

SELECTIVE WEED CONTROL IN ALFALFA WITH EPTC-TREATED SEED

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EPTC (S-ethyl-dipropylthiocarbamate) has been used to control weeds selectively in new seedings of alfalfa for 25 years. EPTC is normally sprayed on the soil surface, and then incorporated with the soil by various mechanical methods, typically by disking twice. The crop seed is then planted. Application, incorporation, and planting can involve as many as four trips over the field. Because of increasing costs of machine operation, it is important to reduce the number of trips required to do a job.

EPTC can also be applied as lines injected beneath the soil surface. The herbicide moves from the concentrated lines to control weeds in bands.

In 1976 we discovered that alfalfa tolerated EPTC applied directly in the row with the seed. Weeds were controlled in a band about 2 inches wide, and the alfalfa was not affected appreciably more than from conventional applications of similar rates of EPTC. This type of application is like a shallow subsurface injected line, so the band of weed control was not surprising. In contrast, the tolerance of alfalfa was not at all expected, because the herbicide for a 2-inch band was in close contact with the seed in a groove about 1/8-inch wide. Thus the seed was planted in a 16-fold concentration of the herbicide.

We went on to concentrate the herbicide even further by placing it within a porous coating directly on the alfalfa seed. With such applications, the alfalfa seed is initially exposed to EPTC at about 250 times the prescribed rate; yet the alfalfa seedlings were not injured appreciably more than they normally are from conventional applications of the herbicide.

There are four principal reasons why close proximity application of EPTC does not injure alfalfa appreciably. These are:

- (1) Non-germinating alfalfa seed is virtually immune to injury from exposure to EPTC. Soaking the seed in technical grade EPTC (an oil-like liquid) for 40 days did not reduce eventual germination or harm the resulting seedlings. Furthermore, storing EPTC-treated alfalfa seed for one year did not reduce seed germination or seedling vigor.
- (2) Alfalfa is inherently very tolerant of EPTC. Although temporary foliar symptoms are common even from normal rates of application, we found that rates of 72 lbs/A (about 30 times a normal rate) applied by conventional soil incorporation did not reduce the stand of alfalfa in either greenhouse or field experiments.
- (3) Probably the most important reason why seed treatment does not injure alfalfa is that alfalfa seedlings do not become susceptible to EPTC injury until they have emerged from the soil. Exposure of seeds while they are imbibing water and germinating or of seedlings during early stages of growth does not lead to injury. The exposure that causes typical foliar symptoms takes place after the seedling has emerged from the soil, normally about 4 to 6 days after seeding.
- (4) EPTC diffuses rapidly from the high concentration on or near the seed to occupy the band in which weeds are controlled. By the time the alfalfa seedlings have emerged from the soil and reached the susceptible growth stage, the extremely high initial concentrations are no longer present. Thus, alfalfa seedlings are not exposed to massive rates at the time when they would be susceptible to injury.

When EPTC-treated alfalfa seed is sown broadcast at a normal seeding rate of 15 lbs/A, the distribution of herbicide usually is imperfect, and the blanket of herbicide-protected soil contains holes through which weeds escape.

The problem of poor distribution can be overcome by mixing the EPTC-treated seed with a granular formulation of EPTC wherein the clay granules resemble alfalfa seed in size and density. When the seed and granules are blended, they do not separate upon shaking, and the mixture can be conveniently seeded in one field operation. Unfortunately, these large granules are not presently available commercially. The granules of commercially available formulations of EPTC are much smaller than alfalfa seed, and separate from a mixture with alfalfa seed.

When EPTC-treated alfalfa is seeded in drill rows spaced 7 inches apart, susceptible weeds are controlled nicely in bands 2 to 3 inches wide, but areas 4 to 5 inches wide between the rows are left without control. Overall control has been excellent when EPTC-treated seed was sown in the rows, and EPTC as a liquid or granular formulation was simultaneously injected as subsurface lines 2 inches deep midway between adjacent drill rows. The EPTC diffuses from the subsurface lines and from the treated seed in the rows to protect the entire area from susceptible weeds.

We are presently investigating other methods of placing EPTC in close proximity to alfalfa seed using untreated seed and presently available herbicide formulations. For row seeding, weeds were satisfactorily controlled about the rows when untreated seed and a commercially available granular formulation of EPTC were applied together in the drill row. The two materials were applied from separate boxes on the drill to avoid the problem of separation of a mixture. For controlling weeds between the drill rows, EPTC was applied by subsurface line injection, either as a liquid formulation from a tank attached to the drill, or as a commercially available granular formulation from a third box on the drill. Seed was sown broadcast with a standard seeder, which drops the alfalfa seed between two corrugated steel rollers. A granular spreader attached on the front side of the seeder spread a granular formulation of EPTC so that both rollers incorporated it in the same operation when untreated alfalfa seed was dropped between the rollers.

Close proximity application of alfalfa seed and EPTC appears to be a viable method of applying the herbicide and planting the seed as one field operation. It is regrettable that the tolerance of alfalfa to such an application was not discovered 20 years ago.