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Research Article

Influence of peat, jiffy tablet and tomato waste spawned by *Pleurotus ostreatus* mycelium media on pepper seedling quality

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ABSTRACT

In this study, the effects of jiffy tablet, peat and tomato waste prepared by spawning of Pleurotus ostreatus mycelium media on growth and quality characters of pepper seedlings were investigated. Seedling height (cm), root length (cm), leaf chlorophyll content (CCI), leaf area (cm^2) and total seedling dry weight (g) were determined as seedling growth and quality parameters. Significant differences ($P \leq 0.01$) were found among media in terms of their influence on growth and quality characters of pepper seedlings. It was determined that the tomato waste medium spawned by P. ostreatus was not suitable for pepper seedling growing. When jiffy tablet and peat media compared, the highest seedling height (18.7 cm), root length (12.4 cm), leaf chlorophyll content (19.5 CCI) and leaf area (4.83) were obtained from the peat medium. The highest total seedling dry weight was determined in jiffy tablet medium as 0.18 g.

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1. Introduction

Turkey is one of the major countries that grow to about 30.4 million tons of vegetable production value. Turkey tomato vegetable production (12.6 million tons), while the first place, watermelon (3.9 million tons) and pepper (2.5 million tons) is in third place. Pepper, which ranks third in Turkey with the amount of fresh production is an important consumed as tomato paste and canned vegetables. Peppers (39%) produced in years in Turkey, 38% sauceboat (capia) constitutes 17% bell pepper and chili varieties çarliston 5% (TUIK, 2017).

Vegetable production has shown a rapid increase in parallel with the increase in production of 14 types of vegetables seedlings ready by 140 different manufacturers are producing seedlings in Turkey. Tomato seedling production is the first with 991.3 million, followed by lettuce, pepper and cucumber (Yanmaz et al., 2015).

Mistakes made in the preparation of the environments used in seedling cultivation lead to low number of seedlings, loss of seed, time, labor and hence crop loss. For this reason, the seedling media to be prepared should be ideal mixtures that can meet the demands of vegetables. Although prepared seedling mortars are useful for one plant, they may not be useful for others. In this respect, it is necessary to determine the ideal mortar mixes that will meet the demands of many vegetables by making various mixtures or the most suitable mortar mixes for each type (Uzun et al., 2000; Doğan, 2003).

In the production of greenhouse vegetable seedlings, some organic media are widely used alone or in combination with inorganic media by agricultural companies. In the Mediterranean region, where greenhouse cultivation is intense, ready-made seedling production is carried out in soilless mixtures consisting of 100% peat, peat-perlite or majority peat-perlite-vermiculite. Although the ratio of peat, perlite and vermiculite in the mixture varies according to the seedling producing company and growing season, vermiculite is used in smaller amounts in the mixtures (Varış et al., 2004).

Peat in the world and Turkey and for reasons such as reduction of perlite is a need for alternative sources seedling breeding environment (Tüzel et al., 2008). About 13 million tons of tomatoes are produced in Turkey (TUIK, 2017) and about 2-3 million tons of tomato waste were released. These wastes cause environmental pollution. By determining whether these tomato wastes can be used directly or after pretreatment as seedling cultivation environment, a raw material that is environmentally beneficial, natural, renewable and recyclable can be obtained from wastes that cannot be evaluated adequately and which cause environmental problems.

In this study, the effects of jiffy tablet, peat and tomato waste prepared by spawning of *Pleurotus ostreatus* mycelium media on pepper seedling quality was investigated.

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2. Materials and methods

The research was carried out in March-April 2017 in the glasshouse of Ondokuz Mayıs University Faculty of Agriculture Department of Horticulture.

Pepper (*Capsicum annuum* L. cv hair sweet) was used as production material in the study. In this study, the effects of *Pleurotus ostreatus* mycelium on tomato waste were compared with peat (control) material and jiffy tablet (42 mm) medium.

