UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

MAR 26 1999

MEMORAMDUM

Subject: Review of Request by North Dakota (99ND0017) and Minnesota (99-MN-21) for the use of sulfentrazone (AI: 129081) on Sunflowers to control kochia. [Barcodes for ND: D253727, D253729 and for MN: D254420, D254421]

From: James G. Saulmon
Herbicide and Insectide Branch
Biological and Economic Analysis Division (7503C)

David Widawsky
Economic Analysis Branch
Biological and Economic Analysis Division (7503C)

To: Jackie Mosby-Gwaltney/Robert Forrest
Registration Support Branch
Registration Division (7505C)

We have reviewed the first requests by North Dakota and Minnesota for emergency exemptions to use sulfentrazone on sunflower to control kochia. We find the situation to be routine. Kochia is not a new weed pest in sunflower.

Biological Aspects

Responses to questions dated 3/23/99 and 3/23/99 (see Appendices 1, 2, and 3) indicate that sulfentrazone is needed only by the 5 to 10 percent of growers using no-till cropping. This contrasts with the requested treatment acreage of over 35%. Growers using conventional tillage find ethalfluralin, trifluralin, or pendimethalin effective for kochia control when applied by pre-emergent incorporation. These herbicides cannot be incorporated effectively in no-till situations. Pendimethalin applied without incorporation is labeled for no-till cropping but requires significant rainfall for activation, hence is not always adequately effective. No data were submitted, nor claim made, that growers needing to use no-till cropping to qualify for conservation subsidies (if any) would suffer significant economic loss if they could not include sunflower in their rotation.

(1)

CONCURRENCES								
SYMBOL	7503C	7503C	7503C					
SURNAME	Saulmon	Widawsky	Keitt					
DATE	3/26/99	3/26/99	3/26/99					

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On page 2 of the application, North Dakota refers to a grower survey to show the importance of kochia in limiting yields since the early 1990s. On page 4, North Dakota again refers to grower surveys in the early 1990s to claim "kochia was, by far, the worst weed problem in the dry years of 1990 and 1991, the third worst weed problem in 1992, the sixth and fourth worst weed problems even in the wetter years of 1994 and 1997." If kochia is a problem in sunflower, it has been since the early 1990s and cannot be characterized as a statewide emergency, non-routine weed infestation. In spite of the long-term, persistent kochia situation, farmers in North Dakota appear to have continued growing sunflower profitably in the absence of sulfentrazone. (This piece was provided by David Widawski.)

It should also be noted that in spite of kochia, 1998 sunflower yields in North Dakota were at a high, up 66% over already good yields for sunflowers grown for oil (which represent the vast majority of sunflower acreage in the state). Sunflower yields in each of the last 5 years are among the highest ever for North Dakota. Therefore, given the long history of kochia in sunflowers and recurring high yields, the 20-30% anticipated yield loss (page 7 of the application) does not appear to be an accurate estimate of yield impacts from the absence of sulfentrazone. (This piece was provided by David Widawski.)

Therefore we conclude that there is no non-routine condition that would justify an emergency exemption for sulfentrazone.

Economic Aspects

An economic analysis is required to determine whether significant economic losses will ensue if the request is denied for emergency use of sulfentrazone to control kochia in sunflower. Before presenting the economic analysis, it is worth noting several points:

1. Although a Section 18 exemption is intended to address emergency, non-routine events, the petition suggests that kochia in North Dakota sunflower fields is both routine and not an emergency, either agronomically or economically.

2. The application also states (page 4) that "lack of registered herbicides for broadleaf weed control in no-till and conventional till sunflower production systems limits expansion of sunflower acreage in the U.S." If acreage expansion for no-till methods -- either for revenue enhancement or reducing soil erosion, or both -- is the basis for the request, then a Section 18 exemption would not appear to be the appropriate vehicle to achieve this goal.

3. The application fails to mention where the economic data come from or how production costs are calculated. North Dakota appears to use profitability budgets that include both direct, operating costs as well as fixed costs. Fixed costs include overhead and management costs, as well as capital depreciation. Since *emergency, non-routine* pest damage is most likely to influence only the allocation of operating resources, including fixed costs in the analysis may distort the impact of pest damage on net revenues. Therefore, we use an estimate of operating costs of $63.97/acre, derived from North Dakota Agricultural Extension budgets [available at

http://ndsuext.nodak.edu/extpubs/ecguides.htm] published in 1998 for oil and confection sunflower production in the state (as done for other estimates, costs were averaged across the two types of enterprises and weighted by the proportion of acreage in each type). Although this direct cost estimate is only available for the most recent year and is applied to all years, it at least gives a sense of operating costs and is no worse than using the undocumented crop association figures for all years of the analysis.

