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# RESEARCH ON SOME BIOLOGICAL AND TECHNOLOGICAL ASPECTS OF THE SPECIES HYACINTHUS ORIENTALIS (FAM. LILIACEAE)

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**Abstract**

***In a vase or in a pot, in a bouquet or in an arrangement, in the house, in the garden or in the park, alone or in combination, flowers are just as many occasions of joy that we give to ourselves or to our loved ones. Messengers of human thoughts and feelings, flowers contribute to the development of social relations, reflecting in the most brilliant way the refinement, taste and personality of man. Some authors expand the area of use of some of the flowers in the food sphere, considering them edible flowers. However, flowers mean, above all, love, love, hope, trust, appreciation, lust for life; through them we express everything that is noblest and most beautiful in the life of each of us. It is certain that if each of us understood - even just for a moment - the extraordinary message that a flower so eloquently conveys, then the world we live in would be much better. Flower culture at a high technological level cannot be done without thorough knowledge of biology, plant physiology and ecology, genetics and plant breeding, agrochemistry, pedology, agrotechnics, phytopathology and entomology, and for the commercialization of production and ensuring economic profitability, it is also necessary marketing knowledge and market research. Knowing the biological properties of plants and their reaction to different environmental conditions and agrotechnical works are essential in the design and application of a high-performance technology. The mastery of this information in the sphere of the disciplines mentioned above denotes a high qualification of the florist specialist and the satisfaction of successful crops is possible only by doubling this qualification with intense work, done with a lot of passion and dedication.***

Keywords: hyacinth, vegetative organs, floral organs

## 1. INTRODUCTION

The greenhouse is established in Uliești commune, Croitori village, Dâmbovița county. The climate of Dâmbovița County is continental - moderate with differences in the hill and forest area and in the mountain area. The county's climate has the following characteristics: hot summers and long, cold winters. In the western part of the county, the climate has more arid nuances, summers being generally drier and warmer.
Average annual temperatures (table 1) are between 1°- 5 °C in the eastern part and 7°-10 °C in the western part, the month with the highest temperatures being July with 20°-22 °C, and the one with the lowest temperatures in January with -4°- 4 °C. The relative humidity of the air is also a factor to be considered, so it has been covered in table 1. Although the greenhouses are equipped with their own heating, it is very important to know these temperatures that have been recorded during these years.
Water is an important vegetation factor which, through its role in the unfolding of vital processes, is indispensable in the life of plants. Precipitation is the main source of water supply. These are in the atmosphere as rain or snow.
More abundant precipitation favors the growth and development of the plant. Also, the average duration of the snowfall interval is 50 - 100 days/year, but it can reach 130 days in the higher areas.
**The duration of the sun's shine** can influence the way the biochemical and physiological processes in the plants unfold, but also the loss of water from the soil and the plant.

**Solar radiation** is the main source of energy that provides the heat necessary for the growth and development of plants. In solariums, sometimes the daily radiation values can be deficient, namely, the areas with lower potential in the years with a shorter duration of sunshine and especially in the months of November, December and January.
The values are influenced by the covering materials of solariums or culture shelters, which have a different transmission coefficient (0.8 for glass, 0.7 for polyethylene and 0.6 - 0.65 for polyvinyl chloride), over time the initial transparency of the covering materials decreases by 20 - 30% as a result of the deposition of dust, smoke or snow.

**Aeolian regime**

The predominant winds are west and northwest, with an intensity of 3.8 m/s and a frequency of 12.9%. Winds from the South have the lowest weight (table 4).
For forced crops, knowing the intensity and direction of the winds is of particular importance because cold winds cause significant heat loss from inside the greenhouse, through convection.

## 2. MATERIALS AND METHODS

The Hyacinthus orientalis plants that constituted the material for the study of the biological and technological particularities belong to our own greenhouses.
From the Hyacinthus batch, 3 varieties of the "Hyacinthus orientalis" species were studied, 10 plants were chosen from each variety, 30 plants being analyzed in total. These observations were made during the 3 repetitions.

Plants were chosen that met the characteristics of the variety as faithfully as possible, because the studies carried out followed some biological and technological characteristics of the species. A set of biometric measurements and observations on those characteristics of plants that are directly related to their quality, such as: number of shoots, plant height, flower stalk length, flower length, flower diameter, number of flowers on the floral stem, and the duration of storage in water. Thus, we tried to find the best variety in terms of quality and to last as long as possible by keeping the minimum conditions, because they are popular both in pots, as cut flowers in bouquets, or floral arrangements, and planted in the garden.

