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Studies on the effect of spacing and pruning on growth parameters of bottle gourd (*Lagenaria siceraria*) Var. Samrat under Konkan agro-climatic condition

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Abstract
The present investigation entitled, "Effect of spacing and pruning on growth parameters of bottle gourd (*Lagenaria siceraria*) var. Samrat" was conducted at Department of Horticulture, College of Agriculture, Dapoli, Dist. Ratnagiri (M.S.) during summer season of 2017. The experiment was laid out in Split plot design with three main plot treatments of spacing *viz*. S_1 (1.5 m x 0.5m), S_2 (1.5 m x 0.75 m), S_3 (1.5 cm x 1m) and three sub- plot treatments of pruning P_1-pruning at 1m length, P_2-pruning at 2 m length, P_3- No pruning each treatment replicated thrice. During present investigation, in case of effect of the interactions between spacing and pruning on growth of bottle gourd vine, growth parameters differ significantly. In case of interactions of spacing and pruning results showed that at last harvest stage maximum length of vine was recorded by interaction S_1P_3 (256.93 cm) and S_3P_3 recorded maximum internodal length (13.18 cm) and basal stem diameter (20.21 mm).

Keywords: Bottle gourd, spacing, pruning, interaction effect

1. Introduction
Bottle gourd (*Lagenaria siceraria*) is a tropical and subtropical vine which belongs to the family Cucurbitaceae, sub family Cucurbitoideae and tribe Benincaseae (Richardson, 1972) [12], and is considered to be one of the earliest species of plants to be domesticated by humans. A wide range of variability is available for maturity, yield and fruit characters in this crop. Bottle gourd being monoecious, is a cross pollinated crop and provides ample scope for exploiting its hybrid vigour. Hence, a speedy improvement in production, earliness, uniformity, quality and resistance to pest and disease. In heterosis breeding, plant breeders often face problem to identify the suitable parents. Bottle gourd exhibits a wide range of sex forms and sex expression. Pruning is one of the important factors in vegetable crops to improve yield. Without pruning, most of the female flowers occur between the 10^{th} and 40^{th} nodes. One of the important factor in successful planting is the correct spacing of plants at the time of sowing. Crop spacing is about the number of crops planted in a unit area. It is about the distance between one plant and another.

2. Material and methods
The present experiment entitled, "Effect of spacing and pruning on growth parameters of bottle gourd (*Lagenaria siceraria*) var. Samrat" was conducted at Department of Horticulture, College of Agriculture, Dapoli, Dist. Ratnagiri (M.S.) during summer season of 2017. The experiment was laid out in Split plot design with three main plot treatments of spacing *viz*. S_1 (1.5 m x 0.5m), S_2 (1.5 m x 0.75 m), S_3 (1.5 cm x 1m) and three sub- plot treatments of pruning P_1-pruning at 1m length, P_2-pruning at 2 m length, P_3- No pruning. Each treatment was replicated thrice. The size plot 3.0 m x 3.0 m was prepared as per the plot layout. The seed sowing was done on flat bed at the spacing as per treatment details. In between two replications the additional spacing of 1.0 m was maintained to avoid the uptake of nutrient from other block. Generally, two to three seeds were sown at 2.5 cm to 3cm depth. Only one healthy seedlings per hill was retained. The plants were pruned when they attained 1 m and 2 m length as per treatment details. Secateurs were used to prune the main branch of the plant. Five plants per treatment combination per replication were randomly selected and labeled for recording observations under study.

The data collected were subjected to the statistical analysis by Split Plot Design, the statistical analysis of the data was done by the standard method known as "Analysis of variance " described by Panse and Sukhatme (1995) [10].

