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ORIGINAL ARTICLE **OPEN ACCESS**

Effect of planting time on seed production of summer type and winter type bottle gourd genotypes during summer season in eastern Uttar Pradesh

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ABSTRACT
The present investigation entitled "Effect of planting time on seed production of summer type and winter type bottle gourd genotypes during summer season in eastern Uttar Pradesh" consisting of a total twelve genotypes of bottle gourd, including six summer type and six winter type genotypes were conducted at Vegetable Research Farm at NDUA&T, Kumarganj, Faizabad . The experiment was laid out in Randomized Complete Block Design with three replications in three dates of planting viz. 7th February, 7th March and 7th April 2009.The present study visualized a cut off date of early February planting of winter type bottle gourd genotypes in eastern Uttar Pradesh for normal expression of staminate and pistillate flowers. As far as summer type bottle gourd genotypes are concerned they produce both staminate and pisttilate flowers round the no matter whenever they are planted in eastern Uttar Pradesh. Moreover, the results of the seed yield were significantly increased at the 7thFebruarycrop sown followed by 7th March and 7th April. Therefore, it is suggesting that earlier sowing produced higher seed yield of bottle gourd.
***Keywords**: Bottle gourd, Genotypes, Seed yield*

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INTRODUCTION

Bottle gourd (*Lagenaria siceraria* (Mol.) Standl; synonymously known as *L. vulgaris* Ser., *L. leucantha* Rusby) is popular cucurbitaceous crop grown for multiferous use viz., vegetable, medicinal purpose, musical instruments, utencils, measurements, fishnet floats etc. Based on morphological differences, bottle gourd cultivars and land races of African and New Word origin are recognized as *L. siceraria* ssp. *siceraria* and those of Asia and classified as *L. siceraria* ssp. *asiatica* (Kobiakova) Heiser. Bottle gourd is mainly of monoecious sex form [7] but andromonoecious sex form is also reported [8].The planting time of winter type bottle gourd in frost free areas of north India is generally from late June to mid August. The fruiting in these genotypes usually begins from mid October to early November. The fruit bearing in winter type genotypes continues during winter months and also prolongs in summer months, extending from March to May. Since winter season cultivation using land races of bottle gourd has little commercial consequence, the seed production of these genotypes is not well organized. A few fruits are allowed to mature in the vegetable crop, from where seed is harvested for planting the forthcoming winter crop of bottle gourd. The winter season crop of bottle gourd in frost free areas of north India requires longer duration of about 8 to 9 months for seed maturity. The fruits lefts to mature for seed production generally require double of the period required in summer crop. The main objectives of the investigation were suitable date of planting for seed production of summer type and winter type bottle gourd genotypes.

MATERIAL AND METHODS

The present investigation was conducted during 2009 at Main Experiment Station of Department of Vegetable Science, at Narendra Deva University of Agriculture &Technology, (Kumarganj), Faizabad (U.P.). The experiment site is situated at 26.47^0 N latitude and 82.12^0 E longitude at an altitude of 113 meters above the mean sea level. The soil of the experimental field was sandy-loam. The experimental

material consisted of a total of twelve genotypes of bottle gourd, including six summer type genotypes viz., Pusa Naveen, Narendra Jyoti, NDBG-619-6, NDBG-619-11, NDBG-601 and Andromon-6and six winter type genotypes viz., Narendra Madhuri, Narendra Shishir, Narendra Shivani, Narendra-Bow-Wonder (Rd), Narendra-Bow-Wonder (Obl) and NDBG-628with three dates of planting viz., 7th February, 7th March, and 7th April, 2009. All the three experiments were sown in Randomized Complete Block Design (RCBD) with three replications. Each genotype was planted in 3m x 3m plot size. The distance between rows and plants was kept at 3m and 50 cm, respectively. Six plants were maintained in each plot. The recommended agronomic practices were followed to raise a good crop. Observations were made on 12 economic characters *viz*., days to 50% germination, days to first staminate flower anthesis, days to first pistillate flower anthesis, node number to first staminate flower anthesis, node number to first pistillate flower anthesis, vine length (m), days to seed maturity, number of mature fruits/plot, fruit length/polar length (cm), fruit circumference (cm), seed yield per fruit (g) and seed yield per plot (g). The experimental data were compiled by taking the mean values for the twelve economic characters of the genotypes for all the three dates of planting. The analysis of variance for the design of the experiment was carried out following Panse and Sukhatme [5].

