

## Lime sulphur, an important agent to reduce the use of copper in organic pome fruit growing, results from a collaborative research project

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### Abstract

*In the period from 2011 to 2016, a collaborative research project to reduce the use of copper in the control strategy against apple scab (*Venturia inaequalis*) was carried out in the four major fruit growing regions in Germany. The main subject of investigation were combined strategies using alternative compounds. One of the few alternative plant protection products to prevent scab infestation is CURATIO® (lime sulphur), which was tested in different dose rates and timings during the infection process. In the field trials, CURATIO® showed very good protective, stopping and even curative effects. Especially during the germination period, the degrees of efficiency were consistently high to very high. Used in this period, CURATIO® always showed better results than the comparative products Stulln® (wetable sulphur) and VitiSan® (potassium hydrogen carbonate). Using the authorized application rates between 6.0 and 7.5 l per hectare/meter tree height in the period after flowering, reliable stopping effects were found even under adverse weather conditions as cool temperatures and wetness. Even the limitations of the product became distinguishable within the project work: slight reductions of application rates or of used amounts of water led to considerably reduced efficiencies.*

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**Keywords:** Apple scab, *Venturia inaequalis*, limitation of copper use, organic fruit growing

### Introduction

Only a few products to replace the use of copper controlling apple scab are available in organic apple growing. Besides wettable sulphur products, especially lime sulphur can be considered as a suitable component of combined strategies to fight scab in organic apple growing. At the four most important fruit growing regions in Germany, the Rhineland (DLR Rheinpfalz), the Lake Constance area (KOB Bavendorf), Saxony (LfULG Dresden-Pillnitz) and the "Altes Land"-area field trials have been conducted to replace or minimize the used amount of copper.

### Material and Methods

Multiple field experiments were conducted at DLR Rheinpfalz (Rhine valley), KOB Bavendorf and (Lake Constance area), LfULG Dresden-Pillnitz (Saxony) and ÖON (area Altes Land). Lime sulphur was tested and compared with other products in different points of time during the course of scab infections. Below one of the field trials is presented exemplarily for the trial work done at the four stations. The trial took place in 2016 in Saxony on the cultivar

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"Gala". Overall, 8 different strategies were tested additionally to the untreated control. The applications in the strategies 1 to 5 were without any preventative spraying. In strategy 6 to 9, the applications into the stage of germination were the same as in strategy 1 to 5, with the additional use of copper and wettable sulphur preventative.

Table 1: Tested versions, 1-5: w/o copper a. preventative spraying, 6-8 w/ copper a. preventative spraying (MOG: moment of germination, LS: lime sulphur, CH: calcium hydroxide, WS: wettable sulphur, CO: copper)

1	LS (m. o. g)	5	Cleared supernatant of CH and WS (m. o. g)
2	CH, stirred up (m. o. g)	6	CO & WS preventative, LS (m. o. g.)
3	Cleared supernatant of CH (m. o. g)	7	CO & WS preventative, CH (m. o. g)
4	CH and WS (m. o. g)	8	CO & WS preventative, cleared supernatant of CH (m. o. g)

## Results and Discussion

The research results from 2016 confirm lime sulphur to be by far the most efficient product against apple scab in organic fruit growing (Fig. 1). Although the climate in Saxony is generally more continental than in the western parts of Germany, the high potency of lime sulphur compared to all strategies based on calcium hydroxide is easily recognizable. Even without preventative spraying, an efficiency of 90 % was achieved, applying lime sulphur into the stage of germination (1).

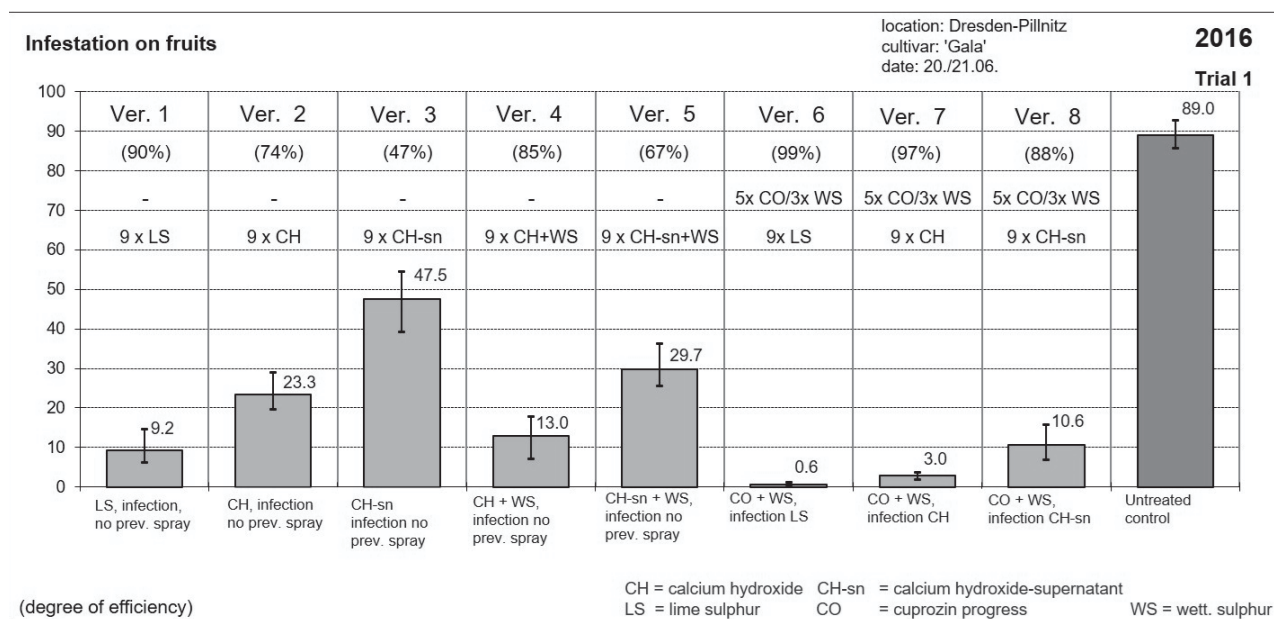


Figure 1: Fruit scab infestation on the cultivar 'Gala' in 2016 in Dresden-Pillnitz.

Combined with the preventative use of copper and wettable sulphur the best efficiency of 99 % in this trial was reached (Ver. 6). In this strategy, the amount of pure copper to control scab could be limited to 850 g per hectare and year.

## Conclusion

Lime sulphur showed its high capability to prevent scab infestations with and without additional preventive applications in the previously mentioned example. It could be shown,

that the highest copper reduction could be achieved in direct measures by using lime sulphur and proven that it is the central component in a successful copper reduction strategy.

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