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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

MEMORANDUM

Date: 8/31/05

Subject: Propazine. Residue Chemistry Summary for the Tolerance Reassessment Eligibility Decision Document (TRED) and a Proposal To Reinstate Food/Feed Use on Grain Sorghum (PP#7F4837).

PP#: 7F4837
DP Number: D308537
Chemical Class: Chloro Triazine Herbicide
40 CFR §180: 243
PC Code: 080808

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This document was originally prepared under contract by Dynamac Corporation (20440 Century Boulevard, Suite 100; Germantown, MD 20874; submitted 07/13/2005). The document has been reviewed by the Health Effects Division (HED) and revised to reflect current Office of Pesticide Programs (OPP) policies.

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Executive Summary

Propazine (2-chloro-4,6-bis (isopropyalamino)-s-triazine) is a member of the chloro triazine class of herbicides. Other members of this pesticide class include atrazine, cyanazine, and simazine. Propazine is a selective herbicide that can be applied before planting, at planting, and after crop emergence for the preemergence control of annual broadleaf weeds. Currently, the only registered uses are for weed control of ornamental plants grown in containers under greenhouse conditions. There are presently no registered food/feed uses of propazine.

Propazine was previously registered for use on sorghum. The 5/19/87 Propazine Residue Chemistry Chapter along with the 12/88 Propazine Reregistration Standard (Guidance Document) identified several data deficiencies for the reregistration of propazine. Ciba-Geigy, which was then the basic manufacturer of propazine, elected to cancel its registrations of propazine. Another petitioner, Griffin Corporation, is now supporting the previously cancelled uses of propazine on grain sorghum and has submitted residue chemistry data which have been evaluated by HED and summarized in this Chapter as a "new active ingredient."

The use of propazine on grain sorghum will be supported at a maximum single application rate of 1.2 lb ai/A with a preharvest interval of 60 days. Following HED review of the proposed use directions and the submitted residue field trial data, the following label amendments are required for sorghum: (i) a maximum of one preemergence application per growing season; (ii) a maximum seasonal rate of 1.2 lb ai/A; (iii) a preharvest interval of 70 days for sorghum forage; and (iv) a preharvest interval of 90 days for sorghum grain and stover.

The EPA's Office of Pesticide Programs (OPP) has determined that atrazine, propazine, simazine, and degradants, diaminochlorotriazine (DACT), desisopropyl s-atrazine (DIA), and desethyl s-atrazine (DEA) should be considered as a Common Mechanism Group due to their ability to suppress the pituitary LH surge and produce consequent effects on reproductive function and reproductive development. For purposes of a cumulative risk assessment and as part of the tolerance reassessment process for these pesticides, they should be considered as a Common Mechanism Group (OPP Office Director Memo on Grouping Triazines, 3/31/2002).

Tolerances are currently established [40 CFR §180.243] for residues of propazine *per se* in/on sorghum commodities (forage, grain, stover, and sweet sorghum) at 0.25 ppm. There are no tolerances established for propazine residues in animal commodities. The Federal Register (Vol. 70. No. 119, June 22, 2005) has recently announced that Griffin Corporation has filed a petition, PP#7F4837, to amend 40 CFR §180.243, by establishing tolerances for residues of propazine and its two chlorometabolites: 2-amino-4-chloro, 6-isopropylamino-s-triazine (G-30033) and 2,4-diamino-6-chloro-s-triazine (G-28273) in/on sorghum stover, forage, and grain at 0.25 ppm.

For the purpose of consistency in nomenclature, the chlorometabolites that are included in the proposed tolerance expression will be referred to in this Residue Chapter by their company code designation. G-30033 will be used for 2-amino-4-chloro, 6-isopropylamino-s-triazine; it is noted

that some study submissions also refer to the metabolite G-30033 as desethyl atrazine (DEA) or atrazine desethyl. G-28273 will be used for 2,4-diamino-6-chloro-s-triazine; some study submissions also refer to the metabolite G-28273 as diamino atrazine (DAA) or atrazine desethyl-desisopropyl.

The nature of propazine residues in sorghum is adequately understood. Total radioactive residues (TRR) were 0.126, 0.133 and 2.344 ppm in/on sorghum forage, grain and fodder (stover), respectively, following one preemergence application of [^{14}C]propazine at 1.96 lb ai/A (1.6x the proposed single application rate). The parent propazine was identified at a range of <0.001-0.011 ppm (0.5-0.8% TRR) in sorghum matrices. The chlorometabolites G-30033 and G-28273 were not detected in grain but were identified as minor residue components in forage (8.7% TRR, 0.011 ppm) and stover (3.9% TRR, <0.091 ppm). Several free hydroxymetabolites (propazine 2-hydroxy; atrazine des-ethyl 2-hydroxy; and ammeline) were identified at slightly higher combined levels in forage (22.2% TRR, 0.028 ppm), grain (12.6% TRR, <0.016 ppm), and stover (8.2% TRR, <0.193 ppm).

In a Memorandum of Understanding between HED and Griffin Corporation for Propazine (see 1/11/96 memo of M. Metzger), HED has indicated that if the metabolism of propazine is shown to be similar to the metabolism of chloro-triazines in sorghum, and toxicity of propazine is also similar, establishment of tolerances and risk assessment would be the same for other triazines. Tolerances would be set for residues of the parent plus the chlorometabolites. Risk assessment would be done using parent plus chlorometabolites for carcinogenic risk assessment, and hydroxymetabolites or total radioactive residues for chronic non-cancer risk assessment.

The submitted sorghum metabolism study indicates that propazine is rapidly and extensively metabolized in sorghum via: (i) N-dealkylation; (ii) replacement of chlorine by hydroxy; and (iii) glutathione conjugation. The results suggest that the metabolism of propazine in sorghum is similar to published and available plant metabolism studies for other triazine herbicides. The propazine residues of concern in plants, for the purposes of tolerance establishment and risk assessment, are those identified by HED in the 1/11/96 Memorandum of Understanding.

The nature of propazine residues in ruminants is understood. In a goat metabolism study where [^{14}C]propazine was administered orally to a lactating goat at 9.9 ppm (~20x the estimated dietary burden of 0.5 ppm) in the diet for seven consecutive days, TRR were 0.080-0.238 ppm in milk, 1.123 ppm in liver, 1.041 ppm in kidney, 0.209 ppm in muscle, and 0.160 ppm in fat. The parent propazine was not detected in goat milk or tissues. The chlorometabolite G-28273 was the principal residue identified in milk (63.4% TRR, 0.141 ppm), fat (50.4% TRR, 0.080 ppm), muscle (26.1% TRR, 0.054 ppm), and liver (2.7% TRR, 0.031 ppm). The metabolite G-30033 was identified in milk (9.4% TRR, 0.021 ppm) but not in tissues. The remaining radioactivity in goat milk and tissues was characterized to be comprised of up to six unknown metabolites. Although each unknown accounted for <7% TRR in milk, several unknowns were present at significant levels in goat tissues. None of these unknown residues co-chromatographed with the 17 reference standards including standards of known chloro- and hydroxy-metabolites of triazine herbicides. When the study is evaluated according to OPPTS GLN 860.1300, the goat

metabolism data are classified as scientifically unacceptable because of insufficient characterization of radioactive residues in goat matrices particularly in kidney, liver, and muscle. However, the Memorandum of Understanding between HED and Griffin stated that if the available goat metabolism studies adequately and separately determine residues of each chlorometabolite, each hydroxymetabolite, and TRR for each commodity for which data are required, further identification work for the metabolism study in which parent propazine was fed should not be required.

Another goat metabolism study was performed using a radiolabeled hydroxymetabolite of propazine as the test substance. TRR were 0.025-0.029 ppm in milk, 0.006 ppm in muscle, 0.001 ppm in fat (renal and omental), 0.110 ppm in kidney, and 0.036 ppm in liver taken/collected from a lactating goat administered orally with [U-^{14}C]2-hydroxypropazine at 10.9 ppm in the diet for three consecutive days. Residue characterization was not conducted in muscle and fat tissues because of low radioactivity (<0.010 ppm). The test substance, 2-hydroxypropazine, was the major residue identified in all matrices accounting for 63.5% TRR (0.069 ppm) in kidney, 77.2% TRR (0.028 ppm) in liver, and 65.0-69.4% TRR (0.017-0.020 ppm) in milk. The only other metabolite identified was desisopropyl hydroxypropazine, which was detected in minor amounts in all matrices: 2.9% TRR (0.003 ppm) in kidney, 3.6% TRR (0.001 ppm) in liver and 8.2-8.5% TRR (0.002 ppm) in milk.

