STUDIES ABOUT THE FERTILIZATION REGIME ON SOME ORNAMENTAL SPECIES CULTIVATED IN INDOOR GREEN WALLS SYSTEMS

STUDII ASUPRA REGIMULUI DE FERTILIZARE AL UNOR SPECII ORNAMENTALE CULTIVATE ÎN SISTEM DE PERETE VERDE

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Abstract. *Green walls have been promoted in particular for the benefits they bring in the climate parameters, such as heat and sound insulating effects or pollutants and particulate filter (European Commision, 2012, Iliescu 2003, Nita, 2016). As the green walls are still relatively uncommon and used in Romania, the main objective of this research was to study the behavior of several ornamental indoor, decorative habitus and leaf species, on a fertilization regime with different fertilizers, reflected in the evolution of the main characteristics defining their decorative potential in the specific limiting conditions of a plant wall culture. The range of ornamental indoor decorative habitus and foliage species was as follows: Hedera helix, Ophyopogon jaburan, Tillandsia cyanea, Nephrolepis cordifolia, Tradescantia zebrina, Clorophytum comosum, Spatiphylium walisii.*
Key words: fertilization regime, green walls, indoor ornamental plants

Rezumat. *Pereţii verzi au fost promova şi în special pentru beneficiile pe care le aduc la nivelul parametrilor climatici, precum efectele de izolator termic şi fonic sau de filtrare a poluanţilor şi pulberilor (European Commision, 2012, Iliescu, 2003, Niţă, 2016). Deoarece pereţii vegetali sunt destul de puţin cunoscuţi şi utilizaţi în România, obiectivul principal al acestor cercetări a fost de a studia comportamentul mai multor specii ornamentale de interior, decorative prin habitus şi frunze, supuse unui regim de fertilizare cu diferite îngrăşăminte, reflectat în evoluţia principalelor caracteristici ce le definesc potenţialul decorativ, în condiţiile spcific-limitative ale sistemului de culturi în perete verde. Sortimentul de specii ornamentale de interior, decorative prin habitus şi frunze ales a fost următorul: Hedera helix, Ophyopogon jaburan, Tillandsia cyanea, Nephrolepis cordifolia, Tradescantia zebrina, Clorophytum comosum, Spatiphylium walisii.*
Cuvinte cheie: regim de fertilizare, plante ornamentale de interior, pereţi verzi.

INTRODUCTION

The vertical gardens known as ***green walls*** are vegetable compositions with vertical arrangement. These innovations regarding the arrangement of

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gardens occurred both because of limited space and the need for near nature and fresh air.

In advanced countries in the European Union, such as France, Italy, Spain, England, the various corporations have set up indoor wall systems or building façades, starting from two important aspects: their appearance and contribution to improving the environment and microclimate.

Their arrangement within companies is also seen as a way to improve the image of the company and brand by promoting openness to European ecological strategies by using systems that consume as little energy as possible.

Vegetable walls fit perfectly into both private and public spaces (the headquarters of a company, banks, hotels, restaurants, cafes, beauty parlors, shops, cinemas, hospitals, medical practices), with the choice of environmentally friendly plants respectively.

If previously the cultivation of species brought from distant areas was the exclusive benefit of the very rich, it has now become accessible to the less well-off. With the availability of a wide range of plants and the knowledge of successful cultivation possibilities, indoor plants have become one of the most widespread passions. Their expansion was made possible by enriching knowledge on plant claims to environmental factors and crop routing by specific technologies.

Do plants really need soil? No, the soil is simply a mechanical support. Only the water and the minerals contained in it are essential to the plants, together with the light and the carbon dioxide needed for photosynthesis.

Throughout the year it is necessary to analyze the aesthetic evolution of the plants in order to preserve their decorative qualities. In order to obtain optimal results in this respect, it is a good practice to select plant plants in the composition of the vegetation walls by a person skilled in the art.

Another important aspect of plants is their maintenance.

Due to the fact that these plants are perennial and their culture in this system implies a low volume of substrate, it is necessary to apply a sustained fertilization regime. The recipe for fertilization differs by the proportions of the constituents and the requirements of the plants.

In order to achieve green wall on interior spaces there exist systems of structures with self-support or simply attached to the wall. Facilities are equipped with recirculation water and nutrient management.

