Vog and Laze Seminar

Abstracts

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VOLCANIC AIR POLLUTION ON PLANTS

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Volcanic air pollution damage to plants may result when foliage is burned by moist air with a high sulfur content or from rainfall in a voggy location which deposits pollutants onto plants.

Periodically, there has been an obvious odor of sulfur at the UH CTAHR Volcano Agricultural Experiment Station on Wright Road. The high sulfur content of the air combines with dew or fog or high moisture in the air to form sulfuric acid which causes contact injury of plants which is expressed as foliage burning. Even vegetables growing in plastic-covered rainshelters and greenhouses do not escape injury. For example, greenhouse-grown lettuce suffered permanent injury, whereas greenhouse-grown tomatoes suffered severe leaf burning, but they recovered and produced well.

During 1969-1973, atmospheric haze (now known as vog) in the Kona area coincided with a Kilauea volcano eruption period. Rainwater collected during this period was acidic (pH 4.0 to 4.4) and it contained measurable quantities of chloride and sulfate ions plus 27 detectable (but unidentified) organic compounds the ppb range. Similar organic compounds in Oahu rainwater measured in the ppt range or a thousandfold less than in the Kona district.

A mysterious tomato disease occurred in the Kona area at this time. Symptoms included blossom drop, poor fruit set, hollow and almost seedless fruits and a less luxuriant appearance plus yields and quality were severely reduced.

Poor pollen germination can cause hollow and almost seedless fruits. Pollen germination decreased as the naturally occurring Kona rainwater became more acid. However, in a laboratory test, pollen germination did not improve when this rainwater was made less acidic. Therefore, both the acidity of the rainwater and other contents in the rainwater (pollutants from vog) contributed to poor pollen germination.

Leaching of nutrients from plants can contribute to a less luxuriant appearance and smaller fruit size. More calcium, magnesiun and potassium leached from tomato leaves immersed in Kona rainwater than from leaves immersed in distilled water. Presumably, the acidic nature of the rainwater caused it to be a better extractant of nutrients from the foliage.

A plastic-covered rainshelter was placed over an experimental tomato plot in the Kainaliu area during an extended vog episode in 1972. These plants produced 6 kg of salable tomatoes per plant, whereas unprotected plants growing in the open field produced no salable yield.

We concluded that injury occurred to the open-field-grown tomatoes because the contents of the vog were dissolved in Kona rainwater and deposited on the plants. The plastic-covered rainshelter intercepted the rainfall, and thus, protected the plants from these pollutants. Therefore, growing plants in plastic-covered rainshelters or greenhouses was a practical solution for growing tomatoes during this vog episode.