

Some Vegetative Traits of the Zucchini Squash (*Cucurbita pepo* L.) under Polyethylene Mulching and Mushroom Farm Residues

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Abstract

A field experiment was conducted at the first research station of the College of Agriculture - University of Anbar during the Autumn season of 2023 to indicate the impact of mulching and the addition of mushroom farm waste on various vegetative characteristics of zucchini squash plants. A factorial design was applied with two factors: first, mulching with and without white polyethylene cover, and second, mushroom farm waste at four levels, 0, 5, 10, and 15 ton. ha⁻¹. The measurements included plant length, stem diameter, number of leaves, leaf area, and dry weight. The results indicated a significant increase in leaf area when mulching was applied (M1), reaching 41.5 dm² compared to the non-covered treatment (M0), which recorded 34.89 dm², with an increase percent 18.95%. Similarly, there was a notable increase in leaf area with the addition of mushroom farm waste at all levels, 0, 5, 10, and 15 ton. ha⁻¹. The highest value was observed with the addition of 15 ton. ha⁻¹, reaching 48.5 dm², while the lowest value was recorded with no addition of mushroom farm waste, amounting to 21.91 dm². This trend was consistent across other measured characteristics, including plant length, stem diameter, number of leaves, and dry weight. On the other hand, the interaction between mulching and mushroom farm waste addition significantly influenced all measured characteristics across all treatments.

Keywords: Zucchini squash plant, vegetative characters, polyethylene, mushroom farm residues.

تأثير التغطية بالبولي اثيلين وأضافه مخلفات مزرعة الفطر في بعض الصفات الخضرية لنبات قرع

الكوسة *Cucurbita pepo* L.

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المستخلص:

اجريت تجربة حقلية في محطة ابحاث كلية الزراعة الأولى - جامعة الانبار لدراسة تأثير التغطية بالبولي اثيلين واطافة مخلفات مزرعة الفطر في بعض الصفات الخضرية لنبات قرع الكوسة، نُفذت تجربة عاملية وفقاً لتصميم القطاعات التامة التعشبية بثلاث مكررات وبعاملين: العامل الاول هو التغطية بالبولي اثيلين الشفاف وعدم التغطية بالبولي اثيلين والعامل الثاني هو مخلفات مزرعة الفطر بثلاث مستويات 5,10,15 طن هـ-1، حساب كل من طول النبات، قطر الساق، عدد اوراق النبات، المساحة الورقية والوزن الجاف، اظهرت النتائج زيادة معنوية في صفة المساحة الورقية لعامل التغطية (M1) بلغت 41.5 دسم مقارنة مع المعاملة بدون تغطية (M0) حيث بلغت 34.89 دسم وبنسبة زيادة مقدارها 18.95% كما بينت النتائج زيادة معنوية في ذات الصفة لعامل مخلفات مزرعة الفطر وفي جميع مستوياتها 5 طن هـ-1، 10 طن هـ-1 و 15 طن هـ-1 حيث كان اعلى قيمة عند مستوى اضافة 15 طن هـ-1 بلغت 48.5 دسم واقل قيمة عند مستوى اضافة 0 طن هـ-1 حيث بلغت 21.91 دسم، وهذا الحال انعكس على باقي الصفات المدروسة كل من ارتفاع النبات، قطر الساق، عدد الاوراق والوزن الجاف، اما بالنسبة لعامل التداخل بين التغطية ومخلفات مزرعة الفطر كان معنوياً في جميع المعاملات ولكل الصفات المقاسة صفة ارتفاع النبات، قطر الساق، عدد الاوراق، المساحة الورقية والوزن الجاف.

الكلمات المفتاحية: البولي اثيلين، مخلفات الفطر، الصفات الخضرية، قرع الكوسة.

Introduction

The issue of water scarcity is one of the most critical challenges confronting the world today. This challenge has emerged due to a significant shortage of water income caused by global trends in general since the beginning of the third millennium to store more water and ration its release, to expand multiple uses of water, and to strengthen their political and economic positions in their international relations, this was accompanied by droughts and lack of rainfall that swept many countries of the world, especially countries in the Middle East, including Iraq, which has caused water scarcity and high levels of salinity in the water and land (Dahash, 2011). The increasing utilization of polyethylene mulching in agriculture over the last few decades is reaching of great magnitude. The presence of these benefits is the reason why polyethylene mulching would be adopted by a farmer, which include minimizing soil moisture loss, improving soil temperature, increasing efficiency of soil nutrient utilization, raising productivity of crops, decreasing the growth of bush and help reducing pest and disease (Santosh et al., 2022).

