
Effect of growing media and 20-20-20 chemical fertilizer on yield performance of melon in plastic house

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Abstract The result indicated that melon which grown in rain tree leaves: coir: manure (2:1:1) plus 20-20-20 7 gram per pot gave the highest fruit weight and the most TSS content with the mean of 1345.90 gram and 12.58 °brix respectively and showed significantly different among treatment combination. Melon those grown in coir plus 20-20-20 9 gram per pot gave the lowest fruit weight with the mean of 779.70 gram. The melon received from those grown in coir only gave the most palatability with the mean of 27.00 score. This study also indicated that growing media and 20-20-20 fertilization rate effected on well quality and quantity of melon grown in plastic house.

Keywords: growing media, fertilizer, melon, yield components, yield quality

Introduction

Melon (*Cucumis melo* L.) is a member of cucurbitaceae which includes cucumber, pumpkin, watermelon, squashe, gourds. (IPGRI, 2003) It's fruit which is rich in carbohydrates, minerals, dietary fiber, flavonoids and vitamins. In Thailand melon cultivation as open field often failed due to many factors such as insect pest problems which require excessive pesticide application, low yield, poor fruit quality over cost production and impact of environmental constraints. Nation (2016) Melon cultivation under protective structure is required in order to avoid mentioned problems and improved their quality. Food safety and market acceptability are the ultimate goal. Melon cultivation need a proper mineral which impact on growth development and their quality (EL-Desuki *et al.*, 2000). The sweetness of fruita could also effected by harvesting date and proper mineral management also (Ferrante *et al.*, 2008).

Materials and methods

4x4 Factorial in Completely Randomized Design (CRD) with four replications.

Factor A represented the growing media; A1 = coir (C), A2 = coir dust: coir: manure (CD:C:M), A3 = rice husk: coir: manure (RH:C:M) and A4 = rain tree leaves: coir: manure (RTL:C:M) and then combining for each growing media in the ratio of 2:1:1.

Factor B represented chemical fertilizer there are 4 rates (NPK, 20-20-20) where B1 (3 g), B2 (5 g), B3 (7 g) and B4 (9 g) with 16 treatment combinations.

7-day seedling of melon #204 orange flesh seedling was transplanted in black plastic pots 15 inch diameter in container filled up with growing media is mixed at a ratio of 2: 1: 1. Growing 1 plant per pot, after 7 day all treatments were treated with 20-20-20 complete fertilizer + water 2 liter per 3 days until 52 days after fruit setting the fruit were harvested for data collection. All treatments were placed under plastic house.

The data of fruit components were recorded as followed There are fresh weight (g), width of fruit (mm), length of fruit (mm) and data of fruits quality, comprising of thickness of flesh (mm), thickness of peel (mm), flesh firmness (N), total soluble solid (°brix), titratable acidity (%), pH juice and palatability test. All the data were analyzed of variance (ANOVA) and mean comparisons by Tukey; HSD method.

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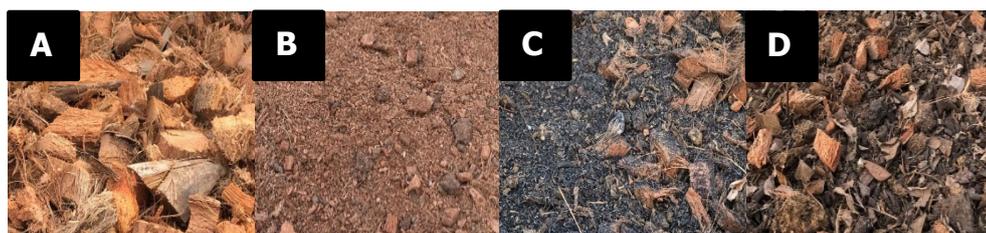


Figure 1. Growing media A = Coir (C), B = Coir Dust:Coir:Manure (CD:C:M), C = Rice Husk:Coir:Manure (RH:C:M), D= Rain Tree Leaves:Coir:Manure (RTL:C:M)

Results

Yield components

This study indicated that melon fruit was harvested on 52 days after fruit setting; firmness, TSS, TA and juice pH were analyzed the data shown in table 1. Melon fruits those grown in various growing media the result showed that melon fruits grown in RTL:C:M (2:1:1) had the most fresh weight and second best fruit was grown in RH:C:M (2:1:1) while the lowest fruit weight received from those fruit grown in C with the mean of 1252.50 grams, 1184.70 grams and 956.60 grams respectively and showed significantly difference among treatment.

