

Bio-stimulants in Dahlia

2018

Worldwide Expertise for Food & Flowers



Commissied by
First-Tree B.V.
Prins Mauritsplein 1A
2582 NA The Hague
The Netherlands

Date
21 januari 2019

Project number
Dahlia Plantversterkers 2018

Version
Final

Executed by
Delphy Flower Bulbs and Tubers
Weeresteinstraat 10
2181 GA Hillegom

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Summary

Flower bulbs and tubers go all over the world. Customers are demanding stricter requirements on the products they buy, soil fertility is under pressure and the number of available crop protection products is decreasing. The pressure on available land for growing is increasing, and there is too little growing soil with the right conditions. The disease pressure is growing and the rotations for crop rotation are often tight. In addition, the quality of the surface water does not suffice in many places. The current agricultural system is not a sustainable situation. Natural resources are becoming depleted, biodiversity is under pressure and the soil is becoming weaker. This requires a new cultivation method with attention for a healthy environment and the right balance within the entire ecosystem.

On the initiative of Delphy team Flower Bulbs and Tubers, a study was carried out in 2018 that focused on the following issue: What is the effect of applying bio-stimulants in dahlia cultivation? And does the use of these bio-stimulants have a positive effect on the total yield?

The research Bio-stimulants in Dahlias was carried out in 2018 on the Testing Ground of Delphy Flower bulbs and Tubers, located at Heereweg 466 in Lisse, The Netherlands. The plot is a dune sandy soil with 1.5% organic matter. All 9 treatments were fertilized in the same way via NBS (nitrogen fertilizer system) and all 9 treatments were sprayed twice with a fungicide against leaf spot disease.

The treatments with bio-stimulants consisted of different soil and crop treatments.

The most important results were:

Relationship between crop vitality and applying bio-stimulants

The crop condition due to different soil and crop treatments with bio-stimulants has no relation with the total harvested weight.

Effect on total harvest weight by applying bio-stimulants

The investigation on bio-stimulants in dahlias has shown that a number of bio-stimulants within this study have a significant effect on the total harvested weight of dahlias.

1 Introduction and objective

Flower bulbs and tubers go all over the world. Customers put more and more stringent demands on the products they buy, soil fertility is under pressure and the number of available crop protection agents decreases. The pressure on the available area for cultivation increases and there is insufficient arable soil having the right conditions. The pressure due to diseases grows and crop rotations often are tight. Furthermore, the surface water quality in many places does not meet the requirements. The current agricultural system is not tenable. Natural resources are depleted, biodiversity is under pressure and the soil is weakened. A new way of cultivation is required including attention for a healthy environment and a properly balanced ecosystem.

In dahlia cultivation, the leaf spot disease *Entyloma dahliae* Syd. causes early crop senescence resulting in a considerable yield loss. Normally, 4 to 5 crop protection sprays against leaf spot disease are applied during regular dahlia cultivation. By treating the soil and the dahlia crop, the vitality of the dahlias is investigated and the susceptibility to leaf spot disease. During this investigation only 2 crop protection sprays against leaf spot disease have been applied.

This investigation has the following objectives;

- Can the susceptibility of dahlias to leaf spot disease be reduced by soil and/or crop treatment with bio-stimulants?
- What is the influence of bio-stimulants on dahlia growth and yield?

2 Material and methods

2.1 Experimental setup

The complete investigation of Bio-stimulants in Dahlias comprised 9 different treatments with 4 random repetitions. Field length was 1 meter. Distance between fields was 1 meter. Beds at the edge 2 times, of which 2 lines planted. All treatments were sprayed twice with a crop protection spray against the leaf spot disease *Entyloma dahliae* Syd.

Cultivar: Arabian Night. A total of 4 lines per meter bed were planted. Plant distance was 16 cm, so 6 cuttings per line of 1 meter. 24 cuttings per meter of bed.

