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HAIL DAMAGE TO PLANTS

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Recent severe hailstorms in north Florida have afforded an excellent opportunity to observe and review the many manifestations of hail damage to a wide array of plants species. Damage caused by the impact of hailstones on plant tissue can take many forms, depending mainly on the size of the hailstone, duration of the storm event, and the condition of the plant tissue when the injury occurs.

Hail can occur at any time of year in Florida, but is most often associated with the larger thunderstorms of spring and summer. Hot, humid, still days result in strong upward convection, creating massive thunderhead (cumulonimbus) clouds. The upper elevations of such clouds are below 0°C, and droplets of water carried into the supercooled middle and upper cloud levels freeze. Enlargement of the ice ball occurs both from repeated trips up and down in the convective currents in the cloud, and by continuous condensation of moisture in the supercooled regions of the cloud. Once the mass of the hailstone exceeds the upward force of the convective currents, the hailstone will fall to earth. Hailstones usually range in size from 0.5 to 1 cm in diameter, but sizes up to 2 to 4 cm are not uncommon (2).

Fig. 1 A. & B. Typical elliptical hailstone impact scars with callused margins on stems of A) *Pittosporum tobira* 'Wheeleri' and B) Vaccinium *corymbosum* Sharpblue. Photo was taken 16 weeks after a twenty minute hailstorm with 1-1.5 cm diameter hailstones. Scars are located on only one side of the branches.

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SYMPTOMS: Hail damage to foliage, flowers, and tender stem tissues appears as bruising, shredding, defoliation, or physical mangling. Tattered holes may be obvious in larger leaves. Fruit, twigs, and even larger stems may exhibit open, ragged-edged wounds in the skin or bark. Damage to fruits nearing maturity can resemble bird pecking damage. Such damage is easily identified immediately after the storm event, which seldom escapes the notice of people residing in the path of the hailstorm. In time, the wounds on twigs and limbs will be surrounded by callous tissue (**Fig. IA & B).** Damaged fruits will mature with surface blemishes and malformations (1, 3).

Even tiny hailstones can inflict severe but initially imperceptible damage to fruits, flower and leaf buds, and seedlings in formative stages. The resulting bruises will manifest themselves days to weeks later as deformed wound-response tissues, and can completely ruin a crop.

In addition to the direct damage caused by hail, wounds caused by impact can serve as the infection court for fungal and bacterial diseases. Twig canker fungi, bacterial and fungal soft rot of fruits, and bacterial fire blight of Rosaceae may take advantage of wounds, resulting in even greater losses (1).

DIAGNOSIS: The pattern of immediate or latent hail damage is the best clue for diagnosis. On plant tissue, scars will appear mainly on the top of horizontally oriented tissues, or along one side (depending on the wind direction during the hailstorm) of vertically or obliquely oriented tissues. When observing the larger scope of hail damage in a particular area, one should detect damage to all plants in the vicinity. It is possible for small zones in the path of a thunderstorm to receive hail while adjacent areas escape. Flagged leaves and small twigs still hanging in a plant/tree, accompanied by tattered debris on the ground, can also be useful in diagnosis. These patterns of hail damage are so distinctive that consultation of local weather records is seldom necessary for confirmation.

CONTROL: Providing overhead protection against hail damage is seldom practical. Crop insurance is available to cover hail damage losses. Protective fungicides and/or bactericides may prevent secondary infections in hail wounds. Severely damaged tissues should be pruned out as soon as possible after the damage and before protective sprays are applied.

SURVEY AND DETECTION: Hail damage is easily recognized immediately after it occurs, but becomes somewhat more difficult to recognize as time passes. The pattern of damage, both on the individual plant and in the plant population, is indicative. Look for bruises or open wounds on one side of the damaged plants or plant parts, with all plants in the vicinity affected similarly. Telltale evidence of hail damage will persist on long-lived tissues for many years, and may show indications of secondary infections in the old wounds.

LITERATURE CITED

1. **Jones, A.L., and H.S. Aldwinkle (eds) 1990**. Compendium of apple and pear diseases. American Phytopathological Society Press, St. Paul, MN. p. 85-86.

2. **Schaefer, V. J., and J. A. Day. 1981**. A Field Guide to the Atmosphere, Peterson Field Guide Series, No. 26. Houghton Mifflin Company, Boston. p. 197, 244-245.

3. **Whiteside, J.O., S.M. Garnsey, and L.W. Timmer (eds) 1988**. Compendium of citrus diseases. American Phytopathological Society Press, St. Paul, MN. p. 5, 19, 59.