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The Effect of Different Seed Sowing Media on the Quality of Cucumber Seedlings

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ABSTRACT

This study was carried out in a plastic greenhouse during the period from 10 July to 15 August. Four different seedling media were formed of commercial peat, farmyard manure, garden soil and perlite. Seedlings of cucumber (*Cucumis sativus* L.) were produced as untransplanted. Quantitative analysis of seedlings was done after pulling out the seedlings out of the trays at the stage of four true leaves. Some properties such as seedling length, leaf dry weight, seedling dry weight, leaf area ratio (LAR), specific leaf area (SLA) were determined. The effect of different seed sowing media on seedling quality in terms of examined properties was found to be significant.

Keywords: cucumber, seed sowing media, seedling quality
Abbreviations: LAR, leaf area ratio; **LWR**, leaf weight ratio; **RWR**, root weight ratio; **SWR**, stem weight ratio; **SLA**, specific leaf area

INTRODUCTION

Having a high economic value, cucumber has marked importance particularly in terms of greenhouse cultivation. Cucumber is generally grown by means of seedlings.

To date, the lack of quality seed usage and the application of proper vegetable growing techniques have been one of the most important reasons of the decrease in vegetable growing. The growing techniques start from the soil mixture, continues along the seed cultivation stage and ends with the improper practices realized within the greenhouse (Alan 1990).

A successful seed cultivation primarily depends on the proper seed type and seedling production procedure. The healthy and strong seedling growth can be maintained by providing appropriate seedling production conditions. One of the most important of these conditions is selection of the material used in the seed sowing and seedling growth media. Optimized growth and development of the seedling is generally maintained by proper preparation of the production mixture. A good seedling compost is composed of the mixtures that are tender enough for the seed to easily germinate, retains enough water, drains excess water and provides the plant enough nutrients during the periods seedling growth and development (Duyar 1986; Ertan 1989; Şahin *et al.* 1989; Demir 2004).

The mixtures generally composed of peat or farmyard manure are used for seedling production. Peat is much more expensive compared to the mixture of farmyard manure. Thus, producers usually prefer the mixtures prepared of farmyard manure.

It was reported that the proportion of quality seedlings obtained from quality seeds and suitable seedling media mixtures were found to be 20-30% higher than those of the seedlings produced with less and seedling media quality (Günay 2005).

Although seedling production is commonly used many countries, the desired level of seedling production in terms of the appropriate media and mixtures have not been reached (Uzun *et al*. 2000).

Success in seedling production starts by obtaining well-rooted seedlings with. Thus, it is essential to carry out research on the effects of the seed sowing places and the media prepared for seedling production pots (Şeniz 1984, 1992).

In vegetable growing seedling production develops as a separate branch of expertise. Mistakes made in the preparation of the seedling production media lead to marked decreases in the number of quality seedlings, and loss seed, time, workforce and consequently yield loss. Thus, the preperad seedling media should be composed of the ideal mixtures which meet the requirements of the selected vegetables. The seedling media may be suitable for a variety while being unsuitable to the other vegetable varieties. In this respect, it is necessary to determine the ideal media to meet the requirements of most of the plants or to prepare the optimal mixture for each plant species through providing various seedling production mixtures (Uzun *et al.* 2000; Doğan 2003).

In this research, different seed sowing media were prepared and the most suitable medium was determined by determining the effects of media used in the present study on the quality of cucumber (*Cucumis Sativus* L.) seedlings.

MATERIALS AND METHODS

This study was carried out in a plastic greenhouse during the period from 10 July to 15 August. In this study, cucumber (*C. sativus* L. cv. 'Sahra' F_1) was used as plant material. Seed sowing was made in seed trays each with 45 cells on the 10th of July. As seed sowing media; commercial peat (Klasmann and Goldhumus), farmyard manure, garden soil and perlite were used. 4 different seed sowing media were prepared by using these materials. The mixtures of the materials for seed sowing media were given in **Table 1**. The procedure of pricking out the seedlings to the bigger seed trays or pots (transplanting) was not applied on the seedlings.

