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VEGARD – BOTANICAL FUNGICIDE

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Abstract

Powdery mildew, caused by the fungus *Sphaerotheca pannosa* var. *rosae*, appears as a white powdery growth on rose leaves, stems, buds, or flowers.. We studied the development of *S. pannosa var.rosae* in roses in Serbia and protection with Vegard 0.5% AS. The trials were set according to the instructions of methods PP1/152(2) (EPPO, 1997) and PP1/104(2). Phytotoxicity was estimated by PP 1/135(2) (EPPO, 1997). The differences of the disease intensity were evaluated by the analysis of variance and LSD-test. The results of the research have demonstrated that there is no statistically significant difference between mid-treatments of other variances and all other treatments, and the differences are incidental. The summary of meteorological data and intensity of infection during the experiment are controled.
Key words: Vegard, Sphaerotheca pannosa var. rosae, roses, efficacy

Introduction

Powdery mildew affects more the 7600 species of hosts worldwide, including subsistence crop (Ridout, 2009). They affect virtually all kinds of plants: cereals and grasses, vegetables, ornamentals, weeds, shrubs, fruit trees, and broad-leaved shade and forest trees.

Rose powdery mildew is caused by the fungi *Sphaerotheca pannosa* var. *rosae*, a member of the *Ascomycete* fungi. It infects a wide variety of roses, but especially those grown in dryer climates Gubler, 2011). Under conditions that are favorable for disease development, powdery mildew can cause complete defoliation. It appears as a white powdery growth on rose leaves, stems, buds, or flowers.

Effective management of rose powdery mildew begins by using resistant varieties of rose, but it can also be managed through the use of fungicides, or by planting in sun since rose powdery mildew prefers the shade (Gubler, 2011). In fact, increasing the exposure of rose powdery mildew from 18 to 24 hours of light per day reduced the production of conidia, the asexual spores of the fungi, by as much as 62% (Suthaparan, 2010). There are a variety of fungicides that have proven to be effective. Examples are mylobutanil, azoxystrobin, triadimefon, and thiophanate-methyl formulations (Gubler, 2011). Chemical fungicides are not always necessary, however, it is possible to use more environmentally-friendly solutions such as a water-vinegar spray, or mixtures of baking soda and insecticidal soaps (Mouchet, 2003). Recent studies have also shown that using a planting medium which includes silicon can also reduce the occurrence of powdery mildew by as much as 57% (Datnoff, 2006).

There are many fungicides registered for control of powdery mildew on roses. In 1998 we lost use of triforine which was especially effective for control of powdery mildew as well as rust andblack spot. Some of the most effective products are found in the sterol inhibitors (triazoles and imidazoles) including propiconazole, myclobutanil, triflumizole and triadimefon. Others are found in the strobilurin group including azoxystrobin, kresoxim methyl and trifloxystrobin. The products listed fall into 7 distinct chemical groups and rotation between groups is highly recommended. Care should be taken to test all new products for safety on your rose cultivars. Some of the "environmentally friendly" products are not always safe for our ornamental crops.

Increasing public concern over the use of chemical pesticides has made the development of biological control agents for powdery mildew highly desierable, since they could provide an alternative to or reduce dependency on currently used control measures. Moreover, the emergence of fungicide-insensitive variants *of Sphaeroteca fuliginea* (Schlectend:Fr.)Pollacci, the fungus responsible for powdery mildew on cucumber has been reported (McGrath, 1991, Schepers, 1983).

The biggest problem with the chemical are and the induction of pathogen resistance. Biofungicides have more specific effects on the target body from chemicals, therefore only affect the target organism and not cause toxigenic effects on the environment and thereby increase biodiversity and wildlife. Development of new, harmless sustainable strategies - biopesticides which involves the use of beneficial micro-organisms or their metabolic products (as an alternative to chemical, synthetic compounds) is conditioned by the demands of the global need for reduced use of chemical pesticides that are considered harmful.

There is accumulating evidence that several biological control agents can be effective antagonists of powdery mildew. *Ampelomyces quisqualis* Ces. (Sundheim, 1982, Rajkovic, 2010), *Acremonium alternatum* Linc:Fr. (Malathrakis, 1985), *Tilletiopsis* spp. (Hijwegen, 1986, Klecan et al., 1990), and *Sporothrixflocculosa* Traquair, Shaw and Jarvis (Belanger et al., 1994, Hajlaoui and Belanger, 1993) have been reported to attack mycelia and reproductive structures of mildew fungi.

Given an increasing international demand to reduce the use of toxic pesticides, because of human health and environmental concerns (Tjosvold & Koike 2001), there is a need to seek more benign disease control alternatives. This is particularly relevant to the powdery mildew /rose interaction, since powdery mildew control can account for up to 40% of the pesticide volume applied to rose crops (Tjosvold & Koike 2001).

Milk has been reported to be effective for the control of powdery mildew in squash and wine grape crops (Bettiol 1999; Crisp & Bruer 2001), but the use of raw milk has had problems including difficulties in handling/storage and unwanted growth of nontarget organisms. Different fractions of milk were tested and AMF was found to be the most toxic to powdery mildew on glasshouse-grown squash (K.V. Wurms, unpublished data). The anti-fungal activity of plant oils against powdery mildew in tomato has also been reported (Ko et al. 2003).

