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Fumigation of grapes (*Vitis vinifera*) with sulphur dioxide (SO₂) to control insect-pest during storage

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ABSTRACT

India is one of the major grape (*Vitis vinifera* L.) producers, and exporters in the world and now the country is exploring new markets for Indian grapes. New Zealand and Australia are the future potential export markets for Indian grapes to high demand and low domestic production in these countries. Phyto-sanitary requirements of New Zealand for the import of grapes are very strict and they considered *Drosophila suzukii* (Matsumura) as an invasion insects in Indian grapes. These flies are present on damaged wine grapes during the harvest period, especially when the damage of berries skin takes place due to cracking, disease, hail injury, and bird damage. Reports indicated presence of *Drosophila suzukii* in temperate regions of India; however, no report showed presence of these flies in grapes producing regions of India. The USA developed a fumigation treatment method (SO₂/CO₂ in combination) of grapes followed by cold disinfestations treatment to manage spiders and *Drosophila suzukii* in fresh table grapes, and Europe Union countries also followed this method. The treatment includes fumigation of grapes with 6% CO₂ and 1% SO₂ for 30 min followed by cold treatment for 6 days or more at -0.5 to 0.5°C pulp temperature. Such treatment of grapes is not in practice in India which limits the export of Indian grape. Controlled release and uniform distribution of SO₂ and CO₂ in fumigation chambers is a technological challenge in India. Higher concentration of SO₂ softens the grape berry, making it unacceptable for export. Development of automated fumigation chamber may reduce the post-harvest spoilage of grapes and standard protocol of fumigation with SO₂ may assist in satisfying the international norms of quality. An automated fumigation chamber for standardization of fumigation protocol for Indian grapes is prepared to meet international standards for export.

Key words: Grapes, CO₂, *Drosophila suzukii*, Fumigation, Fumigation chamber, SO₂

Grapes (*Vitis vinifera* L.) contribute to about 16% of global fruits production and it is preferably consumed as fresh. It is also used for producing raisins, wine and other value added products. India is 9th major grape producer in the world with total production of about 2.48 mT in 2013-14 (DAC, 2015). Tropical regions of India are the major producing areas while Maharashtra and Karnataka contribute to about 95% of total production. In India 71% grape goes for fresh consumption, nearly 27% dried for raisin, 1.5% for wine making, and 0.5% for juice production (APEDA, 2016). Further, a recent survey reported that 8.6% of

total grapes produced in India are lost during harvest and post-harvest operations due to mechanical injuries, physiological decay, water loss, glut in season, and inadequate storage infrastructure (Jha et al., 2015). Use of advanced technologies and creating export market demand may reduce such losses.

India exported 0.19 mT grapes to over 40 countries across the Asia, Europe, America and Africa and contributed to about 9.1% of total fruit exports from the country (Sharma and Jain, 2011; APEDA, 2016). However, Indian grape (*Vitis vinifera*) exporters are facing specific problem to export grapes in New Zealand and Australia due to their phytosanitary certification criteria. New Zealand phytosanitary requirements consider *Drosophila suzukii* (Matsumura)

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