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Effect of Support System on the Growth and Yield of Honeydew Melon (*Cucumis melo* L. Var. *Indorus* Naud.)

[1]A.S.M. Harunor Rashid, [2]S.P. Chakma, [2]M. Islam and [2]S. Roy

[1]Principal Scientific Officer
[2]Scientific Officer, Hill Agricultural Research Station,
Raikhali, Rangamati Hill District, Bangladesh

Abstract: A field experiment comprising five different supporting systems *viz.*, T_1 = vertical support system by bamboo branches, T_2 = vertical support system by rope wire, T_3 = horizontal support system by bamboo macha (trellis), T_4 = horizontal support system by bamboo branches just lying over ground, T_5 = control (without support) was conducted at the Hill Agricultural Research Station, Raikhali, Chandraghona, Rangamati Hill District during 2012 and 2013 to find out the proper supporting system for the growth and yield of honeydew melon (chinal) in hill valley of Chittagong Hill Tracts. The number of node at 1st male (8.63) and female flowers (17.95) were higher in control. The maximum number of fruits (9.08) was found in T_3 that was statistically similar to T_1 and T_2 while the minimum (4.05) in control. The peak of fruit rot was counted in control, whereas no fruit rot in T_1, T_2 and T_3. The highest yield (26.75 t/ha) was observed in T_3 and the lowest (13.68 t/ha) in control that was half of the previous.

Key words: Honeydew · Chinal · Support system · Hill valley · Yield

INTRODUCTION

Honeydew melon, locally known as chinal (*Cucumis melo* L. var. *indorus* Naud.) is one of the most expensive and in demand fruit vegetables in the world. It belongs to the cultivar group of melon Indorus group under the family of Cucurbitaceae [1-3]. The origin of this crop is uncertain and has been cultivated since ancient time in Asia, West Africa and Mediterranean regions [4]. It is vine tender annual crop and commonly known as winter melon that has fruit with little of the musky odor, ripening late and smooth surface [5]. Mature fruits are eaten fresh which is rich in sugars, vitamins and minerals. Each 100 g edible portion contains 0.6-1.2 g protein, 500 – 4200 IU Vitamin A, 6-60 mg Vitamin C and 130 – 330 mg potassium [6]. In 2004 honeydew consumption was 2.2 pounds in the United States. Melon consumption in the United States is high for a variety of reasons including health consciousness of consumers, improved year round availability, creative marketing and improved varieties. The largest producers of cantaloupes and other melons worldwide in 2004 was China. While by acreage and weight, California leads the United State in honeydew production. The world's largest exporter of cantaloupe and other melons is Spain, followed by the United States and the Costarica [7]. Immature fruits can be used in salads, cooked or pickled. There is no released variety of honey dew (chinal) in Bangladesh. It is not familiar to the most of consumers of Bangladesh as because of unavailability in the market. It will be an emerging vegetable fruits in Bangladesh. However, the information on variety or local cultivars, morphology, agronomy, production technology and yield potential of this crop under local climatic condition is scarce that can be considered as a major obstacle to develop and popularize this nutritionally important vegetables fruits in Bangladesh. There are a lot of locally cultivating lines of honey dew available in Chittagong Hill Tracts those are cultivated along with jum (shifting cultivation). These locally cultivated lines are grown without trellis or macha but on the ground that cause fruit rot and fruit drops severely. It reduces the yield of honey dew.

Corresponding Author: A.S.M. Harunor Rashid, Principal Scientific Officer, Raikhali, Rangamati Hill District, Bangladesh.

Trellising improves total and marketable yield compared with ground culture [8]. Because it is a useful technique to utilize vertical space and to keep crops off the ground resulting in clearer and quality fruits that are less susceptible to rot, to certain soil borne diseases and insects and to ground dwelling pests. Trellising also improves air circulation around plants and can help to reduce foliar disease problem [4]. It increases harvesting efficiency by reducing damage to vines and improving net photosynthetic rate [8]. Therefore, this experiment was carried out to evaluate the growth and yield of honeydew melon (chinal) considering different support system.