RESULTS AND DISCUSSION

Vegetative growth

The data indicate that there were significant differences among (certain) genotypes for the number of days required to 50% germination in 7th February sown crop and 7th April sown crop. There were no significant differences among the genotypes for these traits in 7th March sown crop. The general means for the 7th February sown crop (16.00 days), 7th March sown crop (9.86 days) and 7th April sown crop (6.28 days) vividly differed from each other for this trait(Table 1).Robinson and Decker-Walters [6] reported that generally, seed germination is inhibited at temperatures below 15^0C and is rapid at 25-30^0C. Similar findings of Seshadri and Parthsarathy[7] reported that soil temperature is a determining factor for quick germination and early maturity and production.

Table: 1 Mean performance of different sown crop on the vegetative characters of bottle gourd

SNo	Genotypes	Days to 50% germination			Days to first staminate flower anthesis			Days to first pistillate flower anthesis		
		7th February	7th March	7th April	7th February	7th March	7th April	7th February	7th March	7th April
Summer genotypes										
1	Pusa Naveen	15.67	10.00	5.33	61.90	49.70	42.37	61.83	52.20	43.03
2	Narendra Jyoti	17.67	10.33	5.67	67.12	53.07	41.43	65.87	53.33	43.37
3	NDBG-619-6	16.00	9.67	5.67	67.40	51.00	41.80	68.60	51.13	41.83
4	NDBG-619-11	16.00	9.33	5.33	65.43	50.17	43.17	63.17	50.43	42.67
5	NDBG-601	17.00	9.67	6.00	66.53	52.57	45.57	65.40	53.10	44.07
6	Andromon-6	16.33	10.33	6.67	68.00	54.60	46.47	74.77	55.13	48.50
Mean of summer genotypes		**16.44**	**9.88**	**5.77**	**66.06**	**51.85**	**43.46**	**66.60**	**52.55**	**43.91**
Winter genotypes										
7	Narendra Madhuri	16.00	10.00	6.33	70.23	60.67	51.50	66.83	60.83	52.57
8	Narendra Shishir	15.33	10.33	7.33	78.73	69.33	-	79.20	72.90	-
9	Narendra Shivani	15.67	9.00	6.00	67.63	64.63	-	68.67	-	-
10	Narendra-Bow-Wonder (Rd)	15.67	10.33	6.67	66.30	58.17	-	70.53	63.97	-
11	Narendra-Bow-Wonder (Obl)	16.00	10.00	7.33	67.07	60.10	-	69.53	-	-
12	NDBG-628	15.00	9.33	7.00	67.20	69.10	49.90	77.33	-	-
Mean of winter genotypes		**15.55**	**9.83**	**6.77**	**69.52**	**63.66**	**50.07**	**72.01**	**65.09**	**52.57**
General mean		**16.00**	**9.86**	**6.28**	**67.80**	**57.76**	**45.28**	**69.31**	**57.00**	**45.15**
SEm±		0.34	0.31	0.34	0.46	0.53	0.60	0.44	0.49	0.65
CD at 5%		1.01	-	1.00	1.35	1.54	1.81	1.28	1.48	1.99
CV (%)		6.63	5.49	9.37	1.32	1.58	2.31	1.21	1.50	2.48

