

Safe cleaning of anti-reflection glass (AR glass)



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Modern energy-efficient greenhouses are built on a large scale with AR glass, glass with an anti-reflection treatment. AR glass allows more sunlight to pass through for higher crop production. At the same time, more solar energy in the greenhouse contributes to saving fossil fuels. In times of high energy prices, all measures help.

On the other hand, uncertainty about how a new greenhouse will perform ten years after construction can lead to reluctance to invest in energy-saving measures and innovation in the sector in general. More knowledge about AR glass can help to remove some uncertainty. After all, if the glass is cleaned incorrectly, the AR effect will be affected and part of the light transmission will be lost. This has direct consequences for production.

In the 'Safe and effective cleaning of AR glass' project, the first phase examined which cleaning agents can be used to safely clean AR glass without affecting the AR function. The results of this are now known. In a second phase, this year researchers are looking at which cleaning agents and methods are most effective for removing the dirt on the greenhouse.

Approach

In the first phase of the project, researchers focused on tests to clean glasses safely without affecting the AR effect on the glasses. To this end, a standardized test has been developed to simulate the annual cleaning of the greenhouse roof with a brush machine on the outside or a high-pressure cleaner on the inside. In collaboration with machine builders, standardized test setups have been made for both a brush and a high-pressure cleaner, as would be used in commercial greenhouses. A standardized test protocol has been developed and tests have been carried out and these have been repeated ten times, so that the results indicate a lifespan of approximately ten years of the greenhouse.

Ten different cleaning agents were tested, plus demineralised water as a reference, and several AR glasses from four manufacturers, plus a reference glass without AR. The cleaning agents include agents specifically developed for AR glass, as well as traditional cleaning agents for glass or chemical or biological pollution in general. The AR lenses are different lenses with both coating and etching technology.

Results

The results in the first phase of the project show that there are:

- three cleaning agents and water on all types of glasses from all manufacturers are completely safe in combination with both a high-pressure and brush machine;
- one cleaning agent (containing fluorine) should never be used;
- the other agents can sometimes have a (slight) influence on the light transmission of the AR glass, depending on the type of AR glass, the agent and the cleaning method (brushing or high pressure) and can therefore eventually lead to light loss after frequent application (here ten times, comparable to ten years).

Conclusions

- All tested agents, together with brushing and high-pressure spraying, can be safely used on traditional horticultural glass without AR = reference glass
- Four agents are always safe on all AR glasses: (demi) water, Menno Ter Forte, Hyperclean X, **ReduClean**
- One agent is very unsafe on all glasses with AR: **GS4** (fluorine-containing agent);
- All other agents do show (a slight) damage to AR on one glass, on the other glass; especially in combination with brushing. Results are comparable to 10 years of use.

Follow-up

As a result of the first phase of the project, researchers now have a standardized test set-up and standardized test protocols available at [WUR LightLab](#) to test whether a cleaning agent can be used safely on an AR glass without affecting the AR effect. Test set-up and protocol can also be used for other agents and glasses in the future if suppliers or growers are interested.

In the second phase of the project, the researchers will focus on the most effective way of removing a lot of chemical and biological dirt (such as fungi) that occur on greenhouse roofs. They can then advise which combinations of cleaning agents and AR glasses are the most safe and effective for cleaning a roof by a grower.

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