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Studies on Mean Performance for Yield and its Contributing Traits of Sponge Gourd [*Luffa cylindrica* (Roem) L.]

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The experiment trial were conducted in two years with aims to determine average mean performance of sponge gourd involving 14 parental lines and their 40 F_1 hybrids with three replications in RBD. Analysis of variances for line × tester mating design revealed that variance due to treatments, parents and crosses were highly significant for all the traits in both the years, variances due to parents *vs.* crosses were highly significant for all the characters except for vine length and fruit circumference in both the years and variances due to line *vs.* testers were highly significant for all the traits except for fruit circumference and average fruit weight in both the years along with some of the component traits in Y_1 and Y_2. Partitioning of variances into lines revealed highly significant differences for all the traits and variances due to testers were also highly significant for all the traits in both the years. The highest mean performance for fruit yield per plant (kg) along with some of the component traits was exhibited by parents NDSG-21 (3.39 and 3.51), NDSG-12 (3.36 and 3.24), NDSG-1 (3.28 and 3.13), Pusa Chikni (3.24 and 3.18) and NDSG-15 (3.04 and 2.99) in both the years and some others genotypes given better performance in respects to fruit yield and other contributing traits. Highest yielding hybrids was NDSG-55 × NDSG-11 (3.95 and 4.23 kg) followed by NDSG-63 × Pusa Chikni (3.95 and 4.35 kg) and NDSG-24 × Pusa Chikni (3.89 and 4.12 kg) in Y_1 and Y_2,respectively, while some other parents and also hybrids given better performance in respects to fruit yield and other contributing traits. The above mentioned genotypes may be used as donor parents in hybridization programme for developing high yielding varieties of respective groups.

Introduction

Sponge gourd (*Luffa cylindrica* MJ. Roem (L.) syn. *L. aegyptica* Mill.) Is one of the most important cucurbit vegetable, which is grown rainy and summer season throughout the country and world? Its origin place is subtropical Asian region particularly India and it is domesticated species (Kaloo, 1993). It belongs to the family Cucurbitaceae with diploid chromosome number 2n = 2x = 26. In India, a number of major and minor cucurbits are cultivated which share about 5.6 per cent of the total vegetable production. The main goal of research on cucurbitaceous vegetables in India is to improve productivity on sustainable basis through developing biotic and abiotic resistant variety/hybrid coupled with quality attributes. The yield potential of cucurbits could be increased by adopting the

standardized agro-techniques and plant protection measures. India being the second largest producer of vegetables in the world next only to China, shares about 15 per cent of the world output of vegetables from about 3 per cent of total cropped area in the country. The current production level is over 110 million tonnes from an area of 7.2 million hectares. The nutritive value of sponge gourd fruits per 100 g edible portion (tough skin removed, edible portion 80%) is: water 93.2 g, energy 18 kcal, protein 1.2 g, fat 0.2 g, carbohydrate 2.9 g, fibre 2.0 g, Ca 36 mg, P 19 mg, Fe 1.1 mg, carotene 120 µg, thiamine 0.02 mg, riboflavin 0.06 mg, niacin 0.4 mg and the composition of young leaves per 100 g edible portion is: water 89 g, protein 5.1 g, carbohydrate 4.0 g, fibre 1.5 g, Ca 56 mg, Fe 11.5 mg, carotene 9.2 mg, ascorbic acid 95 mg (Holland *et al.*, 1991). In spite of such a large production, the per capita per day supply of vegetables could not rise above 175 g in the country which is lower than the recommended dietary allowance (RDA) of 350 to 400 g per capita per day for a balanced diet (Rai and Pandey, 2007). The vegetable requirement of our country is estimated to be 220 million tonnes by 2020 (Singh, 2004). This target can best be achieved through use of improved varieties and hybrids technology in combination with superior crop management skills. It is a monoecious and highly cross pollinated crop in which a large amount of variations are observed for most of the economically important traits. Variability found in shape, size and colour of fruits is most conspicuous. The tender fruits are rich in vitamin A, vitamin C and iron (Yawalkar, 2004) (Fig. 1).

In India little attention has been given for the genetic improvement of sponge gourd by collecting diverse germplasm, their morphological characterization and assessing the variability parameters. Although, the information on above aspects in sponge gourd is available, the literature pertaining to such aspects is relevant to the materials and environments used and can't be generalized. Therefore, further studies aimed at generating and comparing information on above aspects in sponge gourd are warranted to facilitate the development of high yielding hybrid cultivars as well as varieties.

Materials and Methods

In the present investigation 54 genotypes (10 lines, 4 testers and 40 F_1's) were evaluated in Randomized Block Design with three replications at the Main Experiment Station of the Department of Vegetable Science, Narendra Dev University of Agriculture and Technology, Faizabad (U.P.) India, under two *Zaid* seasons during 2014 (Y_1) and 2015 (Y_2). The treatments were sown in rows spaced 2.50 meters apart with a plant to plant spacing of 0.50 meter. All the recommended agronomic package of practices, protection measures and recommended dose of manures and fertilizers were applied to raise a good crop. Observations were recorded on all the six plants maintained carefully in each plot for fourteen quantitative characters *viz*., node number to anthesis of first staminate flower, node number to anthesis of first pistillate flower, days to anthesis of first staminate flower, days to anthesis of first pistillate flower, node number of first fruit harvest, days to first fruit harvest, number of primary branches per plant, inter nodal length (cm), vine length (m), fruit length (cm), fruit circumference (cm), average fruit weight (g), number of fruits per plant and average fruits yield per plant (kg). Analysis of variance was carried out as suggested by Panse and Sukhatme (1967).

