DNA RESEARCH AND GROWING MEDIA

Growers increasingly want to know in advance whether there are harmful fungi or bacteria in the substrate supplied. DNA research is therefore regularly carried out on growing media. They hope to determine whether it is free of harmful organisms. DNA research is also used more often to determine the cause of damage in a culture. But how reliable are the results?

DNA research

In DNA research, DNA sequences (specific genetic information) are used to determine which organisms, such as fungi, are present in a sample. For example, one technique that is used is PCR (Polymerase Chain Reaction). In this process, the DNA of the fungus found is multiplied. Identification of the fungal species is done by comparing the DNA sequences with reference databases. DNA analysis techniques are often used to identify fungi/bacteria on, for example, plants or food. In recent years, this same DNA research has also been applied to growing media. Growers increasingly want to know in advance whether harmful fungi or bacteria are present in a substrate that can lead to culture damage. Another reason to use a detection method is when culture damage has occurred. The grower then wishes to name the fungus or bacterium, in order to be able to apply the correct control and to trace the source of the contamination. In the case of the classical research methods on growing media, the results were clear. A fungus or bacterium was identified by means of plating. Since growers want more data, laboratories have started to use existing DNA research that was not primarily developed for the analysis of organic substrates. In fact, no reliable research results can be obtained for this purpose.

DNA research on growing media

DNA research has not been developed primarily for organic substrates and often has not been validated for these products. DNA research of organic substrates can give incorrect test results. To clarify this, a few examples:

Is the fungal species actually harmful to the crop?

If, for example, the fungus *Pythium* sp. is found, it means a result at the gender level. There are more than 150 species within this genus. Harmful and harmless species. The result does not make it clear which species is present and whether it is a harmful (pathogenic) species. If it is a pathogenic species, the next question is whether it is also harmful to the crop in question and whether there are enough spores present to affect a plant.

Is the fungus still alive or is it already dead?

DNA research doesn't show whether the fungus or bacteria found is still viable. DNA, both

dead and living, is multiplied and thus detected. Dead DNA means that the organism, if it is still in the substrate, is already dead and therefore no longer causes problems for the culture anyway. This means that the test result can be a 'false positive'.

What does it actually say that this species of fungus has been found?
For example, with DNA research the complex fungal species *Fusarium solani* has been found. The type isn't known with research like this. However, *F. solani* has many different types, most of which aren't even pathogenic to crops. Demonstrating *F. solani* without the type doesn't really say much. This is also true for other complex species including *Fusarium oxysporum* and *Rhizoctonia solani*. If *F. solani* is found in 2 samples, there is a good chance that they are different types that have nothing to do with each other. Based on current knowledge and experience we know that the chance that a substrate in which *F. solani* is found causes damage, is very small. Even the presence of *F. solani* in an affected crop doesn't necessarily mean that this is the cause. Further identification is then necessary. In addition, a detection doesn't automatically lead to a causal relationship with any culture damage.

Was the sampling done correctly?
There are significant risks of incorrect test results due to incorrect sampling of the substrate or the sampling site. This is even more important with DNA research. Especially since sometimes less than a gram of substrate is used in the analysis.

What are the guidelines of the RHP quality mark?

All quality requirements of the RHP quality mark are described in the RHP product certification scheme, which is continuously updated based on developments. For the quality marks RHP and RAG, RHP mainly carries out control analyses in its own laboratory and test greenhouse. To this end, affiliated companies provide product samples of their certified raw materials and growing media. DNA research isn't (yet) part of these analyses. However, RHP is closely involved in the development of future analysis techniques for reliable research of fungi and bacteria in organic substrates. If, after a culture damage, one wants to look for a possible match of organism(s) in substrate and crop, there are possibilities for a research project at RHP.

Advice for the user

Caution should be exercised with current DNA research if they are used for growing media. These haven't been developed for this purpose, which means that DNA research on growing media can deliver incorrect test results. The fungus found may as well not be harmful or already dead and therefore not cause any problems for the crop. Such a false positive test result can have negative consequences for the grower and substrate supplier. DNA research can be useful in damage cases, but is a tool and isn't yet conclusive evidence in the case of claims. In the future, it may be possible to demonstrate a causal relationship between a culture problem and a DNA analysis of the substrate. The development of DNA research on growing media has taken off in recent years. The techniques are becoming more specific and cheaper.