Following the research and measurements carried out, it was found that within the varieties studied, the storage time of cut flowers is between 8 and 12 days, the height of the plants can reach up to 40 cm, and the number of flowers on the flower stalk is between 8 and it can go up to 23.

It should be noted that these observations and measurements were made during the first flower harvest. It was necessary to make the set of observations during the first harvest, because in the greenhouse we put other flowers depending on the season.

Following the researchers, it was found that only one flower stem grows on the plant. It could also be observed that the flowers open successively on the floral stem.

The cultivation technology applied to this Hyacinthus crop was that for planting in greenhouses and solariums and all the steps were followed to obtain a crop as productive as possible, but at the same time that does not involve very high costs. The plants were grown by sowing directly in the soil, in furrows and in pots.



**Figure 1. Preparation for planting**



**Figure 2. Garden soil**

The soil mixture for this crop consisted of garden soil, peat and perlite. To begin with, basic fertilization was done with superphosphate and magnesium sulfate.

The planting distance was 15 cm between rows and 15 cm between plants per row. Watering was done by sprinkling until the seedlings were caught, after which it was switched to drip irrigation, until flowering. Fertilization with chemical fertilizers took place weekly with nitrogen, potassium and calcium.



**Figure 3. Peat**



**Figure 4. Perlite**

**Description of varieties**

***Hyacinthus Orientalis Blue Jacket*** is a perennial bulbous plant that is part of the *Liliaceae family.*
***Hyacinthus Orientalis Blue Jacket*** is an intense blue variety, extremely fragrant. The colors fade and blend as the flower develops. Flowering takes place in the middle of spring, for 2 - 3 weeks. Height at maturity 20 - 30 cm. The stem is erect, vigorous, bright green, completely covered with flowers.
Hyacinths are extremely popular garden plants due to their wide assortment of colors and incredible smells. Superb spring flowers, of a special naturalness, which, despite their simplicity, attract the eye, evoking a feeling of peace and calm.



**Figure 5. *Blue Jacket* bulbs**

The flowering period of the Blue Hyacinth is in the months of April and May. This flower has an easy growth. The places it prefers and where it develops best are places with a lot of light and sun. The soils in which Blue Hyacinth grows best are well-drained, moist and fertile soils.
*Hyacinthus Blue Jacket* is a very decorative flowering plant and appreciated due to its beautiful appearance and due to the fragrance, it emits. The blue hyacinth is an ornamental plant for the garden, but it can also be planted in pots to decorate rooms and homes.



**Figure 6. *Blue Jacket* hyacinth**

***Pink Pearl*** hyacinth
Common name: ***Hyacinth.***
Scientific name: ***Hyacinthus Orientalis 'Pink Pearl'.***
***Pink Pearl*** hyacinth is a perennial garden plant with good resistance to winter cold. In other words, viola bulbs should not be taken out of the ground in the fall, before frost. The cold of winter is a necessary stage for good flowering the following year.
***Pink Pearl*** hyacinth bulbs are easy to propagate.
It also does well in the sun, but also in semi-shaded areas.
The ***Pink Pearl*** hyacinth is distinguished by its large, light pink, fragrant flowers.
One should plant ***Pink Pearl*** hyacinth bulbs in autumn, at a depth of 10-15 cm as the bulbs are quite large.



**Figure 7. *Pink Pearl* hyacinth**

Depending on the weather, the ***Pink Pearl*** hyacinth will bloom between April and May.
***Pink Pearl*** hyacinth characteristics may vary depending on sun exposure, time of planting, moisture level, fertilizers, soil type, maintenance performed, pests, and other factors.
***White Pearl*** hyacinth
The dense flowers, grown in bunches, are appreciated both for their tender appearance and their sweet scent. Hyacinths were cultivated on the old continent from the second half of the 16th century, but they became famous in the 18th-19th centuries.



**Figure 8. *White Pearl* hyacinth**

Essential for a well-developed plant with a large inflorescence is to have large bulbs. Plant them in pots at least 11 cm in diameter and more than 20 cm deep.
Hyacinth bulbs are planted about 15 cm deep and need a substrate of 6-7 cm.
There must also be a drainage layer (gravelly sand) up to the bottom of the pot. It is recommended that the pots have holes in the bottom. Good drainage is very important for potted bulb plants.

