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Varietal evaluation of ash gourd [*Benincasa hispida* (THUNB) Cogn.] in Gajapathi district

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Abstract

The present investigation 15 genotypes of ash gourd for evaluating their performance different traits. The analysis of variance revealed that mean sum of squares due to genotypes were highly significant for all characters. Which revealed the existence of considerable variability in material studied for improvement for various characters. The highest yield was recorded in genotype Pusa Ujjwal (31.14 kg), followed by Raygada Local (24.5 kg), Kasi Surbhi (23.2 kg). The earliest flowering was recorded in Hiramandalam Local (60 days), Greenie (61 days), Dristhi (62.75 days). Maximum number of fruits vine-1 was recorded in Pusa Ujjwal (5.41), Dristhi (5.16), Raygada Local (4.33). Maximum fruit length was recorded in Mahima (43.16cm), Dristhi (41.05cm), Raygada Local (40.03cm). Maximum fruit width was recorded in Pusa Ujjwal (68.58cm), Mahima (66.91cm), Kasi Surbhi (65.72cm). Average fruit weight was recorded in Sunabeda Local (6.35 kg), Pusa Ujjwal (6.18 kg), Raygada Local (5.86 kg). Earliest harvesting was recorded in the genotype MAH-1 (119 days), Mahima (119.66), Greenie (121 days). The estimation of mean values revealed that no genotype was superior for all the characters.

Keywords: Ash gourd, genotypes, quality characters

Introduction

Ash gourd is grown throughout India and found in both cultivated and non- cultivated lands and genetic variability is present for fruit shape, size of the fruit, days to flowering, wax deposition and other vegetative traits. Better knowledge of genetic diversity helps to yield is a complex character controlled by a large number of contributing characters and their interconnection. Information about the relationship among best breeding populations and the genetic diversity in available germplasm is important for the excellent design of any breeding program. This helps to choose desirable parents for establishing new breeding populations. Good knowledge of genetic diversity (or) genetic similarity could help to sustain long term selection gain (Chowdhary *et al.*, 2002) [4]. Ash gourd is much priced for its medicinal properties, but comparatively little attention had been paid for the improvement of this crop. One disadvantage of this crop is its trailing habit and big sized fruit which makes the plant rather difficult to handle. Besides, due to this growth habit, the plant occupies a considerably larger area thus makes it less profitable than many other cucurbitaceous vegetables. At present there is urgent need to develop early maturing high yielding variety possessing desirable processing traits. The genetic improvement of any crop depends upon the available genetic variability for quantitative traits and its judicious exploitation through efficient breeding methods (Chandra *et al.* 2012) [3]. The genetic improvement of any crop depends upon the available genetic variability for quantitative traits and its judicious exploitation through efficient breeding methods. At present, there is an urgent need to develop early maturing high yielding region specific varieties to address local problems and also varieties with wider adaptability (Wright 1921). There are many hybrids and varieties of ash gourd having different characters prevailing in India, especially the southern parts of India. Therefore, the major concern for any breeder is the genetic variability to fruit yield and its characteristics. Hence the present study focuses on estimation of available genetic variability for yield and yield related characters in 15 ash gourd genotypes.

Materials and Methods

The basic material for the study included fifteen genotypes of ash gourd from different agro climatic regions of India including the released varieties such as Pusa Ujjwal, Kasi Surbhi, CO-2. The seeds of the fifteen genotypes were laid out in randomised complete block design (RCBD) with three replications. In each replication four pits per genotype were taken and a two plants was maintained in each pit.

Normal cultural methods as per the package and practices the recommendations were adopted (KAU, 2007). Seeds were sown in pits of 60 cm diameter and 35-45 cm depth taken at a spacing (row to row) 1.2 m*1.2 m. Fertilizers at the rate of 28:10:10 g NPK were given per pit. Weeding and raking of the soil were done at the time of fertilizer application. Four plants per genotype were selected for recording the following biometric observations: Days to 1st staminate flower appearance, Number of node bearing 1st staminate flower, Days to 1st pistillate flower appearance, Number of node bearing 1st pistillate flower, Vine length (m), Number of primary branches plant- 1, Number of fruits vine-1, Average fruit weight (kg), Fruit yield vine-1 (kg), Fruit length (cm), Fruit girth (cm), Flesh thickness (cm), Dry weight (%), 100 seed weight (g), Vitamin-c (mg/100g), Total soluble solids

(°Brix). Data from mean of individual genotypes were subjected to method of analysis of variance and statistical analysis that was performed to estimate the genetic variability.

