

Poinsettia study tour 2013

Welcome to the State Horticultural College and Research Institute Heidelberg, Germany

The modern competence center for horticulture, landscaping and arboriculture
in responsibility of the Ministry of Nutrition and Rural Areas Baden-Württemberg

We do research for a environment friendly horticulture and landscaping

- We develop and test new ecologically sustainable methods in the area of ornamental plant production, vegetable production, arboriculture and landscaping
- We offer support for decision making in particular in the area of choice of products and sustainability
- We offer attractive courses for professionals
- We work for the Ministry of Nutrition and Rural Areas Baden-Württemberg

The College for Horticulture, Landscaping and Arboriculture Heidelberg Training and Further Education

- Training for landscapers and growers of ornamental plants (1200 h, degree of "Meister")
- Training for landscapers, growers of ornamental plants and vegetables (600 h, degree of "Meister")
- Training for arborists (600 h, degree of "Fachagrarwirt Baumpflege und Baumsanierung")
- Training for European Tree Workers and European Tree Technicians
- Rope Climbing Courses
- Training, Demonstrations and presentations for professionals and multipliers

The Research Institute for Horticulture and Landscaping Heidelberg

- The modern research station is of a state of the art condition. Our facilities contain 0,6 ha of greenhouses/plastic tunnels and 3 ha of uncovered ground. We develop production strategies and schemes for the modern grower of ornamental plants and vegetables. Climate control, alternatives for chemical plant growth regulators, plant nutrition, biological pest and disease management, concepts for the retail and cost calculation are our main subjects.
- Growers profit from our support for the choice of cultivars
- We guarantee unbiased comparison of cultivars. We test outdoor sustainability in the climate of the Rhine Valley.
- The horticultural retailer profits from our sales arguments for retailers and our support for professional marketing.
- Our research in landscaping concentrates on subjects like water management in public and private areas and on testing perennials for the use in public areas. Easier Care of private and public greens. Trees and their needs in urban surroundings are another focus of our research activities.
- Take advantage of our guided tours, show plantations, ideas and inspirations for professional and hobby gardeners.

Poinsettias 2013: Comparison of varieties

Growing facts:

- Origins:** Beekenkamp, Dümmer, Ecke, FloriPro Services/Syngenta, Selecta-Klemm (see attached table)
- Potting:** cw 30 and 31, depend on arrival of rooted cuttings
Pot size: 12 cm
- Substrate:** 'RHP 15' (Klasmann-Deilmann)

Analytical parameters of used substrate (composite sample)¹:

sampling	salinity g/l	pH	total nitrogen content	NH ₄ /L (mg)	NO ₃ /L (mg)	P ₂ O ₅ /L (mg)	K ₂ O/L (mg)	Mg/L (mg)
13-06-12	0,76	5,5	138	44	94	94	246	139

¹(Values from LUFA-soil institute, Karlsruhe)

Parameters of substrate during growing period:²

13-10-11 Cw 41	2,08	5,1	-*	-*	378 = 272/pot	-*	-*	-*
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²(Values from LVG Heidelberg)

* = can not be analysed by LVG Heidelberg

Trial location: Geothermal Greenhouse, compartment 14b (south)

Pinching: two weeks after potting, pinching height = 6 nodes

Darkening: not in use, using influence of regular short day period

Temperature set points:

Set points (°C)	long day period			short day period
period	cw 30-34 (day/night)	cw 33-37 (08.13.-09.13) "Cool morning", duration: 4h after sunrise (day/night)	Settings after "Cool morning" (day/night)	starts at cw 37 (09.14) (day/night)
Heating (°C)	8/8	8/8	8/8	16/16
Airing (°C)	22/22	10/10	22/22	18/18 20/20 (from cw 42)
Estimated average day temperature	-	21,0		17,0
Effective mean temperature	-	22,6		17,7

Activated RAM climate control computer settings: "General time program"

Space requirement:

after potting for all varieties 24 plants/m²
 spacing in cw 37: 12 plants/m² for all varieties
 spacing only vigorous varieties in cw 40 9 plants/m²
 (see attached table)

Fertilization:

Nitrogen uptake/pot: 800 mg, Fertilizer: Fertiplant ACID 15:10:15 (Planta)
 Use of rainwater (EC 0,2)

Nutrition program:

Cw	EC-level set points (mS)
33-34	2,6
35-37	1,4
from 38	0,8

Magnesium sulphate ("Bittersalz") 0,2 %: 25.9.-08.10. (cw 39-41)
 due of using rain water and resulting sulphur deficiency