The nature of propazine residues in poultry is understood. TRR were 0.019-0.448 ppm in whole egg, 0.010-0.669 ppm in egg yolk, 0.024-0.327 ppm in egg white, 1.196 ppm in liver, 0.961 ppm in composite muscle, and 0.172 ppm in composite fat taken/collected from laying hens orally administered with [^{14}C]propazine at 20.3 ppm (~102x the dietary burden MTDB of 0.2 ppm) in the diet for 14 consecutive days. The parent propazine was not identified in poultry eggs or tissues. The only residue component identified was G-28273 which was quantitated in poultry matrices as follows: liver (4.3% TRR, 0.171 ppm), muscle (18.3% TRR, 0.212 ppm), fat (48.1% TRR, 0.083 ppm), egg yolk (35.3% TRR, 0.236 ppm), and egg white (51.9% TRR, 0.170 ppm). Seven unknown compounds were detected in select matrices some of which were observed at >10% TRR. The petitioner characterized these unknown metabolites to be relatively more polar than propazine based on the chromatographic profiles.

Based on the available goat and poultry metabolism data, the propazine residues of concern in animals, for the purposes of tolerance establishment and risk assessment, are those identified by HED in the 1/11/96 Memorandum of Understanding. The results suggest a Category 3 situation with regard to the need for animal commodity tolerances as per 40 CFR §180.6. There is no expectation of finite residues of propazine and its chlorometabolites in animal commodities as a result of the proposed use on sorghum. Thus, animal feeding studies are not needed, and tolerances need not be established for meat, milk, poultry, and eggs.

An adequate enforcement method for plants is currently not available and is required for propazine and its two chlorometabolites (G-30033 and G-28273). Currently, the Pesticide Analytical Manual (PAM) Vol. II lists Method IV (AG-281) for the determination of only the chlorometabolite G-28273 in crops and animal tissues. Samples of sorghum forage, grain, and

stover, that were collected from the sorghum field trials, were analyzed for residues of propazine and its chlorometabolites by Corning Hazelton analytical method CHW 6641-106 (Method 1, Rev. 1). The method determines residues of propazine and G-30033 by GC/MSD, while residues of G-28273 are determined by GC/NPD. The LOQ for each analyte in all sorghum matrices is 0.05 ppm. Overall, the method is adequate for data collection based on acceptable concurrent method recovery data. HED is recommending that the data-collection method (CHW 6641-106, Method 1, Rev. 1) be subjected to an independent laboratory validation (ILV) as per GLN 860.1340. If the ILV is successful, the method will be subjected to further validation by Agency chemists at ACL/BEAD. At this time, animal enforcement methods are not required for the reinstatement of propazine uses on sorghum since there is no expectation of finite secondary residues in animal commodities.

According to FDA's PAM Volume I, Appendix II, propazine is completely recovered using Section 302 (Protocol D), partially recovered using Section 303 (Protocol E), and not recovered using Section 304 (Protocol F). There are no multiresidue methods recovery data for the chlorometabolites G-30033 and G-28273, and these data are required. To fulfill this requirement, the petitioner is required to follow the directions for the protocols found in PAM Vol. I, Appendix II under paragraph (d)(1) of OPPTS GLN 860.1360, starting with the decision tree for multiresidue methods testing and the accompanying guidance found in the suggestions for producing quality data.

No storage stability data were submitted to support the sorghum field trials and limited field rotational crop trials. However, the petitioner has indicated that a storage stability study has been initiated and will be submitted in a separate report upon completion. Samples from the sorghum field trials were stored frozen for 25.7-26.6 months prior to residue analysis. The maximum frozen storage intervals of samples from the limited field rotational crop trials were 129 days (4.2 months) for lettuce, 79 days (2.6 months) for mustard leaves, 100 days (3.3 months) for radish tops and roots, 79 days (2.6 months) for turnip tops and roots, 141 days (4.6 months) for wheat forage, 125 days (4.1 months) for wheat hay, and 89 days (2.9 months) for wheat grain and straw. The submitted plant and animal metabolism studies are supported by adequate storage stability data. The chromatographic profiles of residues appeared stable following re-analysis of select matrices.

Pending submission of supporting storage stability data and label revision, the proposed use of propazine is supported by adequate residue data. Following a single preemergence broadcast application of a representative FlC formulation of propazine at 1.47-2.43 lb ai/A (1.2-2.0x the proposed single application rate), the results of the sorghum field trials indicate the following: In **sorghum forage** harvested at a PHI range of 69-117 days, residues of propazine and G-30033 were each less than the LOQ (<0.05 ppm) in/on 26 treated samples. Residues of G-28273 ranged 0.050-0.087 ppm in/on four treated forage samples but were <0.05 ppm in/on 22 treated samples. In **sorghum grain and stover** harvested at a PHI range of 86-152 days, residues of propazine, G-30033, and G-28273 were each <0.05 ppm in/on 26 treated samples. These data support the proposed tolerance of 0.25 ppm each for the combined residues of propazine and its two chlorometabolites (G-30033 and G-28273) in/on sorghum stover, forage, and grain. Residue data

on the aspirated grain fractions of sorghum are not required since the proposed use of propazine on grain sorghum is for preemergence or preplant application.

A sorghum processing study is not required at this time but may be needed at a later date.

The nature of propazine residues in rotational crops is adequately understood. The study was initiated by applying [^{14}C]propazine to bare sandy loam soil at 2.39 lb ai/A (~2.0x the proposed single application rate for sorghum). Lettuce, turnip, and spring wheat were then planted in the treated soil as rotational crops at plantback intervals (PBIs) of 29, 120, and 365 days. At the 29-PBI, total radioactive residues were 1.298 ppm for wheat forage, 5.787 ppm for wheat straw, and 1.680 ppm for wheat grain heads. At the 120-day PBI, TRR were 0.103 ppm for lettuce, 0.179 ppm for turnip tops, 0.057 ppm for turnip roots, 0.355 ppm for wheat forage, 1.987 ppm for wheat straw, and 0.928 ppm for wheat grain heads. At the 365-day PBI, TRR were 0.209 ppm for lettuce, 0.450 ppm for wheat forage, 1.028 ppm for wheat straw, and 0.245 ppm for wheat grain heads. Propazine was identified (<1-43% TRR) in all rotational crop matrices from all plantback intervals, but appears to decrease with longer plantback intervals. In addition to the parent, the following metabolites were identified: atrazine des-ethyl (G-30033); propazine 2-hydroxy (GS-11526); and atrazine des-ethyl 2-hydroxy (GS-17794). Quantitative data pertaining to the level of metabolite identification is presented in the topical section for OPPTS 860.1850. The primary metabolic products in rotational crops are similar to those found in the sorghum metabolism study. The propazine residues of concern in rotational crops, for the purposes of tolerance establishment and risk assessment, are those identified by HED in the 1/11/96 Memorandum of Understanding.

Two limited field rotational crop trials with propazine were conducted in NC and TX. At each site, a 4 lb/gal flowable concentrate formulation of propazine was applied as a preemergence ground spray to grain sorghum, the primary crop, at a nominal rate of 1.2 lb ai/A (1.0x the proposed single application rate). The primary crop was removed (by cutting) from the plots approximately 90 days after the test substance application. The following rotational crops were then planted at each field site: radish or turnip (a root vegetable), lettuce or mustard (a leafy vegetable), and winter or spring wheat (a cereal grain). The plantback intervals used in the study were 94, 127, and 242/280 days for the NC field site and 97, 120, 195, and 239 days for the TX field site.

The results of the NC trial indicate that residues of propazine, G-30033, and G-28273 were each below the LOQ of 0.0500 ppm in/on all samples of rotational crop commodities (mustard leaves, turnip tops/roots, and spring/winter wheat forage, hay, straw, and grain) at all PBIs (94, 127, and 242/280 days). The results of the TX trial indicate that residues of propazine, G-30033, and G-28273 were each below the LOQ of 0.0500 ppm in/on the following rotational crop commodities and plantback intervals: (i) lettuce leaves at a 97-day PBI; (ii) radish root at PBIs of 97 and 239 days; (iii) wheat forage at PBIs of 120 and 195 days; (iv) wheat hay, straw, and grain at PBIs of 97, 120, and 195 days. A few rotational crop commodities from the TX trial showed quantifiable residues including: (i) lettuce leaves at the 239-day PBI (propazine was detected at 0.0505-0.0510 ppm, G-30033 at 0.137-0.139 ppm, and G-28273 at 0.139 ppm); (ii) radish tops at

the 97-day PBI (propazine was detected at 0.051-0.052 ppm); and (iii) wheat forage at the 97-day PBI (G-30033 was detected at 0.102-0.107 ppm). These data trigger the need for extensive field rotational trial data, as described under OPPTS 860.1900, to determine appropriate plantback intervals and tolerances for inadvertent residues of propazine and its chlorometabolites.

Analytical standards for propazine are currently available at the National Pesticide Standards Repository. However, standards for the chlorometabolites G-30033 and G-28273 are not available and are required.