Results and Discussion

Analysis of variances for line × tester mating design revealed that variance due to

treatments, parents and crosses were highly significant for all the traits in both the years, variances due to parents *vs.* crosses were highly significant for all the characters except for vine length and fruit circumference in both the years and variances due to line *vs.* testers were highly significant for all the traits except for fruit circumference and average fruit weight in both the years along with some of the component traits in Y_1 and Y_2.

Fig.1 Fruit shape of sponge gourd (parents and crosses)

Fig. I

Fig. IV

Fig. II

Fig. V

Fig. III

Fig. VI

Table.1 Analysis of variance for 14 characters of line × tester set of crosses and their parents in sponge gourd (Y_1=2014 and Y_2=2015)

Sources of variation	Years	*df*	Node no.to anthesis of first staminate flower	Node no.to anthesis of first pistillate flower	Days to anthesis of first staminate flower	Days to anthesis of first pistillate flower	Node no. of first fruit harvest	Days to first fruit harvest	No. of primary branches per plant
Replications	Y_1	2	0.071	0.391	0.144	2.100	0.667	7.473	0.085
	Y_2	2	0.098	0.563	3.376	1.381	0.347	8.749	0.159
Treatments	Y_1	53	12.090**	18.168**	85.673**	74.999**	18.379**	66.324**	3.916**
	Y_2	53	15.392**	18.064**	84.872**	70.830**	16.549**	66.368**	4.513**
Parents	Y_1	13	33.878**	42.517**	197.508**	136.871**	37.834**	84.191**	7.223**
	Y_2	13	46.532**	39.818**	185.022**	105.603**	32.339**	84.027**	9.091**
Parents (Line)	Y_1	9	38.097**	30.224**	171.692**	145.092**	23.855**	92.169**	8.538**
	Y_2	9	50.992**	20.829**	166.769**	91.122**	19.438**	70.653**	9.681**
Parents (Testers)	Y_1	3	20.758**	93.538**	339.645**	157.816**	91.236**	65.762**	3.645**
	Y_2	3	41.151**	107.294**	290.649**	149.978**	81.660**	112.620**	4.508**
Lines *vs* Testers	Y_1	1	35.264**	0.094	3.438	0.052	3.438**	67.680**	6.120**
	Y_2	1	22.541**	8.288**	32.425**	102.811**	0.486	118.614**	17.527**
Parents *vs* Crosses	Y_1	1	149.504**	198.483**	539.444**	327.576**	213.811**	251.287**	0.044
	Y_2	1	164.577**	249.438**	450.061**	332.401**	263.797**	292.015**	2.121**
Crosses	Y_1	39	1.304**	5.429**	36.759**	47.899**	6.882**	55.626**	2.913**
	Y_2	39	1.187**	4.879**	42.124**	52.532**	4.946**	54.695**	3.049**
Error	Y_1	106	0.131	0.321	3.728	4.021	0.319	7.322	0.152
	Y_2	106	0.121	0.312	3.52	4.161	0.317	7.084	0.184

*, ** Significant at 5% and 1% probability levels, respectively.

Table.1 Cont....

Sources of variation	Years	*df*	Inter nodal length (cm)	Vine length (m)	Fruit length (cm)	Fruit circumference (cm)	Average fruit weight (g)	No. of fruits per plant	Average fruits yield per plant (kg)
Replications	Y_1	2	0.406	0.019	0.565	0.338	132.476	6.651	0.055
	Y_2	2	0.001	0.068	0.082	0.364	23.152	2.112	0.017
Treatments	Y_1	53	5.785**	3.777**	47.285**	1.156**	1361.004**	93.070**	0.960**
	Y_2	53	5.590**	3.269**	43.558**	1.475**	1131.408**	93.096**	1.163**
Parents	Y_1	13	8.948**	4.432**	72.697**	1.297**	1761.850**	106.041**	1.041**
	Y_2	13	6.225**	3.733**	62.647**	1.865**	1612.218**	100.914**	1.019**
Parents (Line)	Y_1	9	9.179**	5.720**	84.128**	1.462**	2249.789**	145.799**	1.114**
	Y_2	9	5.294**	4.928**	77.457**	2.200**	1865.727**	138.422**	1.179**
Parents (Testers)	Y_1	3	10.820**	1.150**	53.310**	1.216**	866.074**	7.738*	0.504**
	Y_2	3	10.236**	0.538**	27.191**	1.471**	1316.520**	2.987	0.382**
Lines *vs* Testers	Y_1	1	1.259*	2.688**	27.977**	0.061	57.720	43.136**	2.004**
	Y_2	1	2.577**	2.561**	35.729**	0.032	217.728	57.128**	1.481**
Parents *vs* Crosses	Y_1	1	19.311**	0.001	0.002	0.722	748.321**	245.344**	7.603**
	Y_2	1	28.473**	0.132	38.217**	0.012	1241.996**	354.175**	7.776**
Crosses	Y_1	39	4.384**	3.656**	40.027**	1.120**	1243.099**	84.841**	0.763**
	Y_2	39	4.791**	3.195**	37.332**	1.383**	968.303**	83.796**	1.042**
Error	Y_1	106	0.197	0.063	2.238	0.296	60.431	2.599	0.046
	Y_2	106	0.189	0.063	2.263	0.306	57.288	2.426	0.039

