



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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OFFICE OF CHEMICAL SAFETY
AND POLLUTION PREVENTION

MEMORANDUM

SUBJECT: BEAD Chemical Profile for Registration Review: Ethofumesate:
(PC Code: 110601)

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Peer Review Panel date: September 9, 2015

SUMMARY

Ethofumesate is a selective herbicide that was registered in the United States in 1977 (USEPA, 2005). It can be applied as pre-plant, pre-emergence, and post-emergence treatments to control many economically important annual grasses and broadleaf weed species. It is used primarily on sugar beets and onions. According to the WSSA (Weed Science Society of America) classification of herbicides, ethofumesate belongs to the family of benzofuran herbicides (Group 16).

Based on private market usage data from 2009-2013, usage averaged approximately 35,000 pounds active ingredient (a.i.) applied annually on 104,000 acres. The average application rate a.i. (active ingredient) over this time period is 0.34 pounds a.i. /acre. From 2009 to 2013 the highest usage of ethofumesate was on onion and sugar beets. Minnesota, Oregon and California are the states with the most usage. There are isolated reported usage data for table grapes and apricots, but no reported usage data for carrots. There are no reported usage data for non-agricultural use sites.

INTRODUCTION

The Biological and Economic Analysis Division (BEAD) Chemical Profile (BCP) provides an overview of the pest management roles and quantitative usage information for ethofumesate. The BCP includes summaries of previous BEAD products and available public and/or private use and usage data for ethofumesate to describe its role in pest management. Information provided in this BCP may be used by stakeholders (e.g., users and registrants), OPP risk and benefit assessors, OPP risk managers, and the general public during the Registration Review of this herbicide.

USE SITES

Agricultural Use Sites

Registered agricultural use sites include: carrots, garlic, onion, shallot and beets (sugar beets, garden beets, and table beets).

Non-Agricultural Use Sites

Non-agricultural use sites which are registered for ethofumesate application include: grasses grown for seed, ornamental lawns, turf, and ornamental sod farms.

FORMULATIONS AND APPLICATION METHODS

Ethofumesate is formulated as a flowable liquid concentrate, emulsifiable concentrate, and soluble concentrate/liquid. It may be applied pre-plant, pre-emergence or post-emergence. Application methods include banding, broadcast, soil-incorporation, and impregnated dry bulk fertilizer.

HISTORY OF ETHOFUMESATE and BEAD PRODUCTS

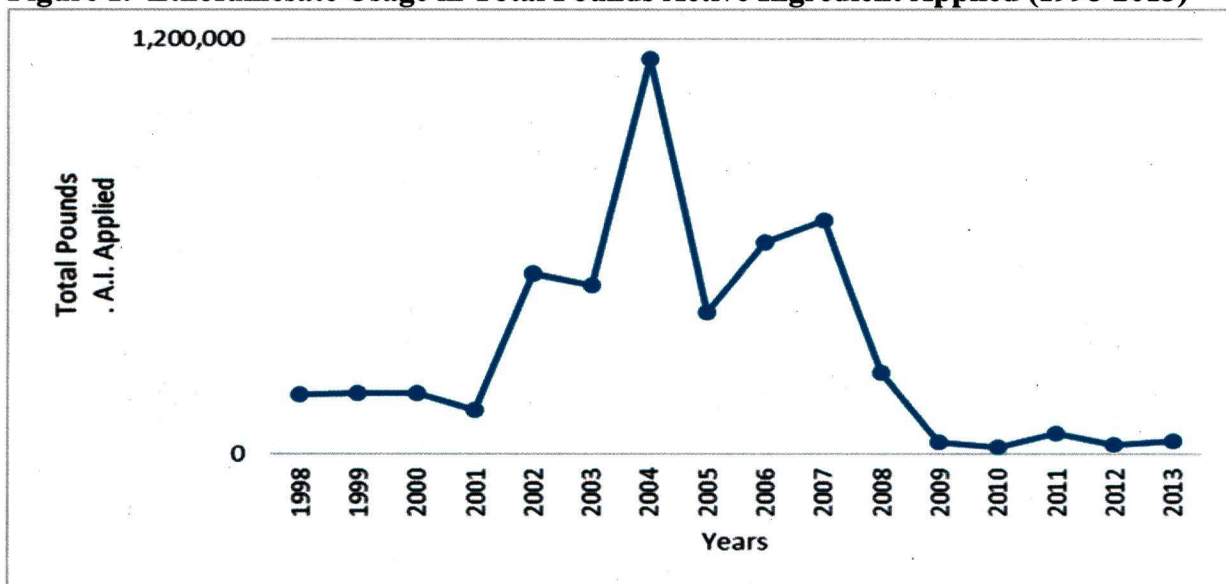
A search of the BEAD database for previous assessments for ethofumesate indicates that there are no records of prior benefits assessments or Section 18 Emergency Exemption Requests in the last 10 years. Recent Section 18 Emergency Exemption Requests might suggest that a chemical is important for the uses granted in the request; however, a lack of Section 18 Emergency Exemption Requests is not an indication of the relative importance of the chemical.

