Growth Response and Production of Melon (*Cucumis melo* L.) Through The Fertilization of Cow Manure and Rice Straw Organic Mulch

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ABSTRACT

This study aims to determine the response of the growth and yield of melon plants with the application of cow manure and organic rice straw mulch. This research was conducted in February-April 2021 in Kendari City, Southeast Sulawesi. The study was arranged based on a factorial design in a Randomized Block Design, consisting of two treatment factors. The first factor was the application of various doses of cow manure (P), namely: without cow manure (P0), 5 tons ha-1 cow manure (P1), 10 tons ha-1 cow manure (P2), and the second factor is giving rice straw mulch (M), namely: without rice straw mulch (M0), 5 tons ha-1 rice straw mulch (M1), 10 tons ha-1 rice straw mulch (M2). This experiment consisted of 9 treatment combinations, each treatment consisted of 3 times, so there were 27 experimental units. The results showed that the use of cow manure and organic rice straw mulch had a significant effect on plant length, plant leaf area, and plant fruit weight. This was caused by the use of cow manure and organic rice straw mulch to increase the growth and production of melon plants. 1 rice straw mulch.

Keywords: *melon, rice straw organic mulch, cow manure.*

INTRODUCTION

Melon (*Cucumis melo* L.) is a fruit containing several vitamins and minerals that are beneficial for the health of the body. Cantaloupe melon is a source of vitamin C, vitamin A, potassium, vitamin n B6, folic acid, and niacin. The content of vitamin A and vitamin C in cantaloupe melons is 54% and 49%, respectively, of the daily nutritional adequacy rate. The mineral content in melons includes potassium, calcium, iron, magnesium, phosphorus, sodium, and zinc. The orange flesh color of the melon indicates the presence of carotenoids which are beneficial for heart health and the immune system, while the green flesh of the melon contains vitamin B6 which is beneficial for maintaining strong bones and teeth (1).

In general, the condition of agricultural land in Indonesia has experienced a decline in fertility, soil damage, and a decline in productivity. This is caused by: a) imbalance of nutrient levels in the soil; b) nutrient depletion and deficit; c) decrease in soil organic matter content; d) shallowing of the plow tread layer; e) agrochemicals or waste pollution; f) decrease in microbial population and activity; and g) salinization/alkalinization. As a result of improper nutrient management, most of the paddy fields indicated very low organic matter content (C-organic in Indonesia has low to very low organic matter content (C-organic) (2).

Efforts to manipulate the plant's growing environment can be made by mulching. Giving mulch indirectly affects the growing environment of plants because it can prevent erosion, and increase soil water content, soil temperature, soil air, and reflection of sunlight (3). Organic mulch might increase the permeability and aggregation of the poor structure of the soil surface, in addition to being a protection from rainfall that can cause compaction, it also provides a food supply for soil fauna such as

earthworms, termites, and ants. These soil organisms create air holes, increasing the rate of water movement, and earthworms can fix soil aggregates. Organic mulch such as rice straw contains 0.6% N, 0.1% P, 5% S, 1.5% K, and 40% C (4).

One alternative to increase soil fertility is through the use of organic fertilizers, namely cow manure.Some of the advantages of cow waste manure are soil structure improvement and also a decomposer of organic matter by soil micro-organisms (5).The use of organic fertilizers in the plant cultivation process can increase soil fertility, increase the amount of soil nutrients needed by plants, and support sustainable agricultural processes (2).

Organic fertilizers and mulching are important components in an effort to increase plant growth and yields. The use of mulch can save water use by reducing the rate of evaporation from the land surface and minimize fluctuations in soil temperature to benefit the growth of roots and soil micro-organisms, reduce the rate of soil erosion due to collisions of raindrops and surface runoff, and inhibit the growth rate of weeds. The benefits of mulch can also provide additional organic matter after decomposition. Organic mulch of straw and reeds can be decomposed to increase the organic matter of the soil (6).

The application of organic matter to melon plants gave better yields and quality when compared to the results obtained from the application of chemical fertilizers.This is because organic matter in addition to providing macro nutrients, this fertilizer also contains micro nutrients needed by melon plants (7). The content of organic rice straw mulch and cow dung fertilizer is very useful for plants, so research on the effect of cow dung fertilizer and organic rice straw mulch on melon plant growth needs to be done. The purpose of this paper was to determine the growth response and yield of melon (cucumismelo l.) through the application of cow manure and organic rice straw mulch.

MATERIALS AND METHODS

Time and place

This research was conducted in February-April 2021 in Kendari City, Southeast Sulawesi.

The materials used in this study were melon seeds of Gracia F1 variety, cow manure, and organic rice straw mulch.The tools used in the study were hoe, meter, scale, knife, bucket, sack, sieve, soil survey instrument, digital instrument, soil sample ring, wet newspaper, polybag, stake, raffia rope, and camera.

