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Studies on the Seed Yield Performance of Isabgol (*Plantago ovata* Forsk) Elite Genotypes under Semi-Arid Conditions of Haryana

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ABSTRACT

A field experiment was conducted during the years 2016- 2017, 2017-18 and 2018-19 to evaluate the performance of 13 elite Isabgol genotypes for commercial cultivation under semi-arid conditions of Haryana at Research Farm of MAP Section, Department of Genetics and Plant Breeding CCS Haryana Agricultural University, Hisar. The results on the basis of mean performance over three years seed yield data of all 13 genotypes revealed that, the highest seed yield (kg/ha) was found in genotype HI-137 (307.89 kg/ha) and closely followed by HI-135 (307.86 kg/ha), which were significantly superior to all the genotypes. Some other genotypes like Niharika (290.82 kg/ha) and HI-133 (293.13 kg/ha) also produced good yield. Lowest seed yield was recorded in genotype HI-136 (189.94 kg/ha). On the basis of average of three years data, it is consolidated that the genotype, HI-135 had the longest spike (5.55 cm) followed by HI-131 (5.38 cm), HI-137 (5.26 cm) and HI-138 (5.16 cm). Likewise, HI-137 was also recorded the maximum number of florets/spike (47.71 florets/spike) closely followed by GI-2 (46.52 florets/spike), Niharika (46.11 florets/spike) and HI-135 (44.36 florets/spike). Under different environment conditions, the elite genotypes, HI-137 (307.89 kg/ha) and HI-135 (307.86 kg/ha) were able to perform better and were significantly superior to all other genotypes, therefore, these genotypes may be recommended for cultivation in semi-arid region of Haryana after further testing their preference over time and space.

Keywords: Isabgol, elite genotypes, and seed yield

Introduction

Allover the world, the demand and prices of different kind of medicinal plants have been increased several folds due to spread of COVID 19. The growing demand of medicinal plants makes them remunerative alternate crops to the traditional ones for marginal farmers. Suitable model for cultivation of medicinal plants need to be developed to optimize the production per unit area which help farmers in adopting commercial cultivation of medicinal and aromatic plants in a sustainable manner (Kirti and Arya**,** 2019).

Isabgol (*Plantago ovata* Forsk.) is one of the important and export potential medicinal plant of India, which is locally known as Isabgul, Issabagolu, Isakol, Isphagol, Ispaghol, Psyllium etc. Isabgol belongs to family Plantaginaceae. Isabgol is native to the Mediterranean region and West Asia extending up to Sutlaj and Sindh in West Pakistan. It is short stemmed plant which may grow upto 40 cm, highly cross pollinated winter season crop. It has alternative leaves having parallel venation. Its flowers are minute and white in colour. Its seeds are ovate and 1.8 to 3.8 mm long having brown grey colour and covered with two translucent membrane structures known as husk. The husk is the membranous covering of seeds, which may be white to brown grey light pink in colour. Isabgol husk has property of absorbing and retaining water (40-90%). The husk and seed are major products of Isabgol plant.

Isabgol seeds have 23.5% crude fibre, 8.7% protein, 50.65% carbohydrates and 6.85% ash, (Pendse et al. 1976). The outer seed coat contains hydrocolloidal polysaccharides i.e. mucilage, cellulose, fixedoil, tannin, aucubinglyvaside, sterols, starch, sugars and proteins etc. The mucilage of Isabgol is colloidal in nature which is composed ofxylose, galacturonic acid, arabinose, rhamnose and galactose (Salyers et al. 1978). In addition these, Isabgol seed contain amino acids i.e. valine, aniline, glutamic acid, glycine, cystine, lysine, leucine and tyrosine (Tyagi et al. 2016). Isabgol seeds husk is mild laxative, emmallient and demulcent, cooling, diuretic and used in inflammatory conditions of mucous membrane of gastro-intestinal and genital-urinary tract. It is also used in curing of chronic dysentery, diarrhea, duodenal ulcer, constipation and piles (Arya et al. 2021). It has hypoglycemic, anti-cancerous, antitoxic, hypotensive cardiac depressant,hypochloresteremic and cholinergic activities. In addition to these medicinal uses, it is also utilized in ice-cream/food industry, dyeing/calico-printing as stabilizer. The dehusked seeds have nutritive value and are also used as birds/poultry and cattle feed (Tyagi, 2008).

