

THE BEHAVIOUR OF SOME GREENERY VEGETABLES AT THE SOLARIUM CULTURE

MĂNIUȚIU N. Dănuț, Sandor RÓZSA*, Rodica SIMA, Tincuța-Marta GOCAN

University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca

Faculty of Horticulture, Calea Mănăștur Street, No. 3-5, 400372, Romania

e-mail: drd.rozsa.sandor@gmail.com

Abstract: In this paper, studies were carried out on spinach (*Spinacia oleracea* L.), rucola (*Eruca sativa* Mill.) and lamb's lettuce (*Valerianella locusta* L.) plants, sown at different times and harvested at different development stages. The studies were carried out in the locality of Aghireșu-Fabrici, Cluj county on an area of 50 m². The crops were established in two different times, the autumn was sown on October 27, 2017 and harvested between 10-25 March, and the spring was sown on February 25 and harvested between 15-25 April in the case of spinach and rocket and April 22-May 5 at the lamb's lettuce. The best spinach production was obtained at the spring crop at the last harvest phase of April 25, 2018 of 3.95 kg/m². At the rucola in the second harvest phase, from April 25 to the spring crop, there was a production of 2.19 kg/m². In the third phase of harvest, from March 25 to the autumn sowing obtained 1.97 kg/m². At the lamb's lettuce, the best results were obtained in the autumn crop, with a maximum production value at the third harvest phase of 1.54 kg/m².

Key words: spinach, rucola, lamb's lettuce, production, solarium

INTRODUCTION

Vegetables are plant foods, from which different organs are consumed, fresh or preserved. Greenery vegetables are the category of vegetables from which the leaves are consumed (salad, spinach, lobster) or petiole (florencia fennel, mangold, petiole celery, revent) usually fresh, in the form of salads, but also prepared (GOTO, 2012).

Vegetables are an important source of vitamins, such as vitamins A, B, C and K, mineral substances (calcium, potassium) because they are harvested in early spring, when nutrition is poorer in vitamins. In addition to vitamins, they also contain mineral salts, antioxidant substances and a large amount of bioactive substances. The antioxidant character, in addition to the presence of vitamin C, vitamin A, is also given by vitamin E and carotenoids (GENE et al. 2013).

Vegetables are resistant to low temperatures, so crops can be set up in late autumn or early spring, as well as early or successive crops. They are the first vegetables that appear in the spring, respectively the last ones that are harvested in the fall. They can be harvested in stages, delivering the product to different sizes depending on the consumer's requirements (SEDAT and SONMEZ, 2010).

Spinach is an important source of vitamins and mineral salts. It is used to prevent the occurrence of cancer, regulates the proper functioning of the lymphatic, digestive, excretory system and last but not least strengthens the immune system. Spinach is also used in weight loss belts due to its laxative effect (NEMADODZI, 2015).

A general problem of green vegetables is the accumulation of too much nitrate, due to the excessive use of nitrogen fertilizers (SEDAT and SONMEZ, 2010).

Along with the superior nutritional properties held, spinach is also of great economic importance because it resists very well at low temperatures and behaves well in conditions of light insufficient for the cultivation of other vegetables more demanding than the environmental conditions (GENE et al., 2013).

Rucola is a new species in the nutrition of the indigenous population, but it is constantly expanding due to its nutritional and therapeutic properties. The roots of the plant are used as an infusion for its diuretic qualities, but the leaves are mainly consumed, in the form of assorted salads, in combination with other herbs, having an effect in preventing anemia, lowering cholesterol. It also relieves fatigue and fatigue in the spring, providing energy to the body, protecting the liver and improving blood circulation (BARLAS et al., 2011).

Rucola is recommended in diets for weight loss, having satiety effect. It contains vitamins and mineral salts important for the bone and cardiovascular system, prevents infections and helps strengthen the immune system (JAKSE et al., 2013).

Lamb's lettuce leaves have a specific taste due to chlorophyll and some ethereal oils. It is used in the treatment of respiratory, intestinal, diuretic disorders (GOTTARDI et al. 2012). From its leaves of preparation salads and soups, which in addition to the pleasant taste, sweet sour taste, have the property to relieve stress and fatigue. Lamb's lettuce contains vitamins and mineral salts, like other vegetables (ZNIDARCIC, 2016).

MATERIAL AND METHOD

The experiences were carried out in the period 2017-2018 in the locality of Aghireșu-Fabrici, Cluj county, and it was followed the behaviour of three species of greenery vegetables (spinach, rucola and lamb's lettuce) in the solarium culture depending on the sowing time and the harvesting phase.

