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# The Opportunities of Using Mushroom Compost Waste in Strawberry Growing

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**Abstract:** The aim of this study is to see whether Mushroom compost waste (MCW) can be used as an alternative fertilizers to Farm yard manure (FYM) because the latter is very expensive in Strawberry growing.

Experiment was carried out with frigo plants of Douglas cv. in summer planting system. In this experiment, both MCW (test material) and FYM (as control) were used. The obtained MCW and FYM were used 10, 20 and 40 tons per hectare. Experiment was designed as Randomized Blocks with 3 replicates. Applications in question during the growing season are observed the earliness, the yield per plant and fruit quality.

According to the results of this two-year-experiment, it was determined that MCW can be used as an alternative fertilizer to FYM in strawberry growing.

### Çilek Yetiştiriciliğinde Mantar Kompostu Atıklarının Kullanılma Olanakları

**Özet:** Bu çalışmanın amacı yanmış çiftlik gübresinin çok pahalı olmasından dolayı çilek yetiştiriciliğinde mantar kompostu atığının çiftlik gübresine alternatif olarak kullanılıp kullanılamayacağını araştırmaktır.

Deneme Douglas çilek çeşidiyle, yaz dikim sisteminde frigo bitkiler ile kurulmuş ve hem mantar kompostu atığı (test materyali) hem de yanmış çiftlik gübresi (kontrol) kullanılmıştır. Mantar kompost atığı ve yanmış çiftlik gübresi hektara 10, 20 ve 40 ton dozlarında kullanılmıştır. Deneme 3 yinelemeli Tesadüf Bloklarına göre yapılmıştır. Yetiştirme periyodu boyunca erkencilik, bitki başına verim ve meyve kaliteleri incelenmiştir.

İki yıllık denemenin sonuçlarına göre çilek yetiştiriciliğinde mantar kompostu atığının yanmış çiftlik gübresine alternatif olarak kullanılabileceği saptanmıştır.

## Introduction

In Turkey's agriculture, generally farm yard manure (FYM) is used commonly to enrich the soil by organic matter. But to take a good result from FYM, it must have been matured. Otherwise some plants sometimes die because of nonmaturation of the FYM. Nowadays maturing the FY is done in ordinary conditions. However there are several studies on maturing it (1-7). As a result, some important criteria were established. It is stated that it can prevent the effect of harmful microorganism and stimulate the growth and development of the plant in question.

Because matured FYM is very expensive, and the germination of different weed seed problem increases the cost, people try to find other ways that will help to increase the yield and quality (8, 9).

In this study, it is hypothesized that we can use waste of mushroom compost (MCW) as the organic material. The waste mushroom compost has the characteristics of plant growing medium both physically and chemically. Some research conducted for this purpose has shown that MCW can be a good soilless cultur subsrate when it is mixed with soil as a farmyard fertilizer or used alone in order to recover the physical conditions of the soil (10-14).

In Turkey, mushroom growing has developed in the last twenty years. The result of some studies have revealed that mushroom growing is approximately 7000-10000 tonnes per year. Since such an increasing amount of waste, has been obtained this waste can be used in strawberry growing.

## Materials and Methods

The obtained mushroom compost waste (MCW) administred to the raised beds in the rates of 10, 20 and 40 tons per hectare (ha), and were mixed on the soil. As control, farm yard manure (FYM) was used also in the same rates.

Table 1. Levels of macro and micro elements in the FYM and MC.

| | N(%) | P(%) | K(%) | Fe (ppm) | Zn (ppm) | Mn (ppm) | Cu (ppm) |
|---|---|---|---|---|---|---|---|
| FYM | 1.1795 | 0.1673 | 0.9 | 2989.9 | 77.5 | 384.8 | 44.0 |
| MC | 1.6275 | 0.1238 | 1.0 | 606.2 | 44.8 | 158.9 | 157.8 |

Table 2. The effects of MC and FYM on the total and monthly yield (g/plant) during 1993-94 period.

| Media | MC doses | | | FYM doses | | |
|---|---|---|---|---|---|---|
| | Yield (g/plant) | | | | | |
| Months | 10 ton/ha | 20 ton/ha | 40 ton/ha | 10 ton/ha | 20 ton/ha | 40 ton/ha |
| March | 24.4 | 36.2 | 50.1 | 32.9 | 27.1 | 38.9 |
| April | 266.9 | 260.6 | 239.3 | 233.6 | 262.0 | 241.2 |
| May | 171.9 | 141.5 | 130.1 | 122.2 | 143.8 | 130.5 |
| June | 158.7 | 128.5 | 128.4 | 119.5 | 140.1 | 185.4 |
| Total | 621.9 | 566.8 | 547.9 | 508.2 | 573.0 | 596.0 |
| Mean | | 578.9 | | | 559.1 | |

D%5 (Doses)=N.S. D%5 (Media)=N.S. D%5 (Doses*Media)=N.S.

