STAGE OF KNOWLEDGE ON CULTIVATION OF MICROGREENS PLANTS

STADIUL CUNOAŞTERII ASUPRA CULTIVĂRII PLANTELOR LEGUMICOLE MICROGREENS

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Abstract*. Microgreens are a form of young plants produced from vegetables, aromatic plants and other species harvested between 7 and 25 days. They range in size, from 3 to 10 cm, are more developed than germs and smaller than the "petit" and "baby" plants. Vegetable plants of the microgreens type can be considered a visual plus but also nutritional for any dish. The main advantage of this type of culture is the vegetation period, which is very short. This paper presents several important aspects of microgreens plant production technology and its success.*
Keywords: microgreens, culture, species.

Rezumat*. Microgreens reprezintă, o formă de plante tinere, produse din legume, plante aromatice şi alte specii, recoltate între 7 şi 25 de zile. Acestea variază în mărime, de la 3 la 10 cm, sunt mai dezvoltate decât germenii şi mai mici decât plantele "petit" şi "baby". Plantele legumicole de tip microgreens pot fi considerate un plus vizual, dar şi nutriţional pentru orice farfurie. Principalul avantaj al acestui tip de cultură este perioada de vegetaţie, care este foarte scurtă. Lucrarea de faţă prezintă câteva aspecte importante ce vizează tehnologia de producere a plantelor de tip microgreens şi reuşita acesteia.*
Cuvinte cheie: microgreens, cultura, specie.

INTRODUCTION

The history of microgreens is relatively recent, the first occurrence being reported in America in 1980 in San Francisco, the concept being thought of by some chefs who have decided to give a bit of color and diversity to the dishes of food. Large-scale production began in California in 1990, with a wide variety of species (broccoli, cabbage, red beet, basil) (Di Gioia and Santamaria, 2015).

This growing stage of cotyledonous seedlings is found in the case of any species that grow generatively (by seeds), the latest studies performed demonstrating the beneficial properties of plants at this age, some species containing large amounts of antioxidants, anti-inflammatory substances, with a

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very high potential in the prevention, protection and therapy of a high number of diseases (Xiao, 2013).

Recent studies in several US universities have shown that plants at this stage of growth can be up to 40 times more concentrated in beneficial nutrients, vitamins and minerals. Unlike germs, microgreens plants accumulate nutrients from three parts: from the peat-based organic substrate, the photosynthetic solar light from the plant and the seed reserve (Eric and Jasmine, 2009; Xiao, 2013; https://extension.msstate.edu/sites/default/files/publications/publications/p2884.pdf).

MATERIAL AND METHOD

In this paper the studies were conducted using existing information in the literature and the method used was the comparison information used in development work.

RESULTS AND DISCUSSIONS

Results on species selection

In terms of gastronomy and nutrition, something that makes culture microgreens to be interesting is the possibility of using species and varieties whose leaves are characterized by - a wide range of shapes, colors (green, purple, red, yellow), crisps (succulent) and taste (sweet, sour, spicy) (Di Gioia and Santamaria, 2015). The vegetable species most commonly used to produce microgreens belong to several botanical families (fig. 1), including:

- Fam. *Brassicaceae* (cauliflower, broccoli, cabbage, Chinese cabbage, radish)
- Fam. *Asteraceae* (salad, andive, chicory)
- Fam. *Apiaceae* (dill, carrot, fennel, celery)
- Fam. *Amarillydaceae* (usute, onion, leeks)
- Fam. *Amaranthaceae* (amaranth, beet, spinach)
- Fam *Cucurbitaceae* (melon, cucumber)
- Fam. *Leguminiaceae* (chickpeas, beans, lentils, peas)

including aromatic plants such as basil, cumin, coriander, lemon, parsley etc. (https://www.greenharvest.com.au/DownLoads/SproutingBooklet.pdf; https://extension.msstate.edu/sites/default/files/publications/publications/p2884.pdf; Di Gioia and Santamaria, 2015; Kyriacou *et al.,* 2016).

It is very important to pay special attention to the choice of species that can be used to produce microgreens by assessing their edibleness in the seedling stage. For example, species belonging to *Solanaceae*, such as tomatoes, eggplants, in the seedling stage cannot be edible due to the content in this phase of growth of some anti-nutrients; the selection of species for microgreens must be related in particular to the character in the seedling phase.

Fig. 1 Vegetable plants of the microgreens type
(photo source: https://economictimes.indiatimes.com/magazines/panache/serving-nature-on-a-plate-farm-to-fork-gets-a-twist-with-microgreens/articleshow/60956251.cms)

Results on the selection of production areas

The production of vegetable plants in the microgreens system is usually carried out in a controlled environment, in greenhouses or in high tunnels, with simple or advanced technologies, depending on the size of the farm and the climate conditions at its disposal (http://www.ecoffshoots.org/wp-content/uploads/2010/03/Guidelines-for-Growing-Microgreens-ECO-City-Farms.pdf).