USAGE

Ethofumesate is an herbicide that was registered for use in the U.S. in 1977. A Registration Eligibility Decision (RED) was published in 2005 and revised in 2007.

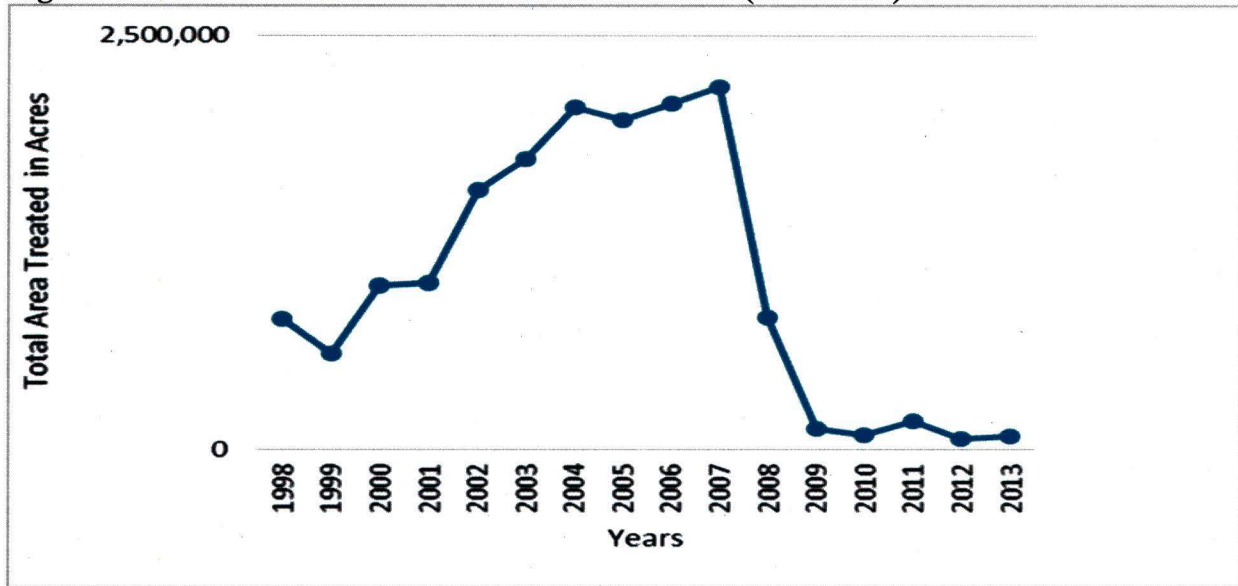
Figure 1 & 2 present total pounds a.i. applied and total area treated in acres over the 1998-2013 time period (Market Research Data, 1998-2013). The use of ethofumesate, in terms of total pounds applied and total area treated in acres increased from 1998 through 2007, then decreased significantly from 2008 and 2009 before stabilizing in 2010-2013, as shown in Figures 1 & 2.

Figure 1. Ethofumesate Usage in Total Pounds Active Ingredient Applied (1998-2013)



Source: Market Research Data, 1998-2013

Figure 2. Ethofumesate Total Area Treated in Acres (1998-2013)

