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—Scientific Note—

Compatibility of Scions on Two New Rootstocks

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Rootstocks are an important component of citrus production systems around the world because they can have profound effects on tree size, fruit quality, and tree health (Martínez-Cuenca et al., 2016). Citrus rootstock development is a long process during which selections undergo extensive testing to cull those cultivars that have undesirable traits. Graft incompatibility, defined generally as the inability of the rootstock and scion to form a successful union (Goldschmidt, 2014), is an undesirable trait and can be a major concern with many fruit tree species. Recently, graft incompatibility symptoms have been observed on several commercial citrus cultivars when grafted on two new citrus rootstocks, 'US-1283' and 'US-1284'. In this study, we sought to characterize incompatibility symptoms of three scion cultivars on these rootstocks in comparison to a control rootstock, 'US-812', and describe the physiological effects on the trees.

True-to-type seedlings of rootstock cultivars 'US-1283', 'US-1284' and 'US-812', all hybrids of mandarin (*Citrus reticulata*) and trifoliate orange (*Poncirus trifoliata*) were grafted with scion cultivars 'Bearss' lemon (*C. limon*), 'Star Ruby' grapefruit (*C. paradisi*), and 'Valencia' sweet orange (*C. sinensis*). Trees were grown for one year in an environmentally controlled greenhouse and were irrigated by an automated dripper system 3-4 times a week with weekly fertigation. Tree growth and incompatibility symptom development were tracked monthly by measuring trunk diameters, visual rating of graft union swelling and rootstock stem grooving. In addition, hydraulic conductivity was measured through the scion, the rootstock and the graft union tissue. Transverse sections of rootstock stems were sectioned, stained with toludine blue O, and visualized by light microscopy.

After 52 weeks, all scion combinations with 'US-1283' and, to a lesser extent, with 'US-1284' developed grooving on the rootstock stem in addition to swelling of the scion directly above the graft union (Fig.1) while combinations with 'US-812' developed none. However, no differences in rootstock diameter were observed between the rootstocks for any of the combinations. Except for two trees which died, trees looked healthy. Hydraulic resistivity was highest in the scion combinations with 'US-1283' when compared to combinations with 'US-812'; however, the hydraulic resistivity through the graft union

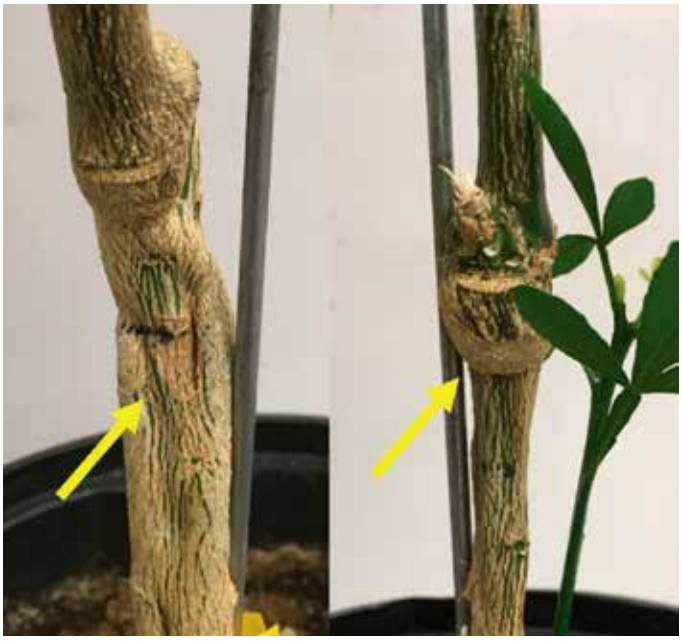

Fig. 1. Rootstock stem grooving and scion swelling on incompatible graft combinations of 'Bearss' lemon (*C. limon*), and 'US-1283' rootstock.

was an order of magnitude higher than that of the rootstock and the scion, regardless of the graft combination. There was a moderate, negative correlation between graft union resistivity and rootstock diameter in combinations with 'US-1283', which was not observed in combinations with 'US-1284' or with 'US-812'. Transverse rootstock sections of symptomatic 'US-1283' revealed that secondary xylem development was inhibited in the grooved regions (Fig. 2). In addition, necrotic tissue, varying in the degree of severity, was often present in the grooves extending into the wood. These abnormalities were absent in all graft combinations with 'US-812'.

It has been noted that previous grafted trees of sweet orange on rootstocks of 'US-1283' and 'US-1284' propagated by stem cuttings did not exhibit grooving or swelling at the union and were superior in field performance to other rootstocks (Bowman and McCollum, 2015). It is unclear why there was a large dif-

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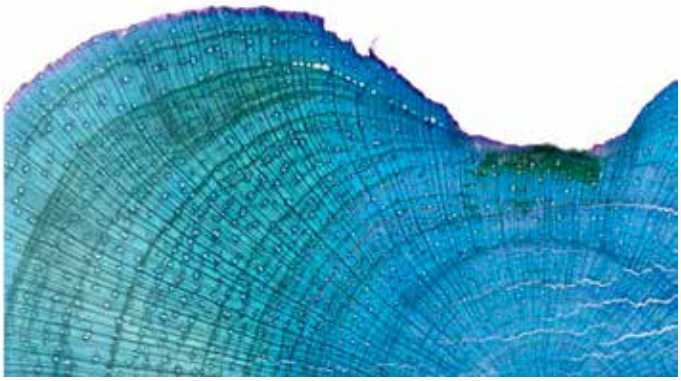

Fig. 2. Transverse light microscopic section of a grooved region on 'US-1283' rootstock grafted with 'Bearss' lemon (*C. limon*). The grooved region shows little secondary xylem growth and necrotic vascular tissue.

ference in compatibility reaction for rootstocks propagated by cuttings and nucellar seedlings. Transcriptomics and metabolomic study are in progress to identify the underlying physiological factors.

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