USE OF JASMONIC ACID AND SALICYLIC ACID TO INHIBIT GROWTH OF SUGARBEET STORAGE ROT PATHOGENS

Karen Klotz Fugate[1*], Jocleita P. Ferrareze[2] and Melvin D. Bolton[1]
[1]USDA-ARS, Northern Crop Science Laboratory, 1605 Albrecht Blvd. N., Fargo, ND 58102-2765 and Federal University of Viçosa, Viçosa, MG, Brazil 36571-000

ABSTRACT

Jasmonic acid (JA) and salicylic acid (SA) are endogenous plant hormones that induce native plant defense responses and provide protection against a wide range of diseases. Previously, JA, applied after harvest, was shown to protect sugarbeet roots against the storage pathogens, *Botrytis cinerea*, *Penicillium claviforme*, and *Phoma betae* by reducing the severity of rot symptoms due to these pathogens by 51, 44, and 71%, respectively (Fugate et al., 2012, Postharvest Biol. Technol., 65:1-4). Research was conducted to determine the ability of SA to protect sugarbeet roots from these storage rot pathogens and to investigate the use of preharvest treatments of JA or methyl jasmonate (MeJA), a low cost derivative of JA, to reduce storage rot due to *B. cinerea*, *P. claviforme*, or *P. betae*. The effect of water stress on severity of rot symptoms due to *B. cinerea*, *P. claviforme*, and *P. betae* was also investigated.

SA, applied after harvest at concentrations of 0.01, 0.1, 1.0 or 10 mM, had no effect on the severity of storage rot symptoms in roots obtained from healthy, unstressed plants after inoculation with *B. cinerea*, *P. claviforme*, and *P. betae*. However, when roots were obtained from water-stressed plants, 0.01 to 10 mM SA reduced the severity of rot symptoms due to *B. cinerea* by 49—58%, *P. claviforme* by 30—53%, and *P. betae* by 47—74%. All concentrations of SA provided statistically similar reductions in the weight of rotted tissue for each of the three pathogens, and on average, postharvest SA treatment reduced the weight of rotted tissue due to *B. cinerea*, *P. claviforme*, and *P. betae* by 54, 45, and 58% respectively. SA reduced the weight of rotted tissue in roots from water-stressed plants by reducing lesion size, but had no effect on the incidence of infection. The ability of SA to reduce rot severity in water-stressed roots but not in roots harvested from plants that received sufficient water prior to harvest suggests that SA mitigated the negative effects of water stress, but did not directly protect roots against storage pathogens.

Results from SA experiments described above suggested that drought stress increased root rot severity due to *B. cinerea*, *P. claviforme*, and *P. betae*. To verify this, water was withheld from greenhouse-grown plants, roots were harvested two days after plants were severely wilted, and the harvested roots were inoculated with *B. cinerea*, *P. claviforme*, or *P. betae*. Relative to roots obtained from well-watered plants, roots from water-stressed plants had 2.3-fold more rot due to *B. cinerea*, 1.4-fold more rot due to *P. claviforme*, and 2.4-fold more rot due to *P. betae*. Field-grown roots from water-stressed plants also exhibited increases in rot severity due to *B. cinerea* and *P. betae*, but not *P. claviforme*.

The ability of preharvest JA treatments to reduce storage rot was determined by application of 0.01 or 10 µM JA or MeJA to foliage 3, 7, 14, or 30 days prior to harvest. Although this research is not complete, preliminary results suggest that preharvest JA or MeJA treatments reduce the severity of storage rot due to *B. cinerea*, *P. claviforme*, and *P. betae*. In general, 0.01 µM JA was more effective in reducing storage rot than 10 µM JA. As was

observed previously for postharvest JA treatments, preharvest JA treatments were most effective against *P. betae* and least effective against *P. claviforme*.