

# RESEARCHES ON BEHAVIOR OF A NEW HYACINTHUS ASSORTMENT FOR FORCED CULTURE

## CERCETĂRI PRIVIND COMPORTAREA UNUI SORTIMENT NOU DE ZAMBILE ÎN CULTURA FORTAȚĂ

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**Abstract.** Throughout this experiment, we tried to mark out the characteristics of some hyacinth cultivars, and it's suitability to be produced in greenhouses, in order to determine the preferences to certain environmental factors, which provides the plant a good length and quality flowers. The experiment was conducted in the greenhouse of USAMV Cluj-Napoca, Floriculture Department. The biological material were imported from Holland and it is represented by nine *Hyacinthus orientalis* L. cultivars: 'Amethyst', 'Blue Jacket', 'Carnegie', 'Delft Blue', 'Fondant', 'Peter Stuyvesant', 'Pink Pearl', 'Purple Star' and 'Splendid Cornelia'. The variants used in the experience are: V1- garden soil+peat+sand; V2 - garden soil; V3 - garden soil + sand. Following research, on the new nine cultivars of hyacinths, concluded that the mixture of standing garden soil peat and sand provides the requirements of Hyacinth, and it is recommended to be used as a potting soil for producing hyacinth in greenhouses. Remarkable varieties with outstanding results, 'Carnegie', 'Pink Pearl', 'Splendid Cornelia' and 'Peter Stuyvesant' which is recommended for promotion to culture forcing.

**Key words:** cultivars, forcing, temperature treatment, soil substrate

**Rezumat.** Prin studiile și cercetările efectuate, în cadrul prezentei lucrări, s-a încercat să se evidențieze particularitățile fenotipice ale unor soiuri noi de zambile și pretabilitatea lor la cultura forțată, cu scopul de a determina preferințele lor față de anumiți factori de mediu, și anume substratul de cultură care corespunde evoluției soiurilor din punct de vedere al vigorii de creștere și calității florilor. Studiile au fost efectuate în serele USAMV Cluj-Napoca, Disciplina de Floricultura. Materialul biologic a fost importat din Olanda și a cuprins 9 soiuri de *Hyacinthus orientalis* L. (zambile): 'Amethyst', 'Blue Jacket', 'Carnegie', 'Delft Blue', 'Fondant', 'Peter Stuyvesant', 'Pink Pearl', 'Purple Star' și 'Splendid Cornelia'. Acestea au fost studiate în 3 variante de substrat: Varianta I - pământ de grădină+ turbă+nisip, Varianta II - pământ de grădină, Varianta III - pământ de grădină+nisip. În urma cercetărilor efectuate, la cele nouă soiuri de zambile, se poate trage concluzia că amestecul de pământ de grădină, turbă și nisip corespunde cu cerințele zambilelor și se recomandă ca substrat de cultură pentru forțarea acestora. Se remarcă cu rezultate deosebite soiurile 'Carnegie', 'Pink Pearl', 'Splendid Cornelia' și 'Peter Stuyvesant' care se recomandă pentru extinderea în cultură forțată.

**Cuvinte cheie:** soiuri, forțare, tratament termic, substrat de cultură

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## INTRODUCTION

Hyacinth (*Hyacinthus orientalis*) or jewel of the Orient is considered one of the most beautiful bulbous plants with flowering in winter, in the culture of forced and early spring in normal (fig. 1). Forced hyacinths culture enables us to enjoy spring flowers in the cold days of winter, but this advantage requires that certain conditions and requirements to get flowers as a prolonged period decor.

Culture production and floral national research continues to make their presence felt in higher education institutions where research is developing programs that will improve the assortment with new creations obtained worldwide and creating permanent new varieties or new production technologies implementation of the performance, including environmental, in accord with trends in Europe and worldwide. Among the concerns and achievements since 1990 include: enriching the range of species and varieties, implementation of environmental technologies, establishing for the first time the *in vitro* production protocol and the behavior of its seedlings in field crops and greenhouses and plant species such as tuberose and indoor plants (Toma, 2005).



