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ASSESSMENT OF SOME EXOTIC AND LOCAL GRASSPEA GERMPLASM IN BANGLADESH

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Abstract

The experiment was conducted at Pulses Research Centre, Ishurdi, Pabna during the Rabi season of 2013-14 to estimate the variation among the genotypes. Fourty two genotypes of grasspea were evaluated viz. SEL-1328, SEL-521-B_1, SEL-1327, SEL-1304, SEL-554, SEL-587, SEL-1329, SEL-2177, SEL-387, SEL-1784, SEL-289, SEL-1303, BKX-0011-1, SEL-449, BKX-0003-1, BKX-0008-1, BKX-0002-1, RU-155, B-111, SEL-1321, SEL-1326, SEL-ETH-1/299, BKX-0002-4, Sirajgonj Local, Madaripur Local, Patuakhali Local, Pabna Local, BKX-0008-8, SEL-1307, SEL-1330, SEL-299, SEL-1942, SEL-2119, SEL-1959, SEL-390 CGI-08941789, SEL-132-22, 0893347, 08942279, SEL-1332 and Natore Local. The experiment was laid out in Alpha-lattice design with 2 replications. All the genotypes were grouped into six clusters based on D^2 values according to their 100 seed weight (g) and yield response (g/m^2). The composition of different clusters varied from 5 to 12 genotypes. Cluster I comprised of 12 genotypes followed by cluster V, VI, IV, III and II consisting of 7, 6, 6, 5 and 5 genotypes respectively. Cluster IV exhibited the lowest mean value for 100 seed weight (4.91g) and cluster III possesses highest mean value (7.25 g) for that character. The highest yield per m^2 (231.02 g) was recorded in cluster IV followed by cluster II and the lowest was found in cluster III. Finally thirteen genotypes were selected from different clusters for future use in breeding purpose.

Key words: Grasspea, Exotic and local genotypes, evaluation, Cluster and yield

Introduction

Grasspea is a traditional foodstuff in many cultures of the world including Bangladesh. Among all the pulses grown in Bangladesh grasspea occupies the second highest position in terms of both acreage and production (BBS, 2007). In our country pulses are termed as the "poor man's meat" as they are cheaper. In general, pulses contain 20- 25% protein and provide about 8% of the world's protein supply. *L. sativus* contains 25.6%-28.4% protein (Rotter *et al*., 1991). In Bangladesh, grasspea is cultivated in an area of 239, 343 ha with a production of 174, 245 tonnes, the mean yield being 728 kg/ha. Among the pulses, it occupies the highest area (33%) and production (34%).

The genus *Lathyrus* is large with 187 species and subspecies being recognized (Allkin *et al*. 1983). Species are found in the Old World and the New World. There are centres of diversity for Old World species in Asia Minor and the Mediterranean region (Zeven and de Wet 1982). However, only one species – *Lathyrus sativus* – is widely cultivated as a food crop (Jackson and Yunus 1984), while other species are cultivated to a lesser extent for both food and forage. Some species are valued as ornamental plants, especially the sweet pea (*L. odoratus*). The grass pea is endowed with many properties that combine to make it an attractive food crop in drought-stricken, rain-fed areas where soil quality is poor and extreme environmental conditions prevail (Palmer *et al*. 1989).

Despite its tolerance to drought it is not affected by excessive rainfall and can be grown on land subject to flooding (Kaul *et al*. 1986; Rathod 1989; Campbell *et al*. 1994). It has a very hardy and penetrating root system and therefore can be grown on a wide range of soil types, including very poor soil and heavy clays. This hardiness, together with its ability to fix atmospheric nitrogen, makes the crop one that seems designed to grow under adverse conditions (Campbell *et al.* 1994). Compared with other legumes, the grass pea is resistant to many pests including storage insects (Palmer *et al.* 1989).

Cytogenetic and biosystematic studies that have been conducted on some of the main pulse crops have focused attention on wild species genetic resources and their more efficient utilization in crop improvement. Pulses Research Centre has already released a total of three grass pea varieties and also doing research for the development of stress tolerant and ODAP free high yielding grass pea variety. But the genetic base is very narrow that was found not only for grass pea but also for all the pulse crops which is a great barrier for new variety development. This work, therefore, advocated evaluating the genetic variability of fourty two exotic and local germplams of different origins. The selection for recovering the accessions with superior quality traits introduces a valuable genetic material for local or national breeding programmes.

Materials and Methods

The experiment was conducted at Pulses Research Centre, Ishurdi, Pabna during the Rabi season of 2013-14. A total of 42 germplasm from ICARDA (International Center for agricultural Research in Dry Areas), Alleppo, Syria and local sources were evaluated viz. SEL-1328, SEL-521-B_1, SEL-1327, SEL-1304, SEL-554, SEL-587, SEL-1329, SEL-2177, SEL-387, SEL-1784, SEL-289, SEL-1303, BKX-0011-1, SEL-449, BKX-0003-1, BKX-0008-1, BKX-0002-1, RU-155, B-111, SEL-1321, SEL-1326, SEL-ETH-1/299, BKX-0002-4, Sirajgonj Local, Madaripur Local, Patuakhali Local, Pabna Local, BKX-0008-8, SEL-1307, SEL-1330, SEL-299, SEL-1942, SEL-2119, SEL-1959, SEL-390, CGI-08941789, SEL-132-22, CGI-0893347, CGI-08942279, SEL-1332 and Natore Local. But one entry (110-8-1) completely failed to germinate. The experiment was laid out in Alpha-lattice design with 2 replications. Each plot was consist of two rows of 4 m long with row to row spacing of 50 cm and plant to plant distance was 10 cm. Fertilizers were used as per recommendation as basal during final land preparation. The importance of balanced fertilization has long been recognized to achieve high productivity and fertilizer use efficiency. Due to its ability of nitrogen fixation from the atmosphere legumes require less nitrogen application. But for initial establishment of plant up to the stage of nodule formation starter dose of 20-40-20-10 NPKS was applied, respectively. Seeds were sown in the rows carefully by hands at 3 cm depth and then covered by soils. Post sowing irrigation was given to ensure seed germination. Weeding was done to keep the plots free from weeds. Data was recorded on one qualitative character like flower color and quantitative traits were collected from five plants randomly sampled where the traits comprised of days to 50% flowering, days to maturity, plant height, branches/plant, pods per plant, seeds per pods, pod length, pod width, 100 seed weight and grain yield per m^2. But in this study for analysis and discussion, only the data of 100 seed weight and yield per m^2 was used. The statistical analysis was done by using GENSTAT-5.5 computer software.

