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RESEARCH ON THE INFLUENCE OF FERTILIZATION REGIME ON MORPHOLOGICAL, ANATOMICAL AND PRODUCTIVE CHARACTERISTICS OF *PELARGONIUM CITROSUM* PLANTS

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Abstract

Pelargonium citrosum is much appreciated both due to increased rich and very beautiful appearance of the leaves and the strong scent that exudes the whole plant. It drew this perfume plant called mosquito plant. Recent research has shown, however, that this name is not justified in removing the effect of plant mosquito void. It is clear however that this fragrance because Pelargonium citrosum plants are used not only for decoration but also as a raw material in the food, cosmetic and pharmaceutical. Getting rich growth of plants and compact to serve both decorative purposes and as a raw material in the industries mentioned above was the objective of our research. The plants were obtained by cutting and then were applied to four different types of fertilizers. Plant growth and development was pursued both by macroscopic biometric measurements (diameter, height and weight of plant, no. of leaves) and microscopic analysis of tissue by incorporation of leaf lamina and petiole. The results of this research show that the highest values of the parameters determined (both macroscopic and microscopic ones) were recorded in the variants which fertilization was applied twice a month and nitrogen have slightly exceeded phosphorus and potassium.

Key words*: fertilizer, plant growth, limb leaf, petiole leaf, Pelargonium citrosum.*

INTRODUCTION

The *Pelargonium citrosum* plant is the subject of numerous research conducted around the globe (Matsuda and al., 1996; Nianqiong and al., 2006; Liu Yu-mei and al., 2009).

Many of the research is aimed at testing the alleged repellent properties of mosquito plants (Matsuda and al., 1996) or to in vitro plant multiplication (Gill R. and al., 1992; Wei HP, Tan JY, Chen S, 2005; Zhou J. and al., 2007). For this reason, it is commonly known as the mosquito plant. Plants of *Pelargonium citrosum* are grown, on a large scale, for their aesthetic, medicinal and culinary properties (Toma, 2009).

Our research has focused precisely on these aesthetic, medicinal and culinary properties of *Pelargonium citrosum* plants.

Through our research, we wanted to obtain a massive plant mass that would be of benefit both from the ornamental point of view and from the quantity of raw material used in the pharmaceutical and culinary industry (Toma, 2009).

MATERIALS AND METHODS

Macroscopic observations

To study the influence of the NPK on plant growth we used four types of fertilizer with different reports on nitrogen, phosphorus and potassium (Toma, 2009). Thus, for the first fertilizing plant (V0), a fertilizer with a NPK ratio of 16:11:10 was used, applied to the planting of the rootstocks. For plants of the second fertilizer variant (V1), a fertilizer with a NPK ratio of 10: 5: 6 was applied at one month interval. For plants of the third fertilization variant (V2), a fertilizer with a NPK ratio of 7: 4: 5 was applied at two weeks. Four fertilizer with a NPK ratio of 4: 5: 6 was applied weekly to the 4th fertilizer plants (V 3). At the end of the six months of different fertilization programs we weighed the plants for each of the fertilization variants.

Also, we registered the total number of leaves by plants.

Microscopic observations

In order to observe the influence of fertilization variant on the internal structure of *Pelargonium* plants were analysed tissues constituents of the leaf, blade and petiole, in the cross-sections. For the blade, were measured both the epidermis and the cuticle layer and the mesophilic tissues. For the petiole were analysed the epidermis, parenchyma tissue and sclerenchyma, both the tissue and cell walls thickness. The cross-sections were clarified with a saturated solution of Chloral hydrate for 24 hours, washed 2-3 times with distilled water, acidified water with 1% acetic acid and again distilled water and stained with Alun-Carmine and Iodine Green to highlight the cell wall structure (Georgescu M.I. and al., 2001). Images were obtained with a digital camera (Panasonic DMC-LZ7) at an optical microscope (Optika DM-20).

