

The WRF-ARW application in predicting meteorological conditions for Downy mildew (Plasmopara viticola) appearance of wine grape

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Outline

- **Idea for research:** Introduction of short term weather forecasting into prediction of meteorological conditions for downy mildew appearance.
- Data used: From Forecasting and Warning Service of Serbia in plant protection observed dieses and meteorological data form two locations Čerević (2016) and Vršac (2015).
- **Models used:** empirical conditions, Müller's method, WRF-ARW
- Meteorological conditions for dieses appearance were found in both observed and predicted weather data, from that incubation period was calculated and compared with observation of the dieses appearance on the sites.





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Downy mildew of wine grape

Plasmopara viticola, the causal agent of grapevine downy mildew, is a heterothallic oomycete that overwinters as oospores in leaf litter and soil.





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Algorithm for predicting the downy mildew in wine grape

Müller's method:

- conditions for primary infection:
 - oospore are present in the leaf litter ,
 - leaves are 2-3 cm wide,
 - during 48h there was at least 10 mm of precipitation,
 - mead day temperature is 12°C or more,

- if these conditions occur then incubation period can be calculated:

$$c = \frac{a}{b} - b$$

a – sum of incubation based on temperature and Müller's curve, form the day of primary infection, b – number of days from infection to calculation day, c – when will incubation end .





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Algorithm for predicting the downy mildew in wine grape





Weather forecasting **Meteorology/PFNS**



WRF ARW numerical weather prediction model

- The WRF ARW model is a fully compressible, nonhydrostatic model (with a hydrostatic option). Its vertical coordinate is a terrain-following hydrostatic pressure coordinate. The grid staggering is the Arakawa Cgrid. The model uses higher-order numerics.
- Run with 0.25° GFS input data on 3h
- 10km resolution, 1h output

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Results

Čerević – Lat 45.1916, Lon 19.669, 09/05/2016













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Conclusion

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- Muller's method for calculation of incubation period with observed data showed good results on examined sites.
- Integration of numerical weather forecasting results into prediction of meteorological conditions for appearance of downy mildew of wine grape has shown good results.
 - If results of the operation model are used, the simulation can be better.
 - If mesurements are not present, output from numerical weather prediction can be used for prediction of downy mildew of wine grape, very succesfuly.
- If weather forecasting is used we can know in advance.



Weather forecasting Meteorology/PFNS



"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691998".

Serbia for Excell

Thank you for your attention