It has ability to grow in a wide range of agro-climatic conditions, but it requires warm temperate regions cool and dry weather conditions for better growth and development of crop plants. The low rainfall areas with assured irrigation are best suited for its commercial cultivation. It needs 20°C temperatures for good seed germination. At flowering, the cloudy weather, mild dew or even light showers causes heavy shedding of flowers and seeds with intense losses in seed yield. Isabgol crop is generally able to grow in all type of soils, but the light and well drained sandy loam having pH 7-8 has been found more suitable for successful cultivation and seed production. Since, the crop is grown in the south-west region of Haryana and found successful to grow under sandy loam marginal lands and rained conditions; but, the identification of suitable elite genotypes, for these semi-arid conditions are major limiting factor for its cultivation. Keeping the above points in view, the present study was carried to evaluate the performance of Isabgol elite genotypes in order to identify superior genotypes for seed yield under semi-arid conditions of Haryana.

Materials and Methods

To conduct the field experiment, 13 newly developed elite genotypes of Isabgol (*Plantago ovata* Forsk.) were grown in RBD during winter 2016-17, 2017-18 and 2018-19 at Research Farm of MAP Section, Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar located 29°10'N latitude and 75°46'E longitude with an elevation of 215.2 m above the mean sea level. The plot size was kept 4.0 x 1.2 m^2 with spacing 30x10 cm^2. The soil of experimental site was sandy loam, medium in available nitrogen (141.0 kg/ha), available phosphorus (14.0 kg/ha), available potassium (240.0 kg/ha)and organic carbon (0.46%). Weekly weather parameters data recorded from research area during winter 2016-17,2017-18 and 2018-19 given in Fig. 1, 2 and 3. Each elite genotype was planted in four rows of four meter length spacing 30 cm apart. All the recommended package of practices was followed to raise a good healthy crop. The observations on different morphological and yield attributing eight characters viz. plant height (cm), number of leaves, number of branches, length of spike, number of spikes, number of florets, days to maturity, seed yield (kg/ha) were recorded from five randomly selected plants from each replications. The data was subjected to statistical analysis as per standard procedure.

Results and Discussion

The mean performance of 13 elite genotypes of Isabgol for all the eight characters recorded during winter 2016-17, 2017-18 and 2018-19 presented in Tables 1-4. The analysis of variance showed significant variation among the different genotypes for all the characters during 2016-17 and 2017-18 except for length of spike (cm), and during 2018-19 except for plant height (cm), number of branches/plant, length of spike (cm), number of spikes/plant, number of florets/spike.

Plant height

The data (Table 1) revealed that amongst 13 elite genotypes under present investigation, for plant height, during 2016-17, Niharika was the tallest with 35.24 cm plant height followed by HI-138(34.80 cm), HI-131 (34.68 cm), GI-2 (33.79 cm) and HI-133 (33.78 cm). During 2017-18, HI-133 was the tallest with 37.00 cm followed by GI-2 (36.78 cm), Niharika (36.44 cm) HI-138(35.78 cm) and HI-2009 (35.78 cm). During 2018-19, HI-131 was the tallest with 38.33 cm followed by HI-133 (37.60 cm), GI-2 (37.60 cm), HI-138 (37.20 cm) and HI- 5(37.20 cm). On an average basis over the three years data revealed that the genotype, HI-133 was tallest (36.13 cm) and followed by GI-2 (36.06 cm), HI-131(36.04 cm) and Niharika (35.98 cm). The variable results might be due to genetic constituents of genotypes and variation in agro-climatic conditions during different years. The mean performances between various genotypes in Isabgol for different characters have also been reported earlier (Tyagi et al. 2016).

