 56	15	22	18	2.1	3.7	2.9	97	88	92	2096	1400	1748
15.	K.S. X K.B.	22	15	18	3.4	2.8	3.1	95	93	94	1463	1683	1573
16.	PBIG 86 X PBIG 2	23	25	24	3.9	4.5	4.2	95	93	94	1334	1211	1272
17.	PBIG 86 X PBIG 90	14	22	18	2.9	4.7	3.8	95	90	93	1463	1476	1470
18.	PBIG 86 X PBIG 4	18	25	22	2.6	3.8	3.2	95	93	94	1510	1517	1514
19.	PBIG 86 X PBIG 3	32	23	27	4.8	4.8	4.8	95	95	95	1194	1282	1238
20.	PBIG 86 X PBIG 56	13	23	18	1.7	3.2	2.5	95	93	94	1406	1430	1418
21.	PBIG 86 X K.B.	25	23	24	4.3	4.3	4.3	97	93	95	1472	1398	1435
22.	PBIG 2 X PBIG 90	20	15	18	3.3	3.6	3.5	95	95	95	1149	1331	1240
23.	PBIG 2 X PBIG 4	30	22	26	5.0	4.0	4.5	97	90	94	1608	1386	1497
24.	PBIG 2 X PBIG 3	35	26	30	6.4	5.2	5.8	97	90	94	2076	1386	1731
25.	PBIG 2 X PBIG 56	26	26	26	4.0	4.4	4.2	97	93	95	1452	1378	1415
26.	PBIG 2 X K.B.	35	19	27	5.3	3.1	4.2	95	95	95	1738	1966	1852
27.	PBIG 90 X PBIG 4	40	19	30	6.6	3.3	5.0	97	90	94	1745	1890	1818
28.	PBIG 90 X PBIG 3	14	22	18	2.8	4.3	3.6	92	93	92	1147	1350	1249
29.	PBIG 90 X PBIG 56	25	21	23	3.5	3.8	3.7	95	93	94	1586	1411	1499
30.	PBIG 90 X K.B.	14	24	19	2.2	4.4	3.3	97	93	95	1784	1541	1663
31.	PBIG 4 X PBIG 3	24	29	27	3.1	4.4	3.8	95	93	94	1326	1609	1468
32.	PBIG 4 X PBIG 56	26	32	29	3.8	6.0	4.9	97	93	95	1413	1221	1317
33.	PBIG 4 X K.B.	20	28	24	3.4	4.2	3.8	97	93	95	1608	1591	1600
34.	PBIG 3 X PBIG 56	19	18	19	3.4	3.3	3.4	95	93	94	1653	1498	1576
35.	PBIG 3 X K.B.	13	25	19	2.4	3.8	3.1	92	90	91	1572	1440	1506
36.	PBIG 56 X K.B.	20	19	19	4.0	4.9	4.5	92	95	94	1776	1563	1670
	C.D. 5 %	2.34	3.74		0.43	0.68		3.43	6.06		161.21	164.94	
	C.V. (%)	6.66	10.33		7.73	10.73		2.21	4.02		6.18	6.75	

K.S. = Kalyanpur Sona; K.B. = Kalyanpur Baramasi

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