Ein Aussetzen der Schwefelanwendungen im Jahr 2007 führte sowohl bei den Familien der Tarsonomidae und Tetranychidae als auch bei der Familie der Tydeidae zu einer Erholung der Populationen.

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Biocontrol of covered kernel smut of sorghum and detection of the causal organism, *Sporisorium sorghi*, in planta

Covered kernel smut disease of sorghum (*Sorghum bicolor* (Linn.) Moench) caused by *Sporisorium sorghi* (Link) Clinton occurs in all countries where sorghum is grown. In Egypt it is regularly causing heavy losses of grain yield. The teliospores of *S. sorghi* adhere to the seed surface. The optimum temperature for spore germination and infection of the plant is 30 °C. Infection takes place only in the time period between grain germination and seedling emergence.The present work was started to identify non-chemical seed treatments that are effective against the disease. The treatments tested included experimental microorganisms, plant strengthening agents and other agents of natural origin. Because the symptoms of kernel smut become visible only after development of the panicle, methods for early detection of the pathogen in the plant tissue were developed. The fungus could be detected microscopically after staining of hand sections with trypan blue. Using this method, mycelium was found in the apical buds and in the nodes. In the same tissues the presence of the fungus was diagnosed by PCR. DNA was extracted from mycelium grown in vitro or from plant material using the DNeasy® Plant mini Kit. Amplification of a sequence within the glyceraldehyde-3-phosphate dehydrogenase (GADPH) gene with the primer pair G3PD-1096F + G3PD-2020R yielded a band of 930 base pairs in length that was also present when infected plant tissue was assayed.

Prior to testing in the greenhouse a screening was performed in vitro. A total of 270 microorganism was included. The microorganisms were inoculated on agar media as spots and cultured for approx. 48 h. The colonies were then killed with chloroform vapours. Afterwards, the plates were spray-inoculated with a suspension of teliospores of *S. sorghi*. After 18 h of cultivation at 28 °C the plates were inspected under the microscope, and 48 h after inoculation inhibition zones were measured. As a second screening step, the microorganisms were cultured in liquid media, and the culture filtrates were added at different concentrations to potato dextrose agar. Likewise, water extracts prepared from dried plant material were added to PDA in Petri plates. Teliospores of *S. sorghi* were plated on the agar surface, and after incubation at 28 °C for 18 h spore germination was evaluated microscopically. Based on the results of the pre-screening, 12 treatments were selected for efficacy testing in the greenhouse.

For the greenhouse tests sorghum seeds (cv. Dorado) were pre-germinated for 6 h on moist filter paper, dried, dusted with teliospores of *S. sorghi* (5 g / kg) and then treated with the agents to be tested (suspensions of microorganisms, plant extracts, Tillecur suspended in a small amount of water). Per 5 g of seed, 100µl were applied by vigorously shaking in a flask. Seeds treated with water served as controls. After treatment the seeds were sown in plastic pots (18 x 18 cm) at 3 seeds per pot and 18 pots per treatment. The pots were placed in a greenhouse at 25 - 30 °C with supplementary light from sodium high pressure lamps. About 3 weeks after sowing two plants per pot were harvested and used for detection of the fungus by microscopy and PCR. Examination of the panicles of plants grown from the water-treated control seeds revealed an infection rate of 94 %. Seed treatment with Tillecur (Schaette, Bad Waldsee), Quillaja (NorNatur, Hvidovre, Danmark) and *Trichoderma harzianum* T39 isolated from Trichodex (Makhteshim-Agan, Israel) controlled the disease completely. A good efficacy (78 %) was recorded for garlic extract. The results of the greenhouse experiment were in good agreement with the microscopical evaluation and the PCR analysis performed with the apical buds of the plants harvested 3 weeks after sowing. A second greenhouse experiment with the same treatments has been started. The results of the microscopical analysis of the apical buds in this second experiment correspond well with the results of the first experiment. This indicates that infections of sorghum by *S. sorghi* can be reliably detected at an early stage of plant development. In this way, the time period needed to evaluate seed treatments for control of *S. sorghi*.