*, ** Significant at 5% and 1% probability levels, respectively.

Table.2 Mean performance, general mean, range, coefficient of variation, critical difference and standard error for 14 characters of line × tester set of 40 F_1's and their 14 parents of sponge gourd (Y_1=2014 and Y_2=2015)

S. No	Genotypes	Node no. to anthesis of first staminate flower		Node no.to anthesis of first pistillate flower		Days to anthesis of first staminate flower		Days to anthesis of first pistillate flower		Node no. of first fruit harvest		Days to first fruit harvest		No. of primary branches per plant	
		Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2
1	NDSG-1 X NDSG-11	4.67	4.30	6.17	6.73	28.17	30.20	32.10	30.33	7.17	7.23	46.27	48.87	6.20	6.47
2	NDSG-1 X NDSG-12	3.90	4.10	7.13	7.03	32.13	33.17	38.20	38.23	7.60	7.27	50.60	48.53	4.20	4.27
3	NDSG-1 X NDSG-15	6.03	5.53	8.23	8.03	35.37	36.23	42.17	40.00	9.07	8.37	52.13	50.27	5.47	5.67
4	NDSG-1 X Pusa Chikni	5.33	5.77	7.33	7.50	30.17	31.43	33.37	35.23	8.20	8.47	51.23	51.53	6.10	6.33
5	NDSG-2 X NDSG-11	5.80	5.47	8.43	8.57	34.33	32.30	34.53	31.87	8.50	8.80	46.10	44.80	6.87	7.00
6	NDSG-2 X NDSG-12	4.30	4.20	7.07	7.43	32.17	31.90	40.30	41.33	8.10	7.50	50.13	52.13	4.57	4.87
7	NDSG-2 X NDSG-15	5.47	5.27	8.50	8.27	35.40	36.67	37.07	36.30	10.03	10.27	47.50	46.40	5.13	5.23
8	NDSG-2 X Pusa Chikni	4.63	4.53	11.07	10.13	32.30	34.13	38.53	37.27	11.97	10.63	50.17	51.27	6.60	6.50
9	NDSG-4 X NDSG-11	4.07	4.07	6.73	6.47	23.20	22.73	28.23	30.23	6.77	7.20	40.53	38.50	7.07	7.10
10	NDSG-4 X NDSG-12	4.13	4.30	5.97	5.07	29.20	30.20	32.23	30.17	6.13	8.27	45.67	47.37	5.03	5.17
11	NDSG-4 X NDSG-15	4.70	4.63	7.23	7.13	28.43	30.47	35.50	36.27	9.03	7.13	45.37	44.83	6.13	6.10
12	NDSG-4 X Pusa Chikni	4.03	4.23	7.17	7.10	24.07	25.37	30.20	31.67	8.27	8.00	55.23	54.63	7.13	7.20
13	NDSG-6 X NDSG-11	4.57	5.23	7.17	7.50	28.60	27.47	30.27	28.53	7.27	7.53	41.27	39.30	8.17	8.10
14	NDSG-6 X NDSG-12	4.50	5.10	6.17	6.27	31.30	30.50	31.53	32.13	7.00	6.30	47.13	46.20	6.10	6.27
15	NDSG-6 X NDSG-15	5.13	5.40	7.07	6.07	32.33	33.47	36.00	37.57	7.03	7.40	42.40	41.43	6.47	6.40
16	NDSG-6 X Pusa Chikni	4.57	4.47	7.33	7.43	27.27	26.07	33.00	32.20	8.47	8.20	43.43	44.50	7.33	7.20
17	NDSG-10 X NDSG-11	3.97	4.10	6.13	6.10	23.17	23.13	25.47	27.40	7.00	6.77	38.23	41.27	6.07	6.27
18	NDSG-10 X NDSG-12	3.03	3.07	6.10	6.27	28.40	27.77	34.23	36.17	7.03	6.87	40.10	42.33	5.10	4.83
19	NDSG-10 X NDSG-15	3.13	3.33	7.00	8.00	30.10	32.00	31.00	30.20	8.03	8.30	40.33	42.20	5.93	5.80
20	NDSG-10 X Pusa Chikni	3.53	3.73	6.13	6.43	29.50	28.27	32.40	34.07	6.13	6.43	44.33	46.10	7.23	7.30
21	NDSG-18 X NDSG-11	3.87	3.53	6.10	6.37	21.17	21.67	25.80	23.87	6.13	7.13	38.17	40.63	7.50	7.87
22	NDSG-18 X NDSG-12	3.87	4.23	6.43	6.23	25.17	27.57	38.37	41.43	6.43	7.10	43.33	45.43	6.03	6.27
23	NDSG-18 X NDSG-15	4.13	4.03	8.03	8.23	25.73	27.27	31.50	32.30	8.70	8.37	43.33	45.47	7.13	7.53
24	NDSG-18 X Pusa Chikni	4.00	4.33	7.23	7.20	26.37	27.23	35.23	34.37	7.30	7.70	45.57	47.47	8.43	8.60
25	NDSG-21 X NDSG-11	4.20	3.90	7.67	7.40	28.43	25.43	30.57	28.23	8.13	8.23	40.00	42.07	6.07	6.50
26	NDSG-21 X NDSG-12	4.50	4.67	12.20	11.63	30.07	32.23	38.17	36.43	13.30	12.40	50.33	50.33	4.87	4.60
27	NDSG-21 X NDSG-15	5.13	5.33	8.03	8.27	30.30	31.13	33.20	31.40	9.13	8.50	44.83	43.17	5.33	5.50
28	NDSG-21 X Pusa Chikni	4.43	4.37	8.27	8.07	34.43	35.03	35.40	35.50	8.57	8.40	49.97	51.23	6.17	6.30
29	NDSG-24 X NDSG-11	4.10	3.80	7.03	7.17	26.37	24.50	26.23	25.50	9.13	7.23	41.23	40.33	7.10	7.07
30	NDSG-24 X NDSG-12	4.70	4.40	8.10	9.13	34.43	34.43	37.67	38.47	10.07	10.47	49.93	50.37	6.17	6.27

