

Timing of fleece covering and uncovering in production of early carrots

Purpose:

To investigate the potential loss when postponing the fleece covering of carrots after seeding and to investigate timing of uncovering the carrots before harvest

Background:

Normal practice in carrot production in DK has been to cover the early seeded carrots just after seeding and uncover them again in middle of June or just a few days before harvesting. However, often the capacity or weather conditions are not always suitable for fleece covering the same day as seeding. Sometimes it's too windy or too wet for a few weeks before successfully fleece covering. In literature carrots are given to germinate at very low temperature (1.3 °C according to Andersen 1991 and 4.4 °C according to Maynard 2007). So even though it seems very cold the first weeks, carrots might lose some important germination days and earliness. In this investigation we want to see how much it costs to delay the fleece covering. In middle of May and often in June there will be days in DK with high temperatures over 25 °C. In literature optimum temperature for carrot production is often told to be around 18-20 °C (i.e. Maynard 2007). Over 25 °C may reduce the growth rate and over 28 °C may reduce the growth rate dramatically. With temperatures from 16 °C and up to 25°C carrots will produce longer leaflets with increasing temperature. Short leaflets are preferable for bunch carrots.

Based on this it's often discussed among carrot growers when to take off the fleece. With this investigation we want to find the optimal timing for fleece uncovering.

Description:

The carrot field was seeded on the 18th of February in field 600-0 at Midt Jutland in Denmark, with the variety Napoli.

Trial was established on the 19th of February with fleece covering of the first 6 plots.

Temperature-loggers logging the temperature every hour were wrapped in alufoil and laid out in each plot on soil surface - not covered by soil.

The fleece delivered for the test was 19 g's fleece from Novagryl. The surrounding field was covered with fleece on the 23rd of February.

Test plan for field 600-0

Plot	Covering data	Uncovering date	Harvest date
1.	19. Feb.	2. June	29. June
2.	19. Feb.	21. May	
3.	19. Feb.	16. June	
4.	19. Feb.	2. June	
5.	19. Feb.	21. May	
6.	19. Feb.	16. June	
7.	06. March	2. June	
8.	06. March	2. June	
9.	20. March	2. June	
10.	20. March	2. June	

11.	Control		
12.	Control		

Temperature loggers EL-USB-1 were collected again when the last fleece cover was taken off. Loggers were set to log temperature each 60 min's. Temperature data were used to calculate Growing Degree Days with base temperature at 3.3 °C according to Maynard 2007.

Vegetation index (NDVI) was measured with GreenSeeker on days where the fleece was taken off.

Results:

Timing of fleece covering and uncovering 2015

Covering date	Uncovering date	Top ton/ha	Root ton/ha	Weight g/root	
19 Feb.	1 June	29	57	39	<i>Fleece covering and uncovering on time</i>
19 Feb.	18 May	26	52	37	<i>Fleece uncovering 14 days too early</i>
19 Feb.	15 June	27	50	34	<i>Fleece uncovering 14 days too late</i>
05 March	1 June	27	54	36	<i>Fleece covering 14 days after seeding</i>
19 March	1 June	26	51	38	<i>Fleece covering 28 days after seeding</i>
Control	-	25	38	28	<i>No fleece</i>

