

Studies for using frameless plastic in the forcing of some ornamental crops

Lévai P. and Farkas Zs.

College of Kecskemét, Faculty of Horticulture
H-6001 Kecskemét, Erdei F. tér 1.

INTERNATIONAL
JOURNAL OF
HORTICULTURAL
SCIENCE

AGROINFORM
Publishing House, Hungary



Key words: forcing, ornamentals, frameless plastic, protected culture.

Summary: On the basis of a six-year experiment a method was elaborated for forcing and off-seasons growing of tulips, narcissus and gladioli under frameless plastic cover. The advantages of this cheap energy-saving method are manifested in an improved quality of flowers and essentially in the earlier flowering. With this method mostly first-class flowers can be obtained immediately after the season of forcing in heated constructions with plastic cover, and anticipated outdoor flowering.

The possibilities of applying the method are studied on further ornamental plant species (other bulbous plants, *Paeonia lactiflora*, annual ornamentals).

Introduction

It is widely known, that earlier growing can be achieved partly with introducing new cultivars with shorter growing-time, and partly with an improvement of the temperature conditions by the use of glasshouses or plastic-covers. One of these methods is the use of frameless plastic. This method fits well between the season of semi-early forcing and the early outdoor growing.

The method of using frameless plastic cover for growing of early vegetables was developed in Hungary from 1974 on, at the College of Horticulture in Kecskemét. Later the method was applied all over the country through the extension activity of this College.

The aims of the present research were as follows:

- elaborating a technology for growing flowers under frameless plastic cover;
- introduction of an „earliness index“, taking in account the time between the planting and the peak of harvesting season, and the quantity of flowers harvested during the peak-season as well as the quantity of all harvested flowers;
- study of the effect of different kinds and differently perforated plastic covering materials on the shoot growth, earliness of blooming and on the quality of flowers;
- possible prolongation of the marketing season of flowers, by using different combinations of frameless covering and plastic tunnels;
- comparison (and evaluation) of different flower species and cultivars grown under frameless plastic.

Our further aim was to examine the yield and quality of some annual dry flowers and cultivars of *Paeonia lactiflora* grown under different covering systems.

Review of literature

The introduction of plastic as a covering material (cheaper and easier manageable than the traditional greenhouses and frames) involved radical change in the early growing of vegetables in Hungary. This new material made possible the development of several new constructions and new growing technologies as well. Such a new growing method was the frameless plastic bed, where the plastic was supported by ridges (*Filius*, 1982), instead of a frame.

The frameless plastic covering system (*Matthaus*, 1977) is both a material- and an energy saving method. The frameless plastic bed (*Filius, Dobos & Kovács*, 1980), is a modernized form of that.

Filius & Csurgai (1987) pointed out the significant advantages of new plastic covering methods, in early-time growing of bulb-flowers. A 0.03 or 0.04 mm thick polyethylene foil is suitable to cover the beds. This cover increases the protection against the late spring frosts. The heat-saving is enhanced by the high humidity underneath, as it keeps the hidden heat-reserve. According to the measurements of *Filius* (1982), the relative humidity in the frameless plastic beds is 20-25% higher than outside.

For frameless covering plastics with various thicknesses can be used, but with the growing thickness the extra costs become also higher (*Turi*, 1993). According to *Müller* (1977), the most suitable plastic for increasing the earliness is the 10 meter wide and 0.05 mm thick PE (Polyethylene). *Gólya* (1986) points out that the frameless plastic covering is useful both in bringing forward the harvesting time and in achieving a uniform crop-ripening with improved quality.

Pillár (1982) considers that the disadvantages of the frameless plastic cover are a 40-50% loss of useful surface, and the higher amount of the plastic and the labour for making the ridges. In order to decrease these disadvantages, the author made experiments with 5.4 meter wide frameless plastic cover without ridges. The cover was 0.04 thick PE plastic perforated with 350-400 holes/m². The plastic was fixed with soil-covering on the brink of the beds. Compared with ridge-planting method, the advantage of this frameless plastic system was a 1.7 times better utilization of land.

In Germany, mainly 0.025-0.05 mm thick and maximum 12 meter wide closely-perforated PE plastic cover is used. In this case the holes are 10 mm in diameter with 500-700 holes/m² perforation. The number of holes depends on the environmental conditions and the ecological demands of the plants (Seitz, 1981).