S. No	Genotypes	Node no. to anthesis of first staminate flower		Node no.to anthesis of first pistillate flower		Days to anthesis of first staminate flower		Days to anthesis of first pistillate flower		Node no. of first fruit harvest		Days to first fruit harvest		No. of primary branches per plant	
		Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2
31	NDSG-24 X NDSG-15	4.80	4.63	7.33	7.47	31.47	32.23	32.33	33.63	8.03	7.53	44.27	45.60	7.17	7.27
32	NDSG-24 X Pusa Chikni	4.00	4.23	8.00	8.23	31.37	31.27	36.30	37.13	9.20	8.93	50.37	50.27	7.27	7.70
33	NDSG-55 X NDSG-11	4.03	4.27	7.07	7.13	27.07	25.03	28.23	30.63	7.27	7.37	38.33	37.50	7.37	7.37
34	NDSG-55 X NDSG-12	5.07	4.83	10.03	9.20	30.10	31.10	37.97	37.37	10.13	9.33	47.23	46.40	5.13	5.20
35	NDSG-55 X NDSG-15	4.83	4.77	7.87	8.00	31.77	31.57	33.60	34.43	7.93	8.30	42.20	41.47	6.27	6.43
36	NDSG-55 X Pusa Chikni	4.07	4.03	7.07	7.07	30.27	30.17	36.00	37.10	8.23	8.13	48.10	50.00	6.47	6.70
37	NDSG-63 X NDSG-11	4.57	4.53	8.03	8.23	25.53	26.33	27.20	27.60	8.40	8.30	41.30	40.13	5.07	5.43
38	NDSG-63 X NDSG-12	5.53	5.47	8.10	8.40	32.23	33.70	33.67	34.47	9.17	8.90	48.47	47.40	5.87	5.97
39	NDSG-63 X NDSG-15	4.13	4.10	8.97	9.13	33.53	32.00	35.37	36.47	9.57	9.37	43.60	42.17	6.57	6.37
40	NDSG-63 X Pusa Chikni	5.13	5.03	9.93	10.07	30.13	29.07	33.17	34.80	10.27	10.70	47.97	47.27	7.50	7.70
41	NDSG-1	6.67	5.60	8.33	10.20	36.47	37.63	41.70	39.30	10.07	9.03	51.70	52.93	4.07	5.13
42	NDSG-2	10.40	11.40	13.23	14.33	43.53	44.53	48.43	46.53	13.43	14.77	58.60	55.43	4.57	4.13
43	NDSG-4	4.60	3.57	7.13	8.90	27.60	29.57	33.27	31.13	9.33	8.03	43.93	46.83	6.17	5.70
44	NDSG-6	12.27	14.13	10.30	12.33	38.10	40.50	43.10	41.63	10.40	12.60	52.20	53.57	6.90	8.40
45	NDSG-10	3.00	2.67	7.77	6.63	26.93	25.40	28.40	30.73	8.07	9.10	41.47	42.73	5.50	6.07
46	NDSG-18	4.63	3.93	8.47	9.20	21.23	23.27	27.27	29.10	9.30	10.03	40.80	41.47	9.07	8.07
47	NDSG-21	7.17	9.13	17.33	15.43	45.77	43.43	41.83	37.47	17.63	15.93	48.40	46.37	4.07	3.73
48	NDSG-24	5.13	5.17	10.53	10.57	34.63	36.40	36.40	37.27	12.17	11.00	48.43	48.37	7.80	9.17
49	NDSG-55	5.10	4.60	7.50	9.30	33.47	32.20	36.67	34.57	9.03	10.37	44.73	45.97	5.00	6.47
50	NDSG-63	13.40	12.27	11.37	10.77	31.10	28.77	30.73	32.13	12.07	11.27	44.30	43.13	7.17	5.83
51	NDSG-11	4.27	3.83	7.30	8.17	22.53	20.70	26.63	29.53	8.00	8.07	43.60	42.50	7.13	8.13
52	NDSG-12	3.30	3.43	6.70	5.47	34.27	33.10	41.23	45.60	7.20	8.00	54.57	56.50	5.47	6.20
53	NDSG-15	9.10	11.17	18.43	18.60	47.50	44.63	42.70	43.17	18.77	18.77	51.33	53.00	6.77	7.37
54	Pusa Chikni ©	4.17	4.07	7.93	6.90	28.70	30.47	36.87	39.50	8.10	9.07	51.57	53.60	8.13	9.10
	Mean	**5.03**	**5.08**	**8.30**	**8.39**	**30.62**	**30.80**	**34.40**	**34.55**	**9.03**	**8.99**	**46.15**	**46.47**	**6.30**	**6.49**
Range	**Lowest**	3.00	2.67	5.97	5.07	21.17	20.70	25.47	23.87	6.13	6.30	38.17	37.50	4.07	3.73
	Highest	13.40	14.13	18.43	18.60	47.50	44.63	48.43	46.53	18.77	18.77	58.60	56.50	9.07	9.17
	C.V.	7.21	6.85	6.84	6.66	6.31	6.10	5.83	5.90	6.26	6.27	5.86	5.73	6.19	6.62
	S.E.	0.21	0.20	0.33	0.32	1.11	1.08	1.16	1.18	0.33	0.33	1.56	1.54	0.23	0.25
	C.D. 5%	0.59	0.56	0.92	0.90	3.13	3.04	3.25	3.30	0.92	0.91	4.38	4.31	0.63	0.70
	C.D. 1%	0.78	0.75	1.21	1.20	4.14	4.02	4.30	4.37	1.21	1.21	5.80	5.70	0.84	0.92