Regulatory Recommendations and Residue Chemistry Deficiencies

HED has examined the residue chemistry database for propazine and identified the residue chemistry deficiencies listed below before the use of propazine on grain sorghum can be reinstated.

- For consistency of the proposed use pattern with the submitted field trial data, the following label amendments are required for sorghum: (i) a maximum of one preemergence application per growing season; (ii) a maximum seasonal rate of 1.2 lb ai/A; (iii) a preharvest interval of 70 days for sorghum forage; and (iv) a preharvest interval of 90 days for sorghum grain and stover.

- A plant enforcement method is required. HED is recommending that the data-collection method (CHW 6641-106, Method 1, Rev. 1) be subjected to an independent laboratory validation as per GLN 860.1340. If the ILV is successful, the method will be further validated by Agency chemists at ACL/BEAD.

- There are no multiresidue methods recovery data for the chlorometabolites G-30033 and G-28273, and these data are required. To fulfill this requirement, the petitioner is required to follow the directions for the protocols found in PAM Vol. I, Appendix II under paragraph (d)(1) of OPPTS GLN 860.1360, starting with the decision tree for multiresidue methods testing and the accompanying guidance found in the suggestions for producing quality data.

- The results of an ongoing storage stability study need to be submitted upon completion to support the storage conditions and intervals of samples collected from the sorghum field trials and limited field rotational crop trials.

- A set of field accumulation in rotational crop studies is required because in the confined and limited rotational crop study propazine and its chlorometabolites were identified in various rotational crops and intervals and quantified at levels greater than 0.01 ppm. Based upon these limited field trials, restrictions of not less than one year for a plant back for propazine are needed on the end-use product labels. Crops selected for these field trials should be selected on the basis of those crop rotations that the registrant intends to support. HED may be contacted to discuss possible reduced sets of field trials to fulfill these requirements. When the required field rotational crop studies are submitted, appropriate plantback intervals and tolerances for inadvertent residues of propazine and its chlorometabolites will be determined.

- Analytical standards for propazine are currently available at the National Pesticide Standards Repository. However, standards for the chlorometabolites G-30033 and G-28273 are not available and are required.

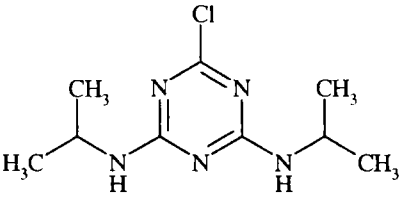
- The tolerances established under 40 CFR §180.243 are currently defined for residues of propazine *per se*. Griffin Corporation has filed a petition, PP#7F4837, to amend 40 CFR §180.243, by establishing tolerances for residues of propazine and its two chlorometabolites: 2-amino-4-chloro, 6-isopropylamino-s-triazine (G-30033) and 2,4-diamino-6-chloro-s-triazine (G-28273) in/on sorghum stover, forage, and grain at 0.25 ppm. The results of a sorghum metabolism study indicate that the proposed tolerance expression for plants is appropriate. Therefore, HED is recommending the revision of the residue definition under 40 CFR §180.243 to specify tolerances for the combined residues of propazine and the chlorometabolites G-30033 and G-28273. Also, HED recommends that the designation "(N)" be deleted from the 40 CFR for all tolerance level entries.

- Tolerances for propazine residues of concern in meat, milk, poultry, and eggs are not required for the purpose of this petition only. The results of the reviewed ruminant and poultry metabolism studies suggest a Category 3 situation with regard to the need for animal commodity tolerances as per 40 CFR §180.6. There is no expectation of finite residues of propazine and its chlorometabolites in animal commodities as a result of the proposed use on sorghum. Thus, animal feeding studies are not needed, and tolerances need not be established for meat, milk, poultry, and eggs.

- The established tolerance for sweet sorghum should be revoked unless propazine use on sweet sorghum is proposed and supporting residue data are submitted.

Background

The PC Code and nomenclature of propazine as well as the physicochemical properties, are presented in the tables below.

Propazine Nomenclature.	
PC Code 006308	
Chemical structure	
Common name	Propazine
Molecular Formula	$C_9H_{16}N_5Cl$
Molecular Weight	229.7
IUPAC name	6-chloro-N^2,N^4-di-isopropyl-1,3,5-triazine-2,4-diamine
CAS name	2-chloro-4,6-bis(isopropylamino)-1,3,5-triazine OR 6-chloro-*N*,*N*'-bis(1-methylethyl)-1,3,5-triazine-2,4-diamine
CAS #	139-40-2

Physicochemical Properties of Propazine.		
Parameter	Value	Reference
Melting point	217.7 °C	RD D219079, 9/26/95, S. Malak
pH	5.66	
Density, bulk density, or specific gravity	0.46 g/mL	
Water solubility	3.8 ppm at 25 °C	
Solvent solubility (at 25 °C)	14,252 ppm in acetone 4,696 ppm in 1-octanol	
Vapor pressure	2.9 x 10^{-8} mm Hg at 20 °C 2.98 x 10^{-5} Torr at 45 °C	Product Chemistry Chapter of the Propazine Reregistration Standard, 5/19/87 RD D219079, 9/26/95, S. Malak
Dissociation constant, pK	Not applicable; practically insoluble in water.	RD D219079, 9/26/95, S. Malak
Octanol/water partition coefficient	P = 1234.7 Log P = 3.08	
UV/visible absorption spectrum	Not available	

860.1200 Directions for Use

SRRD issued on June 30, 2004 a Propazine Use Closure Memo which details the food and nonfood uses for the Reregistration Eligibility Decision (RED) risk assessments. The risk assessments for propazine will be based on the use sites and usage data in BEAD's LUIS report, documents presented in the June 21st SMART meeting, and the product labels. Information on food/feed use patterns that will be supported is presented in Table 1. A tabular summary of the adequacy of the chemistry science guideline topics, for the purpose of tolerance reassessment, is presented in Table 2.

Following HED review of the proposed use directions and the submitted field trial data, the following label amendments are required for grain sorghum: (i) a maximum of one preemergence application per growing season; (ii) a maximum seasonal rate of 1.2 lb ai/A; (iii) a preharvest interval of 70 days for sorghum forage; and (iv) a preharvest interval of 90 days for sorghum grain and stover.

Table 1. Food/Feed Use Patterns Summary for Propazine

SITE NAME	LIMITATIONS					
Application Timing Application Type Application Equipment	Maximum Single Application Rate	Maximum Seasonal Rate	Maximum Number of Application Per cc & Year	MRI	REI	PHI/PGI/PSI Use Limitations
SORGHUM	70 day PHI for sorghum forage. 90 day PHI for sorghum grain and stover. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not apply through any type of irrigation system. Do not contaminate water by cleaning of equipment or disposal of equipment wash waters. Do not contaminate water, food, or feed by storage or disposal. Do not make more than one preemergence application per growing season.					
Preemergence Ground Aerial	1.2 lb ai/A	1.2 lb ai/A	1/cc (NS)	NS	24 hr	
Preplant Ground Aerial	1.2 lb ai/A	1.2 lb ai/A	1/cc (NS)	NS	24 hr	

HEADER ABBREVIATIONS

Site Name - The site name refers to the entity (crop, building, surface or article) where a pesticide is applied and/or which is being protected.
Limitations - Precautionary statements related to the use of the product(s).
Application Timing - The timing of pesticide application and is the primary application sort (not aggregated).
Application Type - The type of pesticide application (aggregated).
Application Equipment - The equipment used to apply pesticide (aggregated).
Max. Single Appl. Rate to a Single Site - Maximum Dose for a single application to a single site. System calculated.
Max Seasonal Rate - The maximum amount of pesticide that can be applied to a site in one growing season (/cc) and during the span of one year (/yr).
Max. # Apps/cc & yr - Maximum Number of Applications per crop cycle and per year.
M R I - Minimum Retreatment Interval (days) (at any rate). The minimum interval between pesticide application (days).
R E I - ReEntry Interval - The minimum amount of time that must elapse before workers can reenter a treated area.
PHI/PGI/PSI Use Limitations (May not apply to all Reg.#s) - Preharvest/Pregrazing/Preslaughter Interval use limitations pertinent to the application.
Current As Of: - The label data for the listed products in this report is current of this date.