Research design

The study was arranged based on a factorial design in a Randomized Block Design, consisting of two treatment factors.The first factor is the application of various doses of cow manure (P), namely: without cow manure (P0), 5 tons ha-1 cow manure (P1), 10 tons ha-1 cow manure (P2), and the second factor isgiving rice straw mulch (M), namely: without rice straw mulch (M0), 5 tons ha-1 of rice straw mulch (M1), and 10 tons ha-1 rice straw mulch.This experiment consisted of 9 treatment combinations, each treatment consisted of 3 times, so there were 27 experimental units.The research data were analyzed for variance, if the F-count showed a real or very significant effect, then continued with Duncan's Multiple Distance Test (UJBD) at a 95% confidence level.

Research Procedure

The fertilizer used in this study was cow manure. Rice straw is obtained from rice plants that have been harvested in rice fields. Media for seeding in the form of a mixture of soil and cow manure with a ratio of 2:1 put into polybags measuring 8 x 10 cm. Fertilization is given according to the treatment dose and applied 10 days before planting by spreading it evenly over the surface of the bed and then hoeing it evenly

with the soil. Selection is done by choosing fruit that is slightly oval in shape.In one plant, 2 pieces are left, then the fruit stalks are tied with raffia rope on a bamboo pole so that the fruit does not come into direct contact with the soil or mulch.Observation variables: plant length (cm), leaf area (cm^2), and fruit weight (grams). The observed data were analyzed for variance, if the F-count showed a real or very significant effect, then continued with Duncan's Multiple Distance Test (DMRT) at a 95% confidence level.

RESULTS AND DISCUSSION

Effect of Interaction of Cow Manure and Rice Straw Mulch on Melon Growth

In areas with a dry climate and in fields where there is no source of irrigation, melon should be planted towards the end of the dry season or the beginning of the rainy season (8). The results of DMRT on the effect of cow manure and organic rice straw mulch on plant length (cm), and plant leaf area were presented in the following Table 1.

Table 1. Plant length (cm) and leaf area (cm^2) melon at the age of 10, 20, and 30 (days after planting/ dap) in the application of cow manure and organic rice straw mulch

Treatment	Plant length (cm)			**Leaf area (cm^2)**		
	10 dap	20 dap	30 dap	10 dap	20 dap	30 dap
P_0M_0	44,23 ^{pb}	45,03^{pc}	45,37 ^{pc}	29,93^{rb}	36,47^{qb}	38,60^{pc}
P_1M_0	45,80^{pb}	45,90 ^{pc}	50,60 ^{pc}	30,33^{pb}	36,83^{pc}	39,37^{pc}
P_2M_0	46,80^{qb}	51,03^{pb}	52,33^{pb}	30,33^{qb}	37,20^{pb}	40,27^{pb}
P_0M_1	49,80 ^{qb}	53,97^{pb}	55,17^{pb}	30,67^{qb}	37,70^{pb}	42,03^{pb}
P_1M_1	50,10 ^{qb}	55,27 ^{pb}	57,67^{pb}	31,00^{qb}	38,20^{pb}	42,92^{pb}
P_2M_1	52,53 ^{qb}	53,87^{pb}	55,97^{pb}	31,70^{qb}	40,20^{pb}	41,93^{pb}
P_0M_2	61,27 ^{qa}	62,47 ^{pa}	68,70 ^{pa}	34,77^{qa}	41,97^{pa}	45,20^{pa}
P_1M_2	66,23 ^{qa}	68,60 ^{pa}	75,70 ^{pa}	35,15^{qa}	42,67^{pa}	46,17^{pa}
P_2M_2	66,40 ^{qa}	70,50 ^{pa}	76,87 ^{pa}	35,57^{qa}	43,03^{pa}	47,93^{pa}
Average	53,68	56,29	59,82	32,16	39,36	42,71

Note: The values followed by the same letter show no significant difference in the Duncan Multiple Range Test (DMRT) at a 95% significant level.

Table 1 indicated that the length of melon plants from the age of 10 dap to 30 dap had the maximum plant length, namely the P2M2 treatment at the age of 30 DAP with an average value of 76.87 cm. While the lowest value was 30 dap in the control plant (without treatment) with an average plant length of 45.37 cm. This illustrated that the application of cow manure and organic rice straw mulch with the highest dose (10 tons ha^{-1} cow manure with 10 tons ha^{-1} rice straw mulch) was better than the other treatments. Plant growth was strongly influenced by the availability of nutrients that was absorbed by plants. One element having an important role in plant growth was nitrogen. The nitrogen content of cow manure was high enough to provide additional nutrient requirements for plants.

