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The Effects of Different Growing Mediums on the Root and Stem Development of Corn

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Abstract

This research was carried out to determine the effects of different growing mediums on dry and wet root weight, dry and wet stem weight, root and stem lenght of corn in the Soil Since Department of Agriculture Faculty, Atatürk University. In this research, pure materials of soil, pumice, perlite and torf, and mixtures of 50% + 50 %pumice + soil, 50 %+ 50 %perlite + soil, 50 %+ 50 %torf + soil were used as growing mediums.

As to the findings of this study; the effects of different growing mediums on the root and stem dry weight, root and stem length of corn were found to be statistically significant but root and stem weight nosignificant. According to the result, the highest valuees of dry root weight (0.78 g/pot), wet root weight (2.00 g/pot), dry stem weight (0.92 g/pot) wet stem weight (11.44 g/pot), root length (200 cm/pot), stem length (272 cm/pot) were obtanied from the pots in which pumice + soil 50 % + 50% was used. The lowest value were determined from the pots containing pumice, perlite and torf 100%. As a result, it was determined that the best root and stem development of corn was in 50% + 50% Pumice + Soil environment.

Key Words: Corn, Media, Root, Stem, Soil, Weight

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INTRODUCTION

Soils that can be used in plant production are both limited and variable. It is important that the soil which is the production medium in vegetable production has the desired physical and chemical characteristics such as proper drainage, adequate aeration conditions, optimum water holding capacity and suitable soil reaction together with useful moisture content. In order to provide the ideal conditions for plant growth in the soil environment, different organic and inorganic materials are used to regulate the physical and chemical properties of the soil.

In some studies carried out in different cultivation environments, pumice, which is mixed with soil, decreases plant water consumption, plant root and stem dry weight increased soil conditioners such as perlite and pumice in greenhouse conditions have a positive effect on the yield and yield components of carrot plant, soil, perlite, pumice, zeolite and mixtures thereof for barley. In the perlite medium, lower values of dry root weight than pumice are obtained the soil properties improved with the addition of pumice to the soil, and the best plant (strawberry) development was in the pumice environment mixed with the soil size between 4-8 mm and 45%. In another study, the stem diameter, number of leaves, seedling weight, seedling width, leaf length and leaf width of the best results, normal cibre + 25% super coarse perlite mixture; seedling size, rooted seedling length, root weight, rooted seedling weight and root length of the peat + 25% super coarse perlite mixture was determined (Karaman, 1993; Türk vd. 2003; Göçmen, 2005; Şahin et al. 2005 & Çinkılıç, 2008).

MATERIAL AND METHODS

The research was carried out to compare pumice, perlite and peat media using corn plant and to determine the optimum medium for plant root and stem development. Corn plant was chosen because of its hairy root formation. As control, soil is used and seven different cultivation media consisting of pure forms and mixtures of other materials were prepared. As a result, 100% Pumice, 100% Perlite, 100% Peat, 100% Soil, 50% + 50% Pumice + Soil, 50% + 50% Perlite + Soil, 50% + 50% Peat+ Soil have formed the cultivation media in research. The research was carried out as a pot experiment in Atatürk University Faculty of Agriculture Department of Soil Science. The experiment was conducted in three repetitions according to the pattern of fully randomized plots, in polyethylene black pots. Plants were planted as five plants in each pot, irrigation was done during the development period and no nutrients were given. Plants were harvested after seven weeks. The research results were statistically tested using the SPSS 13 package software, with variance analysis (ANOVA) and Duncan multiple comparison test (5%) (Dowdy & Wearden, 1983).

Research Findings and Discussion

Root Dry And Wet Weight (g/pot)

Plants obtain a large portion of the nutrients they need, from the environment in which they develop, with the under ground organs (roots) and a small portion of them, from the aboveground organs (stems, branches and leaves). For this reason root systems are of great importance in plants. Root system refers to all the roots of the plant. Root systems differ in terms of structure, weight, development and propagation under the influence of the

environmental conditions in which plants grow, and in water and nutrient absorption, root tip is of vital importance in plant root systems.

The results of variance analysis and mean values of the root dry and wet weight values of corn plant grown in different growing media are given in Table 1. Media were found significant at 1% level in terms of root dry weight. Root wet weight was found to be insignificant. According to the Duncan multiple comparison test, the mean values of root dry weights fall into in three different groups and values of root wet weights fall into in two different groups (Table 1).

