Results from 2-year consecutive trials in the USA and The Netherlands

Growstones produce fruit yields similar to Rockwool. This was proven in three continuous trials with tomato and cucumber in the US (The University of Arizona, 2006 through 2008) and two continuous trials with tomato and cucumber in The Netherlands, WUR (2006 and 2007). Tomato yields in Growstones and Rockwool reached 40 kg per m^2 in a 5-month production period in Arizona (Figure 1). This is especially significant considering that no CO_2 enrichment was used. In The Netherlands tomato yields outperformed Rockwool by 4% due to a higher incidence of blossom end rot (Figure 3).

A summary of crop yields, fruit quality and other plant responses between Growstones and Rockwool, is presented below.

Tomato plants growing in Growstones had the same yields than those in Rockwool (Controlled Environment Agriculture Center, The University of Arizona, Tucson, AZ; Wageningen University and Research Center; The Netherlands and, 2006 – 2008) (Figure 1 through 3).

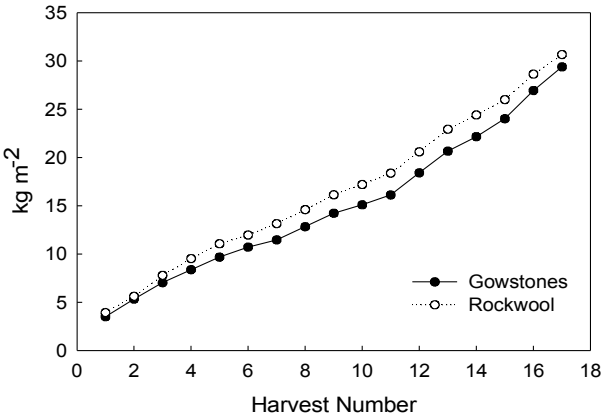

Figure 1.Tomato cumulative yields (kg m^{-2}) in Growstones within 4% of Rockwool for February - May 2007 crop season at The University of Arizona, Tucson, AZ. N = 18.

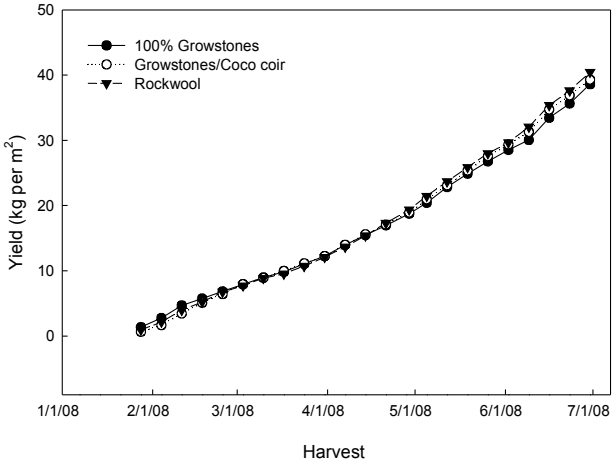

Figure 2 . Tomato cumulative yield (kg per m^2) for different Growstones based growing media and Rockwool (Control) for Jan – June 2008 crop season at The University of Arizona, Tucson, AZ. N = 10.

At the end of 23 weeks (Jan 28 – June 30, 2008) cumulative yields of different Growstone based substrates resulted in similar yields to Rockwool (ca. 40 kg/m2).

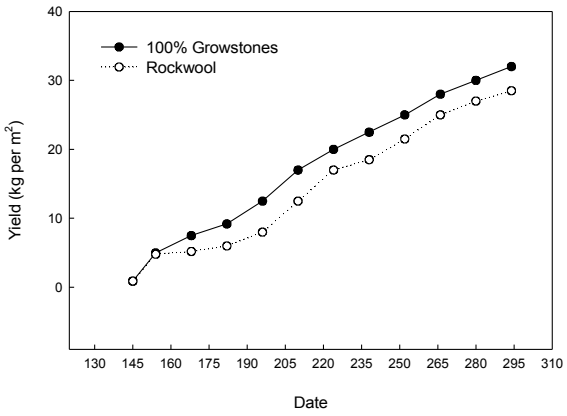

Figure 3. Tomato cumulative yields (kg per m^2) vs. harvest day in Growstones and Rockwool for May 25 – October 17, 2007 crop season at Wageningen University and Research Center, The Netherlands. N = 15.

Higher tomato yields observed in Growstones was due to significantly higher incidence of blossom end rot (BER) in plants grown in Rockwool during a portion of the crop season, compared with Growstones.

In cucumber greenhouse trials at Wageningen University and Research Center, The Netherlands in 2006, Growstones yields slightly outperformed Rockwool.

