Current Trends in Natural Sciences Vol. 7, Issue 14, pp. 122-128, 2018

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

ELABORATION OF ALTERNATIVE TECHNOLOGIES FOR THE PRODUCTION OF PEPPERS

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Abstract
The purpose of the work is to follow the behavior of unspecified pepper varieties grown in polythene-coated greenhouse at different planting distances and directing modes. Taking into account that the peppers have a significant share in human nutrition, new varieties and hybrids, new cultivation technologies or different ways of preparing them will permanently appear. We studied two pepper hybrids. Brillant F1 is more vigorous than Bobiță F1. The planting distances influences the height increase of the studied hybrids and a relatively higher increase are observed in the plantations planted at a distance of 35 cm between the plants in row. Regarding the directing mode by cutting (plant management), it can be seen that in both hybrids the two- and three-arm steering has positively influenced the height increase of the plants. If the hybrid has high vegetative power, it generates unlimited new shoots, this being at the expense of fruiting. The first flowers on the plant appeared on the Brillant F1, which proved to be earlier than Bobiță F1. The planting distances do not particularly influence the number of plant-growing flowers in any of the studied hybrids.

Keywords: directing mode, peppers, planting distances, varieties.

1. INTRODUCTION

The pepper has an important place among the vegetable species cultivated in our country, with many uses. Fruits can be consumed fresh, which is of great importance because vitamins are used entirely by the human body. Pepper fruits are very rich in carotenoids (Wall M. et al., 2001); furthermore, either immature or mature fruits contain a high concentration of antioxidant phenolic compounds.

The peppers are used to prepare a very wide range of dishes; they are suitable for processing in the canned or pepper powder. The energy value is about 26 kcal / 100 g for sweet pepper and over 116 kcal / 100 g for pepper.

Capsic tincture is used in the preparation of some useful adjuvants in the treatment of rheumatic diseases (Bereşiu et al., 1993).

In 2016 the area harvested in Europe with chillies and green peppers was 111215 ha and the production was 3132394 tonnes (www.fao.org). Pepper production has grown steadily from 2012 to 2016.

The surface cultivated with peppers in Romania in 2014 was 18000 ha.

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Table1. The evolution of the areas and productions of peppers (www.madr.ro)

Culture	Specification	UM	2007	2008	2009	2010	2011	2012	2013	2014
Pepper	Area	thousands of hectares	18.6	20.2	20.0	21.0	20.0	19.9	19.5	18.0
	Total production	thousands of tons	184.9	238.7	245.7	243.5	253.5	207.1	227.7	229.0

It is cultivated all over the country, but the favorable and traditional areas are those in the south, south-east and southwest of the country. The largest areas are located in the counties of Teleorman, Olt, Călărasi, Dolj, Arad, Brăila, Ialomița (Apahidean et al., 2010). There are specialized centers in Domnești and Cornetu in Ilfov, in Corabia, as well as in Zimnicea, Smârdioasa, Turnu Măgurele. Low-temperate areas are less favorable for pepper culture. At temperatures below 15 the growth and development of pepper are negatively influenced (Mateos et al., 2013). Flowers abort frequently depending on temperature, light intensity, disturbances occurring in the synthesis, distribution and accumulation of organic substances in the plant (Popescu et al., 1999).
The strain of pepper plant is simplistically branched, but there is a great diversity in the branching and formation of shoots. In greenhouses the plants reach heights of over 2 m, requiring support. Plants cut at 1-4 cm above the soil form shoots from new lateral buds under favorable environmental conditions. They are able to flourish and harvest (Popescu, 1977). In order to favor the branching of plants and vegetative growth, the first floral button is removed (Ciofu, 1994). It is very important to remove it even from the floral bud stage; leaving this flower to form a fruit will lead to the degeneration of the plant's physiological behavior by slowing vegetative development and concentrating the plant on the fruit growth, also decreasing the root development, and these phenomena have serious consequences on the subsequent development of the plant and implicitly the decrease in productivity.
The increasing of planting distances has led to the increase of the number of branches per plant, number of leaves per plant, stem girth, number of fruits per plant, days to first harvest, fruit length, individual fruit weight, yield per plant but plant height at different stages, number of fruits per plot, days to 50% flowering, fruit breadth, yield per plot and yield per hectare increased with decreasing planting distances (Islam et al., 2011).