ABBREVIATIONS

NS - Not Specified (on label)

Table 2. Residue Chemistry Summary for Tolerance Reassessment of Propazine.			
GLN Data Requirements	Current Tolerances (ppm) [40 CFR §180.243]	Additional Data Needed?	MRID Nos. [1]
860.1200: Directions for Use	N/A = Not Applicable	Yes [2]	See Table 1
860.1300: Nature of the Residue - Plants	N/A	No	00024330 00024436 00024728 00087881 00111694 44184813[3] 44184814[3] 44287315[3]
860.1300: Nature of the Residue - Animals	N/A	No	00087890 44184815[3] 44184816[3] 44184817[3]
860.1340: Residue Analytical Method			
- Plant Commodities	N/A	Yes [4]	00041371 00068044 00087887 00112982 00118949 00119532
- Animal Commodities	N/A	No	00080630 00087889 00112982 00140830
860.1360: Multiresidue Method	N/A	Yes [5]	PAM Vol. I
860.1380: Storage Stability Data			
- Plant Commodities	N/A	Yes[6]	
- Animal Commodities	N/A	No	
860.1400: Magnitude of the Residue - Water, Fish, and Irrigated Crops	N/A	N/A	
860.1460: Magnitude of the Residue - Food Handling	N/A	N/A	
860.1480: Magnitude of the Residue - Meat, Milk, Poultry, Eggs			
- Milk and the Fat, Meat, and Meat Byproducts of Cattle, Goats, Hogs, Horses, and Sheep	None established	No	00093525 00140830
- Eggs and the Fat, Meat, and Meat Byproducts of Poultry	None established	No	00087885
860.1500: Crop Field Trials			
Cereal Grains (Crop Group 15)			

Table 2. Residue Chemistry Summary for Tolerance Reassessment of Propazine.

GLN Data Requirements	Current Tolerances (ppm) [40 CFR §180.243]	Additional Data Needed?	MRID Nos. [1]
- Sorghum grain	0.25	No	00016607 00016990 00016991 00016992 00026271 00044427 00047878 00063246 00065582 00068044 00087880 00087884 00105170 00111672 00111693 00118949 44287316[3]
- Sorghum sweet	0.25	Yes [7]	

Table 2. Residue Chemistry Summary for Tolerance Reassessment of Propazine.

GLN Data Requirements	Current Tolerances (ppm) [40 CFR §180.243]	Additional Data Needed?	MRID Nos. [1]
Forage, Fodder, and Straw of Cereal Grains (Crop Group 16)			
- Sorghum forage and stover	0.25 each for sorghum forage and stover	No	00016607 00016990 00016992 00026271 00044427 00047878 00063246 00065582 00068044 00087880 00087884 00105170 00111672 44287316[3]
860.1520: Processed Food/Feed			
- Sorghum	None established	No	
860.1650: Submittal of Analytical Reference Standards	N/A	Yes [8]	
860.1850: Confined Accumulation in Rotational Crops	N/A	No	44184810[3]
860.1900: Field Accumulation in Rotational Crops	N/A	Yes [9]	44184811[3]

1. References were reviewed in the 5/19/87 Residue Chemistry Chapter of the Propazine Registration Standard. All other references were reviewed as noted.

2. Based on the submitted residue data, the following label amendments are required for sorghum: (i) a maximum of one preemergence application per growing season; (ii) a maximum seasonal rate of 1.2 lb ai/A; (iii) a preharvest interval of 70 days for sorghum forage; and (iv) a preharvest interval of 90 days for sorghum grain and stover.

3. DP Barcode D310517, 8/31/05, J. Morales and G. Kramer.

4. A plant enforcement method is required. HED is recommending that the data-collection method (CHW 6641-106, Method 1, Rev. 1) be subjected to an independent laboratory validation as per GLN 860.1340. If the ILV is successful, the method will be further validated by Agency chemists at ACL/BEAD.

5. There are no multiresidue methods recovery data for the chlorometabolites G-30033 and G-28273, and these data are required. To fulfill this requirement, the petitioner is required to follow the directions for the protocols found in PAM Vol. I, Appendix II under paragraph (d)(1) of OPPTS GLN 860.1360, starting with the decision tree for multiresidue methods testing and the accompanying guidance found in the suggestions for producing quality data.

6. The results of an ongoing storage stability study need to be submitted upon completion to support the storage conditions and intervals of samples collected from the sorghum field trials and limited field rotational crop trials.

7. The established tolerance for sweet sorghum should be revoked unless propazine use on sweet sorghum is proposed and supporting residue data are submitted.

8. Analytical standards for propazine are currently available at the National Pesticide Standards Repository. However, standards for the chlorometabolites G-30033 and G-28273 are not available and are required.

9. A set of field accumulation in rotational crop studies is required because in the confined and limited rotational crop study propazine and its chlorometabolites were identified in various rotational crops and intervals and quantified at levels greater than 0.01 ppm. Based upon these limited field trials, restrictions of not less than one year for a plant back for propazine are needed on the end-use product labels. Crops selected for these field trials should be selected on the basis of those crop rotations that the registrant intends to support. HED may be contacted to discuss possible reduced sets of field trials to fulfill these requirements. When the required field rotational crop studies are submitted, appropriate plantback intervals and tolerances for inadvertent residues of propazine and its chlorometabolites will be determined.

SUMMARY OF SCIENCE FINDINGS

860.1300 Nature of the Residue - Plants

The nature of propazine residues in sorghum is adequately understood. The submitted sorghum metabolism study indicates that propazine is rapidly and extensively metabolized in sorghum via: (i) N-dealkylation; (ii) replacement of chlorine by hydroxy; and (iii) glutathione conjugation. The metabolism of propazine in sorghum is similar to published and submitted plant metabolism studies for other triazine herbicides.

Consistent with the Memorandum of Understanding between HED and Griffin Corporation for Propazine (see 1/11/96 memo of M. Metzger), the residues of concern in plants for tolerance reassessment are the parent plus the chlorometabolites G-30033 and G-28273. Risk assessment would be done using parent plus chlorometabolites for carcinogenic risk assessment, and hydroxymetabolites or total radioactive residues for chronic non-cancer risk assessment.

Figure 1 depicts chemical structures of propazine and its chloro- and hydroxy-metabolites that were identified in plants and animals. The Executive Summary of the sorghum metabolism study DER is reproduced in this TRED document and follows Figure 1.

FIGURE 1. Propazine and its Metabolites in Plants and Animals.

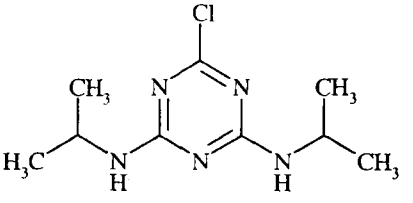
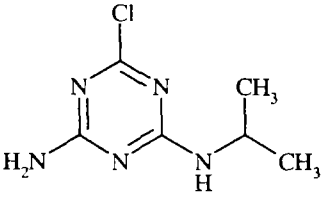
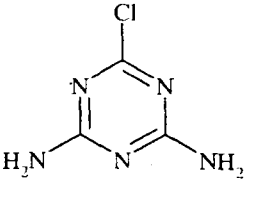
Common Name (Code) Chemical Name	Substrate	Chemical structure
Propazine (G-30028) 2-chloro-4,6-bis(isopropylamino)-s-triazine	Sorghum forage, grain, and stover 120- and 365-day PBI lettuce; 120-day PBI turnip tops and roots; and 29-, 120- and 365-day PBI wheat forage, grain and straw.	
Propazine des-ethyl (G-30033) 2-amino-4-chloro-6-(1-methylethyl-amino)-s-triazine or 2-amino-4-chloro, 6-isopropylamino-s-triazine)	Sorghum forage and stover Goat milk 120- and 365-day PBI lettuce; 120-day PBI turnip tops and roots; 29-, 120- and 365-day PBI wheat forage; and 29- and 120-day PBI wheat grain and straw.	
DACT (G-28273) 2,4-diamino-6-chloro-*s*-triazine	Sorghum stover Goat milk, liver, muscle, and fat Poultry liver, muscle, fat, egg yolk, and egg white	

FIGURE 1. Propazine and its Metabolites in Plants and Animals.

