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EFFECT OF VINE PRUNING ON YIELD AND QUALITY OF SWEET GOURD (*CUCURBITA MUSCHATA*)

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Abstract

A study was conducted to evaluate the pruning response on yield performance and fruit quality of sweet gourd at four different treatments viz.T_1 (Maintaining three secondary vines after pruning), T_2 (Maintaining four secondary vines after pruning), T_3 (Maintaining five secondary vines after pruning) and T_4 (control).T_1 treatment (3-vine), T_2 treatment (4-vine) and T_3 treatment (5-vine) showed statistically similar performance (0.43, 0.49 and 0.45 respectively) in respect of number of fruits per vine.T_3 treatment (5-vine) produced the highest number of fruits per plant (2.23). The fruit yield significantly varied ranging from 2.24 to 3.57 kg/plant among the treatments. The treatment T_3 (5-vine) produced the highest yield per plant (3.57 kg) resulting commercial yield 11.90 ton/ha. The highest percentage (57%) of large fruits (>2000g) was obtained from T_1 treatment. The highest percentage of flat round (78%), ball round (28%) and oval (44%) shape of fruit was found in T_3 treatment (5-vine) and T_2 treatment (4-vine) respectively. Carotene content varied significantly among the treatments ranging from 0.158 mg to 0.223 mg/100g of best sweet gourd. T_3 treatment (5-vine) produced the fruit which was the highest in carotene content and T_2 (4-vine) produced the lowest carotene content fruit. Total soluble solids ranged from 7.67% to 10.50%. Reducing Sugar also varied significantly among the different treatments and the highest reducing sugar (0.84%) was found in the treatment T_3. Significant variation was observed in the total sugar ranging from 1.00 to 1.24%. The highest amount of non reducing sugar was showed by the T_3 treatment (5-vine).

Keywords: Pruning response, vine pruning, fruit quality.

Introduction

Sweet gourd is relatively high in energy and carbohydrate and a good source of vitamins, especially high carotenoid pigments and minerals (Bose and Som, 1998). Pruning is an effective technique for improving fruit yield in sweet gourd. Pruning is a crucial step for pumpkin production. Number of nodes per plant, stem length and days to 50% male and female flower of vine crop were significantly

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affected by pruning (Humphries *et al.* 2004). Pruning is performed to achieve a balance between vine growth and fruit set (Bantoc, 2006). There was significant differences among the types of pruning on the total yield and yield compounds concerning with quality (Peyvast and Charawi, 2004).The sink reduction (fruit number per plant) provided fruits with higher values of net rind, pulp thickness, length, diameter, total soluble solids, total soluble sugars and non-reducing sugars (Queiroga *et al.* 2008).The present investigation was undertaken to evaluate the pruning response on yield performance and fruit quality of sweet gourd.

Materials and Methods

The experiment was conducted at the research farm as well as in the seed technology laboratory of Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur during the period from, August, 2008 to January, 2009.An advanced sweet gourd line collected from Genetics and Plant Breeding Department of BSMRAU was included in this study.There were four different treatments viz.T_1 (Maintaining three secondary vines after pruning), T_2 (Maintaining four secondary vines after pruning), T_3 (Maintaining five secondary vines after pruning) and T_4 (control). The treatments were randomly distributed to the experimental plots. Only 3, 4 and 5 secondary vines (T_1, T_2 and T_3 treatments) developed on each of the main vines were kept randomly and others were removed. Tertiary small branches and buds developed from secondary branches were pruned regularly and cut ends were buried. In case of control treatment the plants were totally un-pruned. Three plants were selected at random from each plot for recording data. The experiment was laidout using Randomized Complete Block Design (RCBD) with three replications.The fertilizers cow dung, TSP, Urea and MP were applied at the rate of 15000, 125, 150 and 100kg/ha (Anonymous, 2005). The experimental land was prepared by deep and cross ploughing and harrowing followed by laddering. In each 5m x 3m size plot, five pits of 30cm x 30cm x 30cm were prepared. Main vines were pruned when they attained a length of about 1.00m to 1.50 m.

