

resistance in SDM has recently been documented in France, genetic resistance may prove to be both the more stable and more economical means of control.

* Influence of soil amendments on frequencies of endophytic fungi in *Amaranthus hybridus*

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Amaranthus hybridus is a nutritious vegetable crop with the potential for increased use in semi-arid regions of South Africa. A sustainable pest and disease management approach for the cultivation of *A. hybridus* requires an understanding of abiotic and biotic factors affecting this crop. Endophytic and latent-infecting fungi have been shown to play an important role in the health and vigour of many plants. The objectives of this study were to quantify fungi associated with *A. hybridus* and to determine the influence of soil amendments on their occurrence. Five-month-old *A. hybridus* plants from Potchefstroom were sampled in 1997. The four treatments comprised the addition of fertilizer, wood ash, or manure to irrigated or non-irrigated soil; control plots were not amended or irrigated. Ten leaves, 10 petioles, and 10 roots from each of five plants per treatment were rigorously surface-disinfected to remove exterior micro-organisms, and small sections were then placed on corn-meal agar. After five days, the resulting fungal colonies were counted. Significant differences in recovery of fungi occurred among the four treatments ($P < 0.001$ for all tissue types). The highest recovery rate occurred from the fertilized and watered treatments for all tissues (mean 99% for all tissue types). Recovery rate from leaves was positively correlated with biomass ($r = 0.60$, $P < 0.001$). Differences in recovery rate also occurred among plant tissues ($P < 0.001$). Leaf sections yielded fungi 98% of the time, petioles 84%, and roots 60%. These results suggest that endophytic fungi of plants may serve as useful bio-indicators of host vigour.

A preliminary study on the biological control of *Fusarium subglutinans* f. sp. *pini* in South African nurseries

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Biological control of soil-borne plant pathogens is becoming more prevalent as an alternative to the use of chemical pesticides. Following frequent outbreaks of *Fusarium subglutinans* f. sp. *pini* in South African forestry nurseries, it was decided to investigate biological control as a possible management strategy. Various potential biocontrol agents were isolated from the rhizosphere of healthy seedlings and subsequently screened *in vitro*, using the triple-layer technique. A selection of promising isolates was then further screened *in vivo*, by applying the potential biocontrol agents as a seed coat. Approximately 30 isolates, either alone or in combination, were able to suppress root rot caused by *Fusarium subglutinans* f. sp. *pini*. The mechanism associated with biological control is currently being investigated.

Water hyacinth: new approaches to biological control

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Water hyacinth, *Eichhornia crassipes* (Mart.) Solms., is an important aquatic weed in South Africa, including the fynbos area. It is a free floating weed that often forms dense mats covering waterbodies and increasing evapotranspiration approximately threefold. Attempts to control water hyacinth by conventional methods, either by mechanical or manual removal and chemical herbicides, have only provided a temporary

and often costly solution. Integrated management with biological control, with both insects and plant pathogens playing the central role, is possibly the only long-term and sustainable solution in water hyacinth management. Several highly virulent plant pathogens occur in different parts of the world and some of them are at present receiving attention at the Weeds Research Division, Stellenbosch. Among them are *Acremonium zonatum*, *Alternaria eichhorniae*, *Cercospora piaropi*, *Myrothecium roridum* and *Uredo eichhorniae*. The first three already occur in South Africa but are not widespread. Their association with several of the insect biocontrol agents, already introduced into South Africa, are being studied with a view to optimising their efficacy. *Uredo eichhorniae*, the water hyacinth rust fungus, is still restricted to South America, the original home of water hyacinth, but has been introduced into quarantine in South Africa where its lifecycle and host range are being studied with a view to establishing it here.

* Influence of soil amendments on species composition of endophytic fungi in *Amaranthus hybridus*

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Endophytic and latent-infecting fungi have been shown to play an important role in the health and vigour of many plants by affecting various ecological and physiological processes. The objectives of this study were to identify endophytic or latent-infecting fungi found in *Amaranthus hybridus* field plants, determine species composition of different plant tissues, and determine the influence of soil amendments on species composition. Five-month-old *A. hybridus* plants from Potchefstroom were sampled in 1997. The four treatments comprised the addition of fertilizer, wood ash, or manure to irrigated or nonirrigated soil, control plots were not amended or irrigated. Ten leaves, 10 petioles, and 10 roots from each of five plants per treatment were rigorously surface-disinfected to remove exterior micro-organisms and small sections were then placed on corn-meal agar. After five days, fungi growing from the tissues were transferred from colony margins onto separate water agar plates and identified. Differences in species composition occurred among plant tissues ($P < 0.001$) and among soil treatments ($P < 0.001$). The most common species isolated from leaves was *Alternaria alternata* (89% of the samples). *A. alternata* was also the most common species isolated from petioles, but only occurred 74% of the time. Different genera predominated in the roots. These observations suggest that not only the abundance of endophytic fungi, as previously shown, but also species diversity in *A. hybridus* are influenced by environmental factors.

Evaluation of *Paecilomyces lilacinus* with and without a growth stimulant for the control of *Meloidogyne javanica* in flue-cured tobacco within an integrated control system

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A virulent strain of *Paecilomyces lilacinus* (Thom) Samson from the Philippines became available in South Africa. A greenhouse experiment was conducted to determine the efficacy of *P. lilacinus* over time against the root-knot nematode *Meloidogyne javanica* (Treub) Chitwood on flue-cured tobacco. An untreated control was compared with a *P. lilacinus* treatment for 13 weeks. Every week the nematode count and the aerial dry mass were determined. A decline in the population density of the larvae and females of *M. javanica* was observed in the *P. lilacinus* treatment 12 weeks after application. No significant differences could be detected for the dry aerial mass. In a field trial the efficacy of *P. lilacinus* with and without a growth stimulant at various dosage rates and application times was compared with an untreated control and a standard aldicarb treatment. Twelve weeks after planting the effect of the various treatments could be detected in the larval and female population