The purpose of this study was to evaluate emulsified formulations of Vegard 15% AS to control powdery mildew in glasshouse-grown roses and to establish if there were any plant health issues associated with regular applications. This represents a novel use for these products.

Material and methods

The studies were performed on the Roses (Quercus robur L.) varieties Candid profit in the locality Gložan, old 5 years, growing on the bush form, with the distance of planting 1.5 x0.5, the phenological stages before flowering.

The trials were set in accordance with methods PP 1/152 (2) (EPPO, 1997) and the treatment plan was made according to fully randomized block design. The experiment was conducted on species of roses Candid in four repetitions on basic plots consisting of 8 roses (1,5x0.5 m apart), 25 m^2 in total.

The estimation of leaves with secondary infection with powdery mildew was conducted as follows:on 10 plants, on 50 leaves. The scale of values which was used to record the results of each leaf is as follows: 0 = no infection, 1 = very low infection, 2 = partial attack (scattered spots affected by powdery mildew), 3 = moderate to severe disease (up tohalf of the leaf surface is affected by powdery mildews), 4 = very severe disease (more than half of the leaf surface under the powdery mildew; edges of the leaves begin to crumple and dry up).

Regarding the method of application and amount of water per unit surface, the fungicides were applied using the backstroke sprayer “Solo”; with the consumption of 1000 l/ha of water.

The biofungicide was applied on: I 1.06.2012. – Phenophasis-developed shoots, II 18.06.2012. – Phenophasis-developed shoots and bud, III 25.06.2012. – Phenophasis - beginning of flowering.

Biofungicide Vegard 0.5% AS is ahighly bioactive plant-derived (Rheum officinale Baill) fungicide newly developed by Beijing Kongbo Biotech Co., Ltd. The fungicide provides exellent preventive effectivness on powdery mildew of vegetables, as well as gray mold and anthracnose. It is very low toxic to human being and livestock and friendly to environment.

Fungicide Benomyl - Active ingredient: Benomyl, Declared: 50.00%, found: 50.38 ± 0.20%, method (CIPAC Handbook, 1988, D, 14), number of repetitions: 4, Standard deviation is calculated according to Murray and Spiegel (1961)

The appearance and development of powdery mildews is followed with the initial appearance and development of the disease on the control variation, as well as through accomplishment of a clear difference between the control and other variations on which biofungicides were applied.

The intensity of disease was assessed by the method of EPPO: Guideline for the efficacy evaluation of fungicides - *Sphaerotheca pannosa var. rosae*, no. PP 1/104(2) (OEPP, 1997 d). in Guideline for the efficacy evaluation of Plant Protection Products, 1997, 100-102. Time of estimation was 11/07/2012. Phytotoxicity was estimated according to instructions of PP methods (1/135 (2) (OEPP, 1997).

Data processing was performed using standard statistical methods (intensity of infection according to Towsend-Heuberger, the efficiency according to Abbott, analysis of variance according to Ducan test and methods PP/181 (2) (EPPO 1997). The differences of the disease intensity were evaluated by the analysis of variance and LSD-test.

Results and discussion

In the Table 1 we are presented data on the intensity of attack of *Sphaerotheca pannosa var. rosae* on the leaves of roses in the locality Gložan. Tested fungicides had shown statistically significant efficacy compared to the control, in which the intensity of the disease was 31.12%.

Table 1: The intensity of the attacks *Sphaerotheca pannosa var. rosae* on the leaves of roses and efficacy of fungicides and biofungicides

No	Fungicide	Conc.(%)	Infection(%)	Efficacy (%)	Standard (Benomyl =100%)
1	Vegard 0.5%AS	4,0	0.50 a	98.38	100.34
2	Benomyl WP 50	0,04	0.61 a	98.04	100.00
3	Untreated	-	31.12 b	0.00	0,00
	$Lsd_{0.05}$		11.47		

In the locality Gložan is determined the intensity of infection of 31.12% on control variant. On this infection examined preparation showed satisfactory efficacy at the recommended concentration (98.38%). There are no significant differences between the tested fungicides and standard products whose efficiency is 98.04%.

Based on the variance analysis of the randomized block design it was determined that the difference between the mid repetitions was statistically significant at the probability of 95%, since $F_0>F_{0,05}$. Moreover, a statistically significant difference was'nt found between mid treatments at the probability of 99%, since $F_0>F_{0,01}$. Between the mean values of control and variance Vagard0.5%AS there is no a statistically significant difference at the probability of 99%.

By means of a multiple comparison procedure (Duncan test, 1955) one homogenous groups were identified with statistically significant differences at 99%, which match the previously explained groups studied in the variance analysis.

Vagard 0.5% AS are new biofngicide and there are no other similar trials with him. This is preliminary trials in this field.

Conclusion

Biofungicide Vagard 0.5% AS at a concentration 4% use very effectively against *Sphaerotheca pannosa var. rosae* (98.38%) and can be successfully used to protect roses from the causal agent of powdery mildew of rose. It has good characteristics and physical-chemical properties making it suitable for practical application.

Biofungicide Vagard 0.5% AS have more specific effects on the target body from chemicals, therefore only affect the target organism and not cause toxigenic effects on the environment and thereby increase biodiversity and wildlife.

Useing biofungicides in powdery milew controling we reduce the induction of pathogen resistance.

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