



Evaluation of Horsegram Cultivars for Seed Storability

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Twenty three cultivars of horsegram (straw testa (47.82 %), black testa (37.13 %) and light straw testa (13.04 %)) were screened during Rabi, 2008-09 and 2009-10 for yield and yield components and seed quality characters and stored in cloth bags for two years under ambient conditions. Results showed that more than 97 % germination was recorded in 21 cultivars (91.30 %), where as the remaining 8.70 % recorded < 97 % germination. HG 52 from black testa category recorded good germination and vigour besides possessing bold seeds. Among the straw testa group, HG 15 and HG 11 are considered to be good storers, vigorous and bold seeded. HG 14, HG 32 and Palem 2 from the light straw testa category were found superior for both germination and vigour. The light coloured fractions consistently showed highest germination per cent and seedling vigour followed by medium and dark coloured types in all the 23 accessions of horsegram.

Key words: Germination, seed storage, horsegram.

Horsegram (*Macrotyloma uniflorum*) is one of the lesser known beans. Improper storage conditions leads to poor germination and less vigour. It is very difficult to store the horsegram seeds with good germinability and vigour for longer periods. Hence, there is a need to identify the horsegram lines with good seed longevity for use in hybridisation programme. Keeping this in view, work was initiated in horsegram storability and evaluating the available cultivars to select the better storer lines with good seed viability.

Materials and Methods

Twenty three cultivars of horsegram were evaluated at Seed Research and Technology Centre, Acharya N G Ranga Agricultural University, Rajendranagar, Hyderabad for two consecutive years i.e. rabi, 2008-09 and 2009-10 for various morpho-physiological, yield and yield attributing characters. Seed from two consecutive harvests were cleaned, dried to safe moisture level as per ISTA standards and stored in cloth bags for two years under ambient conditions. Seeds were evaluated for various seed quality characters viz., test weight, germination, speed of germination, total seedling length, seedling dry weight, seedling vigour indices I and II, and seedling growth rate as per the ISTA rules (1985).

Results and Discussion

The twenty three genotypes characterised for seed colour were grouped into three classes: straw testa accounted for maximum number of genotypes i.e. 47.82 %. followed by black genotypes (37.13 %) and light straw testa (13.04 %) category.

The overall frequency distribution of horsegram

genotypes, stored in cloth bags under ambient conditions for two years for seed quality characters is depicted in figure 1. With respect to seed quality parameters like germination, all the nine black seeded genotypes exhibited the germination per cent in the range of 97.5 to 100. In case of straw seeded genotypes, 81.81 % exhibited more than 97 % with 18.18 % reporting lower values. Among light straw seeded, all genotypes exhibited more than 97 % germination. An interesting observation made from the study is that the horsegram seed maintained germination in the range of 95-100 even after storage for two years. Of the 23 cultivars screened for germination, more than 97 % germination was recorded in 21 cultivars (91.30 %), where as the remaining two cultivars (8.70 %) recorded < 97 % germination and maintained above standard seed germination in all the horsegram cultivars. In soybean, even after two years of storage, more than 90 % germination was reported is 15 % soybean genotypes only (Kumar *et al.*, 2007).

Mean germination per cent was found to be highest in light straw coloured cultivars (99.8 %) and followed by black (99.4%) and straw (99.2%) coloured. The light coloured seeds showed better germination and storability even after two years of ambient storage as and when compared to dark and medium coloured seeds. Anuradha *et al.* (2009) reported that the germination potential of bengal gram was high in light brown colour seeds (89 %) followed by brown coloured (81%) seeds. In comparison, all the genotypes irrespective of the seed coat colour, exhibited higher germination than the Minimum Seed Certification Standards (80%). However, considerable variation in seedling vigour of horsegram genotypes was noticed and were

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Table 1. Seed quality characters for different genotypes of horsegram