Materials and methods

The experiments were carried out with tulip varieties (belonging to Triumph, Darwin hybrid, Parrot, Crispa, Cottage and Lily-flower groups); narcissus belonging to the trumpet-, cup-flowered and double groups; gladioli from the early, early forcing and middle-early forcing groups. From the annual dry flowers *Gomphrena globosa*, *Helichrysum bracteatum* and *Limonium sinuatum* were used. The varieties of *Paeonia lactiflora* were 'Mikado' and 'Instituteur Doriat'.

The bulbs of tulips and narcissus were planted into 90 cm wide beds at a spacing of 10 x 10 cm and 10-12 cm deep between 25 September and 15 October. Then the beds were covered with wood-chip or pine-bark to protect from freezing. The plastic cover and the „Agro“ fleeces-plastic cover (20 g/m²) were put onto the flower beds between 30 January and 23 February.

The gladiolus-corms were planted into the beds between 13 and 20 March with 80 pieces/m² and covered immediately with thin plastic. In order to increase the earliness-index, one part of them were potted up on February 5 and were pre-grown in a heated greenhouse. After the pre-grown plants developed 2-3 leaves, they were planted outdoors (at March 24), and covered with the 400-hole-type thin plastic cover. Along with the frameless plastic, a combination of frameless plastic and 4.5 meter wide unheated plastic tunnel was also studied.

The experiments were laid out in 5 replicates, and with 100 bulbs (corms) per plot. The measurements were taken every 3rd and 7th day - depending on the weather.

Two-factorial randomized block system was used for the study of earliness and the quality of flowers and a simple randomized block system for the study of different coverings. Regression calculations were performed concerning the connection between temperature and earliness of flowering.

For the forcing of annual dry flowers, the width of beds with frameless plastic was 120 cm. Bare-root young plants were planted out into four rows at a spacing of 30 x 25cm².

Paeonia lactiflora plants were planted into 120 cm wide

beds on September 30th, at a spacing of 80 x 60 cm. As a covering material „Agro“ fleeces-plastic cover was used, which was put onto the beds between February 8 and 20.

Results

For the study of the earliness a probability variable (the, so called, „earliness index“) was used, which is the value of the flower numbers after the first peaktime in percentage of the total crop, divided by the number of days until the first peaktime. The value of the chosen probability variable well expresses the earliness, because it takes into consideration the time-factor as well as the quantity until the first peaktime, and the number of flowers harvested during the whole growing season.

Tulips. Darwin hybrid cultivars, 'Red Champion' and 'Pax' under the frameless covered treatment gave significantly earlier blooming compared with the non-covered control. The later flowering species gave significantly earlier peaktime with the use of the double covering method (Figure 1).

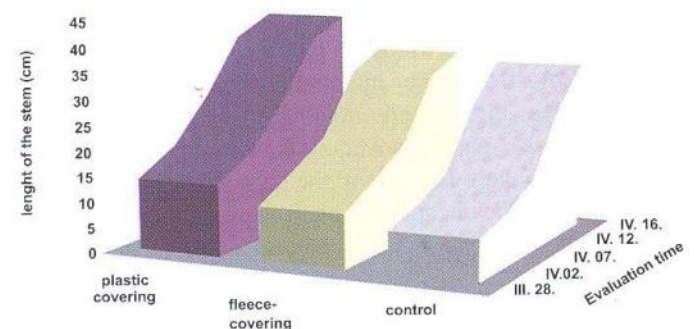


Figure 1 The shoot-growth of 'Apeldoorn' tulips (Keeskemét, 1987)

In average, the different covering methods gained in earliness 7-9 days as compared to the uncovered control. (With the fleeces-plastic covered plants 7 days, and with the thin „400-hole-plastic“ 14 days). The peakperiod of the tulips became three times longer with the combined use of different covering systems. Flower quality of the covered plants was better than that of the uncovered control.

Narcissus. The varieties 'Dutch Master', 'Carlton', 'Ice Follies' and 'Prof. Einstein' proved to be earlier. The gain of earliness of various covering systems was 5 days (in the average of varieties). With the fleeces-plastic covering 6 days earlier flowering was achieved and with use of frameless plastic cover 11 days. The peakperiod became nearly one month (26 days) longer with the combined use of various covering systems. Using frameless cover under a plastic tunnel the flower stems became by 5-6 cm longer because of the favourable soil-moisture and humidity.