Since 1982 Patrik Blanc continuously developed the concept of vertical vegetable gardens and in 1996 and it has patented.

Considering the above, we considered it equally important to identify an assortment of ornamental species, adapted to the vertically system and responding to such a system, in a many seasonal projection in the same time with identifying an available fertilization regime to ensure the healthy life for the plants.

MATERIAL AND METHOD

The experience was carried out in a greenhouse compartiment of the experimental floral field, within USAMV Bucharest. This 1000 m² floral greenhouse is the teaching base for university students for floral plant research.

The vertical walls were made in two versions, on the same panel placed "back to back", using the followed ornamental species for interior decoration (habitus and leaves): *Hedera helix, Ophyopogon jaburan, Tillandsia cyanea Nephrolepis cordifolia, Tradescantia zebrina, Clorophytum comosum, Spatiphylium walisii.*

Nephrolepis cordifolia Presl. The leaf bush can reach 150 cm in diameter, with large leaves, sect, arched, colored in intense green (Amăriuței and Vâşcă-Zamfir, 2015).

Tradescantia zebrina is a plant with spiked shoots, which can reach a length of 30-60 cm. The foliage is spectacular due to the striped, green, silver and violet on the top, with the purple reverse (Şelaru, 2006).

Chlorophytum comosum Bak. forms a bush that can reach 40-50 cm in diameter. The leaves are beautifully arched, green in different shades or cloaks with white or cream. From the middle of the bush grow thin flexible stems, beautiful arched pendent, up to 1 m long, bearing here and there small plants (rosette leaves), very decorative (waterfall effect) (Şelaru, 2006).

Spathiphyllum walisii grows like a rich bush of brightly colored, bright green leaves (rarely more than 30 cm). Inflorescence is a typical spade, with creamy white creams, slightly scented and white, oval-elliptical. (Şelaru, 2006).

Hedera helix L. as an indoor plant does not exceed 1.5 m long. Flexible stems have adventive root knots that favors clamping. The leaves are palmate-lobed, deep green or green colored board / stained with various shades of yellow, beige, white, depending on the variety (Amariutei sticky-Zamfir, 2015).

Tillandsia cyanea hort. The species belongs to the large group of Bromelles. The leaves, numerous (60), long (max. 35 cm) and narrow are arranged in the form of a rosette. The solitary inflorescences with blue flowers appear among the pink bracts at the tip of a slender peduncle (Preda, 1989)

Ophyopogon jaburan Lodd. It is a small species (30-40 cm). The persistent, linear-lanceolate, green leaves form a dense bush (Amăriuței, Vâşcă-Zamfir, 2015).

It has been ensured drip watering system, separately for each panel (different wetting times).

The culture substrate was made up of **garden soil + peat + perlite** (1: 1: 0.5) placed in plastic wall pots with a volume of 1.5 liters (fig.1).

The green wall (panel), after populated with plants is presented in the figure 1(b). Also in the figure 3 (c) there can be seen the aspect at the end of the experimental period with plant at the maximum of their decorative potential.

It were applied the specific maintenance work spaces (conducting the microclimate factors).

It has pursued the development of decorative potential in dynamic compared to the same range of species grown in conventional systems.

Plants were fertilized weekly, using 1 fertilizer cap (10 mL) per 1 liter of water, resulting a 0.1% concentration solutions (usual for ornamental indoor plants).

The experimental variants were:

V_m Unfertilized plants on greenhouse clasic system
V_1 Unfertilized plants on green wall system
V_2 Fertilization with Substral 0,1% solution
V_3 Fertilization with Biopon 0,1% solution

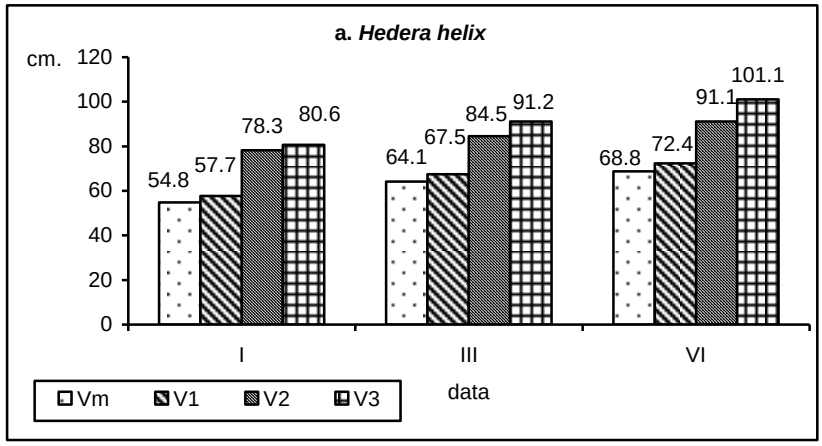
a) b) c)

