THE EFFECT OF DAYLENGTH AND TEMPERATURE ON GROWTH AND FLOWERING OF TRACHELIUM CAERULEUM

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Abstract

T r a c h e l i u m c a e r u l e u m is a new attractive cut flower suited for commercial growing.

In the summer 1984 an experiment was carried out to investigate the influence of daylength (12, 16 or 20 h) and temperature (12, 15 or 18°C) on the growth and flowering of pinched and non-pinched plants of Trachelium.

A daylength of 20 h was essential for 100% flower induction. High temperature decreased the time to flowering, the amount of low branching and the plant height compared to the lower temperatures. Pinching increased the number of stems produced per square meter.

Introduction

For some years work has been going on at the Institute of Glasshouse Crops with the development of new cut flowers. One of the plants which is of interest is T r a c h e l i u m c a e r u l e u m L. (family: Campanulaceae) (Bredmose & Pilgaard, 1984).

Trachelium is an erect perennial herb 0.5-1 m high. The numerous small violet-blue flowers are borne in corymbose panicles.

The good vase-life and steady stems make Trachelium an interesting new cut flower well suited for commercial growing.

The natural flowering period of Trachelium is July to September. To control flowering it is necessary to know the reaction of the plant to different daylengths and temperature levels.

Our own early observations suggested that long day was essential for flower induction (Bredmose & Pilgaard, 1984). This was confirmed by results of van der Krogt (1983, 1985).

The temperature level has an influence on time of flowering (van der Krogt, 1985). The recommended day temperature is in the range of 10°C to 15°C.

The present experiment was carried out to investigate the exact influence of daylength and temperature on growth and flowering of pinched and non-pinched plants of Trachelium caeruleum.

Methods

Seeds of T r a c h e l i u m c a e r u l e u m L., provided by the Botanic Garden of Copenhagen, were sown 16 March. The seedlings were transplanted once and planted 11 May. Plant density was 31 plants per m^2.

The experiment was carried out in the phytotrone at the Institute of Glasshouse Crops. The plants achieved natural daylight in the glasshouse compartment from 6 a.m. to 6 p.m. Long day conditions were obtained by extending the day with 40 W per m^2 incandescent lamps, installed in dark chambers (the photo flux density was 3.5 +/- 1.9 $\mu Em^{-2}s^{-1}$). CO_2 was supplied (1000 ppm) in the daytime.

In the experiment the following factors were compared in a factorial design:

1. Plant material
    1. non-pinched plants
    2. pinched plants. Thinned to 3 shoots
2. Daylength
    1. 12 h
    2. 16 h
    3. 20 h
3. Temperature
    1. 12°C (ventilation at 14°C)
    2. 15°C (ventilation at 17°C)
    3. 18°C (ventilation at 20°C)

Recordings and measurements may be seen from the table and figures.

The data has been treated statistically using factorial analyses of variance and Duncans Multiple range test at the 5 per cent level.

Results and Discussion

Daylength clearly shows to have a great influence on flower induction (fig. 1).

Apparently the percentage of flowering (number of flowering plants x 100/total number of plants) is much better for the non-pinched than the pinched plants. This might be due to an induction in a very early stage of development. When the plants are pinched this early flower induction is probably removed. In light of this the pinched plants gave the most correct impression of the influence of the daylength on flower induction and therefore there will be a further analysis of these results:

By increasing the daylength from 12 h to 20 h the percentage of flowering increased significantly. Only 20 h day gave a 100% flower induction. Results of van der Krogt (1983, 1985) suggested that 16 h daylength was enough to initiate a 100% flower induction. The disagreement in our results could be caused by the special conditions which rule an experiment in a phytotrone where daylight changes directly to darkness without any inserted period of twilight.

Takimoto and Ikeda (1961) has carried out some experiments to investigate the effect of twilight on short day plants. An illuminance as low as 1 lux was recorded as day by Pharbitis, Glycine, Perilla and Xanthium. Maybe twilight is as important to other plants including Trachelium, but to our knowledge no experiments of this kind have been carried out with long day plants.

The effect of temperature on time to flowering has been studied by van der Krogt (1985). By rising the minimum temperature from 8°C to 13°C the time to flowering was reduced by 4-5 weeks. Apparently this period could be further reduced by increasing the temperature to 18°C (table 1). Increasing the temperature from 12°C to 18°C reduced the time to flowering by approximately 3 weeks. The quality was not affected negatively by this high temperature.

Another positive effect of increasing the temperature is that the plants become shorter (fig. 2). A Trachelium crop often has the tendency to grow too tall. By rising the temperature from 12°C to 18°C the plant height was reduced by 15-20 cm. This gave a final plant height of approximately 70 cm which is satisfactory.

Additionally it was observed that low branching was more abundant when the temperature was fixed at 12°C compared to 18°C, especially when the plants were non-pinched. Low branching reduces the quality noticeably and should be avoided.

Finally, pinching significantly increased the number of produced stems per m^2 compared to non-pinched plants providing the day-length was kept at 20 h. The quality was not noticeably affected.