Table.2 Cont……..

S. No	Genotypes	Inter nodal length (cm)		Vine length (m)		Fruit length (cm)		Fruit circumference (cm)		Average fruit weight (g)		No. of fruits per plant		Average fruits yield per plant (kg)	
		Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2
1	NDSG-1 X NDSG-11	6.27	6.47	2.53	2.30	27.57	28.23	8.17	8.10	145.40	153.30	30.63	26.30	3.70	3.59
2	NDSG-1 X NDSG-12	6.00	6.20	3.03	3.10	25.23	26.23	9.57	9.63	161.57	160.23	23.23	21.27	3.26	2.91
3	NDSG-1 X NDSG-15	6.60	6.83	2.20	2.40	21.20	22.33	8.37	8.27	150.10	162.43	28.43	26.20	3.54	3.79
4	NDSG-1 X Pusa Chikni	4.63	4.60	2.93	3.10	23.17	22.30	8.17	8.33	155.37	144.90	27.20	28.27	3.69	3.67
5	NDSG-2 X NDSG-11	6.73	6.50	2.60	2.63	31.23	32.17	8.07	8.13	131.23	135.47	25.63	24.43	3.09	2.96
6	NDSG-2 X NDSG-12	5.77	5.90	3.20	3.03	28.83	29.40	9.63	9.33	135.40	138.33	27.53	26.10	3.27	3.20
7	NDSG-2 X NDSG-15	8.37	8.67	2.43	2.43	24.17	25.03	8.33	8.37	140.37	148.30	22.27	22.13	2.61	2.81
8	NDSG-2 X Pusa Chikni	4.13	4.37	3.93	3.33	22.20	23.37	8.37	8.23	145.10	145.10	17.27	16.47	2.17	2.08
9	NDSG-4 X NDSG-11	5.87	5.93	2.37	2.43	30.30	30.50	8.53	8.33	148.20	150.83	18.47	20.27	2.46	2.51
10	NDSG-4 X NDSG-12	5.83	5.77	5.67	5.50	26.93	28.53	9.43	9.37	157.83	145.33	21.53	22.03	2.86	2.69
11	NDSG-4 X NDSG-15	8.63	8.70	2.17	2.17	25.37	26.27	8.60	8.47	165.60	155.40	20.33	22.23	2.90	3.23
12	NDSG-4 X Pusa Chikni	4.87	4.93	4.43	4.40	28.73	27.20	7.90	7.60	186.40	170.27	19.17	17.47	3.08	2.79
13	NDSG-6 X NDSG-11	6.90	6.77	2.90	2.93	32.50	33.00	9.13	9.17	150.40	145.20	25.37	26.43	3.31	3.39
14	NDSG-6 X NDSG-12	6.17	6.43	3.43	3.50	25.07	26.40	9.53	9.67	140.17	138.33	27.27	27.47	3.28	3.17
15	NDSG-6 X NDSG-15	8.70	8.80	3.07	3.40	27.37	23.70	9.83	9.67	150.50	150.57	24.40	25.30	3.23	3.36
16	NDSG-6 X Pusa Chikni	6.30	6.63	3.30	3.17	25.23	26.30	9.23	9.17	174.70	190.10	20.27	18.20	3.04	2.92
17	NDSG-10 X NDSG-11	8.97	9.17	2.27	2.40	23.60	23.20	8.17	8.33	154.43	151.57	17.40	15.27	2.25	2.12
18	NDSG-10 X NDSG-12	7.50	7.87	3.60	3.47	19.27	20.27	9.73	9.93	180.57	165.60	17.27	20.27	3.03	2.87
19	NDSG-10 X NDSG-15	8.73	8.93	2.23	2.30	17.67	18.23	8.50	8.43	200.83	187.47	16.17	18.17	2.83	2.87
20	NDSG-10 X Pusa Chikni	7.60	7.87	3.47	3.33	19.47	19.13	8.40	8.37	160.30	155.27	17.27	19.20	2.44	2.66
21	NDSG-18 X NDSG-11	6.40	4.87	2.50	2.57	23.33	24.10	9.30	9.63	125.07	120.63	37.63	38.60	3.87	4.01
