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PRELIMINARY STUDIES ON THE CURRENT STAGE OF RESEARCH ON THE PRODUCTION OF PLANTING MATERIAL AND GERBERA CUT FLOWERS IN DIFFERENT VARIANTS OF HYDROPONIC CULTURE

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Abstract

The study was carried out in the doctoral thesis entitled, Research on the production of seedlings and flowers cut by gerbera in various variants of hydroponic cultivation, and refers to the identification of the best way to obtain as many flowers per plant as well as recommendation of the best type of substrate for obtaining cut flowers. In the study we used three varieties of gerbera, 'Dune', 'Balance' and 'Blind Date''. The substrate variants used in the experiments were: V1 - peat with a pH of 4; V2 - Perlite; V3 - 50% Perlite + 50% peat with pH-4; V4 - 50% Perlite + 50% peat with pH 5.5; and V5 - Peat with pH 5.5 (Control Variant). We followed the response of plants grown in different types of substrate on the growth, development and yield of gerbera flowers in the unconventional system. Analyzes and correlations were performed with environmental factors to determine their influence on the number of flowers and their quality.

Key words*: gerbera, cultivar, substrate, soilless.*

INTRODUCTION

Gerbera (*Gerbera jamesonii*), family *Asteraceae*, order *Asterales,* is one of the flowering species that has a diversity of shapes being attractive through the colors of the inflorescences.

Toma (2009) mentions that at the basis for obtaining the horticultural species is the genus *Gerbera* which includes about 40 herbaceous species. He states that the most frequently cultivated forms are the species from which the cross resulted from the horticultural species *Gerbera hybrida* Hort. namely the species *Gerbera jamesonii* Bolus et Hook and *Gerbera viridifolia* Sch.

Yuniarto et al. (2018) appreciate that the gerbera is a species of great importance for some growers and is also highly valued as a flower in the pot.

Gerbera is a species sensitive to low temperatures (Mansito and Aballero, 1989; Singh and Mandhar, 2002; Gelder, 2014), diseases and pests, nutrition regime (Savvas, 2001). Pettersen and Gislerød (2003) estimate based on research conducted in the greenhouse that the highest yield on the growth of gerbera plants as well as the formation of the number of flowers per plant was obtained at a lighting time of 20 hours. Panter et al. (2016) emphasize that additional LED lighting contributes to an increase in production.

As for the gerbera culture substrate, it needs to be very well aerated, light, well supplied with nutrients. All types of substrate used in unconventional crops, vegetables and flowers can be used with very good results (Drăghici, 2017. Gerbera (*Gerbera jamesonii* L.) is one of the flowering species that can be grown in different substrates perlite, mineral wool, vermiculite, sand, coconut fiber (cocopeat), clay, organic substrates, compost, zeolite, pumice stone, sand and so on (Khalaj, 2007; Fakhri et al., 1995).

Different substrate variants were tested such as some volcanic rocks (Barrios-Díaz et al., 2012) zeolite, perlite Maloupa et al. (1993). Guerrer et al. (2017) and William et al. (2010) mention that the granulation of the substrate is very important. In some areas but also in the period with very high temperatures, gerbera plants grown only on the perlite substrate were less developed but those grown on perlite mixed with coconut fibers positively influenced the growth (Paradiso and Pascale, 2008).

In some areas the substrate of rice husks, coconut peat, castor residue and vermicompost in equal proportions (Chauhan et al., 2014) or only peat or vermicompost Arunesh et al., (2020) can also be used.

Growing in containers, pots, polyethylene bags or plastic baskets involves the individual planting of plants in containers and has the same advantages as the culture on tanks. Gerbera grown in pots has recently become more common in interior decoration but dwarf varieties are used.
Sujatha et al. (2002) mention that for a proper vegetative growth of gerbera plants, it is necessary to apply a nutrient solution with an appropriate pH. Enache et al. (2019) based on some studies, he appreciates that the use of structured water in the preparation of the nutrient solution leads to obtaining vegetative growths and production increases.
The application of biostimulators has led to a much better growth and flowering of gerbera plants (Petre et al., 2018; Ahmed et al., 2020).
Carrying out foliar treatments with amino acids (glycine, arginine, asparagine, alanine, tryptophan) led to an increase in the number of leaves per plant, the leaf area, the total mass of plants as well as the number of flowers per plant Abd-Elkader et al. (2020) and Petra et al. (2020).
The aim of the study was to identify the best culture substrate to obtain as many flowers as possible on the plant.