Regarding with growing media indicated that therefore growing media impact to fruit width fruit length and thickness of flesh. The most of these parameters received from melon grown in RTL:C:M (2:1:1) with a mean of 133.54 mm, 130.61 mm and 113.52 mm. respectively while the lowest fruit width, fruit length and thickness of flesh got from those grown in C with the mean of 124.96 mm, 119.84 mm and 103.06 mm respectively and showed significantly among treatment.

Regarding with 20-20-20 fertilization rate showed that melon fruits treated with 20-20-20 at 3,5,7 and 9 grams per pot had a range of fruit weight, fruit width, fruit length, flesh thickness and peel thickness with a range of 1113.40-1147.80 grams, 127.4-132.01 mm, 126.75-132.26 mm, 107.93-112.10 mm and 8.08-9.22 mm respectively and showed non-significantly different among treatment (table 2).

Table 1. Effect of growing media on yield components of melon grown in plastic house.

growing media	fruit weight(g)	width of fruit(mm)	length of fruit(mm)	thickness of flesh(mm)	thickness of peel(mm)
C	956.60c	124.96b	119.84b	103.06b	8.02
CD:C:M (2:1:1)	1123.10b	132.54a	133.15a	113.49a	9.10
RH:C:M (2:1:1)	1184.70ab	131.01ab	132.97a	111.24a	8.28
RTL:C:M (2:1:1)	1252.50a	133.54a	130.61a	113.52a	9.06
F-test	**	*	**	**	ns
C.V. (%)	10.64	5.74	7.38	7.35	23.57

** = Significant difference at 0.01 level, * = Significant difference at 0.05 level, ns = Non-significant difference, C = Coir, CD = Coir Dust, RH = Rice Husk, RTL = Rain Tree Leaves, M = Manure.

Table 2. Effect of 20-20-20 fertilization rate on yield components of melon grown in plastic house.

fertilization rate (g)	fruit weight(g)	width of fruit(mm)	length of fruit(mm)	thickness of flesh(mm)	thickness of peel(mm)
20-20-20 3g/pot/3 days	1124.00	127.40	126.75	107.93	8.08
20-20-20 5g/pot/3 days	1147.80	131.62	130.35	112.10	8.64
20-20-20 7g/pot/3 days	1131.70	132.01	127.21	109.91	9.22
20-20-20 9g/pot/3 days	1113.40	131.02	132.26	111.37	8.51
F-test	ns	ns	ns	ns	ns
C.V. (%)	10.64	5.74	7.38	7.35	23.57

** = Significant difference at 0.01 level, * = Significant difference at 0.05 level, ns = Non-significant difference, C = Coir, CD = Coir Dust, RH = Rice Husk, RTL = Rain Tree Leaves, M = Manure.

The interaction between growing media and 20-20-20 fertilization rate effected on fruit weight this study found that melon grown in RTL:C:M x 20-20-20 7 grams per pot per 3 days had the highest fruit weight with the mean of 1345.90 grams per pot per 3 days while the lowest fruit weight got from melon grown in C x 20-20-20 9 grams with the mean of 779.70 grams and showed significantly different among treatment. The fruit width, fruit length, flesh and peel thickness had no influence from growing media and the 20-20-20 fertilization rate which showed non-significantly different (table 3).

The melon grown in RTL:C:M x 20-20-20 7 grams per pot per 3 days had the most fresh weight with the mean of 1345.90 grams and give the most flesh thickness with the mean of 118.32 mm. while the second best received from those grown in RTL:C:M x 20-20-20 9 grams per pot per 3 days with the mean of 1336.80 and 117.62 mm. respectively (table 3). The lowest fruit weight and peel and pulp thickness got from those grown in C x 20-20-20 9 grams per pot per 3 days with the mean of 779.70 grams, 6.09 mm. and 93.81 mm. respectively and showed significantly different (table 3).

Fruit quality.

This study found that melon grown in RTL:C:M (2:1:1) and fruits were harvested on 52 days after fruit setting gave the most flesh firmness with the mean of 38.12 newton while the lowest flesh firmness got from those grown in C with the mean of 28.86 newton and showed significantly different (table 4). Total soluble solid (TSS) the highest TSS content of fruit juice received from those grown in RTL:C:M (2:1:1) with the mean of 12.27 °brix therefore the lowest TSS got from those grown in C with the mean of 10.29 °brix and showed significantly different. Regarding to growing media only the result of titratable acidity, juice pH the statistical analysis showed non-significantly different. Table 4 also indicated that there is non-significantly different and showed the mean of palatability score 19.06-21.38 score with well accepted from consumer.

