Atrazine carryover in conservation tillage systems

By D. E. Smika and E. David Sharman

ATRAZINE carryover can reduce the wheat stand in winter wheat-fallow cropping systems that employ conservation tillage. Atrazine carryover is influenced by clay content, pH, cation exchange capacity (CEC), and organic matter level of Great Plains' soils. Clay content provides a basis for relating the other factors to stand reduction because it is one of the characteristics used in describing and classifying soils. Information on the clay content of soils can be obtained from soils maps, which are available at Soil Conservation Service offices.

Figures 1, 2, and 3 show the relationship between clay content and pH, CEC, and organic matter with curves for various stand-reduction percentages. Also shown in the figures are the probabilities of incurring a stand reduction as great as that represented by the curve.

These figures provide the herbicide user with a guide for the stand reduction that might be expected if soil texture and either pH, CEC, or organic matter is known and 1 pound of atrazine (active ingredient) per acre is used. For any given set of soil characteristics, the percentage of stand reduction can be reduced about 10 percent with each 0.1-pound active ingredient-per-acre reduction in atrazine applied (*1*).

Following are examples of how the figures can be used to determine the expected stand reduction:

1. A soil with 16 percent clay, pH of 7.8, CEC of 30 milliequivalent per 100 grams soil, and organic matter of 0.8 percent has estimated stand reductions of 60 percent, 50 percent, and 40 percent as depicted by the number .1 in figures 1, 2, and 3, respectively.

2. A soil with 19 percent clay, pH of 6.8, CEC of 20 milliequivalent per 100 grams soil, and organic matter of 3.7 percent, depicted by the number .2, has no stand reduction indicated in any of the figures.

3. A soil with 10 percent clay, pH of 8.3, CEC of 35 milliequivalent per 100 grams soil, and organic matter of 1.0 percent, depicted by the number .3, has a stand reduction estimate exceeding 80 percent in all three figures.

Organic matter is the most conservative of the three bases used for estimating stand reduction. It should be used only when pH and/or CEC are unknown.

Current label calls for a minimum effective rate of 0.5-pound atrazine (active ingredient/acre) to be applied at the beginning of a 14-month fallow period. Atrazine should not be used when the clay content of the soil exceeds 30 percent (Figures 1 and 2).

Where average annual precipitation is between 14.1 and 16.0 inches, the performance of atrazine can be expected to remain as presented here. Where average annual precipitation exceeds 16 inches and stand reductions of 40 percent or less are expected, each 0.5-inch increase in precipitation can be expected to decrease the stand-reduction 10 percent (*1*). Where average annual precipitation is between 12 and 14 inches, atrazine should be used only when soil conditions produce estimated stand reductions of less than 20 percent. The rate of atrazine applied should be reduced 0.125 pound (active ingredient) per acre for each 0.5-inch drop in precipitation. Where average annual precipitation is less than 12 inches, atrazine is not recommended for use.

In field tests, we observed no yield reduction where the stand reduction was uniform and did not exceed 25 percent. For stand reductions between 25 and 40 percent, each 1 percent in stand reduction reduced yield 0.25 bushel per acre. Stand reductions greater than 40 percent reduced yields logarithmically, and when stand reductions exceeded 80 percent, yields were 5 bushels per acre or less.

When climatic and soil conditions indicate a stand reduction greater than can be tolerated, herbicides other than atrazine can and should be used. Several short-term residual herbicides that can provide up to 90 days of weed control are available, and some, following label restrictions, can be applied within 60 days of wheat seeding with few carryover problems. Also, contact herbicides can be used, depending upon weed species present and length of control desired. Tank mixes of some herbicides are possible, but the label always should be checked before mixing any herbicides.

New herbicides are becoming available that appear to have a place in the fallow-wheat conservation cropping system. Some herbicides are available that control volunteer small grain and cool-season grassy weeds specifically. Others offer promise for controlling broadleaf weeds without damaging wheat. To keep advised of the status of herbicide availability, contact commercial applicators or the Extension Service of research institutions.

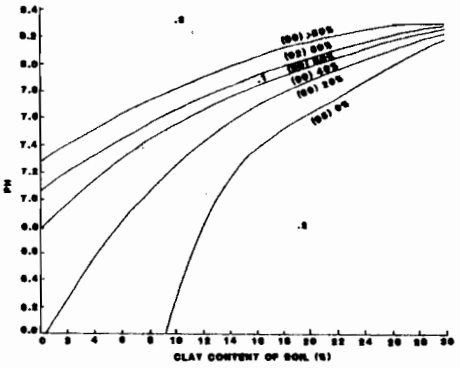

Figure 1. Stand reduction as related to soil pH and clay content.

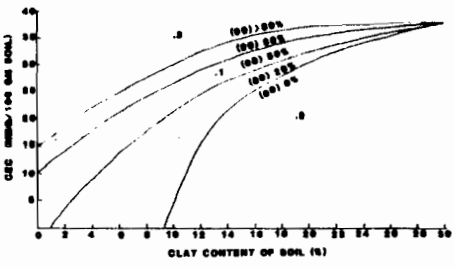

Figure 2. Stand reduction as related to soil cation exchange capacity and clay content.

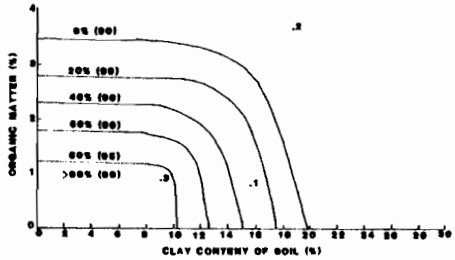

Figure 3. Stand reduction as related to soil organic matter and clay content.

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