Bacteria inoculation on sheep wool to improve vegetative growth, yield, taste and aroma in soilless strawberry production

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Introduction

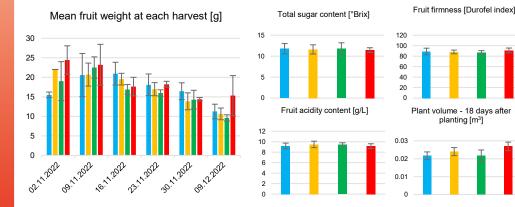
Most plants form symbiotic relationships with microorganisms such as bacteria and fungi to improve their fitness in their changing environment. Long-term associations between symbiotic organisms are characterized by, for instance, nutrient exchange and protective effects against biotic and abiotic stresses. One very-well studied symbiotic relationship is between legume plants such as peas and soybeans and nitrogen-fixing soil bacteria called rhizobia. Strawberries also have rhizobia and strengthening their symbionts can improve health and productivity.

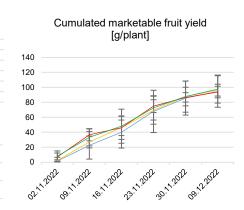


Objectives

Evaluation of the effect of sheep wool inoculated with Bacillus amyloliquefaciens FZB42 on strawberry plants (Sensation variety) grown on substrate in a plastic tunnel compared to substrate inoculation by irrigation (standard method). Determination of plant physical characteristics and aroma profile.

Results on physical characteristics of strawberry plants





Control wool only Wool + Bacillus by irrigation Wool + Bacillus innoculated mixed with substrat Wool + Bacillus innoculated on surface

Quantification of B. amyloliquefaciens by qPCR in roots and substrate

qPCR quantification on 16 strawberry plants

Roots					
1R	(+)	9R	++		
2R	-	10R	1		
3R	-	11R	1		
4R	+	12R	(+)		
5R	-	13R	-		
6R	-	14R	++		
7R	-	15R (+)			
8R	+	16R -			



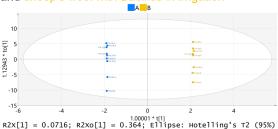
(+) ct between 30 and 35 cycles ct after 35 cycles

Conclusion

Innoculation with B. amyloliquefaciens in combination with sheep wool showed a positive trend in strawberry growth. A symbiotic relationship between the strawberry roots and the selected bacteria is clearly quantifiable when the bacteria are supplied by irrigation. Volatile compound analysis also showed a difference between control plants and plants in contact with the bacteria. This preliminary study shows great potential for symbiotic studies between plants and selected bacteria to improve plant growth and promote the assimilation of nitrogen from the air rather than from the substrate. For example, the controversial use of peat in crops could be replaced by a substrate rich in symbiotic bacteria.

DHS-VTT-GC-MS Results

Multivariate analysis by OPLS-DA of control wool only and sheep's wool with Bacillus in irrigation



Selection of aroma compounds based on OPLS-DA multivariate analysis

Selected aroma compounds based on OPLS-DA results	CAS N°	Odor description (www.thegoodscentscompany.com)	Control wool only	Bacillus in irrigation
Hexanal	66-25-1	Green woody vegetable apple grassy citrus orange fresh	952538	616048
2-Hexenal, (E)-	85761-70-2	Green leafy	818921	618391
Pentanoic acid	109-52-4	Acidic and sharp, cheese-like, sour milky, tobacco, with fruity nuances	15556596	11545534
Hexanoic acid	142-62-1	Sour fatty sweat cheese	15522168	11536986
Ethyl Acetate	141-78-6	Etherial, fruity, sweet, grape and rum- like	49629703	31633265
Ethanol	64-17-5	Strong alcoholic ethereal medical	28544486	21260038
1-Propanol, 2-methyl-	78-83-1	Fusel whiskey	41675	52346
1-Butanol, 2-methyl-	137-32-6	Ethereal alcoholic fatty greasy cocoa whiskey fusel leathery	225241	330897
3(2H)-Furanone, 4-methoxy-2,5- dimethyl- (Strawberry furanone)	4077-47-8	Musty, sweet, caramellic, musty beany, cocoa, coffee with slightly meaty and vegetative nuances	903256	1717340