Experiment was carried out with frigo plants of Douglas cv. as a summer planting. The experiment was designed as a Randomized Blocks with 3 replicates. Each replicate which is a parcel contains 30 plants. Statistical analyses were resolved by COSTAT pocket program.

The experiment continued for two years. In the first year, plants were grown under high tunnel during winter period. In the second year, plants were grown in the open conditions within the same period of time. In both trials, the effects of MCW and FYM on the earliness, yield per plant, and berry quality were observed (15).

## Result and Discussion

### Mineral Nutrient Contents of MCW and FYM

Macro and micro nutrient contents of the MCW and FYM are given in Table 1. In terms of macro elements, the amount of P and K (except N) were almost a like in both media. The amount of N in MCW was observed to be higher (1.6275%) than FYM. In terms of micro elements, Fe, Zn and Mn (except Cu) were higher in FYM than in MCW.

### The yield and its monthly distribution

During the whole growing period of 1993-94, the highest yield (621.9 g/plant) was obtained from the 10 tons/ha dose of MCW (Table 2, Figure 1). It was followed by 40 tons/ha of the FYM (596.0 g/plant).

During the 1993-94 season in all the treatments the harvests started in March. The highest yield in March was obtained from the 40 tons/ha dose of MCW (50.1 g/plant).

During the whole growing period of 1994-95, the highest yield (490.5 g/plant) was obtained from the 10 tons/ha dose of MCW as it was the same last year (Table 3, Figure 2). It was followed by 10 tons/ha of the FYM (472.2 g/plant).

As earliness yield, during the 1994-95 season in March the highest yield was obtained from the 40 tons/ha of the FYM and 10 tons/ha of the MCW (22.0 g, 19.3 g/plant, respectively) (Table 3).

When Table 2 and 3 are studied together, it can be seen that the yield is higher in 1993-94 than 1994-95 season. The reason of this low yield may be that plants were grown in walk-in high tunnel in the first year (16). The same results were observed in precocity. In the trial of 1993-94, the yield of March was more than the yield of March 1994-95. This may be due to the fact that the plants were grown in high tunnel in which they grow, develop, and give flowers earlier than plants in the field (16).

### Average Berry Weights

Average berry weights in both experimental year are given Table 4 and 5. The largest berries were obtained in March of 1993-94 and 1994-95 seasons (Figure 3, 4).

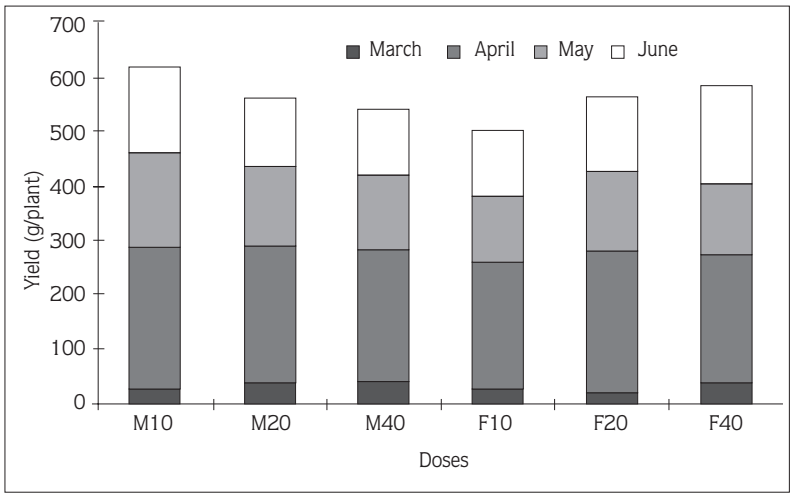


Figure 1. The effects of MCW and FYM on the yield during 1993-94 period (M10: 10 tons/ha; M20: 20 tons/ha; M40; 40 tons/ha of MCW and F10: 10 tons/ha; F20; 20 tons/ha; F40; 40 tons/ha of FYM).