Shading:

set point after potting for "closing": 40 klx
 after taking roots and starting branching raising up to 60 klx
 from the beginning of short day without any shading

PGR:

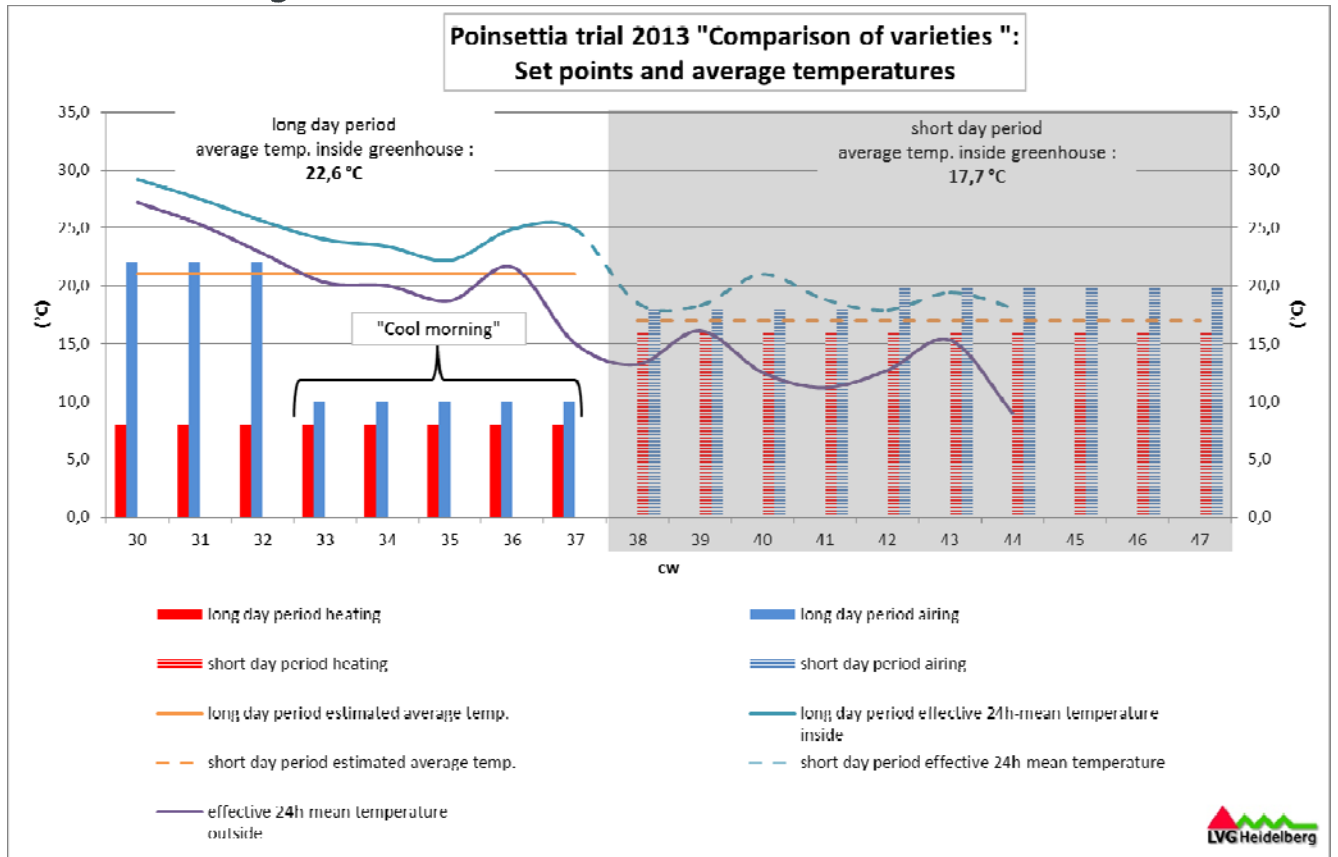
"Stabilan 720" (Chlormequat- chlorid), application rate : 100 ml/m², konz.: 0,1 %
 spraying: weekly, if required depending on variety 2 x per week
 (current amount of spray applications see attached table)

Plant protection:

Fonganil Gold (Metalaxyl-M), conc.0,013%, casting immediately after potting
 Previcur N (Propamocarb), conc.0,15%, casting 10 days after Metalaxyl treatment

Biological plant protection:

Steinernema felitae application overhead after potting with nematode sprayer
 "Aqua Nemix 2%"; repetition in cw 44 by casting each pot
Encarsia formosa: weekly according to specific plan by beneficial company
Chrysoperla carnea in cw 39
 Blue and yellow adhesive panels