3. Results and Discussion

3.1. Effect of interactions of spacing and pruning on length of vine (cm) in bottle gourd at various stages of growth

The effect of interactions of spacing and pruning on length of vine in bottle gourd showed non-significant differences among the different treatment combinations at 30 and 45 DAS. The effect of interaction of spacing and pruning on the length of vine of bottle gourd at 60 DAS showed significant difference among the interactions of spacing and pruning. The maximum length of vine was recorded in S_3P_3 (204.93 cm) which was at par with S_1P_2 (200.00 cm), S_2P_2 (200.00 cm) and S_3P_2 (200.00 cm). The minimum length of vine was recorded in S_1P_1, S_2P_1 and S_3P_1 (100.00 cm). At 75 DAS significant difference was observed in length of vine due to interactions effect. The maximum length of vine was recorded in S_3P_3 (233.53 cm) which was at par withS_2P_3 (231.80 cm). The effect of interactions of spacing and pruning on the length of vine in bottle gourd at 90 DAS showed significant differences among the different treatment combinations. The maximum length of vine was recorded in S_3P_3 (241.60 cm) which was significantly superior over all interactions. The last harvest showed significant differences among the different treatment combinations. The maximum length of vine was recorded in S_1P_3 (256.93 cm) which was significantly superior over all treatments. From the present study it was observed that there was increase in the length on vine with increase in the growth period of vine from 30 DAS (12.12 cm) to last harvest (182.54 cm) in respect of spacing and pruning treatments.

3.2 Effect of interactions of spacing and pruning on number of leaves in bottle gourd at various stages of growth

The effect of interactions of spacing and pruning on the number of leaves of bottle gourd at 30 DAS and 45 DAS showed non-significant differences among the different treatment combinations. The effect of interactions of pruning and spacing on the number of leaves of bottle gourd at 60 DAS showed significant difference. However, the maximum number of leaves were recorded in S_3P_3 (73.27) which was significantly superior over other interactions. The minimum number of leaves were recorded in S_1P_1 (64.33). The data on the effect of interactions of spacing and pruning on the number of leaves in bottle gourd at 75 DAS showed non-significant difference among interactions. The effect of interactions of spacing and pruning on the number of leaves of bottle gourd at 90 DAS showed significant difference. The maximum number of leaves were recorded in treatment S_3P_3(77.33) which was significantly superior over other interactions. The minimum number of leaves were observed in treatment S_1P_1 (68.67). The effect of interactions of spacing and pruning on the number of leaves of bottle gourd at last harvest showed non-significant differences among the different treatment combinations.

It is seen from the Table 2 that, the number of leaves of bottle gourd vine were increased from 30 DAS (7.14) to 75 DAS (81.01) and thereafter decreased till the last harvest (63.69), respective of spacing and pruning treatments. In case of spacing the number of leaves were found to be increased with increase in spacing during entire growth period, except 30 DAS. Similar findings have been reported by Jan *et al*. (2000) [4] in bottle gourd, Dash and Tripathy (2001) [1] in pointed gourd.

3.3 Effect of interactions of spacing and pruning on internodal length (cm) in bottle gourd at various stages of growth

The effect of interactions of spacing and pruning on the internodal length (cm) in bottle gourd at 30 DAS showed significant difference among the different treatment combinations. However, the maximum internodal length was recorded in treatment S_2P_3 (4.42 cm) which was at par with S_2P_2(4.25cm), S_1P_3 (3.86cm) and S_1P_1 (3.84cm). The minimum internodal length was recorded in S_2P_1 (3.04 cm). At 45 DAS, significant difference among the different treatment combinations were observed for internodal length. However, the maximum internodal length was recorded in S_3P_3 (7.45cm) which was significantly superior over all treatment combinations. The minimum internodal length in bottle gourd was observed in S_3P_1 (5.47 cm). The effect of interactions of spacing and pruning on internodal length (cm) in bottle gourd at 60 days after sowing showed significant difference among the interactions. However, the maximum internodal length was recorded in S_3P_3 (10.65 cm) which was significantly superior over all interactions. The minimum internodal length was recorded in S_1P_1 (6.76 cm).

The data about the effect of interactions of spacing and pruning on the internodal length (cm) in bottle gourd at 75 DAS showed significant difference among interactions. The maximum internodal length was recorded in S_3P_3 (11.23 cm) which was significantly superior over all interactions. The minimum internodal length was observed in S_1P_1(5.66 cm).

At 90 DAS, the effect of interactions of spacing and pruning on the internodal length (cm) in bottle gourd showed significant difference. However, the maximum internodal length was recorded in treatment S_3P_3(10.90 cm) which was significantly superior over all interactions. Whereas, the minimum internodal length was observed in treatment S_1P_1 (5.50 cm). The effect of interaction of spacing and pruning on the internodal length (cm) in bottle gourd at last harvest showed significant difference among the different interactions. However, the maximum internodal length was recorded in S_3P_3 (13.18 cm) which was significantly superior over all treatment combinations. Whereas, the minimum internodal length was observed in treatment S_1P_1 (5.50 cm).

