Journal of Crop and Weed, 18(2): 94-103 (2022)

ISSN- O : 2349 9400 ; P : 0974 6315

http://cwssbckv.org
www.cropandweed.com

Growth, yield and quality of okra (*Abelmoschus esculentus* L. Moench) F_1 hybrids as influenced by planting time and spacing under Teraiagro-climatic zone of West Bengal

***K. GHOSH AND J. C. JANA**

Department of Vegetable and Spice Crops, Faculty of Horticulture,
Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar-736165, West Bengal, India

Received : 04.05.2022 ; Revised : 04.07.2022 ; Accepted : 18.07.2022

DOI: https://doi.org/10.22271/09746315.2022.v18.i2.1578

ABSTRACT

A field experiment was laid out at the Horticulture Instructional Farm of Uttar Banga Krishi Viswavidyalaya, Cooch Behar, to find out the effects of planting times of 1st day of March, May, July and September, spacing of 60×30 cm and 60×60 cm on growth, yield and quality of okra F_1 hybrids namely Mahyco Hybrid-10, Varun F_1 hybrid, Venusand Noori in three factor 4x4x2 factorial randomized complete block design. The highest fruit yield of 22.25 t ha^{-1} was obtained in July planted crop. Mahyco Hybrid-10 recorded the maximum fruit yield of 19.84 t ha^{-1}.The close spacing of 60 × 30 cmproduced the highest fruit yield of 18.98 t ha^{-1}. The treatment combination of F_1 hybrid Venus when planted on 1stday of July with 60 × 30 cm spacing produced the highest fruit yield of 28.41 t ha^{-1} with ascorbic acid content of 18.48 mg 100g^{-1}.

Keywords: F_1 hybrids, interaction effect, okra, planting dates, spacing,

Okra (*Abelmoschus esculentus* L.Moench) being one of the important major vegetable crops,it is widely cultivated in different regions of the world. Okra is a multiuse crop for its various plant parts (Mihretu *et al*., 2014). Okra is preferred for cultivation in home garden as well as in large commercial farms for nutritional and livelihood security.It is one of the most important exportable vegetable crops of India ranking first in production with 6416 thousand tones from an area of 523 thousand hectare. In West Bengal, it occupies an area of 79.1 thousand hectares producing 893.96 thousand tonnes per annum (Anonymous, 2022). However, its average yield is comparatively low in India when compared to developed countries. Among different reasons for poor growth and fruit yield of okra, planting time, variety and spacing play important role. The day temperature of 25 ^{0}C to 40 ^{0}C and night temperature over 22 ^{0}C is required for its proper growth, flowering and fruit development (Thamburaj and Singh, 2018). There is a good demand of okra throughout the year for its nutritional importance and role in improved nutrition and health. The climate of Teraizone of West Bengal is subtropical humid with high rainfall and prolonged winter. During the months December to February, it is colder and the temperature usually starts increasing from the end of March and days remain warm till the middle of October and then it falls rapidly throughout the region. Although the zone experiences high average annual rainfall (higher than 3000 mm) with an uneven distribution as 75 % of average annual rainfall is received from June to August whereas minimal or no rainfall is received during the winter months. The planting times have a marked role on its production as temperature, humidity and radiation influence different aspects and phases of crop growth. Besides, the planting time has a direct influence on YVMV disease incidence. The production of okra is mainly affected by planting low yielding cultivars atsub optimal spacing, attack of pests. Higher production could be possible by selection of F_1 hybrids that show higher returns when compared with other cultivars grown in same conditions with similar production inputs. Most of the farmers are cultivating the private hybrids for high yield and biotic pest resistance without knowing their performance and suitability to the particular agro-climatic zone. However, its productivity could be increased through careful selection of okra F_1 hybrids based on location specific performances (Deepak *et al*., 2015). Suitable spacing also could give to its optimum yield. A cultivar planted in improper time give poor yield as a cultivar performs best in its optimum climatic condition (Hussain *et al*., 2006 and Zeb *et al*., 2015). The information regarding planting time, variety and spacing for okra cultivation in different seasons is not sufficient for the zone. Therefore, the present study was carried out to exploit planting time, F_1 hybrid cultivar and spacing combination for okra production for its prolonged availability during different seasons.