MATERIALS AND METHODS

The experiment was conducted at Agricultural Research Station, Raikhali, Chandraghona, Rangamati Hill District during 2012 and 2013 to find out the proper supporting system for the growth and yield of honeydew (chinal) in hill valley of Chittagong Hill Tracts (CHT). The experimental site belongs to AEZ 29 with the piedmont plain soil having medium loamy to moderately fine textured soil (sandy clay loam), 0.48% organic matter and its pH was 6.5 – 6.8. The honeydew genotype CMRai008, variety in pipeline to release as BARI Chinal-1, was used in the experiment. Five supporting systems *viz.*, T_1 = vertical support system by bamboo branches, T_2 = vertical support system by rope wire, T_3 = horizontal support system by bamboo macha (trellis), T_4 = horizontal support system by bamboo branches just lying over ground, T_5 = control (without support). The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. Seeds were directly sown in the field on 3rd April of two consecutive years 2012 and 2013. The unit plot size was 3 m × 2 m with spacing 2 m × 1.5 m. The soli was fertilized with well decomposed cow dung 10 tons, 80 kg N, 80 kg P_2O_5 and 90 kg K_2O per hectare of land. The entire quantity of cow dung, P_2O_5, 1/3rd of N and 1/3rd of K_2O were applied during final land preparation. The rest of N and K_2O were applied in three equal installments at 20, 40 and 60 days after sowing. The intercultural operations *viz.*, irrigation, mulching, weeding and plant protection measures were taken as and when necessary. Data were collected on the days to 1st male and female flowers, number of node at 1st male and female flowers, vine length at 1st male and female flowers, number of fruits per plant, average individual fruit weight, fruit length, fruit breadth and fruit yield. Data were statistically analyzed using computer MSTATC program.

RESULTS AND DISCUSSION

The data on growth and yield parameters as influenced by various treatments of different support systems in 2012 and 2013 are presented in the Table 1 to 4 and Fig. 1.

1st Flowering: The results revealed that there were significant differences in terms of days to 1st male and female flower in both the years of experimentation as influence by different support system treatments (Table 1). It was observed that treatment T_4 (horizontal support system by bamboo branches just lying over ground) required highest (42.22) days after sowing (DAS) for 1st male flowering which was as per to treatment T_3 = horizontal support system by bamboo macha (trellis) and shortest time (34.76) was required for Control

Table 1: Effect of support systems on 1st flowering of chinal (honey dew)

	Days to 1st male flower (DAS)			Days to 1st female flower (DAS)		
Treatments	2012	2013	Pooled	2012	2013	Pooled
T_1	40.24 a	39.66 ab	39.95	47.66 b	47.11 ab	47.39
T_2	39.44 a	38.56 ab	39.00	47.89 ab	47.34 ab	47.62
T_3	40.93 a	40.55 a	40.74	48.28 ab	47.38 ab	47.83
T_4	42.55 a	41.89 a	42.22	50.32 a	49.33 a	49.83
T_5	34.33 b	35.22 b	34.76	43.03 c	43.45 b	43.24
Mean	39.50	39.18	39.33	47.44	46.92	47.18
LSD (0.01)	3.59	4.81		2.36	3.85	
CV (%)	3.32	4.49		1.81	3.00	

Mean values in a column having the dissimilar letter/letters indicate significant differences at 0.01 levels of significance (DMRT)

Note: T_1 = Vertical support system by bamboo branches, T_2 = Vertical support system by rope wire, T_3 = Horizontal support system by bamboo macha (trellis), T_4 = Horizontal support system by bamboo branches just lying over ground, T_5 = Control (without support)

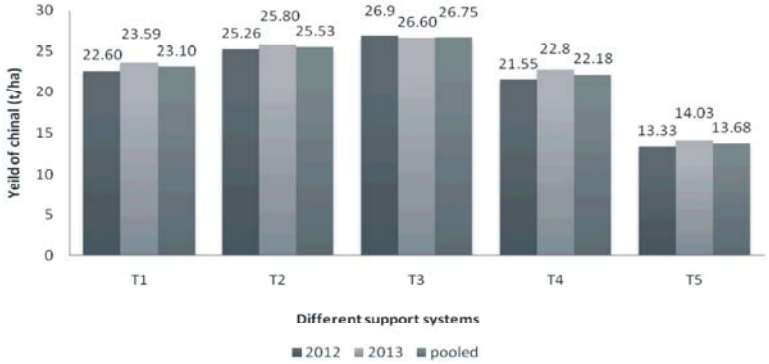

Fig 1: Effect of support systems on the yield of chinal (honeydew) during 2012 and 2013.