Table 1. Dry and Wet Root Weight of Plant Grown in Different Growing Media

Breeding Envıronments (%)	Root Dry Weight (g/pot)	Root Wet Weight (g /pot)
Pumice 100%	0.24 a	0.78 a
Perlite 100%	0.39 ab	1.11 ab
Peat 100%	0.35 ab	1.25 ab
Pumice 50 % + Soil 50 %	0.78 b	2.00 b
Perlite 50 % + Soil 50 %	0.73ab	1.83 ab
Peat 50 % + Soil 50%	0.30 ab	1.15 ab
Soil 100 %	0.55 c	0.75 ab
Envıronments	**	**

** p<0.01, * p<0.05, ns none significant

Stem Dry And Wet Weight (g/pot)

As can be seen in Table 2 the stem dry weight of corn plant grown in different growing media was found to be significant at 1%. While the number of stem wet weight was found to be insignificant. At the same time. the average number of stem dry and wet weight values fell into two different groups.

Table 2. Dry and Wet Stem Weight of Plant Grown in Different Growing Media

Breeding Envıronments (%)	Stem Dry Weight (g/pot)	Stem Wet Weight (g /pot)
Pumice 100%	0.59 a	6.49 ab
Perlite 100%	0.91 a	4.73 a
Peat 100%	0.93 a	8.43 ab
Pumice 50 % + Soil 50 %	1.09 a	13.48 b
Perlite 50 % + Soil 50 %	0.69 a	7.99 ab
Peat 50 % + Soil 50%	0.55 a	5.99 ab
Soil 100 %	0.83 b	4.4 ab
Envıronments	**	ns

** p<0.01. *p<0.05. ns none significant

According to the results. highest stem dry weight (1.09 g/pot) values and stem wet weight (13.48 g/pot) values were recorded in 50% Pumice + 50% Soil medium while the lowest value was found in the 50% Peat + 50% Soil medium (0.55 g/pot) and Perlite 100 % (4.73 g/pot). In medium with perlite or perlite + soil mixture. soil is not hardened. contact between root and soil increases and consequently adequate porosity is provided for plant root and stem development and of roots and stem length increases. Because of the excess water retention capacity of the peat medium. plant roots are thought to rot.

Sahin et al. (2005) found that the number of leaves, leaf area, dry and fresh root weight, root length and fresh weight were positively affected by different ratios of pumice in strawberry plant.

Root and Stem Length (cm/pot)

The variance analysis results and mean values for the root and stem length of corn plant grown in different growing media are given in Table 3. While root and stem length values were significant at 1% level. According to the Duncan multiple comparison test root and stem length values fell into two different groups.

Table 3. Root and Stem Length Values of Corn Cultivated in Different Growing Media (cm/pot)

Breeding Envıronments (%)	Root Length (cm)	Stem Length (cm)
Pumice 100%	200 a	194 b
Perlite 100%	297 b	191 b
Peat 100%	312 b	195 b
Pumice 50 % + Soil 50 %	328 b	272 b
Perlite 50 % + Soil 50 %	198 a	265 b
Peat 50 % + Soil 50%	188 a	245 b
Soil 100 %	110 ab	103 a
Envıronments	**	**

** p<0.01, * p<0.05, ns none significant

The plant needs macro and micropores for root development. Root growth decreases as the oxygen content of soil air drops below 8%. and when it is less than 2% growth stops. Root development and elongation decrease significantly in soil which is compressed. whose volume weight increased and pores lost for any reason. Root growth is adversely affected at low temperatures and the formation of lateral roots retards (Anonymous, 2018). Root growth and development in plants are closely related to soil texture. In addition to clay layer. rocks etc. which are to be found in any part of the soil, the height of the groundwater level and the lack of plant nutrients significantly limits the root growth. Plants generally form thinner and deeper roots with more lateral branches in sandy soils compared to clayey soils. In this study it is thought that the use of soil with clay-loam texture, the high water retention capacity of perlite and peat media could negatively affect the length of roots and stem.

Celik (2009) found that the best rooting medium was peat+perlite in the research using sand, peat, perlite and blends of these media. In another study where the quality of fig plant was determined, soil, forest soil, perlite, pumice, zeolite and their mixtures were used as the growing medium and it was noted that best root length values were obtained in perlite + zeolite medium and the best root number values in the pumice medium (Ertan et al. 2007).

CONCLUSION

According to the results of the research. It was found that the most effective medium on dry and wet root weight, dry and wet stem weight, root and stem length of corn was found to be mixed perlite medium among the different media used for root and stem development.

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