Number of leaves per plant

For number of leaves per plant (Table 1), during 2016-17, the maximum number of leaves per plant (94.01) was exhibited in HI-2009 followed by HI-137 (91.58 leaves/plant), HI-133 (87.68 leaves/plant), and HI-134 (85.90 leaves/plant). However, during 2017-18, HI-134 revealed the maximum number of leaves per plant (85.11) followed by HI-133 (82.00 leaves/plant), JI-4 (80.56 leaves/plant) HI-131(74.44 leaves/plant) and Niharika (74.44 leaves/plant). Likewise, during 2018-19, HI-134 was having the maximum number of leaves per plant (84.80 leaves/plant) followed by HI-133(84.50 leaves/plant), JI-4 (78.95 leaves/plant) and HI-131(75.00 leaves/plant). On an average basis over the three years revealed that the genotype, HI-134 was found with maximum number of leaves per plant (85.27 leaves/plant) and closely followed by HI-133 (84.73 leaves/plant), and HI-2009 (80.89 leaves/plant).

Number of branches per plant

The results are presented in Table 2 for number of branches per plant during 2016-17, the maximum number of branches per plant (7.53) was exhibited in HI-133 followed by JI-4 (7.30 branches/plant), HI-132 (6.90 branches/plant), and HI-5 (6.88 branches/plant). However, during 2017-18, HI-5 revealed the maximum number of branches per plant (5.56) followed by HI-131 (5.33 branches/plant), HI-2009 (5.22 branches/plant) and HI-133 (5.11 branches/plant). Likewise, during 2018-19, Niharika was having the maximum number of branches per plant (6.87 branches/plant) followed by HI-135 (6.80 branches/plant) and JI-4 (6.80 branches/plant) and HI-134 (6.67 branches/plant). The average of data over the three years reflected that the genotype, HI-133 and HI-5 were found with maximum number of 6.32 branches per plant followed by JI-4 (6.26 branches/plant), and HI-2009 (6.06 branches/plant). In a similar study, Tyagi et al. (2016) reported the maximum seven numbers of branches per plant in Palampur-2 and HI-4.

Length of spike

The data of 2016-17 presented in Table 2 for length of spike revealed that, the genotype HI-134 exhibited longest spike with 5.30 cm followed by HI-135 (5.22 cm), HI-137 (5.18 cm) and HI-2009 (5.15 cm). However, during 2017-18, HI-135 revealed the longest spike (5.73 cm) followed by HI-131 (5.54 cm), HI-137 (5.31cm), HI-133 (5.26) and HI-138(5.26). Likewise, during 2018-19, HI-135 was having the longest spike with 5.70 cm followed by HI-131(5.50 cm), HI-137 (5.29 cm) and HI-138(5.27 cm). On the basis of average of three years data, it is consolidated that the genotype, HI-135 had the longest spike (5.55 cm) followed by HI-131 (5.38 cm), HI-137 (5.26 cm) and HI-138 (5.16 cm). The mean performances between various genotypes of Isabgol for different characters have also been supported by earlier findings (Hendry and Daulay, 1992).

Number of spikes/plant

For number of spikes/plant during 2016-17, the maximum number of spikes/plant (35.57) was exhibited in HI-2009 followed by HI-136 (35.34 spikes/plant), HI-133 (34.55 spikes/plant), and HI-137 (32.68 spikes/plant). Likewise, during 2017-18, HI-2009 revealed the maximum number of spikes/plant (42.22) followed by HI-138 (40.44 spikes/plant), HI-133 (38.56 spikes/plant) GI-2 (37.22 spikes/plant) and HI-131 (36.78 spikes/plant). However, during 2018-19, HI-138 was having the maximum number of spikes/plant (38.87 spikes/plant) followed by HI-131 (38.53 spikes/plant), HI-2009 (36.13 spikes/plant) and HI-133 (36.00 spikes/plant). The mean performance over the three years revealed that the genotype, HI-2009 was found with maximum number of spikes/plant (37.97) and closely followed by HI-133 (36.37 spikes/plant), HI-138 (35.70 spikes/plant) and HI-131 (35.00 spikes/plant). In another study, Tyagi et al. (2016) observed the maximum number of spike per plant was for Gummary (38.8) followed by HI-2009 (36.9) and Palampur-2 (36.0), respectively.

