

The effect of pruning and planting density on yield of greenhouses cucumber in Jiroft

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Abstract

Pruning and planting density plays an important role in the growth and yield of greenhouse cucumber. In order to study the effect of pruning and planting density on yield of cucumber, a factorial experiment in a randomized complete block design with three replications was conducted. Factors were planting density (30,000, 35,000 and 40,000 plants per hectare) and pruning methods (Pruning No. 1 (after 40-30 cm height, a fruit and a leaf on each branch was kept and then the terminal bud branches were cut), Pruning No. 2 (after the 40-35 cm height, 25 cm at the top of leaves on each branch was kept, a cucumber and a terminal bud branch were cut and then second at 25 cm on each branch 2 cucumbers and 2 leaves and 25 cm 3 cucumbers and three leaves on each branch holds the third and delete the residues, and so up until four fruit and the plant will be pulled down. This procedure is repeated pruning and pruning (3) (all branches on the main stem at an angle of each leaf is removed and allowed only one fruit grow from the main stem)). Karim on the company Gavrish the major crops and export region, were studied. Data recorded includes total yield per unit area, yield per plant, average fruit weight, fruit number, length and fruit diameter measurements were analyzed. Data analysis with SAS statistical software and means were compared using Duncan test. The results showed significant differences

among the three methods of pruning and density was relation to the total yield, yield per plant, number of fruits per plant, average fruit weight per plant. In this study it was found that the highest performance and most desirable in pruning fruit quality was No. 3 with a density of 35,000 plants per hectare.

Keywords: density, pruning, cucumber, Karim, greenhouse.

Introduction

Cucumber cultivation area in Jiroft to 2013 was about 20 thousand hectares of which approximately 1,500 hectares are for greenhouse cultivation. Which is the highest among all provinces acreage is allocated. As well as a growing trend that is increasing. (statistics, 2012). Pruning a very important role in the growth and yield of greenhouse cucumber. Pruning branches, leaves and fruit, taking into account the balance between vegetative and reproductive growth to maximize power production can be done. The growth in greenhouse cucumber in such a way that on the side of each sheet produces one or more fruits, Along each side of the leaf buds appear gradually become a side branch. And when a set of fruit in part of the plant each branch or leaf angle or axis from which branch be generated. Due to the insufficient nutrients number of abortion or fruits they produce undesirable, So Pruning branches should be done regularly. Because otherwise the growth of side branches derived from each successive greenhouse space into a forest of leaves and stems that have operations, traffic and services difficult and reduce the yield and prevalence of pests and diseases, On the other hand grow faster and better quality fruits are on the main stem and the distance from the main stem grows fruit, its quality decreases. Chlorophyll levels of pruning can be

produced with a favorable balance between vegetative and reproductive growth of the plant was to achieve maximum yield and fruit quality. By removing leaves, fruits and branches from the main stem and lateral additional, lateral buds on the main stem with leaves and fruits quickly appear more recent. Increase fruit yield per plant. The importance of density in the greenhouse under the effect of pruning is inappropriate because the density of the air flow into and out of trouble and conditioning for greenhouses is difficult. On the other hand, if the density is less than the amount of data on the number of plants per hectare greenhouse gases also yield less. So many factors affect plant density and pruning cucumber under greenhouse conditions are in production management (Kian 2000). New hybrid varieties of cucumber in the greenhouse, all flowers occurring substance. Lower nodes appear in the first plant, and consequently leads to early fruiting and because in this time of growth is not sufficient to support the growing natural fruit. As a result, the fruit appeared in the lower part of the plant will be smaller. The fruit is affected by plant size and density. Increasing plant density or lack of pruning the bushes overlap on each other and thus reducing light penetration into plants and fruit color fading and disease are developed. Therefore optimum density and pruning of branches to limit the growth and development of flowers, shape control of the plant and to continue to stimulate flower induction and shoots used (Hesami., 2012). Including that desire is necessary can be used to increase performance without a significant reduction in the number of plants per unit area yield per plant, a significant reduction in plant performance and easy control of pests and diseases and pointed to mechanical harvesting. Also pruning to remove damaged or dry parts of the plant, strengthening and maintenance of the parts of plants that are desirable. Enhancing the productivity of flowers and

fruit, influence and facilitate more effective use of light is carried out. Greenhouse cucumbers have infinite growth on the main stem is constantly "creates a new stems and leaves. For this reason frequently pruning to control the growth and harvesting of the leaves and stems with high quality and performance. Pruning to increase the flow of air around the plant that helps to reduce pests and diseases.