The temperatures of each medium used for the research were measured three times per day (8:00, 14:00, 21:00) by using soil thermometer and the mean daily temperatures were calculated by averaging the values measured. The mean daily temperatures were given in **Fig. 1**.

The roots of the seedlings with four true leaves were pulled

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Research Note

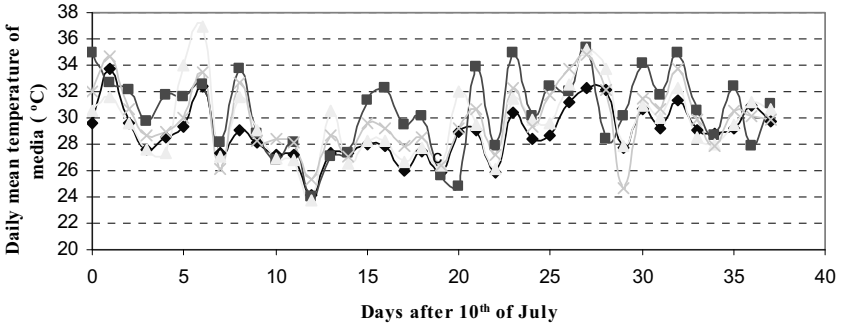

Fig. 1 The mean daily temperatures of different seed sowing media. Diamond: FYM+S; square: KP; triangle: GP; cross: KP+P

Table 1 The material mixtures of the seed sowing media.

Media	Material mixtures
FYM+S	Farmyard manure and garden soil (2:1, v/v)
KP	Commercial peat (Klasmann)
GP	Commercial peat (Goldhumus)
KP+P	Commercial peat (Klasmann) and perlite (1:1, v/v)

Table 2 Determination methods of some plant growth parameters.

Parameters	Determination methods
Leaf Weight Ratio (LWR)	Leaf dry weight (g) / Total seedling dry weight (g)
Root Weight Ratio (RWR)	Root dry weight (g) / Total seedling dry weight (g)
Stem Weight Ratio (SWR)	Stem dry weight (g) / Total seedling dry weight (g)
Leaf Area Ratio (LAR)	Leaf area (cm^2) / Total seedling dry weight (g)
Specific Leaf Area (SLA)	Leaf area (cm^2) / Leaf dry weight (g)

out from the trays, were thoroughly washed and the measurements were performed. The root, stem and leaf parts of the seedlings were separated, put in paper bags and dried at 80°C in an oven for approximately 48 h. Dry weights of the plant parts were determined by using a 0.001 g sensitive digital scale. The leaf areas of the seedling were measured with planimeter before the leaves were placed in the oven.

Seedling height (cm), stem diameter (mm), leaf dry weight, stem dry weight, root dry weight, total seedling dry weight, leaf area, leaf weight ratio, stem weight ratio, root weight ratio, leaf area ratio and specific leaf area ratio of the seedlings were determined as growth parameters.

Determination methods of some plant growth parameters which were calculated according to (Uzun 1996a, 1996b) were given in **Table 2**.

The experiment was carried out in a randomized block design with 3 replications and 5 seedlings were used for measurements for in each replication. The data analysis and graph drawing processes were carried out by using Excel package programmed. Standard error bars were employed during the statistical comparison of the data obtained. The standard error bars on the graphics were placed for $P < 0.05$ level.

RESULTS AND DISCUSSION

The effects of the different seed sowing media on the seedling height are given in **Fig. 2**.

As seen in **Fig. 2**, the highest seedling height (25.83 cm) was obtained from the farmyard manure and garden soil. The lowest seedling height (10.54 cm) was determined from the seedlings grown in GP medium.

When **Fig. 3** is examined, it is observed that the highest seedling stem diameter was determined in the plants from FYM+S medium. This medium was followed by the KP medium. The lowest stem diameter was obtained in the plants of GP and the KP+P media. There were no significant differences between these two media.