2. MATERIALS AND METHODS

The experience was assembled in a farm in Draganu, Arges County, in a solar-arbor of arched metal structure, covered with polycarbonate. As a biological material, we used Brillant F1 and Bobiță F1 peppers.
Brillant F1 is a generous, high-yielding hybrid of sweet pepper, binds the first fruits very fast, the fruits are cubic, fleshy, very pleasant, and resistant to preservation and handling. The very strong crown does not require support, but requires high nitrogen fertilization. The fruit has 3-4 lobes, white-greenish, fleshy, tasty, with a special gloss, weighing 130-160 g. It matures in red. Highest yield is obtained on two arms.
Bobiță F1 is a hybrid of sweet pepper with unlimited growth, with exceptionally large fruit and fleshy walls. The fruit weight is 140-180 g, white at consumption maturity, orange at physiological maturity. It has high productivity and is not sensitive to calcium deficiency. It is recommended for crops in protected areas, with or without heating, as well as in open fields between 15 March and 15 July. In protected areas a density of 4-5 plants / square meter is recommended. It is an early, fleshy,

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of excellent quality, suitable for fresh consumption and for export. It can be kept for a long time on the stall.

Figure 1. Brillant F1

Figure 2. Bobiță F1

A trifactorial experience with peppers of type 2x3x5 has been assembled, totalizing 30 experimental variants. Three plants were used for each variant in three rehearsals and a total of 270 pepper plants.

Variable factors:
A. Pepper hybrid, with two graduations:
A.1 – Brillant F1;
A.2 – Bobiță F.
B. The distance between plants in a row, with three graduations:
B.1 - 50/30 cm;
B.2 - 50/35 cm;
B.3 - 50/40 cm.
C. Directing plant mode, with five graduations:
C.1 - natural growth (without intervention);
C.2 - 2 strains plant;
C.3 - 3 strains plant, on the retained arms are formed rod-bearing shoots which are cut after the formation of 2 fruits;
C.4 - 3 strains plant, pe on the retained arms are formed rod-bearing shoots which are cut after the formation of 3 fruits;
C.5 - 4 "V"strains, two headed to the left and two to the right, and on the retained arms are formed rod-bearing shoots which are cut after the formation of 2 fruits.
Planting was performed on May 3 according to the studied variants. After planting, we watered all the culture with the hose to better supply the soil with water, and then installed the drip irrigation system. Later we removed the first floral bud from each plant to stimulate plant branching.
The weeds were repeatedly removed with the hoe. The fertilization was carried out at the same time as drip irrigation with manure. The control of diseases and pests has been carried out by the application of specific treatments. Six treatments were performed 10 to 15 days apart, using several products: Ridomil plus 48 - 0.25%, Benlate 0.05% and Bravo 500 SC - 0.2% for fungi, and Novadim Progres 0.20% and Mospilan 20 SC - 0.01% were used as insecticides to pests control, mainly fruit hooves and greenhouse mussel. A treatment against mites was also performed using

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Nissorun 10 WP - 0.04%. With the phytosanitary treatments a foliar fattening was applied with Cropmax - 100% natural foliar fertilizer - 2.5 ml / 10 l water. The plants were linked when they could no longer support their weight. Defoliation was repeated as the basal leaves turned yellow.
In this experience, observations and determinations were made regarding the plant height increase, the number of leaves per plant, the number of flowers per plant and the number of fruits per plant. We determined the plant growth rate by measuring 5 to 5 days from 8 February to 3 April when the seedlings were planted in the solar.

Figure 3. Aspect of pepper culture

3. RESULTS AND DISCUSSIONS

We determined **plant height** growth by making measurements until July (figure 4).

