# STUDY REGARDING GERBERA CULTURE ON ARTIFICIAL SUBSTRATES

## STUDIU PRIVIND CULTURA GERBEREI PE SUBSTRATURI ARTIFICIALE

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***Abstract:*** *This study was done in a 1200 m$^2$ glasshouse built according to a Dutch project within SAPARD programe. It is located in a private farm, in Hălchiu village, in Braşov county. The gerbera plants were grown in individual containers, or cultivated on raised beds on the soil. The experimental material belongs to Rubin variety. As culture substrate were used coconuts coir peat, which was periodically fertilized with macro and micronutrients, according to the specific requirements of different culture stages. The experimental technology of using artificial substrates, assured a high flowers production, bigger in the second year of culture. In May - June period were produced the most flowers (22-28 fl/m$^2$), in comparison with winter period (2-5 fl/m$^2$ ). Coconuts coir peat has high moisture retention, reduces frequency of irrigation, improves aeration in substrates, enhances a strong and healthy root system, with good performances regarding vegetative growth and flowers production.*

***Rezumat:*** *Prezentul studiu a fost efectuat într-o seră cu o suprafața de 1200 mp, construită după proiect olandez, prin programul SAPARD, aflată într-o fermă privată din localitatea Hălchiu, Județul Braşov. Plantele de gerbera din soiul Rubin, au fost crescute în containere individuale, timp de doi ani, comparativ cu varianta de cultură pe brazde înălțate la sol. Substratul de cultură alcătuit din fibră de nucă de cocos, a fost aprovizionat ritmic cu îngrăşăminte complexe şi microelemente, conform cerințelor diferitelor faze de cultură ale plantelor. Tehnologia experimentală a utilizării substratului artificial, a asigurat o producție ridicată de flori, mai mare în anul al doilea de cultură. În lunile mai-iunie s-au produs cele mai multe flori (22-28 flori/mp.), comparativ cu cele din timpul iernii (2-5 flori/mp.). Fibrele de cocos au reținut umiditatea mai bine, reducând frecvența fertirigărilor şi au îmbunătățit aerarea în substrat, provocând o dezvoltare sănătoasă şi puternică a sistemului radicular, cu consecințe favorabile directe asupra creşterii vegetative şi a producției de flori*

## INTRODUCTION

Gerbera (*Gerbera jamesonii*) is one of the most important cultures for cut flowers, appreciated by the buyers due to its beauty and the various assortments (color, shape of flowers as for her good keeping capacity in water after harvest).

There were made many experiments at gerbera, as to others flower species, to substitute the usual culture soil with different culture growing substrates, technique named "*Soil less culture*", or "*Hydroponics*".

Many growers preferred this new culture system to avoid the losses produced to the plants by the soil transmitted diseases and nematodes, as the expenses connected to the structural improvement and chemical of the soil, to make it less compact and with a good nutritive composition.

For gerbera soil less culture, different authors experimented several materials able to constitute a favorable culture substrate, as perlite, zeolite, thin gravel, coconuts coir fibres or coir peat, expanded clay, rice chaff (peel of the rice), pine bark, polystyrene foam, rock wool, a.s.o., in function by the accessibility, the cost price and experiences obtained in their utilization [1].

It was accumulated thus a good experience, in the last years in the cultivating gerbera countries, like Holland, Italy, France, Brazil, Colombia, Costa Rica and others. Up to day researches conducted in Turin, Italy by Drs. Angelo Garibaldi and Ludovica Gullino [2, 3, 6], has proved extremely helpful in understanding nutritional and watering needs of this plant, as well as establishing parameters for adequate pest and disease management.

Generally, they had in view the acquiring of a good drainage, an increase of air capacity of the substrate as the retention of mineral elements solutions at the level of substrate, to take over by the plants roots, for inducing an increase of the production and quality of the flowers, particularly in the periods with poor light from wintertime.

The aim of this study is to test the capacity of growing soil-less artificial substrate for gerbera, composed by coconut coir, as a substitute for peat.

## MATERIALS AND METHODS

The experiment was done in a glass house built after a Dutch project, through a SAPARD program, having a 1200 $m^2$. surface, located in the Hălchiu locality, Braşov county.

The glass-house is 3,5 m high, the opening of the windows is done automatically, for automatic controlling and adjustment of the temperature and humidity, to the projected parameters for gerbera culture.

Two plastic sheets in what the air is keeping under a necessary pressure form the glass-house walls. The heating is done by natural gas, the thermic agent being warm water, the glasshouse is heated in cold time for achieving the optimal temperature parameters.