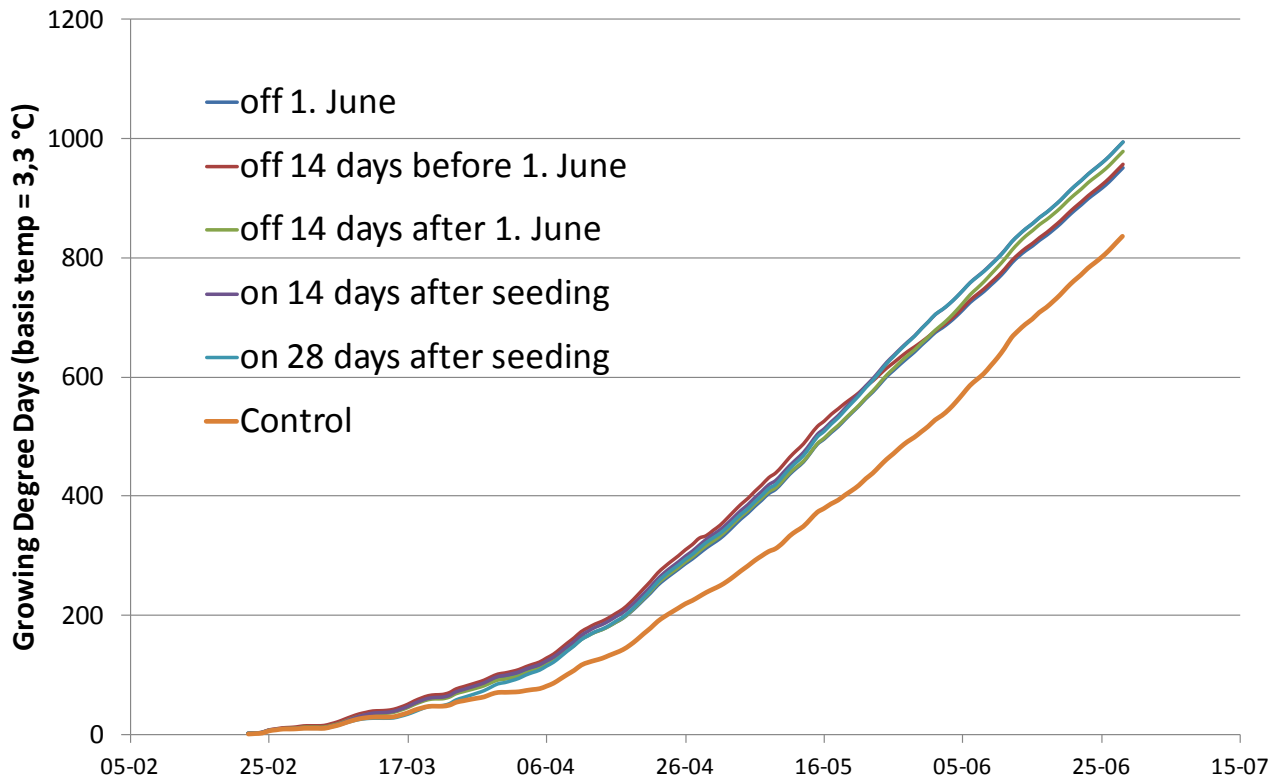
Harvest day: 29th June

Timing of fleece covering and uncovering 2015

Covering date	Uncovering date	GreenSeeker NDVI
19 Feb.	1 June	0,84
19 Feb.	18 May	0,80
19 Feb.	15 June	0,81
05 March	1 June	0,83
19 March	1 June	0,82
Control	-	0,73

NDVI was measured just after uncovering on the 15th June

The week before harvest and on the day of harvest, a test digging was conducted in the fleece covered carrot around the trial. This test showed a growth rate of 1.5 ton/day/ha. Normal growth rate would be around 2 ton/ day/ha. Water deficit during that week might explain the slowdown in growth rate.



Growing degree days (GDD) show very little difference. Only the control plots with no fleece are significantly lower than the rest. The growing degree days for control plot hits 800 around 12-14 days after plots with fleece cover. That corresponds very well with the yield calculations.

Conclusions:

- When the fleece is taken off too late, the canopy gets long, thin and lanky. That was the result where the fleece was staying on the carrot until the 15th of June.
- On the day when the last fleece was taken off, the canopy looks pale and light green. The canopy looks very dense and with dark green color in all plots where the fleece were taken off very early and in the plots where there were no fleece at all, compared to fleece covering to 15th of June.
- Even though there were some differences in the canopy density and color, there were only small differences in the NDVI readings reflecting the vegetative index. NDVI readings might be a tool for optimizing the nitrogen fertilization, but probably not a tool for timing the fleece uncovering.
- In the plots without fleece cover there were around 5 % flowering carrots. Flowering can be initiated by senescence induction when weather is cold in early spring.
- Provided the growth rate is 1.5 ton/day/ha:
 - taking the fleece off 2 weeks too early will postpone harvest by 3 days
 - taking the fleece off 2 weeks too late will postpone harvest by 4.5 days
 - covering with fleece 2 weeks after seeding will postpone harvest by 2 days
 - covering with fleece 4 weeks after seeding will postpone harvest by 3.5 days
 - when fleece covering and uncovering is timed correctly, carrot will be ready 12 days before carrot with no fleece.

At optimal conditions growth rate can easily be 2-2.5 ton/day/ha in early carrot just before harvest time. Under those conditions fleece covering will only give the farmer 7-9 days earlier harvest. Those 7-9 days earlier harvest must be able to pay the price that it costs to cover the carrots with fleece. Given that often farmers are not able to determine the optimal timing of fleece covering and uncovering, there might only be one week gained by covering carrots with fleece!

Based on this test it's not possible to estimate an optimal number of Growing Degree Days for the fleece cover to be taken off. It's not clear where to place the temperature logger to get a good impression of how the carrots are affected by the temperature fluctuations. Growing Degree Days are probably not a good tool for timing the fleece uncovering.

Appendix

Foto taken 6st of March



Foto taken 15th of May



Temperature logger EL-USB-1



Foto taken 1st of June



Foto taken 1st of June



Harvest 29th of June



Literature:

Maynard 2007: *Donald N. Maynard and George J. Hochmuth 2007. Knott's Handbook for Vegetable Growers. Fifth Edition. ISBN 978-0-471-73828-2*

Susanne Klug Andersen 1991. *Grønsagsdyrkning. 2. Letrevideret udgave. 1. oplag.*

Lars Møller, 14.01.2015