Overview on Poinsettias 2013
(shape of product: multiple-shoot, pot size: 12 cm)



Geothermal compartment 14b bench #	Geothermal compartment 14b order #	serie	variety	origin	final distance plants/m ²	PGR: "Stabilan 720" (Chlormequat- chlorid), application rate : 100 ml/m ² , konz.: 0,1 %											total amount	remarks
						cw 33	cw 34	cw 35	cw 36	cw 37	cw 38	cw 39	cw 40	cw 41	cw 42	cw 43		
1	1	Solar	Red	Beekenkamp	12	1	1	1	1	2	2	2	1	1	1	1	14	
1	2		1030 Compact	Beekenkamp	12	1	1	1	1	2	2	2	1	1	1	1	14	
1	3	Saturnus	Red	Beekenkamp	12	1	1	1	1	2	2	2	1	1	1	1	14	
1	4	Saturnus	Pink	Beekenkamp	12	1	1	1	1	2	2	2	1	1	1	1	14	
1	5		Harlequin Red	Beekenkamp	14	1	1	1	1	2	2	2	1	1	1	1	14	
1	6	Titan	Red	FloriPro/ Syngenta Flowers	12	1	1	1	1	2	2	2	1	1	1	1	14	
1	7	Mira	Red	FloriPro/ Syngenta Flowers	12	1	1	1	1	2	2	2	1	1	1	1	14	
2	1		SK 100	Selecta-Klemm	12	1	1	1	1	2	2	2	1	1	1	1	14	
2	2		SK 104	Selecta-Klemm	12	1	1	1	1	2	2	2	1	1	1	1	14	
2	3		SK 106	Selecta-Klemm	12	1	1	1	1	2	2	2	1	1	1	1	14	
2	4		SK 110	Selecta-Klemm	12	1	1	1	1	2	2	2	1	1	1	1	14	
2	5		SK 108	Selecta-Klemm	12	1	1	1	1	2	2	2	1	1	1	1	14	
2	6		SK 111	Selecta-Klemm	12	1	1	1	1	2	2	2	1	1	1	1	14	
2	7	RF	3269	Dümmen	12	1	1	1	1	2	2	2	1	1	1	1	14	
2	8	Supreme	Bright Red 2012	Dümmen	14	1	1	1	1	2	2	2	1	1	1	1	14	
3	1	Premium	White 2012	Dümmen	16	1	1	1	1	2	2	2	1	1	1	1	14	
3	2	Christmas Feelings		Selecta-Klemm	12	1	1	1	1	2	2	2	1	1	1	1	14	
3	3		Happy Day	Selecta-Klemm	12	1	1	1	1	2	2	2	1	1	1	1	14	
3	4	Christmas	Beauty	Selecta-Klemm	12	1	1	1	1	2	2	2	1	1	1	1	14	

Geothermal compartment 14b bench #	Geothermal compartment 14b order #	serie	variety	origin	final distance plants/m ²	PGR: "Stabilan 720" (Chlormequat- chlorid), application rate : 100 ml/m ² , konz.: 0,1 %											total amount	remarks
						CW 33	CW 34	CW 35	CW 36	CW 37	CW 38	CW 39	CW 40	CW 41	CW 42	CW 43		
3	5	Christmas Feelings	Pearl	Selecta-Klemm	12	1	1	1	1	2	2	2	1	1	1	1	14	
3	6		Glace	Dümmen	14	1	1	1	1	2	2	2	1	1	1	1	14	
3	7	RF	RR1301	Dümmen	12	1	1	1	1	2	2	2	1	1	1	1	14	
3	8	Scandic	Pink (005)	Dümmen	14	1	1	1	1	2	2	2	1	1	1	1	14	
4	1	Princettia	Pearl	Beekenkamp	14	1	1	1	1	2	1	1	1	1	1	1	12	
4	2	Amaris	Pink	Dümmen	14	1	1	1	1	2	1	1	1	1	1	1	12	
6	1	RF	4047	Dümmen	14	1	1	1	1	2	2	2	1	1	1	1	14	
6	2	RF	FL 1301	Dümmen	14	1	1	1	1	2	2	2	1	1	1	1	14	
6	3		Glace Early (GL 1301)	Dümmen	14	1	1	1	1	2	2	2	1	1	1	1	14	
6	4		Prima Vera (NN 1301)	Dümmen	14	1	1	1	1	2	2	2	1	1	1	1	14	
6	5		Prima Donna (NN 1302)	Dümmen	14	1	1	1	1	2	2	2	1	1	1	1	14	
6	6	Polar	Bear	Ecke	14	1	1	1	1	2	2	2	1	1	1	1	14	
6	7		Brilliant Red	Ecke	12	1	1	1	1	2	2	2	1	1	1	1	14	
6	8	Champion	White (001)	Dümmen	12	1	1	1	1	2	2	2	1	1	1	1	14	
7	1	RF	VK 1301	Dümmen	12	1	1	1	1	2	2	2	1	1	1	1	14	
7	2		Sigma	FloriPro/ Syngenta Flowers	14	1	1	1	1	2	2	2	1	1	1	1	14	
8	1		Sorbet (1373)	Ecke	14	1	1	1	1	2	2	2	1	1	2	2	16	
8	2		Advantage Red (1303)	Ecke	12	1	1	1	1	2	2	2	1	1	2	2	16	
8	3	Monet	Early Pink	Ecke	14	1	1	1	1	2	2	2	1	1	2	2	16	
8	4	Jubilee	Red	Ecke	12	1	1	1	1	2	2	2	1	1	2	2	16	