Table 2: Effect of support systems on number of node at 1st flower of chinal (honeydew)

	Number of nodes at 1st male flower			Number of nodes at 1st female flower		
Treatments	2012	2013	Pooled	2012	2013	Pooled
T_1	7.22 c	7.45 b	7.34	14.89 bc	14.89 b	14.89
T_2	7.56 bc	7.46 b	7.51	13.33 c	13.52 b	13.43
T_3	6.33 d	6.17 c	6.25	12.87 c	13.11 b	12.99
T_4	7.97 b	8.27 a	8.12	17.00 ab	17.39 a	17.19
T_5	8.56 a	8.70 a	8.63	17.67 a	18.22 a	17.95
Mean	7.53	7.61	7.57	15.15	15.43	15.29
LSD (0.01)	0.54	0.63		2.56	2.23	
CV (%)	2.64	3.04		6.16	5.27	

Mean values in a column having the dissimilar letter/letters indicate significant differences at 0.01 levels of significance (DMRT)

Note: T_1 = Vertical support system by bamboo branches, T_2 = Vertical support system by rope wire, T_3 = Horizontal support system by bamboo macha (trellis), T_4 = Horizontal support system by bamboo branches just lying over ground, T_5 = Control (without support)

Table 3: Effect of support systems on vine length at 1st flower of chinal (honey dew)

	Vine length at 1st male flower (cm)			Vine length at 1st female flower(cm)		
Treatments	2012	2013	Pooled	2012	2013	Pooled
T_1	109.40 bc	113.20 bc	111.30	204.30 b	205.30 b	204.80
T_2	110.80 bc	112.00 bc	111.40	216.80 a	218.10 a	217.45
T_3	118.40 b	120.10 b	119.25	184.80 c	182.10 c	183.45
T_4	98.67 c	99.00 c	98.84	203.20 b	204.00 b	203.60
T_5	138.20 a	138.70 a	138.45	206.80 b	209.90 b	208.35
Mean	115.11	116.60	115.86	203.18	203.89	203.54
LSD (0.01)	18.42	15.95		7.64	6.62	
CV (%)	5.84	4.99		1.37	1.19	

Mean values in a column having the dissimilar letter/letters indicate significant differences at 0.01 levels of significance (DMRT)

Note: T_1 = Vertical support system by bamboo branches, T_2 = Vertical support system by rope wire, T_3 = Horizontal support system by bamboo macha (trellis), T_4 = Horizontal support system by bamboo branches just lying over ground, T_5 = Control (without support)

(without support). In case of 1st female flowering treatment T_4 (horizontal support system by bamboo branches just lying over ground) required highest (49.83) DAS but shortest time (43.24) was required for Control (without support).

Number of Nodes at 1st Flower: Number of nodes at 1st flower varied significantly among different treatments (Table 2). The number of node at 1st flower of chinal were significantly higher (8.63 and 17.95, respectively) incase of control (without support) treatment for both male and female flower which is statistically similar with treatment T_4 (horizontal support system by bamboo branches just lying over ground). But lower number (6.25 and 12.99, respectively) of nodes at 1st flower was recorded at treatment T_3 (horizontal support system by bamboo macha) both case of male and female flower. It seems that horizontal direction is more preferable to node formation of chinal (honeydew) that vertical direction.

Table 4: Effect of support systems on fruit characters and fruit rot per plant of chinal (honey dew)

	Number of fruits per plant			Individual fruit weight (gm)			Fruit length (cm)			Fruit breadth (cm)			Number of fruit rot per plant		
Treatments	2012	2013	Pooled	2012	2013	Pooled	2012	2013	Pooled	2012	2013	Pooled	2012	2013	Pooled
T_1	7.46 ab	7.52 ab	7.49	1067 ab	1103 ab	1085.0	9.13 b	9.18 bc	9.16	8.23 a	8.18 a	8.21	0.0 c	0.0 c	0.0
T_2	7.89 ab	8.05 a	7.97	1127 ab	1127 ab	1127.0	9.50 ab	9.66 ab	9.58	8.33 a	8.17 a	8.25	0.0 c	0.0 c	0.0
T_3	9.11 a	9.04 a	9.08	1033 b	1054 b	1043.5	9.17 b	9.06 c	9.12	7.70 b	7.67 b	7.69	0.0 c	0.0 c	0.0
T_4	6.16 b	6.32 b	6.24	1220 a	1257 a	1238.5	10.00 a	9.87 a	9.94	8.13 a	8.23 a	8.18	1.7 b	1.5 b	1.6
T_5	4.00 c	4.09 c	4.05	1167 ab	1197 ab	1182.0	9.70 ab	10.11 a	9.91	8.17 a	8.09 a	8.13	3.7 a	3.2 a	3.5
Mean	6.92	7.00	6.96	1122.67	1147.53	1135.1	9.50	9.58	9.54	8.11	8.07	8.09	1.07	0.93	1.0
LSD (0.01)	1.82	1.47		148.70	147.70		0.75	0.57		0.35	0.40		0.53	0.36	
CV (%)	9.59	7.65		4.84	4.70		2.88	2.16		1.54	1.80		18.15	13.83	

