Groen Agro Control
LABORATORIUMONDERZOEK & ADVIES

Analysis and advice for agricultural sector

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Groen Agro Control

Agricultural Laboratory

DELFT RESEARCH GROUP BV

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GROEN AGRO CONTROL

CROP ADVICE

ISO 17025

LABORATORY

RESEARCH

ANALYSES

LABORATORY RESEARCH

APPLIED RESEARCH

- CHEMICAL
- MICROBIOLOGICAL
- PESTICIDE-ANALYSIS

- DNA-METHODS

- PLANT PATHOGENS
- PLANT DAMAGE

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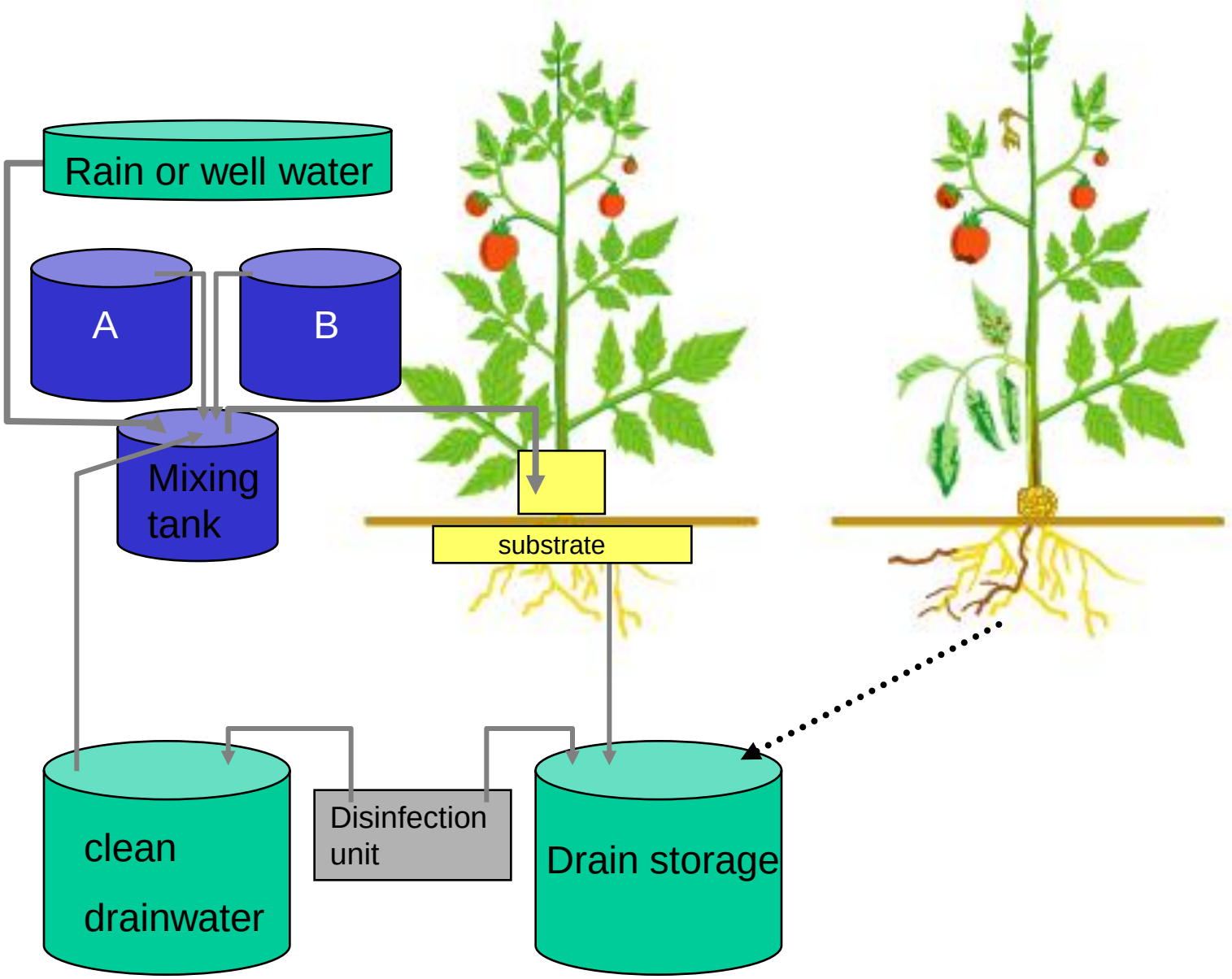
Research, analysis and advice for all parts of the food production chain