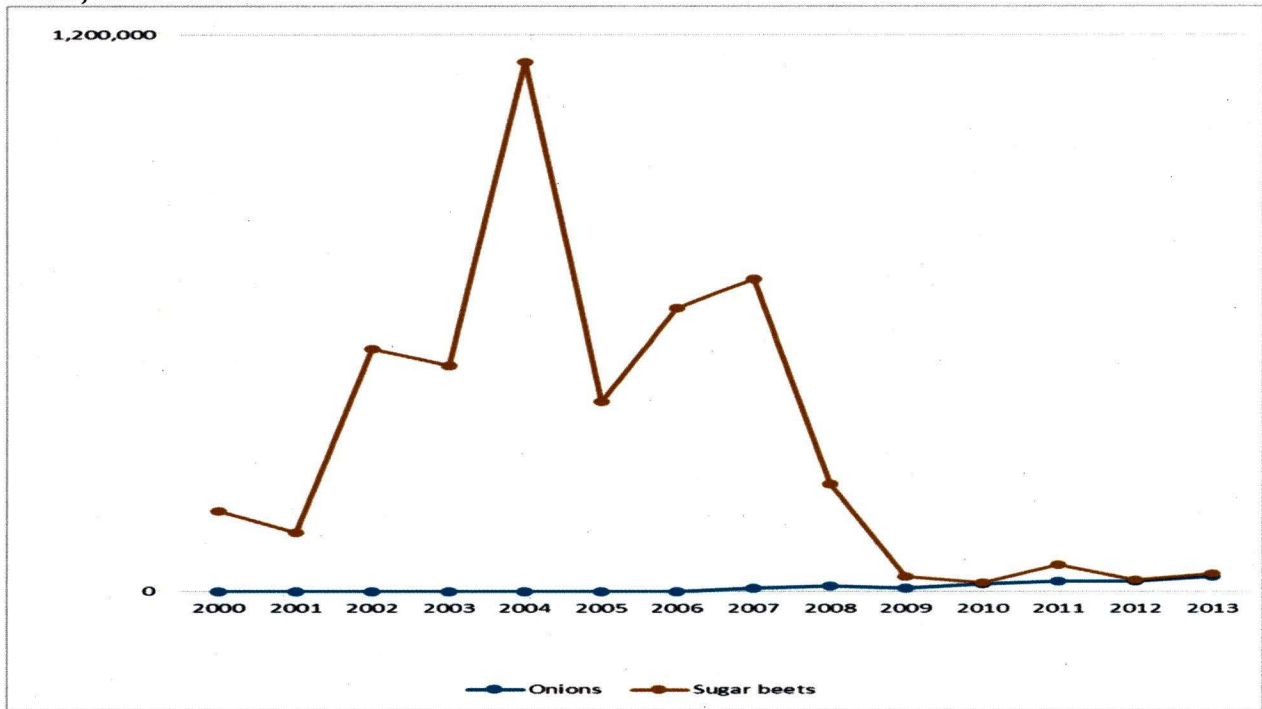


Source: Market Research Data, 1998-2013

There were no reported usage data on onions during the 1998-2005 time frame. The reported use of ethofumesate during this period was totally on sugar beets. The use on sugar beets peaked in 2004, and decreased thereafter until 2009. The wide adoption of glyphosate-resistant sugar beets began in about 2009 which coincides with the steep decline in ethofumesate usage. (Figure 3).

The major use of ethofumesate is on sugar beets and onions. The use on onions remained almost constant and has slightly increased since 2009 (Figure 3). The agricultural use sites in terms of the number of average annual pounds used were sugar beets (300,000 lbs. a.i.) followed by onions (10,000 lbs. a.i.) for 2004-2013 time period. The crops with the greatest percent crop treated include sugar beets, with an average of 30 percent crop treated annually and onions with an average of 20 percent crop treated annually. The annual percent crop treated for sugar beets and onions indicate that growers still find benefits for use on these crops, or at the very least, a reliance on ethofumesate to control pests on these crops.

Figure 3. Ethofumesate Usage in Pounds Active Ingredient Applied on Onions and Sugar Beets, 2000 - 2013.



Source: Market Research Data, 2000-2013

The use of ethofumesate is about 60% sugarbeets and 40% onions during the 2009-2013 time span, as shown in Table 1.

Table 1. Comparison of Crops with Highest Use of Ethofumesate, Percent Pounds AI Applied (2000-2004 and 2009-2013)

2000-2004		2009-2013	
Average Annual Usage = 489,000 lbs/yr		Average Annual Usage = 35,000 lbs/yr	
Crop	% Lbs	Crop	% Lbs
Sugar Beets	100	Onions	57
		Sugar Beets	42

Source: Market Research Data, 2000 -2013.

In the 2000-2004 time frame, the states with the highest use of ethofumesate in terms of pounds applied were North Dakota and Minnesota, the largest producers of sugar beets. This changed in the 2009 to 2013 time period when use declined in North Dakota and Idaho and increased in Minnesota, Oregon and California.