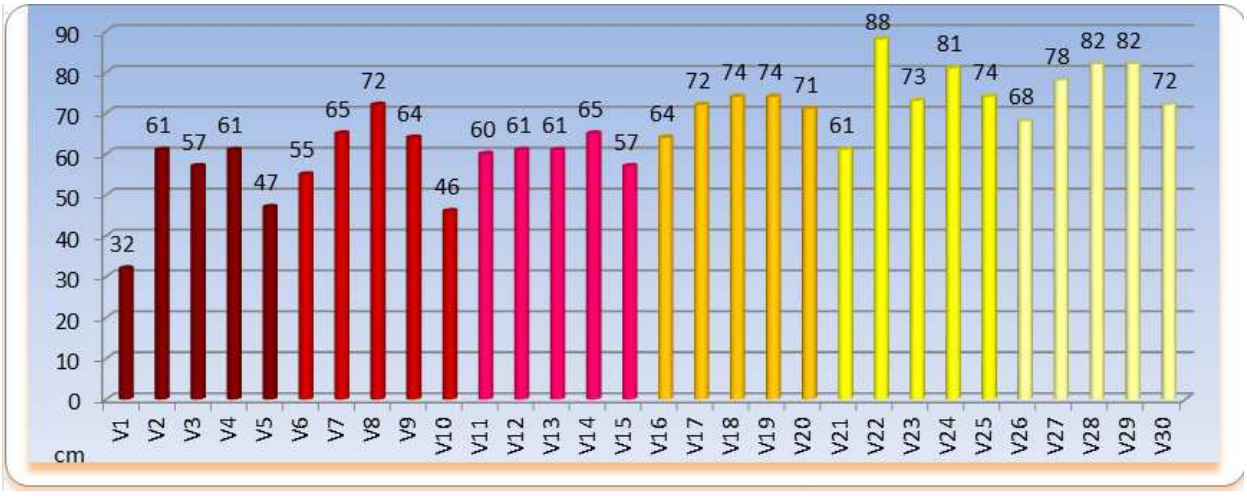

Figure 4. Plants height at the end of the research period (cm)

Brillant F1 has, generally, higher heights than Bobiță F1. The highest value of this character is observed in variant V 22, and the lowest value at V1. The distance between plants in a row influences the height increase of studied hybrids. There is a relatively higher increase in peppers planted at a distance of 35 cm between plants per row. Regarding the way of plant management by

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cutting, it can be seen that in both hybrids the two- and three-arm plants has positively influenced the height increase of the pepper plants.

The next character studied was the **number of leaves per plant** (figure 5).