Mean values in a column having the dissimilar letter/letters indicate significant differences at 0.01 levels of significance (DMRT)

Note: T_1 = Vertical support system by bamboo branches, T_2 = Vertical support system by rope wire, T_3 = Horizontal support system by bamboo macha (trellis), T_4 = Horizontal support system by bamboo branches just lying over ground, T_5 = Control (without support)

Vine Length at 1st Flower: Statistically significant result was found from different treatment incase of vine length at 1st flower (Table 3). The maximum vine length (138.45 cm) was found at control (without support) treatment, while the minimum (98.84 cm) was found at T_4 (horizontal support system by bamboo branches just lying over ground) which is statistically identical with T_1 and T_2 incase of male flower. But in female flower maximum vine length (217.45 cm) was found at T_2 (vertical support system by rope wire) and minimum (183.45 cm) was in T_3 (horizontal support system by bamboo macha). The maximum vine length was also observed in vertical support system than without support in cucumber by Okonmah [9].

Fruit Character: Significant variation in fruit character was observed due to different treatment of support system (Table 4). Number of fruits per plant ranged from 9.08 to 4.05. The maximum number (9.08) of fruits per plant was recorded at T_3 (horizontal support system by bamboo macha) that was statically similar to T_2 (vertical support system by rope wire) and identical to T_1 (vertical support system by bamboo branches),while the minimum (4.05) was recorded at control (without support).

Although number of fruits per plant was maximum at T_3,while the individual fruit weight (1043.5gm) was minimum. The highest number of fruits was also found on horizontal trellis in sponge gourd by Silva *et al.* [10]. The maximum individual fruit weight (1238.5gm) was found at T_4 (horizontal support system by bamboo branches just lying over ground) which was statistically identical to all except T_3 treatment. The individual fruit weight was varied from 1043.5g to 1238.5 g.

The maximum fruit length (9.94 cm) was found at T_4 (horizontal support system by bamboo branches just lying over ground) treatment which was as per to T_2 and T_5, whereas the minimum fruit length (9.12 cm) was found at T_3 (horizontal support system by bamboo macha) treatment.

The highest fruit breadth (8.25 cm) was found at T_2 (vertical support system by rope wire) which was statistically similar to all except T_3 (horizontal support system by bamboo macha) that produced the lowest (7.69 cm) fruit breadth. It was found that the small size (length and breadth) fruit was produced by the treatment T_3 (horizontal support system by bamboo macha) that gave the maximum number (9.08) of fruits per plant.

Fruit Rot per Plant: Variation in number of fruit rot per plant was found statistically significant (Table 4). No fruit rot was found in T_1, T_2 and T_3 treatments. The highest number of fruit rot (3.5) per plant was counted in control treatment and the lowest (1.6) in T_4 (horizontal support system by bamboo branches just lying over ground).

Yield: From the result it was found that the significant treatment effect was observed only in control (without support) treatment regarding to yield of chinal. The yield of chinal varied from 26.70 to 13.68 ton per hectare. The highest yield (26.75 t/ha) was found at T_3 (horizontal support system by bamboo macha) treatment that was statistically similar to all, except control treatment. Control treatment produced lowest (13.68 t/ha) yield among the treatments. This lower yield was supposed to be due to certain soil borne diseases and insects and to ground dwelling pests that cause fruit rot and fruit drop severely in control treatment. The same result was also depicted in sponge gourd by Silva *et al.* [10].

The results of the present study revealed that honeydew melon (chinal) should be cultivated on horizontal support system for better yield and quality fruit.

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