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Using colored covers, for example, black plastic, has had considerable impacts on most of the studied features of broccoli plants, such as stem length, which reached 13.60 cm compared with the control treatment with 12.63 cm. Furthermore, a significant weight of the broccoli head was even higher than the control treatment, reaching 254.25 g instead of 144.63 g in the control treatment. Additionally, it was noted that the total yield was significantly enhanced and increased to 6.73 tons. ha⁻¹ instead of 3.41 tons (Koushik et al., 2022). The use of black polyethylene led to an increase in the averages of vegetative growth characteristics of broccoli plants, including leaf area, plant length, curd disc weight, and broccoli shoot weight (Kaur, 2021).

Ahmed et al. (2020) indicated that using black polyethylene covers on cucumber plants showed a significant superiority in increasing the length of the plant, as it reached 195.50 cm compared to the control treatment, which gave 164.50 cm, and showed superiority in the yield of one plant compared to the control treatment. Yasmin et al. (2021) stated that the use of different covers, including black and clear, when conducting an experiment on broccoli plants at seedling age 21, 28, and 35 days in the growth and yield of broccoli plants, as black plastic gave the best results in plant length at all ages of seedlings, as it reached 31.28, 32.08, and 36.58 cm compared to the control treatment, which reached 26.87, 27, and 30.47 cm, respectively. It also gave the highest number of leaves, which reached 16.67, 16, and 16.57 leaves per ton. plant⁻¹.

Spent mushroom waste, or spent mushroom compost as it is known, is a kind of effective organic fertilizer that is used in combination with other essential nutrients to give a boost to the physical, chemical, and biological properties of the soil. These wastes contain many important nutrients such as nitrogen, potassium, phosphorus, calcium, and magnesium, in addition to some minor elements such as iron, zinc, manganese, and copper. By using spent mushroom waste, soil fertility can be improved, and the nutrients needed for plant growth can be provided. The spent medium is the active substance that is formed after harvesting white mushrooms (*A. bisporus*). It consists of agricultural wastes such as straw of wheat, barley, rice, and corn husks, as well as horse and poultry waste, cottonseeds, and gypsum. This medium contains important nutrients such as nitrogen, phosphorus, potassium, magnesium, calcium, and high protein.

The spent medium is considered an ideal material as a soil improver, as it contains the necessary nutrients and is characterized by its ability to retain water in drought conditions and drain excess water in high humidity conditions. In addition, mushroom farm waste contains a variety of microorganisms that contribute to accelerating decomposition processes and improving the formation of soil aggregates. By using spent media, soil quality can be improved and nutrient availability increased, which helps promote plant growth and increase crop productivity. The use of spent media is considered a sustainable way to dispose of mushroom residues and preserve the environment. The ratio of carbon to nitrogen in mushroom farm waste gives a general indication of the extent of nitrogen availability, as it may reach 1:20. The concentration levels of these materials and the chemical and physical properties of mushroom farm waste may vary according to the variety of materials used in preparing these cultivation media (Idham et al., 2014). The use of mushroom farm waste at a level of 30% of the soil weight for squash plants led to an increase in the number of leaves, plant length, and leaf area, as they reached 41 leaves. plant⁻¹, 160.5 cm, and 197.6 cm² compared to the control treatment, which recorded 24 leaves. plant⁻¹ and 120.8 cm and 128.7 cm² (Jonathan et al., 2011). Marques et al. (2014) demonstrated the positive impact of adding mushroom farm waste on lettuce, resulting in significant increases in various parameters such as the number of leaves, fresh weight, dry weight, stem diameter, plant length, as well as the yield and quality of marketable heads. Abbas and Najm (2015) showed that the addition of mushroom farm waste enhanced the growth of cucumber plants, especially dry weight and plant length, compared to the control treatment.