Result and Discussion

The quantitative traits of all the genotypes differed from each other with respect to 100 seed weight and yield per m^2. Among the tested entries minimum value for 100 seed weight was found as 4.41 g and the maximum was 11.52 g with a mean value of 5.84. Again for yield, it was found minimum as 3.7 g/m^2 and the maximum was 275.8 g/m^2 with a mean value of 110.9 g/m^2 (Table 1).

Table 1. Minimum, maximum and mean value of 100 seed weight and yield of studied germplasms

Character	Minimum value	Maximum value	Mean value
100 seed weight (g)	4.41	11.52	5.84
Yield (g/m^2)	3.7	275.8	110.9

Through multivariate analysis, fourty one genotypes were grouped into six clusters based on D^2 values (Table 2) of 100 seed weight (g) and yield response (g/m^2). The composition of different clusters varied from 5 to 12 genotypes. Cluster I comprised of 12 genotypes followed by cluster V, VI, IV, III and II consisting of 7, 6, 6, 5 and 5 genotypes, respectively.

Table 2. Distribution of 41 germplasm of grasspea in different clusters based on 100 seed weight and yield/m^2

Cluster	No. of genotypes	Name of Genotypes
I	12	SEL-1328, SEL-521-B_1, SEL-1327, SEL-1304, SEL-554, SEL-587, SEL-1329, SEL-2177, SEL-387, SEL-1784, SEL-289, SEL-1303
II	5	BKX-0011-1, SEL-449, BKX-0003-1, BKX-0008-1, BKX-0002-1
III	5	RU-155, B-111, SEL-1321, SEL-1326, SEL-ETH-1/299
IV	6	BKX-0002-4, Sirajgonj Local, Madaripur Local, Patuakhali Local, Pabna Local, BKX-0008-8
V	7	SEL-1307, SEL-1330, SEL-299, SEL-1942, SEL-2119, SEL-1959, SEL-390
VI	6	CGI-08941789, SEL-132-22, 0893347, 08942279, SEL-1332, Natore Local

The diversity was also supported by the appreciable amount of variation among the cluster means for the above two characters (Table 3). Cluster IV exhibited the lowest mean value for 100 seed weight (4.91g) and cluster III possesses the highest mean value (7.25 g) for that character. The highest yield/ m^2 (231.02 g) was recorded in cluster IV followed by cluster II and the lowest was found in cluster III.

Table 3. Cluster means for 100 seed weight and yield of 41 grasspea germplasm

Cluster	100 Seed Weight (g)	Yield (g/m^2)
I	6.33	55.94
II	5.51	178.33
III	7.25	27.83
IV	4.91	231.02
V	5.36	93.7
VI	5.45	133.98

From the above clusters a total of thirteen genotypes were selected based on two different characters studied (Table 4). Two bold seeded (B-111 and SEL-ETH-1/299) and six high yielding lines (BKX-0002-4, Sirajgonj Local, Madaripur Local, Patuakhali Local, Pabna Local and BKX-0008-8) and five others having both the attributes in a good range (SEL-132-22, BKX-0011-1, BKX-0003-1, Natore Local and BKX-0008-1) were selected from different cluster for next breeding trials to find out better one considering all other characters. The lines may also be used in national ongoing crossing programme for the development of high yielding grasspea variety.

Table 4. Performance of selected 13 Grasspea entries in respect of 100 seed weight and yield

Serial No.	Entry no.	Entry Name	100 seed weight (g)	Yield (g/m^2)
1	4	SEL-132-22	6.38	147.25
2	5	B-111	11.52	31.38
3	8	BKX-00011-1	6.04	167.25
4	12	BKX-0002-4	5.06	225.38
5	22	Sirajgong local	5.10	213.75
6	23	Madaripur local	4.96	275.75
7	24	Patuakhali local	4.90	223.50
8	25	Pabna local	4.41	224.50
9	29	SEL-ETH-1/299	6.44	35.75
10	32	BKX-0008-8	5.09	223.25
11	33	BKX-0003-1	5.37	184.00
12	36	BKX-0008-1	5.54	189.13
13	42	Natore local	5.66	119.50

Conclusion

The selected thirteen genotypes viz. BKX-0011-1, BKX-0003-1, BKX-0008-1, B-111, SEL-ETH-1/299, BKX-0002-4, Sirajgonj Local, Madaripur Local, Patuakhali Local, Pabna Local, , BKX-0008-8, SEL-132-22 and Natore Local are comparatively good for seed yield. Among the selected genotypes ten genotypes viz. Madaripur Local, BKX-0002-4, Pabna Local, Patuakhali Local, BKX-0008-8, Sirajgonj Local, BKX-0008-8, BKX-0003-1, BKX-0011-1and SEL-132-22 will be evaluated further in different breeding trials for developing a new high yielding variety of grasspea.

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