

LUCRĂRI ȘTIINȚIFICE SERIA HORTICULTURĂ, 60 (2) / 2017, USAMV IAȘI

PRELIMINARY STUDIES ON THE CULTURE OF VEGETABLE PLANTS IN POTS AND CONTAINERS

STUDII PRELIMINARE PRIVIND CULTURA PLANTELOR LEGUMICOLE ÎN GHIVECE ȘI CONTAINERE

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Abstract. *This paper presents a literature review of the vegetable growing in pots and containers. Growing vegetables in this system it is known for a long time in the countries of Western Europe and in some areas of our country. Adopting this system in Romania requires in-depth studies regarding: the suitable species, the type of pots and soil recipes needed, crop establishment and maintenance (fertilizers application, irrigation) and, in some cases, optimization of the certain referring to light and placement of pots and containers. This cultivation system is spread mainly in peri-urban areas where the interest among gardeners to grow their own crops and secure their vegetable needs is high and has a favorable environment. Vegetable plants cultivated in pots and containers present a large diversity worldwide but, within this diversity, the climatic conditions from our country must be appropriate for an efficient activity.*

Key words: vegetable crop, irrigation, substrate, fertilizers

Rezumat: *Lucrarea prezintă o sinteză a literaturii de specialitate referitoare la cultura plantelor legumicole în ghivece și containere. Cultivarea legumelor în acest sistem este cunoscută de foarte mult timp în țările din Vestul Europei și uneori chiar și la noi. Adoptarea acestui sistem în România necesită studii aprofundate referitoare la: speciile potrivite, tipul de ghiveci, substraturile folosite, modul de înființare a culturilor, lucrările de îngrijire (fertilizare, irigare) și eventual reglarea unor factori referitori la lumina și amplasament. Acest tip de cultură este răspândit mai ales în zonele periurbane unde există dorința cultivatorilor de a-și asigura necesarul de legume precum și un mediu favorabil. Plantele legumicole cultivate în ghivece și containere prezintă o largă diversitate la nivel mondial, dar în cadrul acestei diversități, trebuie alese condiții care sunt adecvate de la noi din țară. Prin studiile și cercetările pe care mi le-am propus se dorește găsirea soluțiilor posibile de aplicat de la noi din țară.*

Cuvinte cheie: culturi de legume, irigare, substrat, fertilizări

INTRODUCTION

The development of the cultivation of vegetables from the last decades can be observed from the continuous growth of the crop surfaces and quantities. At the same time, the technologies have constantly assured the growth of the crop

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quantity and quality, thus appearing the so called systems of cultivation (Ciofu *et al.*, 2003). Therefore, we can distinguish between open space systems and protected space systems, the system on natural soil and that on artificial soil, conventional and nonconventional systems (ecological) etc. The industrial and the domestic systems (family type) are also of major interest. Within the last one, it has recently become more obvious that there is the possibility of a system of crops in pots and containers (Pipa, 2008).

A major attention has been given to improving the methods of cultivation in pots and containers and also to the development of an appropriate type of technology, able to assure the good use of family yards and gardens, in a pleasant way, through the aesthetics of the plants, and the utility of this system, through the quantity and quality of the vegetable plants. Pot gardening gives the opportunity to assure plant growing throughout the year, and thus it becomes an easy and pleasant activity. Besides this, for many people this is the only way of gardening when the outside space is relatively small or it does not exist at all (as it is for many people living in blocks of flats) (Wilson, 2007).

The vegetables that are cultivated in pots and containers can be placed in different parts of the garden, where there are the best conditions for growth and development, giving also a pleasant aspect to the garden, the sense of harmony, balance and elegance, enhanced by the organization and placement of the pots. Also, the pots and the containers can be placed on terraces or in the garden as design elements. Within the present work, we are trying to generally describe the steps that need to be followed in order to achieve the cultivation of vegetable plants in pots and containers.