22	NDSG-18 X NDSG-12	7.57	7.63	3.00	3.30	22.13	21.20	9.80	10.07	99.70	105.40	33.37	31.37	2.89	2.79
23	NDSG-18 X NDSG-15	8.23	8.37	2.50	2.70	20.13	21.43	9.07	9.07	115.53	125.17	32.77	31.03	3.06	3.45
24	NDSG-18 X Pusa Chikni	7.10	7.30	5.30	4.97	23.30	24.20	8.57	8.20	118.33	130.57	34.43	37.50	3.79	4.06
25	NDSG-21 X NDSG-11	7.23	7.57	2.40	2.40	22.50	23.53	8.27	8.13	148.20	155.30	27.73	25.40	3.66	3.46
26	NDSG-21 X NDSG-12	7.60	7.47	3.63	3.47	21.03	23.17	9.27	9.37	135.73	141.97	27.27	24.97	3.16	3.12
27	NDSG-21 X NDSG-15	8.50	8.53	2.57	2.43	21.40	21.73	8.07	8.10	150.53	161.30	25.37	23.13	3.28	3.34
28	NDSG-21 X Pusa Chikni	7.23	7.47	3.90	4.00	24.53	25.03	7.93	7.50	155.07	151.37	27.13	29.17	3.79	3.89
29	NDSG-24 X NDSG-11	7.23	7.20	3.07	3.23	22.13	23.30	8.63	8.63	115.43	130.53	26.10	23.33	2.67	2.48
30	NDSG-24 X NDSG-12	7.80	7.67	4.57	4.40	19.17	20.50	9.17	9.27	150.37	150.23	23.57	24.33	3.06	2.90
31	NDSG-24 X NDSG-15	8.30	8.43	5.33	5.03	18.43	19.43	8.37	8.27	130.27	121.57	22.23	24.20	2.56	2.45
32	NDSG-24 X Pusa Chikni	7.50	7.60	6.13	5.93	19.17	20.43	8.53	8.33	163.23	170.50	26.30	25.33	3.89	4.12
33	NDSG-55 X NDSG-11	7.03	7.07	2.43	2.53	22.67	23.27	8.10	8.27	165.57	152.87	33.67	31.30	3.95	4.23
34	NDSG-55 X NDSG-12	7.67	7.40	3.53	3.67	20.20	20.33	9.67	9.83	138.23	131.20	29.70	32.27	3.67	3.53
35	NDSG-55 X NDSG-15	8.40	8.70	2.37	2.43	20.43	21.43	8.03	8.00	162.83	150.23	26.33	28.23	3.76	3.59
36	NDSG-55 X Pusa Chikni	7.50	7.47	3.00	3.00	20.57	21.73	8.47	8.43	125.37	138.07	33.40	32.23	3.68	3.83
37	NDSG-63 X NDSG-11	6.13	6.33	6.37	6.43	27.47	28.07	9.27	9.37	123.50	110.40	24.73	26.33	2.39	2.49
38	NDSG-63 X NDSG-12	5.87	5.97	3.30	3.33	26.37	27.07	9.60	9.47	138.10	135.63	24.33	23.23	2.92	2.65
39	NDSG-63 X NDSG-15	8.77	8.63	3.00	3.20	25.37	24.37	9.20	8.77	132.03	130.23	24.23	23.23	2.76	2.47
40	NDSG-63 X Pusa Chikni	5.83	5.93	3.03	3.20	24.50	23.53	9.03	9.10	153.33	160.23	28.17	30.20	3.95	4.35
41	NDSG-1	4.50	4.73	2.10	1.93	26.40	28.13	7.87	8.17	138.43	131.27	26.53	30.33	3.28	3.13
42	NDSG-2	3.57	4.10	4.33	4.03	30.07	31.00	8.10	7.87	126.20	118.30	21.23	19.33	2.36	2.52
43	NDSG-4	4.63	4.97	3.13	2.97	28.90	19.57	8.60	7.83	163.57	153.60	11.77	10.33	1.70	1.48
44	NDSG-6	6.43	6.23	3.00	3.30	31.23	29.30	9.83	8.33	153.50	160.23	22.47	21.33	2.84	2.95