It is observed from the Table 3 that no specific trend in internodal length of bottle gourd vine was observed during growth period. The internodal length in bottle gourd vine was increased from 30 DAS (3.73 cm) to 60 DAS (8.42 cm) and then decreased at 75 DAS (7.83 cm) and again increased till last harvest (8.54 cm).

The above results indicated that there was an increase in the internodal length with the increase in spacing which might be due to availability of more space for each plant in higher spacing. Even there was a linear increase in internodal length with increase in pruning. The similar results were also reported by Jan *et al.* (2000) [4] in bottle gourd, Olayini and Fagbayide (2008) [9] in watermelon.

3.4 Effect of interactions of spacing and pruning on basal stem diameter (mm) in bottle gourd at various stages of growth

The effect of interactions of pruning and spacing on the basal stem diameter (mm) in bottle gourd at 30 DAS showed non-significant differences. The effect of interactions of spacing

and pruning on the basal stem diameter (mm) in bottle gourd at 45 days after sowing showed significant difference among the different treatment combinations. However, the maximum basal stem diameter was recorded in S_3P_3 (14.61 mm) which was significantly superior over all treatment combinations. Whereas, the minimum basal stem diameter was recorded by S_1P_1 (8.80 mm). The effect of interactions of spacing and pruning on basal stem diameter (mm) in bottle gourd at 60 DAS showed significant difference among the interactions. However, the maximum basal stem diameter was recorded in S_3P_3 (16.05 mm) which was at par with S_2P_3 (15.67 mm). The minimum basal stem diameter was recorded in S_1P_1 (11.17 mm). The data about the effect of interactions of spacing and pruning on the basal stem diameter (mm) in bottle gourd at 75 DAS showed significant difference among interactions. However, the maximum basal stem diameter was recorded in S_3P_3 (18.31 mm) which was significantly superior over all interactions. Whereas, the minimum basal stem diameter was observed in S_1P_1 (14.42 mm).

The effect of interactions of spacing and pruning on the basal stem diameter (mm) in bottle gourd at 90 DAS showed significant differences among the different treatment combinations. However, the maximum basal stem diameter was recorded in treatment S_3P_3 (20.18 mm) which was superior significant over all treatments. The minimum basal stem diameter was observed in treatment S_1P_1 (13.32 mm). At last harvest stage the effect of interactions of spacing and pruning on the basal stem diameter (mm) in bottle gourd showed significant difference. However, the maximum basal stem diameter was recorded in S_3P_3 (20.21 mm) which was significantly superior over all the treatments combinations. Whereas, the minimum basal stem diameter was observed in treatment S_2P_1 (14.13 mm).

It is seen from the Table 4 that basal stem diameter in bottle gourd vine was found to be increased with increase in growth of vine from 30 DAS (8.25 mm) till last harvest (16.48 mm). The above results indicated that there was an increase in the basal stem diameter with the increase in spacing which might be due to availability of more space for each vine in higher spacing which might have increased the basal stem diameter. With increase in pruning level the basal stem diameter was found to be increased from P_1 to P_3, except at 30 DAS. This might be the effect of pruning, as the number of branches per vine were increased with increase in pruning level from P_1 to P_3 they might have affected the basal stem diameter. The similar results were also reported by Fadhil (2011) [2] in cucumber.

3.5 Effect of interactions of spacing and pruning on number of branches per vine in bottle gourd at various stages of growth

The effect of interactions of spacing and pruning on the number of branches per vine in bottle gourd at 30 DAS showed non-significant difference among the different treatment combinations. The effect of interactions of spacing and pruning on the number of branches per vine in bottle gourd at 45 DAS showed significant difference among the different treatment combinations. However, the maximum number of branches per vine were recorded in S_1P_1 (5.20) which was significantly superior over all the treatment combinations. The minimum number of branches per vine were observed in S_1P_2 (3.07). The effect of interactions of spacing and pruning on the number of branches per vine in bottle gourd at 60 DAS showed significant differences among the different treatment combinations. However, the maximum number of branches per vine were recorded in S_1P_1 (7.47) which was significantly superior over all the interactions. Whereas, the minimum number of branches per vine were observed in S_2P_3 (4.60). Result were significant with respect to effect of interactions of spacing and pruning on number of branches per vine in bottle gourd at 75 DAS. However, the maximum number of branches per vine were produced in S_1P_1 (17.53) which was significantly superior over all interactions. The minimum number of branches per vine were observed in S_3P_3 (11.40).