Geothermal compartment 14b bench #	Geothermal compartment 14b order #	serie	variety	origin	final distance plants/m ²	PGR: "Stabilan 720" (Chlormequat- chlorid), application rate : 100 ml/m ² , konz.: 0,1 %											total amount	remarks
						CW 33	CW 34	CW 35	CW 36	CW 37	CW 38	CW 39	CW 40	CW 41	CW 42	CW 43		
8	5	Jubilee	Pink	Ecke	12	1	1	1	1	2	2	2	1	1	2	2	16	
8	6	Premier	Red	Ecke	12	1	1	1	1	2	2	2	1	1	2	2	16	
8	7		Red Soul (1295)	Ecke	12	1	1	1	1	2	2	2	1	1	2	2	16	
8	8	Premier	Pink	Ecke	14												0	
8	9	Majestic	Red	Ecke	12	1	1	1	1	2	2	2	1	1	2	2	16	
9	1	Amaris	Lipstick Pink	Dümmen	14	1	1	1	1	2	1	1	1	1	1	1	12	
9	2	Amaris	Hot Pink	Dümmen	14	1	1	1	1	2	1	1	1	1	1	1	12	
10	1	Christmas Feelings	White	Selecta-Klemm	9	1	1	1	1	2	2	2	2	1	1	1	15	
10	2		White Christmas	Selecta-Klemm	12	1	1	1	1	2	2	2	2	1	1	1	15	
10	3	Matinee	Bright Red	Dümmen	12	1	1	1	1	2	2	2	1	1	1	1	14	
10	4	Prestige	Sunrise	Ecke	12	1	1	1	1	2	2	2	1	1	2	2	16	
10	5	RF	ML 1301	Dümmen	12	1	1	1	1	2	2	2	2	1	1	1	15	
10	6	RF	HJ 1301	Dümmen	12	1	1	1	1	2	2	2	2	1	1	1	15	
10	7		SK 107	Selecta-Klemm	12	1	1	1	1	2	2	2	2	1	1	1	15	
10	8		SK 109	Selecta-Klemm	12	1	1	1	1	2	2	2	2	1	1	1	15	
10	9		Vesuvio	Selecta-Klemm	12	1	1	1	1	2	2	2	2	1	1	1	15	

Poinsettia 2013: Temperature strategies for energy saving

Growing facts:

Origins:	Dümmen, FloriPro Services/Syngenta, Selecta-Klemm
Varieties:	Sandic Red, Ouverture Dark Red, Neva Red, Christmas Day, Christmas Glory
Potting:	cw 30 and 31, dependend on arrival of rooted cuttings Pot size: 12 cm
Substrate:	'RHP 15' (Klasmann-Deilmann)

Analytical parameters of used substrate (composite sample)¹:

Location	sampling	salinity g/l	pH	total nitrogen content	NH ₄ /L (mg)	NO ₃ /L (mg)	P ₂ O ₅ /L (mg)	K ₂ O/L (mg)	Mg/L (mg)
	13-06-12	0,76	5,5	138	44	94	94	246	139

¹(Values from LUFA-soil institute, Karlsruhe)

Parameters of substrate during growing period:²

14.2 AlZPr	13-10-11 Cw 41	2,08	5,1	-*	-*	378 = 272/pot	-*	-*	-*
14.1 dAt	13-10-11 Cw 41	1,90	5,2	-*	-*	370 = 266/pot	-*	-*	-*
10.2 dAt	13-10-10 Cw 41	2,01	6,0	-*	-*	236 = 170/pot	-*	-*	-*
10.3 AlZPr	13-10-11 Cw 41	1,78	6,1	-*	-*	119 =85,7/pot	-*	-*	-*