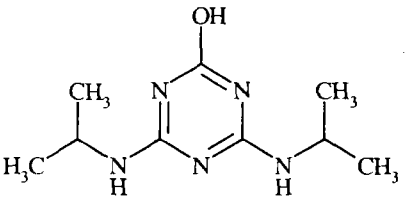
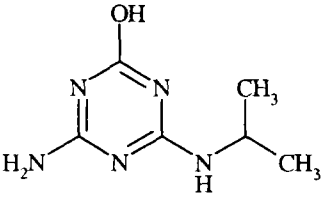
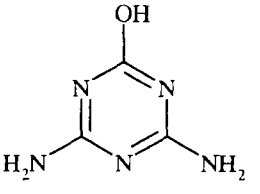
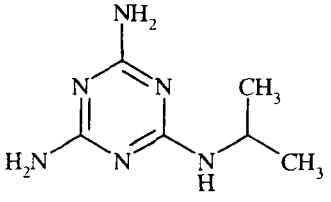
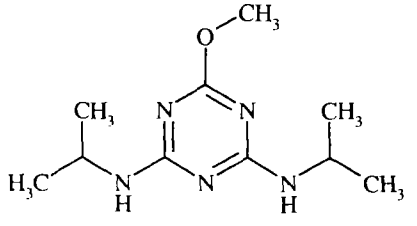
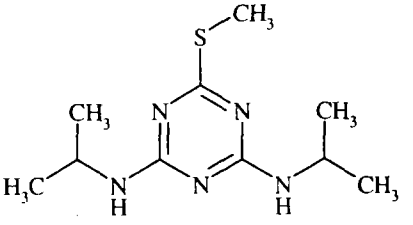
Common Name (Code) Chemical Name	Substrate	Chemical structure
Propazine 2-hydroxy or **2-hydroxypropazine** (G-S11526) 2-hydroxy-4,6-bis-(1-methylethyl-amino)-s-triazine or 2-hydroxy-4,6-bis (isopropylamino)-s-triazine	Sorghum forage, grain, and stover Goat kidney, liver, and milk (from the goat metabolism study using [U-^{14}C]2-hydroxypropazine as the test substance) 120-day PBI turnip tops; 29-day PBI wheat forage and straw; and 29- and 120-day PBI wheat grain.	
Desisopropyl hydroxypropazine 4-amino-2-hydroxy-6-isopropylamino-triazine	Goat kidney, liver, and milk (from the goat metabolism study using [U-^{14}C]2-hydroxypropazine as the test substance) Sorghum forage, grain, and stover 120- and 365-day PBI lettuce; 120-day PBI turnip tops and roots; and 29-, 120- and 365-day PBI wheat forage, grain and straw.	
Ammeline (GS-17791) 2,4-diamino-6-hydroxy-*s*-triazine	Sorghum stover	
Triazine-methyl-triamine (CGA-101248) N-(1-methyl)-1,3,5-triazine-2,4,6-triamine	Sorghum stover	
Prometon (G-31435) 2-methoxy-4,6-bis (1-methylethylamino)-*s*-triazine	Sorghum stover	

FIGURE 1. Propazine and its Metabolites in Plants and Animals.		
Common Name (Code) Chemical Name	Substrate	Chemical structure
Propazine-2-methyl-sulfinyl (GS-16141) 2,4-bis (1-methylethylamino)-6-methylsulfinyl-*s*-triazine	Sorghum stover	

Sorghum

44287315.der.wpd (Includes MRIDs 44184813 and 44184814)

Griffin Corporation has submitted a sorghum metabolism study with propazine under greenhouse conditions. Four days after sorghum was seeded in test plots, [^{14}C]propazine (labeled uniformly in the triazine ring, specific activity of 49.42 mCi/mmole) was applied as one broadcast spray directed to the soil of test plots at target rates of 2.4 and 4.8 lb ai/A; the achieved application rates were verified at 1.96 and 3.91 lb ai/A, respectively. Sorghum forage samples were harvested 45 days after treatment, while grain and stover samples were harvested 124 days posttreatment. The in-life phase was conducted by PTRL East, Inc. (Richmond, KY), and the analytical phase was conducted by PTRL West, Inc. (Richmond, CA).

Total radioactive residues were 0.126, 0.133 and 2.344 ppm in/on sorghum forage, grain and fodder (stover), respectively, following one application of [^{14}C]propazine at 1.96 lb ai/A. At the treatment rate of 3.91 lb ai/A, the TRR were 0.084, 0.132 and 2.678 ppm in the forage, grain and stover, respectively. Samples which received the treatment rate of 1.96 lb ai/A were selected for residue characterization and identification.

Residues in/on treated sorghum matrices were extracted using a series of solvent systems. Solvent extraction with methanol and methanol/water released 67.6% of TRR in forage and 53.4% of TRR in stover. For grain, extraction with methanol and methanol/water released 39.7% of TRR, and hydrolysis with 6 N HCl further released 34.1% of TRR. Additional radioactivity was released in sorghum matrices by: (i) methanol/0.1 N HCl for grain; (ii) 0.1 N HCl; and (iii) 3 N KOH. Nonextractable residues following extraction/hydrolysis accounted for 4.8%, 6.0% and 12.1% TRR in the forage, grain and stover, respectively. The accountabilities were 101.6%, 103.8% and 97.4% in forage, grain and stover, respectively. Residues were identified and quantitated primarily by C18 and SCX HPLC co-chromatography with confirmatory analysis by HPLC and/or TLC co-chromatography. These methods successfully identified the predominant residues in sorghum forage, grain and stover.

In **forage**, chromatographic analysis of the combined methanol and methanol/water extracts (subsample B) identified the parent propazine as a trace component at 0.8% TRR (0.001 ppm). The chlorometabolite, atrazine des-ethyl (G-30033), was identified at 8.7% TRR (0.011 ppm)

along with the following hydroxymetabolites: propazine 2-hydroxy (GS-11526) at 13.5% TRR (0.017 ppm) and atrazine des-ethyl 2-hydroxy (GS-17794) at 8.7% TRR (0.011 ppm).

In **grain**, chromatographic analysis of the combined methanol and methanol/water extracts (subsample A) also showed trace amounts of the parent propazine at 0.8% TRR (<0.001 ppm). Other residue components include atrazine des-ethyl 2-hydroxy (GS-17794) at 10.3% TRR (0.013 ppm) and propazine 2-hydroxy (GS-11526) at 2.3% TRR (<0.003 ppm).

In **stover (fodder)**, chromatographic analysis of the chloroform layer of the combined methanol and methanol/water extracts (subsample D) resolved propazine at 0.5% TRR (0.011 ppm). All other residue components were identified at <10% TRR. Atrazine des-ethyl (G-30033) and prometon (G-31435) accounted for 1.7% TRR (<0.039 ppm) and 1.6% TRR (0.037 ppm), respectively. Propazine 2-hydroxy (GS-11526), atrazine des-ethyl 2-hydroxy (GS-17794), and GS-16141 accounted for 2.7% TRR (0.064 ppm), 3.3% TRR (0.077 ppm), and 3.4% TRR (0.080 ppm), respectively (quantified in the 6 N HCl extracts and combined methanol and methanol/water extracts of subsample A). Ammeline (GS-17791) and atrazine des-ethyl des-isopropyl (G-28273) both accounted for 2.2% TRR (<0.052 ppm; quantified in the combined methanol and methanol/water extracts of subsample A). The ammeline (GS-17791) and atrazine des-ethyl des-isopropyl (G-28273) peaks, overlapping in all HPLC methods employed in the study, accounted for an additional 3.7% TRR (0.086 ppm). CGA-101248 accounted for 2.7% TRR (0.064 ppm; quantified in the combined methanol and methanol/water extracts of subsample A).

The remaining radioactivity in sorghum matrices was characterized as unassigned or diffuse radioactivity, accounting for 35.7% TRR (0.045 ppm, ~27 peaks) in forage, 27.1% TRR (0.036 ppm, ~10 peaks) in grain, and 46.1% TRR (1.081 ppm, ~49 peaks) in stover. In forage, ~18% TRR was characterized based on acid hydrolysis (0.1 N HCl and 6 N HCl), and 11.2% TRR was characterized following base hydrolysis. In grain, 2.1% TRR was characterized based on acidic methanol extraction, approximately 42% TRR was characterized based on acid hydrolysis (0.1 N HCl and 6 N HCl), and 13.6% TRR was characterized following base hydrolysis. In stover, 16.1% TRR was characterized based on acid hydrolysis with 0.1 N HCl, and 2.8% TRR was characterized following base hydrolysis. In forage and grain, the dichloromethane partitioning of the hydrolysates of the 6 N HCl and 3 N KOH extractions, which were found to contain ~10% TRR, indicated that the radioactivity compounds were highly polar, water-soluble materials, not organic. These hydrolysates could not be analyzed by HPLC due to their viscosity after concentration.

An additional subsample of sorghum stover (subsample B) was subjected to a different extraction scheme after the initial extraction with methanol and methanol/water in order to maximize the release of radiocarbon by using increasingly harsh extractions to break down the plant constituents into various classes of organic materials. Solvent extraction with methanol and methanol/water released the majority of the TRR (66.5%). Additional radioactivity was released in sorghum stover by: (i) phosphate buffer (6.5% TRR, 0.152 ppm); (ii) α-amylase (4.0% TRR, 0.095 ppm); (iii) pronase (2.7% TRR, 0.062 ppm); (iv) pectin (3.1% TRR, 0.072 ppm); (v) lignin

(1.8% TRR, 0.043 ppm); (vi) hemicellulose (5.0% TRR, 0.116 ppm); and (vii) cellulose (4.2% TRR, 0.099 ppm). Nonextractable residues following extraction/hydrolysis accounted for 1.4% TRR. No metabolites were identified in the HPLC analyses of the exhaustive/enzymatic extractions.