Literature review

Results of a study showed that limiting the number of stems of sweet pepper on weight, is effective and the number of stems per plant is less pepper, fruit produced will have high weight (Dazgan and Abakan, 2003). Planting Pattern on some aspects of qualitative and quantitative evaluation of performance and morphological traits greenhouse cucumber greenhouses in Jiroft. The results with maximum strip width of 30 cm height and fruit yield showed. With increasing plant density plant height, fruit diameter, fruit length, fruit weight significantly decreased. It also significantly increased yield per unit area. Density 25 showed the highest yield per unit area. However, the figures did not show a significant difference in terms of performance (Mmnoee et al, 1392). The effect of pruning on yield and quantitative traits on two varieties of cucumber greenhouse cucumbers names RX22915 and Rubah-R results showed that pruning branches removed after two fruits and two leaves and fruits of the stem to a height of two meters, the highest total yield, marketable yield and yield per plant had RX22915 (Annex and Chrvy, 1383). The effect of pruning and planting density on yield related traits of three varieties of cucumber, The highest performance and performance per m^2 / plant. The treatment leaving two nodes and the leaf next to it on all the tributaries of the $2/16 \text{ kg} / m^2$. The effect on all traits, except number of diformed fruits

per plant, was significant at the 1% level. (Nemati et al., 2010). The effect of the density of 30,000 and 40,000 plant And three branches results showed that the performance of peppers in greenhouse The performance was obtained in 40000 plants and train three branches (Saifi et al., 2010). In another study the variety; Thunder, Sakura - Efdal with three New education system was Vsystem best results were obtained in New system and the Efdal (nomads and Lan, 1993). In another study the effect of pruning on growth and yield five varieties of cucumbers The results showed that Pruning effects on cucumber cultivars was significant and the maximum yield per hectare and fruits on pruning April and the highest spicies obtained Asshley.

In another study also stated that the pruning and marketable yield in terms of size and weight of the fruit and the result is clean fruits (Eifediyi and Remison, 2009). Comparing the performance of pruning bushes with no pruning saw that it was not done, that Factors such as the number of leaves, The number of flowers, Days to 50% flowering Along the main axis The pruning treatments were performed on them, On the contrary, the treatments did not do any Hersey factors such as the number of fruits, fruit length, fruit diameter, fruit weight, fruit number of non-market-friendly and also more marketable fruits were obtained. (Ekwu et al, 2012) The study effect of pruning on yield and quality of cucumber cultivars, the results showed that The removal of branches and main stem fourth node, Or removal of branches and main stem of the flowers up to 30-40 cm And pruning of branches and leaves left after a fruit, Increase the yield and marketable fruit. By applying this method, the number and weight of fruits per plant at the 1% level showed a significant difference In this case, the pruning of fruit number and fruit weight was less than average (Than, 1997). In study of Qian, 2009 Four clay which contains: Without pruning,

remove all branches, Remove branches to ten node The rest of the branches on the main stem and a leaf, and a fruit and ultimately leaving a leaf and a fruit was imposed on all branches, The highest number of fruits per plant, the treatment was without pruning and a positive correlation with fruit number and fruit weight had the highest average fruit weight per plant, obtained in the medium without pruning. The highest total yield was given treatment without pruning and pruning thereafter the fourth, produced the highest yield. He also reported There was a significant effect of density on all performance indicators and the highest performance per m^2 was related to treatment with high density, But the interaction of density and pruning for all traits were not significant. According to the results of researches, Plant density and pruning system has an important role to play in the effective use of plant greenhouses, Therefore, knowledge of methods and techniques associated with the optimum density and pruning, it seems necessary. The aim of this study was to investigate the effects of pruning and planting density on yield of cucumber.

Materials and Methods

The effect of pruning and plant density on yield of cucumber Factorial experiment in a randomized complete block design with three replications in both 1391 and 1392 in greenhouses Land Research Center for Agriculture and Natural Resources southern province of Kerman. Factors that planting density densities of 30,000, 35,000 and 40,000 plants per hectare The plants at densities of 3, 5.3 and 4 plants per m^2 were sown. Given that each plot has a size of $5/1 \times 75/2 m^2$ and consists of two ridge, The distance between the rows of plants cultivated for the density of the 4/44, 1/38 and 3/33 cm respectively were obtained. Plant number 20 and the middle was conducted Statistics operation of 10 plants Three