The interaction between growing media and 20-20-20 fertilization rate effected on flesh firmness, total soluble solid, titratable acidity, pH juice palatability. Table 6 indicated that flesh firmness, titratable acidity and palatability had a range of 20.17-41.40 newton, 1.36-2.48 percent, and 15.38-27.00 score and well accepted with non-significantly difference and it also showed that TSS content of flesh juice showed significantly different. The highest TSS content had a mean of 12.78 °brix which received from melon those grown in CD:C:M x 20-20-20 9 grams per pot while the lowest TSS got from the melon grown in C x 20-20-20 9 grams per pot with the mean of 8.68 °brix and showed significantly different therefore the highest and lowest pH juice got from the melon grown in RTL:C:M x 20-20-20 9 grams per pot and CD:C:M x 20-20-20 9 grams per pot with the mean of 6.68 and 6.31 respectively and showed significantly different among treatment. This study also indicated that flesh firmness titratable acidity and palatability score showed non-significantly different but well accepted palatability and showed significantly different.

Table 3. Effect of interaction of growing media and 20-20-20 fertilization rate on yield components of melon grown in plastic house.

treatment	fruit weight(g)	width of fruit(mm)	length of fruit(mm)	thickness of flesh(mm)	thickness of peel(mm)
C x 20-20-20 3g/pot/3 days	942.40cd	122.82	122.08	103.33ab	7.70
C x 20-20-20 5g/pot/3 days	996.20cd	127.78	121.91	106.42ab	9.57
C x 20-20-20 7g/pot/3 days	1108.30abc	132.71	124.96	108.68ab	8.70
C x 20-20-20 9g/pot/3 days	779.70d	116.52	110.39	93.81b	6.09
CD:C:M x 20-20-20 3g/pot/3 days	1204.10abc	132.64	130.18	113.46ab	8.77
CD:C:M x 20-20-20 5g/pot/3 days	1114.30abc	132.59	133.90	116.11a	8.02
CD:C:M x 20-20-20 7g/pot/3 days	1011.50bcd	131.21	129.64	107.69ab	10.22
CD:C:M x 20-20-20 9g/pot/3 days	1162.40abc	133.72	138.89	116.72a	9.39
RH:C:M x 20-20-20 3g/pot/3 days	1195.00abc	126.42	128.25	108.27ab	8.43
RH:C:M x 20-20-20 5g/pot/3 days	1307.70ab	133.89	136.61	114.46ab	7.69
RH:C:M x 20-20-20 7g/pot/3 days	1061.30abcd	129.54	126.66	104.94ab	8.18
RH:C:M x 20-20-20 9g/pot/3 days	1174.80abc	134.24	140.34	117.27a	8.83
RTL:C:M x 20-20-20 3g/pot/3 days	1154.50abc	127.74	126.48	106.66ab	7.44
RTL:C:M x 20-20-20 5g/pot/3 days	1172.80abc	132.21	128.97	111.40ab	9.29
RTL:C:M x 20-20-20 7g/pot/3 days	1345.90a	134.61	127.59	118.32a	9.78
RTL:C:M x 20-20-20 9g/pot/3 days	1336.80a	139.60	139.40	117.67a	9.74
F-test	**	ns	ns	*	ns
C.V. (%)	10.64	5.74	7.38	7.35	23.57

** = Significant difference at 0.01 level, * = Significant difference at 0.05 level, ns = Non-significant difference, C = Coir, CD = Coir Dust, RH = Rice Husk, RTL = Rain Tree Leaves, M = Manure.

Table 4. Effect of growing media on fruit quality of melon grown in plastic house.

growing media	flesh firmness (N)	total soluble solid(%brix)	titratable acidity (%)	pH juice	palatability test (score)
C	28.86b	10.29c	1.70	6.53	20.16
CD:C:M (2:1:1)	34.91ab	10.88bc	1.64	6.61	21.38
RH:C:M (2:1:1)	34.59ab	11.44b	1.88	6.64	19.06
RTL:C:M (2:1:1)	38.12a	12.27a	2.06	6.61	19.44
F-test	*	**	ns	ns	ns
C.V. (%)	26.26	6.36	26.95	2.53	17.16

** = Significant difference at 0.01 level, * = Significant difference at 0.05 level, ns = Non-significant difference, C = Coir, CD = Coir Dust, RH = Rice Husk, RTL = Rain Tree Leaves, M = Manure.

Regarding to effect of 20-20-20 fertilization rate on flesh firmness, total soluble content (TSS), titratable acidity, pH juice, and palatability score, a side from table 5. showed that TSS content and palatability score pronounce effected. The highest of TSS content and highest palatability gave a mean of 11.91 °brix and 22.50 score respectively, therefore the highest TSS got from the melon applied with 20-20-20 5 grams per pot while the palatability received from those melon applied with 20-20-20 3 grams per pot and showed non-significantly different, flesh firmness, titratable acidity and pH juice give a range of 30.57-37.62 newton, 1.76-1.90 percent and 6.54-6.69 respectively and showed non-significantly different (table 5).