RESULTS AND DISCUSSIONS

Macroscopic observations

The weighing of the plants after six months of application of the fertilization program revealed the following values of the weight of the plants: 85.81 g for the plants of variation V0; 67.09 g for V1 plants; 92.80 g for V2 plants; 81.88 g for V3 plants (Figures 1-5).

Figure 1: Weight of plants from variant V0

Figure 2: Weight of plants from variant V1

Figure 3: Weight of plants from variant V2

Figure 4: Weight of plants from variant V3

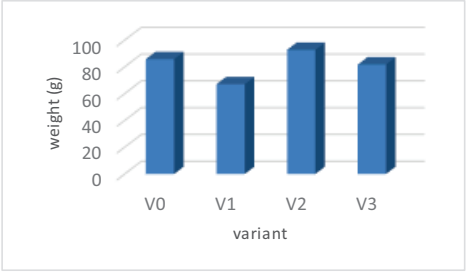

Figure 5: The variation of weight of plants

The number of leaves on the plant varied between 92, at V 1, with the NPK ratio of 10: 5: 6 and the monthly application frequency and 185 at V2 with the NPK ratio of 7: 4: 5 and the bi-monthly application frequency (figure 6).

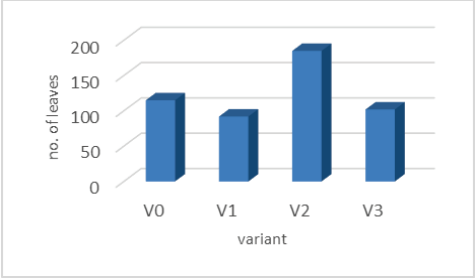

Figure 6: The variation of no. of leaves on the plants

Microscopic observations

The blade. The cross section of the blade shows the two epidermis, upper and lower, consisting of a single layer of cells protected by a cuticle.

On both surfaces are multicellular secretory hairs accompanied by bicellular protective hairs, only on upper epidermis. The mesophyll is bifacial type, with a single row of cells in the palisade tissue.

The highest value of the mesophyll thickness - 20.03 µ is recorded on variant V2, the mesophyll of the remaining variants having relatively similar size (17.00 - V3; 17 07 µ - V0, respectively 17, 53 - V1) (Table 1)

Cells' height of the lower epidermis is between 1.53 µ (variant V2) and 1, 40 µ (variant V3) (Table 1).

The measurement values of the upper epidermis ranges between 2.03 µ (variant V0) and 2.64 µ (variant V1) and of the cuticle between 0.37 µ (variant V2) and 0.51 µ (variant V0) (Table 1). There is a correlation between these values and the thickness of the mesophyll (Figures 7, 8).

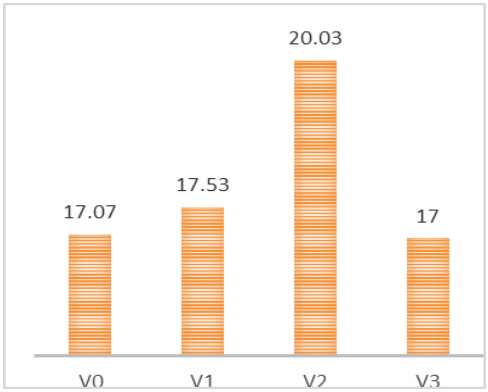

Figure 7: Mesophyll thickness (µ)

Towards the inside of the cross-sections there are collateral vascular bundles on one circle, limited outwards by an arch of sclerenchyma, linked to a mesarch sclerenchyma.