Fig. 1 - *Hyacinthus orientalis*

The varieties grown today, especially the Dutch, are characterized by large flowers, bearing 40-50 simple flowers, or 20-30 abundant flowers, arranged in bloom gaining overall cylindrical shape. There are approximately 265 species in the genus *Hyacinthus*: *H. albulus*, *H. augustifolius*, *H. belgicus*, *H. bifolius*, *H. campanulatus*, *H. candicans*, *H. lineatus*, *H. litwinowii*, *H. muscari*, *H. nanus*, *H. orientalis*, *H. transcaspicus*, *H. romanus* ([www.zipcodezoo.com](http://www.zipcodezoo.com)).

*Hyacinthus orientalis* Linnaeus 1753, is the species used most as genitors for varieties of hyacinths (Cantor and Pop, 2008). By selection, hyacinths, particularly in the Netherlands, have reached a high level of perfection in aspect and pointing out beautiful colors and abundance of single or double flowers. Applying heat treatment technique for forcing hyacinths under glass was introduced earlier this century. Like tulips and other bulb plants, hyacinths flowers do not produce superior long enough floral stems or if bulbs are not subject to a period of low temperature.

Unlike other species of tulip bulbs, hyacinth bulbs are not subject to low temperatures, no pre-cooling before planting before forcing. Subject to thermal treatments during storage bulbs are considering flower bud formation and preservation of vegetation until the bulb release. Heat treatment of bulbs involves three stages: floral bud formation, leaf formation and stem elongation flowers.

Growing success is due to forced bulbs properly applied thermal treatments for conservation floral bud and ensure optimum cold period after planting. The training period is accelerated leaf high temperature during the culture of bulbs, and thus shelf-life of floral bud is rushed. Compared with other plant bulbs, flower bud formation and conservation of the hyacinth, the specific temperature is achieved by ensuring this phase. This can be achieved by taking early bulbs, and storage rooms with air conditioning to ensure the heat treatment. Depending on harvest time and heat treatment applied is the difference between forcing bulbs in pots or intended for cut flowers. Thus, flowering bulbs destined for the December-January are harvested in early June and held first two weeks at 30°C. Thereafter, the temperature is lowered to 25.5°C for three weeks and then maintained at 23°C until the flower is fully formed. From now and until planting takes place in September, storage temperature is 17°C. The bulbs will be subject to late forcing (flowering in February-March), harvested in late June, and then kept at 25.5°C until planting (mid November).

Other variants of heat treatments are as follows:

- immediately after harvesting, the bulbs are kept at 25°C for 8 weeks and then up to planting, at 18°C;
- immediately after harvesting, the bulbs are kept at 33°C for 2 weeks, then at 25°C, within 5-6 weeks, followed by 3-4 weeks at 15°C and finally, the bulbs are kept at 12°C until planting.

Bulbs to be grown outdoors as propagating material, they will keep the temperature of 35°C for 5 weeks early varieties, and 8 weeks later varieties, followed by 17°C until planting in the field (Toma, 2005). For bulbs that heat treatments were applied for training and conservation floral bud temperature storage until planting bulbs is 17°C. During this period occurs floral stem elongation stage. Although the flower bud is formed, this period is very important for quality flowers. A temperature below 17°C is not recommended because it increases the risk of attack this time of *Penicillium*. For bulbs that have not applied thermal treatments, were harvested later stage of flower stem elongation begins four weeks before planting. If bulbs are planted in the forcing after December 15, storage temperature must be higher, 25°C until planting, to prevent formation of a possible attack roots and *Penicillium*. In this case the cold period should be extended by 1-2 weeks.

