Quick phosphine generation and recirculation in gastight structures for quarantine treatment

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Abstract

Before fresh plants are exported they require short and effective disinfestation process that will meet plant protection authorities' demand; the plants must be free of live insect pests at the destination. To develop fumigation technology that will be suitable and effective to replace MB, experiments were carried out using phosphine. Experiments were carried out under laboratory conditions at temperature of 4°C for 24 h exposure time. The tested herbs were: dill, parsley, tarragon, basil, mint, sage, oregano, thyme and rosemary. In addition, laboratory and commercial scale tests were carried out at 2°C for cut flowers: *Gypsophila* and *Trachelium*. The insect pests: *Laphigma* spp., *Prodenia* spp., *Geometridae*, *Thrips*, *Bemisia tabaci*, *Liriomyza trifolii* and *Tetranychus urticae* were collected at their adult and larval stage with the plants from the field, then they were exposed to phosphine fumigation. Most plants had no quality deterioration due to the treatment even after 14 d of storage. To implement the technology, a quick phosphine release generator was developed. The generator was designed to control fresh plant' pests at exposure temperature in the range of 2 to 18ºC within 24 h exposure to a gas concentration of about 1,000 ppm. The generator is connected to a gastight rigid fumigation chamber which must hold a pressure decay test of 5 minutes (half-life time pressure). The rigid gastight chamber is equipped with recirculation fan connected to the gas generator, pressure relief valve to ensure gas tightness within set limits, breathing bag to absorb pressure changes due to temperature fluctuations during the cooling process, and gas exhaust fan to release the gas. At the end of the fumigation, the chamber is opened after gas concentration in the chamber is <0.1 ppm. This technology has been commercially available to control QPS treatments of cut flowers, seedlings and cuttings in Israel.

Keywords: phosphine generator, fumigation, fresh plants fumigation, gastight fumigation chamber, QPS treatment