MATERIALS AND METHODS

The experiment was conducted at the Horticulture Instructional Farm of Uttar Banga Krishi

Email: ghosh.kheyali13@gmail.com

Viswavidyalaya, Pundibari, Cooch Behar (26^{0}19´ 86´´ N latitude, 89 ^{0}23´ 53´´ E longitude and 43 m altitude above the mean sea level) in three factor 4 x 4 x 2 factorial randomized complete block design with three replications to find out the effects of sowing times of 1st day of March (D_1), May (D_2), July (D_3) and September (D_4) and plant spacing with 60 × 30 cm (S_1)and 60×60 cm (S_2)on different F_1 hybrids of okra namely Mahyco Hybrid-10 (H_1), Varun F_1 hybrid (H_2), Venus (H_3) and Noori (H_4), separately and in combination with other for its growth, yield and quality under Teraiagro-climatic zone (25^0 57 ´´ to 26 ^{0}36 ´´ N latitude and 89 ^{0} 54 ´´ to 88 ^{0}47 ´´ E longitude) of West Bengal during 2020-21.

The average soil properties of the experimental site in agricultural entisol before conducting the experiment was sandy clay loam with pH 5.7, 0.91% organic carbon, 132.46 kg ha^{-1} available nitrogen, 46.48 kg ha^{-1} available phosphorous and 67.85 kg ha^{-1} potash.Planting of seeds of four F_1 hybrids was done on four different timesthrough dibbling two seeds per hill at different spacing at two months interval from 1stday of March to 1stday of September. Thinning of okra was done at 15 days after planting retaining one plant in each hill. Well-decomposed farmyard manureat 10 t ha^{-1}and chemical fertilizers at 200:100:100 kg ha^{-1} N, P_2O_5 and K_2O, respectively were appliedaccording to Mal *et al*. (2013). Half dose of the recommended nitrogen and full dose of phosphorous and potash were used as basal and rest nitrogen was applied as top dressing in two equal splits, first after three weeks of planting and second at the time of flowering. Irrigation, weeding and other cultural operations were done on time. Tender green fruits were harvested every two days as practiced by the farmers.

Plant height and number of branches of a plant were recorded at last harvest stage. To calculate fruit number per plant and fruit length, diameter and weight, fruits at different pickings from five marked plants were recorded and averaged. Fruit yield obtained from each plot was converted to get the yield in tonsper hectare. The amount of ascorbic acid of the marketable fruits was estimated by using 2,6-dichlorophenol indophenol as suggested by Ranganna(1986).The data obtained from the experiment was pooled and analyzed according toPanse and Sukhatme (1985).

RESULTS AND DISCUSSION

Plant height

The height of okra plant at last harvest stage showed significant variation for different planting time, hybrid and spacing separately (Table 2). With respect to planting date, the tallest plant of 152.21 cm was obtained in July planted crop (D_3) and the smallest plant of 128.89 cm was obtained in March planted crop (D_1). There was 49.07 % increase in plant height in July planted crop (D_3) over March planted crop (D_1) and 30.42 % decrease in plant height in September planted crop (D_4) over July planted crop (D_3). Prevailing unfavourable low and high temperature during crop period hindered vegetative growth. These observations were similar with Moniruzzaman *et al.* (2007) and Sood and Kaur (2019). Among the hybrids, Mahyco Hybrid-10 (H_1) recorded maximum plant height of 131.51 cm and minimum in Venus (H_3).The closer spacing resulted longer plant height.Among the interactions, planting times with hybrids showed significant variations in plant height and other interactions were statistically non-significant. The tallest plant of 173.93 cm was recorded in July planted crop (D_3) with Mahyco Hybrid-10 (H_1).