45	NDSG-10	9.00	8.53	2.07	2.27	15.87	17.37	8.30	8.63	190.23	174.53	9.97	10.37	1.45	1.61
46	NDSG-18	7.33	6.60	5.33	5.10	22.07	24.27	9.20	8.80	95.53	100.60	31.23	29.20	2.60	2.67
47	NDSG-21	7.77	6.30	2.40	2.23	22.50	20.47	8.23	9.50	155.53	170.20	25.07	23.20	3.39	3.51
48	NDSG-24	7.73	7.17	6.17	5.93	18.80	20.10	8.40	9.27	150.60	139.37	18.37	20.13	2.47	2.61
49	NDSG-55	7.30	6.50	3.67	3.43	19.23	18.63	8.03	8.30	110.33	115.30	29.57	26.07	2.77	2.67
50	NDSG-63	5.57	4.97	2.90	3.10	27.50	28.33	9.67	10.60	129.83	125.87	23.20	20.80	2.53	2.36
51	NDSG-11	5.57	6.20	2.10	2.37	23.77	22.23	8.33	7.80	119.70	115.07	23.53	24.63	2.44	2.46
52	NDSG-12	5.60	5.77	3.50	3.33	20.77	20.73	9.57	9.40	144.80	150.47	26.17	24.33	3.36	3.24
53	NDSG-15	8.67	9.23	3.30	3.10	17.70	18.27	8.13	8.83	154.83	145.47	22.40	23.37	3.04	2.99
S. No	**Genotypes**	**Inter nodal length (cm)**	**Vine length (m)**	**Fruit length (cm)**	**Fruit circumference (cm)**	**Average fruit weight (g)**	**No. of fruits per plant**	**Average fruits yield per plant (kg)**	**S. No**	**Genotypes**	**Inter nodal length (cm)**	**Vine length (m)**	**Fruit length (cm)**	**Fruit circumference (cm)**	**Average fruit weight (g)**
54	Pusa Chikni ©	4.17	5.03	2.90	2.73	27.57	25.47	8.80	9.13	156.55	164.87	24.63	22.43	3.24	3.18
	Mean	**6.86**	**6.88**	**3.34**	**3.32**	**23.75**	**23.95**	**8.76**	**8.76**	**145.75**	**145.05**	**24.66**	**24.35**	**3.04**	**3.04**
Range	**Lowest**	3.57	4.10	2.07	1.93	15.87	17.37	7.87	7.50	95.53	100.60	9.97	10.33	1.45	1.48
	Highest	9.00	9.23	6.37	6.43	32.50	33.00	9.83	10.60	200.83	190.10	37.63	38.60	3.95	4.35
	C.V.	6.47	6.32	7.49	7.54	6.30	6.28	6.21	6.32	5.33	5.22	6.54	6.40	7.06	6.52
	S.E.	0.26	0.25	0.14	0.14	0.86	0.87	0.31	0.32	4.49	4.37	0.93	0.90	0.12	0.11
	C.D. 5%	0.72	0.70	0.41	0.41	2.42	2.44	0.88	0.90	12.58	12.25	2.61	2.52	0.35	0.32
	C.D. 1%	0.95	0.93	0.54	0.54	3.20	3.22	1.17	1.19	16.65	16.21	3.45	3.34	0.46	0.42

Table.3 Range of variation in mean values and grand means of various traits in sponge gourd (Y_1=2014 and Y_2=2015)