The effect of interactions of spacing and pruning on the number of branches per vine in bottle gourd at 90 DAS showed significant differences in different treatment combinations. However, the maximum number of branches per vine were produced in S_1P_1 (17.93) which was significantly superior over all the treatment combinations. Whereas, the minimum number of branches per vine were observed in S_3P_3 (12.20).

The effect of interactions of spacing and pruning on the number of branches per vine in bottle gourd at last harvest showed non-significant differences among the different treatment combinations. It is seen from the Table 5 that the number of branches per vine were increased from 30 DAS (2.07) to 90 DAS (14.88) and then decreased at last harvest (11.90). The decrease in branches at last harvest may be due to drying of branches to some extent which were not counted. It is seen form the data that no specific trend of number of branches per vine was observed with respect to spacing treatments. However, treatment S_1(0.5mt spacing) has recorded maximum number of branches throughout growth period. This may be the effect of minimum spacing at S_1 which might have induced more number of branches.

Similar findings were reported by Nweke *et al.* (2013) [7] in cucumber and Oga and Umekw (2016) [8] in watermelon. In case on interactions of spacing and pruning, interaction S_1P_1 recorded maximum number of branches per vine from 45 DAS till last harvest. This might be the combined effect of minimum spacing and early pruning of vine. Similar findings were recorded by Humphries *et al.* (2004) [3] in cucumber.

3.6 Effect of interactions of spacing and pruning on number of nodes per vine in bottle gourd at various stages of growth

The effect of interactions of spacing and pruning on the number of nodes per vine in bottle gourd at 30 and 45 DAS showed non-significant differences among the different treatment combinations. The effect of interactions of spacing and pruning on the number of nodes per vine in bottle gourd at 60 DAS showed significant differences among the different treatment combinations. However, the maximum number of nodes per vine were recorded in S_3P_3 (21.00) which was significantly superior over all the interactions. The minimum number of nodes per vine were observed in S_1P_1 (13.87). The effect of interactions of pruning and spacing on the number of nodes per vine in bottle gourd at 75 DAS showed significant differences. However, the maximum number of nodes per vine were produced in S_3P_3 (24.20) which was significantly superior over all the treatments. Whereas, the minimum number of nodes per vine were observed in S_1P_1 (13.87). Significant differences were observed in number of nodes per vine with respect to interactions of spacing and pruning. However, the maximum number of nodes per vine were produced in S_3P_3 (28.53) which was significantly superior over all the treatments. The minimum number of nodes per vine were observed in S_1P_1(13.87). The effect of interactions

of spacing and pruning on the number of nodes per vine in bottle gourd at last harvest showed non-significant differences among the different interactions. It is seen from the data that number of nodes per vine were increased from 30 DAS (3.40) to 90 DAS (19.59) and slightly decreased at last harvest (18.40).

The above results indicated that there was a linear increase in the nodes of vine due to increase in the spacing. Wider spacing in S_3 provided favourable environment which reduced the competition for nutrients resulting in increased length and hence increases in nodes. Similar results were reported by Kanwar *et al*. (1993) [5] in squash melon, Jan *et al.* (2000) [4] in bottle gourd, Parasanna *et al.* (2004) [11] in ridge gourd, Sabo *et al*. (2013) [13] in watermelon, Karde (2014) [6] in zucchini and Oga and Umekw (2016) [8] in watermelon.

3.7 Effect of interactions of spacing and pruning on number of days required for branching per vine

The interactions of spacing and pruning on the number of days required for branching per vine in bottle gourd showed non-significant differences among the different treatment combinations.

3.8 Effect of interactions of spacing and pruning on number of days required for vining per vine in bottle gourd

The interactions of spacing and pruning on the number of days required for vining per vine in bottle gourd showed non-significant differences among different treatment combinations.