methods of pruning and pruning the number 1, 2 and 3 on the karim cultivar of the company Gavrish (cultivars exporting cultivated area) were studied cucumbers Three weeks before the date of transition transplanting prepared and it was done in the greenhouse in late October. With solarization and the use of poison all the sodium (Vapam) during the summer, the greenhouse soil was decontaminated. After preparing of the greenhouse and the manure and chemical fertilizers based on soil test and create stacks and installation of irrigation equipment for irrigation after 2 to 3 times ridges. The seedlings Was transfer inside the greenhouse. After transplanting to the garden The full deployment watering plants on a daily basis by applying the treatment. Plant by the end of the growing season means the end of May were kept. On October transplanting and harvest start date was 40 days thereafter. The plants grow to a height of 40-30 cm was closed and the main stem with threads prices were high conductivity. The thread of the wires running along the rows and at a height of three meters were installed 2-3 days and end it by hand to stem persistent connection and counter-clockwise around the Twisted to help plant stand.

Pruning Number (1)

After a height of 40-30 cm on each branch a fruit and a leaf (or two fruits and two leaves) was kept and then the terminal bud branches were cut.

Pruning (2)

After a height of 40-35 cm, 25 cm at the top of leaves on each branch was kept a cucumber and a terminal bud branches were cut then. 25 cm in the second on two cucumbers and two leaves per branch and the third Third in 25 cm 3 cucumbers and 3 on each branch to keep and delete the rest and will continue to do so up to four fruit and the plant is lowered after the

procedure is repeated pruning (pruning this plant is pyramid-shaped growth).

Pruning (3)

All branches on the main stem removed Each leaf of the main stem at an angle are allowed to grow only one fruit. In other words after the 5-6 leaf stage of plant growth this function also makes Seedlings grow quickly and end of the opportunity to create a strong stems and branches to produce sufficient proof. After reaching maturity and stem the high wire to wire by closing down the plant was allowed to grow.

The seeds planted two to three weeks before transplanting into the box and after the 3-2 leaf stage of the row width of 40 cm and a distance of 1 m were prepared planting. The criteria in this study included Total yield per unit area (m^2) fruit length, fruit diameter, number of fruits per plant, stem length and stem diameter. Harvest of the twenty-first began in November and continued until May eighth. A total of 24 fruits were harvested. Harvest for two or three days in between (depending on the greenhouse temperature) The fruits was not too big And are not marketability outside of the state Crop harvested from each plant, each time was measured On this basis, the total yield (m^2), yield, Number of fruits per plant and average fruit weight were measured. The recalcitrant fruits (deformed and non-standard) separated and were counted for each plant. Data analysis with SAS statistical software and means with Duncan Was carried out and the results and explain the impact of educational methods yield the best type of pruning and training cucumbers was introduced.

Results

Table 1: Variance analysis studied in the first year

| Source of variation | Degrees of freedom | Performance (m ²) | Yield per plant | The number of fruit | The average fruit weight | fruit length | The fruit |
|----------------------------|--------------------|-------------------------------|---------------------|---------------------|--------------------------|---------------------|---------------------|
| replicate | 2 | ^{ns} 14/70 | ^{ns} 8/030 | 268/71* | ^{ns} 249/70 | ^{ns} 17/92 | ^{ns} 0/23 |
| Factor a (condensation) | 2 | 51/95* | * 3/689 | 12/57** | 59/78* | ^{ns} 3/20 | ^{ns} 0/93 |
| Factor b (pruning) | 2 | 4/27* | 0/354* | 44/56* | *5/67 | ^{ns} 5/46 | ^{ns} 0/016 |
| a*b | 4 | 2/25* | 0/302* | 22/78* | ^{ns} 65/69 | ^{ns} 0/89 | ^{ns} 0/061 |
| Error | 16 | 7/92 | 0/666 | 36/15 | 72/90 | 1/16 | 0/045 |
| Total | 26 | | | | | | |
| %CV | | 17/28 | 23/35 | 14/40 | 10/27 | 8/97 | 9/73 |

| Treatment | Performance (m ²) | Yield per plant | number of fruit | average fruit weight | fruit length | Fruit diameter |
|-----------------|-------------------------------|-----------------|-----------------|----------------------|--------------|----------------|
| characteristics | | | | | | |

| | | | | | | |
|-------------------------|----|--------|-------|--------|--------|--------|
| Pruning methods | 1 | | b3/98 | c26/37 | a12/37 | a2/30 |
| | | b14/87 | | | c75/87 | |
| | 2 | | c2/01 | b37/88 | a12/55 | a2/21 |
| | | c13/11 | | | b79/11 | |
| | 3 | | a5/1 | a41/23 | a85/55 | a12/55 |
| | | a22/33 | | | | a2/75 |
| ImplantSpace(Cm) | 30 | b15 | a4/12 | a43/87 | | a13/25 |
| | | | | | a86/37 | a2/52 |
| | 35 | a16/77 | b3/8 | b38/88 | b83/33 | a12 |
| | | | | | | a2/24 |
| | 40 | | a4/14 | c32/66 | c77/88 | a12/33 |
| | | c12/77 | | | | a2/18 |

Same letters in each column according to Duncan's multiple range test at 5% represents the meaning and ns is not significant difference between the mean.

