

Effect of adjuvant on the movement of ^{14}C -glyphosate in two model plants

Shiv D. Sharma¹ and M. Singh²

¹CCS Haryana Agricultural University, Regional Research Station, Karnal, India

²University of Florida, Citrus Research and Education Center, Lake Alfred, Florida, United States of America

Summary The study was conducted to examine the effect of glyphosate with or without surfactant on *Commelina communis* L. (dayflower) and *Solanum nigrum* L. (black nightshade) at the University of Florida, USA. Glyphosate is a non-selective, systemic, broad spectrum, post-emergence herbicide. Deposition, distribution, and retention characteristics of spray droplets constitute major influences on herbicide penetration into a leaf. The chemical constituents of epicuticular wax and surface characteristics of the leaf surface affect these parameters. Improved herbicide efficacy with adjuvants has been attributed to the increase in leaf wettability and penetration resulting from reduced surface tension and contact angle of spray droplets on the leaf surface. *C. communis* is an annual plant often found in moist habitats and occurs in dense populations under citrus trees. It is difficult to control using glyphosate. *S. nigrum* is an annual plant with a smooth leaf surface, controlled effectively by glyphosate. The effects of glyphosate alone, or formulated with surfactant, applied to *C. communis* and *S. nigrum* were examined. *C. communis* seedlings

at the two to three leaf stage collected from a citrus grove were transplanted and *S. nigrum* seeds were sown in potting mix in plastic pots of 15 cm diameter. Each pot contained only one seedling of either plant and was kept in a greenhouse maintained at 25/16°C ($\pm 0.5^\circ\text{C}$) day/night temperatures with 70% ($\pm 5\%$) relative humidity under normal light conditions.

Uptake and translocation of ^{14}C -glyphosate were significantly higher in *S. nigrum* than *C. communis* possibly because of a smooth leaf surface and presence of high amounts of non-polar waxes on its leaf surface. Uptake and translocation of ^{14}C -glyphosate were significantly higher with surfactant than with glyphosate alone. Significantly higher absorption and translocation of ^{14}C -glyphosate was recorded up to 48 h after application. Uptake and translocation values of ^{14}C -glyphosate were consistent with the percent control of these two weeds by glyphosate \pm surfactant. It is thought that the application of glyphosate with surfactant either disrupted or dissolved the waxes present on the leaf surface allowing for increased penetration of glyphosate active ingredient into the plant.