

FORAMSULFURON AND ISOXADIFEN-ETHYL: ABSORPTION, TRANSLOCATION AND METABOLISM. Ken Pallett*, Ponnar Veerasekaran, Mandy Crudace, Helmut Köcher and Brent Collins. *Head of Herbicide Biology, Aventis CropScience, GmbH, Industriepark Hoechst, D-65926, Frankfurt am Main, Germany.

Foramsulfuron (AE F130360; 1-(4,6-dimethoxypyrimidin-2-yl)-3-(2-dimethylcarbamoyl-5-formamidophenylsulfonyl)urea) is a novel sulfonylurea herbicide for post-emergence use in corn. As with other sulfonylurea herbicides, it is a very potent inhibitor of the enzyme acetolactate synthase (ALS). Foramsulfuron is effective against major grass weed species, as well as some broad-leaved weeds. It is applied with the new Aventis CropScience safener, isoxadifen-ethyl (AE F122006; ethyl 5,5-diphenyl-2-isoxazoline-3-carboxylate), which ensures the highest level of selectivity without compromising product effectiveness.

The foliar uptake of foramsulfuron is substantially enhanced when applied with adjuvants such as esterified seed oil and over 80% penetration is achieved with 1% Hasten 72 hours after application. Foramsulfuron shows only limited translocation, with less than 5% of ¹⁴C-activity translocated out of treated leaves. However, the potent inhibition of ALS ($pIC_{50}=7.5$) presumably contributes to the effective control of susceptible weed species. Using an excised leaf system to monitor metabolism of ¹⁴C-foramsulfuron a correlation has been established between sensitivity to the herbicide and its metabolic half-life. In tolerant corn hybrids, such as P3394 the half-life of foramsulfuron is 4.2 hours, whereas in a more susceptible hybrid, Lorenzo it is 13.9 hours and exceeds 40 hours in susceptible weed species. Foramsulfuron is detoxified in corn via three initial metabolic routes, a hydrolytic cleavage of the sulfonylurea bridge; a deformylation of amino group; and oxidative metabolism of the dimethoxy-pyrimidyl ring.

Foliar uptake of the safener in a 1:1 mix with foramsulfuron and 1% Hasten, exceeds 90% after 24 hours. It is more systemic than foramsulfuron. The safener has no impact on the rate of foliar penetration of foramsulfuron nor on the translocation of ¹⁴C- activity from treated leaves. In the excised leaf system isoxadifen-ethyl enhances the degradation of foramsulfuron in corn. In a comparative whole plant study, in which the second leaf of 3-leaf corn plants was treated with ¹⁴C-foramsulfuron in the presence and absence of the safener, there was a reduction in the proportion of ¹⁴C-activity remaining as parent sulfonylurea in both Lorenzo and P3394 three days after treatment. In the absence of safener with Lorenzo 29% of ¹⁴C-activity in treated leaves was parent compared to 14% in the presence of isoxadifen-ethyl. The proportion of translocated foramsulfuron was 23% and 10% in the absence and presence of safener respectively. In P3394 the proportions of ¹⁴C-activity remaining as foramsulfuron reduced from 16 to 13% in treated leaves and from 13 to 5% in translocated activity in the presence of isoxadifen-ethyl.

In conclusion, foramsulfuron is extensively metabolised in corn but not in susceptible weed species. The addition of the safener enhances the selectivity by increasing the detoxification of foramsulfuron in corn.