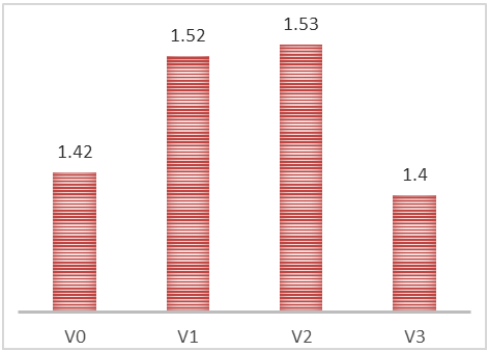

Figure 8: Lower epidermis thickness (µ)

A chlorenchyma is under the epidermis. The thickness of this parenchyma varies from 11.57 µ (variant V3) and 13.43 µ (variant V0) (Table 1). The height of the epidermal cells has values between 1.25 µ (variant V0) and1.31 µ (variant V2) (Table 1).

The petiole. The petiole's cross-section is circular; the epidermis, with a single cells layer, is covered with glandular and protective hairs on the abaxial side (Figure 9)

Sclerenchyma tissue and cell wall thickness showed higher values in the variants in which nitrogen is in small quantity, at V2 and V3 variants, to V0 and V1 variants (Table 1, Figure 9).

Figure 9: Variant V 2, petiole – cross-section
p – glandular hair; ep – epidermis; chl. – chlorenchyma; fc. – vascular bundles; schl. – schlerenchyma

Table 1: Morphometric values (μ) of the internal structure components of the leaf blade and petiole depending on the variant of fertilization

Var	NPK ratio	Lamina				Petiole				
		upper epidermis	cuticle	mesophyll	lower epidermis	epidermis	parenchyma	sclerenchyma bundles	mesarch sclerenchyma	wall's sclerenchyma cell
V0	16-11-10	2.03	0.51	17.07	1.42	1.25	13.43	3.05	3.04	0.29
V1	10-5-6	2.64	0.44	17.53	1.52	1.24	12.48	2.63	2.97	0.35
V2	7-4-5	2.43	0.37	20.03	1.53	1.31	12.23	4.02	3.51	0.41
V3	4-5-6	2.34	0.38	17.00	1.40	1.28	11.57	3.41	3.30	0.42

CONCLUSIONS

Bimonthly fertilization with fertilizer with a slightly nitrogen-friendly NPK gives rise to a higher weight of *Pelargonium citrosum* plants. The beneficial effect of this variant of fertilization is also evidenced by the recording of higher morphometric values of the components of the internal structure of the foliage and petiole.

REFERENCES

Gill R, Gerrath J, Saxena PK, 1992. High-frequency direct embryogenesis in thin layer cultures of hybrid seed geranium (*Pelargonium*). Canadian Journal of Botany 71, 408-413.

Georgescu Mihaela Ioana, Savulescu Elena, Padure Ioana Marcela, Luchian Vasilica, 2001. Practical works on botany-plant morphology and anatomy. Ed. of USAMV Bucharest.

Liu Yu-mei and col., 2009. Research Advance in the Biological Characteristics and Cultivation Technologies of *Pelargonium* [J]; Journal of Anhui Agricultural Sciences; 2009-17.

Matsuda BM, Surgeoner GA, Heal JD, Tucker AO, Maciarello MJ (1996) Essential oil analysis and field evaluation of the citrosa plant "*Pelargonium citrosum*" as a repellent against populations of Aedes mosquitoes. Journal of the American Mosquito Control Association 12, 69-74.

Nianqiong Jiang Zhang Rui, Zheng Yizhi, Clonal Propagation of *Pelargonium citrosum* Vanleenii and Main Factors Affecting its Large-scale Production. Chinese Agricultural Science Bulletin 2006-09.

Toma F. Floriculture and Floral Art. Vol. I and III. Ed. InvelMultimedia Bucharet-Otopeni, 2009.

Wei HP, Tan JY, Chen S, 2005. Study on tissue culture and plant regeneration of *Pelargonium* × *citrosum* Vanleenii. Journal of Anqing Teachers' College 11, 50-53.

Zhou J. Yang Miao-xian, Xian Yuan-xiang, 2007. In Vitro Shoot Organogenesis from *Pelargonium* x *citrosum* Vanleenii Leaf and Petiole Explants. Floriculture and Ornamental Biotechnology, 2007, Global Science Books.