The highest leaf dry weight (1.101 g) and stem dry weight (0.64 g) were obtained from the seedlings grown in the FYM+S medium, whereas the lowest leaf dry weight (0.50 g) and stem dry weight (0.36 g) were found in the GP medium (**Figs. 4, 5**).

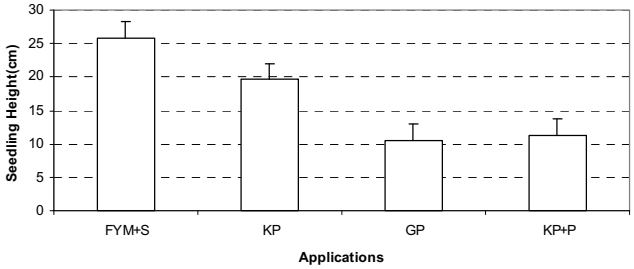

Fig. 2 The effects of the different seed sowing media on the seedling height (cm).

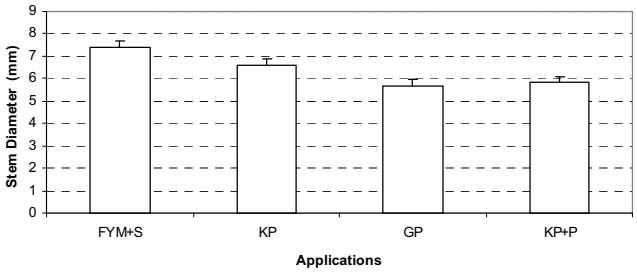

Fig. 3 The effects of the different seed sowing media on seedling stem diameter (mm).

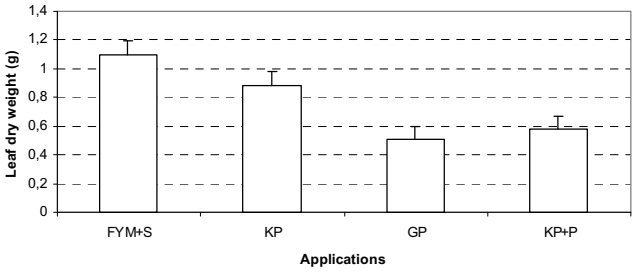

Fig. 4 The effects of the different seed sowing media on seedling leaf dry weight (g).

As seen in **Fig. 6**, the highest root dry weight was determined in the plants from FYM+S medium (farmyard manure and garden soil) as 0.213 g. This medium was followed by the KP medium and no statistical difference was found to be between these two media. The lowest root dry weight was recorded from the the seedlings grown in the KP+P medium as 0.13 g.

When **Fig. 7** is examined, it is observed that the seedlings of the FYM+S medium had the highest total seedling dry weight (1.96 g), whereas those of the seedlings of the GP medium had the lowest total seedling dry weight (1103 g).

The highest seedling leaf area was determined from the

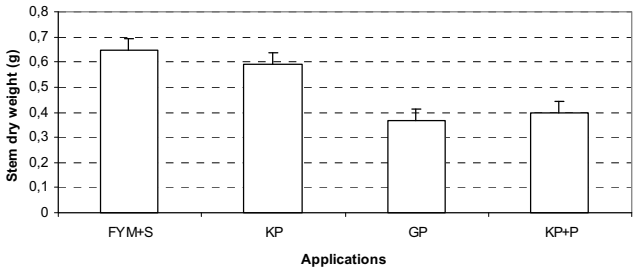

Fig. 5 The effects of the different seed sowing media on seedling stem dry weight (g).

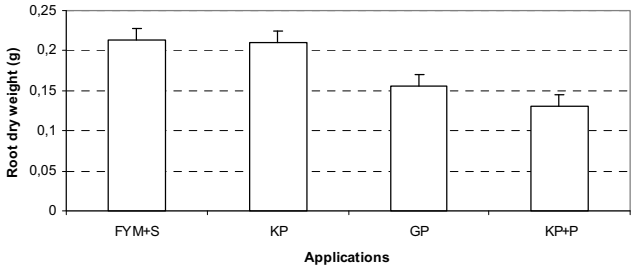

Fig. 6 The effects of the different seed sowing media on seedling root dry weight (g).