The squash plant, or Summer Squash, *Cucurbita pepo*, is considered one of the most important vegetable crops of the Cucurbitaceae family. While all zucchini cultivars belong to the Cucurbitaceae species, they belong to different subspecies within the species *Cucurbita pepo* (Purseglove, 1972). Zucchini plants are grown in Iraq in the fall and spring seasons openly, but in recent years, farmers have turned to growing them under low plastic tunnels. In 2003, the area planted with zucchini in Iraq reached 40,900 dunums, and the total production reached 111,700 tons at a rate of 2731.2 kg ha⁻¹, which can be attributed to several factors: absence of adoption of modern agricultural techniques, inadequate utilization of high-quality crop varieties, poor management practices, and a high incidence of disease infections contribute to this issue. The Aim was to know the effect of mulching with white polyethylene and using white mushroom farm waste on the growth characteristics of zucchini squash plants.

Materials and Methods

A field experiment was carried out in the fall season of 2023 at the First Agricultural Research Station (Al-Bu'itha), affiliated to University of Anbar - College of Agriculture in Ramadi District, Anbar Governorate, located on longitude E. 10' 48" 43° East and latitude N 40" 26' 33° North. The sample was dried (air-dried) for 48 hours, then ground together and passed through a sieve with a diameter of 2 mm, to conduct chemical and physical laboratory analyses of some soil characteristics before planting, Table 1. The seeds were planted in the autumn season 15th August, 2023. The agricultural activities, such as fertilization and hoeing, were performed throughout the growing season until plant removal on 20th November, 2023.

A factorial experiment was carried out according to a completely randomized block design, with three replications; the total number of experimental units became 24. The experiment included studying the following factors:

1. Levels of adding mushroom farm waste, symbolized as O, where the waste was added mixed with the soil at a depth of 0.3 m.

This factor includes the levels shown below:

- (O₀) Without addition (control treatment).
- (O₁) Adding 5 tons ha⁻¹.
- (O₂) Adding 10 tons ha⁻¹.
- (O₃) Adding 15 tons ha⁻¹.

2. Coverage factor (M)

A- (M₀) Without coverage

B- (M₁) Clear Polyethylene Coverage.

Zucchini squash seeds were planted in a field on terraces with a width of 0.75 m, and planting line the length was 7 m. The number of plants in one line was 17 plants, and the distance between one plant and another within one line was 0.40 m, and between one line and another was 1 m, and between one sector and another was 2 m.

Table 1. Some physical and chemical soil characteristics before planting.

Physical catachrestic	specific value	Units	Chemical catachrestic	specific value	Units
Sand	684	gm.k ⁻¹	Ec	1.62	ds.m ⁻¹
Silt	112	gm.k ⁻¹	SAR	2.62	Cmol.k ⁻¹
Clay	204	gm.k ⁻¹	O.M	0.29	gm.k ⁻¹
Texture	Sandy Clay Loam		pH	7.14	
Particle density	1.35	µg.m ⁻³	CaSo ₄	1.5	gm.k ⁻¹
Bulk density	2.55	µg.m ⁻³	CaCO ₃	103	gm.k ⁻¹
Porosity	46.56	%	Ca ²⁺	5.23	meq.L ⁻¹
Saturated water conductivity	3.35	cm.h ⁻¹	k ⁺	1.39	meq.L ⁻¹
Mean-wight diameter	0.31	mm	Na ⁺	5.6	meq.L ⁻¹
			Mg	3.89	meq.L ⁻¹

Seeds of relatively uniform size were chosen from squash (*Cucurbita pepo* L.), specifically from the Dutch variety known as MARTA F1. A germination test experiment was conducted before planting on 15th August, 2023. The seeds were planted at a rate of 3 seeds per hole. After germination, the plants were thinned to one plant per hole, with a distance of 0.40 m between each plant. The ground fertilization method was applied to provide the crop with the nutrients necessary for growth and production. Nitrogen and potassium fertilizers were added after the plants were thinned. Nitrogen fertilizer was added in the form of urea fertilizer 46% N at a rate of 100 kg. ha⁻¹, which was added in three batches. As for potassium fertilizer, it was added in the form of potassium sulfate fertilizer (50% K₂O) at a rate of 200 kg K₂O. ha⁻¹, distributed in two batches according to the fertilizer recommendation (Ali et al., 2014). The pathogens were controlled by using Cold Dazim (fungicide, preventive and curative) at a rate of 1 ml. L⁻¹ of water to prevent fungal diseases that affect the zucchini squash plant. Super Plus (insecticide) was used at a rate of 1 ml. L⁻¹ of water to combat the insect diseases that infect the leaves of the zucchini plant. Weeds were removed from the exposed treatments four times during the experiment period. The irrigation process (drip irrigation system) from the Euphrates River was carried out

according to the stages of plant growth during the growing season. A moisture depletion rate of 30% of the available water was adopted. The experiment was completed on 11/20/2023, and some vegetative growth characteristics were measured.