Table 2. Comparison of States with Highest Use of Ethofumesate, in Terms of the Percent of Pounds AI Applied (2000-2004 and 2009-2013)

2000-2004 Average Annual Usage = 489,000 lbs/yr		2009-2013 Average Annual Usage = 35,000 lbs/yr	
State	% Lbs	State	% Lbs
North Dakota	30	Minnesota	31
Minnesota	27	Oregon	23
Idaho	13	California	18
Montana	8	Idaho	8
Wyoming	7	North Dakota	8
Nebraska	5	Texas	4
Michigan	4	Washington	4

Source: Market Research Data, 2000 -2013

The average application rate (a.i.) for the top crops was the highest for onions at 0.44 lbs a.i./acre and the lowest for sugar beets at 0.25 lbs. a.i./acre as shown in Table 3.

Table 3. Ethofumesate Use on Top Crops (2009-2013)

Crop	Average Annual Pounds AI Applied	Average Annual Total Acres Treated*	Average Annual A.I. Rate (lbs. a.i. /acre)	Label A.I. Max. App. Range Rate
Onions	20,000	45,000	0.44	0.48-1.00
Sugar Beets	15,000	59,000	0.25	1.45-3.78

*Total Acres Treated sums all acres treated for a crop.

Source: Market Research Data, 2009 -2013

Geographic Distribution of Ethofumesate Use

As the following map (figure 4) shows most use of ethofumesate is in Oregon and Minnesota. The map included herein is for general use in the registration review process. The map provides a very broad geographical view of the total acres treated (TAT) over 5 years of a pesticide on all agricultural crops. The map units are total acres treated, which accounts for all agricultural acreage treated with this chemical and includes multiple treatments to the same area.

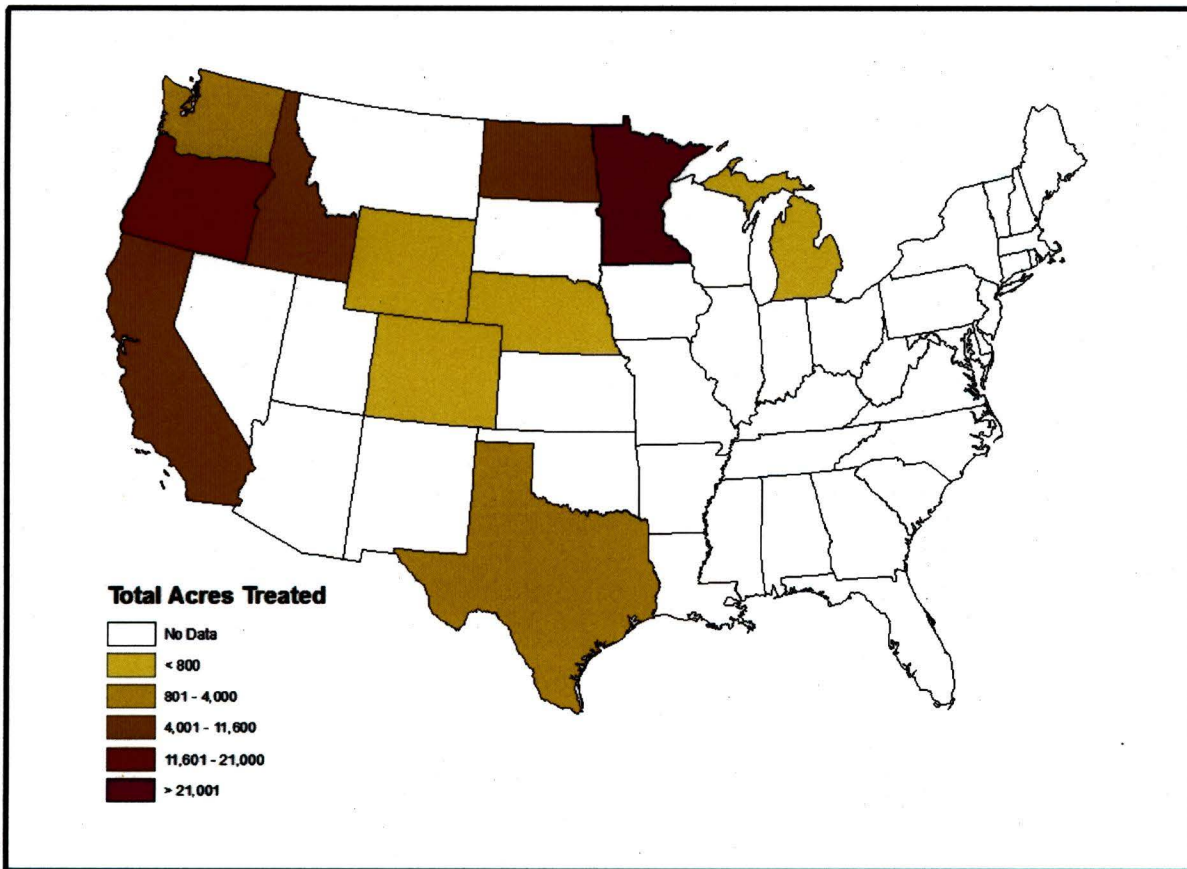


Figure 4. Total Acres Treated of Ethofumesate.
(Source: Market Research Data, 2009-2013)