The study was conducted under controlled atmosphere, the private firm with 80 m<sup>2</sup> area. Throughout the storage until the time for planting, bulbs were stored in a dry room at a temperature of 17-18°C. The root chamber, pots were kept at a temperature between 4-9°C and during forcing in heated greenhouses, the temperature was kept at 20-23°C day and 12-16°C at night.

## MATERIAL AND METHOD

The experience was carried out in USAMV Cluj-Napoca greenhouses between 15 November 2010 - March 30, 2011. Biological material consisted of nine varieties of hyacinths (*Peter Stuyvesant*, *Delft Blue*, *Blue Jacket*, *Amethyst*, *Splendid Cornelia*, *Purple Star*, *Fondant*, *Pink Pearl*, *Carnegie*) which were forced on three types of mixed soil (table 1). Processing and interpretation of statistical data were analyzed using the mean characteristics for each variety studied. All data were statistically interpreted for each character, and test significance of differences between the test versions using Duncan (Ardeleanu *et al.*, 2002).

Table 1

The biological material studied in the experience

Nr.	Varieties	Number of pots studied/substrate		
		Garden soil + peat + sand	Garden soil	Garden soil + sand
1	Peter Stuyvesant	10	10	10
2	Delft Blue	10	10	10
3	Blue Jacket	10	10	10
4	Amethyst	10	10	10
5	Splendid Cornelia	10	10	10
6	Purple Star	10	10	10
7	Fondant	10	10	10
8	Pink Pearl	10	10	10
	Carnegie	10	10	10

In this experience were studied 270 bulbs, 10 pots of each variety and each kind of mixture of soil substrate. The hyacinth bulbs were planted on November 15, 2010, and stratified in the cellar, found room for rooting. They were placed in heated greenhouse on 21 February 2011, after a period of 10 weeks of cold. Two phytosanitary treatments were applied with 0.2% Dithane, first to plant bulbs and the 2<sup>nd</sup>, two weeks after planting in the rooting chamber. After planting bulbs watering was applied, and then in the greenhouse, while forcing pot kept moist at all times. No fertilizers were applied.

## RESULTS AND DISCUSSIONS

The results for the hyacinth flower stem length, for three types of substrates used are shown in table 2.

After statistical processing of vigor flowers, it appears that the varieties Delft Blue, Blue Jacket, flux, Carnegie in the version I and Delft Blue, Blue Jacket, Founder and Carnegie, the third variant, differs statistically compared to the average experience considered the control variant (26.1 cm). Of these, Carnegie (29 cm) of variant I differs significantly positive, Fondant (29.9 cm) of variant III shows a distinct difference significant, and the other six variants differs significantly from to the average experience.

Varieties: *Peter Stuyvesant*, *Amethyst*, *Splendid Cornelia*, *Purple Star*, *Fondant*, *Pink Pearl* and Carnegie in the version II, Pink Pearl of variant III were characterized by a reduced average height of the average experience.

It should be noted that variety: Carnegie and Fondant differ significantly positive on the mixture of garden soil and peat, respectively garden soil + sand, and the same two varieties differ significantly negative for garden soil.