Determination of β-carotene: At first two grams of sweet gourd was taken and then homogenized with twenty milliliters acetone-hexane (4:6 by V/v) solution. The sample was centrifuged after filtering. Then optical density was measured by using UV-2100 spectrophotometer at 663 nm, 645 nm, 505 nm and 453 nm.

Determination of ascorbic acid: Ascorbic acid was determined as per procedure described by Pleshkov (1976).

Total ascorbic acid: Ten ml of the prepared extract was taken in a conical flask and extract was passed through cation exchange column (CG-IR-120). To the extract five ml of 5% KI, two ml of glacial acetic acid were added. Finally it was titrated with 0.00IN KIO3 solution.

Estimation of Sugars: Reducing, non-reducing and total sugars were estimated by Somogyi (1952) using Bertrand A, Bertrand B and Bertrand C solutions.

Reducing sugar: Ten ml each of Bertrand A [40g $CuS0_4$ $5H_2O$ dissolved in water and diluted to 1 liter] and Bertrand B [200g of sodium-potassium tartarate and 150g of NaOH dissolved in water and diluted to 1 liter] solutions were added to five ml of sample solution. The precipitation was washed repeatedly until blue color was present. Then 10 ml of Bertrand C [To 50g Fe2 $(S0_4)3$, 115ml of conc. H_2SO_4 was added and diluted to 1 liter] solution was added to dissolve the precipitation. Finally the solution was titrated with 0.4% KMn04 solution. Reducing sugar was calculated comparing tabulated values. Before calculation of reducing sugar factor 0.4% KMnO4 was determined.

Total sugar: Five milliliter of the extract solution was taken in a volumetric flask and 2-3 drops of 4N HC1 was added. The flask was boiled for three minutes on a hot plate for hydrolysis. The extract was neutralized after cooling with IN NaOH. The rest of the procedure was same as mentioned in reducing sugar.

Non-reducing or invert sugar: Non-reducing sugar was calculated by deducting reducing sugar from total sugar.

Statistical analysis: The recorded data on different parameters were statistically analyzed by using MSTAT software to find out the significance of variation resulting from the experimental treatments. The difference between the treatments means were judged by Duncan's Multiple Range Test (DMRT).

Results and Discussion

Number of node for first male flower: The nodal position of male flower opening showed significant variation (Table 1) and the T_1 (3-vine) treatment (6.63) was highest in this respect which was statistically identical with the T_4 (control) treatment (5.98) and early male flower appeared in the T_3 (5-vine)

treatment (4.96) which was statistically different from the T_1. Humphries *et al.* (2004) reported that number of nodes per plant, stem length and days to 50% male and female flower of vine crop were significantly affected by pruning.

Number of node for first female flower: The highest number of node for first female flower opening was observed in the treatment T_1 keeping 3-vine (19.55) which was statistically similar with T_4 treatment and the lowest (16.93) number of node for first female flower opening was observed in the treatment T_3 (5-vine) (Table 1) which was statistically similar with T_2 (4 vine) treatment (17.74).

Number of male flowers/vine: Significant variation was observed among the treatments in respect of number of male flower/vine (Table 1). Highest number of male flower/vine was observed in the treatment T_1 (28.17) and the lowest number of male flower/vine was observed in the treatment T_3 (23.84). In this respect T_3 (23.84) performed better because our desire is less number of male and maximum number of female flower for getting higher yield.

Number of female flowers/vine: Number of female flower/vine showed non-significant variation among all the treatment combinations (Table 1).

Vine length (m): Significant variation was observed in vine length among the treatments (Table 1). The longest vine (2.87m) was observed in the treatment T_1 (3-vine) and the shortest vine was observed in the control treatment (2.31m) which was statistically different from each other. The differences may be due to the nutrient availability in pruning response. Bantoc (2006) reported that pruning is performed to achieve a balance between vine growth and fruit set.