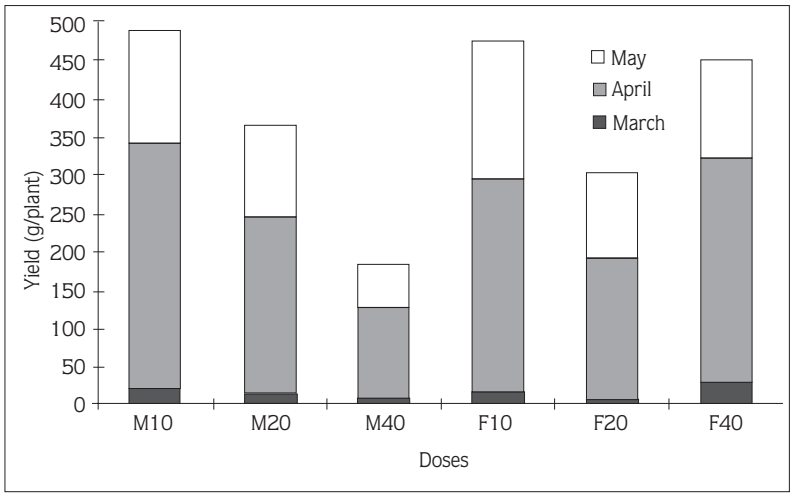


Figure 2. The effects of MCW and FYM on the yield during 1994-95 period (M10: 10 tons/ha; M20: 20 tons/ha; M40; 40 tons/ha of MCW and F10: 10 tons/ha; F20; 20 tons/ha; F40; 40 tons/ha of FYM).

Table 3. The effects of MCW and FYM on the total and monthly yield (g/plant) during 1994-95 period.

| Media | MCW doses | | | FYM doses | | |
|---|---|---|---|---|---|---|
| | Yield (g/plant) | | | | | |
| Months | 10 ton/ha | 20 ton/ha | 40 ton/ha | 10 ton/ha | 20 ton/ha | 40 ton/ha |
| March | 19.3 | 13.1 | 6.7 | 16.6 | 5.1 | 22.0 |
| April | 322.0 | 234.3 | 119.5 | 277.4 | 186.3 | 280.2 |
| May | 149.2 | 118.7 | 57.3 | 178.2 | 111.2 | 149.1 |
| Total | 490.5 | 366.1 | 183.5 | 472.2 | 302.5 | 451.2 |
| Mean | | 346.7 | | | 408.6 | |

D%5 (Doses)=N.S. D%5 (Media)=N.S. D%5 (Doses*Media)=N.S.

In 1993-94, the average weights of berries were 24.4 g with 40 tons/ha dose of MCW and 22.9 g with 10 tons/ha and 20 tons/ha of FYM.

In 1994-95, the largest berries were obtained from 10 tons/ha of MCW with 24.7 g/plant and 40 tons/ha of FYM with 22.4 g/plant. In all trials, as the season progressed the berry weight decreased. This decrease is due to the characteristic of strawberry because the earlier flowers in strawberry give larger fruits (16).

| Media | MCW doses | | | FYM doses | | |
|---|---|---|---|---|---|---|
| | Berry Weight (g) | | | | | |
| Months | 10 ton/ha | 20 ton/ha | 40 ton/ha | 10 ton/ha | 20 ton/ha | 40 ton/ha |
| March | 20.6 | 20.7 | 24.4 | 22.9 | 22.9 | 18.0 |
| April | 9.4 | 10.0 | 10.0 | 9.7 | 10.6 | 9.3 |
| May | 8.8 | 8.4 | 9.1 | 8.7 | 8.7 | 8.5 |
| June | 7.1 | 5.8 | 7.0 | 6.2 | 6.2 | 6.2 |
| Average | 11.5 | 11.2 | 12.6 | 11.9 | 12.1 | 10.5 |
| | | 11.8 | | | 11.5 | |

D%5 (Doses)=N.S. D%5 (Media)=N.S. D%5 (Doses*Media)=N.S.

Table 4. The effects of MCW and FYM on the average berry weights (g) in different months of 1993-94 period.