4. Since yields, costs, and prices are available for 1998 sunflower production, that year is included in the economic sample.

Net operating revenues, over direct operating costs, are calculated below in Table 1 for five years -- 1994-1998. Given the range of net revenues, a significant economic loss would occur when net operating revenues were expected to be below $84/acre. Taking average price ($11.99/cwt) and operating cost ($63.97/acre) figures, the average yield associated with net operating revenues of $84/acre would be 1233 lbs/acre. Given that sunflower acreage that is cultivated (90-95%) appears to benefit from effective kochia control with currently available chemicals, average yield reduction is not expected, and the lack of sulfentrazone is not expected to cause significant economic loss.

SUMMARY: The economic analysis does NOT suggest that kochia in sunflower is a non-routine or urgent event that will cause significant economic loss in the absence of sulfentrazone. If losses under current weed control and tillage practices were to reach 20-30%, then significant economic losses could occur. However, the prospect for such yield losses are not convincing from the biological and yield evidence. On the contrary, the yield record shows high yields over the last 5 years, even with the presence of kochia, which has been considered a persistent weed at least as early as 1990. Rather, it appears that the economic problem is one of revenue enhancement insofar as no-till practices might become profitable on an additional 15-20% of acreage, sunflower acreage that is currently managed with cultivation. While reductions in soil erosion might be another motivation for shifting to reduced tillage crop management, there is still no evidence of impending economic losses and we cannot certify that there will be significant economic losses within the framework of this petition.

Table 1. Average Production, Cost, and Operating Revenue for North Dakota Sunflowers

Year	Average Yield (lbs/acre)	Price ($/cwt)	Revenue/acre ($)	Operating costs per acre ($)	Net Operating Revenue ($)
1994	1435	10.70	153.55	63.97	89.58
1995	1247	11.90	148.39	63.97	84.42
1996	1488	12.10	180.05	63.97	116.08
1997	1321	12.25	161.82	63.97	97.85
1998	1517	10.14	153.82	63.97	89.85

Appendix 1

Note that the following questions were sent via email to a sunflower expert, who communicated with other experts regarding response to the following questions:

(Note also that Dr. Calvin G. Meessersmith responded for Dr. Richard Zollinger who was unavailable. Please see Appendices 1 and 2 for Dr. Messersmith's responses.)

3/19/99

To: Dr. Richard K. Zollinger, Box 5051 Loftsgard Hall, Dept. of Plant Sciences, North Dakota State University, Fargo, ND. tel: 701-237-8157, fax: 701-237-8474, rzolling@ndsuext.nodak.edu

Subject: 99ND0017 request to use sulfentrazone on sunflowers to control kochia.

Please respond within 24 hours (if possible -due date for my review is Monday) via e-mail to: James G. Saulmon, Ph.D., USEPA, tel: 703-308-8126; fax: 7003-308-8090; saulmon.james@epamail.epa.gov

Dr. Zollinger,

1. Why do the growers need sulfentrazone?
2. Are the growers getting adequate control of kochia using the herbicides that are registered for use on sunflowers?
3. Within the scope of this sect. 18 request, what percentage of North Dakota's sunflower acreage is no-till?
4. What is your best estimate of percent of control of kochia provided by the following registered herbicides and their application timing for use in sunflower?
a. ethalfluralin
b. trifluralin
c. pendimethalin
d. glyphosate
e. Other ?
5. For the following questions (5a-5c), please comment on each chemical (i.e., sonalan, treflan, and pendimethalin, etc.) regarding estimates of efficacy of weed control and timing (e.g., PPI, PRE) for control of kochia:
5a. In 1998, two states submitted requests, North Dakota (98-ND-35) and Minnesota (98-MN-28) for the use of **ethalfluralin** (Sonalan) to control **kochia** in canola. (Please note that ethalfluralin is one of the herbicides which is registered for use on sunflowers.
However, North Dakota claims in the current request (99ND0017) that **ethalfluralin** provides inadequate control of kochia in sunflower.
5b. 1998 North Dakota Weed Control Guide (re: sunflower), listed timing (PPI = preplant incorporated; PoPI = postplant incorporated), and **kochia** control ratings (excellent = 90 to 99%

control, Good = 80 to 90% control, Fair = 65 to 80% control, Poor = 40 to 65% control), and None = No Control) for the following herbicides: pendimethalin (Prowl) PPI (good to excellent), ethalfluralin (Sonalan) at PPI (good to excellent), treflan (Trifluralin) at PPI (good to excellent), and treflan at PoPI (fair to good).

