ABSTRACT

Keywords: protected ecological culture, tomatoes, sweet peppers, eggplants, cultural density, natural biostimulators, natural foliar fertilizer

The issue of current doctoral thesis regards the need of optimizing the Solanaceae vegetable growing technologies in polytunnels, by identyfing some technological factors with a major influence in this regard.

The researches carried out in order to draw up the doctoral thesis entitled "**Contribution on the improvement of ecological vegetable growing technologies in polytunnels**" were carried out between 2010 – 2013 at UASVM Iași within the Vegetable growing experimental field and laboratory and also in Horticultural Research Centre laboratory.

The goal of the doctoral thesis was to evaluate the possibility of obtaining ecological vegetables of Solanaceae botanical family, in polytunnels, by optimizing three important technological links for vegetable practice: cultivar, crop density, fertilization/biostimulation.

Three major **objectives** have been established on this line:

1. the comparative study of a new assortment of tomatoes, sweet peppers and eggplants.

2. determining the crop density influence on tomatoes, sweet pepper and eggplants polytunnel cultures.

3. determining the influence of some treatments with natural biostimulating substances and natural foliar fertilizers on tomatoes, sweet pepper and eggplants polytunnel cultures.

Several secondary objectives have been drown in order to fulfill the major ones:

- the study of phenological, morphological, growth and development characteristics on the three studied species (total plant hight, the first fruit insertion hight, total number of leaves per plant, total number of flowers per plant, total number of fruits per plant, stem diameter, photosynthesis rate, transpiration rate, water use efficiency, stomatal conductivity and total content of chlorophyll pigments)
- the yield analysis (early yield, total yield and dynamics of yield)

- the analysis of yield quality (fruits content of: dry matter, total protein, reducing sugars, soluble solid content, C vitamin)

Two distinctive bifactorial experiments were carried out between 2011 and 2013 on which cultivar and crop density, respectively cultivar and treatments applied and their combinations: cultivar x crop density and cultivar x treatment applied were analyzed, on achieving the goal and objectives that have been drown.

The cultivars studied in the two experiments were:

- Margarita F1, Primadona F1, Winona F1, Belladona F1, Siriana F1 hybrids and Buzau 1600 local variety (tomatoes);
- Brillante F1 and Bianca F1 hybrids and Export local variety (sweet pepper);
- H1Bz F1, Black Beauty F1 and Edna F1 hybrids (eggplants).

Regarding the distances between plants per row, respectively the crop densities used in experiment:

- 33 cm (33.670 plants per hectare), 40 cm (27.778 plants per hectare) and 50 cm (22.223 plants per hectare) – tomatoes;

- 35 cm (31.746 plants per hectare), 40 cm (27.778 plants per hectare) and 45 cm (24.691 plants per hectare) – sweet pepper;

- 45 cm (24.691 plants per hectare), 50 cm (22.223 plants per hectare) and 55 cm (20.200 plants per hectare) – eggplants.

Four treatments were performed on the three studied species regarding the influence of different treatments research:

- three of them with some natural biostimulating substances with steroidal-glycoside structure (Pavstim, Ecostim and Moldstim), in 0.001% concentration;

- one with a natural foliar fertilizer (Veramin), in 0.25% concentration.

The doctoral thesis includes a number of six chapters, being devided into two parts.

Part I - Current knowledge regarding the ecological vegetable growing. It includes two chapters:

- Chapter I. History, evolution and importance of ecological vegetable growing.
- Chapter II. The importance of some technological factors in practicing the polytunnel ecological culture of tomatoes, sweet pepper and eggplants.

The second part, consisting in results of the own studies and researches, includes a number of four chapters:

- Chapter III. Goal, objectives, biological material and research method

- Chapter IV. The influence of planting distances on an assortment of *Solanaceae* vegetables grown in polytunnels
- Chapter V. The influence of some fertilizers and natural biostimulating products within the *Solanaceae* assortment grown in polytunnels
- Chapter VI. Conclusions and recomandations

The bibliography includes a number of 247 specialty titles, both from our country and abroad.

The first part of the paper is made up of two chapters including general informations regarding the thesis topic's current stage.

On drawing these chapters, documentary studies were conducted, using different sources: Vegetable growing textbooks, book and treaties, journals, scientific articles, doctoral thesis along with a number of recent web informations (FAO, Romanian Ministry of Agriculture and Eurostat Statistical Office websites).

The first chapter o the thesis reveals the importance of ecological vegetable farming, focusing on a range of issues as the history and development of ecological crops, current situation of vegetable growing at global, European and national levels and its trends; it also highlighting the need, opportunity and importance of ecological vegetable growing as well as some ecological principles and the perspectives of improving the quality of life by respecting them.

In **the second chapter** are presented the technological factors for the three species studied. Thus, the first subchapter briefly presents all the technological factors while the second one focuses on those related to the thesis topic: cultivar, crop densities/schemes and fertilization. The chapter concludes by hightlighting the results of other researches on the biostimulating substances used in our experiments.

The third chapter deals with the goal and objectives of the thesis, the researches materials and methods, as well as the environmental, organizational and institutional conditions.