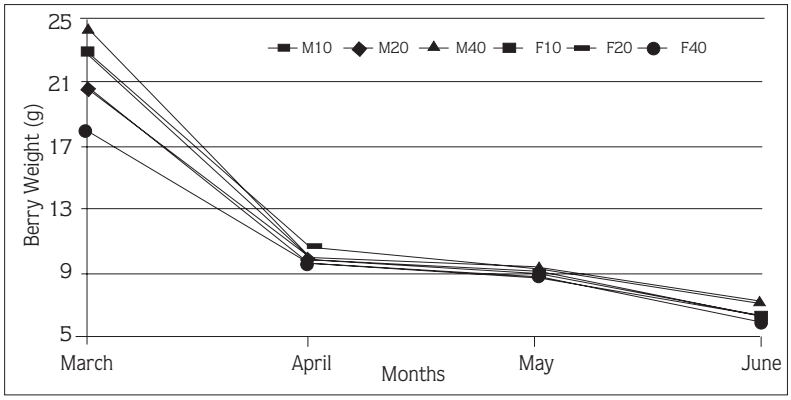


Figure 3. The effects of MCW and FYM on the average berry weights (g) in different mounts of 1993-94 period (M10: 10 tons/ha; M20: 20 tons/ha; M40; 40 tons/ha of MCW and F20: 10 tons/ha; F20: 20 tons/ha; F40: 40 tons/ha of FYM).

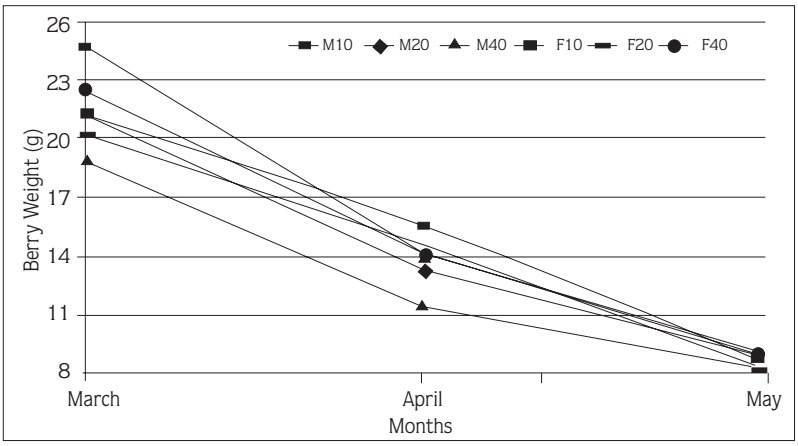


Figure 4. The effects of MCW and FYM on the average berry weights (g) in different mounts of 1994-95 period (M10: 10 tons/ha; M20: 20 tons/ha; M40; 40 tons/ha of MCW and F10: 10 tons/ha; F20: 20 tons/ha; F40: 40 tons/ha of FYM).

### Total Soluble Solid Contents of Berries

TSS contents of the berries generally increased as the season progressed; that means is warmer the days sweeter the berries (Table 6 and 7, Figure 5 and 6). In all treatments there is no statistical significant difference in terms of TSS.

In the first year of the experiment the seasonal mean TSS values were changed between 7.6% and 8.6% (Table 6).

In the second year, the highest content of TSS was obtained from 20 tons/ha dose of FYM with 8.8% and this was almost the same with the other doses.

These results support the findings of other studies (10-14) that when MCW is mixed with soil just as FYM or

Table 5. The effects of MCW and FYM on the average berry weights (g) in different months of 1994-95 period.

| Media | MCW doses | | | FYM doses | | |
|---|---|---|---|---|---|---|
| | Berry Weight (g) | | | | | |
| Months | 10 ton/ha | 20 ton/ha | 40 ton/ha | 10 ton/ha | 20 ton/ha | 40 ton/ha |
| March | 24.7 | 21.0 | 18.8 | 21.2 | 20.2 | 22.4 |
| April | 13.8 | 13.2 | 11.4 | 15.5 | 14.4 | 14.1 |
| May | 8.8 | 8.9 | 8.1 | 8.6 | 8.1 | 9.0 |
| Average | 15.8 | 14.4 | 12.8 | 15.1 | 14.2 | 15.1 |
| | | 14.3 | | | 14.8 | |

D%5 (Doses)=N.S. D%5 (Media)=N.S. D%5 (Doses*Media)=N.S.

Table 6. The effects of MCW and FYM doses on the TSS contents (%) of the berries during 1993-94.

| Media | MCW doses | | | FYM doses | | |
|---|---|---|---|---|---|---|
| | TSS (%) | | | | | |
| Months | 10 ton/ha | 20 ton/ha | 40 ton/ha | 10 ton/ha | 20 ton/ha | 40 ton/ha |
| March | 7.6 | 8.0 | 6.0 | 7.7 | 7.0 | 7.8 |
| April | 8.1 | 8.6 | 7.7 | 7.7 | 7.4 | 8.2 |
| May | 8.4 | 8.6 | 8.9 | 8.3 | 8.9 | 9.6 |
| June | 8.5 | 8.8 | 8.3 | 8.3 | 8.2 | 8.6 |
| Mean | 8.2 | 8.5 | 7.6 | 7.9 | 7.9 | 8.6 |

D%5 (Doses)=N.S. D%5 (Media)=N.S. D%5 (Doses*Media)=N.S.

