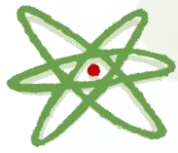




Covered soilless strawberry production in the field by raised substrate beds

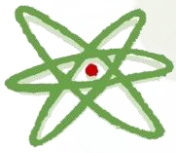
Miet Boonen – Nicole Gallace – Dany Bylemans

International Strawberry Symposium; August 13-17, 2016; Québec (Canada)



INTRODUCTION

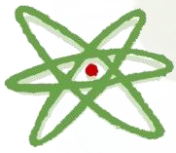
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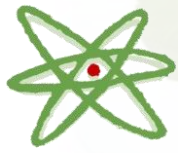


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- ➔ Nematode build-up
- ➔ Soil borne diseases
- ➔ Decrease of production, size grading and fruit quality over time

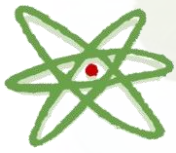


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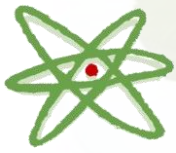
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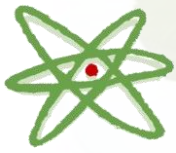
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- Soil fumigation:
 - Expensive
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 - Future use is uncertain



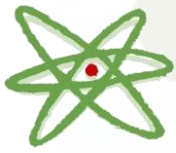
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- Soil fumigation:
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 - Future use is uncertain
- ➔ change to a substrate based system
 - Multiple in-situ crops in one season
 - Any soil can be used
 - Possibility of permanent protection



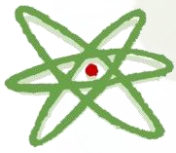
INTRODUCTION

- Permanent protection:
 - Improved labour comfort
 - Harvest reliability
 - Better fruit quality
 - Reduction fruit rot pathogens



INTRODUCTION

- Permanent protection:
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 - Reduction fruit rot pathogens
- Markets are forcing higher demands on fruit quality
 - ➔ **PROTECTED STRAWBERRY CULTIVATION**
 - = TYPICAL FUTURE PRODUCTION SYSTEM**



INTRODUCTION

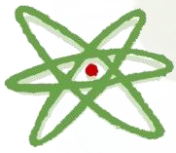
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 - Development of the table-top system
 - Technical expertise to overcome physiological and technical difficulties
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 - Labor intensive





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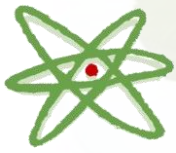
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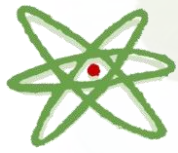
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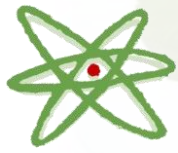
- pcfruit – 2006: Search for alternative systems to soil cultivation
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- ➔ **‘the raised substrate bed’ was borne**
 - **Successive strawberry crops in the same tunnel year after year**
 - **No annual costs associated with constructing tunnels**
 - **Cheap and relatively quick to convert large surfaces to soilless culture**
 - **Simple system**
 - **Even poor soils can be used**