Planting schedule

Experiment 5

2 lines empty	Edge Garden Wonder				2 lines Edge Garden Wonder	2 lines empty
	9 A	6 B	4 C	7 D		
	8 A	2 B	5 C	1 D		
	7 A	4 B	8 C	9 D		
	6 A	7 B	6 C	2 D		
	5 A	1 B	2 C	8 D		
	4 A	9 B	3 C	4 D		
	3 A	5 B	7 C	5 D		
	2 A	3 B	1 C	6 D		
	1 A	8 B	9 C	3 D		
	Edge Garden Wonder					

Figure 1: Dahlia planting schedule at the Testing ground of Delphy Flower bulbs and Tubers

2.2 Treatments

The bio-stimulants used in this investigation have been provided in different ways; either mixed through the soil, applied to the furrow, poured/spread after planting, sprayed on the crop or a combination of these application methods. Table 1 summarizes the application methods per treatment.

Table 1 Bio-stimulant application method per treatment

Treatment	Soil before planting	Furrow	Pour/spread after planting	Crop
Control	-	-	-	-
First Tree		-	-	X
#3	X	X	-	X
#4	X	-	X	-
#5	X	-	-	-
#6	X	-	-	-
#7	X	-	X	X
#8	X	-	-	-
#9	-	-	-	X

2.3 Accommodation and cultivation data

The investigation 'Bio-stimulants in Dahlias' has been executed at the testing ground of Delphy Flower bulbs and Tubers, located at Heereweg 466 in Lisse, The Netherlands. The plot is a dune sandy soil having 1.5% organic matter.

- The dahlia cuttings have been planted on June 13, 2018. Fertilization has taken place according to NBS (nitrogen fertilizer system) en has been similar for all treatments.
- Due to a period of drought and tropical weather conditions, irrigation has taken place on July 3 and July 20, 2018.
- Fa. Bisschops has applied 2 sprays against leaf spot disease on August 9 and September 7, 2018. Both sprays have been executed using 0.55 kg per ha Folicur WG.
- During the growth season the dahlias have been cut back three times viz. July 30, 17 August 17 and en September 17, 2018.

- On November 14, 2018 the dahlias have been chopped and on November 15, 2018 the dahlias were lifted. Determination of the yield has taken place on November 21 and 22, 2018.

2.4 Observations

During the experiment, observations regarding the crop condition have been taken at 2 instances. After lifting the yield per treatment has been determined by recording the yield of 24 tubers in kg as well as the average weight per harvested tuber.

2.5 Processing

The results have been processed using the statistical program Genstat.

Genstat is a statistical software package for agriculture and horticulture. Using Genstat, a distinction can be made between a difference due to random error and a significant difference. In the tables this is indicated by the lsd (least significant difference). All differences smaller than the lsd are insignificant. The significance level for this experiment is 5%.



Picture 1: Lifted dahlia tubers from 1 repetition

3 Results

During cultivation the crop condition was monitored, whereby a poor condition was rated as 1 and a good condition was rated as 10.

Table 1: Crop condition on July 27 and September 17, 2018 as influenced by various bio-stimulant treatments on soil/crops

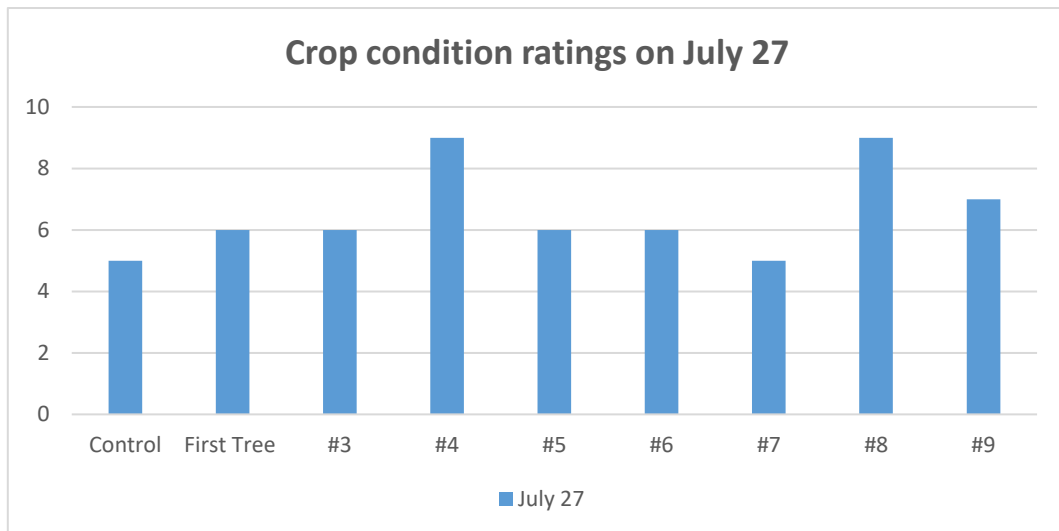
Treatment	July 27	September 17
Control	5	7
First Tree	6	6
#3	6	7
#4	9	8
#5	6	8
#6	6	7
#7	5	10
#8	9	9
#9	7	9
lsd	1.5	1.4