The following observations were made: the period of cultivation, the growth and development of plants and the production according to the sowing time and the harvesting phase.

The biological material used in this experiment is represented by a variety of each cultivated species. The spinach used the Spokane F1 hybrid, which is resistant to mana breeds 1, 2, 3, 5, having a vegetation period of around 65 days and is used for fresh consumption, but also for industrialization.

The rucola variety used was Rukkola, characterized by its good productivity, slightly spicy taste, large, rounded leaves and a 40-50-day vegetation period.

The variety of lamb's lettuce used was Madársaláta, a variety with small leaves, bright green color, characterized by good productivity and vegetation period of 60-65 days.

In order to achieve the proposed objectives, a bifactorial experience was organized.

Factor A - the sowing time with two graduations:

a1 - autumn sown (October 27),

a2 - spring sown (February 25).

Factor B - harvesting phase with three graduations:

b1 - phase 1 - March 10, April 15-25,

b2 - phase 2 - March 15, April 20-25,

b3 - phase 3 - March 25, April 22 - May 5.

The combination of factors resulted in 6 experimental variants that were placed in subdivided blocks with randomized plots. Each variant was placed in 3 repetitions, the experimental plot had an area of 1.5m². The sowing distances between rows were 20 cm and 1-2 cm between plants in a row, the amount of seed used was 2 g/m² at the lamb's lettuce and rucola and 3-4 g/m² for spinach. The depth of sowing was 4-5 cm for spinach and 1-2 cm for the rucola and lamb's lettuce.

RESULTS AND DISCUSSIONS

The cultivation period of the species: spinach, rucola and lamb's lettuce established in autumn, until the first harvest is 143 days. The other two harvests were carried out at 7 and 14 days from the first.

The crops set up in the spring for the same species had a period of vegetation until the first harvest of 46 days for spinach and rucola and 53 days for the lamb's lettuce. As with the crops established in the fall, the second and third harvests were made after 7, respectively 14 days compared to the first.

The first harvest in the autumn crops could be performed earlier with 36 days for spinach and rucola and 43 days for the lamb's lettuce, compared to the spring sowing.

In general, the crops established in the autumn have benefited from good conditions, without major losses.

At the first harvest, in all the studied species, both the number of leaves and the average weight of the plants are higher in the crops established in autumn. In spinach culture, the number of leaves and the weight of the rosette increase sharply from the first harvest phase to the second and lower from the second to the third as the autumn crop (Fig. 1).

At the spring planting, the degree of plant development, expressed by the number of leaves and the average weight of the rosette, register higher values at the last harvesting phase, with the biggest difference compared to the second phase.

In the rucola crop in general, the number of leaves of the plants is higher in all the harvesting phases in the autumn crops (Fig. 2), and the average weight of the plants is lower at the last harvest, than that of the spring.

In the case of the lamb's lettuce culture, there is a constant increase from one phase to another, both in the autumn and in the spring, regarding the number of leaves and the average weight of the plants, being higher in the autumn crop (Fig. 3).

The highest total production, related to the surface unit, was recorded for spinach in the spring crop at the third harvest phase (3.90 kg/m²), followed by the third

harvest phase at the autumn crop (2.94 kg/m²). From the economic point of view, the advantage of autumn sowing and the harvesting in the third phase is obvious.

For an earlier recovery of the harvest and the better possibility of establishing a successive crop, the autumn sowing and spring harvesting in the first phase, when the plants have an average of 9.67 leaves, have a high technical-economic interest.