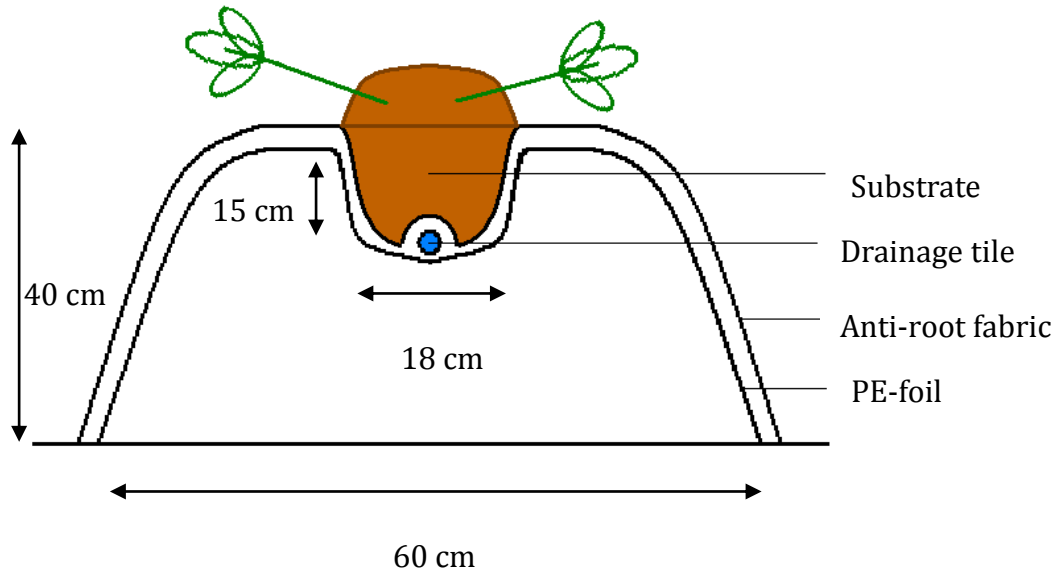
CONSTRUCTION OF RAISED SUBSTRATE BEDS



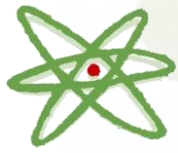
Mechanical construction



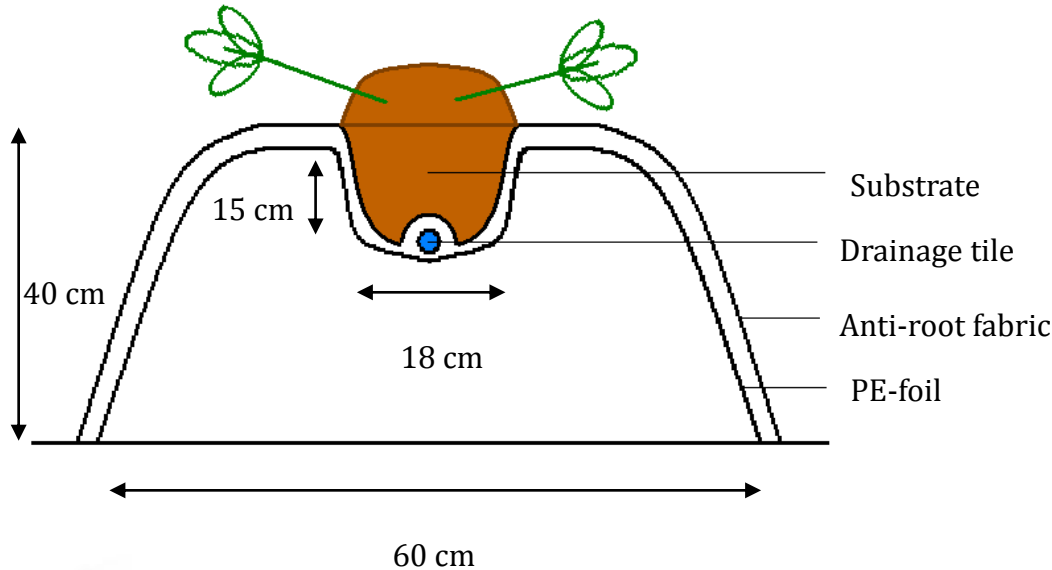
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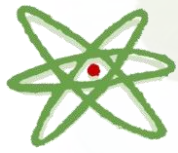
Schematic overview



CONSTRUCTION OF RAISED SUBSTRATE BEDS



- V-shaped through
- Convexly shaped side walls
 - Support flower and fruit trusses
- 20 l peat/coir per running meter
- Drainage system
 - Loamy soil or non-covered



CONSTRUCTION OF RAISED SUBSTRATE BEDS





COST EFFECTIVENESS OF RAISED SUBSTRATE BEDS

Cropping system	Investment cost		Consumables €/m ²	Labour cost €/m ²	Total cost €/m ²
	€/ha	€/m ²			
Tunneled production in fumigated soil					
2 x short day crop	48.501	1.08	3.26	2.11	6.45
Raised substrate beds with tunnel					
2 x short day crop	84.330	1.83	4.60	3.08	9.50
Day neutral crop	84.330	1.83	2.16	2.24	6.24
Table-top production (rain cover)					
2 x short day crop	207.604	2.06	8.51	4.98	15.55
Day neutral crop	207.604	2.06	3.72	3.18	8.97

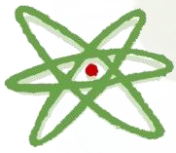




COST EFFECTIVENESS OF RAISED SUBSTRATE BEDS

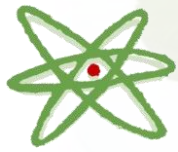
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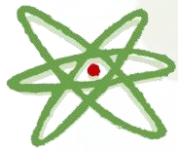
RESEARCH ON RAISED SUBSTRATE BEDS

- Ten years of research on several topics
 - Cropping techniques
 - Mulch type
 - Multi cropping
 - Soil heating
 - Sustainable substrate alternatives
 - Recently: **substrate heating and early forcing**



