EFFECTS OF ADJUVANTS ON COVERAGE, ABSORPTION, AND EFFICACY OF BEAN RUST FUNGICIDES

David H. Gent and Howard F. Schwartz
Department of Bioagricultural Sciences and Pest Management
Colorado State University, Fort Collins, CO 80523-1177

Introduction:

Adjuvants have the potential to significantly improve pesticide coverage, absorption, and efficacy, but their use with fungicides and in disease management has been largely ignored. Laboratory and greenhouse studies evaluated coverage, absorption, and efficacy of commercially-accepted adjuvants with diverse chemistries using *Uromyces appendiculatus* and *Phaseolus vulgaris* L. as a model host-pathogen system. Coverage of uv-fluorescent dye was captured and quantified via black light photography and subsequent digital image analysis. Organosilicone-based adjuvants improved coverage 80-89% compared to latex spreader-stickers and untreated controls. Absorption of 14-C azoxystrobin was improved 73% with the addition of methylated seed oil. Translocation of azoxystrobin was negatively impacted by latex-based spreader-stickers. Field trials in Fort Collins, CO found that bean rust control was significantly improved with organosilicone or nonionic-surfactants.

Materials and Methods:

Leaf discs excised from greenhouse grown 'Olathe' pinto bean were treated in a spray chamber with the highest labeled rates of various commercially-accepted adjuvants + uv-fluorescent dye (5 reps/run x 4 runs). Digital images were captured under black light and pixels counted in Adobe Photoshop to quantify coverage.

14-C azoxystrobin absorption with each adjuvant treatment was measured by leaf dosing, rinsing in a methanol and surfactant solution, and subsequent liquid scintillation spectrometry (LSS). Azoxystrobin volatility was measured with each adjuvant treatment to account for all disintegrations not recovered from treated leaves. Preliminary translocation data were generated by biological oxidation of plant tissues followed by LSS.

Field trials with treatments that provided the most thorough coverage or highest levels of absorption were conducted at the CSU Agricultural Research, Development, and Education Center in Fort Collins, Colorado.

Results and Discussion:

All adjuvant treatments except the latex spreader-sticker Bond improved coverage. Organosilicone-based adjuvants consistently improved coverage 80-89% compared to water controls and Bond (Figure 1).

Azoxystrobin absorption was improved 73% over controls with the methylated seed oil SunIt (Figure 2). Although Figure 2 suggests that Bond had the highest level of absorption, later oxidation of treated and untreated leaves revealed that the fungicide was bound within the spray droplet and did not absorb into the cuticle or translocate.

In field trials, bean rust suppression was improved greater than 50% (nonsignificant) over Maneb alone with the addition of an organosilicone or nonionic surfactant within label-recommended spray intervals. Twenty one days after treatment, Maneb + Kinetic or Latron significantly improved rust control compared to Maneb alone. Some phytotoxicity was observed in treatments with organosilicone surfactants in this study. Careful selection of adjuvants and

rates are essential as phytotoxicity can be significant with certain crops, varieties, and/or pesticides.

Future studies should examine the ability of adjuvants to allow lower application volumes, lengthen spray intervals, and/or reduced rates of pesticides, while not compromising disease control, yield, or quality.

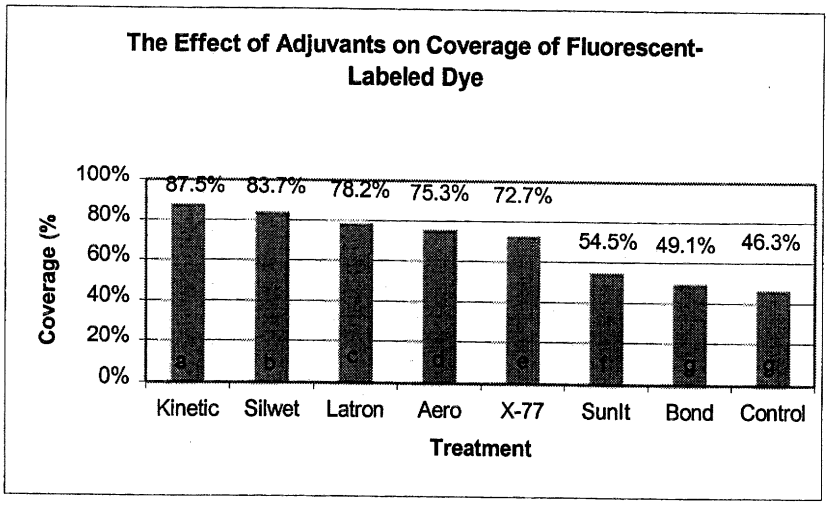

Figure 1. The Effect of Adjuvants on Coverage of Fluorescent-labeled dye. Treatments followed by the same letter are not significantly different ($LSD_{.05}$).

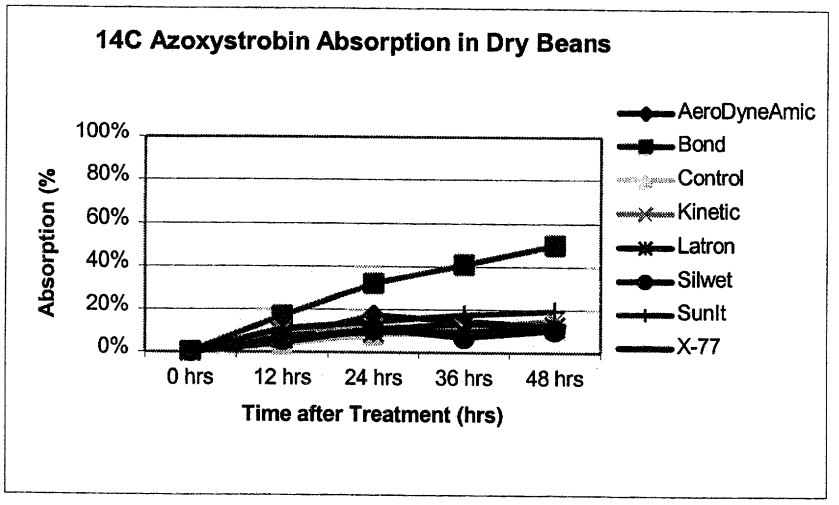

Figure 2. 14-C Azoxystrobin apparent absorption in 'Olathe' pinto bean.