# DNA Nultiscan®: A New Tool for Rapid Detection of Pathogens in Water, Soil, and Plant Tissue©

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The main limitation in plant disease management is the ease of plant pathogen identification. Standard procedures' limitations include:

- Time-consuming and often laborious.
- Require extensive knowledge in both classical taxonomy and culture methods.
- Exclude culture-independent organisms.
- Detect few organism at a time.

Molecular and serological identification methods, on the other hand, generate accurate results rapidly but detect few organisms at a time. The solution is DNA-array technology:

- Originally developed to screen for human genetic disorders in 1989.
- Successfully applied to detect and identify different microorganisms in clinical laboratories in 1992.
- Successfully applied to discriminate and identify DNA samples isolated from specific oomycete (1998), nematode (1999), and bacterial cultures in plant pathology (2003).

The advantages of DNA Multiscan include:

- Multiplex detection.
- Rapid, accurate, simple, and sensitive.
- Semi-quantification.
- Analysis of samples from different biological sources (plants, seeds, soils, composts, potting mixes, rockwool, water, nutrient solution, etc…).
- New microorganisms added regularly.
- Bundling of organisms to meet needs.

Currently detectable organisms are shown in Table 1.

During the analysis, the sample's total DNA is extracted. This includes any plant DNA, bacterial DNA, fungi DNA, yeasts DNA, algae DNA, and nematode DNA. Amplification of pathogens DNA is then carried out. This is followed by hybridization, which is a key step of the DNA Multiscan process. Keys to the success of the process are:

- The specific labeled amplified DNA sequence hybridizes with its correspondent oligo on the macro-array.
- The oligo is specific to the disease causal agent and can be developed in-house for specific needs.

**Table 1.** Currently detectable organisms by DNA Multiscan®.

**FUNGI AND OOMYCETES:**

*Athelia* (*Sclerotium*) *rolfsii*
*Botrytis cinerea*
*Colletotrichum* sp.
*Colletotrichum acutatum*
*Colletotrichum coccodes*
*Colletotrichum fragariae*
*Colletotrichum gloeosporioides*
*Colletotrichum graminicola*
*Cylindrocarpon destructans*
*Cylindrocladium* sp.
*Didymella* sp.
*Fusarium* sp.
*Fusarium oxysporum*
*Fusarium solani*
*Gnomonia comari* (*Zythia fragariae*)
*Penicillium* sp.
*Phytophthora* sp.
*Phytophthora cactorum*
*Phytophthora capsici*
*Phytophthora cinnamomi*
*Phytophthora citricola*
*Phytophthora cryptogea*
*Phytophthora drechsleri*
*Phytophthora fragariae*
*Phytophthora infestans*
*Phytophthora nicotianae*
*Phytophthora ramorum*
*Phoma destructiva*
*Plectosphaerella cucumerina*
*Pyrenochaeta lycopersici*
*Pythium* sp.
*Pythium aphanidermatum*
*Pythium dissotocum*
*Pythium irregulare*
*Pythium polymastum*
*Pythium sylvaticum*
*Pythium ultimum*
*Rhizoctonia solani*
*Sclerotinia* sp.
*Sclerotinia minor*
*Sclerotinia sclerotiorum*
*Sclerotinia trifoliorum*
*Thielaviopsis basicola*
*Verticillium* sp.
*Verticillium albo-atrum*
*Verticillium dahliae*

**BENEFICIALS:**

*Trichoderma asperellum*
*Trichoderma harzianum*
*Trichoderma hamatum*

**BACTERIA:**

*Erwinia carotovora* subsp. *atrospetica*
*Erwinia carotovora* subsp. *carotovora*
*Erwinia chrysantemi*
*Pseudomonas cichorii*
*Pseudomonas marginalis*
*Pseudomonas viridiflava*
*Pseudomonas syringae* pv. *porri*
*Ralstonia solanacearum*
*Rhizobium radiobacter* (syn. *Agrobacterium tumefaciens*)
*Xanthomonas fragariae*

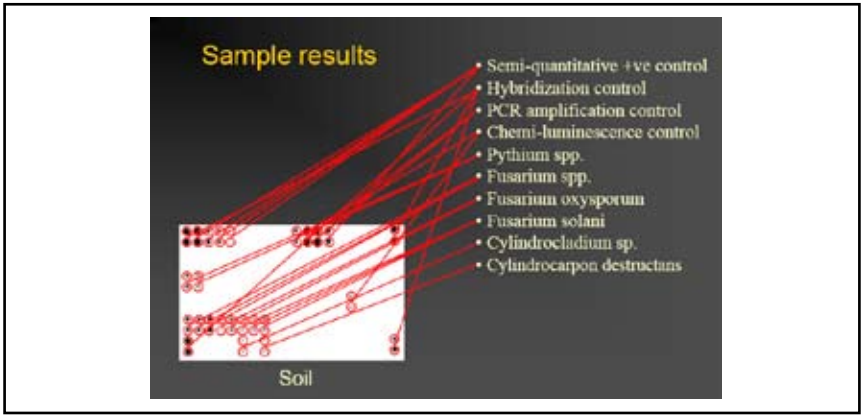


**Figure 1.** Example of sample results.

An example of sample results is shown in Fig. 1.
Current applications include the following:

- Disease diagnosis.
- Continuous monitoring recirculating greenhouse fertilizer solutions or pond water.
- Detection of organisms in soil, peat, compost, and other growing media.
- Regulatory requirement to justify the use of certain restricted chemical pesticides.