

Decision support systems to optimise the efficacy of novel copper alternatives

Problem

Fungal diseases can cause significant yield losses. Fungicides used in organic farming generally have a contact mode of action. Such contact fungicides need to be applied shortly before an infection event in order to have the highest efficacy.

Solution

Decision support systems (DSS) are tools to allow optimal timing of fungicide application. DSS have been developed for various crop-pathogen combinations, e.g., apple scab, grapevine downy mildew, among others.

Outcome

Based on pathogen biology and weather data, DSS support decision-making by the farmers and allow to determine the optimal timing of spray interventions, leading to better efficacy of the products.

Practical recommendations

Different types of DSS are available. Some provide advice on the timing of copper spraying and the quantity of copper needed. Others (i.e., tactical models) are designed to provide farmers with yes/no advice (e.g. treatment is needed or it is not worth the cost), or the model outputs are giving risks of infection (e.g. no risk, low, intermediate, high risk). Some models, e.g. RIMpro (Fig. 1), illustrate the biological processes and visualise the risk of infection. Some DSS are interactive, allowing farmers to enter the basic characteristics of their crops; others work independently, displaying a prediction for the risk of infection (e.g. Agrometeo, Fig. 2).

In many countries and regions, advisory systems provide access to appropriate DSS according to the needs of farmers. Local advisory services can be contacted for information and support. Complete solutions for local (private) collection of weather data and integrated disease forecast models are also available (e.g. iMetoS®, Sencrop).

Applicability box

Input used

- Copper
- Anthelmintics
- Mineral oil
- Antibiotics
- Fertilisers
- Vitamins

Geographical coverage

Global

Application time

During the crop growing season

Required time

Regular check of provisions and forecasts by the DSS

Period of impact

Current crop

Equipment

Smartphone or computer, internet access

Best in

Grapevine, apple, potato. DSS is available for an increasing number of crop-disease combinations, as well as for pests

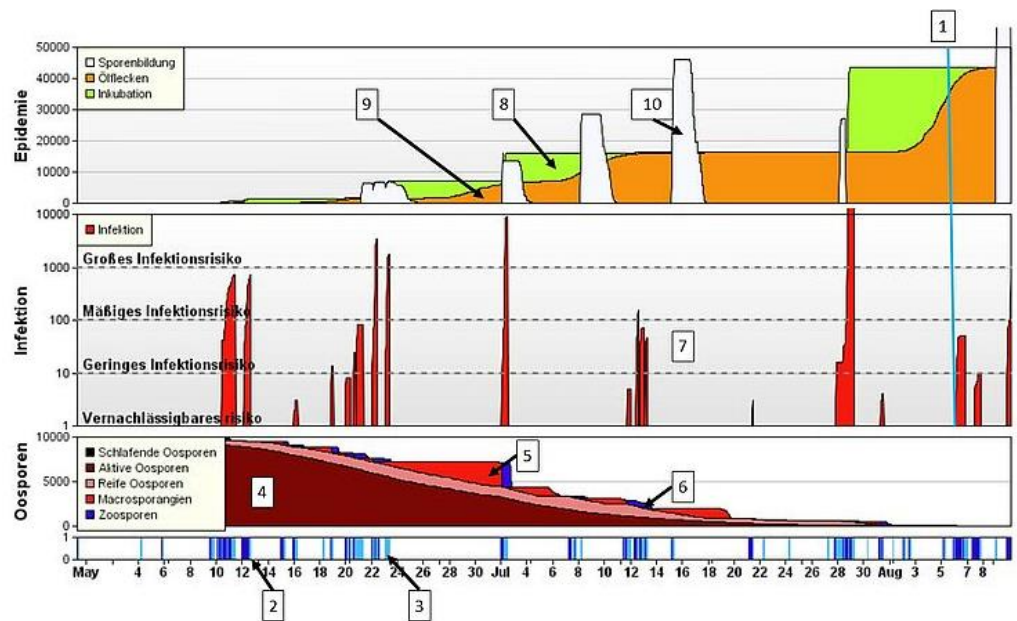


Figure 1: Graph of the RIMpro output for simulation of downy mildew infections and forecast of infections. Rain and leaf wetness (1, 2), development of the pathogen (3, 4, 5), risk of infection (6) and development of the epidemics (8, 9, 10) are displayed.

(Sources: <https://www.rimpro.eu>, <https://www.bioaktuell.ch/pflanzenschutz/prognosen/plasmopara.html>)



Figure 2: Graph of the Agrometeo output to indicate risk of downy mildew infections. Risk is indicated with numbers based on model calculations and colours (green = no risk, light pink = low risk, dark pink = intermediate risk, dark red = high risk) (Source: <https://agrometeo.ch/de/weinbau/falscher-rebenmehtau>)

On-farm application

System approach

Copper alternatives based on natural substances are often degrade faster or show less rain fastness than chemical products. To achieve the best efficacy of these novel copper alternatives, it is crucial to find the best timing for their application. The forecast information of DSS allow such an optimal timing.

Evaluation

The use of DSS can improve the efficacy of new copper alternatives based on natural substances. DSS may reduce fungicide use by half compared to calendar-based strategies without increasing disease risk.

Further information

Further reading

Agrometeo: decision support tool for pest prognosis and risk assessment: <https://organic-farmknowledge.org/tool/30592>

Weblinks

- Forecast models, weather data and monitoring information for pests and diseases in Switzerland: <https://agrometeo.ch/>
- Forecast models, weather data and monitoring for grapevine production <https://vitimeteo.de/>
- Decision support system for the sustainable management of pests and diseases in fruit and grape production: <https://www.rimpro.eu>
- Information system for integrated plant protection (DE). Disease forecast models and monitoring data for pests and diseases: <https://www.isip.de/>

Check the [Farm Knowledge Platform](#) for more practical recommendations.

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RELACS: 'Replacement of Contentious Inputs in Organic Farming Systems' (RELACS) builds on results of previous research projects and takes far-advanced solutions forward. As a system approach to sustainable agriculture, organic farming aims to effectively manage ecological processes whilst lowering dependence on off-farm inputs. The RELACS partners will evaluate solutions to further reduce the use of external inputs and, if needed, develop and adopt cost-efficient and environmentally safe tools and technologies.

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