MATERIALS AND METHODS

The study was conducted in the greenhouses of the Hortinvest Research Center between May 2019 - August 2021 The biological material used in the experiments was represented by 3 varieties of gerbera, 'Dune', 'Balance' and 'Blind Date' characterized as follows: 'Dune' is a variety with orange flower, semi-double, with a floral stem of about 60 cm and a flower diameter of 11-12 cm. It is a productive variety, the first flowers appear 12-14 weeks (85-90 days) after planting. 'Balance' has standard semi-double white flowers, with floral stems of 40-70 cm), flower diameter of 10-13 cm and a shelf life of 13-15 days. 'Blind Date' has a red flower, has a diameter of 10-12 cm, the floral stem is about 45 cm.
The substrate variants used in the experiments were: V1- peat with a pH of 4; V2 - Perlite; V3 - 50% Perlite + 50% peat with pH-4; V4 - 50% Perlite + 50% peat with pH 5.5; and V5 - Peat with pH 5.5 (Control Variant). Gerbera seedlings were planted in pots with a capacity of 3 l filled with substrate according to experimental variants. In each variant I used 5 repetitions. In culture, in the unconventional system, the pots were placed on mattresses filled with perlite with a granulation of perlite 5 mm in diameter.
The culture was pursued in the period 2019-2021. The nutrient solution had a pH of 5.5 and an EC of 2.8.
We aimed to ensure the environmental factors in the greenhouse, temperature, light, atmospheric humidity and we recorded the growth of plants, the number of leaves and flowers per plant.
All data were statistically processed.

RESULTS AND DISCUSSIONS

In the 'Dune' variety, in 2019, the first year of cultivation, starting with May, until December, we obtained a total of 13.3 flowers per plant on acid peat substrate with a pH of 4.0. The highest number of flowers per plant was obtained at V 5- Peat with pH 5.5 of 58.31 flowers followed by V3 -50% Perlite + 50% acid peat with 58.23 flowers. Between 2020 and 2021 we obtained the fewest flowers / plant at V1- acid peat pH 4 of 17.5 flowers (2020) and 6.25 flowers / plant (2021). The highest number of flowers per plant was registered in 2020 of 58.75 flowers / plant at V 4- 50% Perlite + 50% peat and in 2021 of only 12.5 flowers / plant until August. At this cultivar, in the period 2019-2021, 37.05 flowers were obtained at V1- acid peat pH 4 and 112.06 flowers at V 5- Peat with pH 5.5, Figure 1).

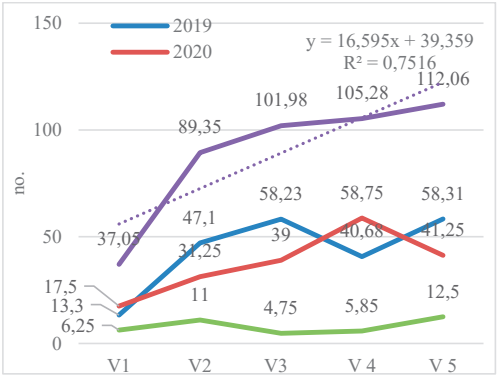

Figure 1. The total number of flowers obtained per plant in the period 2019-2021 'Dune' variety

In the 2019-2021 cultivation period, for the 'Balance' variety, we obtained the highest number of flowers per plant at V5-peat with pH 5.5 of 108.00 flowers/plant compared to V1-peat with pH 4 where we obtained only 83, 10 flowers per plant. We found that the culture substrate had a very large influence R^2 = 0.7458. In 2019, for the 'Balance' variety, we obtained the highest flower production per plant of 53.86 flowers/plant at V 4 - 50% Perlite + 50% peat with 5.5 pH and 43.10 flowers/plant at V2 - Perlite. In 2020 of the number of flowers per plant, the highest number of 43.45 flowers/plant was obtained at V 5 - peat with pH 5.5 and at V1 - peat with pH 4 of only 25.50 flowers/plant. In 2021am we obtained a total of only 10.75 flowers/plant at V 5- peat with pH 5.5 and 18.25 flowers/plant at V2 on Perlite substrate which shows that the fertilizers on this substrate were much better assimilated by to the plant. In August the plants came to rest (Figure 2).