Vegetative growth characteristics of zucchini squash plants:

Plant length (cm): was measured from the soil surface to the end of the leaves. The measurement time was at the end of the season.

Stem diameter (mm): was measured from the middle of the main stem of the plant and at the end of the season.

Number of leaves (leaf. plant⁻¹): The total number of plant leaves (leaf. plant⁻¹) was calculated at the end of the season

Leaf area (dm²): Three leaves were selected from the top, middle, and bottom of the plant stem, and from five plants that were randomly selected from each experimental unit, they were measured using a special program to measure leaf area (Digimizer) (Abdul Latif and Jassim, 2010). The total leaf area. Plant-1 was calculated by multiplying the average of the leaf area. plant-1 by the average number of leaves. plant-1 per experimental unit. The rate was calculated from the following equation, as mentioned by Sadik et al. (2011).

Leaf area (cm² plant⁻¹) = average of leaf area × number of leaves

Dry weight of plant (g):

Five plants were randomly harvested from each experimental unit from the area where the plants touch the soil after the experiment's end. The plants were washed with water, air-dried, and then placed in an electric oven at 65°C until a stable weight was achieved. The average weight for five plants was then calculated (Al-Sahhaf, 1989).

Statistical analysis

The results were analyzed statistically for (RCBD) with three replications using the Genstat program to determine the least significant difference (L.S.D.) at a significant level of 0.05 to compare the parameters included in the study (Al-Sahuki and Wahib, 1990).

Results and Discussion

1- Plant length:

As it is indicated in Table 2, both polyethylene mulching and the addition of mushroom farm waste positively influenced plant length (cm). Statistical analysis further reveals that using white polyethylene mulching significantly impacted plant length, with plants reaching a length of 55.95 cm with mulching compared to 45.74 cm when not covered, representing a 22.32% increase. Mixing the white mushroom waste with the soil surface significantly affected plant length. The maximum plant length was observed at a 15 ton. ha⁻¹ addition level, reaching 62.38 cm, followed by 55.07 cm and 45.17 cm for 10 and 5 ton. ha⁻¹ addition levels, respectively. The lowest plant length was recorded with the control, indicating increases of 13.27%, 38.10%, and 53%, respectively. Furthermore, the interaction between white polyethylene mulching and mushroom waste was significant and positive.

The M1O3 treatment gave the maximum plant length, which reached 71.067 cm, while the lowest value was recorded in the M1O1 treatment reached 39.167 cm. This can be attributed to mulching reducing soil evaporation, maintaining moisture levels in the root zone, and regulating soil temperature, thereby promoting root growth and water absorption, ultimately enhancing plant length through increased cell division. The significant increase in plant length due to the addition of mushroom farm waste is attributed to enhanced nutrient availability in the soil solution and increased root zone temperature, which reflects on vegetative growth. This finding is consistent with previous studies by Ahmed et al. (2020), Santosh et al. (2022), and Ahmed (2018).

Table 2: Effect of mulching and adding white mushroom farm waste on plant length, cm⁻¹

M \ O	O ₀	O ₁	O ₂	O ₃	Average M
M ₀	39.167	43.433	46.667	53.700	45.740
M ₁	42.367	46.900	63.467	71.067	55.950
Average O	40.770	45.1700	55.070	62.380	
LSD	M =1.668		O =2.358		Interference =3.335

2- Stem diameter

The findings from Table 3 demonstrate the positive impact of using polyethylene mulching and the addition of mushroom farm waste on stem diameter (mm). Statistical analysis exposes that using white polyethylene mulching significantly influenced stem diameter, with plants reaching a diameter of 15.80 mm when covered compared to 15.01 mm when not covered, with an increase of 5.26%. as well as, the utilization of white mushroom waste mixed with the surface layer of soil exerted a notable effect on stem diameter, with the highest value observed at the addition level of 15 ton. ha⁻¹, reaching 17.83 mm. followed by 15.73 mm and 14.46 mm for addition levels of 10 and 5 ton. ha⁻¹, respectively. Conversely, the lowest stem diameter value was recorded at 13.61 mm when white mushroom waste was not utilized, representing percentage increases of 13.35%, 23.30%, and 31%, respectively. In the same context, interaction between the two factors of employing white polyethylene mulching and mushroom waste was significant and positive in the stem diameter character. Treatment M1O3 outperformed the rest of the treatments by a value of 18.033 mm, while the M1O1 treatment gave the lowest value, reaching 13.263 mm.