Branches per plant

There was significant variation in number of branches of a plant at last harvesting stage for different planting time, hybrid and spacing, separately. Maximum of 8.09 branches of a plant at last harvesting stage was noticed in May planted crop (D_2) which was statistically at par with D_3 *i. e.* July and D_4 *i. e.* September planted crops and the minimum of 6.26 branches in March planted crop (D_1). There was 29.23 % increase in number of branches of a plant in May planted crop (D_2) over March planted crop (D_1) and 5.31 % decrease in number of branches of a plant in September planted crop (D_4) over May planted crop (D_2) as shown in Table 2.The F_1 hybridVenus (H_3) recorded highest number of branches of 7.95 per plant which was statistically at par with Mahyco Hybrid-10 (H_1) and Noori (H_4) and minimum in Varun F_1 hybrid (H_2).The closer spacing resulted less number of branches per plant. Among the interactions, planting time with hybrid showed marked variation in number of branches and other interactions were statistically non-significant. The highest number of branches of 10.57 per plant was recorded in May planted crop (D_2) with Mahyco Hybrid-10 (H_1). Atallah (2016) also recorded that number of branches changed due to change in both environment and cultivars.This difference in number of branches of a plant might be due to variation in plant height and available space to spread. Similar findings were noticed by Nwangburuka *et al.* (2012); Singh and Jain (2012) and Reddy *et al*. (2013).

Fruits per plant

The fruit numberof an okra plantalso showed great variation for different planting time, hybrid and spacing, separately. Maximum number of fruits of 39.08 per plant in pickings twice in a week during the harvesting period was obtained in July planted crop (D_3) and the minimum

of 19.25 in September planted crop (D_4). There was 12.66 % decrease in fruit number of a plant in May planted crop (D_2) over March planted crop (D_1) and 27.08 % increase in fruit number of a plant in July planted crop (D_3) over May planted crop (D_2) and 50.74 % decrease in fruit number per plant in September planted crop (D_4) over July planted crop (D_3).The highest fruit numberof a plant was counted with July planted crop as the plants receive more natural resources like light, nutrient, water etc. for which resulted in more branches as well as higher fruit number of a plant when compared with other planting times. Among the hybrids, Mahyco Hybrid-10 (H_1) showed maximum of 33.96 fruits from a plant which was statistically at par with Varun F_1 hybrid (H_2) and Venus (H_3) had the minimum fruits (Table 3). The closer spacing resulted in highest fruit number from a plant.This result was supported by Salau and Makinde (2015). Among the interactions, planting times with hybrids showed marked variations in fruit number of a plant and other interactions were statistically non-significant. Highest fruit number of 41.20 from a plant was recorded in D_3H_4 *i. e.*July planted crop with the hybrid Noori which was statistically at par with D_3H_3 *i. e.* July planted crop with Venus followed by D_3H_2*i. e.* July planted crop with Varun F_1 hybrid andD_2H_1 *i.e.*May planted crop with Mahyco Hybrid-10. The fruit number from a plant would depend on the intensity of crop growth. This result was also agreed by Hossain *et al.* (2001) and Jangde *et al.*(2019).

Fruit length

Individual and interaction effects of different planting time, hybrid and spacing of okra showed significant variation on fruit length (Table 3).With respect to planting date, maximum fruit length of 14.86 cm was obtained in March planted crop (D_1) and minimum of 13.01 cm in September planted crop (D_4). There was 0.53% decrease in average fruit length in May planted crop (D_2) over March planted crop (D_1), 4.66 % increase inaverage fruit length in July planted crop (D_3) over May planted crop (D_2) and 15.90 % decrease in September planted crop (D_4) over July planted crop (D_3). Among the hybrids, Varun F1 hybrid (H_2) recorded the maximum fruit length of 14.94 cm and a minimum of 13.50 cm in Noori (H_4). Different genetic makeup of these F_1 hybrids resulted variation in their fruit length. Similar results have been recorded by Rajesh *et al.* (2018).The wider spacing recorded the longer fruit length.Among the interactions, planting time with hybrid and hybrid with spacing showed significant variations and other interactions between themwere statistically non-significant. The highest fruit length of 15.78cm was observed in July planted crop (D_3) with Noori (H_4) which was statistically at par with May planted crop (15.74 cm) with Varun F_1 hybrid (H_2) both at 60 cm x 60 cm spacing (S2).

