

# Phenotypic Analysis of Cyst Nematodes

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Cyst nematodes comprise a group of soil-born pests that globally cause severe damage to cash crops like soybeans, cereals, potatoes and sugar beet. Density of nematode cysts in the soil is a key factor to determine the risk for crop cultivation. The nematodes threaten crop production they colonize crop roots and parasitize them, resulting in significant yield losses. Vice versa, development of nematode resistant cultivars require determination of cysts in-vitro to discriminate resistant from susceptible plant genotypes. Determining cysts per soil sample can be achieved by imaging and image processing. After extraction of cysts from soil samples, they are displayed on filter papers, which are traditionally scored by human eye. By developing an imaging setup for this sample type and a related image processing procedure, it was possible to optimize this scoring process. Imaging and image processing is faster, more comparable, and better documented than visual scoring by human operators.

The imaging and image processing method was referenced with the traditional rating method as it is common practice in the German agricultural monitoring lab at the Julius Kühn Institute. The counting accuracy was highly comparable to the accuracy of visual counting. The optical sensing method delivers a set of additional data beyond the cyst count for phenotyping nematode populations. These comprise length, width, and area of the cyst that enable analyzing cyst dimensions. Sensing measured dimensions were found to be in accordance to literature data. Moreover, image processing enables analyzing cyst colors, a feature that could be important for age determination.