The significant increase observed can be attributed to the valuable effects of mulching, which create profitable conditions for plant growth and maintain soil moisture levels by minimizing evaporation, as well as warming the root zone and maintaining thermal equilibrium in the soil. These factors enhance root activity and improve their efficiency in absorbing water and nutrients, thereby leading to an increase in vegetative growth characteristics, including stem diameter. Similarly, the significant effect of adding mushroom farm waste can be attributed to its role in enhancing soil properties and providing essential nutrients. This improvement in soil condition promotes the vegetative growth of plants. This observation is consistent with findings from studies conducted by Marques et al. (2014) and Santosh *et al.* (2022).

Table 3: Effect of mulching and adding white mushroom farm waste on stem diameter, mm.

M \ O	O ₀	O ₁	O ₂	O ₃	Average M
M ₀	13.263	14.014	15.150	17.631	15.010
M ₁	13.96	14.899	16.301	18.033	15.800
Average O	13.610	14.460	15.730	17.830	
LSD	M =0.454		O =0.642		M*O =0.908

3- Number of leaves (leaf. plant⁻¹)

The results of Table 4 show that mulching with polyethylene and mushroom farm waste has a positive effect on the characteristics of the number of leaves. The statistical analysis also shows that mulching the surface of the soil with white polyethylene has a significant effect on the characteristics of the number of leaves, as the value of the number of leaves when mulching with white polyethylene amounted to 37.50 leaves. plant⁻¹ compared to without mulching, which amounted to 31.25 leaves. plant⁻¹, with an increase of 20%. The use of white mushroom waste mixed with the surface layer of soil had a significant effect on the number of leaves, with its highest value at the addition level of 15 tons. ha⁻¹ reached 43.17, followed by 35.33 and 31.00 leaf. plant⁻¹ for the addition level 10 and 5 tons. ha⁻¹, respectively, and the lowest value reached 28.00 leaf. plant⁻¹ for not using white mushroom waste, with percentage increases reaching 22.19, 39.25, and 54.17%, respectively.

The results also demonstrate that the two-factor interaction between mulching the soil surface with white polyethylene and mushroom waste was a significant and positive one, as the highest value for the number of leaves reached 49.33 leaves. plant⁻¹ in the M1O3 treatment, and its lowest value in the M1O1 treatment reached 27.33 leaf. plant⁻¹. These results can be attributed to the role of coverage in maintaining soil temperature, which increases the spread of roots and activity in absorbing nutrients, leading to an increase in vegetative growth and the number of plant leaves. Meanwhile, the significant effect of mushroom farm waste is attributed to the fact that the decomposition of waste in the soil leads to the availability of nutrients in the soil in a way that can be absorbed by the plant, thus increasing the growth of the shoots. This is consistent with Marques et al. (2014 and Yasmin *et al.*, 2021).

Table 4: Effect of mulching and adding white mushroom farm waste on the number of leaves (plant leaf⁻¹)

M \ O	O ₀	O ₁	O ₂	O ₃	Average M
M ₀	27.33	29.33	31.33	37.00	31.25
M ₁	28.67	32.67	39.33	49.33	37.50
Average O	28.00	31.00	35.33	43.17	
LSD	M =1.75		O =2.486		M*O =3.515

4- Leaves area (dm²)

The results of Table 5 showed that mulching with polyethylene and mushroom farm waste had a positive effect on the characteristics of the leaf area. The statistical analysis also indicates that mulching the soil surface with white polyethylene had a significant effect on the characteristics of the leaf area, as the value of the leaf area reached 41.50 dm² when mulching with white polyethylene, compared to not mulching, which was 34.89 dm², with an increase of 18.95%. Correspondingly, using white mushroom waste mixed with the surface layer of the soil had a significant effect on the characteristic of the leaf area, as it reached the highest value at the addition level of 15 tons ha⁻¹ reached 48.50, followed by 45.19 and 37.19 dm² for both the addition level of 10 and 5 tons. ha⁻¹ of white mushroom waste, respectively.