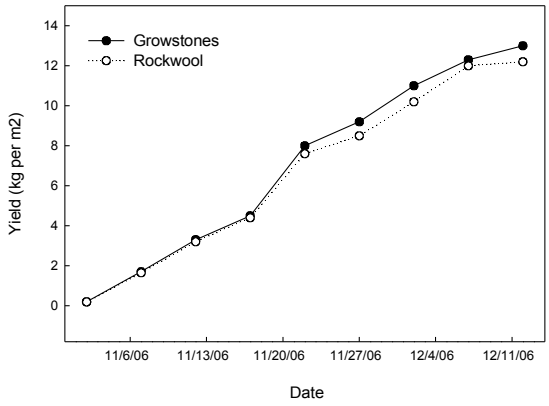

Figure 3. Cucumber cumulative yields (kg per m^2) in Growstones and Rockwool from September to December 2006 crop season at Wageningen University and Research Center (WUR), The Netherlands.

The higher yields in cucumber plants grown in Growstones were due to a significantly higher steerability out of an excessively vegetative crop growth compared to plants grown in Rockwool. Growstones promoted reproductive plant growth with an earlier onset of harvest, faster flower and fruit development.

This is of practical significance particularly in climates which tend to promote excessive vegetative growth with subsequent delays in production.

Other comparative advantages observed in Growstones

Growstones also promoted significantly higher resistance to fungus such as *Pythium* compared to Rockwool (cucumbers, Wageningen University and Research Center, The Netherlands, 2006) (table 1).

Table 1. Number of cucumber plants lost due to *Pythium* infestation in Growstones and Rockwool.

Number of infested plants	
Rockwool	Growstones
15	1

Over time Growstones glass matrix releases silicon as mono silicic acid which is accumulated in leaves and shoots of silicon-accumulator plants. The effect of silicon is currently under study for certain crops, mostly monocots. Several studies (Hogendorp and Cloyd, 2008; Kamenidou et al., 2008; Gang Lu et al., 2008;

Heckman et al., 2003; Gillman et al., 2003) have indicated beneficial effects of high silicon concentration in leaves. Among such benefits is the prevention or mitigation of insect pests and fungal diseases, increased resistance to micronutrients phytotoxicity (Mg), as well as drought and heat resistance in some silicon accumulator crops. Results on silicon content of plants grown in Growstones and Rockwool are presented in Table 2.

Table 2. Silicon content of plant tissue (leaves and shoots), at Wageningen University and Research Center (WUR), and at the University of Arkansas in 2007.

Leaf silicon content (mmol kg^{-1} dry weight)		
WUR		University of Arkansas
Tomato leaves (non-accumulators)		New Guinea shoots
Rockwool	Growstones	25% Growstones
5.1	7.0	673

Growstones drier nature also resulted in significantly higher Brix % in tomato fruits grown under high radiation conditions compared with Rockwool (Controlled Environment Agriculture Center, The University of Arizona, Tucson, 2007) (Figure 4).

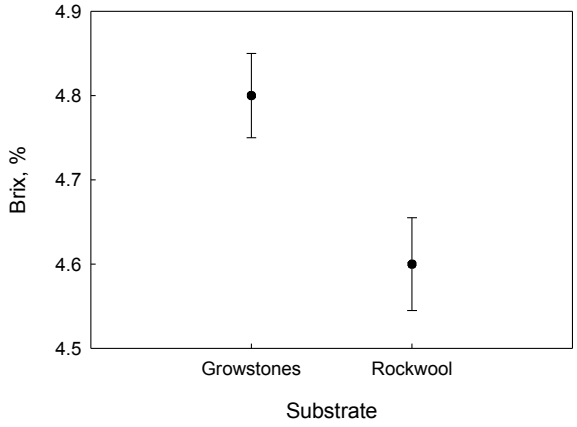

Figure 4. Total soluble solutes (Brix %) in tomato fruits grown in Growstones and Rockwool. Data from 7 harvests between February - May 2007. N = 3.

Leaf Area Index (LAI) with Growstones based crops tends to be slightly lower than in Rockwool. In The Netherlands, LAI was 3.6 m^2/m^2 and 3.8 m^2/m^2, for Growstones and Rockwool, respectively with a plant density of 3.2 plants per m^2. The 5% lower LAI in Growstones had no negative effect on yields.

Recommendations for growing in Growstones

- Being a drier substrate compared to Rockwool and coco coir, growing in Growstones requires simple adjustments in irrigation management – increased frequency and reduced duration of each irrigation cycle, compared to systems based in Rockwool.
- Daily water consumption is similar between Growstones and Rockwool.
- It is recommended to allow 1 week after transplant before attaching the vine twine to the plant. This prevents tilting of propagation blocks sitting on top of the aggregate media.
- All other crop management practices remain the same.