²(Values from LVG Heidelberg)

* = can not be analysed by LVG Heidelberg

Trial location:	Geothermal Greenhouse: "General time program": compartment 14.2 (south) dynamic outside temperature correction: compartment 14.1 (north) Standard Greenhouse: "General time program": compartment 10.c dynamic outside temperature correction: compartment 10.b
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Pinching: two weeks after potting, pinching height = 6 Nodes

Darkening: not in use, using influence of regular short day period
 Geothermal Greenhouse
 From 29.10.2013 30 Min after Sunrise and 30 Min before Sunset
 Standard
 not in use

Shading: set point after potting for "closing": 40 klx
 after taking roots and starting branching raising up to 60 klx
 from the beginning of short day without any shading

Space requirement: after potting for all varieties 24 plants/m²
 spacing in cw 37: 12 plants/m² for all varieties

Temperature set points:

Set points (°C)	long day period		short day period "General time program"		short day period dynamic outside temperature correction		
	period from...until (cw)	cw 30-34	cw 33-37 (08.13.-09.13.) "Cool morning", duration: 4h after sunrise	starts at cw 37		starts at cw 37	
Heating	8 °C	CM	Normal	day	night	day	night
		8	8	16	16	16	16
Airing	22 °C	10	22	18 20 (from cw 42)	18 20 (from cw 42)	18 20 (from cw 42)	18 20 (from cw 42)
Average day temperature	-	21		17		17	
Effective mean temperature at Geothermal Greenhouse	-	Location 14.1	Location 14.2	18,9		17,7	
		22,3	22,6				
Effective mean temperature at Standard Greenhouse	-	Location 10b	Location 10c	17,7		18,2	
		21,4	20,5				

Activatet RAM climate control computer settings: "General time program"

In case of using dynamic outside temperature correction the scheduler is added from short day dynamic outside temperature correction with TSK 500 and min 10°C Roomtemperature

Fertilization: Nitrogen uptake/pot: 800 mg, Fertilizer: Fertiplant ACID 15:10:15 (Planta)
 Geothermal Greenhouse: Use of rainwater (EC 0,2)
 Standard Greenhouse: Use of rainwater maybe with townwater (EC 0,2 – 0,3)

Nutrition program:

Cw	EC-level set points (mS)
33-34	2,6
35-37	1,4
from 38	0,8

Magnesium sulphate ("Bittersalz") 0,2 %: 25.9.-08.10. (cw 39-41)

due of using rain water and resulting sulphur deficiency

PGR: "Stabilan 720" (Chlormequat- chlorid), application rate : 100 ml/m², konz.: 0,1 %
spraying: weekly

Plant protection:

Fonganil Gold (Metalaxyl-M), conc.0,013%, casting immediately after potting
Previcur N (Propamocarb), conc.0,15%, casting 10 days after Metalaxyl
treatment

Biological plant protection:

Steinernema felitae application overhead after potting with nematode sprayer
"Aqua Nemix 2%"; repetition in cw 44 by casting each pot
Encarsia formosa: weekly according to specific plan by beneficial company
Chrysoperla carnea in cw 39
Blue and yellow adhesive panels

Use of near-surface geothermal energy for greenhouse heating purposes

At the LVG Heidelberg is part of a research project on climate regulation and use of geothermal energy in the ornamental plants and vegetable production, a new greenhouse built. This is supplied primarily by near-surface geothermal and heat pumps with heat energy. Under these conditions shall methods to reduce costs while increasing energy efficiency in the ornamental plants (poinsettias, bedding and balcony plants and vegetable production (pot herb) developed.

The increased use of alternative energy sources in future scarcity of fossil fuels is an important issue that face the intensive horticultural production needs. Through the use of renewable energy sources, independent of conventional energy gained while protecting the climate by reducing CO₂ emissions can be operated from shock. A useful source is the regenerative heatground is that plants in the heat supply of residential and commercial is already established. Due to relatively high investment costs and lack of use concepts, technology has been found in commercial horticulture rarely used. In addition to the heat supply, the use of heat pumps can excess energy from the greenhouses to dissipate and cool so active. Into the specific aspect of the cooling (heat periods) due to continued changes and the increased incidence of extreme events in the future become more important.