Number of florets/spike

It is evident from Table 3 for number of florets/spike during 2016-17, that the maximum number of florets/spike (52.62) was exhibited in GI-2 followed by Niharika (51.23 florets/spike), HI-138 (51.12 florets/spike), and HI-137 (50.35 florets/spike). However, during 2017-18, HI-137 revealed the maximum number of florets/spike (53.61) followed by GI-2 (49.94 florets/spike), Niharika (48.61 florets/spike) HI-2009 (47.22 florets/spike) and HI-135 (46.61 florets/spike). However, during 2018-19, HI-5 was having the maximum number of florets/spike (39.42 florets/spike) followed by HI-137 (39.17 florets/spike), HI-135 (38.67 florets/spike) and Niharika (38.50 florets/spike).The mean performance over the three years revealed that the genotype, HI-137 was found with maximum number of florets/spike (47.71 florets/spike) and closely followed by GI-2 (46.52 florets/spike), Niharika (46.11florets/spike) and HI-135 (44.36 florets/spike).

Days to maturity

In 2016-17, days taken to maturity were earliest (119.33) in the genotypes HI-131 and HI-132 followed by GI-2 (120.00 days), HI-138(120.00 days)and HI-5 (120.00 days). The genotypes HI-136 (129.33 days) and HI-137 (128.33 days) were late in maturity. In 2017-18, the earliest maturing genotype was HI-138

(121.67 days) followed by HI-137 (124.67 days) and GI-2 (125.33 days), while the genotypes HI-136 (129.33 days) and HI-133(129.00 days) were late in maturity. In 2018-19, the earliest maturing genotype was GI-2 with 119.00 maturity days, followed by HI-132 (120.33 days), HI-131(122.00 days) and HI-138 (122.33 days), while the genotypes HI-136 (128.33 days) and HI-135 (127.00 days) were late in maturity. The averages of the three years data on maturity revealed that the genotype, HI-138 was earliest in maturity and have average maturity 121.33 maturity days, closely followed by GI-2 (121.33 days), HI-132 (122.66 days) and HI-131(123.22 days). While the genotype HI-136 (129 days), HI-135 (126.44 days) and HI-137 (126.33 days) were late in maturity. The variation in maturity might be due to individual varietal characters and also influenced by environmental factors prevailing during cropping season. Tyagi et al. (2016) identified HI-32 (60.3 days) followed by HI-4 (60.6 days), HI-96 (60.6 days) as early maturing genotypes.

Seed yield (kg/ha)

It is revealed from Table 4 that the environment of year 2017-18 was most favourable for seed production followed by 2018-19 and 2016-17. During 2016-17, the seed yield (kg/ha) varied from 145.80 - 340.30 kg/ha. The highest seed yield (kg/ha) was found in genotype HI-5 (340.30 kg/ha), which was significantly superior to all the genotypes. Some other genotypes like HI-133 (304.20 kg/ha) and HI-2009 (286.10 kg/ha) also produced somewhat higher yield. But significantly lowest seed yield kg/ha was recorded in HI-137 (145.80 kg/ha). However, during 2017-18, the seed yield (kg/ha) varied from 194.44 -407.87 kg/ha. The highest seed yield (kg/ha) was found in genotype HI-137 (407.87 kg/ha), followed by HI-135(402.77 kg/ha) which were significantly superior to all the other genotypes. Some other genotypes like Niharika (312.26 kg/ha) and HI-133 (302.74 kg/ha) also produced somewhat higher yield, however, lowest seed yield was recorded in JI-4 (194.44 kg/ha). Similarly, during 2018-19, the seed yield (kg/ha) varied from 180.00 -370.00 kg/ha. On the basis of mean performance over three years data, the highest seed yield (kg/ha) was found in genotype HI-137 (307.89 kg/ha) and closely followed by HI-135 (307.86 kg/ha), which were significantly superior to all the genotypes. Some other genotypes like HI-133 (293.13 kg/ha) and Niharika (290.82 kg/ha) also produced somewhat higher yield. But, significantly lowest seed yield kg/ha was recorded in HI-136 (189.94 kg/ha). Tyagi et al. (2016) reported the seed yield/plant variation from 2.011 to 5.650 g/plant. They found highest seed yield/plant in Palampur-2 (5.650 g), MPI- 1 (5.141 g), Gummary (4.814 g), DM-11 (4.659 g), DM-10 (4.436 g) and GI-2 (4.413 g). The higher yield of elite genotypes might be due to higher number of branches, which leads to the production of more number of spike per plant that directly affect the production of higher seed yield. An addition this, number of florets/spike may also contributed to higher seed. The findings were also supported by Beniwal et al. (2007); Jadhav et al. (2008); Barfa et al. (2011) and Tyagi et al. (2016).

