

Examining Yellow Flash in Roundup Ready Soybean. Doug Sammons and Mientien Tran, Monsanto, St. Louis, MO 63167

The introduction of Roundup Ready soybeans in 1995 was soon followed by antidotal reports of “Yellowflash” occurring in glyphosate treated fields 4-10 days after treatment. The yellow chlorosis was always in the upper canopy and was usually noted at a pause of the spray boom or a spray boom overlap consistent with a double dose or more of glyphosate. Affected plants recovered in 10-20 days under good growing conditions with no yield loss. Reddy et al first (2004 *Journal of Agricultural and Food Chemistry* 52:5139-5143) reported that the chlorosis was due to glyphosate metabolism to aminomethylphosphonate (AMPA). Our studies on the yellowflash phenomena confirm that AMPA correlates to the appearance of chlorosis. No evidence of shikimate formation was found in any Roundup Ready plants treated with glyphosate or AMPA showing that inhibition of EPSPS was not occurring. Further, those tissues expressed CP4 EPSPS normally. We have correlated the oxidation of <sup>14</sup>C-glyphosate to <sup>14</sup>C-AMPA and the dose dependence to the intensity of chlorosis in glyphosate-resistant soybeans. The formation of AMPA is not light or metal ion dependent and so not a photochemical degradation of glyphosate in the upper canopy. The formation of AMPA is temperature dependent with a doubling of the rate between 25C and 35C. <sup>14</sup>C-AMPA is phloem mobile like glyphosate and accumulates in the growing sink tissues like glyphosate. We investigated a number of possible nutrient associations and found no correlation to any nutrient metal ion or nitrogen deficiency. We found that plant growth was rarely affected although the normal greening of the leaf could be delayed, that is chlorophyll development was delayed but not leaf expansion. Yellowflash occurs faster in glyphosate-resistant soy expressing glyphosate oxidase when treated with glyphosate. Yellowflash intensity occurs as a function of AMPA dosage applied as a spray treatment on glyphosate-resistant soybeans but not in transgenic soy expressing an enzyme capable of N-acetylating AMPA. Our results support those of Reddy et al (2004) and correlate the appearance of yellowflash to the soybean oxidation of glyphosate to AMPA.