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SNo	Genotypes	Node number to first staminate flower anthesis			Node number to first pistillate flower anthesis			Vine length (m)		
		7th February	7th March	7th April	7th February	7th March	7th April	7th February	7th March	7th April
Summer genotypes										
1	Pusa Naveen	5.83	6.83	6.87	7.57	9.10	7.97	1.51	3.76	3.47
2	Narendra Jyoti	7.57	9.63	6.13	8.97	10.57	11.77	1.84	4.28	4.37
3	NDBG-619-6	7.10	9.40	10.80	12.27	8.93	13.10	1.93	3.79	4.47
4	NDBG-619-11	6.53	7.50	12.37	7.70	9.67	12.87	1.74	3.52	4.37
5	NDBG-601	6.97	8.80	10.83	8.33	10.77	10.83	1.46	2.79	3.63
6	Andromon-6	9.63	12.76	14.47	13.03	11.53	12.43	1.73	3.56	4.87
Mean of summer genotypes		**7.27**	**9.15**	**10.24**	**9.64**	**10.09**	**11.49**	**1.70**	**3.61**	**4.19**
Winter genotypes										
7	Narendra Madhuri	10.20	11.97	14.00	9.00	13.77	15.03	1.30	3.19	4.27
8	Narendra Shishir	18.43	20.87	-	23.27	23.90	-	1.53	2.74	4.33
9	Narendra Shivani	10.40	21.57	-	16.67	-	-	2.14	4.07	5.13
10	Narendra-Bow-Wonder (Rd)	8.80	12.03	-	13.37	17.20	-	2.33	4.14	4.97
11	Narendra-Bow-Wonder (Obl)	10.67	12.73	-	13.23	-	-	1.99	3.97	5.70
12	NDBG-628	12.27	21.23	18.23	17.50	-	-	2.28	4.27	5.40
Mean of winter genotypes		**11.79**	**16.73**	**16.11**	**15.50**	**18.29**	**15.03**	**1.92**	**3.73**	**4.96**
General mean		**9.53**	**12.94**	**11.71**	**12.58**	**12.83**	**12.00**	**1.82**	**3.67**	**4.58**
SEm±		0.39	0.31	0.37	0.44	0.29	0.30	0.11	0.07	0.14
CD at 5%		1.13	0.90	1.12	1.30	0.86	0.93	0.32	0.21	0.41
CV (%)		7.01	4.09	5.53	6.11	3.87	4.34	10.50	3.41	5.25

Remarkable differential responses were recorded between summer type and winter type genotypes concerning for to the appearance of staminate and pistillate flowers in the three dates of planting. It may be noted that little differences between all the six summer type and six winter type genotypes bore staminate as well as pistillate flowers in all the three cropping periods. Appearance of staminate flowers in Narendra Madhuri and NDBG-628 in April sown crop and sporadic appearance of pistillate flowers in Narendra Madhuri, Narendra Shishir and Narendra-Bow-Wonder (Rd) in 7th March sown crop and that of Narendra Madhuri in even in 7th April sown crop indicates that responses to high -temperature effect in these winter type genotypes is not as strong as of other winter type genotypes. Such differential behavior of winter type genotypes (s) was also recorded by Kumar [2] and Singh [9]. However, it may also be noted that February sowed crop required the longest period for days to first staminate and first pistillate flower anthesis followed by March and April sown crop.

The results show node number to first staminate and pistillate flower anthesis was found significantly different from all three dates of sowing. In general staminate flower appeared at lower node numbers than pistillate flowers in both summer and winter type genotypes. However, first staminate as well as pistillate flowers were born at lower node numbers in February sown crop as compared to March sown crop. Similarly, node numbers to first staminate and first pistillate flowers were born at lower nodes in March sown crop compared with April sown crop. This data indicated that the bottle gourd crops are sown at higher temperature regime bear first flowers at higher nodes as compared to the crops sown at lower temperature regimes. Similar observations were also made by Maurya [3] and Kumar [2].To assess the growth, rate of 7th February, 7th March and 7th April sown crops vine length at individual genotypes were measured at about two months stage i.e. at 65 days stage. The general mean observed vines growth of winter genotypes was shortest (1.82 m) in 7th February followed 7th March (3.67 m) and 7th April sown crop (4.58 m).Seshadri and Parthasarathy [7] reported that for normal growth most cucurbits require optimum average monthly temperature from 25-30^{0}C. However, the present study revealed that the 7th February sown crop during its early stages till 25th March faced an average temperature below 25^{0}C resulting in slower vine growth, whereas 7th April sown crop face an average temperature ranging from 27.4 to 30.7^{0}C which resulted in faster vine growth.