Sorghum forage samples were stored frozen for ~8 months prior to extraction, while the grain and stover samples were stored frozen for 5 months prior to extraction. The time intervals between extractions and analyses of the test sorghum matrices were not provided. Methanol and methanol/water extraction conducted 24 months after the original extraction date indicated no loss of radioactivity. Subsequent chloroform partitioning of the combined methanol extracts, performed two months after extraction, also yielded a metabolic profile similar to that of the initial chloroform partitioning. No additional storage stability data are required to support the study.

Based on the results of the sorghum metabolism study, the petitioner concluded that propazine is rapidly and extensively metabolized in sorghum via: (i) N-dealkylation; (ii) replacement of chlorine by hydroxy; and (iii) glutathione conjugation. The petitioner stated that the results of the study were similar to other published results of triazine herbicides.

860.1300 Nature of the Residue - Livestock

The nature of propazine residues in livestock is adequately understood based on adequate metabolism studies with goats and hens. Propazine metabolism in animals is similar to that in plants, involving dealkylation and conjugation, with the triazine ring remaining intact. Consistent with the Memorandum of Understanding between HED and Griffin Corporation for Propazine (see 1/11/96 memo of M. Metzger), the residues of concern in animals for tolerance reassessment are the parent plus the chlorometabolites G-30033 and G-28273. Risk assessment would be done using parent plus chlorometabolites for carcinogenic risk assessment, and hydroxymetabolites or total radioactive residues for chronic non-cancer risk assessment. The Executive Summaries of the animal metabolism study DERs are reproduced below.

Goat, [^{14}C]propazine as the test substance

44184815.der.wpd

Griffin Corporation has submitted a goat metabolism study with propazine. The test substance, [^{14}C]propazine (labeled uniformly in the triazine ring, specific activity of 49.42 mCi/mmole), was administered orally to a single lactating goat at 9.9 ppm in the diet. The goat was dosed once per day for seven consecutive days. Milk was collected twice daily throughout the study, and tissues (muscle, fat, liver, and kidney) were collected at sacrifice. The in-life and analytical phases of the study were conducted by PTRL East, Inc. (Richmond, KY).

Total radioactive residues were 0.080-0.238 ppm in milk, 1.123 ppm in liver, 1.041 ppm in kidney, 0.209 ppm in muscle, and 0.160 ppm in fat. Radioactivity was highest in liver and kidney, and lowest in fat. Residues in milk were generally highest in samples collected 8 hours after

dosing and appeared to have reached a plateau after two days of dosing. The study reported that a large portion of the administered dose was excreted, with urine and feces (including cage washes and solids) accounting for a total of ~74% of the administered dose.

Radioactive residues in goat milk and tissues were adequately extracted using water and a combination of organic solvents. Enzyme hydrolysis was also used to release bound residues in muscle and fat tissues only. In milk, ~91% of TRR was retained in the aqueous fraction with hexane extraction. In tissues, ~86-98% of TRR was extractable with water, and additional minor amounts (<3% TRR) were sequentially extracted with ACN/water, ACN, and hexane. Nonextractable residues after solvent extraction and enzyme hydrolysis were 18.9% TRR (0.042 ppm) for milk, 10.8% TRR (0.113 ppm) for kidney, 6.1% TRR (0.068 ppm) for liver, 5.9% TRR (0.012 ppm) for muscle, and 7.2% TRR (0.012 ppm) for fat. These data suggest that further attempts should have been made to release the nonextractable/bound residues in kidney and liver.

Residues in extracts and hydrolysates were subjected to HPLC analysis. Metabolites were identified by comparison of retention times or co-chromatography with 17 reference standards including standards of known chloro- and hydroxy-metabolites of triazine herbicides. The identities of metabolites were confirmed by TLC co-chromatography.

Approximately 73% of TRR was identified in goat milk, 50% TRR in fat, 26% TRR in muscle, and <3% TRR in kidney and liver. The parent propazine was not detected in goat milk or tissues. Atrazine-desethyl-desisopropyl (G-28273) was the principal residue component identified in milk (63.4% TRR, 0.141 ppm), fat (50.4% TRR, 0.080 ppm), muscle (26.1% TRR, 0.054 ppm), and liver (2.7% TRR, 0.031 ppm). The metabolite atrazine-desethyl (G-30033) was only identified in milk (9.4% TRR, 0.021 ppm).

The remaining radioactivity in goat milk and tissues was characterized to be comprised of up to six unknown metabolites. Although each unknown accounted for <7% TRR in milk, several unknowns were present at significant levels in goat tissues. None of these unknown residues co-chromatographed with propazine, propazine-2-hydroxy, ammelide or any other reference standards used in the study. Region G was the major unknown component in kidney (59.5% TRR, 0.619 ppm) and liver (76.1% TRR, 0.855 ppm) but was present at lower levels in muscle (5.8% TRR, 0.012 ppm) and fat (15.6% TRR, 0.025 ppm). Region G was characterized by the petitioner as stable to glucuronidase, sulfatase, and 3 N HCl hydrolysis. Based on the metabolism of other triazine herbicides, the petitioner proposed that the unknown may be an acid stable glutathione conjugate of propazine or one of its biotransformations.

Another unknown, Region A, was quantitated at >10% TRR in muscle (19.9% TRR, 0.042 ppm), fat (10.3% TRR, 0.016 ppm), and kidney (10.2% TRR, 0.106 ppm). Region E was detected in kidney as a significant residue at 21.2% TRR (0.221 ppm). The petitioner stated that acid and enzyme hydrolysis was conducted on the pronase hydrolysate of the aqueous extract of kidney to further characterize unknown residues. However, no discussion of the results and no chromatograms for the acid and enzyme hydrolysates were presented.

Milk samples were stored frozen for <6 months and tissues for ~7 months. Adequate storage stability data were submitted demonstrating the stability of the metabolic profile in goat kidney and liver for up to ~23 months.

Based on the results of the study, the petitioner concluded that propazine is metabolized in goats via sequential dealkylation of the isopropyl alkyl groups with excretion in the urine, primarily as the di-dealkylated metabolite (atrazine-desethyl-desisopropyl or G-28273). A water soluble hydrolytically stable conjugate of propazine or one of its metabolites may also be formed, which is the major metabolite in goat tissues.

Goat, [^{14}C]hydroxypropazine as the test substance

44184817.der.wpd

Griffin Corporation has submitted a goat metabolism study with [^{14}C]hydroxypropazine. The test substance, [U-^{14}C]2-hydroxypropazine (specific activity 55.9 mCi/mmole), was administered orally to a single goat at 10.9 ppm in the diet. The goat was dosed once per day for three consecutive days. Milk was collected twice daily throughout the study, and tissues (muscle, fat, liver, and kidney) were collected at sacrifice. The in-life and analytical phases of the study were conducted by Corning Hazelton, Inc. (Madison, WI).

Total radioactive residues were 0.025-0.029 ppm in milk, 0.006 ppm in muscle, 0.001 ppm in fat (renal and omental), 0.110 ppm in kidney, and 0.036 ppm in liver. Radioactivity was highest in kidney and lowest in fat. Residues in milk were at relatively constant levels during dosing.

Muscle and fat tissues were not extracted because of low radioactivity (<0.010 ppm). In milk, ~88-91% of TRR was retained in the aqueous fraction following hexane extraction, and the nonextractable residues were <7% TRR (0.001-0.002 ppm). The majority of radioactivity was extracted from kidney and liver with methanol/water, with ~40-43% TRR being retained in the aqueous fraction. In liver, 66% TRR (0.024 ppm) remained in the organic fraction, leaving <8% TRR (0.003 ppm) as nonextractable residues. In kidney, only ~34% TRR (0.038 ppm) remained in the organic fraction, and nonextractable residues were <0.05 ppm (26.5% TRR, 0.029 ppm). Accountabilities were ~93-114%. Residues were identified by HPLC analysis, using 2D-TLC, a second HPLC method, and/or cation exchange chromatography for confirmation. These methods successfully identified the predominant residues in goat matrices. No supporting storage stability data are required because milk and tissue samples from the subject goat metabolism study were stored frozen and analyzed within 6 months of collection.

Approximately 66-81% TRR were identified in goat milk, kidney, and liver. The test substance, hydroxypropazine, was found to be the major residue in all matrices, accounting for 63.5% TRR (0.069 ppm) in kidney, 77.2% TRR (0.028 ppm) in liver, and 65.0-69.4% TRR (0.017-0.020 ppm) in milk. The only other metabolite identified was desisopropyl hydroxypropazine, which was detected in minor amounts in all matrices: 2.9% TRR (0.003 ppm) in kidney, 3.6% TRR (0.001 ppm) in liver and 8.2-8.5% TRR (0.002 ppm) in milk. The remaining radioactivity was

attributed to unknowns accounting for 10.3% TRR in kidney, 24.7% TRR in liver, and ≤14.8% TRR in milk; no individual peak unknown was present at >0.003 ppm.

