

# Comparison of different culture media on growth and yield of bell peppers (*Capsicum annum*)

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**ABSTRACT:** In recent years, use of soilless culture (hydroponics) in the world, including Iran due to numerous advantages, such as: the possibility of planting in places where there is no soil or sand is basically the control of plant nutrition, reduce the incidence of disease. and pests and increase the quantity and quality of soil cultivation is expanding. In general it can be hydroponic culture from the standpoint of culture into liquid culture media and granulated culture media divided. The experimental design was a randomized complete block with eight treatments and four replications College of Agriculture, Isfahan. . Beds, including sawdust (100%) and a common platform (Peat 80% perlite 20%) respectively. Transplanting red pepper on 2012/09/29 after preparing the beds were transferred to pots. Watering and feeding nutrient Johnson (50%) in intervals of 45 minutes to an hour each time for one minute according to the plant and greenhouse temperature conditions. During the trial and the end of the vegetative growth factors, reproductive and performance were measured. The results showed the highest shoot dry weight, root dry weight, the earliest flowering, fruiting and the color of the treated sawdust. The results also showed the highest chlorophyll content of the peat bed. Different substrates significant effect on the number of fruits per plant, fruit weight and did not function however sawdust bed after Peat had the highest number of fruits per plant. The results showed that after Peat, in most cases the plants are planted in a bed of sawdust in vegetative and reproductive growth were better.

**Keywords:** Bed Cultivation, Sawdust, Peat, Perlite, Pepper.

## INTRODUCTION

With increasing world population and a shortage of food, discuss the production of high quality and at a lower, more attention has been attracted. Greenhouse plants in a controlled system in terms of nutrition, diseases, pests and weeds used because of the advantages are: increased production per unit area compared with production in the open air, the quality of the product The use of non-arable land using hydroponic or soilless culture, independent of the environmental conditions outside the greenhouse and to set the time of harvest, sustainability and production in all seasons, save the earth and the release of additional land For strategic culture, etc. (1.3) hydroponics or soilless culture, the way in which plants are grown without the use of soil as a medium. In other words, the methods of cultivation of plants in water (nutrient) than soil or hydroponic substrate that is historically a relatively long history. Perhaps the history of hydroponic growing is the size of the pyramids. For example, the hanging gardens of Babylon, the primary form of hydroponics is. Soilless culture in the 1930s by scientists at the California plants prosper, so that modern hydroponics was formed during World War II, America's military in several large hydroponic gardens to provide green island troops to the region (1 ). Because hydroponic cultivation in the country tend to spread but little information regarding the optimal planting beds to grow major crops such as bell peppers, tomatoes, cucumbers and other greenhouse products exists. Bell pepper and sweet pepper called names. Its scientific name is *Capsicum annum* and of the family Solanaceae. All species capsicum has  $2n = 24$  chromosomes. Most species of temperate and tropical pepper planting in areas that are believed to belong to the species of origin is Mexico and Central America. Bell peppers and annual herbaceous plant that low temperature growth is slow period. In some areas, the

weather is favorable, it may be over a year old woody stem and a plant to be two years. When the main stem, 10 to 12 leaves and fruit production is used to produce a goal. The lateral branches that arise from them flowers appear at the end. The whole plant has flowers and stems branching 150 to 180 cm. Leaves no cuts, and single, oval or elliptical and are alternately on the stem. In hydroponics systems nutrient levels proposed for tomato pepper similar to that plant growth on the concentration added. solution pH to 5.6 - 5.5 and EC depending on the solute about ms / cm 2 / 1-5 / 2 is (9) . Technology soilless culture has several advantages over the classic agriculture, but not necessarily for all. We'll water and nutrients. The water in the natural environment is prevented. Three medium or porous substrate for the cultivation of hydroponic based on their origin, including substrates made from rocks or cliffs (rock wool, vermiculite, perlite, pumice and zeolite), substrates made from synthetic materials (sponges, plastic expanded, polyurethane foam and urea-formaldehyde) and organic substrates (sawdust, peat, coco peat and rice husk) is. Upholstering and colleagues (5) the effects of five bed perlite, wood chips, pure wood chips 50% perlite and 50%, wood chips 75% zeolite, 25% perlite and 75% zeolite, 25% of the growth and yield of tomato varieties and quality of tomato showed about Most of the growth traits measured by the number of branches and leaves, shoots growing number of nodes and fresh and dry weight of perlite has been treated. Hope et al (2) also in the vegetative and reproductive traits of the slender eggplant showed the highest number of nodes, shoot dry weight, the highest number of fruits and yield of 95% perlite treated hydrogel 5% and the minimum number of days to flowering plant related to Perlite treatment was 100%. Gurion and his colleagues in the study (52) also proved to be the best material to ensure growth Peat Guelder rose and physical parameters of seed bed there is a direct relationship. Peat was Guelder rose greatest height in the context of the available water was high. Wood and wood chips as side products, some of which are not widely used in other industries. Sawdust is widely used in hydroponics business in Canada in terms of availability, is used. Hard wood like eucalyptus sawdust should be worn before. Mas and Adamson (7) of the material used for growing tomatoes and it was the most suitable for the cultivation of tomatoes, provided that the water required for plants Continuous come. Since the 1970s, the frequency, small, low weight, wood products as suitable for the production of greenhouse tomatoes in the West is considered Canada and New Zealand (3.4). provided optimal conditions for it to be suitable for the production of greenhouse tomatoes. Kang et al (12) also stated that the use of sawdust to improve the physical and chemical.