Table 2

**Results of the *Hyacinthus* flower stem height (cm), under the influence of variety and mix of land used for forcing**

Variants	Variety	Flower stem height (cm)	Relative height of flower stem%	d ±	Significant difference
I.1	Peter Stuyvesant	28.0	107.3	+1.9	-
I.2	Delft Blue	34.0	130.3	+7.9	***
I.3	Blue Jacket	34.5	132.2	+8.4	***
I.4	Amethyst	25.6	98.1	-0.5	-
I.5	Splendid Cornelia	28.7	110.0	+2.6	-
I.6	Purple Star	26.7	102.3	+0.6	-
I.7	Fondant	33.1	126.8	+7.0	***
I.8	Pink Pearl	25.0	95.8	-1.1	-
I.9	Carnegie	31.7	121.5	+5.6	***
II.1	Peter Stuyvesant	15.6	59.8	-10.5	ooo
II.2	Delft Blue	24.5	93.9	-1.6	-
II.3	Blue Jacket	28.2	108.0	+2.1	-
II.4	Amethyst	21.0	80.5	-5.1	ooo
II.4	Splendid Cornelia	19.1	73.2	-7.0	ooo
II.6	Purple Star	20.5	78.5	-5.6	ooo
II.7	Fondant	22.5	86.2	-3.6	o
II.8	Pink Pearl	16.5	63.2	-9.6	ooo
II.9	Carnegie	21.2	81.2	-4.9	ooo
III.1	Peter Stuyvesant	26.0	99.6	-0.1	-
III.2	Delft Blue	31.2	119.5	+5.1	***
III.3	Blue Jacket	32.1	123.0	+6.0	***
III.4	Amethyst	25.8	98.9	-0.3	-
III.5	Splendid Cornelia	27.1	103.8	+1.0	-
III.6	Purple Star	26.3	100.7	+0.2	-
III.7	Fondant	29.9	114.6	+3.8	**
III.8	Pink Pearl	22.1	84.7	-4.0	oo
III.9	Carnegie	29.0	111.1	+2.9	*
	Average of experiment (Control)	26.1	100.0	-	-

DL 5% = 2.8

DL 1% = 3.7

DL 0.1% = 4.7

Note: Variant I-garden soil + peat; Variant II garden soil; Variant III garden soil + sand

The following table can be seen that the varieties Delft Blue and Blue Jacket have a very significant positive influence on the variety, compared with variety Carnegie.

Based on data from Table 3 can be seen that the two varieties, Delft Blue and Blue Jacket, statistically differences compared to the average experience (26.0 cm) considered as the control variant. These, with an average stem length of 30 cm and 31.6 cm respectively, differs very significantly superior to the average. Peter Stuyvesant varieties (23.2 cm), Amethyst (24.1 cm), Pink Pearl (20.5 cm)

were noted by an average reduced the average length of experience (27.3 cm), with deviations statistically to the control variant.

Table 3

**Influence of variety on the hyacinth flower stem length**

Nr.	Variety	The average length of flower stem (cm)	Relative length of the rod floral%	d ±	Significant difference
1	Peter Stuyvesant	23.2	98.2	-2.8	ooo
2	Delft Blue	30.0	115.4	+4	***
3	Blue Jacket	31.6	121.5	+5.6	***
4	Amethyst	24.1	96.7	-1.9	o
5	Splendid Cornelia	25.0	96.2	-1.0	-
6	Purple Star	24.5	94.2	-1.5	-
7	Fondant	28.4	109.2	+2.4	**
8	Pink Pearl	20.5	78.8	-5.5	ooo
9	Carnegie	27.3	105.0	+1.3	-
	Average of experiment (Control)	26.0	100.0	-	-

DL 5 % = 1.6

DL 1% = 2.1

DL 0.1 % = 2.7

Table 4 shows that regardless of the variety used in the experience, the mixture of garden soil with peat growth vigour hyacinths prints real and very significantly superior mixture of garden soil + sand, considered as the control variant, while the garden soil hyacinths prints a very significant negative effect of increasing the mixture of garden soil + sand.

Table 4

**The influence of culture substrate used on the hyacinth flower stem length**

Culture substrate	The average length of flower stem (cm)	Relative length of the rod floral%	d ±	Significant difference
Garden soil + peat + sand	29.5	106.5	+1.8	***
Garden soil	21.0	75.8	-6.7	ooo
Garden soil + sand (Control)	27.7	100.0	-	-

DL 5% = 0.9

DL 1% = 1.2

DL 0.1% = 1.6

The results on the number of flowers in the inflorescence are shown in table 5.

Measurement results on the number of flowers in inflorescence and statistical analysis of data leads to the conclusion that the variety Purple Star (62.6) differs significantly distinct positive, statistically, than the average experience (40.0) considered the control variant, while Pink Pearl variety, with an average of 22.2 flowers per inflorescence is significantly distinct negative. Other variants are insignificant compared to the control variant.