MATERIAL AND METHOD

The study presented in this work was done on the basis of the existing information in literature, and of the experience of the Romanian cultivators. Taking into account the purpose and objectives of the work, the study is structured so that it achieves each one of the objectives. A special attention has been given to the following elements that contribute to the success of this system: the appropriate species, the type of pot, the soil, the method of cultivation, maintenance (fertilizers, irrigation), and the adjustment of some factors, such as the placement of the pots.

The appropriate species. The existing information will be analyzed and compared, according to the plant species: annual and perennial plants, short and tall plants, etc.

The type of pot or container: there are countless 'pots' that can be used; they may be specially designed for cultivation or improvised. They also differ according to size, shape, the material they are made of, price, ornamental value, etc.

The substrate. In the world literature there are many different formulas for organic substrates. Recent research has determined scientists to investigate the possibilities. The soil may have many components. Generally, substrate is made by mixing different proportions of materials together, such as peat, garden soil, organic compost, sand, perlite, vermiculite, some pharmaceutical products, etc.

Crop establishment. The establishment of vegetables in pots and containers can be done by direct sowing (cucumbers, beans) or by seedling (tomatoes, peppers, eggplants,

etc.). The appropriate time to plant is different for every specie, according to its needs referring to heat, period of vegetation, and the time needed before harvesting, but it also depends on the possibilities of the cultivator to establish such cultures.

RESULTS AND DISCUSSIONS

Results about the species of plants able to be grown in pots and containers

The vegetable plants that are cultivated in pots and containers are chosen according to the conditions of vegetation (light, water, nutrition) that the placement can offer, but also according to the design of the place where they would grow (Hudak, 2003).

The majority of the vegetable plants that can be cultivated in pots and containers are aromatic plants, like: oregano, savory, basil, tarragon, mint, lovage, dill. In bigger pots or containers one can grow cucumbers, onions, peppers, beans, lettuce, spinach, parsley, etc. When choosing the plants to be established in pots or containers, one should take into account the size that the plant might reach. One must also pay special attention to the design of the mini-garden in order to maintain a pleasant appearance and to assure that the plants can be taken care of appropriately.

The tomatoes (*Lycopersicon esculentum* L.) can be successfully cultivated in pots or containers. Many breeds of tomatoes can be grown, but the most suitable ones are cherry tomatoes. They are a lot smaller than normal tomatoes and they are highly appreciated for their distinct flavor and sweet taste (fig.1).

The sweet -pepper (*Capsicum annuum*) is a vegetable plant that can easily adapt to the cultivation in pots and containers, as it can be seen in fig. 2. The cultivation of the sweet -pepper can be established either by sowing or by seedling. The development of the seeds starts at 14-15 °C and takes up to 20-25 days for the seed to sprout. At temperatures of 20-25 °C, it lasts for 6-9 days (Chaux and Foury, 1994).

The beans (*Phaseolus vulgaris*) can be grown in a pot or a container because it does not require a lot of care, it easily adapts to the shortage of space of a balcony. The bean is cultivated for its culinary qualities, can be consumed in its state of string bean or when it reaches maturity. There are different types of beans, some cultivated especially to be consumed as string beans, others that are used as mature plants. Along with the common beans, in our country there is also a specie called *Phaseolus coccineus* L. (sin. *P. multiflorus* Lam.), also known as “the giant beans, or large bean, etc. (Munteanu, 1987). *P. coccineus* resembles *P. vulgaris*, but there are some differences: the root is thicker, even cylindrical; the stalk (both of determined and undetermined growth) is much more vigorous and more branched; the flowers, grouped in big axillary clusters (7-15 flowers) are French red, white or a mix of the two colours, as it can be seen in fig. 3; the pods are bigger (long, wide, thick); the seeds are very big (MMB = 900-1300 g), oblong wide, purple with black spots, beige with brown spots or white (Munteanu, 1985).

Among the greens, a good choice for planting in pots and containers is the lettuce, especially the one grown for leaves, which can be harvested by installment, and which is there to decorate the space for a long period of time, especially the types that have a design purpose and have different colours, from green-yellow to red. Other greens that are suitable for planting in pots and containers are: spinach, ramp, rocket salad, cress, savory, dill, etc. The perennial species are also a good choice for planting in pots and containers because they can be acquired and planted in a more advanced stage of development, thus having an ornamental impact immediately after they are planted (Sima, 2017).

