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Testing the efficacy of alternative plant protection products for the control of primary scab

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Abstract

Apple scab, caused by the fungus Venturia inaequalis is one of the most common diseases in apple cultivation. Due to the limited plant protection products in organic farming, sustainable and effective treatments are required. The working group organic farming at the Laimburg Research Centre tests annually various alternative plant protection products against primary scab. For this purpose, an orchard with 'Golden Delicious' was selected in 2020. A total of 10 treatments consisting of plant protection products and plant strengtheners were evaluated. The analysis of the scab infestation intensity on leaves and fruits as well as the data collection of russeting on fruits was carried out on site. The statistical results show clear differences in the effectiveness of the various products.

Keywords: *Venturia inaequalis*, alternative plant protection, treatment efficacy, organic orchard, cupper replacement

Introduction:

Apple scab *(Venturia inaequalis)* is among the most important diseases in apple cultivation. Due to its widespread occurrence and resulting crop losses, a high variety of plant protection treatments are directed against this pathogen (Büchele et al., 2018). Especially in organic farming, sustainable and effective plant protection is required due to the limited possibilities. Beside the traditional treatments with copper, sulphur and carbonate, the finding of alternative products against apple scab is necessary. For this reason, the organic framing group at the Laimburg Research Centre is annually testing alternative organic plant protection products and plant strengtheners, which could fit for the control of *Venturia inaequalis* in the fields. This research will address the question, which predefined plant protection product proved to be most effective against primary scab in 2020 on the cultivar 'Golden Delicious'.

Material and Methods

The research was conducted in 2020 at the Laimburg Research Centre, Vadena, South Tyrol in Italy. The products were tested in an orchard with 'Golden Delicious', which is ideally suited as a test cultivar due to its high susceptibility to scab (Silbereisen et al., 2014). In Table 1 the different plant protection products and plant strengthners are given. The spray scheduling was set according to the meteorological data of the Laimburg Research Centre site. The treatment timings were directed after degree-hours: The number of hours multiplied by the mean temperature in degrees Celsius between the onset of rain and the time of application. If the degree hours were above 250 the treatments were carried out. The potential infection periods were recorded by the scab warning programm RIMpro. Around 6 treatments per trial products were applied starting on April 25, 2020, and ending on May 16, 2020. The spraying program was finalised with an additional treatment of lime sulphur on June 10, 2020, on all test plots. The low precipitation rate decreased the scab pressure and the number of applications. For each treatment, a speed of 3.5 km/h and air-injector flat spray nozzles with a spray pressure of 8.5 bar were used. While using trial product 10 (NEU

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1143F) problems occurred during the application. To prevent foaming, a foam-stopping agent was added in advance. However, this caused clogging of the filter. Possibly, the observed problems with the application are the cause for the lower-than-expected efficacy of the product NEU 1143F.
Before the applications started, the orchard was divided into 44 randomized plots. The experiment included 10 trial products and the untreated control, which were all repeated 4 times. One plot had 10 trees (with 1 border tree on each side), from which 25 shoots (west and east side) were collected. The primary scab infestation on leaves was divided into classes: 0: 0 spots, 1: 1-5 spots, 2: 5-15 spots, 3: more than 15 spots. All leaves per shoot were counted. The primary scab on fruits was divided in two classes: 1 refers to the observation of spots while 0 is given to fruits without spots. Per plot 100 fruits were counted. Russeting fruits assessment was carried out in September. The infestation was estimated in percentage.

Statistic
The data collected were statistically evaluated by one-way ANOVA and the analysis of variance and differences was determined by Games-Howell test. All analyses were performed using the software IBM SPSS Statistics 24.

Table 1: Applicated trial products

Number	Trial products	Agents	application period	Dose gr or ml/hl
1	Poltiglia disperss	Cupper	preventive	25 g
2	GWN-10320	only experimental use	preventive	200 ml
3	GWN-10320 + Poltiglia disperss	not known + cupper	preventive	200 ml + 25 g
4	Plantonic	Salicylic acid	preventive	2 l
5	Plantonic + Poltiglia disperss	Salicylic acid + Cupper	preventive	2 l+ 25 g
6	Auralis - Ibisco	Chitosan-Oligomer + Pectin-Oligomer	preventive	200 ml
7	Romeo	yeast strain Saccharomyces cerevisiae LAS117	preventive	135 g
8	Experimental product 1	/	scab stop	3 kg
9	Experimental product 2	/	scab stop	1 kg
10	NEU 1143F	Pelargonic acid	scab stop	2 l
11	untreated control		-	-

Results and Discussion

The statistical analyses demonstrated statistically significant differences in primary scab infestation between the applied products.

