

SUMMARY

of the doctoral thesis entitled:

STUDY ON THE IMPLEMENTATION OF NEW CULTIVATION TECHNOLOGIES IN VEGETABLE FARMING AND THE ADOPTION OF REGION-SPECIFIC VARIETIES

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This doctoral thesis presents results of a study, as well as research conducted on tomato varieties grown in Romania in greenhouses, along with the evolution of cultivated areas before and after 1989.

This thesis is composed of 130 pages and contain two parts: Part I, which a single chapter, and Part II, which is structured into two chapters. The thesis also includes the consulted bibliography, consisting of 149 references, 6 annexes and the list of publications.

PART I of the doctoral thesis presents a bibliographic study of the experimental studies carried out on tomato culture.

Chapter I, titled "*A Summary of Contemporary Research on the Utilization of Modern Technologies in Non-Conventional Systems*," presented the importance of vegetable farming and the cultivation of tomatoes in non-conventional systems in greenhouses. The chapter provides a synthesis of the emergence of non-conventional tomato cultivation systems in greenhouses, along the role and necessity of that systems. It includes an overview of cultivation technologies and modern systems for maintaining climatic factors within the greenhouse. Additionally, the species *Solanum lycopersicum* is described, covering its history, botanical, biological, and technological characteristics. The chapter also includes studies conducted by various researchers on vegetative factors and effects on tomato growth plant, research on the influence of different growing substrates on tomatoes growth and development in greenhouses.

Part II includes the aims and objectives of the research, the findings of the original research, structured into two chapters. This part also contains the consulted bibliography, appendices, and list of publications.

The study aimed to address several aspects, including the importance of adopting specific varieties for each region in Romania and investigating the impact of implementing new specific cultivation technologies in the vegetable sector. The selection suitable varieties for each region aimed to highlight with maximize the yield and quality of the harvest, taking into account climatic factors, growing substrates, and local characteristics. This allowed for a detailed investigation into the impact of modern technologies on overall growth and development plant, the evaluation of performance in various environments. The methods and results identified in the study can serve as essential information for farmers, researchers, and policymakers in the horticulture sector, contributing to sustainability and competitiveness of the industry.

To achieve the goal, this thesis pursues the following objectives:

Objective 1: Selecting the ideal crop varieties: Choosing vegetable types that are most suited to the local climate and soil characteristics.

Objective 2: Evaluating new cultivation technologies: Analysing emerging technologies in vegetable farming, such as precision agriculture, using of drones, also sensors for monitoring soil and plants, smart irrigation, and cultivation in controlled environments (high-tech greenhouses and tunnels).

Objective 3: Evaluating the yields obtained: Assessing the yields associated with the implementation of cultivation technology using perlite substrate for the Buzău 1600 variety in two

cultivation systems: in tunnels with soil cultivation and in greenhouses with non-conventional cultivation on perlite substrate.

Chapter II, titled "*Study on the Identification of Tomato Varieties Developed in Romania*," presents data on the results obtained from evaluating the pedoclimatic conditions in Romania and identifying the soil and climate characteristics specific to the relevant area for selecting a suitable tomato variety.

Another objective was to analyse varieties of tomato developed in Romania to date. Additionally, the evaluation of the Buzău 1600 variety was pursued, with the aim of promoting this variety for its taste qualities.

All results showed that in Romania, most favourable areas cultivated with tomato are identified in the southern part of the country, particularly in Oltenia, Muntenia, and southern Dobrogea. These regions benefit from optimal temperature conditions for tomato cultivation both in open fields and in greenhouses or protected spaces, as the heating costs for greenhouses are considerably lower. This chapter also highlights tomato cultivation in greenhouses in Romania, discussing climatic variability and extreme weather conditions, as well as the justification for adopting modern

A subsection of this chapter presents an analysis for identifying and registering tomato varieties and hybrids cultivated worldwide, including a global list of the total number of tomato varieties and hybrids.

Another subsection addresses the evolution of varieties and hybrids in Romania, as well as modern greenhouse technologies, covering the evolution of varieties cultivated and developed in Romania before 1989 and up to the present.

The study also presents an analysis of tomato yields in Romania during the period from 1965 to 1981. During this time, mainly Romanian varieties created in research institutes in Romania were used, the number of hybrids created was very small. As a result, the yields were significantly lower compared to the period after 1989. Additionally, the varieties developed during that period did not have adequate resistance to disease and pest attacks.

After 1990, cultivated areas and yields in Romania were smaller, as high-performance hybrids appeared on the market, providing better productivity, quality, and resistance to disease and pest attacks. Analyses conducted on tomato production from 1965 to 1989 show that it was much lower compared to the production from 1990 to 2021, according to statistical data presented in the FAO yearbook.

This chapter also highlights the efforts of research stations to develop high-performance varieties and hybrids.

Regarding the evolution and implementation of modern tomato cultivation technologies in Romania, an analysis was conducted on the new technologies implemented through the construction of modern greenhouses. The number of companies selling seeds in Romania has increased significantly, with each company collaborating with a specific geographic area and offering a wide variety of varieties and hybrids.

This chapter includes a short description of the varieties and hybrids produced in Romania and marketed by various companies, highlighting the new hybrids created at the Buzău Research Station as well as in other research institutes. New varieties of cherry-type tomato varieties and hybrids are also presented.

In **Chapter III**, titled '*Comparative study on the production potential and shelf life of tomatoes of the Buzău 1600 variety in perlite substrate and soil cultivation*' the Buzău 1600 variety is analysed in terms of its production behaviour using the non-conventional perlite substrate cultivation system compared to the conventional soil system. Our observations recorded variations in plant height, favouring those grown in greenhouses and the number of fruits formed in the inflorescences. The fruit set percentage was observed to be much higher and more consistent under the perlite substrate cultivation conditions. This is attributed to the well-monitored climatic conditions of the greenhouse and the precise amounts of fertilizers used. There were differences in the average fruit mass depending on their position in the inflorescences.

The yields obtained under controlled greenhouse conditions were much higher compared to those obtained in tunnels.

Another study conducted was analysis of the chemical composition of the tomato fruits, performed for each inflorescence. Differences was found between the two cultivation systems, favouring the non-conventional perlite substrate system. Additionally, it was observed that in terms of nitrate content, the values were balanced between the two systems, though slightly lower under greenhouse conditions, remaining below the imposed standards.

An analysis of the carbohydrate content was conducted, revealing that the Buzău 1600 variety has a relatively high carbohydrate content, with minimal differences between the two cultivation systems. Regarding fruit acidity, determined by juice pH, no significant statistic differences were observed between these two systems. In addition, fruit firmness was similar between the two systems. It was determined that the greenhouse production outstripped the tunnel production by a margin of 7,590.86 kg per hectare.

Regarding fruit shape, it was observed that under greenhouse conditions, the shape index was slightly different compared to the fruits obtained from tunnel cultivation.

Another study conducted on the Buzău 1600 variety focused on determining its storage capacity. It was found that, although the variety is valuable, its storage capacity under ambient conditions is lower compared to storage in a refrigerator at 6°C until the fruits are marketed.

The bibliography includes a total of 149 references.