Table 1: Effect of spacing and pruning on length of vine (cm) of bottle gourd Var. Samrat at various stages of growth

Spacing(S)	30 DAS			Mean	45 DAS			Mean	60 DAS			Mean
	Pruning (P)				Pruning (P)				Pruning (P)			
	P1	P2	P3		P1	P2	P3		P1	P2	P3	
S1	11.57	11.23	10.27	11.02	82.07	83.00	102.33	89.13	100.00	200.00	189.53	163.18
S2	12.03	11.83	13.23	12.37	85.73	77.80	108.73	90.76	100.00	200.00	196.40	165.47
S3	12.55	12.71	13.61	12.96	90.13	106.93	106.47	101.18	100.00	200.00	204.93	168.31
Mean	12.05	11.93	12.37	12.12	85.98	89.24	105.84	93.69	100.00	200.00	196.96	165.65
	Result	SE.m	CD at 5%		Result	SE.m	CD at 5%		Result	SE.m	CD at 5%	
Spacing(s)	NS	0.53	NS		SIG	3.18	9.81		SIG	1.25	3.84	
Pruning(P)	NS	0.74	NS		SIG	2.20	6.77		SIG	5.18	15.96	
Interaction (Sxp)	NS	0.91	NS		NS	5.51	NS		SIG	2.16	6.65	
Spacing (S)	75 DAS			Mean	90 DAS			Mean	At last harvest			Mean
	Pruning (P)				Pruning (P)				Pruning (P)			
	P1	P2	P3		P1	P2	P3		P1	P2	P3	
S1	100.00	200.00	213.40	171.13	100.00	200.00	232.73	177.58	100.00	200.00	256.93	185.64
S2	100.00	200.00	231.80	177.27	100.00	200.00	238.00	179.33	100.00	200.00	244.40	181.47
S3	100.00	200.00	233.53	177.84	100.00	200.00	241.60	180.53	100.00	200.00	241.53	180.51
Mean	100.00	200.00	226.24	175.41	100.00	200.00	237.44	179.15	100.00	200.00	247.62	182.54
	Result	SE.m	CD at 5%		Result	SE.m	CD at 5%		Result	SE.m	CD at 5%	
Spacing(s)	SIG	1.86	5.72		SIG	0.26	0.79		SIG	1.27	3.9	
Pruning(P)	SIG	2.03	6.26		SIG	1.69	5.22		SIG	2.15	6.62	
Interaction (Sxp)	SIG	3.21	9.90		SIG	0.44	1.37		SIG	2.19	6.76	

Table 2: Effect of spacing and pruning on number of leaveas per vine in bottle gourd Var. Samrat at various stages of growth

Spacing(S)	30 DAS			Mean	45 DAS			Mean	60 DAS			Mean
	Pruning (P)				Pruning (P)				Pruning (P)			
	P1	P2	P3		P1	P2	P3		P1	P2	P3	
S1	7.40	6.53	7.47	7.13	25.53	29.00	33.53	29.36	64.33	67.00	70.00	67.11
S2	8.20	5.53	7.40	7.04	26.53	30.80	34.67	30.67	65.00	68.00	71.00	68.00
S3	7.53	6.47	7.73	7.24	28.00	32.07	36.73	32.27	66.00	69.00	73.27	69.42
Mean	7.71	6.18	7.53	7.14	26.69	30.62	34.98	30.76	65.11	68.00	71.42	68.18
	Result	SE.m	CD at 5%		Result	SE.m	CD at 5%		Result	SE.m	CD at 5%	
Spacing(s)	NS	0.37	NS		SIG	0.25	0.77		SIG	0.11	0.35	
Pruning(P)	NS	0.38	NS		SIG	0.72	2.22		SIG	0.13	0.40	
Interaction (Sxp)	NS	0.64	NS		NS	0.43	NS		SIG	0.19	0.60	
Spacing (S)	75 DAS			Mean	90 DAS			Mean	At last harvest			Mean
	Pruning (P)				Pruning (P)				Pruning (P)			
	P1	P2	P3		P1	P2	P3		P1	P2	P3	
S1	73.07	79.27	84.47	78.93	68.67	71.67	74.67	71.67	53.73	62.60	65.60	60.64
S2	75.20	81.87	85.33	80.80	69.67	72.67	75.67	72.67	59.07	64.73	66.67	63.49
S3	78.47	82.40	89.07	83.31	70.67	73.67	77.33	73.89	66.20	66.73	67.87	66.93
Mean	75.58	81.18	86.29	81.01	69.67	72.67	75.89	72.74	59.67	64.69	66.71	63.69
	Result	SE.m	CD at 5%		Result	SE.m	CD at 5%		Result	SE.m	CD at 5%	
Spacing(s)	SIG	0.41	1.28		SIG	0.07	0.21		NS	2.24	NS	
Pruning(P)	SIG	1.01	3.12		SIG	0.07	0.21		SIG	1.30	4.02	
Interaction (Sxp)	NS	0.72	NS		SIG	0.12	0.36		NS	3.88	NS	