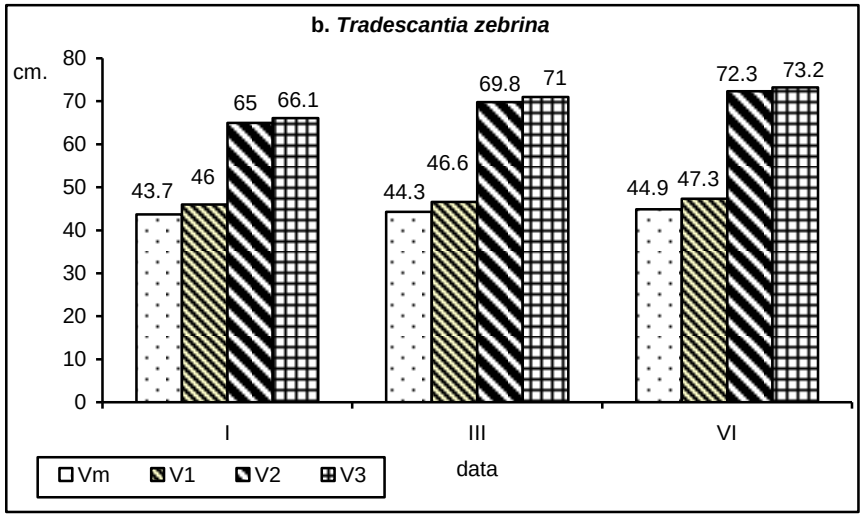
Fig. 1 The panell before (a) and after (b) planting and at the final stage (c)

RESULTS AND DISCUSSIONS

In order to study the effect of the nutrition regime on the growth of shoots and the diameter of the plant, we used one-factor ANOVA for each month and for different species (Steel *et al.,* 1997; Wiliam *et al.,* 2006).

For the study of the growth of the shoots, there were made measurements on *Hedera helix*, *Chlorophytum comosum*, *Tradescantia zebrina*, at three stages in the experimental perioad, in January (I), March (III) and June (VI) (fig. 2 a,b,c).