No. of leaves/Vine: Significant variation was observed in the number of leaves per vine among the treatments (Table 1). The highest number of leaves/vine was observed in the treatment T_1 (3-vine) (37.93) and the lowest number of leaves/vine (30.56) was observed in the control treatment which was statistically different from each other. The highest number of leaves per plant was observed in the treatment T_3 (5-vine) (150.55) and the lowest number of leaves per plant (113.79) was observed in the T_1(3-vine) treatment which was statistically different from each other.

Table 1: Effect of vine pruning on the growth contributing character of sweet gourd

Treatment	Node for 1st male flower	Node for 1st female flower	Male flowers/ vine	Female flowers/ vine	Vine length (m)	Number of leaves/ Vine	Number of leaves/ plant
T_1(3-vine)	6.63 a	19.55 a	28.17 a	2.00	2.87 a	37.93 a	113.79 c
T_2(4-vine)	5.83 ab	17.74 b	25.47 bc	2.07	2.66 ab	34.86 ab	139.44 b
T_3 (5-vine)	4.96 b	16.93 b	23.84 c	1.83	2.49 bc	31.51 bc	150.55 ab
T_4 Control	5.98 a	19.46 a	26.77 ab	1.73	2.31 c	30.56 c	168.08 a
CV%	7.50	4.60	4.37	8.51	6.54	5.26	9.08

Fruit set /plant: T_3 treatment (5-vine) produced highest number of fruits per plant (2.23) which was statistically similar with T_2 treatment (4-vine) and control treatment (1.96 and 1.88 respectively). T_1 treatment (3-vine) produced lowest number of fruits per plant.Omidbaigi *et al.* (2006) reported that pruning at the 6-8 node stage significantly affected the number of fruits and fresh and dry weight of seeds per fruit and per plot.

Fruit Weight (g): Fruit Weight differed significantly among the tested treatments in respect of individual fruit weight (Table 2).The highest fruit weight was observed in the treatment T1(3-vine) and lowest fruit weight was found in the treatment T_4 (control) which was statistically different from each other. Bantoc (2006) reported that pruning increases average fruit weight while reducing the number of unmarketable (cull) fruit. Mohamed (2001) reported that the plant densities of 1.75 and 2 plants/m^2 gave the best yield, plant dry weight, flesh thickness, and minimal decrease in average fruit weight.

Fruit Size: Fruit size differed significantly among the treatments. Highest percentage (57%) of large fruits (>2000g) was obtained from T_1 treatment followed by T_3 treatment (5-vine) and lowest (11%) was obtained from T_4 treatment. Highest percentage (72%) of medium fruits (1000-2000g) was obtained from T_3 treatment (5-vine). However, highest percentage (22%) of small fruits was found in T_4 treatment (control).

Fruit Shape: Fruit shape in different treatment varied mainly due to inherent characters of cultivars. Highest percentage of flat round (78%), ball round (28%) and oval (44%) shape of

fruit was found in T_3 treatment (5-vine) and T_2 treatment (4-vine) respectively. On the other hand lowest percentage of flat round (28%), ball round (10%) and oval (11%) shape of fruit was found in T_2 treatment (4-vine), control and T_3 treatment (5-vine) respectively.

Yield (kg/plant): The fruit yield significantly varied ranging from 2.24 to 3.57 kg/plant among the treatments (Table 2). The treatment T_3 (5-vine) produced the highest yield per plant (3.57 kg or 11.90 ton/ha) which was statistically similar with the treatment T_2 (4-vine) and lowest yield was found in the treatment T_1 (3-vine), it was statistically different with the other treatments. Commercial fruit yield significantly varied among the treatments (Table 2).