Table 3: Effect of spacing and pruning on internodal length (cm) in bottle gourd Var. Samrat at various stages of growth

Spacing(S)	30 DAS			Mean	45 DAS			Mean	60 DAS			Mean
	Pruning (P)				Pruning (P)				Pruning (P)			
	P1	P2	P3		P1	P2	P3		P1	P2	P3	
S1	3.84	3.52	3.86	3.74	5.55	5.52	6.30	5.79	6.76	8.16	8.98	7.97
S2	3.04	4.25	4.42	3.90	5.52	5.67	6.90	6.03	7.10	8.23	9.59	8.30
S3	3.61	3.72	3.37	3.57	5.47	6.18	7.45	6.37	7.86	8.46	10.65	8.99
Mean	3.50	3.83	3.88	3.73	5.51	5.79	6.89	6.06	7.24	8.28	9.74	8.42
	Result	SE.m	CD at 5%		Result	SE.m	CD at 5%		Result	SE.m	CD at 5%	
Spacing(s)	NS	0.12	NS		SIG	0.08	0.24		SIG	0.07	0.22	
Pruning(P)	NS	0.18	NS		SIG	0.15	0.46		SIG	0.40	1.24	
Interaction (Sxp)	SIG	0.21	0.66		SIG	0.14	0.42		SIG	0.12	0.38	
Spacing (S)	75 DAS			Mean	90 DAS			Mean	At last harvest			Mean
	Pruning (P)				Pruning (P)				Pruning (P)			
	P1	P2	P3		P1	P2	P3		P1	P2	P3	
S1	5.66	7.15	8.65	7.15	5.50	7.59	8.94	7.34	5.50	7.59	10.88	7.99
S2	6.19	7.60	9.30	7.70	5.91	8.56	9.75	8.07	5.91	8.56	10.60	8.35
S3	6.63	8.12	11.23	8.66	6.23	8.44	10.90	8.53	6.23	8.44	13.18	9.29
Mean	6.16	7.62	9.73	7.83	5.88	8.20	9.86	7.98	5.88	8.20	11.55	8.54
	Result	SE.m	CD at 5%		Result	SE.m	CD at 5%		Result	SE.m	CD at 5%	
Spacing(s)	SIG	0.12	0.38		SIG	0.10	0.31		SIG	0.19	0.58	
Pruning(P)	SIG	0.10	0.30		SIG	0.23	0.72		SIG	0.23	0.69	
Interaction (Sxp)	SIG	0.21	0.65		SIG	0.18	0.54		SIG	0.32	1	

Table 4: Effect of spacing and pruning on basal stem diameter (mm) in bottle gourd Var. Samrat at various stages of growth