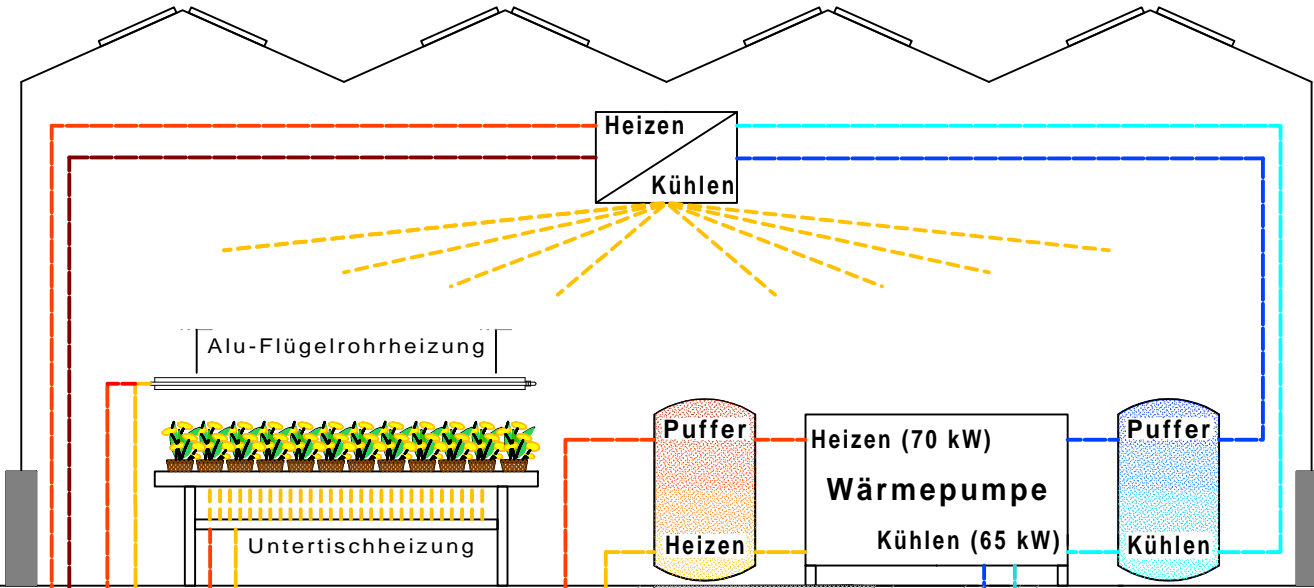
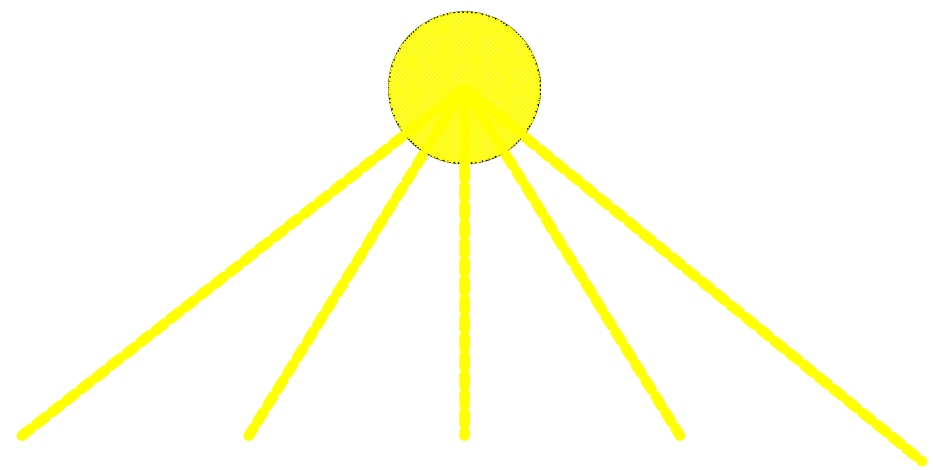
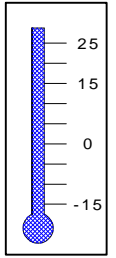
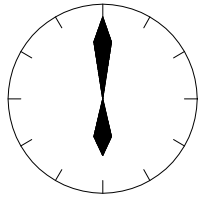
On an area of 1800 m², a 740 square-foot greenhouse (Venlo type) was built in east-west orientation. The house consists of 2 sections of each size of 370 m² and has a wall height of 4.75 m (glass wall) The development of the geothermal field is located next to the new experimental greenhouse and has an area of square feet. For the envelope surface of the greenhouse are single deck material Plexiglas wall sheets (bridge plates, 16 mm, Evonik ALLTOP®). They have a heat transfer coefficient of 2.5 W/m² K and a light transmittance of 91% (technical specifications of the manufacturer) and are UVA and UVB-transmitting. In addition to an energy screen (Today screen / night screen) is also a darkening / shading unit integrated treatment plant, which includes only the area of cultivated land to. Both departments are equipped with increased cultivation in the form of rolling tables with automated for irrigation and fertilization (Ebbe/Flut = low tide/high tide). The climate and irrigation control is provided by the experimental farm in the existing computer system RAM.