***Variants and working method***

Hyacinthus cultivation technology involves several aspects compared to other flower crops. Interventions on the plants must be done with care by those who perform them, the culture also requiring a great finesse and specialization of it. These characteristics are due to the fragility of the flower stems, which can break very easily. For this reason, in this work, a special emphasis was placed on the biology of hyacinths, on their behavior and response to general technological measures. The applied technology was in great accordance with the delivery possibilities and market requirements and the environmental conditions characteristic of the area. The observations made on the batch of flowers followed their response to the conditions encountered during the execution of the study for the preparation of the diploma project. The present paper aims to highlight the biological aspects of the plant and the observed technology and formulate conclusions and recommendations that could help to improve the Hyacinthus orientalis genus.
Observations were made on 30 plants of each variety, 90 plants in total, each being individually numbered. Of the 90 plants, 30 were white, 30 pink and 30 blue.
These researches were carried out over a period of two years, from 2019 to 2021, during which all stages were followed to obtain the Hyacinthus culture.
By analyzing the data obtained from each of the 30 plants taken into analysis, from each variety, their average was performed, being later analyzed with the help of the "t" test to highlight the possible differences between the three varieties regarding the observed characters.

***Observations and determinations***
The observations and determinations made were centralized in 2 main directions, namely:
a.) Biology of vegetative organs;
b.) Biology of floral organs and their relationship with vegetative organs; Regarding the biology of the vegetative organs, the leaf was particularly studied, and in the case of the biology of the floral organs, the flower itself and the floral stems of which it is a part were studied.

## 3. RESULTS AND DISCUSSIONS

In order to be able to thoroughly describe the material that was worked with and also to check the agreement between the general data and those obtained from the research, certain observations and biometric measurements were made on the most important characters of the plant, on which the quality of the flowers depends. Thus, the following were determined: the height of the plant, the length of the floral stem, the length of the flower, the number of flowers on the floral stem, the color of the petals and the storage time as cut flowers in water.
Through this work, the aim was to determine the variety with the best quality of flowers, but also the one that presents as faithfully as possible the general characteristics of *Hyacinthus* cultures.

***Observations and determinations on the plant***

In order to obtain determinations on the plant, the following were taken into account: the height of the plant, the length of the floral stem and the color of the flowers to help distinguish the varieties between them.

***The height of the plant***

For plant height, measurements were made on the 30 plants of each variety, then their arithmetic mean was calculated. The obtained data were noted in the table below and calculated according to the limit difference method. These data were interpreted as follows:

**Table 1.** ***Morphological determinations regarding plant height***

| Variety | Plant height | | Difference (±cm.) |
|---|---|---|---|
| | Absolute (cm.) | Relative (%) | |
| ***„Blue Jacket "*** | 40,00 | 85,25 | - 8,00 |
| ***„Pink Pearl "*** | 37,00 | 102,74 | + 1,00 |
| ***„White Pearl"*** | 34,00 | 113,03 | + 9,00 |
| **Average (Mt)** | **37,00** | **100** | |

DL 5% = 2,45 DL 1% = 5,65 DL 0,01% = 8,55

Regarding the height of the plant, it varies between the limits of 40.00 cm for the *"Blue Jacket"* variety and 34.00 cm for the *"White Pearl"* variety.
Analyzing the average of the 3 we can see that there are varieties with a shorter length, namely the variety *"White Pearl"* (34.00 cm.). From a statistical point of view, regarding the height of the plant, following the observations made, a distinctly significant positive difference was found in the "White Pearl" variety, a very significant negative difference in the *"Blue Jacket"* variety, and an insignificant difference in the *"Pink Pearl"* variety compared to the average of the varieties, considered as a control.

***The length of the flower stem***
Regarding the length of the floral stem, this is a very important character, which was observed in the 3 varieties. The results thus obtained are presented in table 2.

