

PRELIMINARY RESEARCH ON THE BEHAVIOR OF SOME HOSTA SPECIES AND VARIETIES CULTIVATED DURING TWO YEARS IN BUCHAREST

CERCETĂRI PRELIMINARE PRIVIND COMPORTAREA UNOR SPECII ȘI VARIETĂȚI DE HOSTA CULTIVATE PE PARCURSUL A DOI ANI ÎN BUCUREȘTI

AELENEI Ruxandra Ileana^{1*}, *BUTCARU Ana Cornelia*¹,
*PETRA Sorina Aurelia*¹, *TOMA F.*¹

*Corresponding author e-mail: Ruxandra.aelenei@yahoo.com

Abstract. *Hosta* is a perennial plant appreciated especially for its beautiful foliage but also for the delicate flowers that decorate parks and gardens. This article presents research results performed during October 2018 - October 2020 on the influence of cultivar, species and cultivation areas on the parameters of growth and flowering for 11 varieties of *Hosta* (T Rex, American Halo, White Feather, Christmas Island, Fragrant Blue, Patriot, Mighty Mouse, Blue Mouse Ears, Sting, Undulata Univittata, Sunset Grooves). The elements of vegetative growth and flowering were observed. For the vegetative growth, the height of the plants, the number of shoots, the number of leaves, the length and width of the leaves and the diameter of the plants were followed. There were significant differences between the two years of vegetation for each of these elements. The T Rex and Patriot cultivars with a 100% emergence percentage in the two years of vegetation were highlighted.

For the study of blooming, the percentage of flowering plants, the number of floral stems, the duration of the flowering period, the length of the floral stems and the number of flowers in the inflorescence were determined. In the first year all the varieties bloomed and the number of floral stems per plant ranged between 0.4 (Undulata Univittata and Sunset Grooves) and 2.25 (Mighty Mouse). In the second year, eight varieties bloomed and the number of floral stems per plant was between 0.25 (Sunset Grooves) and 3.75 (Fragrant Blue). The highest number of flowers in inflorescences was recorded at Blue Mouse Ears (16.6 in the first year and 16.4 in the second year).

Keywords: blooming, *Hosta*, number of flowering plants, plant diameter, vegetative growth.

INTRODUCTION

Hostas are natives of the Far East, with their center of distribution being Japan. Outlying species occur in China and Korea. *Hostas* are thought to have evolved from lilylike ancestors that migrated from east-central China by two different routes that recombined sometime later to produce the *Hostas* we know today (Greenfeld and Shadrack, 2004).

¹University of Agronomic Sciences and Veterinary Medicine of Bucharest

Hostas are among the most important landscape plants due to their high esthetic value and tolerance to many kinds of environmental stress. (Jenks *et al.*, 2002). *Hosta* is an ornamental groundcover plant world famous for its colored leaves, various leaf shapes, and flower shapes (Liu *et al.*, 2017). Many *Hosta* species are popular as landscaping and ornamental plants because of their astonishing foliage and shade tolerance.

Thus, they have been extensively hybridized to develop various cultivars, resulting in about 6,000 cultivars in the world (Yoo *et al.*, 2021).

The plants grow in the form of leaf bushes. It has rhizomes or stolons in the ground, lanceolate or ovate leaves, ovate-cordiform in *Hosta plantaginea* (Toma, 2003; Toma, 2009) varying in size depending on the species. The leaves have a multitude of shapes and colors, sizes and textures, they can be green, blue, yellow or white, single-colored or variegated, with larger or smaller dimensions. The color of the flowers is white, pink, lavender.

The purpose of the research conducted on the 11 species and cultivars of *Hosta*, planted in October 2018 and studied during two years of vegetation, 2019 and 2020, was to determine the influence of climate on the growth and flowering of plants and their behavior during two years of vegetation, 2019 and 2020.

MATERIAL AND METHOD

The experimental lot, consisting of 11 species and cultivars of *Hosta*, was located within the University of Agronomic Sciences and Veterinary Medicine Bucharest, in the Botanical Garden of the Faculty of Horticulture. The 11 species and cultivars were named variants and marked from V₁ to V₁₁, as follows: V₁ - *T Rex*, V₂ - *American Halo*, V₃ - *White Feather*, V₄ - *Christmas Island*, V₅ - *Fragrant Blue*, V₆ - *Patriot*, V₇ - *Mighty Mouse*, V₈ - *Blue Mouse Ears*, V₉ - *Sting*, V₁₀ - *Undulata Univittata* și V₁₁ - *Sunset Grooves*. In order to set up the experimental field, six rooted sprouts of each species and cultivar were planted, resulting in 66 plants.