Geothermal energy is in the form of heat energy stored beneath the solid surface. It is of primary energy by using a virtually inexhaustible and therefore almost won renewable energy source.

Because of site-specific requirements on the grounds of the LVG Heidelberg can only near-surface geothermal energy, geothermal probes up. 53 m depth are used. As a heat transfer fluid in the probe circuit is not water but a water-Trimethylglycerin mixture is used. It is placed a heat output of 50 W / m depth to bottom. With an estimated drilling grid of 5 m x 5 m and a bore length of 1500 m results in a thermal output of 75 kW, which is made of a heat pump system for heating the greenhouse is available. The energy efficiency of a heat pump system is reflected in the ratio of useful heat delivered by the system to the energy supplied from the system (COP = Coefficient of Performance). A high efficiency is obtained when the temperature difference between heat source and heating flow is minimized. For this reason heat pumps are used in combination with low temperature heating systems. Modern systems have achieved in this annual coefficient of at least "4". The systems are four times as much heat ready when they need electrical power to their preparation. Therefore the project aims to realize the energy for heating deployment with a utilization rate of > 80% of the geothermal heat pump technology through acquisition.

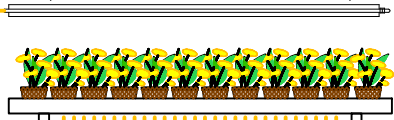
The primary geothermally heated greenhouse can be supplied bivalent, next to the heat pump system for the base load is secure for the peak load supply, a connection to the operational high-temperature heating system. This guarantees that can be achieved even under unfavorable transparent weather and operating conditions, high internal temperatures in case of need. In addition, there is a possibility in the summer of excess heat via the heat pump in a 60 m lead to a large water storage (cooling). To what extent the possible cooling speed in practice, provides cultural advantages, the investigation will show evaluations. The actual heat transfer takes place via sequence-controlled heating systems with flow temperatures between 35° C - 70° C. Thus, over the tables near vegetation aluminum wing tubes and under the tables polypropylene tubes that are attached to the table design, is provided. Both systems have a solid geometry with a favorable surface to volume ratio and therefore have good heat exchange properties. The third heating system ("air heater") installed, which outside the heating or cooling mode drive for the air mixing occurring due different temperatures are used.

The project is supported by the implementation of future investment program of the Federation, the Agricultural Bank's pension and the state of Baden-Württemberg.



Heizen
Kühlen

Alu-Flügelrohrheizung



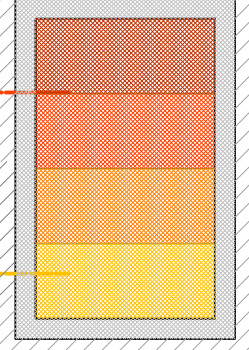
Untertischheizung

Puffer
Heizen

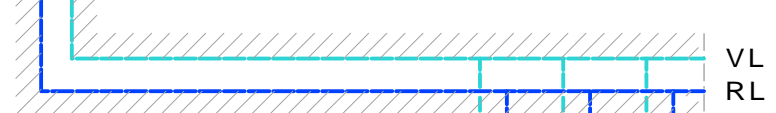
Heizen (70 kW)
Wärmepumpe
Kühlen (65 kW)

Puffer
Kühlen

von Heiz-
zentrale VL
RL



Erdspeicher



Geothermie

25 Erdsonden

VL
RL

Project: Thigmotropism

Abstract

Optimizing thigmomorphogenetic effects for alternative growth regulation in potted horticultural crops by employment of air driven stimuli

The aim of this project is to develop a novel method for alternative growth inhibition on the basis of air movement and to implement this system into practice. It is targeted to design an automatic control of the stimulus intensity based on the evaluation and quantification of stress signals. Further alternative methods of growth regulation, such as climate control strategies, the application of plant strengtheners or the use of electrophysiological stimuli will be integrated into this project.