Today, entire world is concerned about the impact of climate change on plants. In the last two centuries, climate change has been taking place so rapidly that certain plant species have found it hard to adapt. The climate change will have dramatic consequences for crops. The effect of climate on agriculture is related to variability's in local weather parameters rather than in global climate patterns (Arya et al. 2020). Therefore, evaluation of promising genotypes over the year are required to know the consistency in their performance over the environments. Consistently good performance over a range of environments must be one of the important criteria while evaluating any genotype or variety, particularly in a country like India, where great variations occur in environmental conditions (Arya et al. 2010; Kant et al. 2014). The widespread cultivation of the crop all along the globe is largely due to high versatility of genome which enables its adaptation to different agro-climatic conditions (Preeti et al. 2016). Under different environment conditions, the elite genotypes, HI-137 (307.89 kg/ha) and HI-135 (307.86 kg/ha) were able to perform highest seed yield (kg/ha) and were significantly superior than all other genotypes, therefore, these genotypes may be recommended for cultivation in semi-arid reason of Haryana after further testing their preference over time and space.

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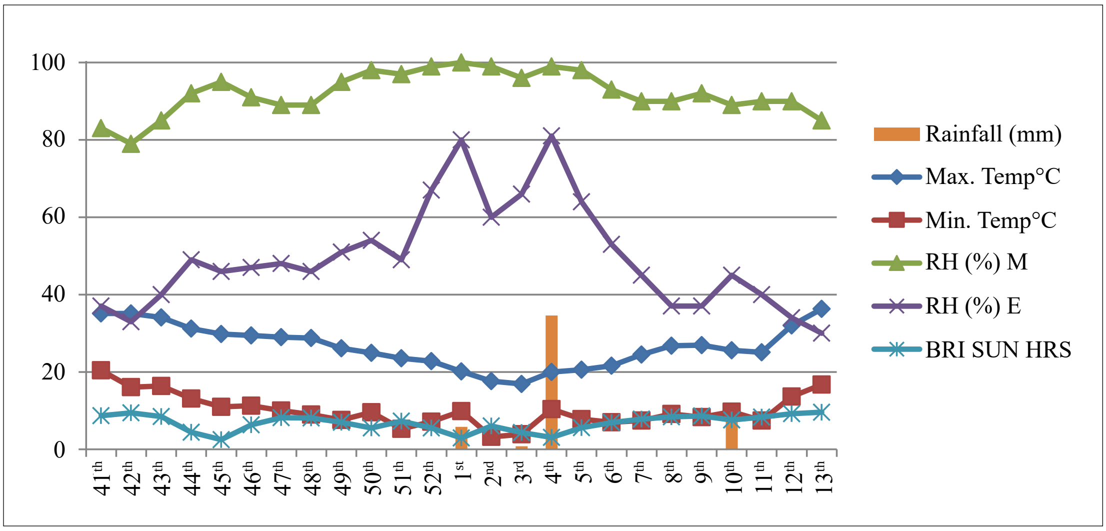

Figure 1.Weekly weather parameters data recorded at Hisar location during 2016-17.

