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RESEARCH NOTE

Fungicidal action of monopotassium phosphite against plant pathogenic fungi

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ABSTRACT: *In vitro* and *in vivo* trials were conducted with monopotassium phosphite (Stamina 50 SL trade mark) production of Luxemburg Industries Ltd, Israel for antifungal activity according to different kind plant pathogenic fungi. The plant protection product is registered in Bulgaria as fungicide against *Plasmopara viticola*. The trials reveal strong fungicidal action not only to grape mildew but also to apple scab (*Venturia inaequalis*), *Botrytis cinerea*, *Alternaria solani* and *Monilia fructigena.*

Keywords: potassium phosphite, Stamina 50 SL, *Plasmopara viticola, Alternaria solani, Monilia fructigena, Botrytis cinerea*ct

Monopotassium phosphate (KH_2PO_3) is an inorganic compound and is commonly used in some inorganic fertilizers (Loub, 1991). However during recent years, numerous studies reveal the strong fungicidal action of potassium phosphite towards different plant pathogenic fungi such as *Phytophthora infestans* that causes potato late blight. The combination of the salt with other commercial fungicides provides efficient protection (Liljeroth *et al.,* 2016).The similar was established towards *Peronospora manshurica,* causal agent of downy mildew of soybean (Silva *et. al.,* 2011). Other investigations show the potential of the potassium phosphite to control ink disease caused by *Phytophthora cinnamomi* through trunk injection on chestnut trees (Gentile *et al.,* 2009). Potassium phosphite was evaluated for its *in vitro* activity against *Penicillium expansum* and for its potential long-term efficacy against postharvest blue mold infections on apple fruit (Amiri and Bompeix, 2011) and suppression of *Microdochium nivale* by potassium phosphite in cool-season turfgrasses (Dempsey *et al.,* 2012).The effectiveness of potassium phosphite evaluated also on diseases infested rice (Martinez, 2016) and coffee plants. Potassium phosphite: a promising product in the management of diseases caused by *Colletotrichum gloeosporioides* in coffee plants and citrus fruit (Yogev *et al.,* 2006).

In the present study *in vitro* and *in vivo* trials with various plants pathogenic fungi were performed in order to be evaluated the effectiveness of the salt. Monopotassium phosphite is relatively safe chemical substance with can causes eventually in pure form serious eye irritation, water solutions are safe. The salt is not dangerous for the environment.

Germ tube inhibition tests were conducted as fresh infected with inspected pathogen plant parts were collected and were incubated in a humid chamber in order to stimulate the conidial sporulation of the plant pathogens. A conidial suspension from spores of tested phytophathogens was prepared with the density 3*104 spores/ml. microscopic slides kind "handing drop" were sprayed with testing solutions and, after drying, 20 µl of conidial suspension was applied. The four slides formed one test variant. The slides were incubated in a humid chamber, in thermostat and after 24-48 h. The four observations on the four sides of every slide were made and the number of germinated and non-germinated conidia were counted by a light microscope, after that percents of germination were calculated and average value of each test variant was determined. The effectiveness was determined on the base of percents of germination with formula of Abbot (Abbott, 1925).In vivo trials with 6 years old apple trees variety "Golden Delicious" and 5 years old grapes variety "Mavrud" were performed. Apples were treated regularity from BBCH 10 to BBCH 81 with 7-10 days interval between treatments. The grapes were treated regularity from BBCH 13 to BBCH 81 also 7-10 days interval between treatments. The per cent disease index (PDI) was calculated by using formula Mckinney during treatment period and Area Under Disease Progressive Curve (AUDPC) was calculated. On the base of data for AUDPC, the percent effectiveness of the treatments was established by the formula of Abbot (Sharma et. al., 2014), (Jeger & Viljanen-Rollinson, 2001). The mathematical manipulation of received data was performed by R language of Statistical Computing (R Core Team, 2020)

The conducted *in vitro* test with conidiospores collected from with four different plant pathogens prove that potassium phosphite (Stamina trade product) prove that in the registered concentration of 0.3 % (v/v), can be achieved 100 % inhibition of spore germination (Fig. 1).