lsd = least significant difference

The bio-stimulants had a significant effect on the crop condition on July 27 and September 17. On July 27, the crop condition was worst in the untreated control and the dahlias treated with the product from treatment 7. The best condition was observed in the dahlias treated with the products from treatments 4 and 8. The next best condition was that of the dahlia treated with the product from treatment 9. The difference between the other treatments was not significant.

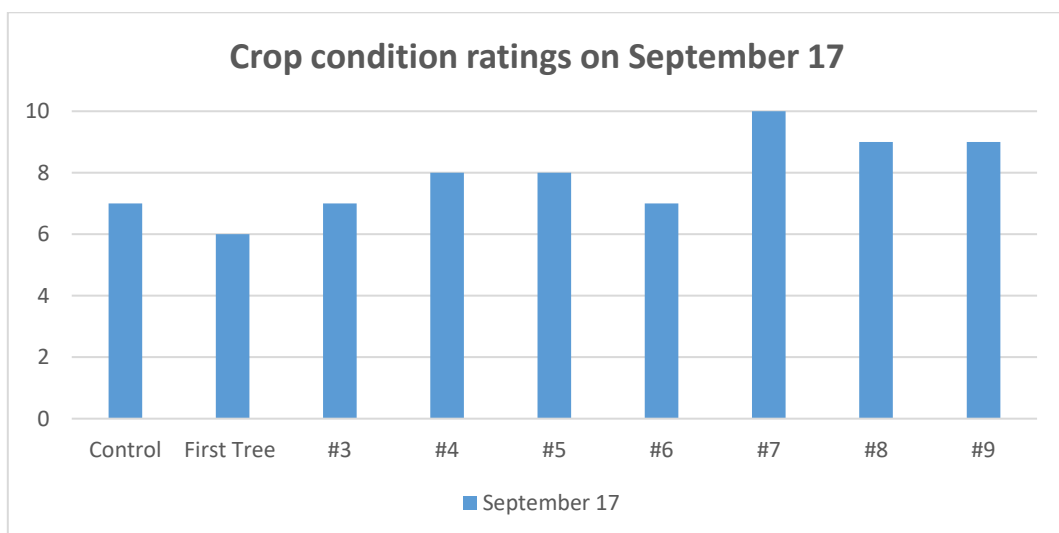
On September 17, the worst crop condition was observed in the dahlias treated with the product from treatment 2. The dahlias treated with the product from treatment 7 had the best condition. The next best condition was that of the dahlias treated with the products from treatments 8 and 9. The difference between the other treatments was not significant.

The crop condition ratings are visually presented in graphs 1 en 2.



Graph 1: The influence of soil/crop treatment on crop condition on July 27, 2018

On July 27, the dahlias treated with the products from treatments 4 en 8 showed a crop condition far exceeding that of any of the other treatments.



Graph 2: The influence of soil/crop treatment on crop condition on September 17, 2018

On September 17, the dahlias treated with the products from treatments 7, 8 and 9 showed a crop condition far exceeding that of any of the other treatments.

On November 15, 2018 the experimental tubers were lifted and during November 21 and 22, 2018 they were assessed by recording the yield of 24 tubers in kg and the average weight per lifted tuber.

