Aqua-Hort® in cut roses

In cut roses, the *Aqua-Hort*®-system results in:

- increased nutrient uptake
- increased number of stems [10.6%]
- increased stem length
- increased head size
- increased leaf size and greener leaves
- reduced spidermites
- reduced agrobacterium

data collected by Harvest Ltd
laboratory readings by den Haan
compiled by Scarab® Solutions Ltd

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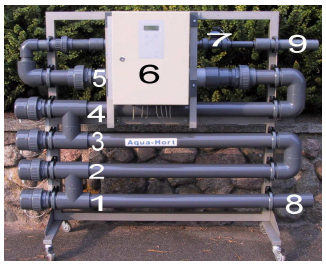
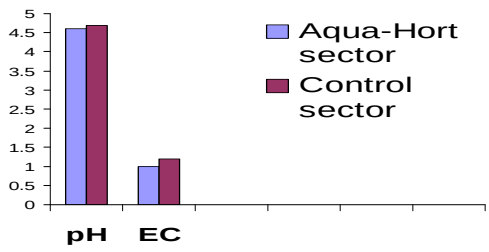
Aqua-Hort® fertigation system

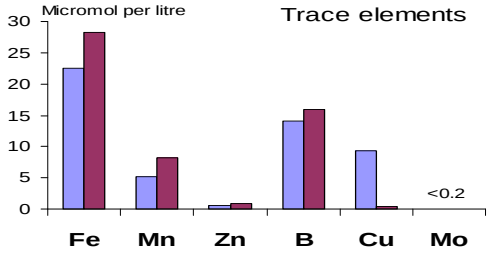
The *Aqua-Hort*® fertigation system injects free copper ions into the irrigation water, killing *Pythium, Phytopthora, Agrobacterium, Erwinia, Xanthonomas, Clavibacteria, Ralstonia* and *Ramorum*. *Aqua-Hort*® increases nutrient uptake, increases production, and reduces crop protection problems.

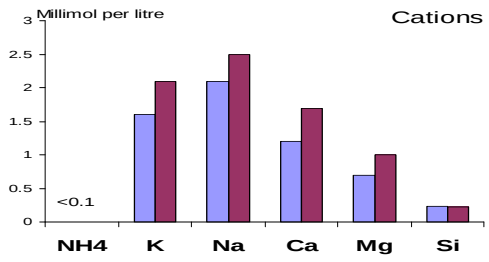


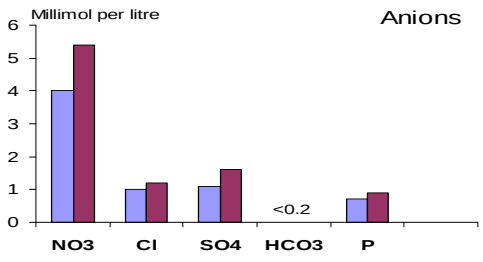
Increased nutrient uptake

An analysis of drainage water from cut roses grown in substrate showed lower concentrations of nutrient elements in the drainage water from the *Aqua-Hort*®-treated greenhouse sector as compared with the control sector. Hence, there is **higher nutrient uptake by *Aqua-Hort*®-treated cut roses**. The drainage water samples below were taken three months after the trial start and analysed by the Relab den Haan laboratories as 'blind samples'.









Increased number of stems

The increased nutrient uptake leads to higher production, in this case **10.6% more stems**, *cf.* table below

Weekly production of stems and percent increase by *Aqua-Hort*®:

Week	Treated	Untreat	%
40	1951	1308	49.2
41	2356	2143	9.9
42	1340	1151	16.4
43	1961	1322	48.3
44	1705	1649	3.4
45	2371	2430	-2.4
46	1690	1841	-8.2
47	1160	1136	2.1
48	1860	1590	17.0
49	1774	1574	12.7
50	1640	1704	-3.8
51	704	690	2.0
TOTAL	20512	18538	**10.6**

Longer stems, larger heads, larger and greener leaves

The increased nutrient uptake leads to improved plant health and improved quality, in this case **7.4% longer stems**, **2.5% larger heads** and **5.8% larger leaves**, *cf.* table below. Data were collected 4½ and 5½ months after trial start. Also, leaves appear greener in the *Aqua-Hort*®-treated sector.
Vase life was the same, but the *Aqua-Hort*®-treated flowers opened more fully up and opened one day earlier than the control flowers.

Mean values, percent increase and significant levels:

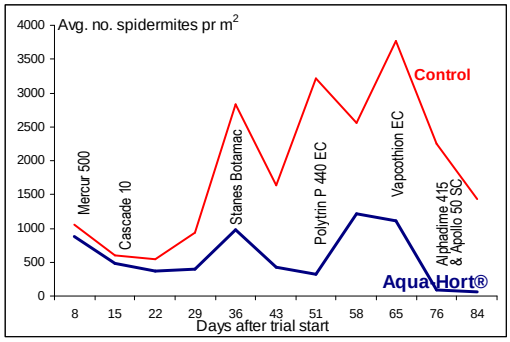
Quality reading	Treated	Untreate	%	P-value
Stem length (cm)	55.2	51.4	7.4	0.004**
Bud heigth (mm)	48.0	46.8	2.6	0.003**
Bud width (mm)	30.1	29.4	2.4	0.044*
Leaf width (mm)	55.0	52.0	5.8	0.000***
Stem weigth(g)	37.5	34.9	7.4	0.057^{NS}

lenotes significance at the 5% level, ** at the 1% level and *** at the 0.1% level, NS denotes no significance

