# HORTICULTURE FOR FOOD AND ENVIRONMENT SECURITY

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# Grafting an Effective Tool for Abiotic Stress Alleviation in Vegetables

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## 1. INTRODUCTION

Even though grafting has been practiced in fruit trees for thousands of years, the commercial use of vegetable grafting is a relatively recent innovation (Lee *et al.*, 2010). Vegetable grafting is a horticultural technology practiced for many years in East Asia to overcome issues associated with intensive cultivation using limited arable land for vegetable production (Kubota *et al.*, 2008). The first record of vegetable grafting was as a control strategy for pest/disease and yield increase in watermelon [*Citrullus lanatus* (Thunb.) Matsum and Nakai], using a squash rootstock (*Cucurbita moschata* Duch.), reportedly developed by a watermelon farmer in Japan (Tateishi, 95 year). This watermelon grafting technique was quickly disseminated to farmers through extension research programmes of regional agricultural experimental stations in Japan, and then later into Korea, during the late 1920s and early 1930s. Use of grafted seedlings in commercial vegetable production occurred as early as the 1930s in Japan for watermelon grafted on *Lagenaria siceraria* (Mol.) Standl. (Oda, 1999). Research on grafting cucumber (*Cucumis sativus* L.) also started in the late 1920s, but its wider commercial applications did not happen until 1960 (Sakata *et al.*, 2008). For members of the Solanaceae, the first record was of eggplant (*Solanum melongena* L.) grafted on scarlet eggplant (*Solanum integrifolium* Poir.) in the 1950s (Oda, 2000). Grafting tomato was introduced commercially in the 1960s (Lee and Oda, 2003).

The adoption of vegetable grafting in the Western world (American, European and Middle East countries) has increased significantly since the banning of the fumigant methyl bromide in 2005 by the Montreal Protocol (Cohen *et al.*, 2007). The primary motive for using grafted plants is to avoid damage caused by soil-borne pests and pathogens in situations in which genetic and/or chemical approaches for disease management are not available (Oda, 1999). Today, grafting restricts input of agro-chemicals against soil-borne pathogens and is, therefore, considered an environmentally friendly cultivation technique, which is strongly recommended for integrated crop management systems (Rivard and Louws, 2008). In addition, grafting can increase plant vigour and yield, induce higher tolerance to abiotic stress conditions such as salinity, heavy metal, nutrient stress, thermal stress, water stress, organic pollutants, and alkalinity (Colla *et al.*, 2010a,b,c, 2011; Rouphael *et al.*, 2008a,b; Savvas *et al.*, 2010; Schwarz *et al.*, 2010) and also improve fruit quality (Proietti *et al.*, 2002; Rouphael *et al.*, 2010).