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TOOLS FOR INTEGRATED CONTROL OF BOX BLIGHT (*CALONECTRIA SPP.)* ON *BUXUS*: EFFICACY TRIAL RESULT AND RESISTANCE MANAGEMENT

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ABSTRACT

Box blight is an important disease on *Buxus* spp. caused by the ascomycete fungus *Calonectria spp.*. The disease spread throughout Europe since the mid-1990s. The disease can cause commercial damage in boxwood nurseries without adequate treatment. Especially under warm and humid conditions, disease symptoms can increase rapidly. Early diagnosis of the disease is paramount, and can be achieved by training growers to detect and distinguish early leaf spots and stem lesions in the nursery. Any young plant material entering the nursery should be thoroughly checked, followed by continued monitoring during the growth season.

Thorough genetical analysis of a collection of isolates from 15 countries from 4 continents showed that the disease symptoms are caused by two distinct Calonectria species : *C. pseudonaviculata sensu stricto* and C. *henricotiae* (sp.nov.), the latter being more recently introduced in Europe (Gehesquiere et al 2016). *C. henricotiae* occurs predominantly in Germany, but can be found in lesser extent in other European countries. Although both are equally pathogenic to *Buxus* spp, they exhibit differences in fungicide susceptibility and thermotolerance.

In a field experiment with 32 *Buxus* species and cultivars, disease development was correlated with temperature, rainfall, windspeed and relative humidity. Plants were placed on an outdoor container field in close contact with artificially inoculated *B. sempervirens* 'Suffruticosa' plants. Disease development was assessed weekly based on the number of diseased leaves per plant. At the end of each experiment the average lesion size, level of defoliation and amount of stem infection were also evaluated. Disease development was strongly weather dependent, but also highly dependent on cultivar. The minimum leaf wetness period for infection was cultivar-dependent. Within each cultivar, this period was also considerably shorter for young leaves compared to mature leaves. Furhermore, young leaves were susceptible already at lower ambient temperatures (6-12°C than older leaves (12-14°C).

In the short term, these results contribute to a better disease risk assessment of the different *Buxus* cultivars. In the long term, they can contribute to the development of a predictive infection risk model, based on cultivar and weather data.

To develop adequate control strategies for boxwood growers, 9 fungicides field experiments were conducted from 2007-2015. As an imitation of preventive and curative treatments, *B. sempervirens* plants were treated with fungicides either 1 day before or 2 days after artificial inoculation. The pathogen was inoculated as a conidiospore suspension (2×10^4 spores/ml ; 400 ml/m^2) using a pressurized spray bottle. To maximize disease development, the plants were incubated under humid conditions. Preventive and curative efficacy of the different fungicides was assessed using a percentage disease severity scale at 1, 2 and 3 weeks after inoculation.

We evaluated 14 fungicides in either screening trials or trials following Good Experimental Practice protocols for registration purposes : Eminent 125 ME (125g/l tetraconazole), Candit 50 WG (50% kresoxim-methyl), Bravo 500 SC (50g/l chlorothalonil), Topsin M 70 WG (70% thiophanate-methyl) and Ortiva Top 200/125 SC (200g/l azoxystrobin + 125g/l difenoconazole), Amistar (250g/l azoxystrobin), Fungaflor 100EC (100g/l imazalil), Switch (37.5% cyprodinil + 25% fludixonil), Panax (166g/l chlorothalonil + 60g/l tebuconazole), Nativo 75WG (50% tebuconazole + 25% trifloxystrobine), Luna experience (200g/l fluopyram + 200g/l tebuconazole), Luna privilege (500g/l fluopyram), Folicur (250g/l tebuconazole). Results show that all fungicides are efficient against *C. pseudonaviculata*. However, both tetraconazole and kresoxim-methyl show strongly reduced efficacy against *C. henricotiae*, while imazalil has slight reduced efficacy.

A more in depth screening of more than 100 isolates from Europe and new Zealand showed that 5 isolates (5%) were at least 10 times less sensitived to tetraconazole and kresxim-methyl than the other isolates. Such resistant strains can no longer be controlled with these products under practical conditions.

We demonstrated that several fungicides can provide adequate control of box blight but that special care is needed to prevent or manage fungicide resistance. Good preventative action (screening of young plants for symptoms), adequate monitoring during growth season (especially in warm rainy weather) and adequate fungicide treatments provide good protection to this disease. Furthermore, variable susceptibility of different species or cultivars provide opportunities for increased resisitance breeding in future cultivars.

REFERENCE

GEHESQUIÈRE B.,CROUCH J.A.,MARRA R.E.,VAN POUCKE K.,RYS F.,MAES M. ,GOBIN B. HÖFTE M.,HEUNGENS K. (2016) Characterization and taxonomic re-assessment of the box blight pathogen Calonectria pseudonaviculata, introducing Calonectria henricotiae sp. Nov. Plant Pathology 65: 37-52