## MATERIALS AND METHODS

In order to study the effect of different substrates on growth characteristics, yield and quality of pepper-sweet fruits of greenhouse hydroponics in a randomized complete block design was performed. In this study, 3 bed planting, 4 replicates and 2 pot for each test and a total of 24 pots were used, each with a plant.

Treatments consisted of 3 different bed hydroponic culture with different volume ratios were as follows :

Sawdust (100%)

Peat (80%) + perlite (20%) as a common platform.

After sifting to separate sawdust and wood powder with dimensions of approximately half to one centimeter and is not used as compost. The bed was made of poplar wood products. Peat used from flower diligent and perlite perlite plant Sepahan Industrial Park purchased Mnzariyh Najaf Abad and after approximately one to three millimeters in size sieve was used. The seven-liter pots were poured into the beds. First, in order to better drainage around 2 cm pots washed pebbles on the bottom of the pots was poured and then the substrate was added.

### ***Preparing and planting seedlings***

In this study, the University of Technology in greenhouses hydroponic method was carried out of the red peppers were Inspratian. Seedlings are ready to participate in the campus of the castle road salt was prepared in stage three true leaves on 2012/09/29 were transferred to the main pot.

### ***Nutrient solution and How Instant update***

For this purpose, the appropriate pump the nutrient through an electric timer was sent to the dropper. At the start of planting small plants because they need less water and nutrients, the number of delivery solutions for less, every hour and every time was one minute. With the growth of plants and increase plant biomass increases the amount of information solutions, and irrigation intervals reduced to forty-five minutes. The amount and distance of nutrient solution was kept constant awareness among all treatments. Was trying to drain the pots to be maintained at 20 to 25 percent in addition to getting enough nutrients by the plants, the accumulation of salts in the media is prevented. This level was maintained. In order to prevent the accumulation of salt in planting beds, pots leaching at different stages at least every three months for three times during the growing season was done.

**Measuring plant growth factors**

The main stem height: Seven months after the average length of two plants in each plot were measured.

The number of main stem nodes: Six months after the start of the count.

Leaf relative chlorophyll content: chlorophyll six months after the start manually using a chlorophyll meter 1 (Hansatech Instrument Ltd, Kings Lynn, UK) was read. For this purpose the two leaf nodes per plant chlorophyll was considered the sixth to tenth. Fresh weight of roots and shoots, eight months after the start of testing in a pilot plant unit was removed from the culture medium. After shaking the roots with water beds as well, the excess moisture was obtained. Aerial roots were separated from the crown of the roots and shoots of the samples in the laboratory by a digital scale were weighed separately.

Dry weight of roots and shoots, root and shoot samples for 48 hours at 80 ° C were in the dryer. Then drying out and dry them separately measured by the digital scale.

**Performance measurement and quality traits of fruits**

Total dissolved solids and 2 of each fruit that had been collected by squeeze mortar and a drop of wine on Saccharimeter 3 (Refractometer) was read in the light TSS. The amount of ascorbic acid (vitamin C): the repetition of a dehydrated fruit and fruit juice with 5 ml of 5 ml of 5% TCA 4 was mixed. The concentration of ascorbic acid by titration with a solution of N- Bormosocsinamid 5 was measured.

All operations were performed by using SAS software and the least significant difference test for comparisons Averages 3 (LSD) were used.