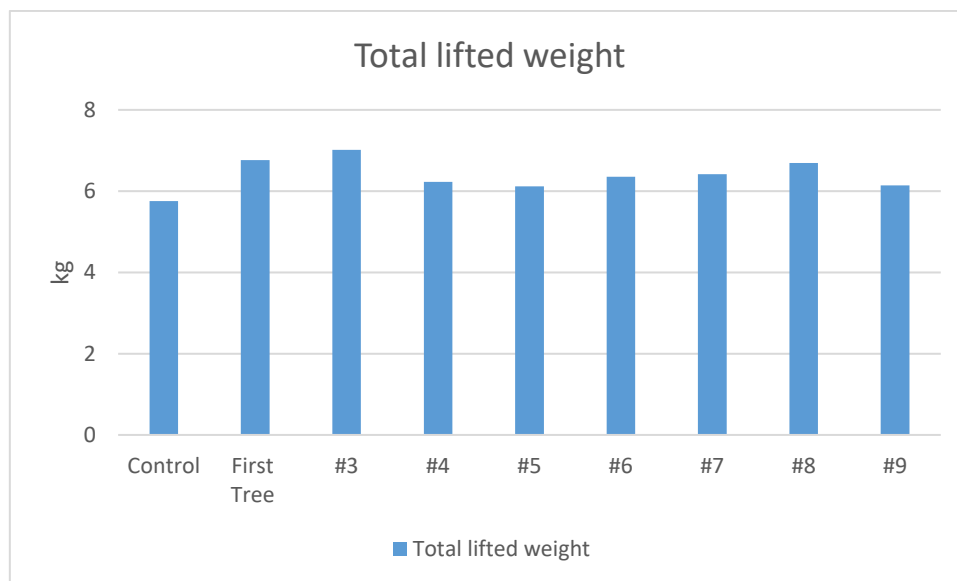
The average weight of 24 lifted tubers for all treatments was 6,386 grams. The effect of the various bio-stimulants on the yield was significant.

Table 3: Total weight of 24 lifted tubers and average tuber weight on November 21, 2018 as influenced by various bio-stimulant treatments

Treatment	Total weight of 24 lifted tubers in kg	Average weight per lifted tuber in g
Control	5.756	239.8
First Tree	6.762	281.7
#3	7.014	292.3
#4	6.228	259.5
#5	6.115	254.8
#6	6.352	263.7
#7	6.418	267.4
#8	6.690	278.8
#9	6.142	255.9
lsd	0.627	1.4

lsd = least significant difference

Graph 3 displays the lifted weights from table 2.



Graph 3: Total weight of 24 lifted tubers as influenced by various bio-stimulant treatments

The treatments had a significant effect on the total lifted weight. The yield of the untreated control was the lowest. The yield of the tubers treated with the First Tree products and the products from treatments 3 and 8 was significantly higher than the yield of the untreated control. The highest yield was observed for the tubers treated with the products from die treatment 3. There was very little difference in yield between the other treatments.

Leaf spots have not been observed during this investigation, including in the untreated control. Therefore, it has not been clarified whether the application of bio-stimulants reduces the susceptibility to this disease.

4 Conclusions

Due to the absence of leaf spot disease, it has not been clarified whether the application of bio-stimulants reduces the susceptibility of dahlias towards leaf spot disease.

- The application of bio-stimulants increased the yield of Dahlias.
- There is no relation between crop condition and total lifted weight due to various soil and crop treatments.
- The bio-stimulant of First Tree and bio-stimulants numbers 3 and 8 have significantly increased the yield.

Annex 1: Treatment schedule First Tree

	Research & Development	21-1-2019
	Field Ledger	
	181010-R&D-DLP01-FL-001	Page 1 of 1

Project data		Telephone	
Principal / contact	Erwin Buschgens	+31 620 425 237	
Company	Delphy		
Address	Weeresteinstraat 10	2181 GA Hillegom	
Project plot & crop			
Address	Heereweg 466	2161 DH Lisse	
GPS	52°14'6"N	4°31'56"E	
Crop name	Variety	Treated row numbers	Control row numbers
Dahlia	Arabian Night	2A, 2B, 2C, 2D	
Plant density per ha	Length (m)	Width (m)	Treated area (m ²)
24,000	1	4	4

Equipment used	Birchmeier manual spray		
Treatment rate	Bio-stimulant	Water	Total
Standard dosage (l/ha)	8.0	114	122
Actual dosage (l/ha)	16.0	234	250
Hold up equipment (l)	0.0	0.0	
Total	16.0	234	250

Activity	Date	Temp	RH	Wind	By
Treatment #1	26-7-2018	21°C	83%	1 m/s	Tjitte
Treatment #2	12-8-2018	19°C	64%	5 m/s	Tjitte
Treatment #3	28-8-2018	19°C	83%	3 m/s	Tjitte
Treatment #4	14-9-2018				Tjitte