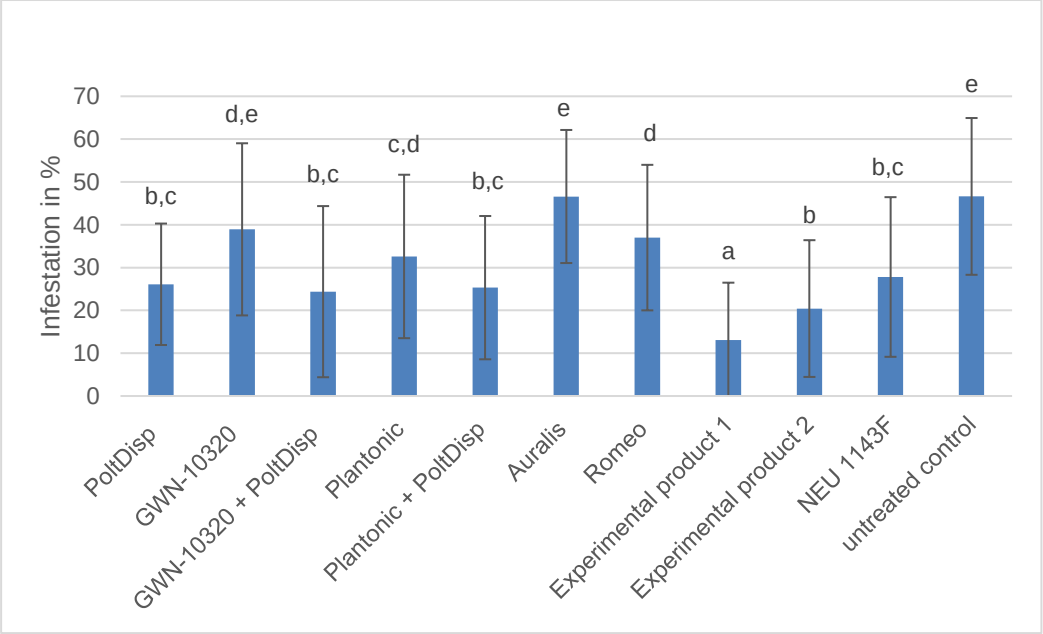

Figure 1: Primary scab infestation intensity on leaves

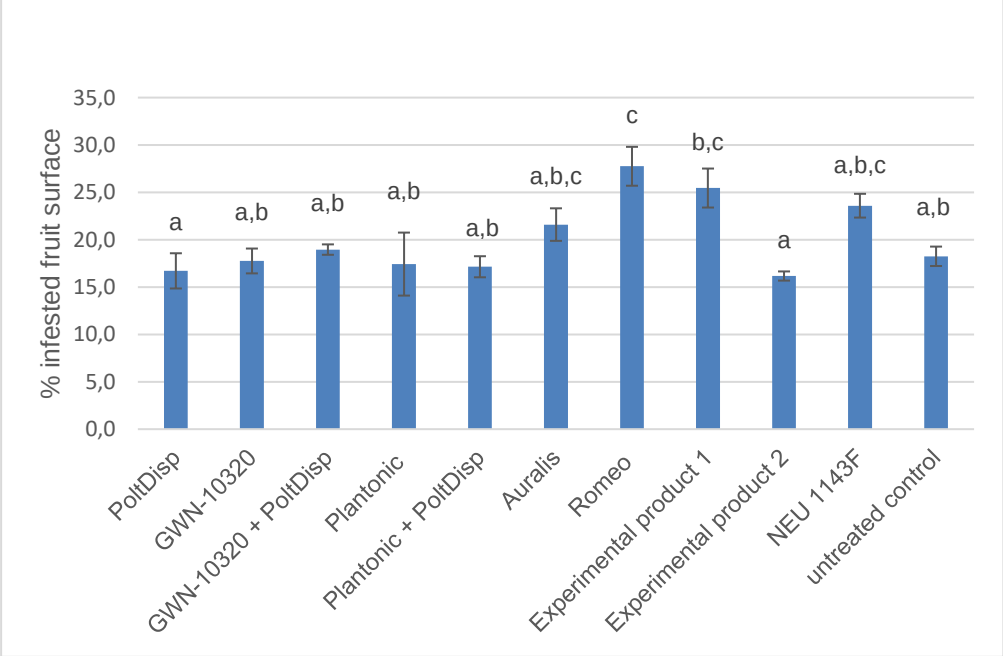

Figure 2: Russeting infestation intensity on fruits

Experimental product 1 and experimental product 2 proved to be very effective against *Venutria inaequalis*. Especially experimental product 1 was able to reduce the infestation intensity on the leaves to 13%. However, the leaf burn caused by experimental product 1 should be considered in future trials. The copper product Poltiglia Disperss achieved the expected effects of a copper-based product. It is evident that, when added to Gowan-10320 and Plantonic, it increased the efficacy of the individual agents. The product

NEU 1143F did not perform as expected. The infestation intensity could be reduced to only 28%. The use of the product resulted in sticky residues in the spray filter and consequently in clogging. However, in publications on NEU 1143F against *Venturia inaequalis*, the agent behaved effective and provided promising results (Benduhn et al., 2020). Therefore, it can be assumed that the foam-stopping agent negatively affected the efficacy of the product NEU 1143F. The products Romeo and Auralis, both registered against powdery mildew, did not have a high efficacy. With an infestation rate of 37% the product Romeo was at the bottom of the range compared to the other trial products. With a percentage of 46.5%, the trial product Auralis performed the worst, and is only very slightly ahead of the untreated control. This means that Auralis cannot be considered effective against primary scab. The infestation of the untreated control had the highest rate with 46.6%.
In the fruit scab evaluations, where only a small number of infected fruits were found, the arithmetic mean was about 5%. For russeting, the major differences were up to 11%. The highest rate had the trial product Romeo (27.8%) followed by trial product 8 (25.5%). The best results achieved trial product 9 (16.2%) and Poltiglia Disperss (16.7%).

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References:

Benduhn, B., Zimmer, J., Buchleither, S., Rank, H. and Kunz. (2020). NEU 1143F, a possible new agent to reduce the use of copper in organic pome fruit growing, results from a joint research project. 19th International Conference on Organic Fruit Growing 17-19 February 2020, Hohenheim, Germany.

Büchele, M. et al. (2018). Lucas' Anleitung zum Obstbau. Stuttgart, Germany: Eugen Ulmer.

Silbereisen, R., Götz, G. and Hartmann, W. (2014). Obstsorten Atlas. Hamburg, Germany: Nikol Verlagsgesellschaft.