Tomato wastes grinded by micelle were shredded using 8-blade hammer type mill with 5 mm diameter sieve. 10% bran was added to the shredded tomato waste and mixed. The medium was soaked to 70% humidity, 10 g of viol size (46.5x36.5x7 cm) were placed in heat resistant bags and the bags were sterilized at 121 °C at 1.1 atm for 1.30 hours. After sterilization, 2 to 2.5 g of *Pleurotus ostreatus* micelle were inoculated into the cooling medium at 2%. PH and EC values of 1: 10 substrate / water mixture in 1 hour of agitation were measured (Table 1).

Table 1. Seedling growing media and their pH and EC values

Media	pH	EC (dS m^{-1})
Tomato wastes grinded by micelle	6.11	1.83
Jiffy tablet	5.32	1.15
Peat	5.45	1.76

Mycelium-grated tomato wastes were placed in 28-well seedling tray with an eye volume of 269 cm 3 (7 x 7 cm) with 3 replicates for jiffy tablets and peat seed cultivation. Seeds of the sweet pepper varieties were planted on 28.03.2017. Seeds were placed on the cultivation benches in the glasshouse controlled by heating and the moisture requirement was controlled during the cultivation period and irrigation was performed.

In this study, seedling height (cm), root length (cm), chlorophyll meter (CCM-200, Opti-Sciences, Hudson, USA) were measured by using a ruler to determine the quality of seedlings. After the dismantling of the seedlings, the roots were washed and the roots, leaves and stems were separated from each other. Leaf, root and stem were dried at 80 °C until constant weight for 48 hours and their dry weight was determined. Total seedling dry weight (g) was calculated according to the obtained results. Leaf area (cm^2) was also determined by digital planimeter (KP-90, Placom, Japan).

The study was designed according to randomized block design with 3 replications and 10 seedlings per repetition. SPSS 17.0 statistical analysis program was used to evaluate the data obtained from the study. The differences between the means obtained were determined by t test ($p \leq 0.01$). Micelle is not shown in the graphs because germination does not occur in the tomato waste medium.

3. Results and discussion

When the effect of medium, jiffy tablet and peat medium prepared by developing *Pleurotus osteratus* mycelium on tomato waste was examined, germination of *P. osteratus* mycelium was not observed. This may be due to insufficient water retention. Because of the lack of improvement in *P. osteratus* micelle squeezed tomato waste media, the results of the study were compared with jiffy tablet and peat media. The effects of these two media on leaf chlorophyll content and leaf area were significant ($P < 0.01$). The highest leaf area was measured in peat with 4.83 cm^2 and the lowest was obtained with jiffy tablet with 3.03 cm^2. Chlorophyll content was determined to vary between 12.45 (jiffy tablet) and 19.45 CCI (peat) (Figure 1).

Although the leaf areas of the plants depend on the plant species and varieties, they also vary significantly according to the environmental conditions in which the plant grows (Özbakır et al., 2012). Especially in pepper seedling cultivation, leaf chlorophyll content increases depending on light and temperature but decreases under extreme light conditions. However, it is stated that high leaf area and leaf chlorophyll content together increase seedling quality (Sarıbaş et al., 2018). In our study, similar results were obtained, the highest leaf area and chlorophyll content were determined in peat environment.

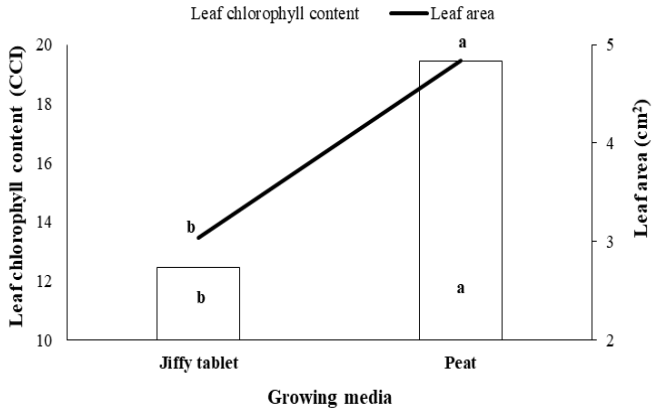

Figure 1. Effect of growing media on leaf area (cm^2) and chlorophyll content (CCI) ($P < 0.01$)

When the total seedling dry weight, which is one of the other important parameters, was examined, the effect of growing media on total seedling dry weight was significant ($P \leq 0.01$). The highest total seedling dry weight was determined in jiffy tablet medium with 0.18 g and the lowest in peat medium with 0.16 g (Figure 2).