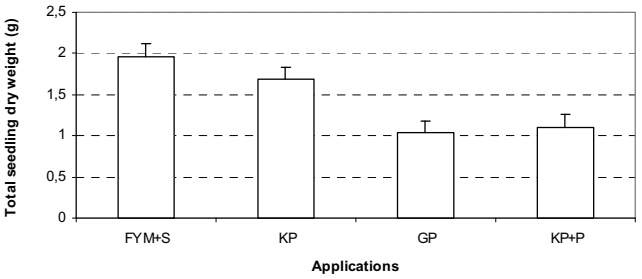

Fig. 7 The effects of the different seed sowing media on total seedling dry weight (g).

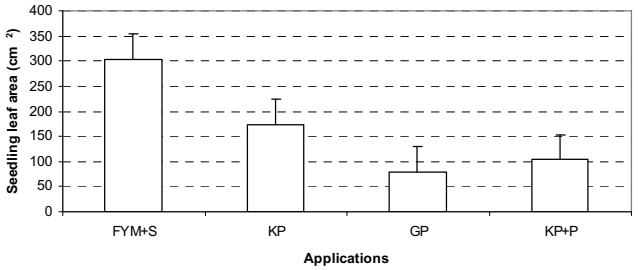

Fig. 8 The effects of the different seed sowing media on seedling leaf area (cm^2).

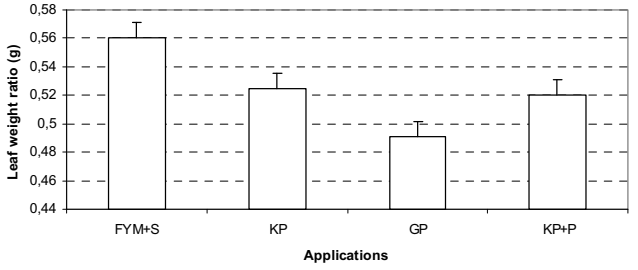

Fig. 9 The effects of the different seed sowing media on seedling leaf weight ratio.

seedlings of the FYM+S medium as 303.52 cm^2, whereas the lowest seedling leaf area was determined from the seedlings of the GP medium as 78.85 cm^2 (**Fig. 8**).

When the leaf weight ratio of the seedlings were taken into consideration, it was observed that the highest leaf

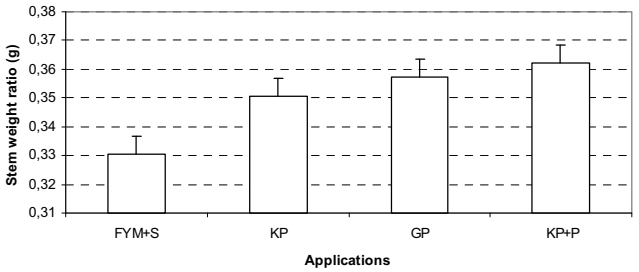

Fig. 10 The effects of the different seed sowing media on stem weight ratio.

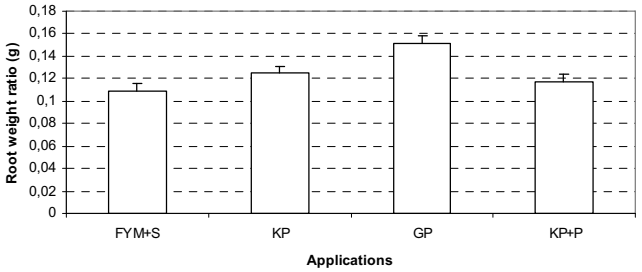

Fig. 11 The effects of the different seed sowing media on seedling root weight ratio.

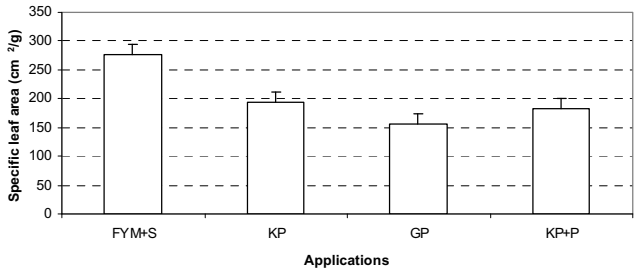

Fig. 12 The effects of the different seed sowing media on seedling specific leaf area (cm^2/g).