**RESULTS AND DISCUSSION**

**The effect on the characteristics of vegetative planting beds**

The results of data length on three occasions at an interval of two months was measured The effect of planting beds along the stem in the first place, the difference in level of 1.0 percent And the second at 1 percent significant and not significant in the final turn, The results showed that the length of treatment compared with sawdust and peat + perlite Bed Current significantly reduced.

Table 1. Effect of different substrates on the main stem of the plant pepper each time

Treatment	Two months after transplanting stem length (cm)	Four months after transplanting stem length (cm)	Six months after transplanting stem length (cm)
Sawdust (100%)	28 <sup>b</sup>	79/50 <sup>ab</sup>	113/5 <sup>a</sup>
Peat (80%) + perlite (20%)	64 <sup>a</sup>	88/25 <sup>a</sup>	126/5 <sup>a</sup>
LSD (P≤0.05)	6/82	16/6	22/6

5% based on the significant difference (LSD) test

**Leaf relative chlorophyll**

Data analysis showed that the relative leaf chlorophyll Bedes planting statistically significant at the level of five percent. The relative chlorophyll leaves the leaf relative chlorophyll Bed peat and the lowest was found in the bed of sawdust. In the case of most vegetative traits measured after treatment Pitt sawdust significant increase or at least not significantly reduced. So better root development in this context also causes water and nutrient absorption and growth has helped shoot. The high ratio of carbon to nitrogen in the bed of sawdust can be a cause of growing plants in the ground.

**Shoot fresh weight**

The results showed that the effect of planting beds shoot fresh weight is a significant level of 1.0 percent. The maximum weight and minimum weight Peat shoots from the base of the shoot was sawed Bed Soil. The results also showed that the fresh weight of shoots in treated sawdust and peat + perlite to the common treatment was significantly lower.

**Shoot dry weight**

The results showed that the effect of planting beds shoot dry weight was significant at the level of 1.0 percent. Maximum shoot dry weight of the bed of sawdust peat and the lowest was in bed. The results also showed that the Soil treatment saw shoot dry weight was significantly lower than in the context of the current peat + perlite treatment. Seems to be the limiting factor for growth in the number of beds used the litter moisture is therefore common ground peat + perlite and treatment of sawdust with high moisture holding capacity (5/86%) and the lowest total porosity (43%) has provided a suitable environment for the growth of plants. Versus sawdust bed due to poor physical conditions (high total porosity and low moisture holding capacity) were not able to provide enough water and nutrients and reduce the dry weight of the plants.

Table 2. Effect of different substrates on vegetative features peppers

Treatment	Chlorophyll Relative	Shoot fresh weight (G)	Shoot dry weight (G)
Sawdust (100%)	33/088 <sup>c</sup>	366/31 <sup>bc</sup>	65/858 <sup>cd</sup>
Peat (80%) + perlite (20%)	55/013 <sup>a</sup>	544/55 <sup>a</sup>	110/590 <sup>a</sup>
LSD (P≤0.05)	10/39	84/564	15/389

### Vitamin C

Data analysis showed that the concentration of ascorbic acid in peat substrate + perlite significant level of five percent. The highest concentration of vitamin C fruits of Soil treatment saw the least vitamin C is related to Bed peat Muller and hip (15) and Marcel (14) have suggested an increase in potassium levels increase the amount of vitamin C are fruits. Soil treatment saw common ground with peat + perlite vitamin C concentrations did not change significantly.

Table 3. Effect of different substrates on fruit quality characteristics pepper

Treatment	Vitamin C (mg per gram of fresh weight of fruit)	TSS
Sawdust (100%)	118/09 <sup>bc</sup>	7/75 <sup>bc</sup>
Peat (80%) + perlite (20%)	111/87 <sup>c</sup>	8/85 <sup>a</sup>
LSD (P≤0.05)	26/988	0/8809

### TSS

Analysis of variance showed that the effect of planting beds on fruit soluble solids level of 1.0 percent is significant. The amount of dissolved solids in the pit with the highest levels of potassium in the fruit and leaves less of sawdust that has been the lowest potassium. Properties that by regulating the activity of a plant enzyme is effective on fruit quality [15]. Potassium increases the rate of photosynthesis and chloroplasts assimilate and sugars from the leaves to the storage organs such as the fruit increases.

## CONCLUSION

Despite the current context of peat + perlite vegetative and reproductive traits in most treatments work better, but in some vegetative and reproductive traits, litter, sawdust can compete with other substrates for planting.

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