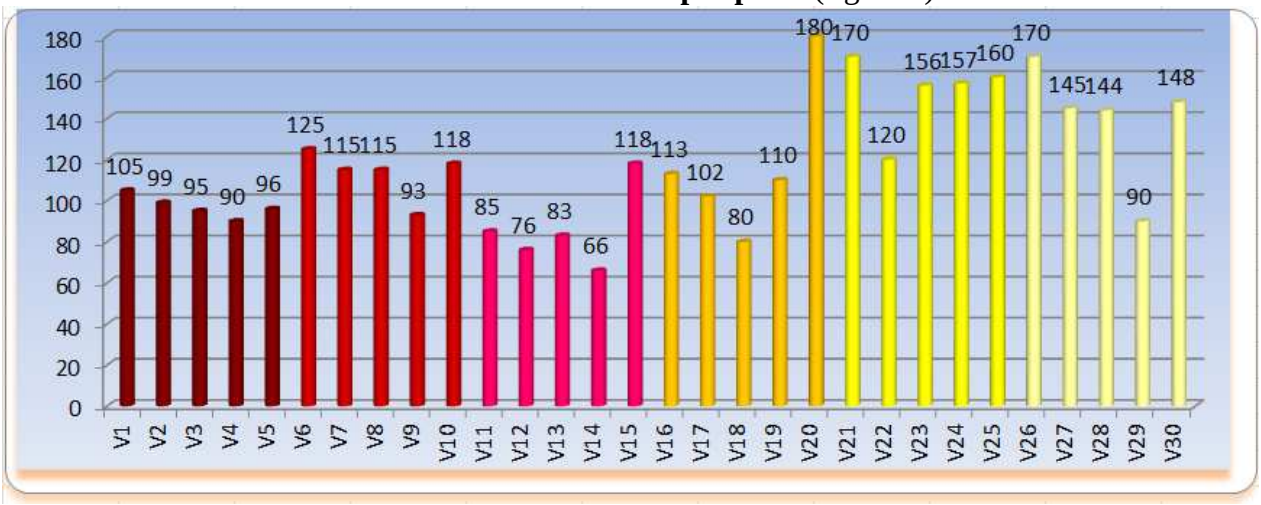

Figure 5. Number of leaves per plant at the end of the research period

The highest recorded value is observed in variant V20, and the lowest at V14. Brillant F1 plants show higher values of the studied character compared to Bobiță F1. Both hybrids under study showed a greater number of leaves / plant in peppers planted at a distance of 35 cm between plants in a row. Plant management has influenced the number of leaves in the sense that in wild-growing variants (without interventions) and in those with four arms the number of leaves per plant was higher because the plants formed numerous shoots on the stopped arms.

Data on the **number of flowers per plant** can be found in figure 6. The first flowers appeared on the plant on 25th of May at Brillant F1, which proved to be earlier than Bobiță F1.

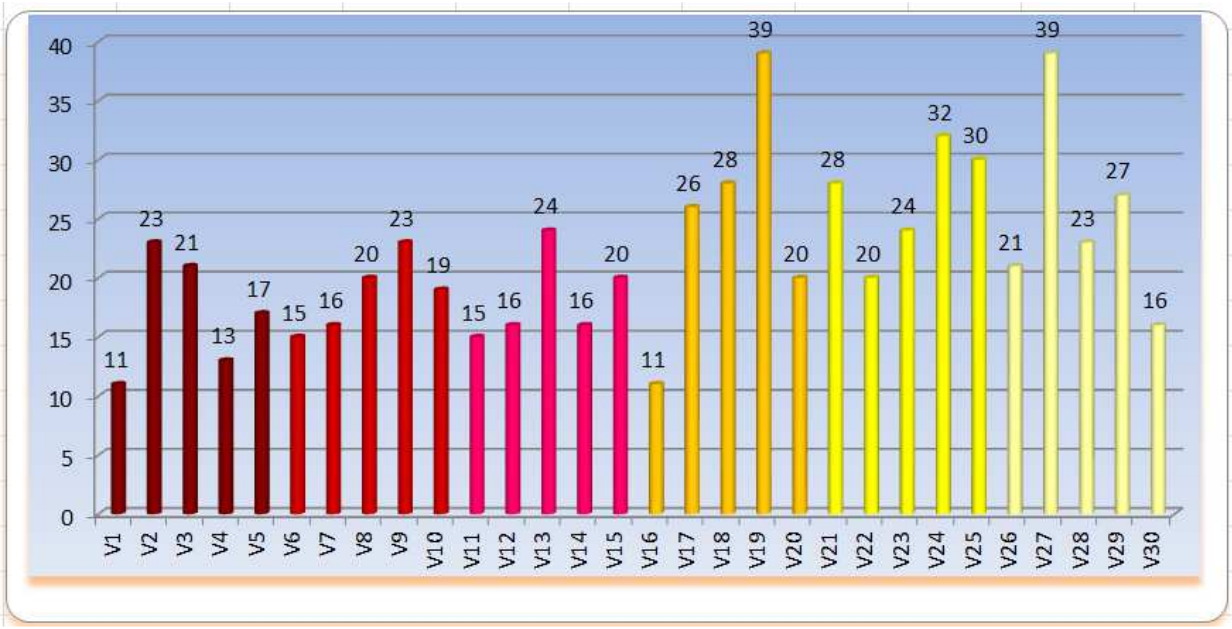

Figure 6. Number of flowers per plant at the end of the research period

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The most flowers are at V19, and the least at V16 and V1. Brillant F1 has formed a larger number of flowers per plant compared to Bobiță F1. Both studied hybrids exhibit the highest values of this character in 2 and 3-arm plants. The density of planting does not particularly influence the number of flowers in any of the studied hybrids.

In figures 7 we note the influence of the hybrid and the applied technology on **the number of fruit formed on the plant**.

