

EFFECT OF DAY AND NIGHT TEMPERATURES ON EARLINESS AND FRUIT PRODUCTION IN CUCUMBER

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Abstract

The influence of day and night temperature, during the period from planting till start of production, on earliness and the aftereffect on production of a greenhouse winter cucumber crop was studied in the climate glasshouse at Naaldwijk.

Increasing night temperatures from 12-20°C did decrease earliness; a further increase till 24°C did not influence earliness. Only a slight effect on production and yield was found.

Increasing day temperatures from 20-26°C did decrease earliness. A day temperature of 17°C disturbed plant development completely. A positive effect on yield and production was found from increasing day-temperature, probably caused by a better shoot development.

Introduction

In an experiment on the influence of night temperature in an early cucumber crop, planting December, January, it was found that night-temperature influenced considerably the earliness of the production, time from planting till first cucumber fruit, but not the rate of production (Van de Vooren et al, 1978). This remarkable difference in temperature influence on cucumber plants before and during production gave the impulse to investigate this first period more closely, both theoretical and practical.

Development, e.g. leaf formation, is one of the temperature sensitive mechanisms in the plant and closely related to earliness of production. This mechanism, dependent on temperature and radiation, can be described in a model as was shown by Challa et al (1979).

From a practical point of view this relation can be used to optimise temperature in a cucumber crop (Challa et al, 1980, Van de Vooren et al. 1980). The question still remains: has the temperature an after-effect on production. Since development is dependent on radiation, it is worthwhile to investigate the effect of day temperature in a practical experiment.

Material and methods

Cucumber plants - c.v. 'Corona', about 30 days old - were planted every week (4 times) from 13 December 1978 in the climate glasshouse (Van de Vooren et al. 1975). Temperature, from 15 December 1978 till 1 March 1979, (night/day) was in 3 replications:

12/23, 16/23, 20/23, 24/23 and
16/17, 16/20, 16/23, 16/26°C.

Plants, 10/treatment, were individually harvested twice a week.

The production curve showed two periods, one for main stem fruits and one for shoot fruits. The earliness for the different treatments was calculated from the main stem fruits.

The kg price in the Netherlands (1974-1978) can be represented by:
 $\log y = 2.494 - 0.0312 x$,
x = weeknumber
y = price in cents/kg (100 cents = 1 Dfl).

Results

The medium calculated earliness of 3 x 10 plants, in days from planting, for the different night/day temperature treatments are represented in table 1.

An increase in nighttemperature from 12 to 20°C decreased the number of days till first production (= earliness) with 14 days. A further increase did not or slightly decrease earliness. An increase in daytemperature from 20 to 26°C decreased earliness with 7-14 days. The temperature treatment 16/17°C did not develop normal fruits (Van de Vooren et al. 1980a).

The production and yield of the treatments with a start of production at 1 March are used to observe the after effect of the temperature (table 2). Production is the number of fruits and weight in kg/plant from 1 March till 17 May. Yield is the result in guilders (Dfl) of production at 17 May.

The 12°C nighttemperature did slightly affect the later production and yield, but a further increase of nighttemperature did not. An increase in daytemperature did increase the later production and yield.

Discussion

Temperature has a clear effect on earliness, most probably caused by its influence on development of shoots and leaves. This is shown by the completely disturbed plant development in the 16/17°C treatment (Van de Vooren et al. 1980a).

The effect of nighttemperature on earliness levels off above 20-24°C. The effect of daytemperature did not reach its maximum at 26°C. This fits well with the data collected by Challa et al (1979).

A nighttemperature, not exceeding 20-24°C, seems recommendable in the first period of a cucumber crop. The optimum temperature remains an economical question, dependent on energy input and cucumber price (Challa et al. 1979, Challa et al. 1980 and Van de Vooren et al. 1980b).

The increase of later production at increasing daytemperatures could be explained by a better plant development, especially of the shoots. The commercial grower of cucumbers can be advised to look carefully at shootdevelopment and if necessary increase daytemperature preferably using natural radiation, taking into account CO₂-level in the glasshouse.

Research will be carried out, concerning the temperature during the production periode taking into account shootdevelopment.

References

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Table 1 - Earliness in days for night/day temperature treatments ($^{\circ}\text{C}$) and 4 plantings.

	1	2	3	4
12/23	75	68	68	66
16/23	68	61	61	62
20/23	61	54	54	52
24/23	61	54	54	48
16/17	-	-	-	-
16/20	75	68	68	62
16/23	68	61	61	62
16/26	61	57	54	55

Table 2 - Production in number and kg, mean fruit weight in g and yield in Dfl from 1 March - 17 May for night/daytemperature treatments ($^{\circ}\text{C}$).

	Number	kg	g	Dfl.
12/23	24	10.5	437	15.4
16/23	27	11.2	415	17.2
20/23	26	11.2	430	17.8
24/23	26	11.2	430	17.8
16/17	-	-	-	-
16/20	25	10.4	416	15.3
16/23	27	11.2	415	17.2
16/26	28	11.8	421	18.5