Based on the results of the study, the petitioner concluded that hydroxypropazine is metabolized in goats by N-dealkylation to yield desisopropyl hydroxypropazine. Furthermore, the petitioner stated that hydroxypropazine, the polar metabolite of propazine, is likely rapidly excreted by lactating animals with little deposition into tissues.

Poultry

44184816.der.wpd

Griffin Corporation has submitted a study investigating the metabolism of [^{14}C]propazine (labeled uniformly in the triazine ring; specific activity of 49.42 mCi/mmole) in laying hens. The test substance was orally administered to five hens at 20.3 ppm in the diet. The hens were dosed once per day for 14 consecutive days. Eggs were collected twice daily, and tissues (liver, fat, and muscle) were collected at sacrifice. The in-life and analytical phases of the study were conducted by PTRL East, Inc.

Total radioactive residues were 0.019-0.448 ppm in whole egg, 0.010-0.669 ppm in egg yolk, 0.024-0.327 ppm in egg white, 1.196 ppm in liver, 0.961 ppm in composite muscle, and 0.172 ppm in composite fat. Residues in eggs appeared to plateau after 9 days of dosing. The study reported that a large portion of the administered dose was excreted, ~77% in the collected excreta and ~5% in the cage wash.

Approximately 72-104% of TRR in poultry liver, egg yolk, and egg white were readily extracted using water. For muscle and fat, water extraction only released ~42-45% of TRR. Subsequent extraction with ACN/water released <5% of the radioactivity from all matrices; additional extractions with organic solvents released <2% of the radioactivity. Nonextractable residues remaining after these solvent extractions measured 15.9% TRR (0.191 ppm) in liver, 50.6% TRR (0.587 ppm) in muscle, 103.6% TRR (0.178 ppm) in fat, 22.6% TRR (0.151 ppm) in egg yolk, and 0.3% TRR (0.001 ppm) in egg white. The nonextractable residues of all of these matrices, except egg white, were subjected to protease hydrolysis. The nonextractable residues remaining after protease hydrolysis measured 0.5% TRR (0.006 ppm) in liver, 3.9% TRR (0.045 ppm) in muscle, 34.2% TRR (0.059 ppm) in fat and 0.5% TRR (0.003 ppm) in egg yolk. The accountabilities ranged ~92-105% for all hen matrices, except fat (~132%).

Residues in extracts and hydrolysates were characterized primarily by HPLC analysis. Residue components were identified by co-chromatography and/or retention time comparison with 17 reference standards which included several putative chloro- and hydroxy-metabolites of triazine herbicides. TLC analysis was performed as a confirmatory technique.

Characterization of the radioactive residues in hen tissues and egg samples by HPLC indicated the presence of at least eight metabolites. The parent propazine was not detected in any extracts and/or hydrolysates. The only residue component identified was atrazine-desethyl-desisopropyl

(G-28273) which was quantitated in poultry matrices as follows: liver (4.3% TRR, 0.171 ppm), muscle (18.3% TRR, 0.212 ppm), fat (48.1% TRR, 0.083 ppm), egg yolk (35.3% TRR, 0.236 ppm), and egg white (51.9% TRR, 0.170 ppm). Seven unknown compounds were found in the matrices: A (RT 4.0-5.5 min.), B (RT 6.0-7.0 min.), C (RT 9.0-9.5 min.), E (RT 14.0 min.), F (RT 15.0-16.5 min.), G (RT 17.0-18.0 min.) and H (RT 25.0-26.0 min.). Compounds A, B, C, G and H were observed at >10% TRR in various matrices. HED would have preferred that additional attempts, such as LC/MS analysis, were made to identify these compounds. However, the petitioner characterized these unknown metabolites to be relatively more polar than propazine based on the chromatographic profiles.

Samples were stored frozen for up to 4 months prior to residue characterization. To demonstrate the stability of frozen samples while in storage, the extracts of liver tissue and egg white were reanalyzed by HPLC after approximately 19 months of sample collection. The results of these analyses indicate that metabolite profiles were stable in liver extracts during frozen storage. In the case of the egg white extracts, reanalysis indicated that a conjugated form of atrazine-desethyl-desisopropyl degraded to atrazine-desethyl-desisopropyl during frozen storage.

Based on the study results, the petitioner concluded that all of the metabolites which were observed in the study were more polar than propazine, indicating that propazine is readily metabolized in the laying hen to more polar metabolites. The petitioner determined that propazine was metabolized via dealkylation of the two isopropyl alkyl group, generating atrazine-desethyl-desisopropyl as a major metabolite. Further degradation to the multiple polar metabolites was suggested to occur via oxidation and/or conjugation.

860.1340 Residue Analytical Methods

Plant commodities

An adequate enforcement method is currently not available and is required for propazine and its two chlorometabolites (G-30033 and G-28273), the terminal residues of concern for tolerance establishment. Currently, the Pesticide Analytical Manual (PAM) Vol. II lists Method IV (AG-281) for determination of only the chlorometabolite G-28273 in crops and animal tissues. G-28273 is extracted from crops and animal tissues by blending the finely chopped material or tissue with methanol:water (9:1; v:v). The tissue extract is washed with hexane to remove oily materials. The methanol/water extract is then taken to dryness, and G-28273 is separated from co-extractives by partition column chromatography using a pH 7.0 buffer as the stationary phase and hexane, hexane:ethyl ether (9:1; v:v), and ethyl ether as the sequential mobile phases. The G-28273 is eluted from the column with ethyl ether. The ethyl ether eluate is evaporated to dryness, and the residue is dissolved in absolute ethanol for determination of G-28273 by GC with Dohrmann microcoulometric detection in the chloride-specific mode or Coulson electrolytic conductivity detection in the nitrogen-specific mode. The detection limit is 0.1 ppm.

Samples of sorghum forage, grain, and stover, that were collected from the sorghum field trials, were analyzed for residues of propazine and its chlorometabolites by a Corning Hazelton

analytical method entitled "Determination of Propazine, Desethyl Atrazine (DEA), and Diamino Atrazine (DAA) in Forage, Grain, and Stover using Capillary Gas Chromatography with Mass-Selective Detection and Nitrogen-Phosphorous Detection", dated 10/16/96. Briefly, a representative sample is soxhlet-extracted with acetone, concentrated by rotary evaporation, and diluted with acetone. An aliquot is extracted with ethyl acetate and saturated sodium chloride. The organic layer is reserved, and the water layer is re-extracted. The organic layers are combined and evaporated to dryness. Residues are redissolved in water and cleaned up on a Chem-Elut column. Residues are eluted with 15% ethyl acetate/hexane for isolation of propazine and DEA (G-30033, Fraction A). The eluate is evaporated to dryness, redissolved in ethyl acetate, and analyzed for propazine and G-30033 using GC/MSD. A second aliquot is taken for isolation of G-28273. The aliquot is evaporated to dryness and redissolved in water. The water solution is centrifuged and cleaned up on a Chem-Elut column. Residues of DAA are eluted with 50% ethyl acetate/hexane (fraction B). The eluate is evaporated to dryness, redissolved in acetone, and cleaned up on a LC-SCX column. Residues are eluted with 1 N ammonium hydroxide:methanol (1:3, v:v). The eluate is mixed with phosphate buffer (pH 6.5) and ethyl acetate. The organic layer is reserved, and the water layer is re-extracted. The organic layers are combined and evaporated to dryness. Residues are redissolved in ethyl acetate and analyzed for G-28273 using GC/NPD. The limit of quantitation (LOQ) for each analyte in all RACs is 0.05 ppm. This method has been deemed adequate for data collection based on acceptable concurrent method recovery data.

HED recommends that the data-collection method (CHW 6641-106, Method 1, Rev. 1) be subjected to an independent laboratory validation (ILV) as per GLN 860.1340. If the ILV is successful, the method will be subjected to further validation by Agency chemists at ACL/BEAD.

Animal commodities

At this time, animal enforcement methods are not required for the reinstatement of propazine uses on sorghum since there is no expectation of finite secondary residues in animal commodities (See Section 860.1480 Meat, Milk, Poultry, and eggs).

860.1360 Multiresidue Methods

According to FDA's PAM Volume I, Appendix II, propazine is completely recovered using Section 302 (Protocol D), partially recovered using Section 303 (Protocol E), and not recovered using Section 304 (Protocol F). There are no multiresidue methods recovery data for G-30033 and G-28273, and these data are required. To fulfill this requirement, the petitioner is required to follow the directions for the protocols found in PAM Vol. I, Appendix II under paragraph (d)(1) of OPPTS GLN 860.1360, starting with the decision tree for multiresidue methods testing and the accompanying guidance found in the suggestions for producing quality data.