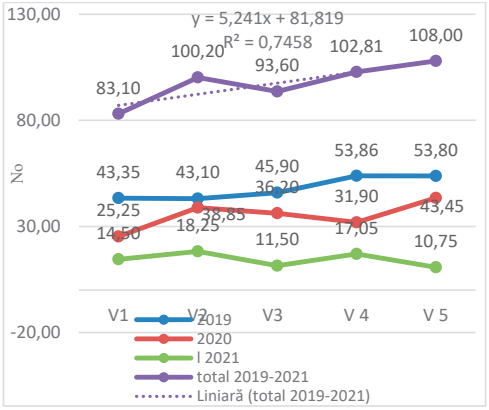

Figure 2. The total number of flowers obtained per plant in the period 2019-2021 'Balance' variety

In the case of the 'Blind Date' variety, a total of 57.00 flowers per plant were obtained at V1 - peat with pH 4 and 102.80 flowers/plant at V3 - 50% Perlite + 50% peat with 4. We found that the type of substrate had an average influence R^2 = 0.5108. In this variety we obtained in year 1 (2019) the highest number of flowers per plant, their number being between 31.5 flowers/plant at V1 - peat with pH 4 and 50.54 flowers/plant at V4 - 50 % Perlite + 50% peat with 5.5 pH. Starting with 2020, the number of flowers per plant began to decrease, obtaining an average of 43.00 flowers/plant at V5 - peat with pH 5.5 and 16 flowers/plant at V1 - peat with pH 4. In the year 2021 we obtained a number of 9.5 flowers / plant at V1 - peat with pH 4 and 20.00 flowers per plant at V2 – Perlite (Figure 3).

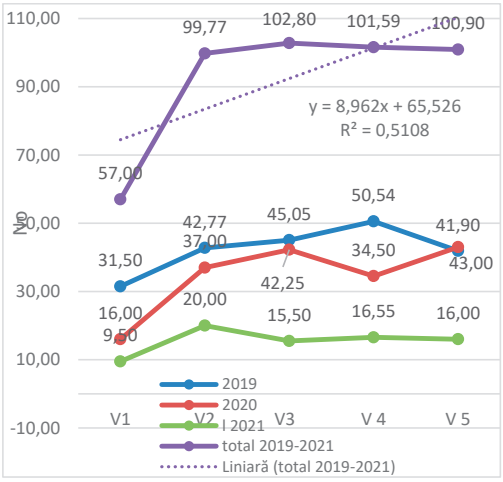

Figure 3. Total number of flowers obtained per plant per plant in the period 2019-2021 variety 'Blind Date'

Analyzing the data obtained for the 'Dune' cultivar, on every month, we could see that on the substrate where we used acid peat (V1-peat with pH 4) we obtained flowers much later after planting, starting with September. We also found that at V 4- 50% Perlite + 50% peat with 5.5 pH by May no flowers were formed on plants compared to V2, V3 and V5 where 8 flowers / plant 9 were obtained, 5 flowers / plant respectively 9.66 flowers / plant (Figure 4.).

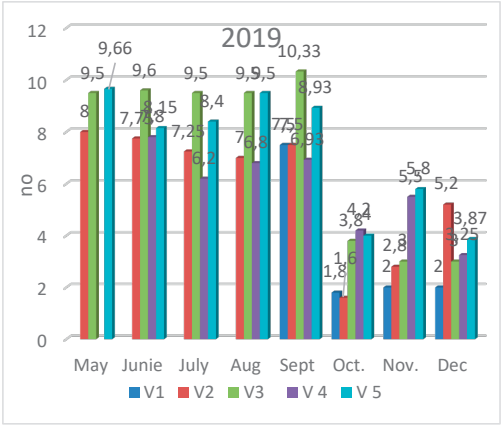

Figure 4. Number of flowers per plant obtained in 2019 from May to December in the 'Dune' variety

In 2020, in the culture of gerbera, during January-December we found that variants 1, 4 and 5 showed a continuous flowering, with a short period of rest in August when the temperatures were higher. Most flowers formed between February-June and September-December for all substrate variants (Figure 5).

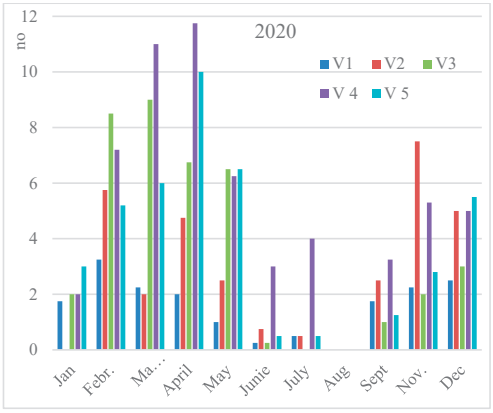

Figure 5. Number of flowers per plant obtained in 2020 from January to December in the 'Dune' cultivar

In 2021, the 'Dune' variety formed a smaller number of flowers per plant compared to the 2019 crop year (Figure 6).