Fruit diameter

The fruit diameter showed significant variation for different planting time, hybrid and spacing separately and also in combination with planting time and hybrid (Table 4).With respect to planting time, the highest fruit diameter of 1.53 cm was obtained in May planted crop that was statistically similar with March planed crop and the shortest of 1.18 cm in September planted crop (D_4). There was 0.65 % increase in average fruit diameter in May planted crop (D_2) over March planted crop (D_1) and 22.87 % decrease in September planted crop (D_4) over May planted crop (D_2). Mahyco Hybrid-10 (H_1) gave maximum of 1.47 cm fruit diameter which was at par with Noori (H_4) and minimum of 1.36 cm in Venus (H_3). Similar to average fruit length, the variation in average fruit diameter in these hybrids may be due to the variation in their genetic composition. These findings were also supported by Shujat *et al.* (2006). The wider spacing resulted in higher fruit diameter.Among the interactions, planting time with hybrid showed significant variations in average fruit diameter. The maximum fruit diameter of 1.66 cm was observed in March planted crop (D_1) with Noori (H_4) which was statistically at par with D_1H_1 *i.e.* March planted crop with Mahyco Hybrid-10 followed by D_2H_4 *i. e.* May planted crop with Noori F_1 hybrid.

Fruit weight

The fruit weight also showed significant variation for different planting time and spacing separately and with combination of planting time and hybrid (Table 4). With respect to planting time, the highest fruit weight of 15.71 g was obtained in May planted crop (D_2) that was statistically similar with July planted crop (D_3) and the lowest of 12.25 g in September planted crop (D_4). There was 8.19 % increase in average fruit diameter in May planted crop (D_2) when compared with March planted crop (D_1) and 22.02 % decrease in September planted crop (D_4) over May planted crop (D_2). Venus (H_3) recorded the maximum fruit weight of 16.83 g and a minimum of 12.25 g in Noori (H_4).This variation might be due to differences in its genetic make-up and also in vegetative growth of the hybrids in different environments that leads to make differences in their photosynthetic accumulation and ultimately average fruit weight. Budania and Dahiya (2018) also found similar findings.The wider spacing resulted in higher average fruit weight. Among the interactions, combination of

Table 1: Meteorological information of Pundibari, Cooch Behar 2020-21

Month	Average temperature (^{0}C)		Average rainfall (mm)	Average relative humidity (%)	
	Maximum	Minimum		Maximum	Minimum
March	29.0	16.1	43.4	74.7	51.2
April	30.8	18.5	107.4	70.5	56.4
May	30.6	21.6	393.5	83.0	71.5
June	31.3	24.3	1107.8	93.0	82.0
July	30.6	24.7	1368.9	96.5	86.0
August	33.2	25.4	409.8	89.0	76.0
September	30.2	23.9	1426.7	93.4	84.0
October	32.9	22.2	90.2	80.0	67.0
November	29.6	14.0	0	71.0	49.0
December	26.0	10.0	0	81.0	55.0

(Source: Gramin Krishi Mausam Sewa (GKMS) Project, UBKV, Pundibari)

planting time with hybrid showed significant variations in fruit weight and other interactions were statistically non-significant. The maximum fruit weight of 14.66 g was observed in September planted crop (D_4) with Mahyco Hybrid-10 (H_1) which was statistically at par with D_2H_4 *i. e*. May planted crop with the hybrid Noori. Similar findings were recorded by Tandel *et al.* (2017).

Fruit yield

The fruit yield (t ha^{-1}) showed significant difference for individual effect ofplanting time, hybrid and spacing and also for interaction effect between planting time and hybrid (Table 5).With respect to planting time, the highest fruit yield of 22.25 t ha^{-1}was obtained in July planted crop (D_3) and the lowest of 15.12 t ha^{-1} in September planted crop (D_4). There was 47.15 % increase in fruit yield in July planted crop (D_3) over March planted crop (D_1) and 19.95 % decrease in September planted crop (D_4) over July planted crop (D_3). Among the hybrids, Mahyco Hybrid-10 (H_1) recorded the maximum fruit yield of 19.84 t ha^{-1}which was statistically at par with H_2*i. e.* Varun F_1 hybrid (19.51 t ha^{-1}) and a minimum of 17.25 t ha^{-1}in Noori (H_4).The closer spacing resulted in more fruit yield.Increase in marketable fruit yield for closer spacing was also supported by Zibelo *et al.* (2016) in okra. The plants with wider spacing may enjoy natural resources for higher growth but plant number per unit area is reduced and results lower fruit yield. This result agreed with the finding of Dhankar *et al.* (2012) and Shukla *et al.* (2013). The interaction effect of planting time with hybrid and spacing showed significant variation. The average maximum fruit yield of 27.50 t ha^{-1} was observed in July planted crop (D_3) with hybrid Venus (H_3).Mahapatra *et al.* (2007) and Simon *et al.* (2013) noticed similar observation.