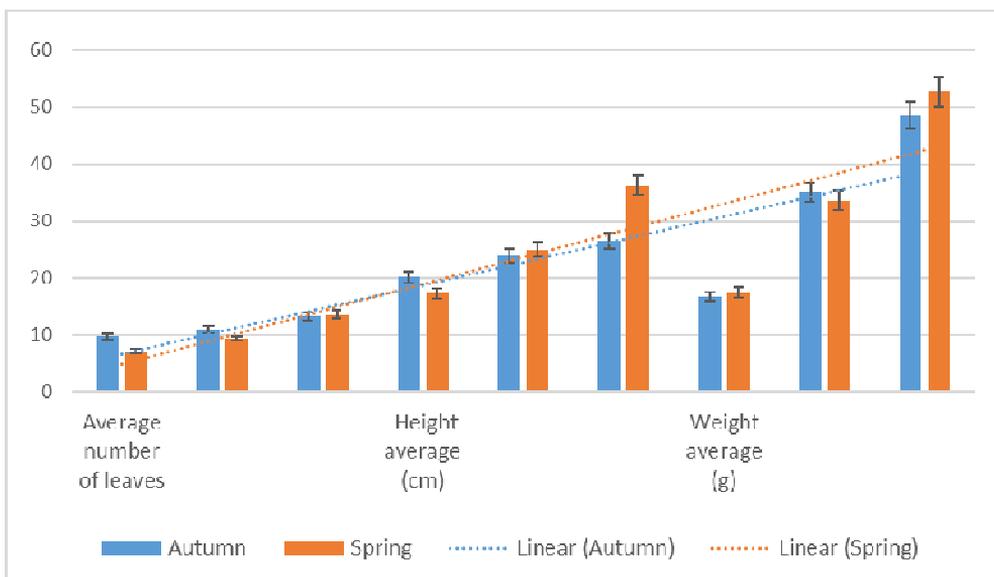


Fig. 1. Growing and developing of spinach plants

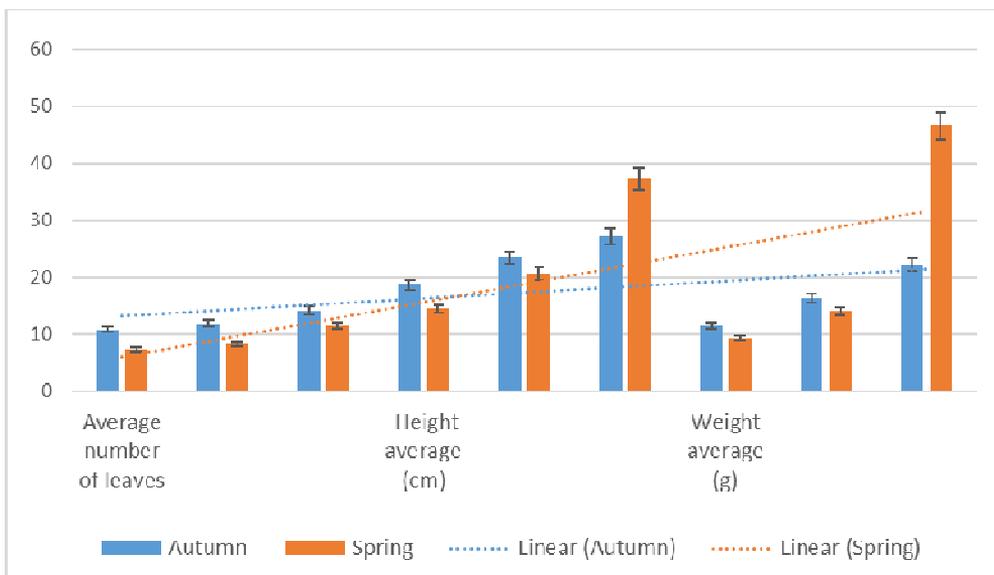


Fig. 2. Growing and developing of rucola plants

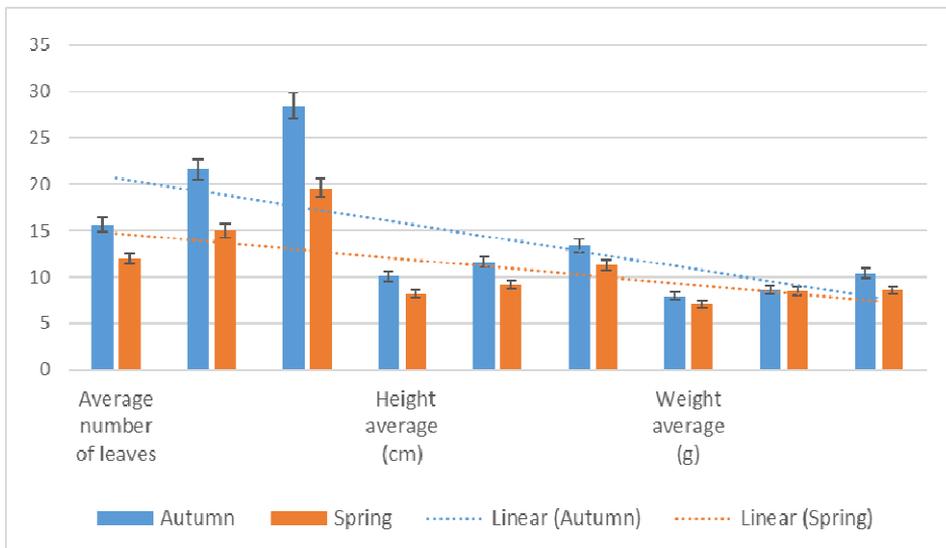


Fig. 3. Growing and developing of lamb's lettuce plants

For the rucola species, the commercial production varies between 1.85 and 1.93 kg/m² in the autumn crop and between 1.46 and 4.57 kg/m² in the spring. The highest production level of 4.57 kg/m² was recorded in the third phase of harvesting at the spring crop. This production far exceeds all other variants and is due to the emergence of flowering shoots, but the product is not suitable for use. A good yield is recorded in the second harvest phase from April 25 at the spring crop (2.16 kg/m²) and at the third harvest phase from March 25 for the autumn sowing (1.93 kg/m²).

For the lamb's lettuce culture, the establishment of autumn crops ensures higher levels of production in all harvesting phases, than in the spring crops, the differences being statistically assured. The highest level of production is recorded in the autumn crop at the third harvest phase (1.51 kg/m²). Harvesting in the first phase of autumn cultivation ensures a good production (1.33 kg/m²) at which the recovery is made 14 days earlier.

CONCLUSIONS

Of the three studied species, spinach provides the highest level of production (1.34-3.90 kg/m²), followed by rucola (1.46-2.16 kg/m²) and lamb's lettuce (0.65 -1.51 kg/m²).

For the spinach cultivation carried out in the solarium, the highest level of the crop is obtained at the spring crop, in the last harvest phase, when the plants have an average of 13.6 leaves.

For the rucola culture the optimum variants at which a high production is obtained, pronounced early and economically advantageous are the autumn sowing in the third harvesting phase (1.93 kg/m²) and in the spring sowing of the second phase harvest (2.16 kg/m²) when the plants have an average of 14.23 leaves, respectively 8.4 leaves.