ANALYSIS	propagation 	culture 	retail 
Chemical analysis	X	X	
Microbiological	X	X	X
Diagnose	X	X	
Hygiene	X	X	
Advice	X	X	
Residu-analysis	X	X	X

Present situation in The Netherlands

- Increase of production/m^2 (tomato): 8 kg/m^2 in soil to 70 kg/m^2 in substrate in modern greenhouses
- Year-round production (retail)
- No emission of nutrients and pesticides to the environment (government rules)
- Food quality (fresh, tasty and uniform product)
- Food safety is the minimal demand of consumer (EurepGAP and QS)

Fertilisation scheme of substrate culture



Examples of substrate cultures in the Netherlands

Tomato

1 year

Rose

5 years

How to achieve maximum yields per/m^2 and year-round production?

- Switch from field-grown to greenhouses (glass or plastic tunnel)
  - Better control of heating, cooling and humidity
  - Greater consistency in quality, volumes and pricing (retail)
  - Lower disease pressure
- Switch from soil to substrates like rockwool, peat and cocos:
  - Better control of waterering, fertilizer, pH, EC and pathogens
- CO_2 to boost yields
- Artificial light

Important conditions for top productions

- Clean and vital young plants most important step
- Optimization of nutrients, water content and pH
- Control of pathogens

Start with young plants free of pathogens

- Clean start at the propagator
  - Seeds free of plant pathogens
  - Hygienic measurements at propagation of young plants
- Grower
  - Low infection level in soil or substrate (disinfection)
  - Good water quality

Water quality is essential

- **Pollution:** **plant toxic compounds**
- **Algae:** **clogging watersystem**
- **Too salty:** **high Na concentration**
- **Too cold:** **roots are sensitive for rapid change**
- **Too warm** **,,** **,,**
- **Not enough water:**
- **Plant pathogens**

Optimal fertilization is the succes of the crop

- Fertilizer:
  - Purity of fertilizer is important for growth
  - Recirculation of drainwater requires the best quality of fertilizer

Main problems with fertilization

pH or EC of nutrient solution wrong

Wrong composition of nutrient in mixing tank

Electricity breakdown 1-4 h

Electric valves problems

Control pH- and EC-meters!

At grower and nursery

Crop disorders due to problems with fertilizer uptake

1. **iron deficiency**
2. **manganese symptoms in leafs**
3. **blossom end rot**
4. **gold spot in tomato**
5. **potassium deficiency**
6. **magnesium deficiency**
7. **boron problems**
8. **calcium symptoms on leafs**

Analyse soil and (drain)water frequently

Minimal 1 x per month

Laboratory analysis

- Frequently analyse the nutrients in soil and substrate to adjust fertilization
- Analysis of leaves to check deficiency and excess of nutrients

Laboratory analysis

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Sample: Drain west greenhouse
Date: 10-10-2006
Crop: Tomato, Antwerpen, Turkey

Agroser
Attn.
Bozak Yalu
PK 53 07500 Antalya

Customer: 2527 Sample nr. 1117295

Element			pH	EC	NH_4	K	Na	Ca	Mg	Si	NO_3	Cl	SO_4	HCO_3	H_2PO_4	Fe	Mn	Zn	B	Cu	Mo
					ppm											ppm					
Analysis			6.0	4.6	0.00	434	50.6	457	158	25.6	325	49.7	302	25.9	83.1	3.0	0.68	0.58	1.0	0.02	0.12
Analysis (EC(c))				3.0	0.00	297	50.6	313	108	25.6	223	34.0	207	25.9	56.9	2.1	0.68	0.40	0.68	0.01	0.08
Target			6.0	3.0	1.9	287		294	97.2		299	71.0	107		51.7	2.2	1.3	0.61	0.86	0.06	
Standard feed				2.3	10.5	283		201	54.7		217	35.5	72.2		54.3	1.7	0.82	0.33	0.38	0.04	0.05
Corrections	Analysis										54.6	17.8	-16.05				0.16	0.07	0.08	0.01	
	Extra					68.0		-25.00	-6.00												
Drip water				**2.5**	**10.5**	**383**		**191**	**53.1**		**252**	**58.3**	**53.7**		**54.3**	**1.7**	**0.99**	**0.39**	**0.45**	**0.05**	**0.05**
Tap/Well	100	from:					0.80	60.1	18.2	0.30		0.58	8.0	244				0.30	4.1		
Surface	0	from:																			
Recirculation	0	from:																			
Injection concentrations					10.5	383		131	34.9	0.00	252	57.7	45.7	244	54.3	1.7	0.99	0.05	0.11	0.05	0.05