Starting with **the fourth chapter**, the synthesis of the experiences results is presented.Since the paper requires the interpretation of a multitude of interdisciplinary data, an ordering so as to facilitate the highlighting of generally influences on the three species was attempted; only afterwards, an examination of the relationship between different genotypes and the experimental factors was carried out. Thus, the chapter analyzes the combined influence of cultivar x crop densities for each species.

This analysis of the experimental factors influence was performed on four perspectives: on growth and development (regarding some morphology and phenology aspects), on the photosynthesis process, on some yield aspects (early yield, total yield, dinamics of yield) and also

on the yield quality.

The fifth chapter includes the analysis of cultivar x treatment applied influence, fully respecting the structure of the previous chapter.

Regarding the influence of planting distances on an assortment of polytunnel solanaceous vegetables

- The three studied species (tomato, sweet pepper and eggplant) presents growth and development indicators that have greatly varied influenced by cultivar and less by crop densities. The total hight of tomato plants had the lowest value at Margarita F1 x 40 cm variant (160.68 cm) and the highest at Buzău 1600 x 40 cm variant (199.49 cm). The total hight on sweet pepper cultivars ranged between 98 cm (Export x 35 cm variant) and 114.8 cm (Brillante F1 x 45 cm variant).

- The total content of chlorophyll pigments from leaves directly proportional increased with the distance between plants per row only at tomat crop. It ranged between 38.93 relative units, at Buzău 1600 x 33 cm variant, and 67.08 relative units, at Siriana F1 x 50 cm variant. At sweet pepper crop, the extreme variants were Export x 40 cm variant (53.92 relative units) and Export x 45 cm variant (77.04 relative units); at eggplant crop, the total content of chlorophyll pigments varied between 51.58 relative units (Black Beauty F1 x 50 cm variant) and 67.40 relative units (H1Bz F1 x 50 cm variant).

- Regarding early tomat yield, the variant that positively stands out is Buzău 1600 x 33 cm variant, with an early yield of 27.43 t/ha. At sweet pepper crop, the best early yield was obtained at Brillante F1 x 35 cm variant (12.45 t/ha), while at eggplant crop, the H1Bz F1 x 45 cm variant had an early yield of 24.29 t/ha.

- On tomato and sweet pepper crops, the higher values of total yield were obtained ast the same variants as in early yield. As such, Buzău 1600 x 33 cm variant had a total yield of 89.76 t/ha, while Brillante F1 x 35 cm variant total yield was of 49.90 t/ha. On eggplant crop, the most productive variant was Black Beauty F1 x 45 cm, with a total yield of 83.03 t/ha.

- The yield dynamics of the cultivars reveals the possibility of a yield scheaduling over an extended period (four-five months) and supplying the market with local ecological fresh fruits.

Regarding the influence of some fertilizers and natural biostimulating substances on an assortment of polytunnel solanaceous vegetable

- The influence of foliar fertilizer on the total number of fruits per plant is significant, judging by its increases: 6.5% (Winona F1 x Veramin 0.25%) – 20.3% (Belladona F1 x Veramin 0.25%), on tomato crop, 9.46% (Brillante F1 x Veramin 0.25%) – 17.24% (Export x Veramin

0.25%), on sweet pepper crop, respectively 11.76% (Edna F1 x Veramin 0.25%) – 24.24% (Black Beauty F1 x Veramin 0.25%), on eggplant crop.

- On all the three studied species, early yield was obviously influenced by the treatments applied. On tomato crop, the top variant was Buzău 1600 x Veramin 0.25% (27.69 t/ha). On sweet pepper crop, the best early yield was noted at Brillante F1 x Veramin 0.25% (13.65 t/ha). On eggplant crop there are highlighted two preeminent variants, H1Bz F1 x Veramin 0.25% (23.95 t/ha) and H1Bz F1 x Moldstim 0,001% (23,86 t/ha).
- On total yield, top tomato variants were Siriana F1 x Veramin 0.25% (93.75 t/ha) and Buzău 1600 x Pavstim 0.001% (93.51 t/ha). On sweet pepper crop, the most productive variant was Brillante F1 x Pavstim 0.001% (44.35 t/ha), while on eggplant crop, stands out two variants, H1Bz F1 x Veramin 0.25% (78.70 t/ha) and H1Bz F1 x Pavstim 0.001% (78.64 t/ha).
- The treatments applied had a distinctlly influence on the total dry matter content of tomato and eggplant fruits, a stimulatory effect being noted at Pavstim and Moldstim treatments, while the foliar fertilizer effect was inhibitory. On sweet pepper crop, Moldstim treatments proved to be the most efficient, ensuring significant increases on fruits dry matter content.
- It is recommended the applying of different treatments on solanaceous crops, positively influencing both growth and development (the foliar fertilizer) and also fruit quality (the natural biostimulating substances).

We conclude that the results of doctoral thesis researches have both a practical and a theoretical contribution on the optimization of technological factors of ecological polytunnel vegetable growing, the goal and the objectives of the thesis being fully realized. A large part of the results have been published in international database papers.