It is stated that seedling dry weight is important in plant breeding and seedlings with high total dry weight are resistant to stress conditions and adaptability is high (Özer and Kandemir, 2016).

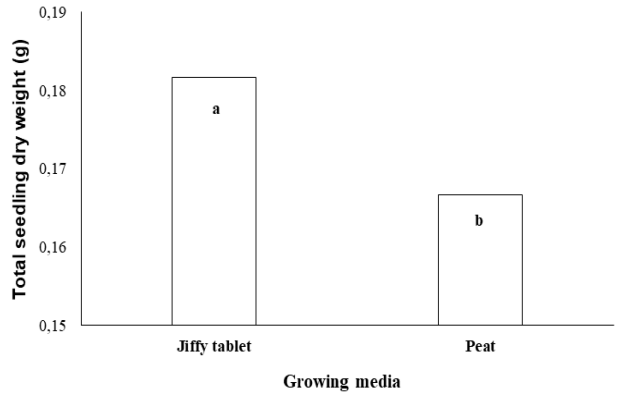

Figure 2 Effect of growing media on total seedling dry weight (g) (P <0.01).

The effect of growing medium on root length was significant (P <0.01), root lengths were found to be 8.0 cm in jiffy tablet medium and 12.43 cm in peat medium. The plant height was 18.73 cm in the highest peat environment and the lowest was 12.1 cm in the jiffy tablet medium (Figure 3). It is reported that the height of pepper seedlings can vary between 6.61 and 26.35 cm (Sarıbaş et al., 2018). The effects of seedling growing media obtained from different mixtures with waste mushroom compost and peat (2: 1: 1 from fertilizer, soil and sand) on broccoli and cabbage seedling quality were obtained from the highest seedling height peat medium (Kandemir et al., 2009). The results obtained from the study are similar to those of the researchers.

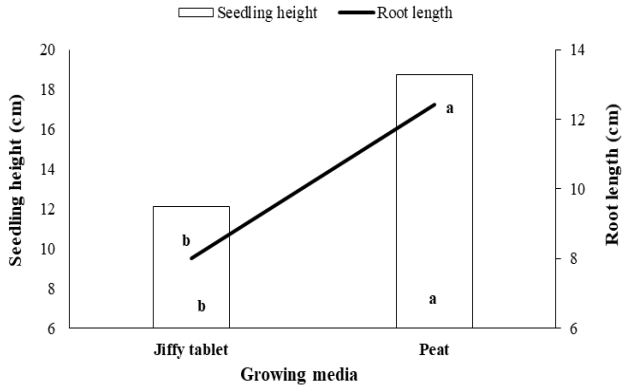

Figure 3. Effects of growing media on plant height (cm) and root length (cm) (P <0.01)

In the study where perlite, peat, gypsum, zeolite, coconut fiber and rock wool environments were compared in terms of their effects on seedling quality in lettuce seedling cultivation, the highest root length was determined in zeolite environment, followed by peat, liberate and perlite environments (Güler, 2011). Seedling height was found to be 12.19, 11.10 and 10.98 cm in white pumice, black pumice and perlite in pepper (Brohi et al., 1995).

There is a great relationship between different seedling growing environments and seedling quality (Ertan, 1989). In the study, the effect of seedling growing environments on seedling quality was found to be significant.

4. Conclusions

In determining seedling quality, total dry weight and seedling height, root length, leaf area and leaf chlorophyll content should be examined together. According to the obtained results, although total dry seed weight was higher in jiffy tablet application, plant height, root length, leaf chlorophyll content and leaf area values were determined higher in peat environment.

As a result, it was determined that micelle structure had negative effect on germination of pepper seeds in *P. osteratus* micelle. Therefore, jiffy tablet and peat media were compared. When the seedling quality characteristics were taken into consideration, it was found that peat media gave better results than jiffy tablet media.

It is thought that the use of plant wastes as a mushroom growing environment and the use of mushroom composts alone or with mixtures of different proportions will contribute to the seedling growing environment studies.

Disclosure statement

No potential conflict of interest was reported by the author

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