**Table 2.** ***Determinations of the length of the floral stem***

| Variety | Lenght of floral stem | | Difference (±) |
|---|---|---|---|
| | absolute (cm.) | relative (%) | |
| **„Blue Jacket "** | 30,00 | 112,50 | + 5,00 |
| ***„Pink Pearl "*** | 25,00 | 105,00 | + 2,00 |
| ***„White Pearl"*** | 28,00 | 82,50 | - 7,00 |
| **Average (Mt)** | **28,00** | **100** | |

DL 5% = 0,25 DL 1% = 3,42 DL 0,01% = 6,22

It can be observed from the research carried out, that this analyzed character varies between the limits of 30.00 cm for the *"Blue Jacket"* variety and 25.00 cm for the *"Pink Pearl"* variety. Taking the average of the character 28.00 cm and analyzing the other variants, we can see that in the variety *"Pink Pearl"* it is smaller than the average. From a statistical point of view, regarding the length of the floral stem, the *"White Pearl"* variety presents a very negative significant difference, the *"Blue Jacket"* variety has a significantly positive difference, and the *"Pink Pearl"* variety presents a distinctly significant positive difference, compared to the average varieties, considered as a witness.

***The color of the petals***

Regarding the color of the petals, the 3 varieties can be distinguished very easily from this point of view, because all 3 varieties have a different color of the petals. These colors are highlighted in table 3.

**Table 3.** ***Petal color determinations***

| Variety | Petal colour |
|---|---|
| ***„Blue Jacket "*** | blue |
| ***„Pink Pearl "*** | pink |
| ***„White Pearl"*** | pure white |

Analyzing table 3., the white (*White Pearl*), pink (*Pink Pearl*) and pure white (*Blue Jacket*) varieties stand out.

***Observations and determinations on the flower***

***Flower length***

Regarding the length of the flower, measurements were made to observe the variety with the largest flowers. The data thus obtained are presented in table 4, which will be interpreted from a statistical point of view.

**Table 4.** ***Determinations of flower length***

| Variety | Flower lenght | | Difference (±) |
|---|---|---|---|
| | absolute (cm.) | relative (%) | |
| ***„Blue Jacket"*** | 1,50 | 78,32 | -1,66 |
| ***„Pink Pearl"*** | 2,50 | 104,44 | +0,34 |
| ***„White Pearl"*** | 3,00 | 117,49 | +1,34 |
| **Average (Mt)** | **2,33** | **100** | |

DL 5% = 0,48 DL 1% = 1,16 DL 0,01% = 1,59

From a statistical point of view, it was observed that in the case of the *"Blue Jacket"* variety, there is a very significantly negative difference, in the case of the *"Pink Pearl"* variety, the difference is insignificantly positive, and in the case of the *"White Pearl"* variety, a distinctly significant positive difference is observed.

***The diameter of the flower***

In the case of the diameter of the flower, the data obtained from the measurements carried out, they were presented in table 5. These data are as important as those related to the length of the flower, so that in the end we can find out which variety has bigger flowers.

The data thus obtained were also statistically interpreted.

**Table 5.** ***Determinations made on the diameter of the flower***

| Variety | Flower diameter | | Difference (±) |
|---|---|---|---|
| | absolute (cm.) | relative (%) | |
| ***„Blue Jacket "*** | 1,00 | 78,99 | -1,33 |
| ***„Pink Pearl "*** | 2,00 | 94,79 | -0,33 |
| ***„White Pearl"*** | 3,00 | 126,38 | +1,67 |
| **Average (Mt)** | **2,00** | **100** | |

DL 5% = 0,43 DL 1% = 1,20 DL 0,01% = 2,18

From a statistical point of view, it follows that the *"Blue Jacket"* variety presents a distinctly significantly negative difference, while the *"White Pearl"* variety is distinctly significantly positive. Regarding the *"Pink Pearl"* variety, it shows insignificantly negative differences, compared to the average of the varieties, considered as a control.

***The number of flowers on the flower stalk***

This aspect is of particular importance, because it directly influences the quality of the flower, the more flowers the flower stem has, both open and in bud phase, the more the flower is appreciated by buyers. The data obtained as a result of the research were noted in table 6. and in this case the data being interpreted from a statistical point of view.

**Table 6.** ***Determinations made on the number of flowers on the floral stem***

| Variety | *Number of flowers on the floral stem* | | Difference (±) |
|---|---|---|---|
| | absolute (cm.) | relative (%) | |
| ***„Blue Jacket"*** | **18,00** | **71,80** | **-3,30** |
| ***„Pink Pearl"*** | **24,00** | **122,89** | **+2,70** |
| ***„White Pearl"*** | **32,00** | **107,19** | **+0,70** |
| **Average (Mt)** | **24,66** | **100** | |

DL 5% = 0,36 DL 1% = 1,89 DL 0,01% = 3,17

Following statistical research, a very significantly negative difference was observed in the "Blue Jacket" variety, a distinctly significant positive difference in the "Pink Pearl" variety, while the "White Pearl" variety shows a significantly positive difference, compared to the control.