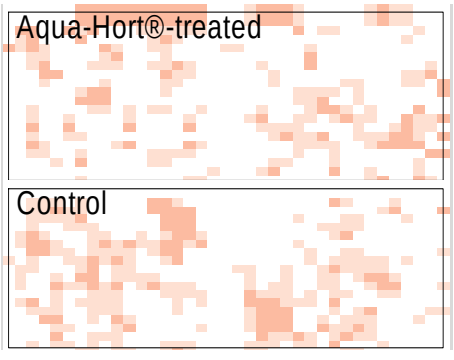
Reduced spidermites

Reduction in spidermites were observed soon after the trial start, see graphs to the right. It is believed that improved plant health and stronger cell walls explain the observations. The Aqua-Hort®-system can **reduce spidermite control to spot treatments** (see distribution map below to the right), and the frequency of spraying is likely to be reducible too. Lower spidermite populations open up for **economically sustainable biological control**.

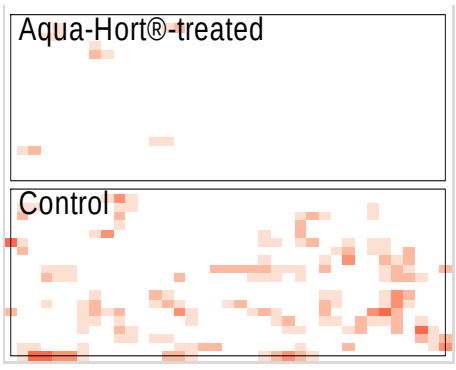
Spidermite trends during 12 weeks:



Spidermite distribution before:



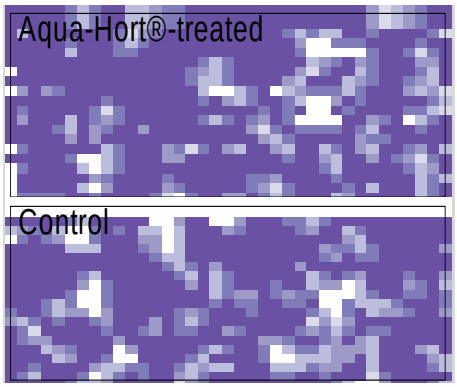
Spidermite distribution after 12 weeks:



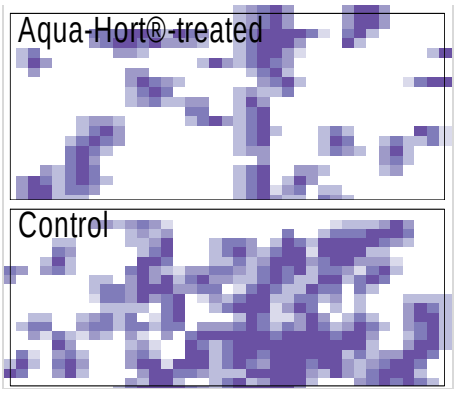
Reduced agrobacterium

Copper is a key element in cell wall lignification. Stronger cell walls, improved plant health, and free copper ions disinfecting agrobacteria transported with the irrigation water - from infected plants to healthy plants - most likely explain the reduction of agrobacterium galls in a heavily infested cut rose crop as illustrated below. Note the **spatial distribution of agrobacterium galls** in the *Aqua-Hort*®-treated sector and the control before and 6 months after trial start:

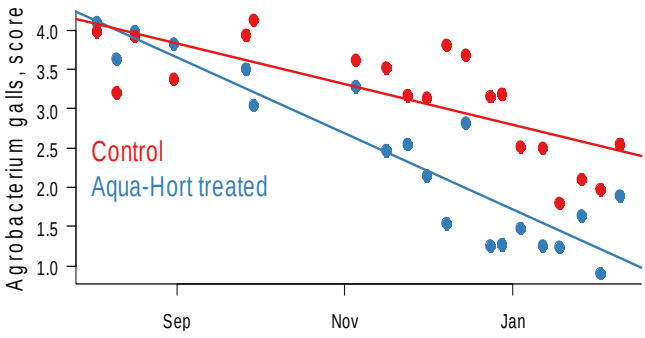
Before:



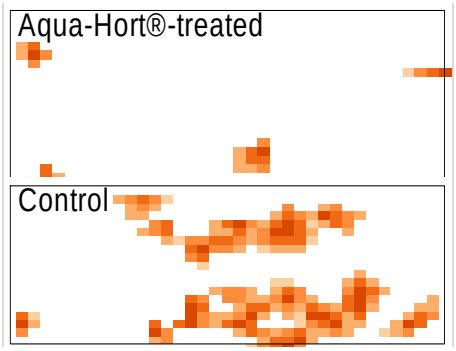
After 6 months:



Below see the **trends in agrobacterium galls during the 6 months** trial period in the *Aqua-Hort*®-treated sector and the control:



Below see the **spatial distribution of *newly emerged* agrobacterium galls 6 months after** trial start in the *Aqua-Hort*®-treated sector and the control:



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