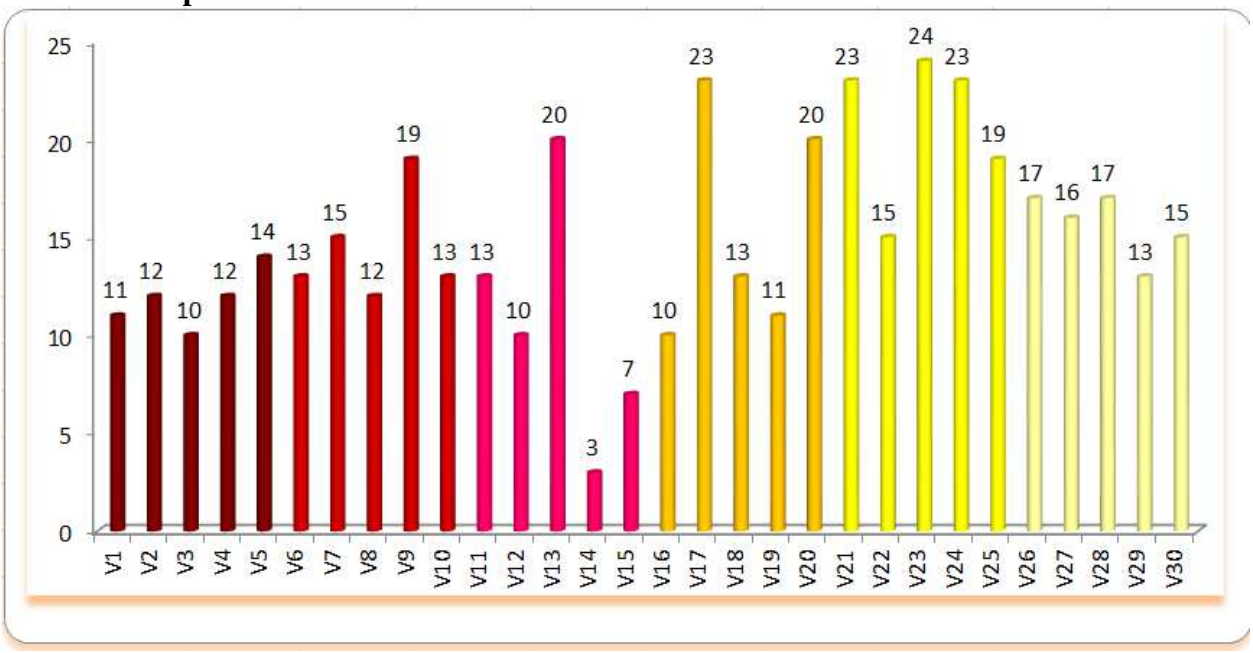

Figure 7. Number of fruits per plants at the end of the research period

Brillant F1 has formed more fruits than Bobiță F1. For Bobiță F1, the 35 cm distance between plants per row has led to the formation of a larger number of fruit per plant, and a more uneven formation is observed at a distance of 40 cm between plants per row. At Brillant F1, the 35 cm spacing between plants gave rise to a greater number of fruit per plant, and a more uneven formation was observed at a distance of 30 cm between plants per row. At Brillant F1, the number of fruits has not been greatly influenced by the way plants are managed. In Bobiță F1, the largest number of fruits is recorded in plants with 3 and 4 arms.

4. CONCLUSIONS

Brilliant F1 is more vigorous than Bobiță F1, generally displaying higher elevations.

The density of the plants influences the height increase of the studied hybrids and a relatively higher increase is observed in the plantations planted at a distance of 35 cm between the plants in row.

Regarding the plant management, it can be seen that in both hybrids the two- and three-arm steering has positively influenced the height increase of the plants.

Plant management has influenced foliage formation in the sense that in natural growth (without intervention) and in those with four arms the number of leaves per plant was higher because the plants formed numerous shoots on the stopped arms.

If the hybrid has high vegetative power, it generates unlimited new shoots, this being at the expense of fruiting.

The first flowers on the plant appeared on the Brillant F1, which proved to be earlier than the Bobiță F1.

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The distance between plants in a row does not particularly influence the number of plant-growing flowers in any of the studied hybrids.
It is recommended to cultivate Brillant F1 pepper at planting distances of 35 cm between plants in a row, with 2-3 branches, leaving 2-3 fruits.

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