Analysis of data from the first year, second year and the two years combined analysis showed that Combined analysis of year was significant. The results of the first year and second year of cultivation set asseparated. And insert the results of the analysis of composites made of two years was refused.

Analysis of variance showed that between different levels of density and purinng in terms of yield, there is a significant difference. The interaction between density and pruning was significant. The interaction between density and significant pruning.

The results of the first year:

Performance per m^2 : The different levels of performance density per m^2 Statistically significant at the 5% level. Pruning (3) with production of 19 kg per m^2 has highest performance per m^2 Pruning (2) with production 5/15 kg / m^2 was after in the next group.

Yield per plant

The effect of pruning and plant density on yield, according to the results of Table (2) results showed that 2.4 kg (3) with production plant pruning yield per plant had the highest yield per plant And pruning 1 and 2 with the production 31/3 and 98/2 respectively were the next category.

Density

35000 plants per hectare density of 35 cm, was the highest yield of fruit per plant. After which the densities of 30 cm and 40 cm were in the next groups. Which indicates that The lower density Increase the yield per plant. The results showed that the yield/ m^2 in the first year with pruning 35 cm 3 density were increased.

The number of fruits per plant and the average fruit weight

In examining the interaction between pruning and density on the number of fruits per plant and the average fruit weight Results showed that the highest number of fruits per plant pruning (1) with the number of 7/45 and the lowest in pruning fruit, (3) with the number of 6/38 was In each plant . Average fruit weight in grams of the highest pruning methods (3) to 3/85 Pruning No. 1 in gram 5/73 allocated The the lowest number. And the pruning (2) with production a 4 / 80 grams was The later group. The length and diameter of fruit in different ways pruning did not affect significantly The number of fruits per plant and average weight of fruit per

plant density of 35 cm with numbers 2/49 and 2/88 g fruits per plant had the highest record. And then density of 30 and 40 cm with production 4/45, 1/85, 4/42 and 1/73 respectively in the second and third groups. The average length and diameter of fruit in all three densities were not significantly different. The interaction of all factors measured in the length and diameter of fruit were significant at the 5% level.

second year

Total yield and yield per plant

Analysis of variance and mean comparison in the second year are as follows. The average yield in production pruning methods 3 and 1 to 3/22 and 87/14 respectively in the first and second category. Pruning (2) With an average production of 11/13 was in second place of the table. Similar results were yield per plant, Thus, pruning 3 with a yield of 1.5 kg per plant pruning the highest yield per plant (1) production plant and prune 98/3 kg was in group two and pruning (2) with the production of 01/2 kg The group three.

The number of fruits per plant and the average fruit weight

The number of fruits per plant and the weight of pruning fruit at No. 3 with the numbers 23/4 and 5/85, respectively. And then pruning the number 2 and 3 respectively in the second and third groups. The type of pruning fruit average weight was located on the main stem of the fruit has formed more branches. The results were consistent with Nemati colleagues.

Density

Density 35 cm in total yield with highest production 7/16 kg /m² And then densities of 30 and 40 cm with a production of 15 and 7/12 kg In the

second and third. Pruning yield per plant in 30 cm 3 density were the highest.

The mean number and weight of fruits per plant.

The average number of fruits per plant and the average fruit weight in 23/41 and 5/85 pruning methods (3) to produce the highest and pruning and pruning (2) with numbers 37/26 and 8/75 lowest numbers 88/37 and 1 (2) / 79 were assigned to the next group. As the results of data analysis in the first year did not show significant differences between the average length and diameter of fruit. Due to the very good results obtained from pruning (3) than the other two methods, it seems increasing performance in three pruning type, due to more nodes on the main axis. Increasing the yield of any third. Increase female flowers on them. The interaction of all factors measured in the length and diameter of fruit were significant at the 5% level.

The length and diameter of fruit

The results of analysis of variance and comparison of the average yield in the first year and second year showed that pruning and plant density on the length and diameter of the fruit did not show significant differences. And all the numbers were obtained in a group.