Supply of optimal nitrogen or with an appropriate dose increased protein synthesis and formation of chlorophyll.This caused the color of the leaves to become greener and to increase the ratio of shoots and roots. Optimum nitrogen application increased the rate of plant growth. Another factor determining the quality of organic fertilizer was the presence of heavy metals.The lower the heavy metal content in organic fertilizers, the better the quality, and vice versa.Heavy metals had a negative impact on plant physiological conditions.

Fertilization was an important for plants so to grow and to develop properly.Plant growth and development was

strongly influenced by the application of fertilizers and the availability of nutrients in the soil. Manure functioned as energy for microorganisms to provide nutrient sources, to increase the ability of the soil to hold water in the soil and to improve soil structure. With regular use of manure, it will gradually form a reserve of nutrients in plants.

Organic fertilizers and mulching were important components in an effort to increase plant growth and yields. The use of mulch saved water use by reducing the rate of evaporation from the land surface, minimizing fluctuations in soil temperature for growth of roots and soil micro-organisms, reducing the rate of soil erosion and inhibiting the rate of weed growth. Mulch provided additional organic matter after decomposition. Organic mulch of straw and weeds was decomposed to increase the content of soil organic matter.

Interaction Effect of Cow Manure on Melon Production

Melon fruit had a very short harvest life. Asie (2008) reported that melons ripen at the age of 65-120 days (9).The effect of organic matter on fresh weight of melon fruit was shown in Table 2. The interaction of cow manure and rice straw mulch had a significant effect on melon fruit weight.Table 2 showed that heavier fruit weight was obtained in plants receiving dose of 20 tons ha^{-1} of cow manure and 10 tons ha^{-1} of rice straw mulch.

Table 2. The interaction effect of cow manure and rice straw mulch on fruit weight (Kg)

Cow manure (ton ha^{-1})	Rice straw mulch (ton ha^{-1})		
	0 (M0)	5 (M1)	10 (M2)
0 (P0)	0,90[a] p	0,98[a] q	1,03[a] r
5 (P1)	0,92[a] p	1,57[a] q	1,83[a] r
10 (P2)	1,10[b] p	1,60[b] q	1,97[b] r
15(P3)	1,19[b] p	1,62[b] q	2,10[c] r
20 (P4)	1,23[c] p	1,63[c] q	2,13[c] r

Note: Values followed by different letter notations in the same column (a-c) or in the same row (p-r) show significant differences in the Duncan Multiple Range Test at a 95% confidence level

Cow manure and rice straw mulch were important components to increase plant growth and yield.The use of mulch saved water use by reducing the rate of evaporation from the land surface, minimizing fluctuations in soil temperature for the growth of roots and soil micro-organisms, and reducing the rate of soil erosion. Mulch also provided additional organic matter after decomposition. Rice straw organic mulch decomposition increased the content of soil organic matter which increased plant growth and yield. The use of thicker mulch stored water, prevented evaporation and maintained better soil moisture (10).

There was a significant interaction between cow manure and rice straw mulch, as well as a significant effect of cow manure and rice straw mulch on the growth and yield of melons.In addition, rice straw mulch underwent a weathering process to increase the photosynthetic translocation process (11). Mulch saved water use by reducing the rate of evaporation from the land surface, minimizing fluctuations in soil temperature

for growth of roots and soil micro-organisms, and reducing the rate of soil erosion (12). Environmental conditions also supported the production process of melons where soil moisture decreased slightly.This provided an advantage to keep water content in the soil available for plants and lowered fluctuations in soil temperature changes between morning and afternoon.days (13).

CONCLUSION

It might be concluded that:

1. The application of cow manure and organic rice straw mulch had a significant effect on plant height and leaf area.
2. Ten tons per ha of cow manure with 10 tons per ha of rice straw mulchgave the best results.
3. The interaction of cow manure and rice straw mulch has a significant effect on melon production.
4. The dose of cow manure resulted in a better effect on the growth and production of melon plants of 20 tons per ha.The dose of rice straw mulch yielding a better effect on the growth and production of melon plants was 10 tons ha-1.

