SERVICE IN ACTION

COLORADO STATE UNIVERSITY EXTENSION SERVICE

Ecofallow under Colorado conditions—selecting soils

K. G. Brengle[1/]

no. .104

Quick Facts

- Ecofallow is a term applied to a fallow system where chemical herbicides have been substituted for some tillage operations.
- Serious stand reduction in the following year's wheat crop can result from herbicide persistence in the soil.
- Herbicide persistence often is related to soil properties, such as soil acidity (pH), organic matter content and textural class.
- The probability of crop damage is greater on some soils than others, but it increases with all soils that are moderately to severely eroded.

Editor's Notes: *pH is the term used to express acid and alkaline levels in soil on a scale from 0 to 14; 7 represents neutrality, numbers less than 7 represent increasing acidity, and numbers greater than 7 represent increasing alkalinity.*

Reference to products and tradenames in this publication is not intended to be an endorsement to the exclusion of others that may be similar. Persons using such products assume responsibility for determining if they are safe and effective for the intended use in accordance with manufacturer's current label directions.

An ecofallow system replaces some tillage operations with chemical herbicides. It is a minimum tillage system since tillage is usually delayed until mid-summer. Chemical fallow refers to a system that eliminates all tillage.

Increased use of ecofallow for Colorado winter wheat production has been relatively low, although there is considerable interest in the practice. Farmers who have had success with the system generally are enthusiastic about it, although some who have not been successful have returned to mechanical tillage.

The system originally was locked into the use of one residual herbicide at one rate. The rate was too high for many soils and climatic conditions in Colorado. Labeling other herbicides and varying the rates of application have increased the flexibility of ecofallow systems. Planning and sound evaluation of the entire operation are necessary to provide the greatest probability of success with ecofallow. Several factors affect the outcome of any attempt to ecofallow. Farmers must be aware of these factors and how they will react under their particular conditions.

Ecofallow starts with wheat harvest. The straw passing through the combine must be spread evenly across the field. Windrows or straw piles—where the combine has stopped in the field—affect both herbicide application and planting. Choppers have not been as satisfactory as spreaders.

Herbicide Carry-Over

Soil properties determine the herbicide combinations and application rates that have the greatest probability of success. Atrazine (a popular herbicide) carry-over damages the subsequent wheat crop and is the principal cause of unsatisfactory ecofallow results. A general guide can be used to evaluate soils for probable atrazine carry-over. Table 1 gives soil property levels that indicate atrazine carry-over, if atrazine is applied at one pound active ingredients (ai) per acre (11 kilograms per hectare). These values have been determined by observation. They may need refinement for application to individual situations since factors other than soil properties can affect residual carry-over. Atrazine persistence increases in the soil when clay content and cation exchange capacity (CEC) are at upper limits. These upper limits have not been fully established, but the clay content is apparently around 50 percent.

[1/] *K. G. Brengle, CSU associate professor, agronomy; material for this summary was taken from the proceedings, Colorado Ecofallow Conferences, Feb. 1981, from papers presented by Darryl E. Smika, Gail A. Wicks, Robert H. Schieferstein, Greg J. Miley and John A. Knapp (12/1/81)*

Table 1: Atrazine persistence in relation to soil properties.

Soil property	Property levels at which carry-over may be likely
Organic matter	less than 1%
pH	greater than 7.5
CEC	less than 10 m.e./100 g
Clay	less than 11%

Probability of Stand Reduction

The Soil Conservation Service has evaluated atrazine persistence in relation to soil properties. A specific soil series was evaluated and the probability of crop damage due to atrazine carry-over increased at higher pH levels (see Table 2).

Stand reduction becomes quite serious at pH levels of 8.0 and above. Effervescence in soil treated with one drop of 10 percent HCl is evidence that the oil alkalinity is too high for safe use of atrazine. It is possible to overcome problems with slight stand reduction in small areas of a field, only if yield is increased on areas where the stand is not affected. Increased erosion on small areas where stands are reduced may damage adjacent wheat.

Table 2: Soil pH and atrazine carry-over.

pH	Total number of sample areas	Number of sample areas by damage level		
		1-10% stand reduction	11-84% stand reduction	85-90% stand reduction
6.8-7	20	20		
7.2	14	12		2
7.4	11	10	1	
7.6	13	9	1	3
7.8	9	6		3
8.0	24	5	4	15
8.2	15	2	3	10
8.4	9	1	1	7
Total	**115**	**65**	**10**	**40**

Carry-Over in Relation to Soil Series

The probability of atrazine carry-over can be estimated for several soil series from an evaluation based on one year's data. Table 3 provides information that should be considered when contemplating the use of atrazine.

Textural class of the surface soil will affect herbicide persistence within a given soil series. As a rule, less crop damage will occur with sandy loam soils than with loamy sand soils, since texture has an effect on the soil properties (see Table 1).

The probability of atrazine carry-over is greater with all soils that are moderately to severely eroded, since the surface soil $CaCO_3$ content increases as subsoil and surface soil mix under eroded conditions.

Table 3: Probability of severe stand reduction from atrazine applied at 1 pound ai after wheat harvest on several soil series in eastern Colorado.*

Possible degree of crop damage		
None to slight	Moderate to severe	Severe
Ascalon	Adena	Colby
Baca	Vona	Wiley
Goshen	Valent	
Haxton	Stoneham	
Keith	Renohill	
Norka	Canyon	
Platner		
Rago		
Richfield		
Tructon		
Weld		
Sampson		

**Eroded soils of a series will have more potential for atrazine carry-over.*

Soil pH

Guidelines to select the safe rates of atrazine can be based on soil pH (see Table 4).

Table 4: Maximum rate of atrazine to be applied following wheat harvest based on soil pH.

Soil pH	Maximum rate of atrazine* (pounds ai per acre)
7.0-7.2	1.0
7.2-7.5	0.75
7.5-8.0	0.50
8.0 +	0

**Eroded soils of a series will have more potential for atrazine carry-over.*

These maximum rates may be higher than those recommended on the atrazine label. The label always should be read and followed. On soils with pH up to 7.8, atrazine has been satisfactory at ¾ pound (.34 kg). However, the amount and distribution of precipitation interacts with soils, and good moisture conditions are necessary for atrazine deactivation to persist.

Summary

It is necessary to know soils and the probability of adequate precipitation to develop a satisfactory ecofallow system. Knowledge of soils can be gained only by thorough inspection of the field, using a soil survey as a guide. Ridges and knolls, where shallow soils normally exist and erosion generally is more severe, are very likely to be problem areas. Therefore, eroded phases of the better soils listed in Table 3 can require a downward adjustment in the rate of atrazine to be used. Only close field inspection can provide this information.