Chapter 6
Effect of Salinity on the Development of Gummosis Caused by Phytophthora Citrophthora on Six Rootstocks Commonly Used in Citrus Orchards

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ABSTRACT

In Morocco, Sour orange is practically the only rootstock used due to its adaptation to the majority of soils and climatic conditions and its acceptable resistance to Phytophthora spp. Additionally, the resistance of sour orange to the attacks of Phytophthora spp. is affected by the salinity of the soil or irrigation water. The objective of this study is to detect the existence of a specific effect of Cl-ions on the development of gummosis caused by Phytophthora citrophthora on six rootstocks commonly used in citrus orchards. After 12 days of inoculation of six different rootstocks treated with NaCl solutions, the first symptoms of the disease appeared in the form of gummy flow, especially on Lime rang pure and citrimelo winter. There is a highly significant correlation between leaf Cl-ion content and the surface of necrosis at the stem. This made it possible to conclude that the alteration of disease resistance is due to a specific effect of these ions, probably by breaking the defense mechanisms of the host plant and/or by stimulating the growth of the pathogen itself.

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INTRODUCTION

The Moroccan citriculture is based on the exclusive use of sour orange (*Citrus aurantium* L.) rootstock. This is due to its adaptation to the majority of soils and climatic conditions and its acceptable resistance to *Phytophthora* spp. (Boudoudou et al., 2023; 2024) (Vanderweyn, 1974) (Nadori, Ouammou, & Kayaf, 1988). However, the widespread use of this rootstock represents a potential danger to the national citrus supply because of its susceptibility to tristeza, as most existing varieties of sour orange are susceptible to this disease. In addition, the resistance of sour orange to the attacks of *Phytophthora* spp. is affected by soil salinity or irrigation water, (El Guilli *et al.,* 2000).

Indeed, many problems threaten the citrus crop such as the excessive salinity of soils and irrigation water that result in especially low percentages of lifting, as well as decreases in yields. In arid and semi-arid areas, the issue takes more proportion arousing serious concerns. In Morocco in irrigated perimeters, the salinity of soils and water of irrigation affects approximately 38% of the total area, (Ftouhi, 1981). The salinity of the soil reduces the growth, and the productivity of the culture, owing to the increase in the osmotic pressure of the medium (Storey & Walker, 1999) and increased concentration of certain ions (Cl and Na+), which then reached a toxic level for the plant, (Grieve & Walker, 1983). These factors interfere not only with physiological processes such as transpiration, photosynthesis, translocation, and respiration but also provoke water and/or ionic imbalance in the plant, (Bohra & Doerffling, 1993).

Under stressful conditions, the physiological processes that limit the pathogen establishment are being activated, (Schoeneweiss, 1975) (MacDonald, 1984). Previous surveys reported that salt acts by the osmotic effect on the pathogenic lifestyle of the pathogen, in particular the pathogenic capacity and the mycelial growth, (Ragazzi & Vecchio, 1992). Other studies have demonstrated that the salinity of the soil and irrigation water predisposes citrus rootstocks to gummosis; caused by *P. citrophthora*, (Sulistyowati, 1993) (Benyahia, 2003) (Beniken et al., 2022).

The objective of this study is to investigate the existence of a specific effect of the Cl^- ions on the development of gummosis caused by *Phytophthora citrophthora* on six rootstocks commonly used in citrus orchards.

1. MATERIALS AND METHODS

1.1 Plant Material and Growing Conditions

The experiment was conducted in a greenhouse where the temperature varies between 20 and 35°C and the relative humidity between 40 and 60%. Cuttings from six citrus rootstocks, 5 cultivars of Citru-melo Citrus and a cultivar of lime Rangpur (Citrus limonia Osbeck).

To promote rooting, the cuttings were first plunged into solution of AIB of concentration 4 g/l for 2 minutes before being planted in pots of (1L) containing a mixture of peat and sterile sand 1:1. Irrigation was performed twice a week with water until the cuttings reached the age of one and a half years. At this time, the cuttings were transplanted in pots of 3L and were irrigated during 2 weeks with a solution of half-concentrated Hoagland and Arnon (1950) (adaptation phase).