Spacing(S)	30 DAS			Mean	45 DAS			Mean	60 DAS			Mean
	Pruning (P)				Pruning (P)				Pruning (P)			
	P1	P2	P3		P1	P2	P3		P1	P2	P3	
S1	7.46	8.15	8.22	7.94	8.80	11.36	13.01	11.05	11.17	13.54	15.37	13.36
S2	8.57	7.43	8.40	8.14	9.94	11.95	13.75	11.88	11.97	14.05	15.67	13.90
S3	8.59	8.15	9.29	8.68	10.72	12.03	14.61	12.45	13.08	14.80	16.05	14.64
Mean	8.21	7.91	8.64	8.25	9.82	11.78	13.79	11.79	12.07	14.13	15.70	13.97
	Result	SE.m	CD at 5%		Result	SE.m	CD at 5%		Result	SE.m	CD at 5%	
Spacing(s)	NS	0.30	NS		SIG	0.11	0.33		SIG	0.09	0.28	
Pruning(P)	NS	0.23	NS		SIG	0.23	0.70		SIG	0.31	0.95	
Interaction (Sxp)	NS	0.52	NS		SIG	0.19	0.57		SIG	0.16	0.49	
Spacing (S)	75 DAS			Mean	90 DAS			Mean	At last harvest			Mean
	Pruning (P)				Pruning (P)				Pruning (P)			
	P1	P2	P3		P1	P2	P3		P1	P2	P3	
S1	14.42	15.28	16.64	15.44	13.32	15.44	17.06	15.27	14.36	15.80	17.11	15.76
S2	14.66	15.65	16.76	15.69	14.03	16.20	18.10	16.11	14.13	16.63	18.18	16.31
S3	15.10	16.10	18.31	16.50	14.77	16.73	20.18	17.23	14.89	17.04	20.21	17.38
Mean	14.73	15.67	17.23	15.88	14.04	16.12	18.45	16.20	14.46	16.49	18.50	16.48
	Result	SE.m	CD at 5%		Result	SE.m	CD at 5%		Result	SE.m	CD at 5%	
Spacing(s)	SIG	0.11	0.33		SIG	0.14	0.45		SIG	0.18	0.54	
Pruning(P)	SIG	0.24	0.70		SIG	0.15	0.47		SIG	0.23	0.71	
Interaction (Sxp)	SIG	0.19	0.58		SIG	0.25	0.77		SIG	0.31	0.94	

Table 5. Effect of spacing and pruning on number of branches per vine in bottle gourd Var. Samrat at various stages of growth

Spacing (S)	30 DAS			Mean	45 DAS			Mean	60 DAS			Mean
	Pruning (P)				Pruning (P)				Pruning (P)			
	P1	P2	P3		P1	P2	P3		P1	P2	P3	
S1	2.00	2.27	2.27	2.18	5.20	3.07	3.53	3.93	7.47	4.73	4.80	5.67
S2	1.87	2.00	2.00	1.96	3.13	3.27	3.73	3.38	5.93	5.20	4.60	5.24
S3	2.33	2.13	1.73	2.07	4.40	3.33	3.80	3.84	6.80	5.33	4.73	5.62
Mean	2.07	2.13	2.00	2.07	4.24	3.22	3.69	3.72	6.73	5.09	4.71	5.51
	Result	SE.m	CD at 5%		Result	SE.m	CD at 5%		Result	SE.m	CD at 5%	
Spacing(s)	NS	0.11	NS		SIG	0.06	0.18		SIG	0.09	0.29	
Pruning(P)	NS	0.07	NS		SIG	0.14	0.44		SIG	0.28	0.87	
Interaction (Sxp)	NS	0.20	NS		SIG	0.10	0.31		SIG	0.16	0.51	
Spacing (S)	75 DAS			Mean	90 DAS			Mean	At last harvest			Mean
	Pruning (P)				Pruning (P)				Pruning (P)			
	P1	P2	P3		P1	P2	P3		P1	P2	P3	

S1	17.53	14.27	12.73	14.84	17.93	15.07	13.33	15.44	14.60	12.67	10.00	12.42
S2	16.27	14.00	12.20	14.16	16.87	14.73	12.80	14.80	13.87	11.53	9.73	11.71
S3	15.73	13.60	11.40	13.58	16.60	14.40	12.20	14.40	13.73	11.67	9.33	11.58
Mean	16.51	13.96	12.11	14.19	17.13	14.73	12.78	14.88	14.07	11.96	9.69	11.90
	Result	SE.m	CD at 5%		Result	SE.m	CD at 5%		Result	SE.m	CD at 5%	
Spacing(s)	SIG	0.10	0.31		SIG	0.05	0.17		NS	0.2311	NS	
Pruning(P)	SIG	0.46	1.42		SIG	0.38	1.17		SIG	0.47	1.45	
Interaction (Sxp)	SIG	0.17	0.53		SIG	0.09	0.29		NS	0.4003	NS	