CULTIVATION ON RAISED SUBSTRATE BEDS

- Good potential for both production and fruit quality
 - Short day crop
 - Programmed short day crop
 - Day neutral crop
 - Two crops in one season:
 - **Best option:** Early short day crop followed by a programmed short day crop

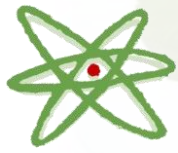


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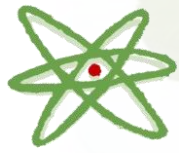


As early as possible



EARLY FORCING ON RAISED SUBSTRATE BEDS

Variety	Planting density (plants/running meter)	Treatment
Flair	12	Control
		Mini-tunnel
		Mini-tunnel + plant heating cable
Opera	10	Control
		Mini-tunnel
		Mini-tunnel + plant heating cable
Malling Centenary	10	Control
		Mini-tunnel
		Mini-tunnel + plant heating cable



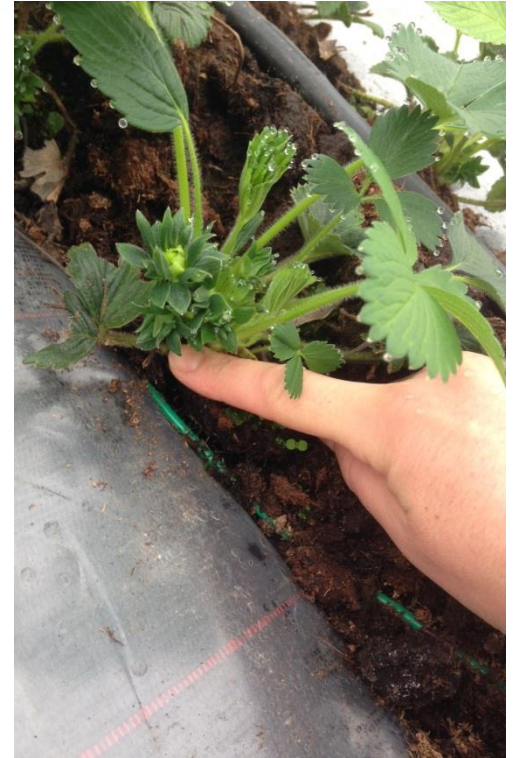
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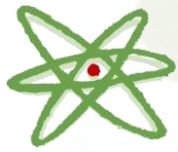
Control



Mini-tunnel

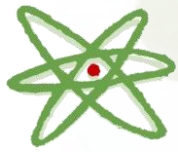


Mini-tunnel + plant heating



EARLY FORCING ON RAISED SUBSTRATE BEDS

- Plant heating cable
 - 250 Watt, electrical, no thermostat
 - Placed on the innerside of the substrate bed, five cm from crown
 - Heating until ambient T reached 16°C
 - Soil T and soil humidity near the roots was monitored



EARLY FORCING ON RAISED SUBSTRATE BEDS

- Results:

Treatment	Average substrate T
Control	14 °C
Mini-tunnel	16 °C
Mini-tunnel + plant heating	21 °C

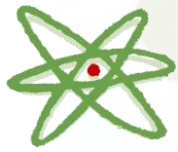
– No differences in production results



EARLY FORCING ON RAISED SUBSTRATE BEDS

- Results early forcing per variety:

Treatment	Flair	Opera	Malling Centenary
Control	-	-	-
Mini-tunnel	o d	3 d	4 d
Mini-tunnel + plant heating	o d	7 d	4 d

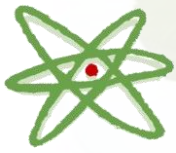


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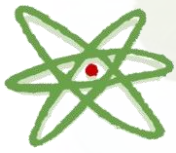
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Control	-	-	-
Mini-tunnel	o d	3 d	4 d
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- **Starting earlier** in the season with **plant heating** will probably **increase the early forcing** possibly also for early blooming varieties ('Flair')



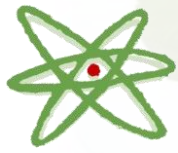
CONCLUSION

- Raised substrate bed
 - Cultivate strawberries continuously on the same soil
 - Tunneled version:
 - Higher quality fruit
 - Eliminating annual cost of constructing tunnels
 - Cheaper solution compared with table-tops
 - Range of different cropping possibilities



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 - Higher quality fruit
 - Eliminating annual cost of constructing tunnels
 - Cheaper solution compared with table-tops
 - Range of different cropping possibilities
- Early forcing of short day crop is possible
 - Later varieties are more responsive



Thanks for your attention !

miet.boonen@pcfruit.be



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& Philip Lieten

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BEL'ORTA