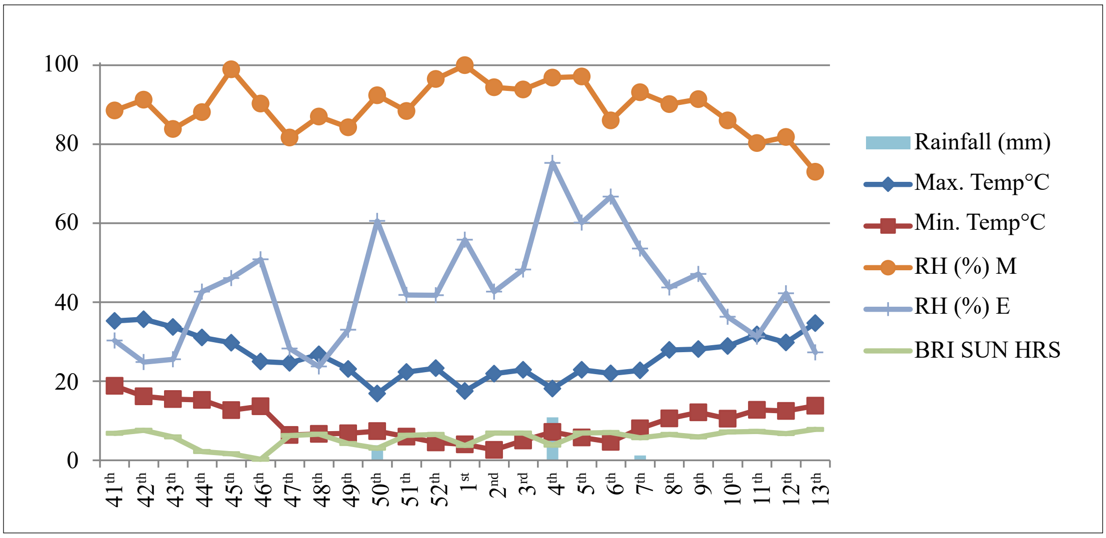

Figure 2. Weekly weather parameters data recorded at Hisar location during 2017-18.

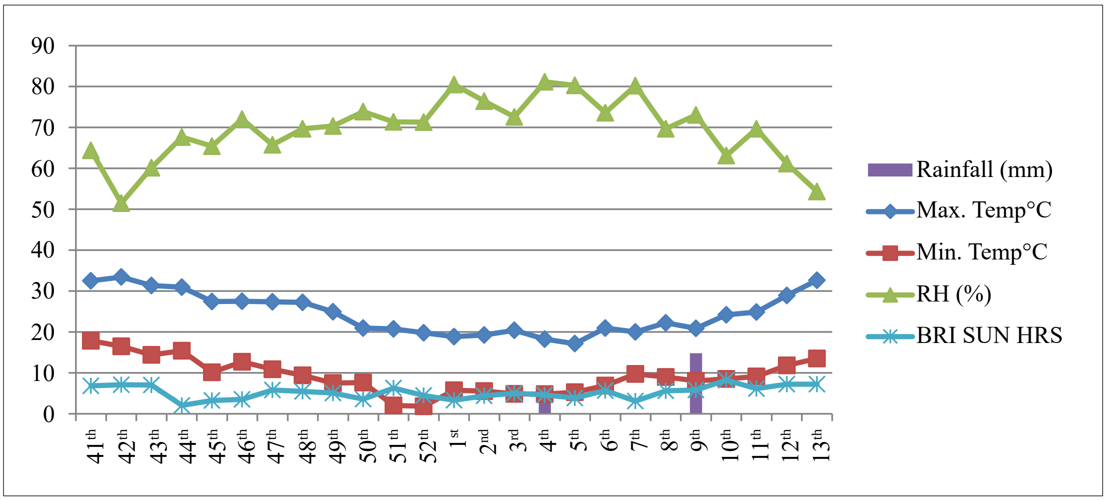

Figure 3. Weekly weather parameters data recorded at Hisar location during 2018-19.

