Phosphorous Acid Application Methods

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What is Phosphorous Acid?

- Phosphorous Acid is sold both as an unbuffered acid product as well as a buffered product.
- The unbuffered acid typically has an assay of about 0-60-0.
- A buffered product typically having about half as much phosphorous in the formulation.
What is Phosphorus Acid?

- Both buffered and unbuffered products can be used as a fertilizer and pesticide in the state of California.

- Buffered phosphorous acid products are sometimes referred to as phosphites or phosphonates.
What is Phosphorous Acid?

- Pesticide and fertilizer applications are treated differently, even though the composition of the products may be identical.
  - Fertilizer applications are mostly unregulated.
  - Pesticidal applications requires the applicator to follow strict rules and guidelines.
What is Phosphorous Acid?

- Phosphorous Acid has the chemical formula H₃PO₃.
- It’s much more common cousin phosphoric acid has the chemical formula H₃PO₄.
What is Phosphorous Acid?

- Almost all phosphorous containing fertilizers sold in the USA are comprised of phosphoric acid or its salts. For example:
  - MAP (monoammonium phosphate)
  - DAP (diammonium phosphate)
  - MKP (monopotassium phosphate)
Phosphorous Acid as a Nutrient

- As a nutrient, phosphorous acid could be considered a time release fertilizer.
- Its role as a nutrient is largely dependent on its conversion from phosphite (PO₃) to phosphate (PO₄).
- This conversion process is ongoing but accelerated by increased temperatures and organisms present in the environment.
Phosphorous Acid as a Nutrient

- In addition to having time release properties, phosphorous acid is less reactive than phosphoric acid.
- It will not be as likely to form insoluble precipitates rendering it unavailable to the plant.
Application Methods

- Foliar
- Injection
- Fertigation
Foliar

- Can apply many different products at the same time, saving labor.
  - Fast uptake
  - Moderate labor requirements
- Drift of spray materials may be undesirable.
Spray when leaves look like this:
Injection

- Effective if done correctly
- Need to have at least two injection sites, preferably three or more per tree to insure complete protection
- Almost all of applied product is consumed by the tree
- Highest labor costs of available methods
Injection

- Injection amounts should be 15 to 20 mls (.5 to .66 ounces) of a buffered product (0-29-26) per one meter (yard) of canopy diameter.

- Example:
  - grove with mature trees planted on 20 X 20 foot spacing should inject about 6 X 20 or 120 mls (4 ounces or about 2.6 shot glasses) per tree.

- If injecting, only use a buffered product.
Injection

Fig 1-A,B,C-Branch canker and bark peeling on avocado after pouring non-buffered Phosphorous acid into an artificially drilled hole.

Fig 2-Callus formation and healed bark after application of buffered Phosphorous acid using an injector.
Injection

- Trunk injection:
  - Eliminates spray drift
  - Reduces worker exposure
  - Protects natural enemies
  - Limits the AI needed to protect the crop

Image by Marlene Cameron

Slide by John C. Wise
Injection

- Trunk Injection represents an alternate technology for delivering pesticides to tree fruit crops.
- Only buffered products should be used for injection.

Image by Marlene Cameron

Phosphorous Acid Application Methods
Injection

- Current market available trunk injection tools:
  - Needle-based tools:
    - Wedgle direct-Inject System®
    - Bite-infusion®.
Injection

- Drill-based tools:
  - Mauget capsules®
  - ChemJet spring powered injector®
  - Quik-jet micro-injection system®
  - Viper air/hydraulic micro-injection system®
  - Tree IV air/hydraulic micro-injection system®.

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Injection
Injection

- Quik Jet
- Mauget pressurized capsules
- ChemJet spring syringes
Injection

- Bite
- Wedgle Direct Inject System
- Tree IV

Phosphorous Acid Application Methods

Slide by Srdjan Acimovic
Injection

- Viper Air-Hydraulic
Injection

- Callus healing of drill-based tool wound

Slide by Srdjan Acimovic
Injection

➢ Callus healing of needle-based tool wound
Injection

- Advantages
  - Limited treatment schedule
  - Eliminate spray drift
  - Reduced worker exposure
  - Reduced pesticide exposure to natural enemies
  - May be able to reduce total pesticide load.
Injection

- Disadvantages
  - Slow application time
  - Wound/tree health
  - Impact on pollinators unknown
  - Time and resources needed to add trunk injection as a labeled use.
  - Concerns over “consumer perceptions” about food safety
Fertigation

- Least expensive method available
- Can be combined with other products
- Efficiency of uptake can vary significantly
- May accelerate resistance, so it should be avoided if possible.
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