

ABSTRACT

Keywords: urban garden, landscaping, raised beds, culinary garden

The studies and research carried out for the realization of the PhD thesis entitled *Possibilities of using vegetable species with multiple uses in the concept of urban and peri-urban gardens* took place in 2017-2021 period, in the experimental field "V. Adamachi" Farm and in the laboratory of the Vegetable Growing discipline at the Faculty of Horticulture in Iași.

The PhD thesis is structured in two parts and comprises seven chapters.

Part I - Current state of knowledge on the use of vegetable plants in landscape design

Chapter 1 - General considerations on the importance of growing vegetables in the context of urban and peri-urban gardens

Chapter 2 – Landscape designs with vegetable plants

Part II - Own research results

Chapter 3 – The purpose and the objectives of the research. Material used and methodology

Chapter 4 - Results on the choice of plant species for the establishment of urban and peri-urban gardens

Chapter 5 - Results on the establishment of urban and peri-urban gardens

Chapter 6 - Results of urban and peri-urban garden maintenance on crop yield and quality

Chapter 7 - General conclusions and recommendations

At the end of the thesis are presented the bibliography, which includes 162 bibliographical references, both from Romania and abroad, and the annexes containing the list of figures, the list of tables, annex 3 with the ANOVA tables and the list of published scientific papers.

The first part of the PhD thesis, the current state of knowledge on the use of vegetable plants in landscaping, consists of two chapters and includes background information from the literature.

Chapter 1 - General considerations on the importance of growing vegetables in the context of urban and peri-urban gardens

This chapter is structured in four sub-chapters in which introductory notions are presented on the food importance of vegetables, the therapeutic importance of vegetables, the economic importance of vegetables and the decorative importance of vegetables.

Chapter 2 – Landscape designs with vegetable plants

The following chapter contains three sub-chapters which provide a brief history of vegetable farming and vegetable gardens, a classification of family vegetable gardens and three case studies.

Data from the scientific literature has allowed us to make a classification of family vegetable gardens, taking into account the following: purpose, style of design, necessity and construction method.

Depending on the purpose, there are vegetable gardens for utilitarian purposes, vegetable gardens for therapeutic purposes and vegetable gardens for culinary purposes. By style there are geometrically designed vegetable gardens, free-style vegetable gardens and mixed vegetable gardens. In terms of necessity, there are ecological, educational, cultural, aesthetic-recreational and health gardens. Depending on the construction method, vegetable gardens can be at ground level, raised beds, vegetable gardens in pots and containers, and vegetable gardens on wicker-beds.

This classification helps to develop the design concept of the vegetable garden for decorative purposes and can be integrated into the overall design of the property.

The second part of the PhD thesis, the results of own research, is the most extensive and is divided into five chapters.

Chapter 3 - The purpose and the objectives of the research. The material used and the working methodology

Chapter 3 is structured in three sub-chapters.

The first sub-chapter presents the research motivation and purpose and the specific objectives.

The need for this study stems from the high migration of the population to urban and peri-urban areas and the desire of people to have a small vegetable garden with multiple uses (decorative, recreational and consumption).

The scarce expert information in this field and the fact that this concept of landscaping family vegetable gardens in urban and peri-urban areas is not sufficiently promoted in our country led me to carry out this PhD study and to demonstrate that a utilitarian vegetable garden can be transformed into a culinary vegetable garden, providing decoration and food source thus, being easily integrated into the landscaping project of the whole garden.

The aim of the research for the PhD thesis is to study different systems of vegetable plant use in order to develop concrete measures for the development of decorative vegetable gardens in the private environment in urban and peri-urban areas, taking into account the possibilities of vegetable plant associations on raised beds.

In order to achieve the proposed goal we have designed a number of five specific objectives:

1. Documentary study, research in the country and abroad on the PhD topic, namely, the study of how to combine vegetable and decorative plants in order to create a plant palette and plant compositions;
2. To create a classification of home vegetable gardens, which helps to accurately fit the family vegetable garden into the garden design;
3. The choice of vegetable and aromatic plant species and varieties based on

research in the field and the creation of a plant palette suitable for cultivation on raised beds in urban and peri-urban areas;

4. Creation of plant compositions using plant species with decorative and food value suitable for growing in raised beds that allow for mutual growth and development with an aesthetically pleasing appearance;

5. Through plant analysis, measurements and statistical analysis of the results, the optimum height for the beds will be determined in order to obtain an optimum harvest and for the plants to provide decoration throughout the growing season.

The stages of construction of the raised beds and the evolution of the plants are photographed and the decorative effect offered by them as well as the results of the harvest are carefully analysed and documented.

The second sub-chapter presents the working materials used. These are divided into biological materials and biotechnical materials.

In this study, the biological material used is composed of seeds, seedlings and potted plants. Crops are established by direct sowing in the field and planting seedlings and potted plants as follows:

- seedling – Kadet, Scarlet and Nero di Toscana leaf cabbage, Chard Bright Lights mangold, Blue de Solaise leek, Di Parma onion, Ekol cucumber, Black Beauty eggplant, Tigerella and Black Cherry tomato, Barbara sweet pepper, Triple Moss Curled, Giant Prague celeriac, Cosmic Purple and Royal Chantenay carrot, Italiano Classico Genovese and Serafim basil, Kreta oregano, Chrestensen medicinal sage, Cinderella mint, Di Provenza thyme, Nana French marigold, Silverdust cineraria;

- direct sowing in the field – Óvári Fehér patty pan squash, Nano Supernano Giallo dwarf bean and Violetă de Iași garden beans;

- potted plants – Cassian chinese grass, Gaudi Red butterfly bush, Little Spire Russian sage, Starshine aster, Munstead lavender, Green Ginger rosemary, Silver Carpet lamb's ear, Caradonna decorative sage.