Yield and yield attributes parameters

Results of this experiment showed that yield and yield attribute traits were affected by different sowing dates. The general mean over genotypes for days to seed maturity in 7th February sown crop was highest (145.58 days) followed by 7th March sown crop (125.66 days) and 7th April sown crop (98.33 days). The mean value for days to seed maturity was lower for summer genotypes as compared to winter genotypes in all the three dates of planting. Gray and Steckel [1] reported that onion seed ripened earlier at higher temperature as compared to the higher temperature of 22-23^{0}C.

The average number of mature fruits per plot for summer type bottle gourd genotypes was higher (15.05) in 7th March sown crop followed by an equal number of average fruits (12.44) per plot in 7th February and 7th April sown crop. Normal fruiting of winter type genotypes took place only in 7th February sown crop. It is therefore conducted that planting winter type genotypes of bottle gourd should not be delayed later than the first week of February if seed production of these genotypes is intended during summer season, except in case of Narendra Madhuri type genotype (s) which could bear satisfactory number of fruits (11.67) per plot in 7th March sown crop. Singh [9] recorded similar results for fresh fruit yield of Narendra Shivani and Narendra Madhuri in different dates of sowing extending from mid - January to mid - March. Fruit length of long fruited genotypes and polar length of round fruited genotypes of both summer type and winter type genotypes consistently decreased from 7th February sown crop through 7th March sown crop to 7th April sown crop. Similar traits of highest average fruit circumference were also recorded in 7th February sown crop for summer as well as winter type bottle gourd genotypes. This observation too suggested that moderate average temperature conditions of 7th February sown crop were favorable for fruit growth and development as compared to the very not conditions of 7th April sown crop.

Table: 2 Mean performance of different sown crop on the yield and yield contributing characters of bottle gourd

SNo	Genotypes	Days to seed maturity			Number of mature fruits per plot			Fruit length /polar length (cm)		
		7th February	7th March	7th April	7th February	7th March	7th April	7th February	7th March	7th April
Summer genotypes										
1	Pusa Naveen	135.67	120.67	95.67	9.67	13.33	12.00	57.33	56.67	51.67
2	Narendra Jyoti	139.67	121.67	96.00	9.67	13.33	11.00	62.00	61.00	62.33
3	NDBG-619-6	142.33	118.33	94.33	12.67	15.00	11.33	65.00	61.67	60.33
4	NDBG-619-11	137.67	117.66	94.33	12.00	16.67	12.33	62.00	59.00	57.00
5	NDBG-601	142.33	121.66	96.33	10.33	13.00	11.00	70.33	63.00	57.00
6	Andromon-6	153.00	125.66	104.67	20.33	21.67	17.00	32.33	31.67	30.00
Mean of summer genotypes		**141.77**	**120.94**	**96.88**	**12.44**	**15.05**	**12.44**	**58.16**	**55.50**	**53.05**
Winter genotypes										
7	Narendra Madhuri	143.33	127.67	107.00	9.00	11.67	2.33	38.33	35.00	31.33
8	Narendra Shishir	159.00	144.00	-	11.67	1.33	-	33.00	32.00	-
9	Narendra Shivani	145.67	-	-	12.00	-	-	107.33	-	-
10	Narendra-Bow-Wonder (Rd)	149.00	133.67	-	11.67	8.00	-	38.33	33.00	-
11	Narendra-Bow-Wonder (Obl)	148.00	-	-	12.00	-	-	53.67	-	-
12	NDBG-628	151.33	-	-	9.33	-	-	71.67	-	-
Mean of winter genotypes		**149.38**	**135.11**	**107.00**	**10.94**	**7.00**	**2.33**	**57.05**	**33.33**	**31.33**
General mean		**145.58**	**125.66**	**98.33**	**11.69**	**12.67**	**11.00**	**57.61**	**48.11**	**49.95**
SEm±		1.06	0.60	0.53	0.81	1.01	0.93	0.93	0.72	0.91
CD at 5%		3.11	1.80	1.63	2.37	3.03	2.87	2.74	2.17	2.81
CV (%)		1.32	0.83	0.93	11.97	13.83	14.65	2.81	2.59	3.14

Cont..