Ascorbic acid content

The amount of ascorbic acid of the marketable okra fruits showed marked variation for various planting time and also for combination of planting time and F_1 hybrid. Maximum ascorbic acid content of 21.06 mg100g^{-1} was obtained in March planted crop (D_1) which was statistically at par with September planted crop (D_4) and minimum of 19.17 mg100g^{-1} in July planted crop (D_3). There was 8.97 % decrease in ascorbic acid in July planted crop (D_3) over March planted crop (D_1) and 6.99 % increase in September planted crop (D_4) over July planted crop (D_3). Among the hybrids, Mahyco Hybrid-10 (H_1) recorded the maximum ascorbic acid content of 20.30 mg100g^{-1} and a minimum of 19.90 mg100g^{-1}in hybrid Varun F1 hybrid (H_2).The wider spacing resulted in higher ascorbic acid content (Table 5). Among the interactions, only planting time with hybrid (DxH) showed significant variation in amount of ascorbic acid. The highest amount of 22.03 mg ascorbic acid per 100 gram of edible fruits as observed in March planted crop (D_1) with hybrid Venus (H_3). Similar observation was also reported by Sarkar *et al.* (2014); Faludon and Ogedeg (2016) and Patil *et al.* (2017). This may be due to varried weather conditions of maximum and minimum temperature, relative humidity and number of rainy days and bright sunshine hours during different crop period and genetic makeup of the F_1 hybrids to give different responses under different weather situations.

On the basis of present study, it may be concluded that though okra can be grown throughout the year except severe winter, maximum okra yield of 28.41 tha^{-1}could be recorded when the F_1 hybrid Venus was planted during 1stday of July with spacing of 60 × 30 cm under Teraizone of West Bengal.

Table 2: Effect of planting time, F_1 hybrid and spacing on plant height and branches per plant in okra

Treatments		Plant height (cm)					Branches per plant				
		H_1	**H_2**	**H_3**	**H_4**	**Mean D**	**H_1**	**H_2**	**H_3**	**H_4**	**Mean D**
D_1	S_1	93.53	106.93	104.26	113.67	102.10	3.95	3.60	7.34	6.27	6.26
	S_2	89.69	103.91	101.26	103.46		6.35	5.21	9.05	8.32	
	Mean	91.61	105.42	102.76	108.56		5.15	4.40	8.19	7.29	
D_2	S_1	144.07	135.67	127.03	116.63	128.89	8.93	6.60	5.23	6.13	8.09
	S_2	141.93	129.96	124.14	111.63		12.22	9.15	8.26	8.24	
	Mean	143.00	132.81	125.58	114.13		10.57	7.87	6.74	7.18	
D_3	S_1	177.67	151.19	139.22	146.00	152.21	7.38	5.90	7.58	6.51	7.75
	S_2	170.19	147.56	142.63	143.19		9.44	8.23	8.78	8.26	
	Mean	173.93	149.37	140.92	144.59		8.41	7.06	8.18	7.38	
D_4	S_1	119.74	105.82	96.11	112.59	105.90	5.99	5.81	7.82	6.20	7.66
	S_2	115.26	98.18	93.22	106.26		9.19	8.29	9.59	8.45	
	Mean	117.5	102.00	94.66	109.42		7.59	7.05	8.70	7.32	
Mean H	131.51	122.40	115.99	119.18		7.93	6.59	7.95	7.30		
Mean S		S_1		S_2			S_1			S_2	
		124.38		120.15			6.33			8.56	
		SEm(±)		**C.D. at 5 %**			**SEm(±)**			**C.D. at 5 %**	
D		**0.81**		**2.29**			**0.29**			**0.83**	
H		**0.81**		**2.29**			**0.29**			**0.83**	
D×H		**1.62**		**4.58**			**0.59**			**1.67**	
S		**0.57**		**1.62**			**0.21**			**0.59**	
H×S		**1.14**		**N.S.**			**0.42**			**N.S.**	
S×D		**1.14**		**N.S.**			**0.42**			**N.S.**	
D×H×S		**2.29**		**N.S.**			**0.83**			**N.S.**	

