

Part 4 Phytotoxicity of 'Fuji' Apples Fumigated with Methyl Bromide

Introduction

In Japan, apples, *Malus pumila* MILLER var. *domestica* SCHNEIDER are produced mainly in Nagano Prefecture, the central mountain area and the Tohoku areas which includes such prefecture as Aomori, Iwate and Yamagata. The 'Fuji' cultivar is widely planted in these production areas. There are two types of cultivation for 'Fuji' apples in Japan. 'Bagged Fuji' are wrapped with paper bags, which remain covered until harvest. The fruit are harvested in late October to mid-November, while 'Unbagged Fuji' are grown without bags and they are harvested in early- to late-November (Statistic and Information Department, Ministry of Agriculture, Forestry and Fisheries, 1990).

'Bagged Fuji' apples are usually stored for eight months (October to March in Controlled Atmosphere storage (CA) and then April to July in Standard Cold storage (SC)) at -1 to 0°C , while 'Unbagged Fuji' are stored four months at most (October to March in SC storage) at -1 to 5°C . However, KUDO (1984) and FUKUDA (1985) reported on various physiological injuries occurring on apples during long storage periods.

Methyl bromide has been widely used as a fumigant for fruit and vegetables (MONRO, 1969a; STAUT, 1983; BOND, 1984; USDA, 1985), but a major disadvantage in the use of methyl bromide is the high dose required to eliminate the insect in question which has often led to injury to the host fruit. The fumigation schedules must provide 100% mortality of the insect in question with little or no injury or quality degradation of fruit and vegetables. There are many reports on tolerance of apples fumigated with methyl bromide and the tolerance varies from variety to variety. Fumigation may have adverse effects on quality of apples (PHILLIPS et al., 1939; CLAYPOOL et al., 1956; MORI et al., 1963; MONRO, 1969; O'LOUGHLIN et al., 1977; ABE et al., 1980; RIPPON et al., 1982; GALLETI et al., 1987; DRAKE et al., 1988; MEHERIUK et al., 1990; DRAKE et al., 1990). Therefore, phytotoxicity tests were conducted on 'Fuji' apples for the tolerance of 'Bagged and Unbagged Fuji' apples to methyl bromide fumigation. Furthermore, large-scale confirmation tests were also conducted to determine if chemical injury on 'Fuji' apples would be caused by the combined cold storage and methyl bromide fumigation treatment established for export of 'Fuji' apples to the United States.