S. No.	Cultivars	Seed colour	Test weight (g)	Speed of germination	Germination %	Total seedling length (cm)	Seedling vigour index I	Seedling dry weight (g)	Seedling vigour index II	Seedling growth rate
1	HG 75	Black	13.40	29.2	99.3	25.2	2507	0.775	76.90	6.99
2	HG 54	Black	16.20	24.1	99.0	24.2	2397	0.825	81.65	7.88
3	HG 63	Black	15.15	21.5	100.0	24.6	2463	0.750	75.00	7.91
4	HG 58	Black	16.55	22.0	97.5	28.0	2736	0.925	90.25	7.48
5	HG 35	Black	15.90	20.0	100.0	25.5	2555	0.917	91.67	7.32
6	HG 50	Black	16.03	20.8	99.2	27.5	2720	0.850	84.33	7.33
7	HG 52	Black	17.38	22.4	100.0	27.7	2765	0.950	95.00	7.36
8	HG 46	Black	16.68	26.5	99.2	28.0	2778	1.033	102.38	7.66
9	Palem 1	Black	15.68	23.1	100.0	30.3	3033	0.875	87.50	7.39
	Mean		15.88	23.3	99.4	26.8	2661	0.878	87.19	7.48
	Range		13.40-17.38	20.0-29.2	97.5-100	24.2-30.3	2397-3033	0.825-1.033	75.00-102.38	6.99-7.91
10	HG 59	Straw	16.38	34.1	96.2	24.8	2373	0.925	88.63	8.03
11	HG 18	Straw	16.78	32.8	95.2	28.8	2731	0.817	77.80	7.83
12	HG 24	Straw	16.88	32.8	100.0	24.4	2443	0.808	80.83	8.50
13	HG 17	Straw	15.40	27.3	100.0	24.5	2455	0.808	80.83	8.12
14	HG 72	Straw	16.20	27.8	99.8	27.7	2765	0.783	78.19	8.11
15	HG 11	Straw	16.60	28.6	100.0	28.1	2807	0.875	87.50	7.84
16	HG 38	Straw	16.18	28.3	100.0	25.2	2515	0.900	90.00	7.46
17	HG 41	Straw	15.00	32.8	100.0	27.6	2756	0.783	78.33	8.57
18	HG 15	Straw	15.38	41.6	100.0	29.2	2922	0.825	82.50	7.00
19	HG 49	Straw	15.03	33.8	100.0	26.6	2660	0.925	92.50	7.39
20	AK 38	Straw	15.93	26.4	100.0	25.6	2562	0.883	88.33	7.46
	Mean		15.98	31.5	99.2	26.6	2635	0.848	84.13	7.85
	Range		15.00-16.88	26.4-41.6	95.2-100	24.4-29.2	2373-2922	0.783-0.925	77.80-90.00	7.00-7.85
21	HG 14	Light straw	16.15	37.1	99.5	24.0	2388	0.883	87.83	7.73
22	HG 32	Light straw	15.35	28.6	100.0	22.1	2207	0.933	93.33	7.71
23	Palem 2	Light straw	16.38	31.5	100.0	27.9	2794	0.858	85.83	7.52
	Mean		15.96	32.4	99.8	24.7	2463	0.892	89.00	7.65
	Range		15.35-16.38	28.6-37.1	99.5-100	22.1-30.3	2207-2794	0.858-0.933	85.83-93.33	7.52-7.71
	G. Mean		15.94	29.0	99.5	26.0	2587	0.873	86.77	7.68
	G. Range		13.40-17.38	20.0-41.6	95.2-100	22.1-30.3	2207-3000	0.783-1.033	75.00-102.38	6.99-7.91

evaluated for different vigour parameters such as speed of germination, seedling vigour indices and seedling growth rate which is discussed in detail.

The average weight of 100 seeds in horsegram ranged from 13.40g to 17.38g and the mean 100 seed weight for 23 genotypes over two years was 15.94 g (Table 1). Generally black and straw coloured cultivars had bold seeds (17.38g and 16.88g respectively) as compared to light straw testa (16.38 g). The data confirms that the light straw testa lines with more germination per cent (99.8) possessed small seeds, where as black coloured genotypes with less germination (99.4 %) had bold seeds. Except HG 59 and HG 18 with 96.2 % and 95.2 % germination, respectively, all other horsegram genotypes recorded germination of 97 % and above at the end of study. It was observed that of these better storers, 54.54 % were straw coloured genotypes with a test weight of 16.1 to 17 g. Horsegram being a hard seeded crop is less prone to attack by store grain pests and the seeds

maintained germinability and capacity to germinate. Storage in cloth bags is the traditional practice and the farmers may safely adopt this practice to store the horsegram seed for two years without losing vigour and germinability.