***The number of petals***

Considering the number of petals of a flower, they are usually 5, the flower being type 5, but following some hybridizations, breeders managed to form varieties that have more than 5 petals. The research data from this point of view were exposed in table 7.

**Table 7.** ***Observations made regarding the number of petals***

| Variety | Number of petals | | Difference (±) |
|---|---|---|---|
| | absolute (pcs.) | relative (%) | |
| ***„Blue Jacket"*** | 5 | 75,76 | -1,6 |
| ***„Pink Pearl"*** | 5 | 75,76 | -1,6 |
| ***„White Pearl"*** | 6 | 101,51 | +2,4 |
| **Average (Mt)** | **5,33** | **100** | |

DL 5% = 1,99 DL 1% = 3,58 DL 0,01% = 5,63

As a statistical interpretation following the research carried out on the number of petals, it can be observed that the *"Blue Jacket"* and *"Pink Pearl"* varieties show insignificantly negative differences, and the *"White Pearl"* variety is significantly positive, compared to the average of the varieties, considered as a control.

**Storage time duration**

Regarding the duration of storage in water, we can say that it is a highly sought-after aspect by buyers, because the longer the duration of storage, the more appreciated the flowers are. Determining the shelf life of cut flowers was carried out by keeping them in plain water, without the addition of preservatives, in order to establish these data under the conditions that can be met by any of the buyers. The data thus obtained are presented in table 8.

**Table 8.** ***Determinations of storage time duration of cut flowers in water***

| Variety | *Storage time duration of cut flowers in water* | | Difference (±) |
|---|---|---|---|
| | absolute (days) | relative (%) | |
| ***„Blue Jacket"*** | 10,00 | 83,33 | -2,00 |
| ***„Pink Pearl"*** | 12,00 | 100,00 | 0 |
| ***„White Pearl"*** | 14,00 | 116,66 | 2,00 |
| **Average (Mt)** | **12,00** | **100** | |

DL 5% = 1,29 DL 1% = 4,52 DL 0,01% = 7,31

From a statistical point of view, distinctly significant positive differences were observed in the *"White Pearl"* variety, negative in *"Pink Pearl"* and an insignificant difference in the *"Blue Jacket"* variety.

**Aspects from the culture**























## 4. CONCLUSIONS

Following the research carried out on the main morpho-decorative characters of the 3 varieties of *Hyacinthus orientalis* taken in the study, the following conclusions are noted:

- under the aspect of plant height, the variety *"Blue Jacket"* can be particularly noted, which recorded a height of 40 cm, unlike *"White Pearl"* which recorded only 34 cm;

- with regard to the length of the floral stem, the variety "Blue Jacket" is also noteworthy with a length of 40 cm, unlike *"White Pearl"* with a length of 34 cm;

- the variety *"White Pearl"* stands out, in terms of the diameter of the flower (3 cm) and the length of the flower (3.5 cm), unlike, again, the variety *"Blue Jacket"* which has a diameter of 1 cm and a length of 1.50 cm;

- regarding the number of flowers and storage time, the highest performances were found in the *"White Pearl"* variety, unlike the *"Blue Jacket"* and *"Pink Pearl"* variety. Following the conclusions listed above, it can be said that the variety *"Blue Jacket"* is not a variety of the best quality, it fails to excel in any of the observations made, although it is one of the most cultivated varieties, because it still manages to attract with the beautiful coloring of the petals (white with dark purple edges).

Although the variety *'White Pearl'* has the largest flowers in size, it does not have as many flowers as the variety *'Pink Pearl'*, which also manages to keep as a cut for about 14 days.

One of the most important recommendations is the introduction into the assortment of varieties that present many flowers on the floral stem, large and with as long a storage time as possible in minimal conditions.