Note: D - planting times (D_1-1st day of March, D_2-1st day of May, D_3-1st day of July and D_4-1st day of September, H - F_1 hybrids (H_1-Mahyco Hybrid No. 10, H_2 - Varun F_1 hybrid), H_3-Venus and H_4-Noori) and S - spacings (S_1-60×30 cm and S_2-60×60 cm). N. S. - Not Significant

Table 3: Effect of planting time, F_1 hybrid and spacing onfruits per plant and fruit length in okra

Treatments		Fruits per plant					Fruit length (cm)				
		H1	**H2**	**H3**	**H4**	**Mean D**	**H1**	**H2**	**H3**	**H4**	**Mean D**
D1	S1	36.00	38.33	35.66	38.00	33.96	15.29	14.20	15.59	14.70	14.86
	S2	32.33	33.33	32.68	35.33		15.33	14.41	15.36	13.96	
	Mean	34.16	35.83	34.17	34.17		15.31	14.30	15.47	14.33	
D2	S1	41.00	39.00	22.69	29.56	30.75	15.29	15.58	15.03	12.55	14.78
	S2	36.33	35.67	19.12	22.65		15.26	15.74	15.29	13.49	
	Mean	38.66	37.33	20.90	26.10		15.27	15.66	15.16	13.02	
D3	S1	38.00	41.33	40.23	42.78	39.08	15.52	15.38	15.05	15.58	15.47
	S2	35.33	37.00	38.67	39.63		15.63	15.59	15.22	15.78	
	Mean	36.66	39.16	39.45	41.20		15.57	15.48	15.13	15.68	
D4	S1	27.66	21.33	18.33	12.00	19.25	11.48	13.56	13.78	10.73	13.01
	S2	25.00	18.33	16.66	14.67		14.22	15.05	14.02	11.22	
	Mean	26.33	19.83	17.49	13.33		12.85	14.30	13.90	10.97	
Mean H	33.96	33.04	27.96	29.33		14.75	14.94	14.92	13.50		
Mean S		S1		S2			S1			S2	
		33.96		33.04			14.33			14.72	
		SEm(±)		**C.D. at 5 %**			**SEm(±)**			**C.D. at 5 %**	
D		**0.48**		**1.35**			**0.15**			**0.44**	
H		**0.48**		**1.35**			**0.15**			**0.44**	
D×H		**0.96**		**2.71**			**0.30**			**0.87**	
S		**0.34**		**0.96**			**0.10**			**0.31**	
H×S		**0.68**		**N.S.**			**0.21**			**0.62**	
S×D		**0.68**		**N.S.**			**0.21**			**N.S.**	
D×H×S		**1.36**		**N.S.**			**0.45**			**N.S.**	

Note: D - planting times (D_1-1st day of March, D_2-1st day of May, D_3-1st day of July and D_4-1st day of September, H - F_1 hybrids (H_1-Mahyco Hybrid No. 10, H_2 - Varun F_1 hybrid), H_3-Venus and H_4-Noori) and S - spacings (S_1-60×30 cm and S_2-60×60 cm). N. S. - Not Significant

Table 4: Effect of planting time, F_1 hybrid and spacing on fruit diameter and fruit weight in okra