References

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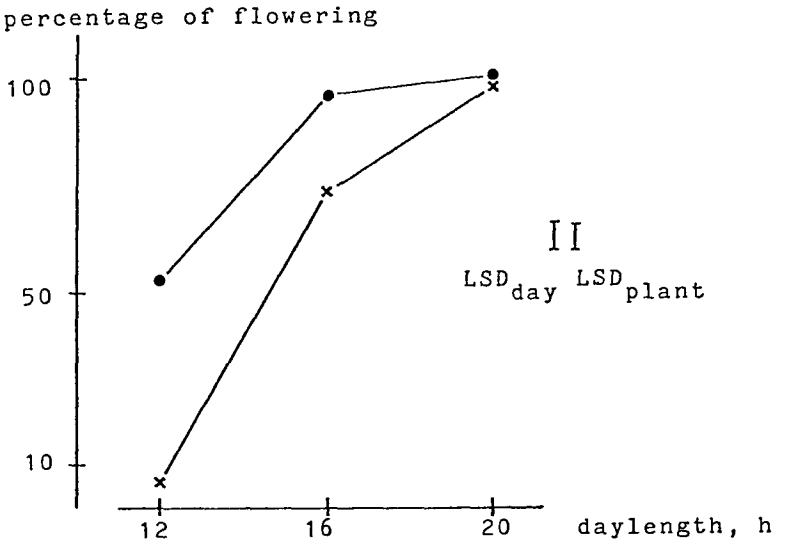

Fig. 1. Influence of daylength on percentage of flowering. Average of three temperatures.
• non-pinched plants x pinched plants
$LSD_{.95}$ plant: for comparison between non-pinched and pinched plants at the same level of temperature or daylength.
$LSD_{.95}$ day or $LSD_{.95}$ temp.: for comparison between two daylength means (or temperature means). Either within the same plant type or between different plant types.

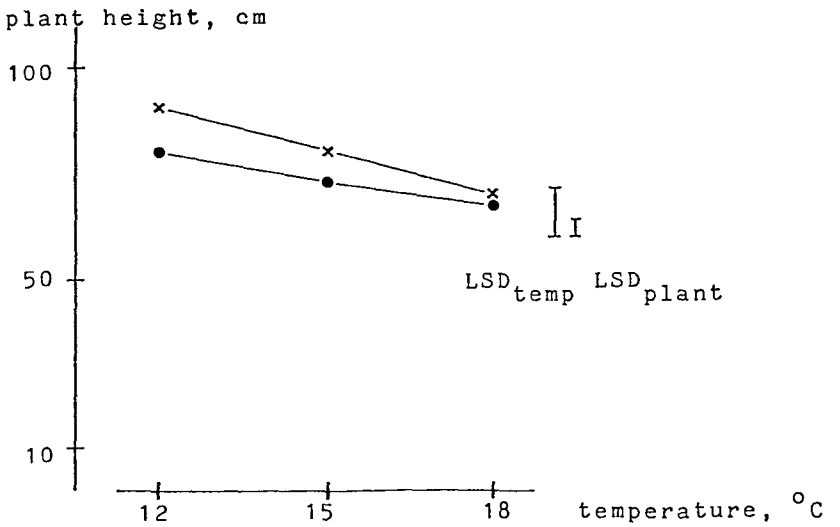

Fig. 2. Effect of temperature on plant height. Average of three daylengths.
• non-pinched plants x pinched plants
LSD: Text as figure 1.

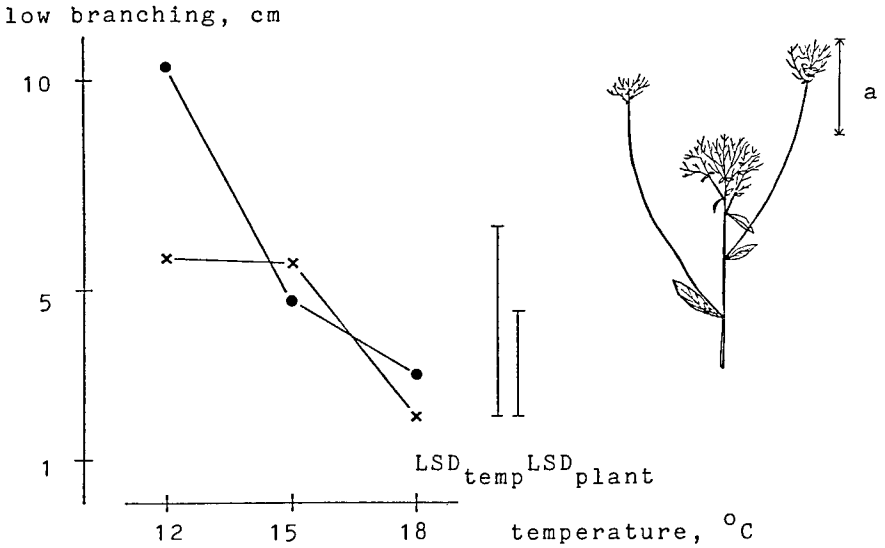

Fig. 3. Effect of temperature on the degree of low branching. Average of three daylengths.
a = degree of low branching measured in cm
• non-pinched plants x pinched plants
LSD: Text as figure 1.

Table 1. Effect of temperature on time from planting to flowering (time of harvest). Average of three daylengths and two types of plant material.

Temperature, °C	Days to flowering
12	106.3
15	93.0
18	82.0
$LSD_{.95}$	1.0