REFERENCES

1. Huda AN, Suwarno WB, Maharijaya A. Karakteristik Buah Melon (*Cucumis melo* L.) Pada Lima Stadia Kematangan. *J.Agron Indonesia*. 2018;46(3):298-305. doi: https://dx.doi.org/10.24831/jai.v46i3.12660.
2. Hartatik W, Husnain, Widowati LR. Peranan Pupuk Organik Dalam Peningkatan Produktivitas Tanah dan Tanaman. *Jurnal Sumberdaya Lahan Desember*. 2015;9(2):107-120.
3. Maulana ID. Penggunaan Mulsa Alang-Alang Untuk Mengendalikan Gulma Pada Tanaman Jagung (Zea mays L.) di Lahan Kering : *IPB Press. Bogor*. 2011.
4. Wati D, Zulfikar. Efek Aplikasi Mulsa Organik Dan Pupuk Kandang Terhadap Produksi Melon (*Citrullus lanatus* (Thunb.) Matsum.et Nankai); Agrosamudra. *Jurnal Penelitian*. 2015;2 (2).
5. Parnata A. Meningkatkan Hasil Panen Dengan Pupuk Organik: *PT. Agromedia Pustaka. Jakarta*. 2010.
6. Sudarmini NK, Kartini NL, Sudarmana IM. Pengaruh Kompos Kandang Sapi Dan Mulsa Jerami Padi terhadap Pertumbuhan Dan Hasil Polong Muda Kedelai Edamame (*Glycine max* (L) Merill) D Lahan Kering : Fakultas Pertanian Universitas Udayana Denpasar Bali-Indonesia. *AGROTROP*. 2015;5(2):167-178. ISSN: 2008-155X.
7. Safuan L, Bahrun A. Pengaruh Bahan Organic Dan Pupuk Kalium Terhadap Pertumbuhan Dan Produksi Tanaman Melon (Cucumis melo L.). Jurnal Agroteknos. 2012;.2(2): 69-76.
8. Soedarya AP. Agribisnis Melon : *Pustaka Grafika. Bandung*. 2010.
9. Asie. Pengembangan Tanaman Melon di Lahan Gambut dengan Budidaya Inovatif. *2008http//www.google.com.*
10. Sirajuddin M, Lasmini SA. Respon Pertumbuhan Dan Hasil Jagung Manis (*Zea mays saccharata*) Pada Berbagai Waktu Pemberian Pupuk Nitrogen Dan Ketebalan Mulsa Jerami. *Jurnal Agroland*. 2010;17(3):184-191.
11. Cahyanti LD. Pengaruh Pemulsaan Jerami Padi Dan Sistem Olah Tanah Terhadap Pertumbuhan Dan Hasil Tanaman Kedelai (*Glycine Max* L. *Merril*) Non-Organik. *Jurnal Florea*. 2015;2 (7).
12. Fikri S. Upaya Peningkatan Pertumbuhan Dan Hasil Tanaman Kedelai (Glycine max) Melalui Aplikasi Mulsa : Jurusan Budidaya Pertanian Universitas Gadjah Mada

Yogyakarta. *Makalah Seminar Umum*. 2012.
13. Aziiz A, Herlina N, Suminarti NE. Pengaruh Jenis Dan Tingkat Ketebalan Mulsa Pada Tanaman K acang Hijau (*Vigna radiata,* L.). *Jurnal Produksi Tanaman*. 2018;6(4):524-530. ISSN:2527-8452.
14. Ahmad R, Lalu J, I Gde M. Aplikasi Pupuk Organik dan NPK Untuk Meningkatkan Pertumbuhan Vegetatif Melon (*Cucumis melo* L.). *Jurnal Biologi Tropis*. 2019;19(1):19 – 24.
15. Arzita D, Simanjuntak P. Analisis Tumbuh Dua Varietas Terung (*Solanum melongena L.*) Pada Perbedaan Jenis Pupuk Organik Cair. *Jurnal Bioplantae.* 2013;2 (1): 33-39.
16. Decoteau DR. Vegetable Crop Prentice Hall Upper Saddille River. *2000N3 07458*.
17. Kurniastuti T, Faustina DR. Pengaruh Dosis Pupuk Kompos Jerami Dan Jenis Mulsa Terhadap Pertumbuhan Dan Produksi Tanaman Melon (*Cucumi smelo* L.). *Jurnal Pertanian Terpadu*. 2019;7(1):79-88. ISSN 2549-7383.
18. Prasetyo, Rizky A, Nugroho A, Moenandir J. Pengaruh Sistem Olah Tanah Dan Berbagai Mulsa Organik Pada Pertumbuhan Dan Hasil Tanaman Kedelai (*Glycine max* (L.)Merr.) Var. Grobogan. *Jurnal Produksi Tanaman*. 2014; 1(6).
19. Setiawan BS. Membuat Pupuk Kandang Secara Cepat : *Penebar Swadaya. Jakarta*. 2010.
20. Sunghening W, Todari, Shiddieq D. Pengaruh Mulsa Organik Terhadap Pertumbuhan Dan Hasil Tiga Varietas Kacang Hijau (*Vigna radiate L. Wilczek*) Di Lahan Pasir Pantai Bugel Kulon Progo. *Jurnal Vegetalika*. 2012;1(2):1-13.
21. Thamrin. Perbaikan Beberapa Sifat Fisik Tanah Dengan Pemberian Pupuk Organik Dan Pengaruhnya Terhadap Produksi Padi Gogo. *2000. http:// www . google.Com*.