S. No.	Characters	Range of mean values				Mean over				Grand mean	
		Parents		Crosses		Parents		Crosses			
		Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2
1	Node no.to anthesis of first staminate flower	3.00 to 13.40	2.67 to 14.13	3.03 to 6.03	3.07 to 5.77	6.66	6.78	4.47	4.48	5.03	5.08
2.	Node no.to anthesis of first pistillate flower	6.70 to 18.43	5.47 to 18.60	5.97 to 12.20	5.07 to 11.63	10.17	10.49	7.64	7.65	8.30	8.39
3.	Days to anthesis of first staminate flower	21.23 to 47.50	20.70 to 44.63	21.17 to 35.40	21.67 to 36.67	33.70	33.61	29.54	29.81	30.62	30.80
4.	Days to anthesis of first pistillate flower	26.63 to 43.10	29.10 to 46.53	25.47 to 42.17	23.87 to 46.53	36.80	36.98	33.56	34.55	34.40	34.55
5.	Node no. of first fruit harvest	7.20 to 18.77	8.00 to 18.77	6.13 to 13.30	6.30 to 12.40	10.97	11.15	8.35	8.23	9.03	8.99
6.	Days to first fruit harvest	40.80 to 54.57	41.47 to 56.50	38.17 to 55.23	37.50 to 54.63	48.26	48.74	45.42	45.68	46.15	46.47
7.	No.of primary branches per plant	4.07 to 9.07	3.73 to 9.17	4.20 to 8.43	4.27 to 8.60	6.27	6.68	6.31	6.42	6.30	6.49
8.	Inter nodal length (cm)	3.57 to 9.00	4.10 to 9.23	4.13 to 8.97	4.37 to 9.17	6.27	6.17	7.06	7.12	6.86	6.88
9.	Vine length (m)	2.07 to 6.17	1.93 to 5.93	2.17 to 6.37	2.17 to 6.43	3.35	3.27	3.34	3.34	3.34	3.32
10.	Fruit length (cm)	15.87 to 31.23	17.37 to 31.00	17.67 to 32.50	18.23 to 33.00	23.74	23.13	23.75	24.24	23.75	23.95
11.	Fruit circumference (cm)	7.87 to 9.83	7.80 to 10.60	7.90 to 9.83	7.50 to 10.07	8.65	8.75	8.80	8.77	8.76	8.76
12.	Average fruit weight (g)	95.53to190.23	100.60 to174.53	99.70 to 200.83	105.40 to190.10	142.12	140.37	147.02	146.69	145.75	145.05
13.	No. of fruits per plant	9.97 to 31.23	10.33 to 30.33	16.17 to 37.63	15.27 to 38.60	22.58	21.85	25.39	25.22	24.66	24.35
14.	Average fruits yield per plant (kg)	1.45 to 3.39	1.48 to 3.51	2.17 to 3.95	2.08 to 4.35	2.68	2.67	3.17	3.17	3.04	3.04

Partitioning of variances into lines revealed highly significant differences for all the traits and variances due to testers were also highly significant for all the traits in both the years (Table 1). The highest average mean performance for average fruit yield per plant along with some of the component traits was exhibited by parental genotypes NDSG-21 (3.39 and 3.51 kg) followed by NDSG-12 (3.36 and 3.24 kg), NDSG-1 (3.28 and 3.13 kg), Pusa Chikni (3.24 and 3.18 kg) and NDSG-15 (3.04 and 2.99 kg) and Some other parental genotypes exhibiting very high mean performance for other characters than average fruit yield per plant (Table 2) were NDSG-18 (40.80 and 41.47 days), NDSG-10 (41.47 and 42.73 days) and NDSG-11 (43.60 and 42.50 days) in both the years for days to first fruit harvest; NDSG-18 (31.23 and 29.20), NDSG-55 (29.57 and 26.07) and NDSG-1 (26.53 and 30.33) for number of fruits per plant, NDSG-6 (31.23 and 29.30), NDSG-2 (30.07 and 31.00) and Pusa Chikni (27.57 and 25.47) in both the years for fruit length and NDSG-10 (190.23 and 174.53), NDSG-4 (163.57 and 153.60) and Pusa Chikni (156.55 and 164.87) in both the years for average fruit weight.

Same result observed by Sabina *et al.,* (2008), Sanandia *et al.,* (2014), Tamil selvi *et al.,* (2015). Some hybrids given desirable mean performance for average fruit yield per plant along with some of the component traits was exhibited by NDSG-55 × NDSG-11 (3.95 and 4.23 kg) followed by NDSG-63 × Pusa Chikni (3.95 and 4.35 kg), NDSG-24 × Pusa Chikni (3.89 and 4.12 kg), NDSG-18 × Pusa Chikni (3.79 and 4.06 kg) and NDSG-18 × NDSG-11 (3.87 and 4.01 kg) in both the years.

The hybrid NDSG-18 × NDSG-11 took minimum number of days to first fruit harvest (38.17 days) followed by NDSG-10 × NDSG-11 (38.23) and NDSG-55 × NDSG-11 (37.50 days) followed by NDSG-4 × NDSG-11 (38.50) in Y_1 and $Y_{2,}$ respectively. The significantly maximum number of fruits per plant was observed in NDSG-18 × NDSG-11 (37.63 fruits) which was followed by NDSG-18 × Pusa Chikni (34.43) and NDSG-18 × NDSG-11 (38.60 fruits) which was followed by NDSG-18 × Pusa Chikni (37.50) in Y_1 and $Y_{2,}$ respectively. While, the havier fruit weight was exhibited by the NDSG-10 × NDSG-15 (200.83 g) and NDSG-4 × Pusa Chikni (186.40 g) and NDSG-6 × Pusa Chikni (190.10 g) and NDSG-10 × NDSG-15 (187.47 g) Y_1 and $Y_{2,}$ respectively.

Range of variation in mean values and grand means of various traits are given in table 3. These genotypes (parents and hybrids) merits due consideration as promising parents for hybridization programme for bringing over all improvement in plant architecture in a component breeding approach ultimately leading to high yielding sponge gourd genotypes even if they have moderate or low fruit yield.

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