The lowest value for leaf area reached 21.91 dm² for not using white mushroom waste, with an increase of 7.32, 30.41, and 121.36%, respectively. As well as, the results indicate that the two-factor interaction between mulching the soil surface with white polyethylene and mushroom waste was significant and positive, as the highest value for the leaf area characteristic reached 52.65 dm² in the M1O3 treatment, and its lowest value reached 18.26 dm² in the M1O1 treatment. The significant increase observed may be attributed to the ability of mushroom farm waste to prepare nutrients for the plant in a readily absorbable form, thus enhancing processes of cell division and elongation, ultimately leading to a positive effect on leaf area. This is consistent with Jonathan et al. (2011), Ahmed (2018), and Taha (2018).

Instead, the significant effect of mulching can be attributed to its ability of optimal growing conditions, including appropriate temperature and humidity, by reducing evaporation. This creates favorable conditions for root growth and nutrient absorption, consequently increasing leaf area. These findings agree with Al-Bayati and Talib (2017). These results align with those obtained regarding the number of leaves, as depicted in Table 4, where an increase in leaf area is evident with the use of polyethylene mulching and an increase in the level of addition of mushroom farm waste, reflecting the increase in the number of leaves. plant-1.

Table 5: Effect of mulching and adding white mushroom farm waste on leaf area dm²

M \ O	O ₀	O ₁	O ₂	O ₃	Average M
M ₀	18.26	35.72	41.23	44.34	34.89
M ₁	25.55	38.66	49.14	52.65	41.50
Average O	21.91	37.19	45.19	48.50	
LSD	M =1.112		O =1.573		M*O =2.225

5- Dry weight (g)

It can be noted from Table 6) the positive and significant effect of mulching with polyethylene and mushroom farm waste on the dry weight of the plant in (g). The highest value as the dry weight was recorded at the mulching treatment, which was 186.62 g, compared to not mulching, amounting to 175.74 g, with an increase of 6.19%. Correspondingly, using white mushroom waste mixed with the surface layer of the soil has a significant effect on the dry weight characteristic. The highest value reached 199.86 g at the addition level of 15 tons ha⁻¹, followed by 185.36 and 172.79 g for both the addition levels of 10 and 5 tons. ha⁻¹ of white mushroom waste, respectively. The lowest value for the dry weight of the plant reached 166.72 g when white mushroom waste was mixed with the surface layer of the soil, which increased by percentages of 7.82, 13.54, and 19.87%, respectively.

The same table also showed that the two-factor interaction between the factors of mulching the soil surface with white polyethylene and mushroom waste was significant and positive, as the highest value for the dry weight characteristic reached 211.87 g in the M1O3 treatment, and its lowest value in the M1O1 treatment was 165.22 g. The reason for the significant increase is that mulching increases the growth and activity of the roots, which leads to an increase in the absorption of water and nutrients by providing appropriate heat and humidity, which reflects positively on the production of plant hormones, which in turn work on the division and elongation of cells in the growing tips, even though the reason for the significant effect of mushroom farm waste is that these wastes work to improve the properties of the soil and increase the availability of plant nutrients as a result of the decomposition of these wastes and the transfer of the elements to the shoot and their entry into various physiological and biological processes, thus increasing the growth of the plant, which is reflected positively on the shoot of the plant. This is consistent with (Taha, 2018; Hamada and Karim, 2020; Abbas and Najm, 2015) The reason may also be due to an increase in the length of the plant, the diameter of the stem, the number of leaves in the plant, and an increase in the leaf area, which leads to an increase in the dry matter and thus an increase in the dry weight in the final result, and this the results obtained are shown in Table (2, 3, 4, 5).

Table 5: Effect of mulching and adding white mushroom farm waste on plant dry weight gm⁻¹.

M	O	O ₀	O ₁	O ₂	O ₃	Average M
M ₀		165.22	171.85	178.05	187.85	175.74
M ₁		168.21	173.73	192.67	211.87	186.62
Average O		166.72	172.79	185.36	199.86	
LSD		M = 0.851		O = 1.204		M*O = 1.702

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