Table 5. Effect of 20-20-20 fertilizer rate on fruit quality of melon grown in plastic house.

fertilization rate (g)	flesh firmness (N)	total soluble solid (°brix)	titratable acidity (%)	pH juice	palatability test (score)
20-20-20 3g/pot/3 days	36.51	10.86b	1.78	6.69	22.50a
20-20-20 5g/pot/3 days	37.62	11.91a	1.90	6.54	19.41ab
20-20-20 7g/pot/3 days	30.57	11.26ab	1.76	6.58	18.94b
20-20-20 9g/pot/3 days	31.78	10.84b	1.84	6.58	19.19b
F-test	ns	**	ns	ns	*
C.V. (%)	26.26	6.36	26.95	2.53	17.16

** = Significant difference at 0.01 level, * = Significant difference at 0.05 level, ns = Non-significant difference, C = Coir, CD = Coir Dust, RH = Rice Husk, RTL = Rain Tree Leaves, M = Manure.



Figure 2. Internal quality of melon effected by various growing media and 20-20-20 fertilization rate.

Table 6. Effect of interaction of growing media and 20-20-20 fertilization rate on yield components of melon grown in plastic house.

treatment	flesh firmness(N)	total soluble solid(°brix)	titratable acidity (%)	pH juice	palatability test (score)
C x 20-20-20 3g/pot/3 days	34.01	10.43cd	2.08	6.52ab	27.00
C x 20-20-20 5g/pot/3 days	38.44	10.45cd	1.68	6.71ab	17.63
C x 20-20-20 7g/pot/3 days	32.18	10.93bc	1.52	6.76a	19.13
C x 20-20-20 9g/pot/3 days	41.40	11.63abc	1.52	6.76a	21.75
CD:C:M x 20-20-20 3g/pot/3 days	33.04	11.50abc	1.60	6.66ab	22.25
CD:C:M x 20-20-20 5g/pot/3 days	35.89	11.70abc	1.68	6.56ab	19.88
CD:C:M x 20-20-20 7g/pot/3 days	40.33	11.68abc	1.36	6.64ab	19.00
CD:C:M x 20-20-20 9g/pot/3 days	41.24	12.78a	1.92	6.31b	19.50
RH:C:M x 20-20-20 3g/pot/3 days	28.20	10.55c	1.76	6.42ab	20.00
RH:C:M x 20-20-20 5g/pot/3 days	31.61	10.73c	1.76	6.61ab	21.63
RH:C:M x 20-20-20 7g/pot/3 days	32.15	11.20abc	2.24	6.61ab	19.25
RH:C:M x 20-20-20 9g/pot/3 days	30.30	11.95abc	1.76	6.67ab	15.38
RTL:C:M x 20-20-20 3g/pot/3 days	20.17	8.68d	1.68	6.54ab	20.75
RTL:C:M x 20-20-20 5g/pot/3 days	33.69	10.63c	2.48	6.55ab	18.50
RTL:C:M x 20-20-20 7g/pot/3 days	33.70	12.58ab	1.92	6.58ab	18.38
RTL:C:M x 20-20-20 9g/pot/3 days	39.56	12.10abc	2.16	6.68ab	20.13
F-test	ns	**	ns	*	ns
C.V. (%)	10.64	5.74	7.38	7.35	23.57

** = Significant difference at 0.01 level, * = Significant difference at 0.05 level, ns = Non-significant difference, C = Coir, CD = Coir Dust, RH = Rice Husk, RTL = Rain Tree Leaves, M = Manure.

Discussion

This experiment indicated that growing media pronounced effect on fruit weight of melon this result mean that melon grown in RTL:C:M (2:1:1) showed highest fruit weight may due to the RTL had the nutrients more than other media supported by the study of EL-Desuki *et al.*, (2000) who study about the organic and mineral fertilization on growth, yield and quality of cantaloupe (*Cucumis melo* L.) Ferrante *et al.*, (2008) too.

It also showed that total soluble solid (TSS) content of those melon grown in RTL:C:M x 20-20-20 9 grams per pot had the TSS higher than the other growing media may be due to its had more N P K and interaction of RTL:NPK also this result supported by the stated of Mengel and Kirkby (1978), Shafeek *et al.*, (2015) who stated that the attribution of increasing in NPK availability and their uptake to obtained the goal.

Aside from these data suggested that melon should grown in media that mixed with optimized RTL or other organic growing media plus NPK fertilizer in order to cope up maximum quality.

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