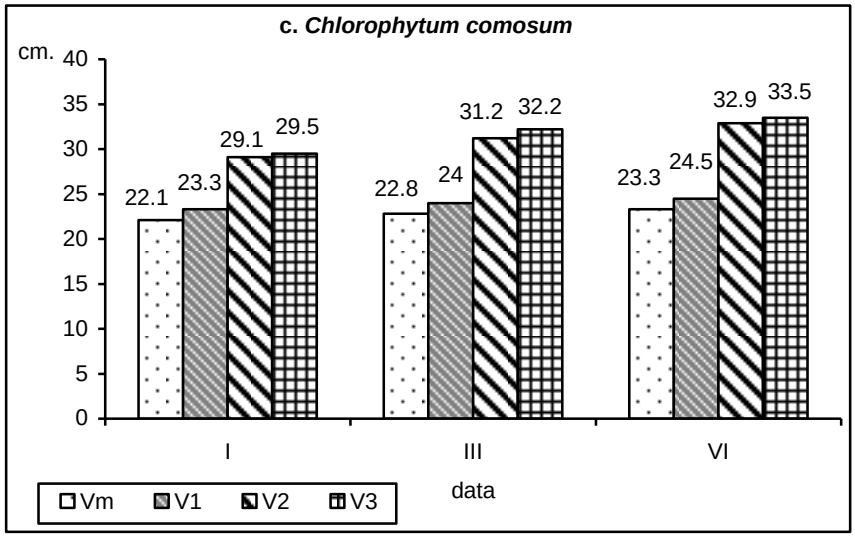


Fig. 2 Shoots lenght(*cm*) on different experimental variants

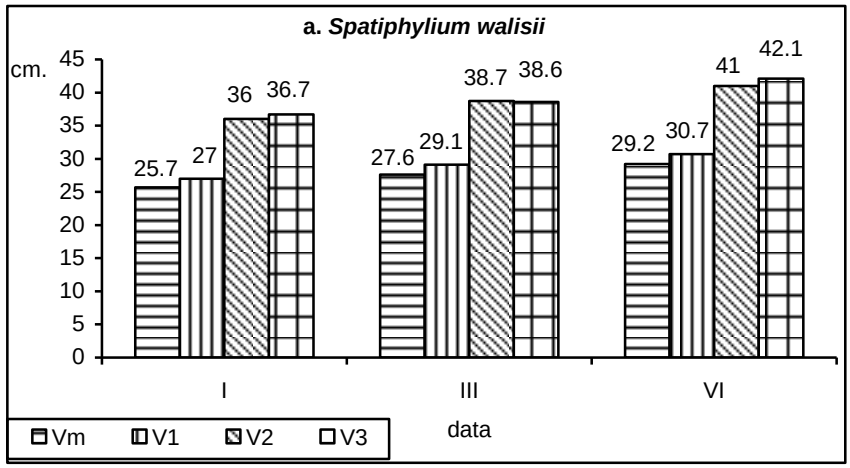
For the study of the diameter of the plant, there were made measurements on *Spatiphylium walisii, Nephrolepis cordifolia, Tillandsia cyanea, Ophiopogon jaburan*(fig. 3 a,b,c,d), on the same data as above.

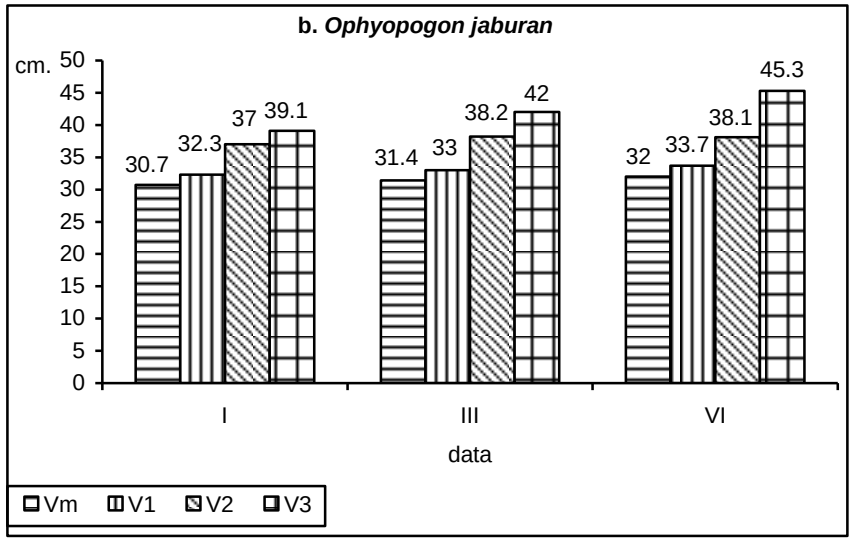
For each month, for each species, significant differences were obtained between the plants grown in the different media [both the F (3,12) values calculated were higher than the tabular value scorres ponding to $\alpha = 0.05$ and the p values were less than 0.05)].

As shown in the Figures 2 and 3, for all species the best values were obtained for V_3 plants. It is generally observed that regardless of the measurement

month, irrespective of the measured characteristic (growth of the shoots or the diameter of the plant) and regardless of the species, the decreasing order of the averaging variants remained the same V_3, V_2, V_1, V_m.

Experimental data showed a normal development during the active vegetation season (spring-summer), with a visible differentiation between plants whose growth has benefited from the intake of fertilizers and whose growth was based only on the nutrient intake in the culture substrate.