Results and Discussion

The analysis of variance of all the characters under study is presented in Table 1. The analysis of variance revealed that mean sum of squares due to genotypes were highly significant for all characters. Which revealed the existence of considerable variability in material studied for improvement for various traits. Similar findings were recorded in Pandit *et al.* (2009) [8], Kumar *et al.* (2012) [6] and Bhardwaj *et al.* (2013) [2] in bottle gourd.

Table 1: Analysis of variance for fruit yield and its component characters in ash gourd

S. No	Character (df)	Mean sums of square		
		Replication	Treatment	Error
		(2)	(14)	(28)
01	Vine length (m)	0.17	32.62**	0.42
02	Number of primary branches vine-1	1.42	22.18**	0.57
03	Days to 1st staminate flower appearance	0.77	61.17**	2.39
04	Days to 1st pistillate flower appearance	0.51	51.75**	4.80
05	Number of node bearing 1st staminate flower	3.35	12.91**	1.10
06	Number of node bearing 1st pistillate flower	0.88	10.01**	2.42
07	Days to 1st fruit harvest	543.35	127.41**	16.92
08	Fruit length (cm)	1.60	104.77**	2.87
09	Fruit width (cm)	4.29	385.90**	9.50
10	Average fruit weight (kg)	0.41	6.59**	0.14
11	Number of fruits vine-1	0.35	1.85**	0.19
12	Fruit yield plant ⁻¹ (kg)	1.26	178.35**	2.53
13	100 seed weight (g)	0.15	2.35**	0.04
14	Flesh thickness (cm)	0.02	1.45**	0.07
15	T.S.S (°Brix)	0.02	0.66*	0.02
16	Vitamin-C (mg/100g)	2.76	56.75**	3.91
17	Dry weight (g)	0.50	2.10**	0.06

* and ** Significant at 5% and 1% level, respectively

Mean performance of different genotypes were presented in Table 2.

Quantitative characters

Vine Length (m)

Vine length ranged from 4.29 (Hiramandalam Local) to 14.74 (Pusa Ujjwal) with a mean of 8.83. Lowest vine length was observed in Hiramandalam Local (4.29) followed by Greenie (4.41) and Kothavalasa Local (5.51) and highest vine length was observed in Pusa Ujjwal (14.74) followed by Mahima (13.79) & CO-2 (13.48).

Number of primary branches vine-1

The maximum number of branches was recorded in 12.5 (Kasi Surbhi) followed by 11.33 (Dristhi) and 11.25 (Pusa Ujjwal) minimum ranged recorded in 4.33 (Greenie) followed by 4.41 (Bangadiya Local) and 5.08 (Hiramandalam Local).

Days to 1st staminate flower appearance

Days to 1st male flower ranged from 40.33 (Hiramandalam Local) to 57.5 (Berhampur Local) with an overall mean of 46.62. Lowest days to 1st male flower appeared in 40.33 (Hiramandalam Local) followed by 41.66 (Dristhi) and 42.66 (Pathapatnam Local) and highest days were recorded in 57.5 (Berhampur Local) followed by 53.66 (Bangadiya Local) and 48.75 (Kasi Surbhi).

Days to 1st pistillate flower appearance

Days to 1st female flower ranged from 60 (Hiramandalam Local) to 76.33 (Berhampur local) with an overall mean of 65.68. Lowest days to 1st female flower appears in 60 (Hiramandalam local) followed by 61.33 (Greenie) and 62.75 (Dristhi) and highest days were recorded for 76.33 (Berhampur local) followed by 67.91 (Pathapatnam local).

Number of node bearing 1st staminate flower

The node number at which first male flower appears ranged from 7 (Hiramandalam Local) to 15.58 (Bangadiya Local) with an overall mean of 11.13. Lowest male node was found in 7 (Hiramandalam Local) followed by 10.16 (Mahima) & 10.58 (Dristhi). Highest node was recorded in 15.58 (Bangadiya Local).

Number of node bearing 1st pistillate flower

The node number at which 1st female flower appears ranged from 16.41 (Pathapatnam Local) to 23.25 (Bangadiya Local) with an overall mean of 19.72. Lowest female node was found in 16.41 (Pathapatnam Local) followed by 17.33 (Raygada Local) and 18.58 (Sunabeda Local). Highest node was recorded in 23.25 (Bangadiya Local).

Days to 1st fruit harvest (days)

Days taken to 1st fruit harvest ranged from 119 days (MAH-1) to 139.66 days (Sunabeda Local) with an overall mean of

128.88. Early harvesting was recorded in the genotype MAH-1 (119 days) followed by Mahima (119.66 days) and Greenie (121days). Maximum days to first fruit harvest was recorded in the genotype Sunabeda Local (139.66 days).