SNo	Genotypes	Fruit circumference (cm)			Seed yield per fruit (g)			Seed yield per plot (g)		
		7th February	7th March	7th April	7th February	7th March	7th April	7th February	7th March	7th April
Summer genotypes										
1	Pusa Naveen	34.00	36.00	33.67	89.00	90.67	50.33	858.33	1206.67	598.33
2	Narendra Jyoti	32.67	32.67	30.00	104.00	99.33	44.00	1005.00	1326.67	481.67
3	NDBG-619-6	35.33	30.00	27.00	91.00	90.33	49.33	1158.33	1363.33	560.00
4	NDBG-619-11	31.00	32.67	31.00	86.33	85.67	46.67	1040.00	1435.00	580.00
5	NDBG-601	34.67	30.00	24.67	85.00	101.67	54.67	876.67	1331.67	605.00
6	Andromon-6	46.00	46.00	44.00	4.33	3.67	1.67	88.33	77.67	28.33
Mean of summer genotypes		**35.61**	**34.55**	**31.72**	**76.61**	**78.55**	**41.11**	**837.77**	**1123.50**	**475.55**
Winter genotypes										
7	Narendra Madhuri	80.33	71.00	64.33	130.00	99.33	69.67	1173.33	1163.33	161.67
8	Narendra Shishir	72.33	67.00	-	95.33	72.67	-	1108.33	98.33	-
9	Narendra Shivani	27.67	-	-	73.33	-	-	876.67	-	-
10	Narendra-Bow-Wonder (Rd)	75.00	61.00	-	159.00	97.33	-	1860.00	773.33	-
11	Narendra-Bow-Wonder (Obl)	47.33	-	-	147.00	-	-	1761.67	-	-
12	NDBG-628	42.33	-	-	131.33	-	-	1231.67	-	-
Mean of winter genotypes		**57.49**	**66.33**	**64.33**	**122.66**	**89.77**	**69.67**	**1335.27**	**678.33**	**161.67**
General mean		**46.56**	**45.15**	**36.38**	**99.64**	**82.30**	**45.19**	**1086.53**	**975.11**	**430.71**
SEm±		1.15	0.85	1.05	3.36	4.14	2.99	94.08	119.56	56.75
CD at 5%		3.38	2.56	3.24	10.74	12.41	9.22	275.91	358.41	174.85
CV (%)		4.29	3.28	5.01	6.37	8.72	11.47	15.00	21.24	22.82

Seed yield per fruit of summer type bottle gourd genotypes was highest in 7th February sown crop except for Pusa Naveen and NDBG-601 where highest seed yield per fruit was recorded in 7th March sown crop. Lowest seed yield per fruit was recorded in 7th April sown crop in all the genotypes, which could produce in this particular cropping period. Similarly in winter type bottle gourd genotypes were highest in 7th February sown crop than 7th March and 7th April sown crop. The general mean over the total genotypes for seed yield per fruit was 99.64 g, 82.30 g and 45.19 g in 7th February, 7th March and 7th April sown crop, respectively(Table 2). Seed yield per plot (g) of all the summer type genotypes, except for Andromon-6, was highest in 7th March sown crop because of the higher number of fruits per plant in this cropping period. However as expected seed yield per plot in 7th March sown crop of winter type genotype was lower because of the lower number of fruits per plot and smaller fruit size. It may be noted that average seed yield per plot of winter type genotypes in 7th February sown crop was higher (1335.53g) than the average seed yield per plot of summer type genotypes (837.77g). Pandey *et al*., [4] revealed that sowing at a proper time allows sufficient growth and development of a crop to obtain a satisfactory yield and different sowing dates provide variable environmental conditions within the same location for growth and development of crop and yield stability.

CONCLUSION

From the above results, it is revealed that yield contributing traits of summer and winter type bottle gourd genotypes differed with different planting dates showed that early bottle gourd genotypes were sown slow vegetative growth and higher seed yield produced in eastern Uttar Pradesh.

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