The frequency distribution of horsegram genotypes for 100 seed weight revealed that majority of the genotypes had test weight in the range of 16.1 to 17.0 g. There was only one genotype i.e., HG 75, which was small seeded with a 100 seed weight below 14 g and one bold genotype (HG 52) of 17.38 g. It is interesting to note that both small and bold seeded lines were black testa types.

Among the 23 horsegram cultivars, HG 15 is the only genotype that recorded highest speed of germination (41.60). Out of nine black seeded genotypes, seven genotypes (77.78 %) showed speed of germination in the range of 20.1 to 25 while 22.22 % of the horsegram genotypes recorded high speed of germination in the range of 25.1 to 30.

Length of the seedling in horsegram genotypes ranged from 22.1 to 30.3 cm and the 23 genotypes of horsegram showed mean seedling length of 26.0 cm after two years of storage. Vigourous and tall seedlings in terms of growth was found in black testa genotypes (26.8 cm) followed by straw testa (21.6 cm) and light straw testa genotypes (24.7 cm).

Frequency distribution of seedling length in horsegram genotypes showed that, 45.45 % of the straw coloured genotypes fell in the range from 23.1 to 26 cm of which 27.27 % alone were vigourous with maximum length ranged between 26.1 and 28 cm. Similarly, 27.27 % of the cultivars were found

vigourous with seedling length of more than 28 cm. Among the light straw testa, 33.33 % ranged between 26.1 and 28.0 cm while none were found with more than 28 cm seedling length. Dry weight of seedling ranged from 0.750 to 1.033 g (Table 1) and average dry weight of seedling was 0.873 g. With respect to seedling dry weight, light coloured genotypes were more vigourous with seedling dry weight of 0.892 g followed by black coloured (0.878 g) and straw coloured (0.848 g).

According to weight frequency distribution 47.83 % of the total genotypes fell in the range of 0.801 to 0.900 g, while 30.43 % recorded less dry weight in the range of 0.701 to 0.800 g. Of the 23 cultivars of