Fruit length (cm)

Fruit Length of fruit ranged from 22.47cm (Greenie) to 43.16cm (Mahima) with an overall mean of 33.53cm. Lowest fruit length was recorded in greenie (22.47cm) followed by Pathapatnam Local (25.89cm) and Bangadiya Local (27.35cm). Highest fruit length was recorded in Mahima (43.16cm).

Fruit width (cm)

Fruit width ranged from 28.91cm (Greenie) to 68.58cm (Pusa Ujjwal) with an overall mean of 53.38cm. Maximum fruit width was recorded in Pusa Ujjwal (68.58cm) followed by Kasi Surbhi (65.72) and the minimum was recorded in Greenie (28.91cm).

Average Fruit weight (kg)

Fruit weight ranged from 1.78kg (Greenie) to 6.35kg (Sunabeda Local) with an overall mean of 4.02kg. Maximum fruit weight was recorded in Sunabeda Local (6.35kg) followed by Pusa Ujjwal (6.18kg) and Kasi Surbhi (5.60kg). Minimum fruit weight was recorded in Greenie (1.78kg).

Number of fruits vine-1

Number of fruits ranged from 2.83 (Hiramandalam Local) to 5.41 (Pusa Ujjwal) with an overall mean of 3.76. Maximum number of fruits were recorded for Pusa Ujjwal (5.41) followed by Raygada Local (4.33) and minimum were recorded for Hiramandalam Local (2.83)

Fruit yield plant⁻¹ (kg)

Fruit yield ranged from 5.4kg (Hiramandalam Local) to 31.14kg (Pusa Ujjwal) with an overall mean of 15.16kg. Maximum fruit yield was recorded in Pusa Ujjwal (31.14kg) followed by Raygada local (24.5kg) & Kasi Surbhi (23.20kg). Minimum fruit yield was recorded in genotype Hiramandalam Local (5.4kg) followed by Greenie (6.08kg).

Seed character

100 seed weight (g)

100 seed weight ranged from 2.19 (Greenie) to 4.79 (Aparna) with an overall mean of 3.52. Maximum 100 seed weight was recorded in Aparna (4.79) followed by 4.59 (Kasi Surbhi) & CO-2 (4.12). Minimum were recorded in Greenie (2.19).

Qualitative characters

Flesh thickness (cm)

Flesh thickness ranged from 1.43 (Greenie) to 3.93 (Pusa Ujjwal) with an overall mean of 2.82. Maximum flesh thickness were recorded for genotypes Pusa Ujjwal (3.93) followed by Kasi Surbhi (3.77) & Mahima (3.56). Minimum were recorded for Greenie (1.43) followed by Hiramandalam Local (1.54).

Total soluble solid (oBrix)

Total soluble solid ranged from 1.66% (Hiramandalam Local) to 3.24% (Bangadiya Local) with an overall mean of 2.39%. Maximum total soluble solids were recorded Bangadiya Local (3.24%) followed by Raygada Local (3.18%). Minimum total soluble solids were recorded in Hiramandalam Local (1.66%) followed by Pathapatnam Local (1.82%).

Table 2: Mean performance for fruit yield and its components in ash gourd

S. No.	Characters	Vine length (m)	Number of primary branches vine-1	Days to 1 st staminate flower appearance	Days to 1 st pistillate flower appearance	Number of node bearing 1st staminate flower	Number of node bearing 1st Pistillate flower	Days to 1st fruit harvest	Fruit length (cm)	Fruit width (cm)	Average Fruit weight (kg)
1	Greenie	4.41	4.33	45.41	61.83	10.83	18.66	121	22.47	28.91	1.78
2	Dristhi	6.89	11.33	41.66	62.75	10.58	21	124	41.05	57.21	3.18
3	Aparna	8.47	9.33	46.91	62.91	10.83	21.75	127.66	28.86	52.96	3.64
4	Mahima	13.79	9.41	46.16	64.33	10.16	19.41	119.66	43.16	66.91	4.58
5	CO-2	13.48	5.33	43.83	65.16	11.66	18.91	123.66	36.9	47.37	3.64
6	MAH-1	6.12	7.41	44	64.75	11.75	22	119	32.65	48.75	4.64
7	Bangadiya Local	8.80	4.41	53.66	73	15.58	23.25	134.33	27.35	50.69	4
8	Berhampur Local	9.97	9.66	57.5	76.33	14.16	18.41	137	34.89	57.36	2.67
9	Pathapatnam Local	9.54	6.75	45.66	67.91	11.58	16.41	135.33	25.89	47.76	3.46
10	Hiramandalam Local	4.29	5.08	40.33	60	7	20.58	132	32.37	39.74	1.86
11	Kothavalasa Local	5.29	9.58	42.66	65.25	10.16	20.41	128.33	30.24	42.23	2.89
12	Sunabeda Local	10.75	10	46.66	66.08	11.08	18.58	139.66	32.87	62.40	6.35
13	Raygada Local	8.24	5.75	45.66	65.91	12.41	17.33	131.33	40.03	64.19	5.86
14	Pusa Ujjwal	14.74	11.25	50.5	64.58	8.08	19	133.66	38.70	68.58	6.18
15	Kasi Surbhi	7.66	12.5	48.75	64.41	11.08	20.08	126.66	35.50	65.72	5.60
16	Mean	8.83	8.14	46.62	65.68	11.13	19.72	128.88	33.53	53.38	4.02
17	CV	7.40	9.33	3.32	3.33	9.42	7.88	3.19	5.05	5.77	9.47
18	SEm (±)	0.37	0.43	0.89	1.26	0.60	0.89	2.37	0.97	1.78	0.22
19	C.D 5%	1.09	1.27	2.59	3.36	1.75	2.60	6.88	2.83	5.15	0.63

