

IODINE AS A PLANT PROTECTANT

Iodine has been an established biocide in the medical and food industry for many decades. In fact it is considered the number one disinfectant in use because it has such a high REDOX value. This means iodine is not challenged with issues of microbial resistance because of its effective capability in oxidation even under high organic loading which is typical in the agricultural, food processing and medical industries.

HISTORICAL USES OF IODINE IN AGRICULTURE

Iodine was discovered in 1811, isolated from the soda ash of seaweed, by the French scientist Courtois and used as a medical tincture in the Civil War. By 1874, it was found to be one of the most efficacious antiseptics, due in part to its low reactivity to proteins, allowing the I₂ molecule to rapidly and thoroughly penetrate the cell wall of micro-organisms.

Research in the early part of the 20th century demonstrated that iodine was quite effective in controlling seed borne diseases, eelworms in bulbs/tubers, fungal diseases such as *Colletotrichum tabificum* on tomatoes, *Pseudoperonospora humuli* (Hop Downy Mildew) and *Phytophthora infestans* (late blight) on potatoes. Iodine was also utilized to help preserve post-harvested fruit, especially grapes, from spoilage organisms. Research conducted at this time also demonstrated that iodine promotes the growth of nitrifying bacteria and intensifies the assimilation of nitrogen.

During the 1950's and 1960's, various forms of iodine were utilized to effectively protect crops, such as citrus from nematodes, psorosi or "scaly bark," *Phytophthora parasitica* or "foot rot"; coffee trees infected with *Hemileia vastatrix*; as well as those diseases considered to be "incurable", such as Dutch Elm disease.

IODINE AND PHYTO-THERAPY

Iodine has also been utilized to contain the following plant diseases: Cut flowers (powdery mildew and rust, *Puccinia* sp.); Cucumbers (*Anthraco*se or *Colletotrichum orbiculare* and angular spot or *Pseudomonas syringae*); Tomatoes (late blight or *Phytophthora infestans* II, early blight or *Alternaria solani*); Wine grapes (Black Rot, *Botrytis*, Downy Mildew); Blueberries (*Anthraco*se); Ginger root (nematodes); Potato seeds (*Rhizoetonia solani* and *Erwinna* rot). Research continues on a variety of crops on different continents.

A NEW GENERATION IODINE

Historically, Iodine applications were messy and/or posed risks of phytotoxicity on crops due to the insolubility of the crude materials as well as the hazards associated with the solvents used to make Iodine soluble. A **cold-processed** "iodophor" iodine has

proprietary surfactants included that keep the concentrate stable in storage. When diluted, the iodine-surfactant bonds are easily ruptured, releasing the active I₂ molecule to do its job of oxidizing microbes. These surfactants are not phyto-toxic. After several hours of exposure to sunlight and air, the iodine that is not absorbed by the plant's tissues readily sublimates leaving virtually no residues on the crop. This makes an effective, safe alternative to post harvest rinse of fruits and vegetables.

Tests conducted at independent laboratories indicate that when applied to field crops, there is no residue on harvested produce. Vegetables and fruits treated with iodine as a post harvest rinse at 12 ppm iodine indicated a negligible level of iodine on carrots and potatoes (0.10-0.50 ppm, 15 minutes to 12 hours post rinse).

CAUTION: ONLY USE IODINE COMPOUNDS THAT POSE NO THREAT TO PHYTO-TOXICITY DUE TO FORMULAS CONTAINING ALCOHOLS, SOLVENTS, HARMFUL SURFACTANTS, ETC.

NOTE: Check with your federal and state regulatory agencies, as well as your organic certifier, to determine the allowable uses of iodine in agricultural/horticultural production.

TRADITIONAL APPLICATIONS FOR USE IN AGRICULTURE

FIELD VEGETABLES & FRUITS: Apply 150-300 ppm solution of Iodine using a minimum of 40 gallons/acre of water. Spray every 7-10 days, preferably in the evening, or early in the morning at temperatures below 75°F (25°C). Apply following a rainfall within this schedule whenever weather permits.

ORCHARDS & VINEYARDS: Apply 150-300 ppm solution of Iodine using 100 gallons of water per acre with a fine mister/blower. Apply as directed as in field vegetables and fruits.

SEED TREATMENT: To destroy eelworms in tubers, bulbs, etc., soak bulbs in an Iodine solution at a minimum of 500 ppm for at least (1) hour. The same solution can be utilized for seed borne diseases. Iodine appears to enhance both the (%) and the rate of germination.

SOIL NEMATODES: Soil **must be moist and have good drainage** prior to treatment! If necessary, in fruit orchards, soil auguring to a depth of 2 feet may be advised on afflicted trees. When using low water volume (e.g. 5 gallons per citrus tree), make up a solution containing 500-1,000 ppm and apply 5 gallons to each tree, the soil of which has been irrigated prior to treatment. After applying Iodine solution, always water thoroughly, to allow the percolation of the Iodine solution into the roots. If using a large volume to deliver Iodine (e.g. 20 gallons per tree), the rate of Iodine may be reduced to 250 ppm.

HARD FRUITS AND TUBERS: Immerse tubers and hard fruits in a solution containing 12 ppm Iodine. Agitate for 1-2 minutes, depending upon soil residues and remove to air dry.

SOFT FRUITS: Spray thoroughly with a fine mist of 12 ppm of Iodine. Allow to air dry before packing.

NOTE: Iodine will discolor any exposed starch on fruits/vegetables to a violet color. Iodine is also an excellent **NO RINSE** disinfectant for use on **hard surfaces** of machinery, tools and processing equipment. Recommended dilution rate is 25 ppm.