Table 6: Effect of spacing and pruning on number of nodes per vine in bottle gourd Var. Samrat at various stages of growth

Spacing(S)	30 DAS			Mean	45 DAS			Mean	60 DAS			Mean	
	Pruning (P)				Pruning (P)				Pruning (P)				
	P1	P2	P3		P1	P2	P3		P1	P2	P3		
S1	3.13	3.35	2.73	3.07	12.00	14.07	15.53	13.87	13.87	16.67	19.53		16.69
S2	4.00	2.87	3.20	3.36	12.73	14.47	16.00	14.40	15.07	17.60	20.07		17.58
S3	3.67	3.53	4.13	3.78	13.80	15.07	16.33	15.07	16.07	18.33	21.00		18.47
Mean	3.60	3.25	3.36	3.40	12.84	14.53	15.96	14.44	15.00	17.53	20.20		17.58
	Result	SE.m	CD at 5%		Result	SE.m	CD at 5%		Result	SE.m	CD at 5%		
Spacing(s)	NS	0.18	NS		SIG	0.11	0.33		SIG	0.05	0.16		
Pruning(P)	NS	0.19	NS		SIG	0.13	0.39		SIG	0.17	0.53		
Interaction (Sxp)	NS	0.32	NS		NS	0.19	NS		SIG	0.09	0.28		
Spacing (S)	**75 DAS**			**Mean**	**90 DAS**			**Mean**	**At last harvest**				**Mean**
	Pruning (P)				**Pruning (P)**				**Pruning (P)**				
	P1	**P2**	**P3**		**P1**	**P2**	**P3**		**P1**	**P2**	**P3**		
S1	13.87	16.67	22.20	17.58	13.87	16.67	25.53	18.69	13.87	16.67	22.13		17.56
S2	15.07	17.60	21.33	18.00	15.07	17.60	24.67	19.11	15.07	17.60	22.67		18.44
S3	16.07	18.33	24.20	19.53	16.07	18.33	28.53	20.98	16.07	18.33	23.20		19.20
Mean	15.00	17.53	22.58	18.37	15.00	17.53	26.24	19.59	15.00	17.53	22.67		18.40
	Result	SE.m	CD at 5%		Result	SE.m	CD at 5%		Result	SE.m	CD at 5%		
Spacing(s)	SIG	0.18	0.54		SIG	0.26	0.79		SIG	0.31	0.95		
Pruning(P)	SIG	0.57	1.74		SIG	1.26	3.56		SIG	0.90	2.78		
Interaction (Sxp)	SIG	0.30	0.94		SIG	0.44	1.36		NS	0.54	NS		

Table 7: Effect of spacing and pruning on number of days required for branching and vining in bottle gourd Var. Samrat

Spacing (S)	Number of days required for branching				Mean	Number of days required for vining		
	Pruning (P)					Pruning (P)		Mean
	P1	P2	P3		P1	P2	P3	
S1	33.47	33.13	32.40	33.00	37.67	36.00	36.67	36.78
S2	33.60	33.33	32.07	33.00	35.80	33.40	35.47	34.89
S3	32.67	31.87	32.00	32.18	35.60	35.87	35.93	35.80
Mean	33.24	32.78	32.16	32.73	36.36	35.09	36.02	35.82
	Result	SE.m	CD at 5%		Result	SE.m	CD at 5%	
Spacing(s)	NS	0.33	NS		NS	0.72	NS	
Pruning(P)	NS	0.24	NS		NS	0.85	NS	
Interaction (Sxp)	NS	0.57	NS		NS	1.26	NS	
S1: Spacing at 0.5m	S2: Spacing at 0.75m		S3: Spacing at 1m	P1: Pruning at 1m length		P2: Pruning at 2m length		P3: No Pruning

4. Conclusion

The growth observations i.e. length of vine, internodal length and basal stem diameter at last harvest showed significant results with respect to interactions of spacing and pruning. However, at last harvest number of leaves, number of branches per vine, number of nodes per vine and days required for branching and vining showed non-significant results. The result showed that at last harvest stage maximum length of vine was recorded by interaction S_1P_3 (256.93 cm) and S_3P_3 recorded maximum internodal length (13.18 cm) and basal stem diameter (20.21 mm).

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