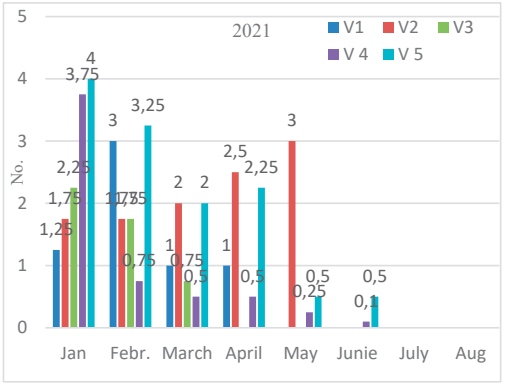

Figure 6. Number of flowers per plant obtained in 2021 from January to December in the 'Dune' variety

In the case of the *Balance* variety, in 2019 we noticed that the plants formed a higher number of flowers per plant in the period May-September followed by a period starting with October in which the number of flowers decreased following as in the following period, by December 2019 it should grow slightly (Figure 7).

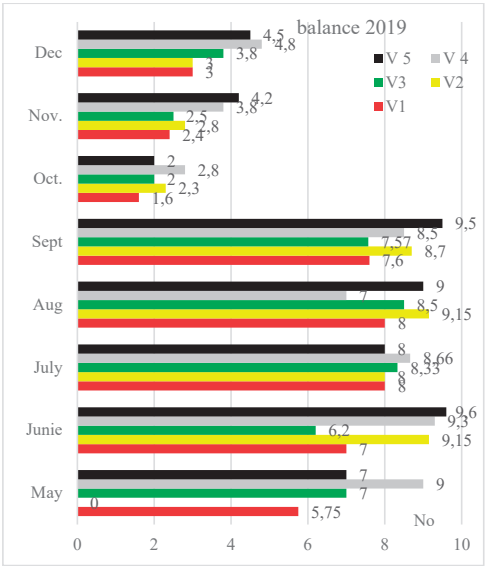

Figure 7. The number of flowers per plant obtained in 2019 for the 'Balance' variety

In 2020, for the 'Balance' variety, we noticed a period of abundant flowering from January to July, followed by a period of vegetative rest starting with August and lasting until November (Figure 8).

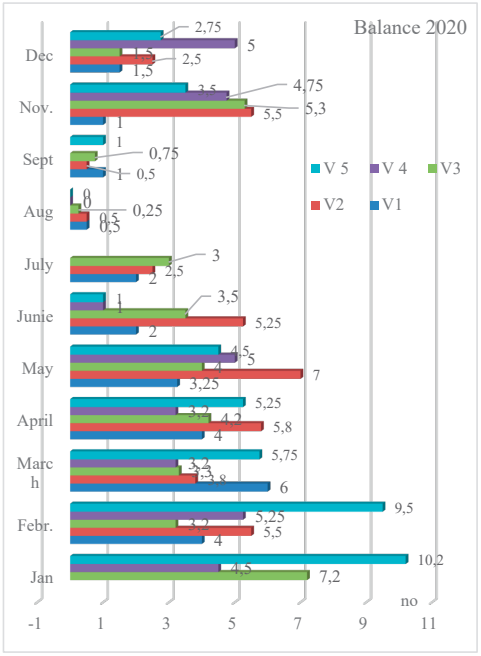

Figure 8. The number of flowers per plant obtained in 2020 for the 'Balance' variety

In 2021 we found an increase in the number of flowers per plant, but smaller compared to 2019 and 2021 (Figure 9).

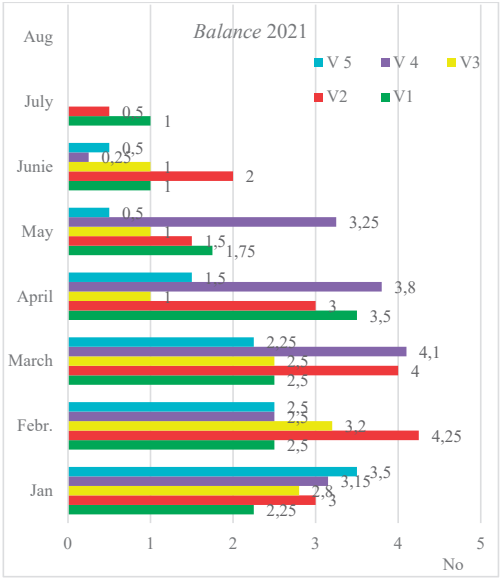

Figure 9. The number of flowers per plant obtained in 2021 in the 'Balance' variety

Figure 10. Aspect from culture in 2019

Figure 11. Aspect from culture in 2020, 'Balance' variety

Figure 12. Aspect of cultivation in 2020 varieties 'Dune' and 'Blind Date'

Analyzing the data on the number of flowers formed per plant in 2019 for the 'Blind Date' variety, we found that the highest number of flowers was obtained in June-September, for all substrate variants. I also noticed that in October the number of flowers per plant decreased, for all types of substrates it will increase by December (Figure 13).