Treatment		Fruit diameter (cm)					Fruit weight (g)				
		H1	H2	H3	H4	Mean D	H1	H2	H3	H4	Mean D
D1	S1	1.56	1.41	1.39	1.58	1.52	14.72	13.87	14.48	14.29	14.52
	S2	1.57	1.43	1.44	1.74		15.14	14.43	14.78	14.48	
	Mean	1.56	1.42	1.41	1.66		14.93	14.15	14.63	14.38	
D2	S1	1.52	1.51	1.50	1.51	1.53	13.90	15.11	16.51	15.66	15.71
	S2	1.54	1.55	1.53	1.62		14.93	15.25	17.15	17.18	
	Mean	1.53	1.53	1.51	1.54		14.41	15.18	16.83	16.42	
D3	S1	1.49	1.30	1.45	1.45	1.46	15.78	15.17	15.26	15.65	15.59
	S2	1.58	1.55	1.42	1.42		15.90	15.50	15.37	16.05	
	Mean	1.53	1.42	1.43	1.43		15.84	15.33	15.31	15.85	
D4	S1	1.26	1.19	1.09	1.12	1.18	13.26	12.96	11.15	11.04	12.25
	S2	1.28	1.26	1.10	1.13		13.65	13.37	11.45	11.15	
	Mean	1.27	1.22	1.09	1.12		13.45	13.16	11.3	11.09	
Mean H	1.47	1.39	1.36	1.45		14.66	14.46	14.52	14.44		
Mean S		S1		S2			S1			S2	
		1.39		1.44			14.30			14.73	
		SEm(±)		C.D. at 5 %			SEm(±)			C.D. at 5 %	
D		0.02		0.06			0.15			0.44	
H		0.02		0.06			0.15			N.S.	
D×H		0.04		0.12			0.31			0.88	
S		0.01		0.04			0.11			0.31	
H×S		0.03		N.S.			0.22			N.S.	
S×D		0.03		N.S.			0.22			N.S.	
D×H×S		0.06		N.S.			0.44			N.S.	

Note: D - planting times (D_1-1st day of March, D_2-1st day of May, D_3-1st day of July and D_4-1st day of September, H - F_1 hybrids (H_1-Mahyco Hybrid No. 10, H_2 - Varun F_1 hybrid), H_3-Venus and H_4-Noori) and S - spacings (S_1-60×30 cm and S_2-60×60 cm). N. S. - Not Significant

Table 5: Effect of planting time, F_1 hybrid and spacing on fruit yield and ascorbic acid content of fruits in okra

Treatments		Fruit yield (t ha^{-1})					Ascorbic acid content (mg 100g^{-1})				
		H1	**H2**	**H3**	**H4**	**Mean D**	**H1**	**H2**	**H3**	**H4**	**Mean D**
D1	D1	19.70	18.25	11.20	12.07	15.12	21.00	20.36	21.67	20.10	21.06
	D2	18.38	17.47	11.85	12.04		21.63	20.55	22.40	20.77	
	Mean	19.04	17.86	11.52	12.05		21.31	20.45	22.03	20.43	
D2	D1	20.44	18.99	20.33	19.65	19.42	20.95	18.77	18.55	20.56	19.71
	D2	19.56	19.10	18.59	18.71		19.55	19.11	19.22	20.95	
	Mean	20.00	19.04	19.46	19.18		20.25	18.94	18.88	20.75	
D3	D1	17.39	19.19	28.41	24.93	22.25	18.89	19.19	18.48	18.79	19.17
	D2	18.53	21.33	26.59	21.62		19.54	19.48	19.48	19.53	
	Mean	17.96	20.26	27.50	23.27		19.21	19.33	18.98	19.16	
D4	D1	23.36	20.92	13.86	15.07	17.81	20.39	20.52	20.40	19.48	20.51
	D2	21.38	20.80	13.19	13.92		20.48	21.19	21.93	19.70	
	Mean	22.37	20.86	13.52	14.49		20.43	20.85	21.16	19.59	
Mean H	19.84	19.51	18.00	17.25		20.30	19.90	20.27	19.98		
Mean S		S1		S2			S1			S2	
		18.98		18.31			19.87			20.35	
		SEm(±)		**C.D. at 5 %**			**SEm(±)**			**C.D. at 5 %**	
D		**0.18**		**0.52**			**0.26**			**0.74**	
H		**0.18**		**0.52**			**0.26**			**N.S.**	
D×H		**0.37**		**1.05**			**0.52**			**1.48**	
S		**0.13**		**0.37**			**0.19**			**N.S.**	
H×S		**0.26**		**N.S.**			**0.37**			**N.S.**	
S×D		**0.26**		**0.74**			**0.37**			**N.S.**	
D×H×S		**0.52**		**1.49**			**0.74**			**N.S.**	

Note: D - planting times (D_1-1st day of March, D_2-1stday of May, D_3-1stday of July and D_4-1stday of September, H - F_1 hybrids (H_1-Mahyco Hybrid No. 10, H_2- Varun F_1 hybrid), H_3-Venus and H_4-Noori) and S - spacings (S_1-60×30 cm and S_2-60×60 cm). N. S. - Not Significant

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