During the research, various technical materials were used: wood materials (plows for support, wood for the construction of beds), organic materials (peat, garden soil, compost, peat moss, perlite, Orgevit), PVC (irrigation system, honeycomb pallets, pots), equipment for various works for the preparation of soil samples and plant material and other materials for the establishment and maintenance of crops (scissors, string, labels).

The third sub-chapter presents the general working methodology: description of the experimental station, experimental design, experimental variants, preparation and set-up of the experimental field, preparation of samples for analysis, determinations and analyses performed, apparatus and equipment used and statistical analysis.

Chapter 4 - Results on the choice of plants for the establishment of urban and peri-urban gardens

In this chapter there are two sub-chapters in which the selection criteria of the species studied are presented (selection criteria from a food and therapeutic point of view, selection criteria from the point of view of biological and ecological requirements, selection

criteria from the point of view of cultivation technology and selection criteria from a decorative point of view) and the partial conclusions of this chapter.

Chapter 5 - Results on the establishment of urban and peri-urban gardens

Chapter 5 is structured in five sub-chapters and presents results on the establishment of urban and peri-urban vegetable gardens, results on the composition of urban and peri-urban gardens, estimated costs of establishment, other design possibilities and partial results.

According to the classification criteria outlined in the first part of the thesis, the purpose of the designed vegetable garden is culinary and is laid out in an informal geometric style with free-style plant placement. The basic needs are the following: ecological, educational, aesthetic-recreational, economic and sanitary. It was built both at ground level and on raised bed with existing substrate in the experimental field.

The substrate used for sowing is composed of Kekkila peat. It was moistened and placed in honeycomb pallets. Subsequently, all the vegetable and aromatic species whose cultivation in the field is established by seedling were sown in the pallets.

The landscaping was done by basic levelling of the land. Subsequently, the land was divided into three equal parts and staked according to the layout plan. For the V1 and V2 variants, frames made of fir wood logs were built for raised beds with heights of 40 cm and 20 cm respectively according to the technical drawings and treated with water-based wood varnish for long-lasting protection. V3 variant was bounded with plastic edging at ground level.

The substrate mixture used was composed of 50% garden soil, 25% peat moss, 15% peat and 10% leaf compost. The mixture was improved every year with 5 kg/m³ of Orgevit.

After the establishment of the beds, basic soil work was carried out to prepare the seedbed and planting: deep soil mobilisation, soil shredding and soil shaping.

After the establishment of the beds, the preparation of the growing medium and the establishment of the irrigation system the field crop was established as follows.

At the end of April, perennial crops were established: Chinese grass, bee flower, Russian sage, aster, lavender, rosemary, lamb's ear, decorative sage, oregano, medicinal sage, mint and thyme.

In the first half of May, cold-resistant plant crops were established: cabbage leaves, beets for petiole and leaves, leeks, onions, celery for roots, carrots and potatoes.

In the second half of May, the crops of heat-demanding plants were established: cucumbers, eggplants, tomatoes, bell peppers, squash, basil and beans.

The ornamental value of the whole design is provided mainly by the colour of the leaves, petiole and flowers, providing decoration until the end of crop period. The space created can be furnished with a table and chairs for outdoor dining, loungers can be placed for relaxing or it can be used as a focal point by placing a statue or a water-feature thus becoming a space with recreational functionality.

The cost of setting up a vegetable garden differs depending on how it is designed and the materials needed to set it up. Beds with a height of 40 cm will have higher costs

because a larger volume of building materials and substrate is required. Costs decrease or increase directly in proportion to the height of the layers.

The advantage of using modules or modular beds is that they can be combined in a variety of ways to create a practical, versatile and easy-to-maintain layout. They can be used on both straight and sloping ground.

Chapter 6 - Results of urban and peri-urban garden maintenance on crop yield and quality

This chapter is structured in four sub-chapters and follows the care work applied, results on the quality obtained, results on the harvest obtained and partial conclusions.

Crust control and soil loosening, weed control, filling in gaps, fertilising the soil, watering crops and preventing and controlling diseases and pests are the general care work applied to crops. The care work applied to both seedlings and field crops are basic and special care work depending on the species. No additional care was required in addition to the literature.

In general, there are significant differences in production between the three variants, so V1 (40 cm height) has the best production results. Results in V2 (20 cm height) and V3 (at ground level) vary depending on the species. In general, the most productive plant species are those for leaf consumption, such as mangold and kale cabbage.

Chapter 7 - General conclusions and recommendations

The last chapter of this PhD thesis contains the general conclusions and recommendations of the study carried out in the framework of the research, which are: general conclusions on the documentary study and research in the country and abroad, general conclusions on the classification of home vegetable gardens, general conclusions on the selection of species and varieties of vegetable, aromatic and flowering plants and the creation of a plant palette, general conclusions on the creation of plant compositions, general conclusions on the results of the analyses of the plant material studied and recommendations.