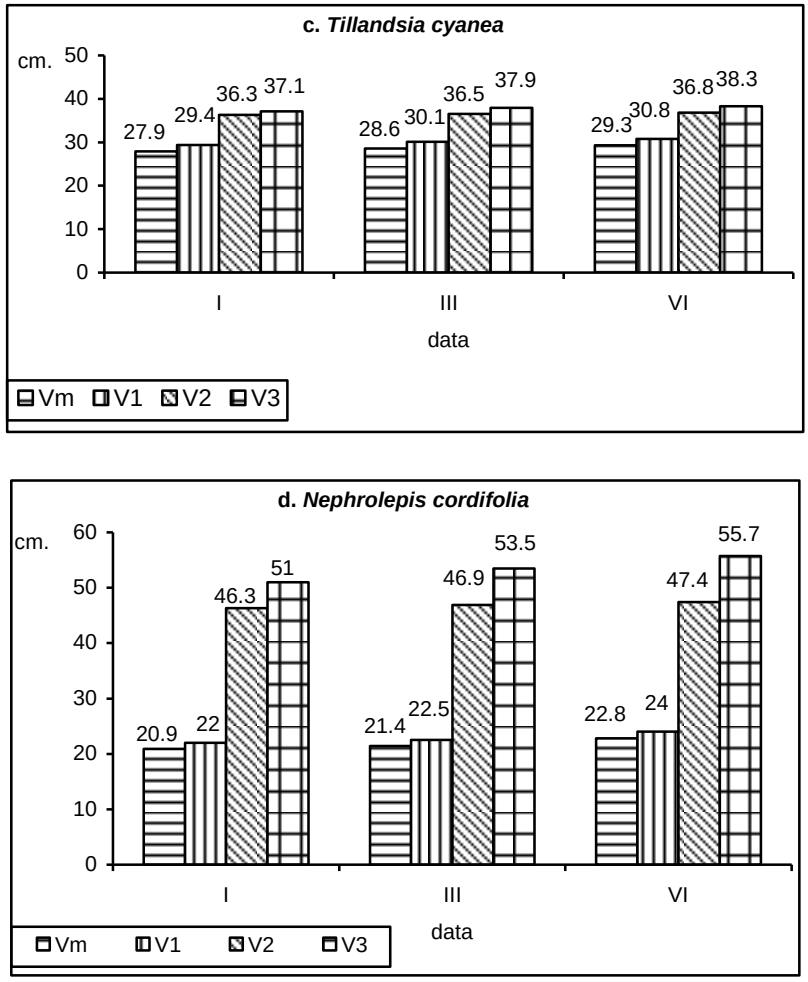


Fig.3 Plant diameter (cm) on different experimental variants

The differences between the two experimental variants applied to fertilizers (V_2 and V_3) in favor of V_3 can be attributed to the different nitrogen content of the two products used for fertilization (8% versus 6%).

CONCLUSIONS

The ornamental studied species have confirmed that are suitable for vertical cultivation systems.

The results, taking into account the restrictions (limited space development/nutrition, exhibition, watering regime etc.) and the intake of fertilizers, are comparable to those obtained in cultures in the classical system.

We consider necessary to continue research in order to extend the assortment, given the development prospects of the green walls system.

REFERENCES

1. **Amăriuței A., Vâşcă-Zamfir Diana, 2015** - *Plante de interior decorative prin frunze*, Ed. ELISAVAROS, Bucuresti
2. **Iliescu Ana Felicia, 2003** - *Arhitectură peisageră*. Editura Ceres, Bucureşti.
3. **Niță M. R., 2016** - *Infrastructuri verzi – o abordare geografică*. Editura Etnologică, Bucureşti.
4. **Preda M., 1989 -** *Dicționar dendroflori*col. Ed Ştiințifică şi Enciclopedică, Bucureşti.
5. **Steel R. G. D., Torrie J. H., Dickey D. A., 1997 -** *Principles and procedures of statistics: a biometrical approach* 1997 3rd ed New York, NY McGraw-Hill
6. **Şelaru E., 2006 -** *Plante de apartament*, (Ediția a II- a), Editura Ceres, Bucureşti
7. **Williams E. R., John J. A., Whitaker D., 2006** - Construction of resolvable spatial row-column designs. Biometrics 62: 103-108
8. ***media.murvegetalpatrickblanc.com/dl/9614 pt. southeast-asia-building-mars-2016
9. ***http://www.verticalgardenpatrickblanc.com/node/1386
10. ***European Commision, 2012. The Multifunctionality of Green Infrastructure. Bruxelles.