Gladiolus. Variety 'Summer Time' proved to be the earliest. Pre-forced and „400-hole“ thin plastic covered plants bloomed significantly earlier than the uncovered

plants. Comparing different perforated thin plastic coverings or fleece-plastic cover, there was not much difference in earliness (3–6 days only). The gain of earliness was one week under fleece-plastic and 10 days under thin PE plastic. The average peak-period became three times longer with the combined use of various plastic covering and the pre-forced plants. The stem length of 5% of the plants forced in plastic tunnel was better than that of the outdoor plants. In this respect, no difference was found between the frameless plastic cover and the uncovered control.

The correlation between the cut flowers and temperature was examined on the example the 'Utopia' gladiolus variety. The so called two variables regression calculation showed a moderate correlation significant on $P = 1\%$ probability level.

Annual dry flowers. Plants covered with „400-hole“ frameless plastic cover and planted out earlier gave 1.5 or 1.7 times higher yields. The optimal spacing of plants under the frameless plastic cover was as follows: of *Gomphrena globosa* 13, *Helicrysum bracteatum* 10, annual *Limonium sinuatum* 8 plants/m². *Helicrysum bracteatum* sown directly in the bed and covered with frameless plastic gave results close to the uncovered plants. The perforated plastic cover influenced favourably the size of flowers. Production of dry flowers in frameless plastic bed can be mechanized, as well.

Paeonia lactiflora. Both the fleece-plastic cover and the unheated plastic house increased significantly by the earliness. The higher and more regular temperature and humidity under plastic covers influenced favourably the stem-length as well. Because of the bulkiness of these plants it seems to be the cheapest to plant them simply out in the field and then to cover them with good aeration, i.e. closely-holed (600 or 800 holes/cm²) polyethylene or fleece-plastic (Lévai, 1985).

Conclusions

An evaluation method of earliness (so called earliness-index) for bulb (or-corm)-grown ornamental plants was developed.

Bulb-flowers (tulips, narcissus, gladioli) can be grown under different plastic covers, like 400-holes or 600-holes normal 0.04 mm thick polyethylene plastic cover or fleece-plastic. Using frameless plastic cover makes possible to increase the earliness of flowering, to improve the quality of plants and to extend the period of sale.

With annual dry flowers, it is possible to improve the crops (yield and quality) and to get a reduction of expenses by direct sowing instead of planting out pre-grown transplants.

With flowering perennials both earliness and longer flowering time can be achieved with the use of frameless plastic and double plastic.

In the large scale growing of dry flowers and early flowering perennial ornamental plants mechanized methods of frameless plastic covering are also available.

References

- Filius I. (1982):** A hő- és fényenergia hatékonysága a zöldségajtatásban. (Efficiency of the heat- and light energy in vegetable growing). Doktori értekezés.
- Matthaus D. (1977):** About the result of experiments with frameless plastic cover in Seeland in 1976. *Gemüsebau* (3): 47-52.
- Filius I., Dobos L. & Kovács A. (1980):** Using frameless plastic beds is possible to increase the utilization of the sunshine in early vegetable growing. *Nemzetközi Mezőgazdasági Szemle* (2): 71-77.
- Filius I. & Csurgai L. (1987):** The use and developing of the plastic in the Hungarian agriculture and plastic-industry. CIPA Kongresszus előadás-kivonat. Budapest.
- Turi I. (1993):** Zöldségajtatás. (The vegetable forcing). *Mezőgazda Kiadó, Budapest.*
- Müller G. (1977):** Frühkartoffel produzieren unter Flach folie. (The early potatoes growing under the veil plastic cover). *Top. Agrar.* (3): 50-51.
- Gólya E. (1986):** A váz nélküli takaró- és fólia fátol. (The frameless covering and veil plastic). *Kertészet és Szőlészet* (12): 4.
- Pillár J. (1982):** Takarás bakhát nélkül. (Covering without ridges). *Kertészet és Szőlészet* (8): 6.
- Seitz P. (1981):** The serial use of frameless plastic cover in outdoor vegetable growing. *Műanyagok a Mezőgazdaságban Kollokvium.* Budapest.
- Lévai P. (1985):** The frameless plastic covering of ornamental plants. In: Somos, A - Filius, I. - Turi, I. (eds.), *Műanyagok a kertészetben.* Mezőgazdasági Kiadó, Budapest.