Results on harvesting and preparation of culture vessels

Due to the short amount of time that microgreens vegetables spend in the used container, it can be any trays, a plastic vessel of different sizes. The most commonly used are the standard 20 x 10 cm plastic trays with drainage holes, and in some situations trays with water collection support can also be used (fig. 2,3,4).

These trays, which are actually those containers used for flower and vegetable seedlings, can be reused, but not prior to their preparation, by applying a disinfecting solution and a flushing with lukewarm water and then applying a drier (ttps://www.greenharvest.com.au/DownLoads/SproutingBooklet.pdf).

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Fig. 2, 3, 4 Culture vessels for microgreens
(photo source: http://www.veganicchoice.com/http://www.seminte-ingrasaminte-turba.ro/produse/Categories-List/6672-Tavite-pentru-rasaduri)

Conclusions on leaching and preparation of the culture substrate

In order to ensure a good germination and optimal growth of seedlings, a good growth medium should have the following properties: a porosity of over 85% of the total volume, a suitable ratio between maco and micro pores to ensure good water exploitation (55-70% of total volume) and a good level of aeration (20-30% of total volume) of the root system (fig. 5, 6).

Culture media can be classified into organic and inorganic, in the first case they are made from biodegradable materials such as peat, while inorganic ones, such as perlite, are usually inert. The most commonly used culture substrates for the production of microgreens at commercial level are peat, perlite and vermiculite, which can be used individually or mixed.

Another alternative for peat is coconut shell, which has the advantage of obtaining it from a renewable source, and when we choose to use it, it is important to consider, due to the particle size, that the substrate properties can remarkable change.

Among the substrates specially developed for the production of microgreens are also mats made of natural materials (coconut fiber, jute fibers, cotton fibers, algae and paper pastes) or synthetic (polyethylene-PET products). Typically, these commercial mats are defined by standardized physical, chemical and agronomic properties and have a good balance between water-holding capacity, good aeration and good hygienic-sanitary quality (Di Gioia and Santamaria, 2015).

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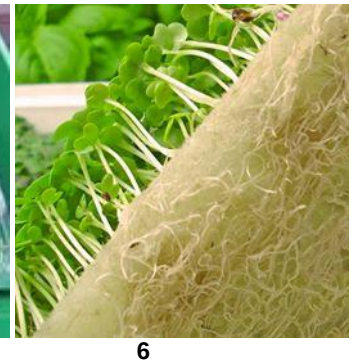

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Fig. 5, 6 Culture media for microgreens
(photo source: https://gardenculturemagazine.com/garden-inputs/growth-media/compostable-hydroponic-media/)

Results on regulating growth and development

Beginning with seed germination, temperature management will be based on species requirements (Ipătioaie *et al.,* 2016; Voicu *et al.,* 2017). Thus, after seed germination has taken place, the temperature will be lowered by 5-7°C for 4-7 days, saving seed resources, uniformizing plant growth and inducing phases of plant growth.

The greenhouse temperature will be closely related to the intensity of the solar radiation. This is necessary because solar radiation represents a contribution of thermal energy in the protected space, through the greenhouse effect, but also influences the intensity of the physiological processes such as: photosynthesis, breathing, sweating. For most microgreens, the optimal development temperature is between 18-28˚C. Relatively low humidity (20-30% ambient) causes microgreens to become soft at the touch, compared with plants that are relatively clean and fresh in relative humidity (50%).

Light conditions greatly influence microgreens morpho-physiology, biosynthesis and accumulation of phytochemicals, especially in controlled growth environments. Additional light sources commonly used in vegetable production include halogen lamps, fluorescent lamps with incandescence (HPS) (Bian *et al.,* 2015; http://www.ecoffshoots.org/wp-content/uploads/2010/03/Guidelines-for-Growing-Microgreens-ECO-City-Farms.pdf).

Results on irrigation and fertilization

During germination, the seeds are usually watered using a mist over the cover covering the substrate, but after germination, submerged systems are preferred, allowing the young seedlings to be irrigated, avoiding excess humidity and limiting the appearance of microbes. Although microgreens plants are small seedlings, fertilization is fundamental, in order to obtain good production, nutrients can be applied before sowing, by incorporation into the culture medium, or fertilization after the germination process (Stan and Munteanu, 2001; Stan *et al.,* 2003).

CONCLUSIONS

1. In recent years, people have a real interest in eating fresh vegetables with a high nutritional intake, so microgreens fits perfectly into this trend. Microgreens are a new range of vegetable products that contain a variety of tastes, colors, textures and unique look.

2. The choice of the culture substrate and the careful management of environmental factors are key links in the implementation of microgreens-type plant technology.

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