5c. Sunflower Production, Extension Bulletin 25 (revised) April, 1994 also provided herbicide weed control ratings for **kochia** as follows: EPTC (fair), Ethalfluralin (good), Imazamethabenz (poor to fair), paraquat (fair), pendimethalin (fair to good), sethoxydim (none), and trifluralin (good).

6. Included in the package for the current request (99ND0017) were the following:
(1) field experiment results given in **1998** North Dakota Weed Control Research,
re sunflower weed control: June 3 reading: Sonalan 99% control of kochia
June 22 reading: Sonalan 53% control of kochia
June 3 reading: Treflan 99% control of kochia
June 22 reading: Treflan 43% control of kochia
June 3 reading: Prowl 93% control of kochia
June 22 reading: Prowl 30% control of kochia

7. Included in the package for the current request (99ND0017) were the following:
(1) field experiment results given in **1997** North Dakota Weed Control Research,
re sunflower weed control: June 6 reading: Prowl 90% control of kochia
June 9 reading: Prowl 89% control of kochia
June 6 reading: Sonalan 89% control of kochia
June 9 reading: Sonalan 91% control of kochia

MANY THANKS FOR YOUR HELP!

Appendix 2

To: Saulmon.James
cc: bjenks@ndsuext.nodak.edu, danelson@pioneer.statend.us, rzollin@ndsuext.nodak.edu
Subj: Re: Sect. 18 (99ND0017) sulfentrazzone to control kochia in sunflower

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Dr. Messersmith,
I will try to copy the 2 pages of questions into the body
of this message as follows:

3/22/99
Dr. Messersmith, messersm@plains.nodak.edu Many Thanks in Advance.

For:
Dr. Richard K. Zollinger, Box 5051 Loftsgard Hall, Dept. of Plant Sciences,
North Dakota State University, Fargo, ND. tel: 701-231-8157, fax: 701-231-8474,
rzolling@ndsuext.nodak.edu

Subject: 99ND0017 request to use sulfentrazone on sunflowers to control kochia.

Dr. Zollinger,
Please respond to the questions (e.g., verify or if disagree, please comment) below within 24 hours (if possible), via e-mail to: James G. Saulmon, Ph.D.,
USEPA, tel: 703-308-8126;
fax: 703-308-8090; saulmon.james@epamail.epa.gov

1. Why do the growers need sulfentrazone?

Sulfentrazone is for producers who use no-till, or would like to use no-till but do not because of concerns about inconsistent weed control, or at least use less tillage than is required for the incorporated herbicides. No-till or reduced tillage systems reduces moisture loss during tillage and reduces soil erosion after the herbicide treatment. Sulfentrazone requires less soil moisture or rainfall to be activated than pendimethalin. Consequently, sulfentrazone has been more consistent for kochia control as well as other weeds than pendimethalin.

2. Are the growers getting adequate control of kochia using the herbicides that are registered for use on sunflowers?

Pendimethalin is the only product labeled for no-till sunflower production. Pendimethalin requires a significant rainfall to activate the herbicide; probably 0.5 inch of rain is marginal and 0.75 to 1 inch usually would result in pretty acceptable control. Lighter rains can be enough to germinate kochia without adequately activating the pendimethalin. Consequently pendimethalin can provide good control when rainfall is timely and in sufficient quantities, but can provide very little control in intermediate moisture situations where the kochia will germinate but the pendimethalin is not activated. In a conversation concerning NDSU test plots at Minot in 1998, too little precipitation occurred until the kochia was too large to be controlled by pendimethalin. Consequently the kochia populations were high and sunflower yields were very low. When moisture conditions are adequate to promote kochia germinate, it seems to be enough to activate carfentrazone.

Ethalfluralin usually provides good to excellent kochia control when thoroughly incorporated under conventional tillage situations. However, incorporation is not possible in no-till situations.

