In this post, I share my experience with the semi-closed glasshouse. There is much confusion on how best to grow crops in a semi-closed glasshouse, and this series of articles tries to clear up confusion, inspire new discussion and educate.

No More Botrytis in a Semi-Closed Glasshouse

The semi-closed glasshouse provides added protection against pests and disease. The screened air inlet and outlets are in most instances protected with a small enough insect screen that insects as small as thrips cannot enter the glasshouse. Of course, insects can still be brought into the glasshouse through staff, visitors and equipment. Once inside, these insects can breed so it is an absolute fairy-tail that a semi-closed glasshouse provides complete protection against pest and disease. What it does provide is protection against mass influxes of pests allowing an Integrated Pest Management system to be more successful and cheaper. With insects, size matters. A tiny insect such as the russet mite will easily find its way into the semi-closed glasshouse. Screening against russet mites would require such a fine screen that air intake would be compromised. Let's look at some other disease types and see what extra advantages a semi-closed glasshouse provides over and above a conventional glasshouse.

Fungal Diseases

Fungal diseases require three things to be present at the same time; A spore, a wound, and the right climatic conditions. Usually, the climate conditions are related to temperature and humidity. The two most common fungal diseases for glasshouse tomato plants are botrytis and powdery mildew. Some varieties are powdery mildew tolerant, but none are resistant. Both diseases thrive at high humidity. It is the reason why growers heat at night. I remember being at a research meeting where plastic unheated tunnel growers insisted, they needed research on better chemicals to fight botrytis and powdery mildew. A glasshouse grower wisecracked that protection against these diseases had already been invented: "it is called heating!".

These two diseases are also the reason why growers do not like introducing moisture into the semi-closed glasshouse at night. It seems counter-intuitive to introduce moisture in a glasshouse at a time when humidity can already be high. But we saw in previous posts that 100% humidity is virtually impossible in a semi-closed glasshouse. The air movement will help dry any wound even if the humidity in the air is 99%. Like the heated greenhouse grower who belittled the tunnel grower, a semi-closed glasshouse grower could tell a conventional greenhouse grower that the cure against Botrytis has already been invented; "It is called air movement!"

Being able to control air movement makes the semi-closed glasshouse better equipped to fight these diseases. But like with insects, it is also not impossible to get them. Common sense needs to be used. If a fungal disease marks its presence, actions must be taken to combat the disease. Higher fan speed, heating, or sprays should be considered. However, the greatest risk for botrytis in a semi-closed glasshouse comes from poor quality labor, not from humidity.

Root borne diseases such as Fusarium (race3), Verticillium and Pythium are just as likely to appear in a semi-closed glasshouse as in a conventional glasshouse.

Viral Diseases

Unsurprisingly the semi-closed glasshouse provides better virus control when insects are the main vector of the virus. The incidence of viruses such as the Tomato Yellow Leaf Curl Virus (TY) and Tomato Spotted Wilt Virus (TSWV) will be much reduced in the semi-closed glasshouse. Some semi-closed glasshouses have been built in areas where the TY is endemic. Conventional glasshouse growers must use TY resistant tomato varieties in order not to lose their crops to this devastating virus. Semi-closed glasshouses in TY infested areas have been planted with non-TY resistant varieties and successfully grown without economic losses from TY. This is important because TY varieties typically yield much less than non-TY resistant strains. A similar story can be told for the Tomato Spotted Wilt Virus. The incidence of thrips entering the glasshouse is much reduced in a semi-closed glasshouse compared to a conventional glasshouse. There are only a few tomato varieties available that are TSWV tolerant or resistant. A semi-closed glasshouse could make the difference between being able to grow a crop or not, especially in areas with heavily thrips infested outside environments.

Figure 1; Tomato Yellow Leaf Curl Virus

Recently outbreaks of the Tomato Potato Psyllid in Australia and New Zealand and Tuta Absoluta might have had less impact if semi-closed glasshouses were used.

Other viruses such as Pepino and the new Tomato Brown Rugose Fruit virus are just as likely to appear in the semi-closed glasshouse because there is no known insect vector.

Bacterial Disease

Semi-Closed glasshouses also provide increased protection against the bacterial disease Candidatus Liberibacter Solanacearum spread by the Tomato Potato Psyllid. The insect is too large for the screens of the air inlets and outlets.

For bacterial diseases such as bacterial canker, wilt, and spot, hygiene is of the utmost importance. A proper hygiene program is essential, both during the crop and in between crops. Some bacterial diseases can be spread from one plant to the other through guttation. Guttation is the excretion of liquid water through the leaves due to high root pressure. Guttation is more likely to happen in a conventional glasshouse, but this represents only a minor cause of the spread of bacterial diseases.

Interplanting

Some of the early semi-closed glasshouses were sold under the premise that, through interplanting, growers would be able to achieve yields of 100Kg/M2. Interplanting allows for continuous harvest for 52 weeks per year by putting a young plant in between old plants and growing both crops side by side until the new crop comes into production. Some semi-closed glasshouses were able to successfully do this for several years. But hygiene concerns and insect pressure have forced most farms back into one monocrop per year with a "green break" at the end of the crop. Now it is generally accepted that semi-closed glasshouses reduce the risk of pest and disease, but not eliminate them enough to have glasshouses continuously planted. Having a short green break allows the grower to start clean, which is an important cornerstone of any IPM strategy.

Birds

The semi-closed glasshouse offers additional protection against birds flying into the glasshouse. Birds offer a potential salmonella threat. Once in the glasshouse, they`re almost impossible to get out. I once had a nest of Willy Wagtails nesting right next to the music loudspeaker. Every year the parents came back to lay more eggs. However cute this may be, they poo in the glasshouse and can potentially spread salmonella when fruit becomes contaminated with their excretions. Having the vents netted, and the air inlet screened, significantly reduces the number of birds entering the glasshouse. As with insects, there are no guarantees, but with ever-increasing food safety regulations, the reduced threat of salmonella represents a benefit.

Future Pests and Diseases

It is almost certainly true that in the future, new insects some of which could be transmitting disease, will be discovered. The semi-closed glasshouse affords a superior proofing from threats past, present and future. The scale and cost of glasshouse structures means that more and more glasshouses projects are funded by investors, who are risk adverse. While the semi-closed glasshouse is certainly not free from risk, the pest and disease danger has been greatly reduced. The semi-closed glasshouse has significantly expanded the geography of where on earth a glasshouse can grow competitive yields. Usually, these are warmer climates in which insect pressure from outside is far greater than in traditional glasshouse areas. The protection a semi-closed glasshouse provides, means that IPM strategies can be implemented with a high chance of success. The superior air movement makes the management of fungal diseases much more manageable, which further enhances the success rate of an IPM management plan as the use of potential beneficial insect killing fungicides is reduced.

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