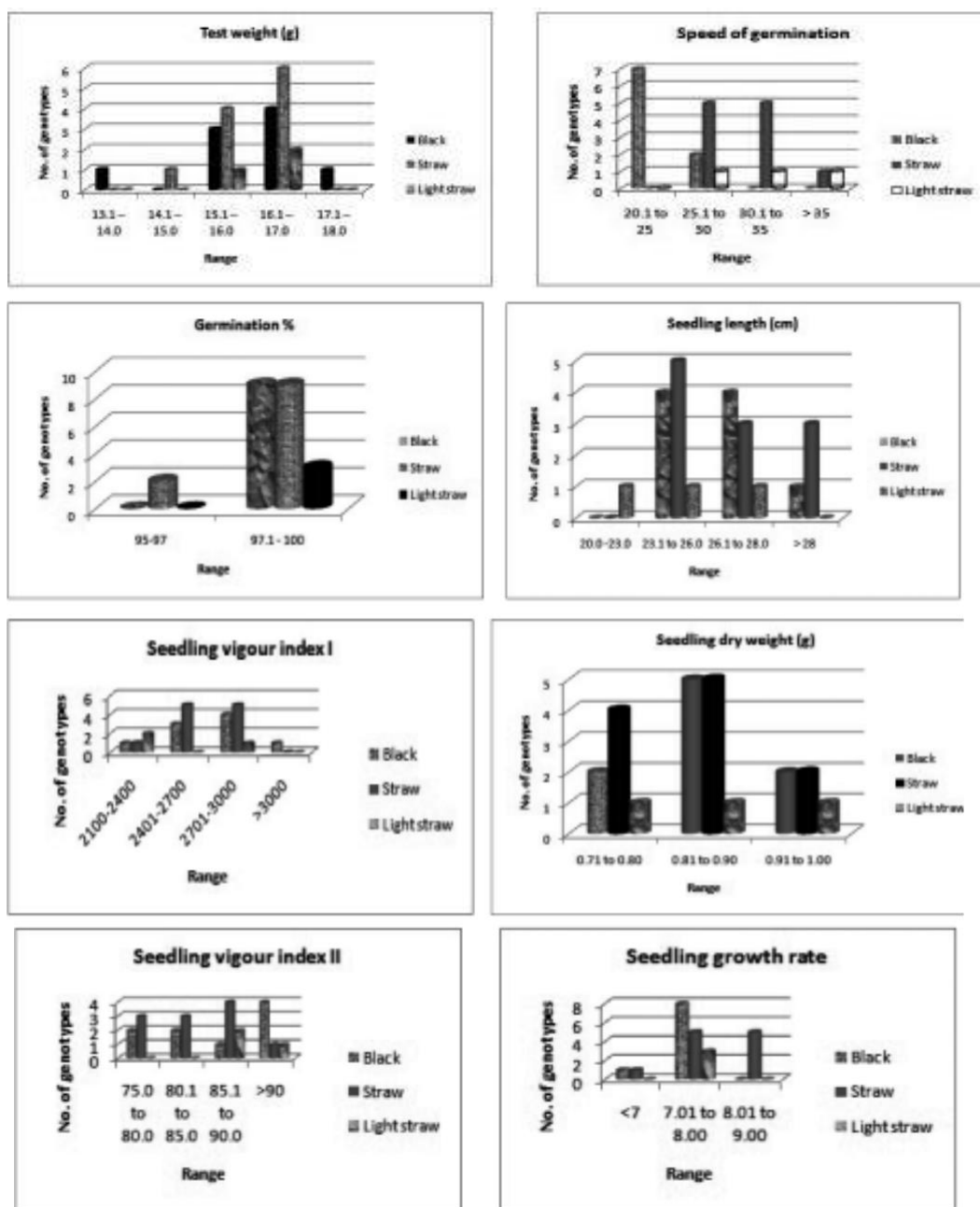


Fig. 1. Frequency distribution of horsegram genotypes for various seed quality characters

horsegram, only 21.74 % of the total genotypes produced more dry weight (0.901 to 1.000 g).

Among the 23 genotypes screened for storability, 45.45 % of the straw testa had maximum vigour in terms of seedling vigour index I while (2701-3000). 17.39 % of had low vigour and (2100 to 2400). a very negligible per cent i.e., 4.35% were highly vigorous (> 3000).

Regarding SVI II, 21.73 % of the total genotypes had very low vigour of 75 to 80 while rest of the genotypes (78.27 %) possessed higher SVI II values.

It is a well known fact that pulses are rich source of proteins and at the same time they are more easily prone to the stored grain pests. The content of proteins in pulses is two to three times more than in cereals and also the amount of lysine in the pulses is also much higher. Maintenance of storability of different horsegram cultivars even after two years in cloth bags might be attributed to hard seed coat. Drying of the seeds of all cultivars to safe moisture level also had significant effect on the storability. The prime cause of insect damage is undoubtedly the mechanical damage during harvesting. Harvesting and threshing manually might have also attributed for high storability in the current study that had reduced mechanical damage. All the above factors might have cumulatively attributed to high seed storability in horsegram and the seed can be safely stored in cloth bags for two years without loss of germinability and vigour.

Though black testa lines recorded comparatively less germination % (99.4 %) than the other lines, they were more vigorous, grew taller and produced vigorous seedlings with more seedling dry matter production. This could be attributed to the bold seededness of these black seeded lines. Tiwari

and Bhatia (1995) indicated that differences in seed size and testa thickness led to genotypic differences in soybean seed storability. Light coloured seeds showed better storability after 2 years of ambient storage as against the medium and dark colored seeds as opined by Singh *et al.* (2009) However, Verma and Gupta (1975) reported that many dark seeded lines of soybean were good storers as compared to light coloured lines.

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