For the lamb's lettuce culture, the establishment of autumn crops ensures higher levels of production in all harvesting phases, much earlier than in the spring sown. The highest level of production is recorded in March (1.51 kg/m²), when the plants have an average of 14.23 leaves.

REFERENCES

1. Gene E. Lester, Donald J. Makus, D. Mark Hodges, and John L. Jifon, 2013, Summer (Subarctic) versus Winter (Subtropic) Production Affects Spinach (*Spinacia oleracea* L.) Leaf Bionutrients: Vitamins (C, E, Folate, K1, provitamin A), Lutein, Phenolics, and Antioxidants, *Journal of Agricultural and Food Chemistry*, 61 (29), 7019-7027, DOI: 10.1021/jf401461z
2. Goto, E., 2012, Plant production in a closed plant factory with artificial lighting. *Acta Hort.* 956, 37-49, DOI: 10.17660/ActaHortic.2012.956.2
3. Sedat C., Sonmez S., 2010, Effects of conventional and organic fertilization on spinach (*Spinacia oleracea* L.) growth, yield, vitamin C and nitrate concentration during two successive seasons, *Sci. Horticult.* 126, 415-420
4. Nematodzi, Lufuno Ethel, 2015, Growth and development of baby spinach (*Spinacia oleracea* L.) with reference to mineral nutrition, University of South Africa, Pretoria, <http://hdl.handle.net/10500/18673>
5. Barlas, N. T., Irget, M. E., & Tepecik, M., 2011, Mineral content of the rocket plant (*Eruca sativa*). *African Journal of Biotechnology*, 10(64), 14080-14082.
6. Jakse, M., Hacin, J., & Kacjan, N. M. (2013). Production of rocket (*Eruca sativa* Mill.) on plug trays and on a floating system in relation to reduced nitrate content/Pridelava navadne rukvice (*Eruca sativa* Mill.) v gojitvenih ploscah in na plavajočem sistemu in možnosti redukcije vsebnosti nitrata. *Acta Agriculturae Slovenica*, 101(1), 59.
7. Gottardi, S., Iacuzzo, F., Tomasi, N., Cortella, G., Manzocco, L., Pinton, R., ... & Cesco, S. (2012). Beneficial effects of silicon on hydroponically grown corn salad (*Valerianella locusta* (L.) Laterr) plants. *Plant Physiology and Biochemistry*, 56, 14-23.
8. Znidarcic, D. (2016). Evaluation of yield and yield components of lamb's lettuce (*Valerianella locusta*) grown in thin layer soilless systems. *Nusantara Bioscience*, 8(1).