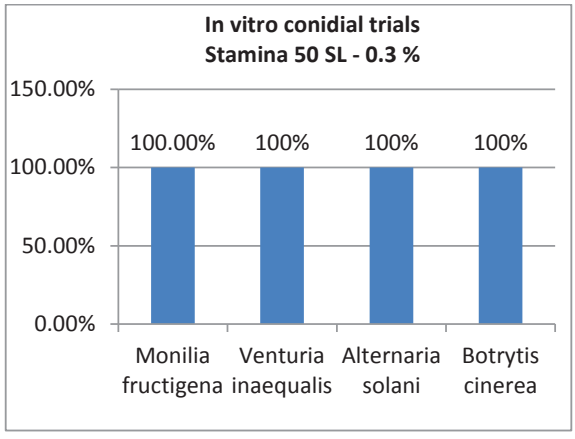

Fig. 1. Effectiveness of Stamina 50 SL (monopotassium phosphite active sustance) towards conidiospores of different plant pathogens

The Figure 1 shows that tested plant protection product Stamina 50 SL on the base of potassium phosphite although is registered against grape downy mildew (Plasmopara viticola) can fully inhibit the germination of conidiopores of various other plant pathogens like Monilia fructigena, Botrytis cinerea, Alternaria solani and Venturia inaequalis. Three years real field in vivo trials with apple scab (Venturia inaequalis) and grape downy mildew (Plasmopara viticola) also prove the effectiveness of the product towards tested pathogens (Fig.2 and Fig. 3).

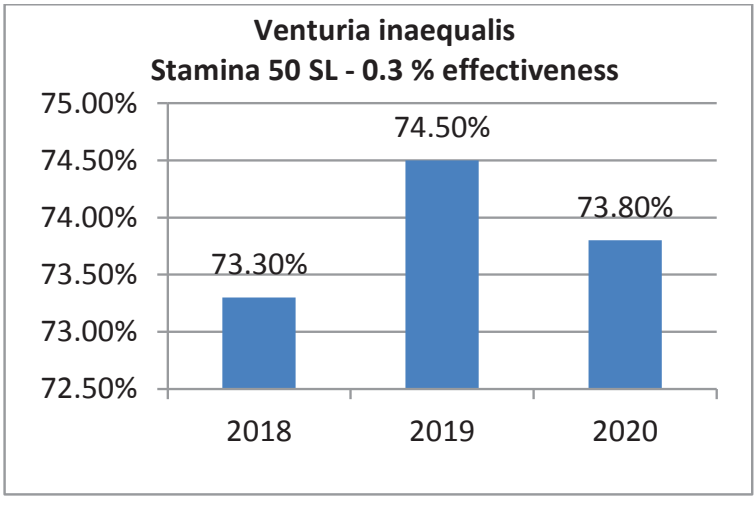

Fig. 2. Three years field test with Stamina 50 SL towards apple scab (*Venturia inaequalis*)

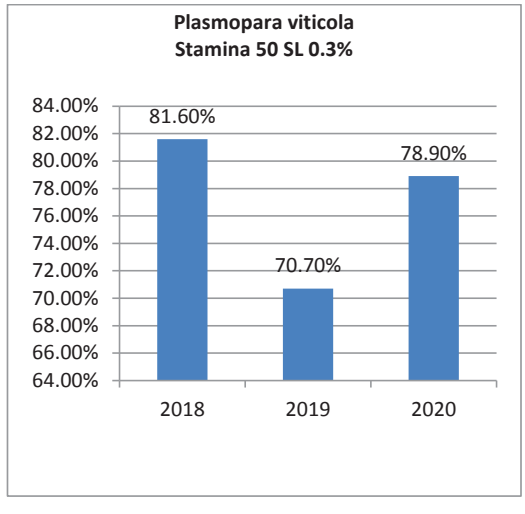

Fig. 3. Effecs of Stamina 50 SL on *Plasmopara viticula*

The effectiveness of Stamina 50 SL was between 70 and 80 % during the test period. The ANOVA analysis proves that there were on statistical differences in the effectiveness of the product towards both plant pathogens between 3 years of testing ($p>0.05$). Although Stamina 50 SL is a plant protection product registered against grapes downy mildew, the present trials prove its effectiveness against apple scab. *In vitro* tests also reveal the potential of the potassium phosphite to be effective way of controlling other important plant pathogens like *Monilia fructigena, Alternaria solani* and *Botrytis cinerea*.

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