Table 7. The effects of MCW and FYM doses on the TSS contents (%) of the berries during 1994-95.

| Media | MCW doses | | | FYM doses | | |
|---|---|---|---|---|---|---|
| | TSS (%) | | | | | |
| Months | 10 ton/ha | 20 ton/ha | 40 ton/ha | 10 ton/ha | 20 ton/ha | 40 ton/ha |
| March | 8.2 | 7.6 | 8.1 | 7.9 | 7.8 | 8.1 |
| April | 7.9 | 8.1 | 8.0 | 7.7 | 8.2 | 7.8 |
| May | 9.9 | 9.6 | 9.9 | 8.9 | 10.4 | 10.1 |
| Mean | 8.7 | 8.4 | 8.7 | 8.2 | 8.8 | 8.7 |

D%5 (Doses)=N.S. D%5 (Media)=N.S. D%5 (Doses*Media)=N.S.

when it is used without soil, it recovers the physical conditions of media.

According to the results, it can be said that the MCW has almost the same positive effects with FYM on the yield and quality of the Douglas strawberry variety. In other words MCW can be considered as an alternative to FYM.

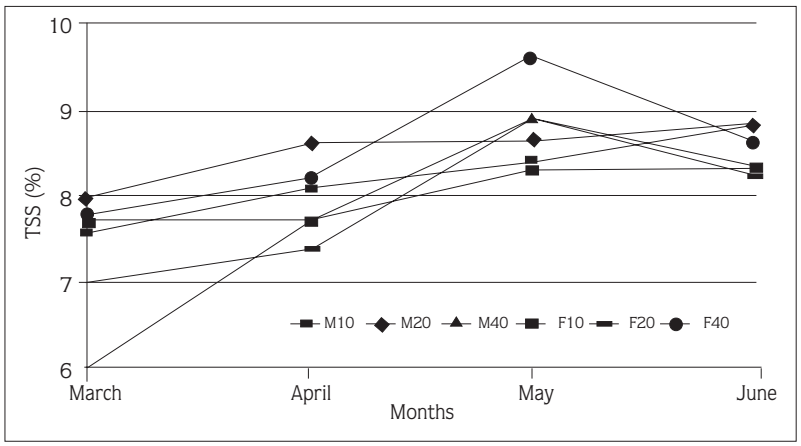


Figure 5. The effects of MCW and FYM on the total soluble solid contents (%) of berries during 1993-94 period (M10: 10 tons/ha; M20: 20 tons/ha; M40; 40 tons/ha of MCW and F20: 10 tons/ha; F20: 20 tons/ha; F40: 40 tons/ha of FYM).

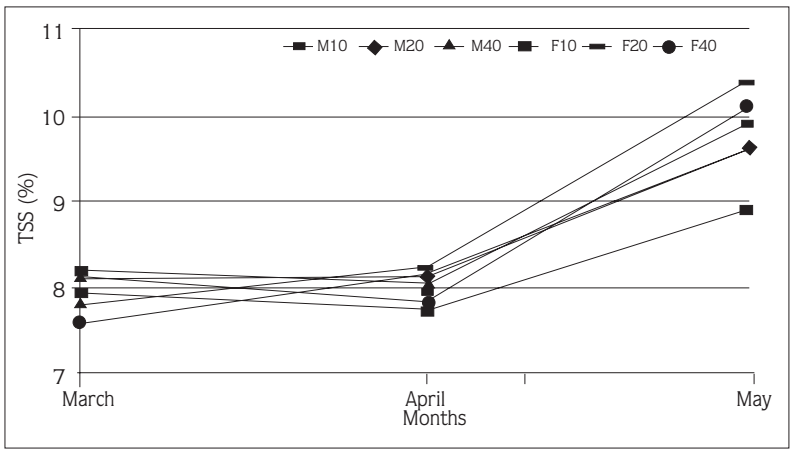


Figure 6. The effects of MCW and FYM on the total soluble solid contents (%) of berries during 1994-95 period (M10: 10 tons/ha; M20: 20 tons/ha; M40; 40 tons/ha of MCW and F10: 10 tons/ha; F20: 20 tons/ha; F40: 40 tons/ha of FYM).

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