

Microencapsulation – An innovative technique to improve the fungicide efficacy of copper against grapevine downy mildew

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ABSTRACT

Copper based fungicides are plant protection products prevalently used in organic agriculture to control several plant diseases. Since copper can have various negative effects on the environment, the amount used should be reduced to the minimum necessary. However, this reduction should not lead to a loss of efficacy, as otherwise the quality and quantity of the yield would be at risk. During this study, a copper sulfate/copper hydroxide mixture was combined with an agent for better adhesion to grapevines. This was achieved by microencapsulation of the active agents into a fat matrix which resulted in the so called CuCaps. Laboratory analysis of dispersibility and particle size proved that CuCaps form an applicable powder, suitable for use in commercial crop protection sprayers. Field experiments demonstrated that CuCaps have an equivalent effect compared to a commercially available copper-based fungicide (CCF). Both, CuCaps and CCF were able to significantly ($p < 0.05$) reduce disease severity (DS) on leaves and bunches in three independent years compared to an untreated control (UTC). This was even true if the applied amount of CuCaps was reduced by one third to 2 kg copper per year and hectare. Additionally, in the particularly severe *P. viticola* epidemic of 2016, CuCaps showed a remarkably better effect on flower clusters and bunches compared to the CCF. However, this effect was not statistically significant due to strong variation within the repetitions. Taken together, this study shows that copper minimization by microencapsulation is possible. Considering the restricted use of copper-based fungicides, CuCaps can be a valuable option for organic farmers, especially in difficult years.

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