

Effect of Micronutrients on the Control of Blue Mold Caused by *Penicillium expansum* in ‘Red Delicious’ Apples

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Abstract: Blue mold of apple (*Penicillium expansum* Link) is a serious post-harvest disease affecting apples worldwide, including in India. In the present study, twenty-three (23) isolates of *P. expansum* were obtained from infected apple fruits collected from different fruit markets across Maharashtra. These isolates were tested for their sensitivity to Thiophanate Methyl on Potato Dextrose Agar (PDA) medium, and the Minimum Inhibitory Concentration (MIC) was determined using the food poisoning technique. Six micronutrients, viz., boron acetate, cobalt acetate, copper acetate, iron sulphate, magnesium sulphate, and zinc sulphate, were evaluated for their effectiveness in controlling *P. expansum*, both individually and in combination with Thiophanate Methyl. In vitro studies revealed that copper acetate showed the highest Percent Control Efficiency (PCE) of 55.00 at 50 µg/ml and 69.23 at 100 µg/ml concentrations. In contrast, magnesium sulphate exhibited the lowest PCE (42.56) at 50 µg/ml, while zinc sulphate showed moderate effectiveness at 100 µg/ml, followed by other micronutrients when compared to Thiophanate Methyl. Overall, PCE values increased with higher concentrations of micronutrients (100 µg/ml) compared to 50 µg/ml. Among them, copper acetate and iron sulphate exhibited significant PCE values of 60.24 and 70.15, respectively, followed by zinc sulphate, boron acetate, magnesium sulphate, and cobalt acetate in decreasing order of effectiveness. In vivo studies demonstrated that boron acetate was most effective at 50 µg/ml (PCE 57.70), while cobalt acetate showed the lowest PCE (47.28). At 100 µg/ml, magnesium sulphate achieved a high PCE value of 68.32. Overall, cobalt acetate consistently recorded the lowest PCE values (53.66 and 63.57 at 50 µg/ml and 100 µg/ml, respectively), whereas the other micronutrients ranged between 58.65–61.50 and 69.22–72.52 at respective concentrations.

Keywords: Apple, Blue mold, *Penicillium expansum*, Thiophanate Methyl, Micronutrients