The biological material utilized is the Rubin variety, obtained by meristematic culture, imported from Holland. Computerized fertigation was applied through drippers irrigation system.

There were experimented by comparison three variants:

$V_1$ – the culture on raised beds on the soil: the bed is raised 10 cm in comparison to the soil level, and over it, is spreading a layer of 20 cm composed by leaves soil, pine bark, old manure and black peat.

The raised beds have 25-30 cm total height, 90 cm bottom width, 70 cm at upper side and with the path of 40 cm. On every bed were planted two rows of gerbera plants, 30-40 cm distanced, corresponding to 7 *pl/m*$^2$;

$V_2$ – the culture in containers, on 80 cm high tables, able to carry the polythene containers and the plants. The containers have about 5*l* in each volume, with the same culture substrate like in $V_1$, in every containers being planted one gerbera plant;

$V_3$ – the culture in containers, in the same manner like in previous variant, but the culture substrate is made by coconuts coir fibers, material imported from Holland.

At $V_2$ and $V_3$ variants, the plant density on the table is also 7 plants/m$^2$., and the date of planting young plants was 25-th June, three years ago.

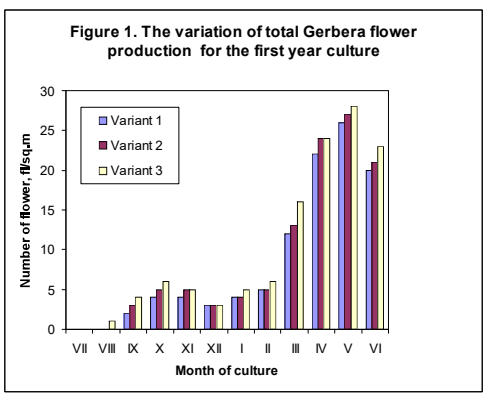
In every variant were studied 28 plants, in four repetitions.

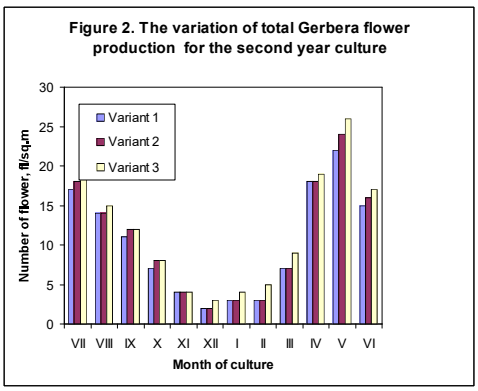
Fertigation was the same for all the variants, utilizing drippers of 2 l/hr capacity, but the frecvency was higher for $V_2$ and V 3, than in the soil. Nutrient solution prepared in a 1,2 m$^3$ tank was applied through the irrigation system and contained the following concentration of nutrients: $NO_3$ – 12 *mmol/l*, $NH_4$ – 1 *mmol/l*, $H_2PO_4$ – 2 *mmol/l*, $SO_4$ – 1 *mmol/l*, K – 10 *mmol/l*, Ca – 2 *mmol/l*, Mg – 1 *mmol/l* and the microelements Fe, Mn, Zn, B, Cu, Mo, with concentrations in the range [1 –25] $\mu$*mol/l*, on the hole, all the mineral elements not exceeding the concentration of 30 *mmol/l*.

The production obtained monthly was registered, on the entire culture period of two years, from every variant and repetition. The beginning of flowering was in the month of July of the planting year, registering of flowers continued until the month of June, the second culture production year.

## RESULTS AND DISCUSSIONS

The number of flowers reported to 1 m$^2$, obtained at each of three variants, on the whole two years culture period, apart for every month, and the total quantity of flowers, are resulting from the following graphics (*figure 1, 2, 3)*:




On the total, in the two years culture, at the three variants, $V_i$, $i \in [1-3]$, they were obtained the following productions, expressed in flowers/ m$^2$ (table 1).