3. Within the scope of this sect.18 request, what percentage of North Dakota's sunflower acreage is no-till?

The people with whom I've visited estimate that between 5 to 10% of the sunflowers currently are grown with no-tillage. If weed control systems were reliable, the acreage could double rather quickly and may go up to 25% as a system proves reliable.

4. What is your best estimate of percent of control of kochia provided by the following registered herbicides and their application timing for use in sunflower?

a. ethalfluralin

Ethalfluralin must be used preplant incorporated. Then our North Dakota general ranking is

Good-Excellent control, which means the control ranges from 80 to 99%. Ethalfluralin would be the most consistent of registered herbicides in sunflower at providing Excellent control, i.e., 90-99%, but it must be incorporated. Ethalfluralin is not labeled for no-till situations, because incorporation is required.

b. trifluralin

Trifluralin also must used preplant incorporated, and has the Good-Excellent rating, similar to ethalfluralin. However, it is not as consistent as ethalfluralin, so control by trifluralin would be lower in side-by-side comparisons with ethalfluralin in many situations. The requirement for incorporation precludes use in no-till situations.

c. pendimethalin

Pendimethalin can be used preplant incorporated, where is has the Good-Excellent rating, similar to ethalfluralin and trifluralin. Probably trifluralin and pendimethalin when incorporated provide similar kochia control, which generally would be lower than ethalfluralin.

Pendimethalin can be surface applied preemergence, where we give it a Fair-Good rating, which means 65 to 90% control. When rainfall is timely and adequate, kochia control can be good. But any time moisture is short to dry, kochia control declines rapidly.

d. glyphosate

Glyphosate provides variable results for kochia control, being rated Fair-Excellent, which means control can range from 65% to 99%. Since glyphosate is non-selective, it usually is used prior to sunflower seeding or at least prior to crop emergence. Glyphosate can be applied as a Shielded Application in sunflower, but few farmers have this equipment and kochia control still would be highly variable.

e. Other ?

Paraquat can be applied before planting or prior to crop emergence, and typically it provides Good-Excellent control. However it can not be used after the crop emerges. If low Good control (80-85%) is obtained, too many kochia survive to compete with sunflower. Also kochia that emerge after the sunflower emerge cannot be controlled with paraquat.

Imazamethabenz (Assert) is the only broadleaf-control herbicide registered in sunflower, but it is totally inadequate for kochia control.

5. For the following questions (5a-5c), please comment on each chemical (i.e., Sonalan, treflan, and pendimethalin, etc.) regarding estimates of efficacy of

weed control and timing (e.g., PPI, PRE) for control of kochia:

NOTE: The general response/efficacy of each herbicide for kochia control was covered in Question 4 above. I won't repeat that information in responding to the questions below.

5a. In 1998, two states submitted requests, North Dakota (98-ND-35) and Minnesota (98-MN-28) for the use of ethalfluralin (Sonalan) to control kochia in
canola. (Please note that ethalfluralin is one of the herbicides which is registered for use on sunflowers.
However, North Dakota infers in the current request (99ND0017) that ethalfluralin provides inadequate control of kochia in sunflower.

Ethalfluralin usually provides acceptable control of kochia when preplant incorporated. My understanding is that the request on canola was for preplant incorporated ethalfluralin (i.e., conventional system), whereas this request on sunflower focuses on no-till sunflower or at least where reduced tillage (less than conventional tillage) is the preferred production system.

(Continued) Questions for 99ND0017

5b. 1998 North Dakota Weed Control Guide (re: sunflower), listed timing (PPI = preplant incorporated; PoPI = postplant incorporated), and kochia control ratings for the following herbicides: pendimethalin (Prowl) PPI (good to excellent), ethalfluralin (Sonalan) at PPI (good to excellent), treflan (Trifluralin) at PPI (good to excellent), and treflan at PoPI (fair to good).

Most of these ratings are for preplant incorporated herbicide, which can be used in conventional tillage, but not no-till or reduced tillage systems. The best rating occur when the herbicide is applied and thoroughly incorporated prior to crop seeding. In the one situation where trifluralin (Treflan) is applied PoPI (after planting but incorporated prior to crop or weed emergence), the kochia control is markedly less than where full incorporation is used. But even the PoPI treatment can not be used in no-till systems. Treflan PoPI is used mostly for foxtail control in wheat.