During two years of vegetation, 2019 and 2020, a series of observations were made regarding the growth stages and flowering stages of the plants. The monitored growth parameters were as follows: the time of plant emergence, the average number of sprouts per plant, the average height of the plants, the average diameter of the bush, the average number of leaves, the average length and width of the leaves. Regarding the flowering of the plants, observations and determinations were made on the following parameters: time of flowering plants, average number of flowering plants, average number of floral stems per plant, average length of floral stems, average number of flowers in inflorescences, duration of flowering. The observations and determinations were made at the beginning of each month, starting from the emergence of the plants and until the end of the vegetation, during the two consecutive years, 2019 and 2020.

RESULTS AND DISCUSSIONS

The observed growth parameters were: plant height, number of sprouts, number of leaves per plant, length and width of leaves and bush diameter.

The highest plant height was recorded at *T Rex* 26.73 cm in 2019 and 21.5 cm in 2020 and the lowest height was at *Mighty Mouse* 9.38 cm in 2019 and at *Blue Mouse Ears*, 6.9 cm in 2020. Plant height recorded significantly different values between the two years, being lower in the second year of vegetation for all species and cultivars. The average plant height was within the limits of 26.73 cm for *T Rex* and 9.38 cm for *Mighty Mouse* in 2019 and from 21.5 cm for *T Rex* to 2.14 cm for *Sting* in 2020 (fig. 1).

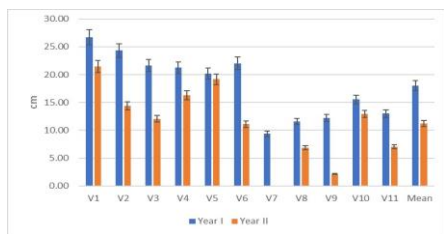


Fig.1. Average plant height

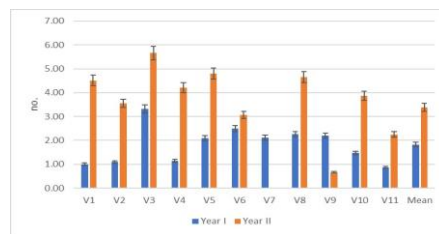


Fig.2. Average number of shoots

The number of sprouts increased significantly in the second year (fig. 2) for 9 cultivars, from 1.82 to 3.38. For a single variant, *Sting*, there is a decrease in the average number of sprouts per plant, from 2.2 in 2019 to 0.7 in 2020. The highest number of sprouts was recorded at *White Feather* 3.32/plant (2019) and 5.7/plant (2020) and the lowest number was recorded at *T Rex*, 1/plant (2019) and at *Sting* 0.7/plant (2020)

The number of leaves per plant was similar in the two years of monitoring. The highest number of leaves recorded was at *Christmas Island* 6.3/plant (2019) and *Fragrant Blue* 6.45/plant (2020) and the lowest number was at *American Halo* 3.6/plant (2019) and at *Sting* 1.8/plant (2020).

Variants V₁, V₂, V₅, V₈ and V₁₀ registered a slight increase in the average number of leaves in the second year, with values between 0.12 (V₁₀) and 2.11 (V₅). For variants V₃, V₄, V₆, V₉ and V₁₁, a reduction of the average number of leaves was observed, with values between 0.01 (V₃) and 2.9 (V₉).

The length of the leaves was also similar in the two years to the experimental variants studied, with a decreasing trend in the second year of vegetation. The highest values of leaf length were at *Christmas Island*, 12.6 cm in 2019 and at *T Rex*, 10.21 cm in 2020. The lowest values were recorded *Mighty Mouse* 3.72 cm in 2019 and at *Sting*, 1.42 cm in 2020.

Regarding the leaf average weight, the values differed significantly in the two years, decreasing in the second year of observations. The largest leaf width was at *American Halo*, 8.39 cm in 2019 and at *T Rex*, 5.81 cm in 2020, and the lowest values were recorded at *Sting*, 3.49 cm in 2019 and 0.73 cm in 2020.

Regarding the diameter of the bush, the values were similar in the two years of observations. The highest values were recorded at *Fragrant Blue*, 25.61 cm in 2019 and at *T Rex* 32.71 cm in 2020, and the lowest values were at *Mighty*

Mouse, 10.76 cm in 2019 and at *Sting*, 3.82 cm in 2020. The diameter of the bush registered a slight reduction in 2020 for five variants: *American Halo*, *White Feather*, *Patriot*, *Sting*, *Sunset Grooves*.

A significant correlation was registered in the first year of vegetation between the length of the leaves and the diameter of the bush ($R^2 = 0.7667$, $y = 1.7014x + 3.9568$, x representing the length of the leaves and y the diameter of the bush).

In the second year of vegetation, the following significant correlations were recorded:

- plant height with bush diameter ($R^2 = 0.9294$, $y = 1.4529x + 2.7345$, where x is the plant height and $y =$ bush diameter).
- number of sprouts with number of leaves ($R^2 = 0.8279$, $y = 1.0858x + 0.9177$, $x =$ number of dragons, $y =$ number of leaves)
- number of dragons with bush diameter ($R^2 = 0.7187$, $y = 4.8576x + 2.6101$, $x =$ number of dragons, $y =$ bush diameter).