Results of the different types of substrate used for pot and container planting

The nutritious substrate plays an important part in the success of the cultivation in pots and containers. The substrate has to be appropriate in terms of fertilization, texture, structure, pH, nutritious elements and their accessibility for the plant, and the right amount of organic substance. Generally, this kind of substrate is obtained by mixing together different proportions of specific materials, such as peat, garden soil, organic compost, sand, perlite, vermiculite, some pharmaceutical products, etc., as it can be observed in figure 4. Many cultivators choose to make their own organic substrate. This kind of substrate is made of different components, such as peat, coconut shell, perlite or vermiculite (Treadwell *et al.*, 2007).

Results concerning the types of pots and containers

Choosing the right type of pot or container is essential for the vegetable plants. There are no rules on their design, except for the one about the efficiency of the biological processes. The vegetable plants that are chosen have to be suitable for the size of the pot, the plants shouldn't grow more the twice the height of the pot and more the one and a half the width of the pot. The appropriate size of the pots depends on the size and the degree of development of the roots of the cultivated plant. The pots or containers may be made out of different types of material (plastic, ceramics, fiber glass, clay). The plastic, ceramics, fiber glass and wooden pots are the most used for planting vegetables and flowers. According to this system of cultivation, the term 'container' includes all types of pots and also, household recycled containers such as: plastic buckets, canisters, tiers, plastic trays, plastic or wooden crates, etc. Plastic bags or polyethylene bags may also be used. Plastic containers are light, cheap, but they are not resistant. Clay containers are cheap and resistant if they are kept away from frost, but they are heavy and allow the water to evaporate too fast. Vitrified ceramic containers have a very high ornamental value. The ones made of fiber glass are light and durable. In the case of wooden containers, those made of sturdy wood (cedar and oak) must be avoided. Generally, void materials containers (clay, concrete or wood) allow the water to evaporate more quickly than those made of plastic or metal. Suspended baskets and boxes can also be used, especially for running plants (Gessert, 1978). The durability of the containers may vary from a few months to a few years,

according to the vegetal production cycle (Camberato *et. al*, 2010). A few examples of pots are presented in fig. 5.

Results of the establishment of the crops

The establishment of vegetable plants in pots and containers can be done by sowing or seedling, same as field crops. The vegetable species that adapt easily when transplanted are those recommended for planting in pots and containers. The sowing with the purpose of obtaining the seedling is done in plug cell tray and the transplanting of the seedling into pots and containers for most plants should be done when the plant has 3-4 real leaves. In the case of species that have adventive roots (tomatoes, cabbage, etc.), they must be more deeply planted in order to assure the forming of a well developed radicular system. The sowing or seedling distances for pots and containers are different for every specie. Planting too close to each other may trigger problems referring to the amount of light they receive, the elongation and etiolation of the vegetable plants, and it may lead to diseases due to the bad circulation of the air (Sima, 2017).



Fig. 1 Cherry tomatoes in a container (<https://www.google.ro/plante/legumicole/in/ghivece>)



Fig.2 Sweet -pepper in a container (original photo)



Fig. 3 Bean flowers (original photo)



Fig. 4 Pot soil (<https://www.google.ro/search.substrat/mixt/pentru/ghiveci>)



Fig. 5 Types of pots and containers (<https://www.rodaliesorganiclife.com/garden/container-gardening>)

CONCLUSIONS

1. The cultivation of vegetable plants in pots and containers is appropriate for many known Romanian species of plants.

2. The pots and containers may differ in size, shape and materials that they are made of.

3. The substrate needs to provide the proper fertility conditions for good looking and useful plants.

The establishment of vegetable plants in pots and containers can be done by sowing (cucumbers, beans) or by seedling (tomatoes, peppers, eggplants, etc.).

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