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Efficacy, soil behavior, and persistence of imazaquin, imazethapyr, chlorimuron, and FMC-57020

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The University of Nebraska - Lincoln, 1987

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EFFICACY, SOIL BEHAVIOR, AND PERSISTENCE OF IMAZAQUIN, IMAZETHAPYR, CHLORIMURON, AND FMC-57020

by

ROBERT N. STOUGAARD

A DISSERTATION

Presented to the Faculty of
The Graduate College in the University of Nebraska
In Partial Fulfillment of Requirements
For the Degree of Doctor of Philosophy

Major: Agronomy

Under the Supervision of Professor Alex R. Martin

Lincoln, Nebraska
September, 1987

TITLE

Efficacy, soil behavior, and persistence of imazaquin, imazethapyr, chlorimuron, and FMC-57020

BY

Robert N. Stougaard

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EFFICACY, SOIL BEHAVIOR, AND PERSISTENCE OF IMAZAQUIN, IMAZETHAPYR, CHLORIMURON, AND FMC-57020

Robert N. Stougaard, Ph.D.

University of Nebraska, 1987

Advisor: Alex R. Martin

Adsorption, mobility, and efficacy of imazaquin and imazethapyr were compared as a function of soil type and pH. Adsorption increased for both compounds as soil pH decreased, resulting in decreased mobility and efficacy. Adsorption was greatest in soils with the highest clay and organic matter content. Imazethapyr was the least mobile, most highly adsorbed, and efficacious of the two herbicides, although it has the highest water solubility.

Soil persistence was also compared as a function of use rate and application timing in a no-till sorghum-soybean - winter wheat rotation utilizing greenhouse and field bioassays with winter wheat. The greenhouse bioassay demonstrated that residual concentrations increased with application date and use rate. Early preplant applications had the lowest detectable concentrations remaining, followed by the preemergence and postemergence applications, respectively. Although injury was apparent with the greenhouse bioassay, the effect was minimal in the field bioassay. This variation in response is largely due to differences in soil moisture conditions which affects availability of these herbicides. There appears to be no difference in the selectivity of winter wheat to the

two herbicides. Results also indicate that there may be an interaction between the imidazolinones and leaf rust organisms, with wheat injury increasing in the presence of the disease.

The final objective of this research was to compare the efficacy and soil persistence of early preplant applications of imazaquin, chlorimuron, and FMC-57020 in a no-till soybean - winter wheat rotation. The most effective weed control was obtained when early preplant applications were followed by sequential preemergence applications of metolachlor or postemergence applications of bentazon. Imazaquin failed to provide adequate control of horseweed and large crabgrass. FMC-57020 was weak on pigweed species, and horseweed. Chlorimuron failed to control large crabgrass and was somewhat weak on velvetleaf. All three herbicides provided excellent control of triazine-resistant kochia. FMC-57020 caused substantial injury to winter wheat. Winter wheat injury appeared to be the least in treatments which had the poorest soybean weed control, suggesting that plant density may have an effect on the carryover potential of FMC-57020.

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Effect of Soil Type and pH on the Adsorption, Mobility, and Efficacy of Imazaquin and Imazethapyr

Abstract. Laboratory and greenhouse studies were conducted to determine the effect of soil type and pH on the adsorption, mobility, and efficacy of imazethapyr (2-[4,5-dihydro-4-methyl-4-(1-methyl)-5-oxo-1H-imidazol-2-yl]-5-ethyl-3-pyridinecarboxylic acid) and imazaquin (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-quinolinecarboxylic acid). Adsorption of both herbicides increased, and mobility and efficacy decreased as pH decreased. Adsorption was greatest in soils with the highest organic matter and clay content. Conversely, efficacy and mobility decreased as organic matter and clay content increased. Imazethapyr was the least mobile, most highly adsorbed, and efficacious of the two herbicides.