The data used to make these maps have many limitations. Any interpretation of the maps should consider the underlying data and the associated limitations carefully. For example, there may be significant differences in the crop acres grown between states and there may be variation in the percent of each of the various crops treated by the pesticide.

TAT is based on private market surveys of pesticide use in agriculture averaged over the last five years (Market Research Data, 2009-2013). These surveys cover about 60 crops and are targeted in states that produce the majority of the crop. Although the surveys capture most of the use of a particular active ingredient in agriculture, there are several limitations to these surveys.

- States with minor production of a surveyed crop are not sampled
- Not all types of pesticides are surveyed in every crop in every year
- Many specialty crops with very small acreages are not included in the survey

The result of these limitations is that states that show no acres treated may actually have a small amount of the active ingredient being used. In some cases, the displayed TAT may be distorted because the surveyed crops and the reported pesticide usage (or TAT) does not accurately represent the actual pesticide usage on the crops produced in the state.

The reader should pay particular attention to the figure legends and realize that a map prepared for a particular chemical is not directly comparable to a map prepared for a different chemical as the total acre treatment intervals used in the legend will likely be different.

CHEMICAL AND USE CHARACTERISTICS FOR ETHOFUMESATE

Ethofumesate is a selective and systemic herbicide that belongs to the benzofuran family (Group 16) of herbicides (WSSA, Undated). The mechanism of action of this herbicide is not well understood, although it appears to inhibit lipid synthesis (Herbicide Handbook, 2014).

Ethofumesate is readily absorbed by roots and shoots of weed species. When ethofumesate is applied as a post-emergence treatment it is poorly absorbed by maturing leaves with a well-developed cuticle (Herbicide Handbook, 2014).

ROLE OF ETHOFUMESATE IN PEST MANAGEMENT

Ethofumesate is registered for the control of major grass and broadleaf weed species in sugar beets, garden beets, table beets, onions, garlic, shallots, and carrots. It is also applied for selective control of weeds in certain grass seed crops and commercial sod production in California, Idaho, Nevada, Oregon and Washington.

Ethofumesate has a broad application window and can be applied as pre-plant, pre-emergence and post-emergence treatments. This herbicide controls broadleaf weed species such as black nightshade (*Solanum nigrum*), common chickweed, (*Stellaria media*), common lambsquarters (*Chenopodium album*), Kochia (*Kochia scoparia*), redroot pigweed (*Amaranthus retroflexus*), Russian thistle (*Salsola Kali Var. tenuifolia*) and wild buckwheat (*Polygonum convolvulus*). The major grass weed species controlled by ethofumesate are barnyardgrass (*Echinochloa crus-galli*), green foxtail (*Setaria viridis*), large crabgrass (*Digitaria sanguinalis*), and yellow foxtail (*Setaria glauca*) (Herbicide Handbook, 2014, Market Research Data). Based on Market Research Data for the period from 2011 to 2013, the top five pests in terms of total acres treated that ethofumesate is used to control are redroot pigweed, kochia, lambsquarters, chickweed and wormwood.

According to Market Research data, the highest usage of ethofumesate was observed in 2004 on sugar beets (Figure 3). Shifting of use of ethofumesate to glyphosate to control weeds in sugar beet production may be the major factor contributed to the observed low usage of ethofumesate on sugar beets during the period from 2009 to 2013 (Figure 3). About 95 percent of U.S. sugar beet production in 2013 was glyphosate-resistant varieties (GMO Compass, 2013).

Ethofumesate may be tank mixed with compatible herbicides with different modes of action which may help manage weed resistance to ethofumesate. There are no reports of any weed species with resistance to the mechanism of action of ethofumesate in the United States (Heap, 2015).

DATA NEEDS

The Agency currently does not have important information on ethofumesate, such as pounds a.i. applied and percent crop treated on some of the registered crops, such as carrots, garlic, and garden and table beets. In addition, obtaining similar information on non-agricultural use sites such as grasses for seed, ornamental lawns and turf, and ornamental sod farms may improve future assessments conducted by the Agency.

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