Detection of virulent potato cyst nematodes using hyperspectral signatures

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The emergence of the new virulence type “Emsland” of the quarantine potato cyst nematode *Globodera pallida* (*G. pallida*) has led to a new thread for potato production.

Since there are neither resistant potato cultivars against the new virulence type nor nematicides available, a sufficient monitoring is crucial. Once a field is contaminated with *G. pallida*, the nematode is able to endure 20 years or longer in the field, which blocks future cultivation of potatoes or other Solanaceae in the crop rotation.

The new virulent population was able to spread undetected, due to cost- and labor-intensive conventional monitoring systems. The typical occurrence in nests of cyst nematodes reduces the probability of localizing an infestation, in addition to the high effort for soil sampling and extraction for detection and identification. If an infestation is recognizable, for example by wilting symptoms, stunted growth or a positive result after taking a soil sample, an area is already significantly contaminated.

The objective of the research project is to develop a detection system based on hyperspectral sensor information. The target value is the detection of early / latent infestations. An early / latent infestation already leads to a strong increase in population densities of *G. pallida*, without visible symptoms. In addition, the level of virulence present should be estimated.

The detection system will be based on an imaging hyperspectral camera (400 – 1000 nm) and on a leafclip attachment, at different inoculum levels of *G. pallida.* Additionally, developmental stages are investigated by destructive sampling in combination with determination of water, chlorophyll and nitrogen content of the plants.

The collected data should be incorporated into a self-learning algorithm, to support early detection of a latent *G. pallida* infestation of virulent populations.

The project aims to develop detection methods for virulent *G. pallida* populations and provides the groundwork for monitoring systems, e.g. using drones or remote sensing. The results serve as a basis for the plant protection services to protect production areas from long-term contamination and thus to avoid a long-term blocking of potato cultivation.