Another significant correlation was registered between the two years of vegetation in terms of plant height ($R^2 = 0.7487$, $y = 0.9958x - 6.6934$, where x is the height in the first year and $y =$ the height of the plants in the second year).

Variation in growth and flowering between species were studied in different flowering plants (Ryu *et al.*, 2019; Mehraj and Shimasaki, 2017; Kim *et al.*, 2014; Ramzan *et al.*, 2014; Gharge *et al.*, 2009; Mantur *et al.*, 2005; Shiragur *et al.*, 2004; Shafique *et al.*, 2011; Reddy *et al.* 2003).

Regarding the flowering of the plants, the percentage of flowering plants, the number of floral stems per bush, the duration of the flowering period, the length of the floral stems and the number of flowers in the inflorescence were determined.

The percentage of flowering plants recorded was 100% in six variants (*T Rex*, *American Halo*, *Chistmas Island*, *Fragrant Blue*, *Patriot* and *Blue Mouse Ears*) in each of the two years. In 2020, the percentage of flowering plants increased by 60% at *Undulata Univittata* and it decreased by 15% at *Sunset Grooves*

The average number of floral stems per bush increased for seven variants (fig. 3), with the exception of *American Halo*, which had equal values of the average floral stems in the two years of vegetation.

The duration of flowering was similar in the two years of monitoring (fig. 4), falling between the following values: 20 days (*Undulata Univittata*) and 30 days *Fragrant Blue* for 2019, and 17 days (*Sunset Grooves*) and 28 days (*Blue Mouse Ears*) for the year 2020.

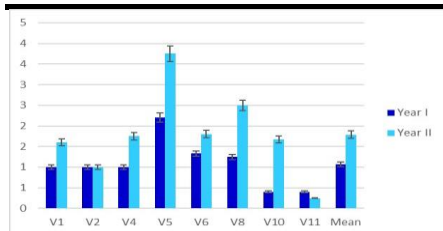


Fig. 3 Average number of floral stems per plant

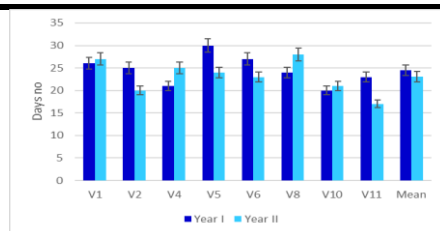


Fig. 4. Flowering period

The length of the floral stems recorded values from 67.42 cm at *T Rex* in 2019, up to 14.78 cm at *Mighty Mouse* in 2020. There was a reduction in the length of the floral stems for 5 variants in the second year (fig. 5).

Regarding the number of flowers in inflorescences (fig. 6), *Blue Mouse Ears* stood out with the highest values for both 2019 (16.6) and 2020 (16.4) and *Patriot* with the lowest values in 2019 (8.75) and in 2020 (10.25).

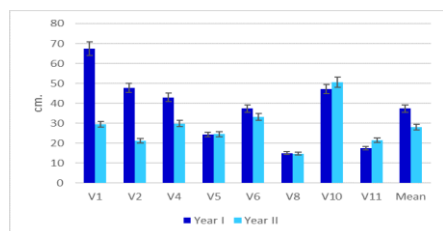


Fig 5 Average length of floral stems

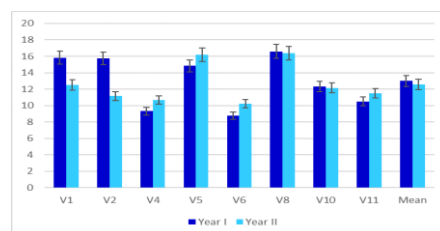


Fig 6. Average number of flowers in the inflorescence

A significant correlation was observed in the first year of vegetation: plant height and length of flower stalks ($R^2 = 0.6775$, $y = 2.8834x - 15.745$, where y = length of flower stalks and x = plant height)

The number of floral stems per bush increased in 2020 for six variants (*T Rex*, *Christmas Island*, *Fragrant Blue*, *Patriot*, *Blue Mouse Ears*, *Undulata Univittata*), the length of floral stems decreased for five variants (*T Rex*, *American Halo*, *Christmas Island*, *Patiot*, *Blue Mouse Ears*), and the number of flowers in the inflorescence decreased to *T Rex*, *American Halo*, *Blue Mouse Ears* and *Undulata Univittata*.

CONCLUSIONS

There were significant differences between the two years of vegetation, for all growth parameters. *Mighty Mouse* behaved like an annual plant. Although there were reductions in some elements of growth, 10 of the 11 variants, studied during two years of vegetation, behaved well as perennials. The variants *T Rex*, *Fragrant Blue*, *Blue Mouse Ears* and *Undulata Univittata* stand out, as they recorded increases for three parameters: sprouts, leaves and bush diameter. In the

first year of vegetation all the varieties bloomed and in the second year eight variants bloomed. *White Feather* and *Sting* did not form flowers in the second year of vegetation.

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