Table 1. Mean performance of elite genotypes of Isabgol for plant height (cm) and number of leaves/plant.

No.	Genotypes	Plant Height (cm)				Number of Leaves/Plant			
		2016-17	2017-18	2018-19	Mean	2016-17	2017-18	2018-19	Mean
1	HI-131	34.68	35.11	38.33	36.04	71.11	74.44	75.00	73.52
2	HI-132	31.11	33.89	35.53	33.51	73.89	64.11	64.75	67.58
3	HI-133	33.78	37.00	37.60	36.13	87.68	82.00	84.50	84.73
4	HI-134	32.80	33.89	35.60	34.10	85.90	85.11	84.80	85.27
5	HI-135	32.91	34.89	36.33	34.71	72.44	68.44	70.33	70.40
6	HI-136	26.51	32.00	34.13	30.88	80.34	68.33	68.00	72.22
7	HI-137	27.03	35.44	35.87	32.78	91.58	70.11	74.33	78.67
8	HI-138	34.80	35.78	37.20	35.93	80.03	66.89	65.09	70.67
9	HI-2009	33.78	35.78	34.53	34.70	94.01	74.22	74.44	80.89
10	GI-2	33.79	36.78	37.60	36.06	72.45	71.33	70.00	71.26
11	JI-4	33.01	34.78	34.27	34.02	77.47	80.56	78.95	78.99
12	HI-5	33.45	35.56	37.20	35.40	80.45	66.94	70.25	72.55
13	Niharika	35.24	36.44	36.27	35.98	76.22	74.44	72.67	74.44
	Mean	**32.53**	**35.18**	**36.19**	**34.63**	**80.27**	**72.84**	**74.00**	**75.70**
	Range	26.51-35.24	32.00-37.00	34.13-38.33	30.88 -36.13	71.11-94.01	64.11-85.11	64.75-84.80	67.58-85.27
	CD (5%)	2.03	1.72	NS	-	4.24	6.04	6.77	-

Table 2. Mean performance of elite genotypes of Isabgol for number of branches/plant and length of spike (cm).

No.	Genotypes	Number of Branches/Plant				Length of Spike (cm)			
		2016-17	2017-18	2018-19	Mean	2016-17	2017-18	2018-19	Mean
1	HI-131	6.00	5.33	6.60	5.98	5.09	5.54	5.50	5.38
2	HI-132	6.90	4.89	6.27	6.02	4.43	4.96	5.00	4.80
3	HI-133	7.53	5.11	6.33	6.32	4.77	5.26	5.25	5.09
4	HI-134	6.43	4.56	6.67	5.89	5.30	4.90	4.89	5.03
5	HI-135	6.30	4.89	6.80	6.00	5.22	5.73	5.70	5.55
6	HI-136	5.33	4.11	6.00	5.15	5.06	4.98	5.00	5.01
7	HI-137	6.43	4.56	5.73	5.57	5.18	5.31	5.29	5.26
8	HI-138	5.63	4.89	6.27	5.60	4.95	5.26	5.27	5.16
9	HI-2009	6.57	5.22	6.40	6.06	5.15	4.82	4.85	4.94
10	GI-2	6.43	3.89	5.73	5.35	4.67	4.88	4.83	4.79
11	JI-4	7.30	4.67	6.80	6.26	4.05	4.81	4.80	4.55
12	HI-5	6.88	5.56	6.53	6.32	3.94	4.89	4.91	4.58
13	Niharika	6.00	5.00	6.87	5.96	4.95	4.79	4.79	4.84
	Mean	**6.44**	**4.82**	**6.38**	**5.88**	**4.83**	**5.09**	**5.08**	**5.00**
	Range	5.33- 7.53	4.11- 5.56	5.73-6.87	-	3.94-5.18	4.79 - 5.73	4.79 -5.70	4.55 -5.55
	CD (5%)	1.23	0.87	NS	-	1.54	NS	NS	-

Table 3. Mean performance of elite genotypes of Isabgol for number of spikes/plant and number of florets/spike.