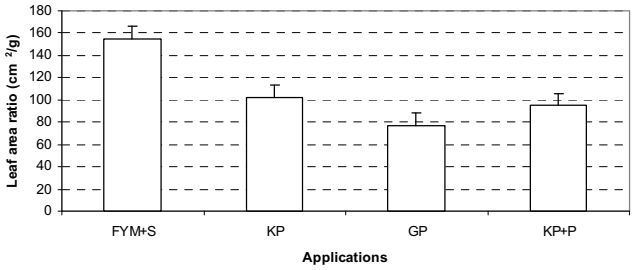

Fig. 13. The effects of the different seed soing media on seedling leaf area ratio (cm^2/g).

weight ratio was measured from the seedlings of the FYM+S medium (0.56), whereas the seedlings of the GP medium gave the lowest leaf weight ratio (0.49) (**Fig. 9**).

As seen in **Fig. 10**, the highest seedling stem weight ratio was obtained from the seedlings of the KP+P medium. This medium was followed by medium GP, KP and FYM+S respectively. There were no significant differences between KP+P and GP seed sowing media.

When **Fig. 11** is examined, it is observed that the highest root weight ratio of 0.15 was seen from the seedlings of the GP medium. This medium was followed by medium KP. The lowest root weight ratio of 0.11 was obtained from the seedlings of the FYM+S medium.

The highest specific leaf area (276.82 cm^2/g) and the leaf area ratio (154.77 cm^2/g) were determined from the seedlings of the FYM+S medium, whereas the seedlings of GP medium gave the lowest specific leaf area (155.77 cm^2/g) and the leaf area ratio (76.46 cm^2/g) (**Figs. 12, 13**).

The most important issue in plant production is to pro-

duce the first production material, in other words the seedling, in the most convenient level (Şeniz 2002; Demir 2004).

Lack of a standardized mixture as seed sowing medium is one of the significant concerns faced by the seedling producers. Various mixtures prepared by the researchers in line with this objective have been tested in different plant types, and the medium mixtures being considered to have positive effects on the seedling quality, plant development, earliness, total yield and quality were recommended to the producers.

Particularly, in greenhouses, the producers spend too much time on preparing the seed sowing and seedling medium and adjusting the moisture and nutrient levels. It would bring along various problems if the media mixtures are not prepared conveniently. For the plant to show the optimal growth and development, it is necessary for the medium to be appropriate both physically and chemically.

Producers usually fail to provide the appropriate medium in seedling production for greenhouses. Thus, most of them use commercial peat. Most of the commercial media used are imported to some countries from the foreign countries or via the branches of the foreign companies in these countries. Farmers occasionally prepare their own seed sowing or seedling production media However, they are unable to take precautions necessary to eliminate the weed seed, diseases and harmful insects.

In the seed sowing and seedling production medium, appropriate aeration and temperature should be maintained and these media should be free of diseases, cheap and easy for sustainability. With good sterilization, FYM+S medium (farmyard manure and garden soil) which was found to be suitable for these characteristics is widely used due to possessing the features required, compared to many seedling media. As the seedlings grown in FYM+S medium allowing more seedling root production per unit area had a higher quantity of root system. It can be said that these seedlings will have better growing potential and the yield of these plants is expected to be higher (Özer *et al*. 2008).

Munsuz *et al*. (1982), which gives explanations regarding peat, mentions that the peat quality may vary significantly depending on the structures of the plants forming the peat. It is the main reason why there are marked differences between commercial seed sowing or seedling production media.

As a result of this study, it can be said that the seedlings produced in the medium which was mixture of farmyard manure and garden soil (FYM+S) dad higher quality. Than those of the seedling produced in other seedling media mixtures.

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