Discussion and conclusion

In this experiment, the different densities and different methods of pruning, had no significant effect on yield and yield related traits. Different methods of pruning. In this study, the average fruit weight and number of fruits were also impressive market-friendly. The results of this study showed. With increased density, the density was followed bushes, Weight reduction,

Increasing the number of fruits on the plant was diformed. At the same time, which could be due to an increase in the formation of several fruits on the plant, Lack of light and poor ventilation. That consistent with results of Taan (16). This results in the use of the method of pruning 2 (After a height of 40-35 cm) In the first 25 cm on each branch a cucumber And it was kept a top leaf and then the terminal bud branches were cut in the second 25 cm On each branch Two cucumbers and two leaves and the third in 25 cm 3 and 3 leaves on each branch kept cucumbers and the rest we will delete and so continued along Fruits and after the plant was down to four this procedure was repeated pruning the pyramid-shaped plant growth was pruning Well matched. In type 3 pruning (All branches on the main stem had to be eliminated and was allowed to each leaf of the main stem at an angle of only a fruit to grow) In fact, by removing side shoots assimilates plant photosynthesis Led to the main stem of plant. And an increased diameter, The increased strength plant, The materials needed guidance from the roots to the shoots of plants during the growing season has increased and increased weight and fruit quality She highest total yield and the plant performance was allocate The results were consistent with the results of the study, Noguchi and colleagues (12). And in contradiction with the above results of Nemati colligues (4) Reported that the density of cucumber had no significant effect on average fruit weight. The point that should be mentioned The use of any of the various methods of pruning When the plants have reached the usefull ceiling Greenhouse The leaves of the plants were little worn and old that performance And more were due to the transfer of pests and diseases in plants during the shoot were pruning Pruning of old leaves And during the period and was alternately. Plant density of 35 cm. Than density of 30 and 40 cm with optimum use of

space and culture Was able to reach the optimum growth of shoots and roots and leaves in the canopy to achieve the perfect makeup. Which leads to reduced competition and increased efficiency of plant photosynthesis in plants and the performance of the entire plant So by increasing the number of plants per m² density 35 cm Better use of factors influencing growth With pruning methods (3) Could provide the conditions for ensuring the proper functioning and the highest performance compared to other treatments, respectively the highest yield and quality fruit to produce market-friendly. it is necessary to mention The results of the test conditions and levels of study are valid and can not be generalized to other varieties and other surfaces.

References

- 1- Dasgan, Y.H. and K. Abak. 2003. Effects of planting density and number of shoots on yield and fruit characteristics of peppers grown in glasshouse. Turk. J. Agric. 27: 29-35.
- 2- Eifediyyi, E, K and Remison, S, U . 2009. Effect of Time of Planting on the Growth and Yield of Five Varieties of Cucumber (*Cucumis sativus* L.) . Report and Opinion 2009;1(5).

- 3- Ekwu, L.G., Nwokwu, G. N. and Utobo, E.B. 2012. Effect of mulching materials and pruning on growth and yield of Cucumber (*Cucumis sativus* L). INT'L Journal of Agric. and Ruraldev. Volume 15 (2): 1014 – 1021.
- 4- Hesami,A.a., Sarikhanikhorami,S., Hosseini,s.s. 2012. Effect of Shoot Pruning and Flower Thinning on Quality and Quantity of Semi-Determinate Tomato (*Lycopersicon esculentum* Mill). Notulae Scientia Biologicae. 4(1):108-111.
- 5-Klieber, A and Lin, W,C. 1993. Training Systems Affect Canopy Light Exposure and Shelf Life of Long English Cucumber. J. AMER. Soc. HORT. SCI. 118(6):786-790.
- 6-Ngouajio, M., G. Wang and M.K. Hausbeck. 2006. Changes in pickling cucumber yield and economic value in response to planting density. Crop Sci. 46: 1570-1575.
- 7-Premalatham.M.G.S.,Wahundeniya.K.B.,Weerakkody.W.A.Pand Wicramathunga.C.K. 2006. Plant Training and Spatial Arrangement for Yield Improvement in Greenhouse Cucumber(*Cucumis Sativos* L.)varieties.Tropical Agricultural Research. Vol 18:346-357.
- 8-Qian Hong. 2000. Effect of pruning and spacing on yield and quality of cucumber. Asian Regional Center. AVRDC. Training report. www.arc.avrdc.org
- 9- Sowley, E. N. K., Damba, Y.2013. Influence Of Staking And Pruning On Growth And Yield Of Tomato In The Guinea Savannah Zone Of Ghana. International Journal of Scientific & Technol Logyresearch Volume 2 , Issue 12.
- 0-Tham T.N. 1997. Pruning effect on yield of different cucumber varieties. Asian Regional center training report. www.arc.avrdc.org.