No.	Genotypes	Number of Spikes/Plant				Number of Florets/Spike			
		2016-17	2017-18	2018-19	Mean	2016-17	2017-18	2018-19	Mean
1	HI-131	29.68	36.78	38.53	35.00	43.72	43.89	33.58	40.40
2	HI-132	31.68	31.56	34.60	32.61	47.89	43.06	35.58	42.18
3	HI-133	34.55	38.56	36.00	36.37	46.63	45.61	38.00	43.41
4	HI-134	30.23	26.33	32.13	29.56	46.51	44.28	38.25	43.01
5	HI-135	32.01	30.56	31.00	31.19	47.79	46.61	38.67	44.36
6	HI-136	35.34	30.67	29.47	31.83	47.22	46.11	37.67	43.67
7	HI-137	32.68	30.22	30.67	31.19	50.35	53.61	39.17	47.71
8	HI-138	27.79	40.44	38.87	35.70	51.12	44.22	34.67	43.34
9	HI-2009	35.57	42.22	36.13	37.97	48.75	47.22	32.42	42.80
10	GI-2	29.55	37.22	34.00	33.59	52.62	49.94	37.00	46.52
11	JI-4	26.35	21.00	30.40	25.92	43.63	45.22	33.83	40.89
12	HI-5	29.33	32.89	35.00	32.41	46.23	44.83	39.42	43.49
13	Niharika	28.79	33.44	35.00	32.41	51.23	48.61	38.50	46.11
	Mean	**31.04**	**33.22**	**33.98**	**32.75**	**47.98**	**46.40**	**36.67**	**43.68**
	Range	26.35-35.57	21.00-42.22	29.47-38.87	29.56-37.97	43.63-52.62	44.22-53.61	32.42-39.42	40.89-47.71
	CD (5%)	2.86	3.26	NS	-	3.78	2.43	NS	-

Table 4. Mean performance of elite genotypes of Isabgol for days to maturity and seed yield (kg/ha).

No.	Genotypes	Days Tomaturity				Seed Yield (kg/ha)			
		2016-17	2017-18	2018-19	Mean	2016-17	2017-18	2018-19	Mean
1	HI-131	119.33	128.33	122.00	123.22	205.60	282.37	255.33	247.77
2	HI-132	119.33	128.33	120.33	122.66	205.60	233.79	210.50	216.63
3	HI-133	121.33	129.00	124.00	124.78	304.20	302.74	272.44	293.13
4	HI-134	122.33	126.33	125.00	124.55	183.30	223.15	200.80	202.42
5	HI-135	125.00	127.33	127.00	126.44	158.30	402.77	362.50	307.86
6	HI-136	129.33	129.33	128.33	129.00	188.90	200.92	180.00	189.94
7	HI-137	128.33	124.67	126.00	126.33	145.80	407.87	370.00	307.89
8	HI-138	120.00	121.67	122.33	121.33	219.40	282.40	254.00	251.93
9	HI-2009	120.67	128.67	123.00	124.11	286.10	281.94	253.75	273.93
10	GI-2	120.00	125.33	119.00	121.44	231.90	225.00	202.50	219.80
11	JI-4	121.33	126.33	124.00	123.89	213.90	194.44	250.45	219.60
12	HI-5	120.00	127.33	125.00	124.11	340.30	263.89	237.50	280.56
13	Niharika	124.00	127.00	125.33	125.44	279.20	312.26	281.00	290.82
	Mean	**122.38**	**126.90**	**123.95**	**124.41**	**227.90**	**277.96**	**250.47**	**252.11**
	Range	119.33-129.33	121.67-129.33	119.00-128.33	121.33-129.00	145.80-340.30	194.44-407.87	180.00-370.00	189.94-307.89
	CD (5%)	1.63	1.36	1.41	-	31.48	36.05	35.17	-

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