Solid Fertilizer with KCl

Water

Tap/Well	100 % B 8.5.9952.2.996/0.9968.0.0
Rain	0 %
Surface	0 %
Recirculation	0 %

System

EC drip water	2.5 mS/cm
Tank A volume	1000 litre
Tank B volume	1000 litre
Concentration factor	100.0 x

Tank A

Calcium nitrate (19%Ca, 16%N)	70.7	kg
Ammonium nitrate (35%N)	0.77	kg
Magnesium nitrate (9%Mg, 11%N)	0.29	kg
Potassium nitrate (38%K, 13%N)	43.0	kg
Potassium chloride (50%K, 45%Cl)	12.1	kg
Fe-chelate 12.5 %	1339	g
	1080	ml

Tank B

Nitric acid 55 %	37.1	liter
Potassium nitrate (38%K, 13%N)	21.9	kg
MonoPotPhos (29%K, 23%P)	23.8	kg
Magnesium sulphate (10%Mg, 13%S)	35.1	kg
Potassium sulphate (45%K, 13%S)	0.00	kg
Mn sulphate 32.0 %	304	g
Zn sulphate 23.0 %	42.7	g
Borax 11.0 %	100	g
Cu sulphate 25.0 %	21.0	g
Na-Molybdate 40.0 %	12.0	g

Remarks:
Recepy for flowering 6e truss.

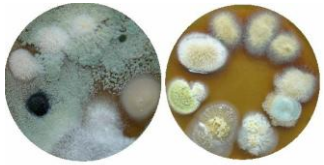
Diagnostic service

Methods:

- Microscope

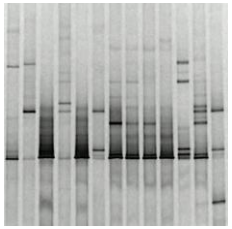
1 day

- Plating



10-14 days

- DNA-technique



2-3 days

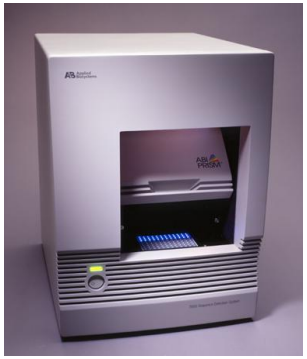
Moderne DNA-techniques

Crop

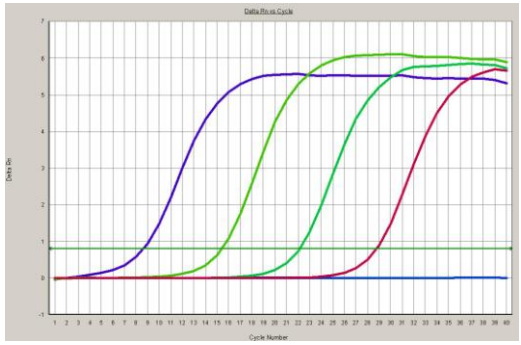
Sampling

Extraction of DNA

PCR



Analysis result

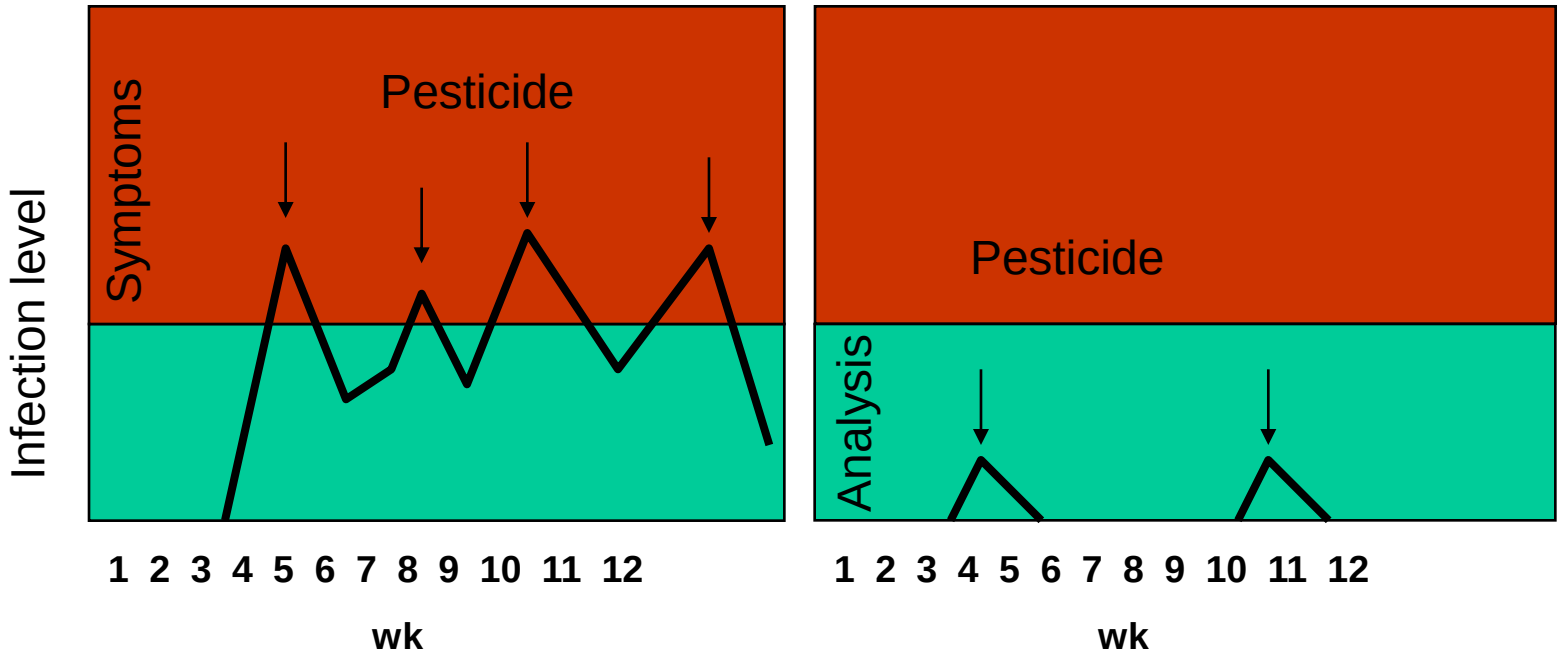


Prevention is better than cure

- Diagnosis of plant pathogens
  - Grower notice plant disease
  - Send plant to a lab for diagnosis

- Monitoring of plant pathogens before symptoms are observed
  - Pathogens are detected in a very early stage of the infection with new DNA-techniques
  - No visible symptoms are observed.
  - Preventitive actions to lower the infection level.

Effective pesticide treatment with monitoring



Food qualty and safety in the Netherlands

- The consument don’t exept a high pesticide residu on his food
- The quality of the Dutch food is high with the lowest level of pesticide residu
- Our lab controls the quality and food safety of the food products.
- EurepGAP and QS are the lowest demands of retail for foodsafety

Minimum conditions to achieve this goals

- Switch from open-field to greenhouses
- Focus on quality, food safety and efficiency.
- Grower associations: not only reduction of costs and labour but also to be a partner for retail
- Example: Dutch association of growers
  - Prominent, Greenery etc

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Our laboratory can assist you to improve your culture

Thank you for your attention

Standard fertiliser scheme tomato

EC	PH	NH4	K	Ca	Mg
2.63	5.5	22	371	216	58

- Extra plant charge
- + 68 ppm K
- - 25 ppm Ca
- - 6 ppm Mg

NO3	Cl	SO4	PO4
853	80	423	145

Fe	Mn	Zn	B	Cu	Mo
0.84	0.55	0.33	0.32	0.05	0.05

Standard fertiliser schema cucumber

EC	pH	NH4	K	Ca	Mg
2	5.5	23	313	160	34

- Extra fruits
- + 62 ppm nitrate
- + 39 ppm potas

NO3	Cl	SO4	PO4
992	0	133	121

Fe	Mn	Zn	B	Cu	Mo
0.84	0.55	0.33	0.27	0.05	0.05