Improving the assortment of cut flowers, with new varieties of *Hyacinthus*, with superior morpho-decorative qualities is a concern of traders, in order to obtain substantial incomes, therefore the varieties with superior qualities must be promoted in culture (*White Pearl* and *Blue Jacket).*

## 5. REFERENCES

[1] Ardelean M., Sestraş R., Cordea M., 2007, „Tehnică experimentală horticolă", Ed. AcademicPres, Cluj-Napoca;
[2] Băla Maria, 1998, „Floricultură generală", Ed. Mirton, Timişoara;
[3] Băla Maria, 2003, „Floricultură specială", Ediţia a II-a, Ed. Timpolis, Timişoara;
[4] Cantor Maria, 2003, „Floricultură generală şi specială", Ed. Risoprint, Cluj-Napoca;
[5] Cantor Maria, Pop Ioana, 2008, „Floricultură – Bază de date", Ed. Todesco, Cluj-Napoca;
[6] Cantor Maria, 2009, „Floricultură generală", Ed. Todesco, Cluj-Napoca;
[7] Ghizdavu Iustin, 2004, „Entomologie agricolă specială. Dăunători polifagi", Ed. AcademicPres, Cuj-Napoca;
[8]. Jidav L., Sonea V., 2002, „Mica enciclopedie de horticultură, Ed. Ştiinţifică şi Enciclopedică, Bucureşti;
[9]. Kiselev, G. E., 1956, „Floricultură", Ed. Agrosilvică, Bucureşti;
[10] Marinescu Gh şi colab., 1988, „Bolile plantelor floricole", Ed. Ceres, Bucureşti;
[11] Nicu Carmen, Doina Anton, Manuela Manda, 2007, „Floricultură specială", Volumul 2, Ed. Universitară;
[12] Oroian Ioan, Puia Carmen, Şerba Ioan, 2002, „Practicum de fitopatologie", Ed. Poliam, Cluj-Napoca;
[13] Preda M., 1980, „Floricultură", Ed. Didactică şi Pedagogică, Bucureşti;
[14] Preda M., 1989, „Dicţionar dendrofloricol", Ed. Ştiinţifică şi Enciclopedică, Bucureşti;
[15] Sonea V. şi colab., 1979, „Floricultură", EPD Bucureşti.

**Average temperatures recorded between 2019 – 2021**

| Month / Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Annual average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2019 | -5,5 | -1,9 | 1,3 | 10,1 | 16,8 | 17,3 | 17,7 | 20,6 | 13,8 | 8,8 | 3,2 | -1,0 | 9,8 |
| 2020 | 1,9 | 3,2 | 2,2 | 11,0 | 15,2 | 14,6 | 20,4 | 19,2 | 14,7 | 9,6 | 4,7 | 2,1 | 9,9 |
| 2021 | 4,8 | 2,4 | 7,5 | 9,7 | 14,3 | 19,1 | 19,9 | 24,3 | 20,5 | 11,2 | 6,3 | 5,4 | 12,1 |
| **Monthly average** | 4,0 | 2,5 | 3,6 | 10,2 | 15,4 | 17,0 | 19,3 | 21,3 | 16,3 | 9,8 | 4,7 | 2,8 | |

**Average precipitation recorded between 2019 - 2021**

| Month / Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Annual average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2019 | 1,0 | 13,2 | 23,2 | 10,6 | 34,0 | 46,4 | 62.4 | 9.0 | 37.8 | 28.2 | 58.0 | 41.6 | **30.4** |
| 2020 | 8,6 | 14,6 | 3,0 | 42,2 | 35,6 | 67,8 | 116,0 | 56,6 | 46,8 | 39,8 | 47,6 | 19,8 | **41,5** |
| 2021 | 0,0 | 0,2 | 5,4 | 20,0 | 83,6 | 165,6 | 29,4 | 0,8 | 0,0 | 0,0 | 6,0 | 9,6 | **26,6** |
| **Monthly average** | **3,6** | **9,33** | **10,5** | **24,2** | **51,1** | **93,3** | **69,2** | **23,9** | **28,2** | **22,6** | **37,2** | **23,7** | |

**The relative humidity recorded between 2019 – 2021**

| Month / Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Annual average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2019 | 88,1 | 82,7 | 67,9 | 68,3 | 72,5 | 69,5 | 75,9 | 80,5 | 81,1 | 82,3 | 91,8 | 88,5 | **79.09** |
| 2020 | 82,7 | 76,7 | 65,3 | 62,0 | 64,1 | 66,7 | 69,8 | 69,2 | 65,5 | 72,7 | 75,3 | 81,6 | **70,96** |
| 2021 | 93,5 | 90,3 | 71,5 | 71,5 | 76,7 | 73,6 | 82,6 | 86,6 | 85,4 | 86,2 | 88,9 | 93,5 | **83.34** |
| **Monthly average** | **88,1** | **83,3** | **68,2** | **67,2** | **71,1** | **69,9** | **76,1** | **78,7** | **77,3** | **80,4** | **85,3** | **87,8** | |