Table 3: Mean performance for fruit yield and its components in ash gourd

S. No.	Characters Genotypes	Number of fruits vine-1	Fruit yield plant ⁻¹ (kg)	100 seed weight(g)	Flesh thickness (cm)	T.S.S (oBrix)	Vitamin-C(mg/100g)	Dry weight (g)
1	Greenie	3.08	6.08	2.19	1.43	2.33	18.33	3.01
2	Dristhi	5.16	16.20	2.58	2.73	2.04	20.16	4.2
3	Aparna	3.41	9.07	4.79	2.80	2.25	21.78	5.14
4	Mahima	4.25	20.50	4.55	3.56	2	29.40	4.18
5	Co-2	3.83	12.18	4.12	2.55	2.65	23.22	3.77
6	MAH-1	3.16	15.56	3.35	2.98	2.57	20.57	2.49

7	Bangadiya Local	3	11.05	3.32	2.62	3.24	19.66	3.42
8	Berhampur Local	2.91	6.52	2.68	2.86	2.67	13.91	4.27
9	Pathapatnam Local	3.48	13.70	3.12	2.66	1.82	15.66	3.09
10	Hiramandalam Local	2.83	5.4	2.73	1.54	1.66	17.26	3.80
11	Kothavalasa Local	3.75	10.01	2.36	2.51	2.61	16.04	2.61
12	Sunabeda Local	3.58	22.36	4.03	3.24	1.93	19.12	4.15
13	Raygada Local	4.33	24.5	4.36	3.10	3.18	24.66	5.27
14	Pusa Ujjwal	5.41	31.14	4.03	3.93	2.18	26.33	4.37
15	Kasi Surbhi	4.16	23.20	4.59	3.77	2.75	25.16	3.1
16	Mean	3.76	15.16	3.52	2.82	2.39	20.75	3.79
17	CV	11.86	10.50	6.25	9.50	7.09	9.53	6.71
18	SEm (\pm)	0.25	0.92	0.12	0.15	0.09	1.14	0.14
19	C.D 5%	0.74	2.66	0.36	0.44	0.28	3.31	0.42

Vitamin C (mg/100 g)

Vitamin C ranged from 13.91 (Bherampur Local) to 29.40 (Mahima) with an overall mean of 20.75. Maximum vitamin-c was recorded in Mahima (29.40) followed by Pusa Ujjwal (26.33) & Kasi Surbhi (25.16). Minimum vitamin-C were recorded in Bherampur Local (13.91) followed by Pathapatnam Local (15.66).

Dry Weight (g)

Dry weight ranged from 2.49 (MAH-1) to 5.27 (Raygada Local) with an overall mean of 3.79. Maximum dry weight recorded in genotypes Raygada Local (5.27) followed by Aparna (5.14) and Pusa Ujjwal (4.37). Minimum were recorded in MAH- 1 (2.49) followed by Kothavalasa Local (2.61).

A wide range of variation was recorded for, Number of node bearing 1st pistillate flower, Days to 1st staminate flower appearance, Days to 1st pistillate flower appearance, Vine length, Fruit length, Average fruit weight and Fruit yield which indicated that there is better scope for selection for the improvement of these characters. These findings are in close proximity with the results of Ram *et al.* (2007) who reported variability for flowering, fruit size, number of nodes on main vine, fruit weight and fruit yield plant⁻¹. Similar finding were also reported in bottle gourd by, Mathew *et al.* (2000), Sharma *et al.* (2010), and Narayan, (2013). The estimates of mean value revealed that no single genotype was superior for all the characters. Pusa Ujjwal, Raygada Local, Kasi Surbhi has the highest fruit yield and superior to all other characters.

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