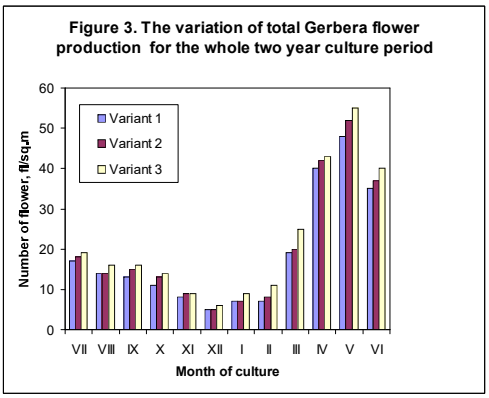



*Table 1.*

**Total flowers obtained from Gerbera culture at all three variants**

| Variant | Total flowers [fl/m$^2$] | from which on the years of culture: | |
|---|---|---|---|
| | | first year | second year |
| $V_1$ | 225 | 102 | 123 |
| $V_2$ | 239 | 110 | 129 |
| $V_3$ | 262 | 121 | 141 |

The experimental data were compared through the method of variation analyses and the determination of test ***F***, for the total gerbera flowers at all three variants, obtained in the two years culture, according to the table 2.

*Table 2.*

**The results of variation analyses and the determination of test F**

| The reason of variability | S.P. | G.L. | $S^2$ | Test F |
|---|---|---|---|---|
| Total | 3370 | 11 | | |
| Repetitions | 296,6 | 3 | | |
| Variants | 2792 | 2 | 1396 | 29,78 (5,14; 10,92) |
| Errors | 281,4 | 6 | 46,88 | |

The experimental value of ***F*** (29,78) exceeding the theoretical value for P=5% and even for P=1%, results that between the three variants are real production differences.

So, $V_3$ - determines the obtaining of a flower production (262 *fl/m*$^2$), distinct significant bigger than at $V_2$ and also bigger than $V_1$ (225 *fl/m*$^2$.). $V_2$, at its turn produces very significant more flowers than $V_1$.

The increasing of flowers number at the variants in containers cultivated on raised table ($V_2$ and $V_3$), take place beginning with the first year production and just from the first month of flowering, what can be explained through a better heating of the culture substrate and a more favorable illumination of plants.

$V_3$ with coconuts coir fibers as culture substrate realized the highest production, the fertigation being the best utilized by the plants, by retention in a good ratio the water and fertilizers substances, with the necessary air for the physiological processes of absorption and synthesis.

In the autumn and winter period, the production decreases at all variants (2-5 *flowers/m$^2$/monthly*) due to the diminishing of daily illumination period, as to the poor light in day time, whereas in the month of April- June it is reached the peak of production (18-26 flowers/m$^2$/month).

From all the 112 gerbera plants that belong to $V_{1,}$ in the two years culture period, 5 plants were affected by *Botrytis* and *Phytophtora* attack and they must be removed from the culture place, while to the others variants the healthy of the plants was better (2 plants were removed at $V_2$ and no one to $V_{3.}$). This is because as the plants are situated in different containers the chance of transmission of diseases is reduced to a minimum, and the water and humidity in the nursery was lower than in soil culture. A big advantage is that the coconuts coir fiber does not have to be disinfected anymore.

The coconuts coir fibers retained better the moisture, reducing the frequency of fertigation and improved the aeration in substrate, determined an strong and healthy root system enhance, with good consequences on vegetative growth and flowers production. To the end of experimentation, after two years of production, the gerbera plants had not losses and looked still vigorous, making possible the production prolonging, for still one year culture cycle, without to be affected the quality of the flowers.

The cultivation in containers on raised table had also some big advantages, in comparison with the culture in glass house soil: crop-maintenance such as leaf picking can be done easier therefore often quicker, reducing in this manner labor requirement per 1000 m$^2$ in hours, especially in the second year of culture.

## CONCLUSIONS

From examination of the gerbera flowers production, at all the tree variants, result the following conclusions:

- the number of flowers reported to 1 m$^2$, obtained in the first culture year is at all variants smaller than in the second culture year ($V_1$ - 102, $V_2$ - 110, $V_3$ - 121, opposite to $V_1$ -123, $V_2$ - 129, $V_3$ - 141);
- between the autumn-winter months production and that of spring months are great differences (2-5 *fl/m$^2$/month*, opposite 18-26 fl/m$^2$/month);
- the phyto-sanitary situation of the plants cultivated in containers on raised tables is better than those cultivated into the soil, the plants from the variant with coconuts coir fibers had not any losses during the two years culture;

- the biggest gerbera flower production, reported at 1 , was obtained at the variant $V_3$, with coconuts coir fibers as artificial culture substrate;
- the coconuts coir fibers proved a well suited medium for plants growing, improving the physical and biological conditions of the culture substrate;
- the cultivation in containers offers good possibilities and can be a significant improvement compared to the cultivation in the soil.

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