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Foliar absorption of calcium by tomato plants: Effects of calcium source & adjuvant

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The deficiency of calcium can have a detrimental effect on the quality and shelf life of fruits. In addition to appropriate soil fertilization, foliar sprays containing Ca2+ sources present an alternative solution to prevent and address this issue. X-ray fluorescence microanalysis was utilized to observe the foliar absorption of CaCl2, Ca-citrate complex, and Ca3(PO4)2 nanoparticles, with and without mineral oil as an adjuvant. The foliar absorption of Sr2+ was utilized as a physiological tracer for Ca2+. The impact of treatments on the cuticle structure was measured via scanning electron microscopy. For this study, 45-day-old tomatoes (Solanum lycopersicum L., cv. Micro-Tom) were employed as the model plant species.
During the 100-hour period, the leaves absorbed 90%, 18%, and 4% of aqueous CaCl2, Ca-citrate, and Ca3(PO4)2 nanoparticles, respectively. The addition of an adjuvant increased the absorption of Ca-citrate to 28%, decreased that of CaCl2 to 77%, and did not affect Ca3(PO4)2. CaCl2 demonstrated an exponential decay absorption profile, with t50% of 15 hours and 5 hours without and with adjuvant, respectively, while Ca-citrate and Ca3(PO4)2 exhibited a linear behavior. Sr2+ proved to be an appropriate tracer for Ca2+ since their absorption profiles were similar. The adjuvant disrupted the epicuticular crystals, and the movement of Ca inside of the leaf was limited to a few millimeters away from the deposited spot. The findings of the study suggest that CaCl2 was more effective than the other sources of Ca2+. The effects caused by the adjuvant imply that CaCl2 and Ca-citrate were mainly absorbed through hydrophilic and lipophilic pathways, respectively.

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