5c. Sunflower Production, Extension Bulletin 25 (revised) April, 1994 also provided herbicide weed control ratings for kochia as follows: EPTC (fair), Ethalfluralin (good), Imazamethabenz (poor to fair), paraquat (fair), pendimethalin (fair to good), sethoxydim (none), and trifluralin (good).

As for the answer to Question 5b, these ratings are for preplant incorporated herbicide. They would not apply to a no-tillage situation.

6. Included in the package for the current request (99ND0017) were the following:
(1) field experiment results given in 1997 North Dakota Weed Control Research, re sunflower weed control:

June 3 reading: Sonalan 99% control of kochia
June 22 reading: Sonalan 53% control of kochia
June 3 reading: Treflan 99% control of kochia
June 22 reading: Treflan 43% control of kochia
(also, Prowl readings showed good control of kochia)

(Note a subsequent e-mail corrected these as 1998 data and added Prowl).
These data with Sonalan (ethalfluralin) and Treflan (trifluralin), including the comparable readings for pendimethalin (Prowl) of 93 and 30%, illustrate the inconsistency of kochia control with these dinitroaniline herbicides, even when incorporated. Sunflower yields would be reduced to unacceptable levels when only 30 to 53% kochia control is obtained (the evaluations for the June 22 dates). By comparison, sulfentrazone provided 99% control on both evaluation dates, which illustrates the consistency of sulfentrazone when the registered products are ineffective.

7. Included in the package for the current request (99ND0017) were the following:
(1) field experiment results given in 1998 North Dakota Weed Control Research, re sunflower weed control:

June 6 reading: Prowl 90% control of kochia
June 9 reading: Prowl 89% control of kochia
June 6 reading: Sonalan 89% control of kochia
June 9 reading: Sonalan 91% control of kochia

(NOTE: a subsequent e-mail corrected these as 1997 data for June 6 and July 9)

These results indicate why Prowl and Sonalan can control kochia quite well when conditions are favorable, but the previous experiment illustrates the lack of consistency.

MANY THANKS FOR YOUR HELP!

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Appendix 3

To: Saulmon.James
cc: bjenks@ndsuext.nodak.edu, danelson%pioneer@state.nd.us, rzollinger@ndsuext.nodak.edu
Subj: Re: Urgent - addendum - sec. 18 sunflowers - 2 more questions

Dr. Messersmith,
Many thanks for your help. Would it be possible to respond before 3:00 p.m. Eastern Daylight Time, today?
My management asked two more questions as follows:

1. How critical is it for growers to use reduced tillage in sunflowers?

Reduced tillage can be very important in those areas where soil moisture, especially for seedling development, is marginal. If the soil at seeding depth is too dry for seed germination or just damp enough to allow seeds to swell but not fully develop as seedlings, then a poor stand or absence of stand can occur. Incorporation of a herbicide, which does dry out the soil, can reduce the soil moisture at seeding depth from a range where sunflower will establish to the range where the final sunflower population is inadequate.

Generally sunflower is a crop that is well adapted to drier conditions for the whole growing season, but adequate moisture for seedling establishment is critical for sunflower stand establishment.

For soils and terrain that are not ideal crop production, reduced tillage can easily mean the difference between adequate moisture for crop establishment versus an unacceptable crop, or too much wind or water erosion

when unfavorable weather conditions occur.

1a. Are the sunflower growers under legal mandate to use reduced tillage?

I don't know the exact nature of Conservation Compliance regulations associated with "Freedom to Farm", but I do believe that farmers are to have a conservation program appropriate for their farm. For soil that is erodible, which would be true on a significant amount of acreage where sunflower is grown, I believe there would be requirements to maintain minimum amounts of crop residue to minimize wind and water erosion. Any requirement to maintain residue would be difficult to achieve whenever a soil-incorporated herbicide must be used.

2. Can the sunflower growers use chisels (without disturbing the soil surface much), e.g., to incorporate Sonalan? How well would this method work and how expensive is it (rough estimate)?

The whole purpose of soil-incorporation for a herbicide like Sonalan is to provide enough physical stirring of soil to get the herbicide near every weed seed that germinates. Essentially herbicides like Sonalan do not move in soil, so if there are voids where a weed seedling can grow without contacting the herbicide, it will survive. Chisels so not cause enough stirring/mixing action to mix a herbicide rather uniformly in the soil. Without enough physical stirring, there are too many "channels" without herbicide where weeds can emerge successfully.

I was in class--hopefully this is the information you need.

Many Thanks.

Jim Saulmon

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