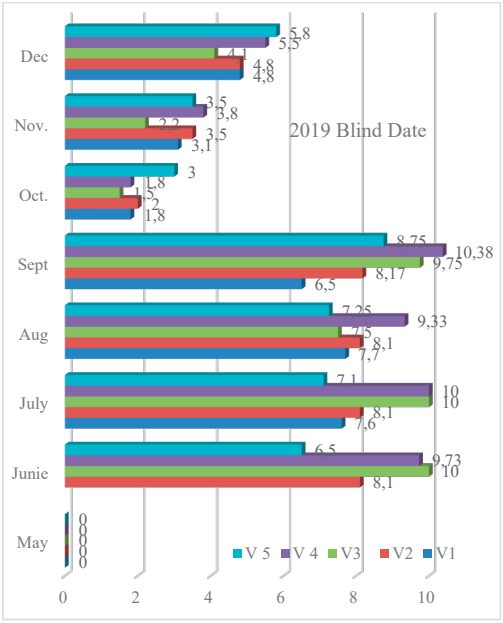

Figure 13. Number of flowers per plant obtained in 2019 in the 'Blind Date' variety

From the Figure 14 we notice the distribution of the number of flowers harvested at the 'Blind Date' variety in the period 2020-2021. We noticed that in 2020 between January and April the number of flowers harvested was higher on the perlite substrate. The number of

harvested flowers started to decrease from July, the plants coming to rest and from November 2020 to increase until May 2021. Starting with June, the plants showed signs of exhaustion.

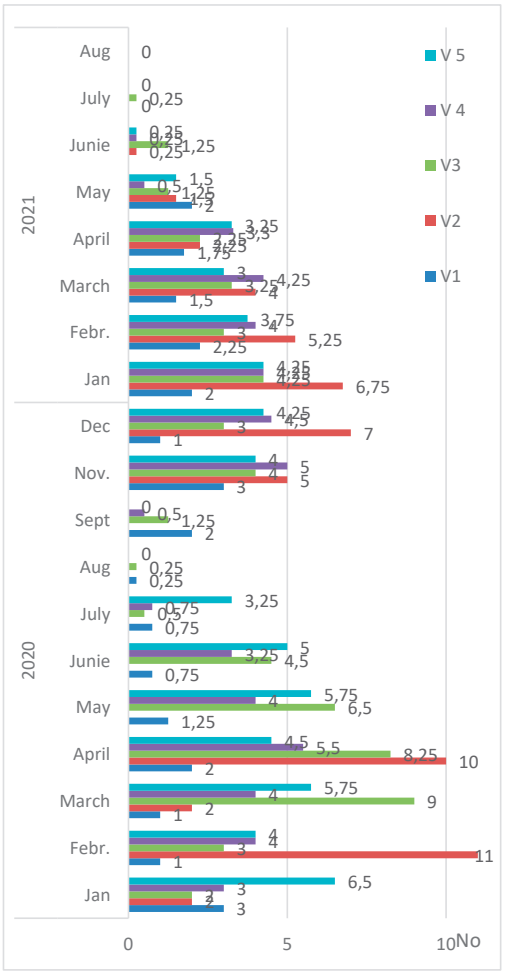

Figure 14. Number of flowers per plant obtained in 2020-2021 in the 'Blind Date' variety

CONCLUSIONS

Cultivation of gerbera varieties on substrates led to high yields of cut flowers. Thus, in the case of the 'Dune' variety, cultivated on a peat substrate with pH 5.5 (V5), a total of 112.06 flowers per plant were obtained compared to the use of a peat substrate with a pH of 4 where they were obtained in the three years of cultivation a number of only 37.05 flowers/ plant. The mixture of peat perlite led to a higher number of flowers per plant.

In the case of the 'Balance' variety in the study period studied, we obtained the highest number of flowers per plant at V5-peat with pH 5.5 of 108.00 flowers/plant compared to V1-peat with pH 4 where we obtained only 83.10 flowers on the plant. The culture medium had an important influence.

In the 'Blind Date' variety, the lowest number of flowers per plant (57.00 flowers) was obtained at V1 - peat with pH 4 and the highest at V3 - 50% Perlite + 50% peat with 4 of 102.80 flowers / the plant.

In the case of all varieties, the highest production of flowers was achieved in the first and second year of cultivation.

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