Table 5

**Summary of results on the number of flowers in inflorescence**

Nr.	Variety	Average number of flowers	Relative number of flowers%	d ±	Significant difference
1	Peter Stuyvesant	31.4	78.5	-8.6	-
2	Delft Blue	39.4	98.5	-0.6	-
3	Blue Jacket	24.8	62.0	-15.2	-
4	Amethyst	48.4	121.0	+8.4	-
5	Splendid Cornelia	50.8	127.0	+10.8	-
6	Purple Star	62.6	156.5	+22.6	**
7	Fondant	46.6	116.5	+6.6	-
8	Pink Pearl	22.2	55.5	-17.8	°
9	Carnegie	34.2	85.5	-5.8	-
10	Average of experiment (Control)	40.0	100.0	-	-

DL 5% = 15.5

DL 1% = 20.8

DL 0.1% = 27.7

In table 6 is shown the summary of results on the influence of the variety of period decor.

Table 6

**Influence of variety of period decor**

Nr.	Variety	The mean length of decor (days)	Relative duration of the period décor %	d ±	Significant difference
1	Peter Stuyvesant	8.3	86.5	-1.3	°
2	Delft Blue	11.5	119.8	+1.9	***
3	Blue Jacket	10.9	113.5	+1.3	*
4	Amethyst	6.9	71.9	-2.4	°°°
5	Splendid Cornelia	10.1	105.2	+0.5	-
6	Purple Star	7.4	77.1	-2.2	°°°
7	Fondant	10.1	105.2	+0.5	-
8	Pink Pearl	11.3	117.4	+1.7	**
9	Carnegie	10.1	105.2	+0.5	-
10	Average of experiment (Control)	9.6	100.0	-	-

DL 5% = 1.1

DL 1% = 1.5

DL 0.1% = 1.9

The longest period decor was recorded in variety Delft Blue (11.5 days) is very significantly positive different from the average of experience taken as a control (9.6 days). A period decor statistically lower in the varieties occurred Purple Star (7.4 days), Amethyst (6.9 days) and Peter Stuyvesant (8.3 days) compared with media experience.

In the table 7 was presented the results obtained concerning the influence of substrate used on the duration of décor.

Table 7

## Influence of substrate used on the duration of decor

Nr.	Type of substrate	Average duration of décor (days)	Relative duration of decor%	d ±	Significant difference
1	Garden soil + peat	12.0	129.0	+2.7	***
2	Garden soil	7.6	81.7	-1.7	ooo
3	Garden soil + sand (Control)	9.3	100.0	-	-

DL 5% = 0.7

DL 1% = 0.9

DL 0.1% = 1.1

Regardless of the varieties grown, in terms of statistical mixture of garden soil + peat prints varieties studied a longer period of decoration, and differs very significantly positively to mix garden soil + sand, considered the control variant. Compared to the control, garden soil is statistically inferior, and print durability hyacinth flowers less.

## CONCLUSIONS

1. The study was performed on nine varieties of hyacinths in forced culture and the hyacinths cultivars showed differences both between varieties and between the same varieties grown on different types of mixed soil.

2. Regarding culture substrate consisting of garden soil and peat, there were positive and insignificant differences from the average experience for all characteristics studied in this experience. However it should be noted that varieties „Carnegie”, „Pink Pearl” and „Splendid Cornelia” distinguished themselves by setting a period longer than the other species studied, being recommended for the culture of forced hyacinths. Satisfactory results were obtained for culture in a mixture of garden soil and sand, with minor differences on phenotypic features studied.

3. In contrast, garden soil, showed negative differences in the period setting of flowers and the flower stem height, two important issues worthy of consideration when you want to obtain quality flowers through forced culture of hyacinths.

4. Measurement results on the number of flowers in inflorescence lead to the conclusion that the type of mixture soil used for forced not affect in any flower.

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