Development of sustainable substrates without peat and coco fibers for strawberry production

André Ançay[1], Nicolas Boisson[1], Mélanie Quennoz[1], Beat Frey[2], Reto Rutishauser[3], Christoph Carlen[1] and Bastien Christ[1]
[1] Agroscope, Plant Production Systems, Conthey, Switzerland
[2] Swiss Federal Research Institute WSL, Forest Soils and Biogeochemistry - Rhizosphere Processes, Birmensdorf, Switzerland
3 Ökohum gmbh, Herrenhof, Switzerland

Background

The part of strawberries (*Fragaria* x *ananassa*) produced using protected cultures and substrates is continuously increasing. Substrate-based production has many advantages such as prevention of soilborne diseases and decrease labor, i.e. increase of picking speed, when using tabletop systems. Currently, most substrates are manufactured using peat and/or coconut coir. Peat is considered non-renewable (or very slowly renewable) and the exploitation of peatlands contributes to the increase of concentration of carbon dioxide in Earth's atmosphere and to the loss of biodiversity. Coconut coir is produced mainly in India and Sri Lanka and therefore requires long-distance transportation. The goal of this project was to develop substrates for strawberry production using renewable organic materials.

Substrate composition

Multiples mixtures were evaluated in 2017, 2018 and 2019 with the everbearing strawberry cultivar 'Murano'.

Substrate composition (%)

Composition	LBo	LC	LPsC	LCo	LB	LM
humus	34	34	24	0	24	34
bark compost				0	10	
wood fibres	18	18	18	0	18	18
rice hulls	12	12	12	0	12	12
coconut fibres	0	14	0	100	28	14
perlite	0	0	10	0	8	0
corn stalks	0	0	0	0	0	14
sheep's wool	8	8	8	0	0	8
wood chips	28	0	0	0	0	0
pine bark	0	0	28	0	0	0
maiden silvergrass	0	14	0	0	0	0

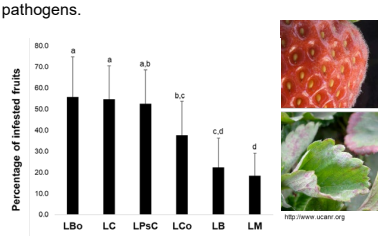
Yield

Similar fruit weight and total yield were obtained with some novel substrates as compared to 100% coconut fibres with 'Murano' in 2017, 2018 and 2019.

Substrate ID	2017		2018		2019	
	Fruit weight (g)	Yield (g/plant)	Fruit weight (g)	Yield (g/plant)	Fruit weight (g)	Yield (g/plant)
LCo	14.4	618	17.5	548	13.7	672
LM	13.9	584	17.2	488	13.3	493
LBo	13.8	606	16	570	12.5	438
LB	13.9	561	16.9	637	14.1	678
LC	14.3	627	16.2	631	13.1	464
LPsC	13.6	532	17.6	564	13.3	574
Pr > F	0.526	0.516	0.201	0.141	0.001	0.001
Significant	No	No	No	No	Yes	Yes

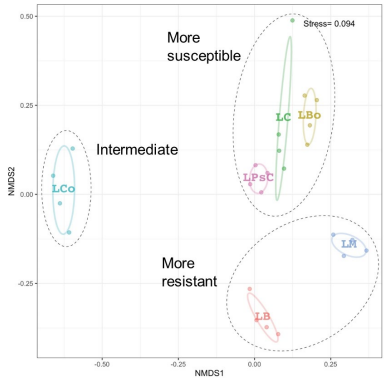
Susceptibility to powdery mildew

Interestingly, we also observed that resistance of everbearing strawberry cultivar 'Murano' to powdery mildew (*Podosphaera aphanis*) was influenced by substrate composition, suggesting that some organic material and/or microbial communities can prime strawberry defense responses to fungal pathogens.



Bacterial and fungal diversity in substrates

Preliminary analysis of the substrates using DNA Illumina sequencing revealed that high bacterial alpha-diversity in the substrates was correlated to high powdery mildew resistance.



Conclusions

Together, our data demonstrate that substrates for strawberry production can be produced using local and renewable organic materials at a cost competitive with standard substrates. Furthermore, substrate composition can influence strawberry susceptibility to powdery mildew.

Innosuisse - Swiss Innovation Agency
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Département fédéral de l'économie, de la formation et de la recherche DEFR
Agroscope

Agroscope une bonne alimentation, un environnement sain