INTERREG V – BioSubstrate

Alternatives for rock wool

Introduction

The conventional production of vegetables in greenhouses is mainly based on the use of stone wool as growing medium. The benefits (e.g. high water holding capacity) stand in contrast to serious disadvantages when it comes to an eco-friendly and sustainable plant production: High energy consumption during production and the problematic disposal of used stone wool slabs are the main downsides that have to be solved without changing the overall production setup.

Problem

INTERREG IV identified hemp shives and wood fibres as suitable replacements for stone wool for a certain time until the organic materials collapsed by microbiological decomposition. In this context, hemp shives showed less durability compared to wood fibres. This "breakdown" of organic compounds (Fig. 1 & 2) can be quantified as nitrogen immobilisation (Tab. 1). Also the poor physical properties have to be considered (e.g. low amount of easily available water, Tab. 1).

Tab.1: Chosen biological & physical properties of substrates

Substrate	Nitrogen Immobilisation [mg N / L]	Easily available water [% v/v]
Stone wool	-	67
Wood fibres	118	11
Hemp shives	601	2

Fig. 1: Growth of fungus in hemp shives (top & bottom)

Goal

Identify and testing of modifications to increase durability of organic alternatives to stone wool (hemp shives and wood fibres) up to nine months without influencing the overall biological soil life in general.

Methods & Actions

- **Test of modifications to improve the durability** (reduction of microbial decay / nitrogen immobilisation)
- **Large practical growing test with tomatoes** (performed at Proeftuin Ron Peters, Klazienaveen NL)
- **Mycorrhiza as innovative approach to check soil life** (qualitative and quantitative)

Results

By the addition of LA2 the nitrogen immobilisation of hemp shives could be lowered in laboratory tests (Tab. 2) down to 174 mg N / L (compared to 676 mg N / L of the control).

Tab.2: Influence of LA2 on the nitrogen immobilisation

Amount of LA2 [kg / m³ hemp shives]	0	5	10	20	30
Nitrogen immobilisation [mg N / L]	676	659	602	481	174

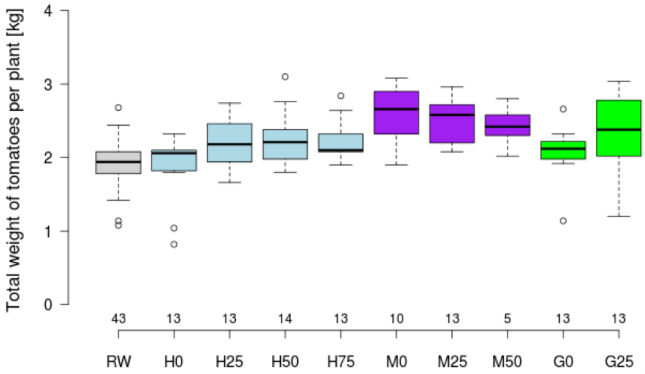

Fig 3: Total weight of tomatoes per plant (final harvest)

Tab.3: Influence of LA2 & substrate on root weight & arbuscular mycorrhiza

Substrate	LA2 [kg / m³]	Root weight [g / plant]	Arbuscular mycorrhiza [%]
Hemp shives	0	340	76
	25	215	61
	50	105	12
	75	65	0
Mix	0	370	69
	25	245	55
	50	195	28
Wood fibres	0	365	71
	25	285	58

The fresh weight of tomatoes of all variants was similar at final harvest (Fig. 3). Variants with additional mycorrhiza showed no difference regarding fresh weight of tomatoes, too (results not shown). The development of root mass and arbuscular cells were influenced by LA2, less by the used substrates (Tab. 3).

Conclusion

- Durability of "BioSubstrate" increased by LA2
- Mycorrhiza mainly influenced by LA2
- Production on "BioSubstrate" similar to Rockwool
- Lack of water capacity of "BioSubstrate" (hemp shives & wood fibres) can be counteracted by an adapted irrigation strategy (exact evaluation / measurements are necessary)

Literature: Dubsky & Sramek (2009): The effect of rockwool on physical properties of growing substrates for perennials (Horticultural Science, Prague)