Table 2: Effect of vine pruning on yield contributing character of sweet gourd

Treatment	Fruits set/ plant	Fruit Weight(g)	Yield (kg/plant)	Yield (t/ha)	Fruit size			Fruit shape		
					Small <1000g (%)	Medium 1000-2000g (%)	Large >2000g (%)	Flat round (%)	Ball round (%)	Oval (%)
T_1(3-vine)	1.30 b	1716.67 a	2.24 b	7.47 b	0.0 c	43 b	57 a	58 b	13 b	29 b
T_2(4-vine)	1.96 a	1606.67 ab	3.13 a	10.43 a	12 b	71 a	17 c	28 c	28 a	44 a
T_3 (5-vine)	2.23 a	1594.33 ab	3.57 a	11.90 a	0.0 c	72 a	28 b	78 a	11 b	11 c
T_4 Control	1.88 a	1478.33 b	2.76 ab	9.20 ab	22 a	67 a	11 c	55 b	10 b	35ab
CV%	14.57	4.25	14.01	12.42	12.39	3.78	8.99	6.21	14.08	12.27

Carotene content (mg/100g): Carotene content varied significantly among the treatments ranging from 0.158 mg to 0.223 mg (Table 3). T_3 treatment (5-vine) produced the fruit which was highest in carotene content and T_2 (4-vine) produced the lowest carotene content fruit. T_1 treatment (3-vine) and control treatment produced the intermediate carotene content fruit.

Ascorbic Acid (mg/100g)Non significant variation was observed among the treatments in respect of Ascorbic Acid contentin sweet gourd (Table 3).

Total Soluble Solids (Brix %): Significant variation was observed in the total soluble solids ranging from 7.67% to 10.50% (Table 3). T_2 (4 vine), T_3 (5 vine) and control treatment showed statistically identical TSS i.e. brix %. The lowest TSS (7.67%) was found in the T_1 treatment (3-vine).Dhillon (2004) studied Total soluble solids (TSS) content and reported the range of 15.2-17.4%, while

juice acidity was in the range 0.59-17.4%. TSS content increased with increasing pruning severity.

Reducing Sugar (%): Reducing Sugar (%) also varied significantly among the different treatments and the highest reducing sugar (0.84%) was found in the T_3 treatment (Table 3). The lowest amount of reducing sugar was found in the treatment T_1 (3-vine). Highest sugar yield/m^2 leaf (82.0 g/m^2) was obtained with 24 buds/vine and medium shoot length, and this combination was also recommended for a good balance between grape quality and yield.

Total Sugar (%): Significant variation was observed in the total Sugar ranging from 1.00 to 1.24 (Table 6). T_2 (4 vine), T_3 (5 vine) and control treatment showed statistically identical total Sugar%. The lowest (1.00) was found in the T_1 treatment (3-vine).

Non reducing sugar (%): Highest amount of non reducing sugar was showed by the T_3 treatment (5-vine) and lowest in T_2 treatment (4-vine). Queiroga *et al.* (2008) reported that the sink reduction (fruit number per plant) provided fruits with higher values of net rind, pulp thickness, length, diameter, total soluble solids, total soluble sugars and non-reducing sugars. The number of fruits per plants did not affect the titratable acidity and reducing sugars.

Table 3: Nutrient content of sweet gourd as influenced by vine pruning

Treatment (%)	Carotene (mg/100g) Sugar (%)	Ascorbic Acid (mg/100g)NS Sugar (%)	TSS	Reducing sugar (%)	Total	Non reducing
T_1(3-vine)	0.170 ab	5.81	7.67 b	0.63 c	1.00 b	0.37 ab
T_2(4-vine)	0.158 b	5.83	9.47 a	0.77 b	1.12 a	0.35 b
T_3 (5-vine)	0.223 a	5.83	10.50 a	0.84 a	1.24 a	0.40 a
T_4 Control	0.217 ab	6.44	10.10 a	0.80 ab	1.16 a	0.36 b
CV%	13.36	5.99	5.69	4.34	5.85	4.51

Values in a column with same letter (s) are statistically similar at 5% level of significance by DMRT

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