At the experimental station of the LVG Heidelberg the required strength and intensity of the stimulus to achieve a defined inhibitory effect will be recorded, documented and standardized for exemplary crops. Therefore already existing “plant petting systems” will be modified in cooperation with KNECHT Company. At the University of Hohenheim the chain of signals induced by the movement stimulus, as well as their physiological effects will be elucidated. Therefore non-invasive ethylene measurements will be performed within the plant stand, further relevant plant hormones will be analyzed by Radio-Immuno-Assays (RIA) and measurements of chlorophyll fluorescence will be conducted. At the University of Hamburg further potential stress signals will be detected by using electrophysiological methods. The acquired data will be used for a target-oriented control of the “thigmo-stress” system. An optimized, special irrigation carriage system will be mounted under practical conditions at KÖLLE enterprise and will be evaluated under economic aspects.

The results will be summarized in layman’s terms to horticultural praxis, embedded into existing knowledge and published in the form of a guideline which also will include crop specific recommendations for the application of the growth inhibition system.

This collaborative research project between the State Horticultural College and Research Institute Heidelberg and the University of Hohenheim is funded by the Bundesprogramm Ökologischer Landbau (BÖLN).

Part I: Thigmotropism 2013

Effects of mechanical stimulation on Euphorbia

Growing facts:

Origins: 'Early Mars': FloriPro Services/Syngenta
'Scandic': Dümmer

Potting: 'Early Mars': cw 30; 'Scandic': cw 31
Pot size: 12 cm

Substrate: 'RHP 15' (Klasmann-Deilmann)

Analytical parameters of used substrate (composite sample)¹:

sampling	salinity g/l	pH	total nitrogen content	NH ₄ /L (mg)	NO ₃ /L (mg)	P ₂ O ₅ /L (mg)	K ₂ O/L (mg)	Mg/L (mg)
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¹(Values from LUFA-soil institute, Karlsruhe)

Parameters of substrate during growing period:²

17-10-11 cw 42	2,8	5,8	-*	-*	285-358 = 312/pot	-*	-*	-*
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²(Values from LVG Heidelberg)

* = cannot be analyzed by LVG Heidelberg

Trial location: Greenhouse, AIZPr: compartment 10.c

Pinching: two weeks after potting, pinching height = 6 nodes

Darkening: not in use, using influence of regular short day period

Temperature set points:

Set points (°C)	long day period		short day period "General time program"		
	period from...until (cw)	cw 30-34	cw 33-37 (08.13.-09.13.) "Cool morning", duration: 4h after sunrise		starts at cw 37
Heating	8 °C	CM	Normal	day	night
		8	8	16	16
Airing	22 °C	10	22	18 20 (from cw 42)	18 20 (from cw 42)
Average day temperature	-	21		17	
Effective mean temperature	-	20,5		17,7	

Activated RAM climate control computer settings: "General time program"

Space requirement: after potting: 24 plants/m² for all varieties
 spacing in cw 38: 16 plants/m² for all varieties
 spacing in cw 41: 14 plants/m² for all varieties

Fertilization: Nitrogen uptake/pot: 800 mg, Fertilizer: Fertiplant ACID 15:10:15 (Planta)
 Use of rainwater (EC 0,2)

Nutrition program:

Cw	EC-level set points (mS)
33-34	2,6
35-37	1,4
from 38	0,8

Magnesium sulphate ("Bittersalz") 0,2 %: 25.9.-08.10. (cw 39-41)
 due to using of rainwater and resulting sulphur deficiency

Shading: set point after potting for "closing": 40 klx
 after taking roots and starting branching raising up to 60 klx
 from the beginning of short day without any shading

PGR: "Stabilan 720" (Chlormequat- chlorid), application rate: 100 ml/m², konz.: 0,1 %
 Spraying only on stabilan control:
 Scandic: weekly (cw 33 – cw 43)
 Early Mars: 1 x per week (cw 33 - cw 43)
 second treatment (cw 37 – cw 43)

Mechanical stimulation:

Brushing: 40 x treatments (6 a.m. - 8 a.m.)
 80 x treatments (6 a.m. - 11:16 a.m.)
 Wind: 40 x treatments (6 a.m. - 8 a.m.)
 80 x treatments (6 a.m. - 11:16 a.m.)

Plant protection:

Fonganil Gold (Metalaxyl-M), conc.0,013%, casting immediately after potting
 Previcur N (Propamocarb), conc.0,15%, casting 10 days after Metalaxyl treatment

Biological plant protection:

Steinernema felitae application overhead after potting with nematode sprayer
 "Aqua Nemix 2%"; repetition in cw 44 by casting each pot
Encarsia formosa: weekly according to specific plan by beneficial company
Chrysoperla carnea in cw 39
 Blue and yellow adhesive panels