860.1380 Storage Stability

Plant commodities

Samples from the conducted sorghum field trials and limited field rotational crop trials are not supported by storage stability data. However, the petitioner has indicated that a storage stability study has been initiated and will be submitted in a separate report upon completion. Samples from the sorghum field trials were stored frozen for 25.7-26.6 months prior to residue analysis. The maximum frozen storage intervals of samples from the limited field rotational crop trials were 129 days (4.2 months) for lettuce, 79 days (2.6 months) for mustard leaves, 100 days (3.3 months) for radish tops and roots, 79 days (2.6 months) for turnip tops and roots, 141days (4.6 months) for wheat forage, 125 days (4.1 months) for wheat hay, and 89 days (2.9 months) for wheat grain and straw. The submitted plant and animal metabolism studies are supported by adequate storage stability data. The chromatographic profiles of residues appeared stable following re-analysis of select matrices.

Animal commodities

Storage stability data for animal commodities are not required since animal feeding studies are not needed; there is no expectation of finite secondary residues in animal commodities.

860.1400 Water, Fish, and Irrigated Crops

There are no registered or proposed uses that are relevant to this guideline topic.

860.1460 Food Handling

There are no registered or proposed uses that are relevant to this guideline topic.

860.1480 Meat, Milk, Poultry, and Eggs

Sorghum grain, forage, and stover are livestock feed items. Following tolerance reassessment, the maximum theoretical dietary burden of propazine has been calculated (see Table 3) as follows: 0.46 ppm for beef cattle, 0.50 ppm for dairy cattle, 0.225 ppm for swine, and 0.20 ppm for poultry.

Table 3. Calculation of Maximum Dietary Burdens of Propazine to Livestock.

Feedstuff	% Dry Matter [1]	% Diet [1]	Estimated Tolerance (ppm)	Dietary Contribution (ppm) [2]
Beef Cattle				
Sorghum grain	86	40	0.25	0.116
Sorghum forage	35	40	0.25	0.286
Sorghum stover	88	20	0.25	0.057
TOTAL BURDEN	--	100	--	**0.46**

Table 3. Calculation of Maximum Dietary Burdens of Propazine to Livestock.				
Feedstuff	% Dry Matter [1]	% Diet [1]	Estimated Tolerance (ppm)	Dietary Contribution (ppm) [2]
Dairy Cattle				
Sorghum grain	86	40	0.25	0.116
Sorghum forage	35	50	0.25	0.357
Sorghum stover	88	10	0.25	0.028
TOTAL BURDEN	--	100	--	**0.50**
Swine				
Sorghum grain	86	90	0.25	0.225
TOTAL BURDEN	--	90	--	**0.225**
Poultry				
Sorghum grain	86	80	0.25	0.200
TOTAL BURDEN	--	80	--	**0.20**

[1] Table 1 (OPPTS Guideline 860.1000).

[2] Contribution = ([tolerance /% DM] x % diet) for beef and dairy cattle; contribution = (tolerance x % diet) for poultry and swine.

In a goat metabolism study where [^{14}C]propazine was administered orally to a single lactating goat at 9.9 ppm in the diet, the parent propazine was not detected in goat milk or tissues. The metabolite G-28273 was the principal residue identified in milk (63.4% TRR, 0.141 ppm), fat (50.4% TRR, 0.080 ppm), muscle (26.1% TRR, 0.054 ppm), and liver (2.7% TRR, 0.031 ppm). The metabolite G-30033 was only identified in milk (9.4% TRR, 0.021 ppm). When the residue level in milk, which shows the highest residue from the study, is interpolated to 1x of the MTDB, the expected residue of G-28273 is about 0.007 ppm.

In a poultry metabolism study where [^{14}C]propazine was administered at 20.3 ppm in the diet, the parent propazine was not identified in eggs and tissues. The only residue identified was G-28273 which was quantitated in poultry matrices as follows: liver (4.3% TRR, 0.171 ppm), muscle (18.3% TRR, 0.212 ppm), fat (48.1% TRR, 0.083 ppm), egg yolk (35.3% TRR, 0.236 ppm), and egg white (51.9% TRR, 0.170 ppm). When the residue level in egg yolk, which shows the highest residue from the study, is interpolated to 1x of the MTDB, the expected residue of G-28273 is about 0.002 ppm

The results of animal metabolism studies suggest a Category 3 situation with regard to the need for animal commodity tolerances as per 40 CFR §180.6. There is no expectation of finite residues of propazine and its chlorometabolites in animal commodities as a result of the proposed use on sorghum. Thus, animal feeding studies are not needed, and tolerances need not be established for meat, milk, poultry, and eggs.

860.1500 Crop Field Trials

Pending submission of supporting storage stability data and label revision, the proposed use of propazine is supported by adequate residue data. Following a single preemergence broadcast application of a representative FlC formulation of propazine at 1.47-2.43 lb ai/A (1.2-2.0x the proposed single application rate), the results of the sorghum field trials indicate the following: In **sorghum forage** harvested at a PHI range of 69-117 days, residues of propazine and G-30033 were each less than the LOQ (<0.05 ppm) in/on 26 treated samples. Residues of G-28273 ranged 0.050-0.087 ppm in/on four treated forage samples but were <0.05 ppm in/on 22 treated samples. In **sorghum grain and stover** harvested at a PHI range of 86-152 days, residues of propazine, G-30033, and G-28273 were each <0.05 ppm in/on 26 treated samples. These data support the proposed tolerance of 0.25 ppm each for the combined residues of propazine and its two chlorometabolites (G-30033 and G-28273) in/on sorghum stover, forage, and grain. Residue data on the aspirated grain fractions of sorghum are not required since the proposed use of propazine on grain sorghum is for preemergence or preplant application.

The Executive Summary of the sorghum field study DER is reproduced below.

Sorghum grain, forage and stover

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Griffin Corporation has submitted field trial data on sorghum with propazine. A total of 13 sorghum trials were conducted in Regions 2 (GA; 1 trial), 4 (AR and MO; 2 trials), 5 (IL, KS, and NE; 3 trials), 6 (OK and TX; 4 trials), 7 (SD; 1 trial), and 8 (CO and TX; 2 trials) during the 1994 growing season. Geographic representation of residue data is adequate since the number and locations of field trials are in accordance with OPPTS Guideline 860.1500.

The field study was designed to include three plots at each field trial site. Plot 1 was untreated to provide control samples. Two additional plots each received a single preemergence broadcast application of the 4 lb/gal flowable concentrate (FlC) formulation at low rates (Treatment Plot 2) or high rates (Treatment Plot 3). Nominal "low rates" of ~0.75, 1.5, or 2.4 lb ai/A were applied in plots with soil described as coarse-, medium-, or fine-textured, respectively. Nominal "high rates" of ~1.5, 3.0, or 4.8 lb ai/A were also applied in plots with soil described as coarse-, medium-, or fine-textured, respectively. Soil analysis was not conducted before application of the propazine test substance, and the principal study investigator 'estimated' the soil texture designation by direct examination and by using available information sources; the target application rates for each soil texture were based on these estimates. Application was made in 10-17 gal/A of water using ground equipment. Samples of sorghum forage (whole green plants) were collected at the late or hard dough stage at a 69- to 117-day PHI, and samples of sorghum grain and stover were collected at normal harvest for each test location with a PHI range of 85/86 to 152 days.

Following treatment, soil samples from each treatment plot were sent to Agvise Laboratories (Northwood, ND) for texture characterization. The results of soil analysis showed discrepancies between the field investigator's "estimates" and the laboratory determinations of soil texture. It was reported that the actual applied rates ranged from 60.4-320% of target rates. Consequently, the study submission only reported residue data from treatment rates bracketing the application rate of 1.2 lb ai/A, which is the maximum single application rate the petitioner wishes to support (see 6/30/2004 Propazine Use Closure Memo) and the rate approved for Section 18 (96-TX-02, dated 1/31/96) use on sorghum for all soil types.

Samples of sorghum forage, grain, and stover were analyzed by a Corning Hazelton analytical method (CHW 6641-106, Method 1, Rev. 1) entitled "Determination of Propazine, Desethyl Atrazine (DEA), and Diamino Atrazine (DAA) in Forage, Grain, and Stover using Capillary Gas Chromatography with Mass-Selective Detection and Nitrogen-Phosphorous Detection", dated 10/16/96. The method determines residues of propazine and the chlorometabolite DEA (aka G-30033) by GC/MSD, while residues of DAA (aka G-28273) are quantitated by GC/NPD. The LOQ for propazine, DEA, and DAA in all sorghum matrices is 0.05 ppm for each analyte. Overall, the method is adequate for data collection based on acceptable concurrent method recovery data.

Samples were stored frozen for 25.7-26.6 months prior to residue analysis. The petitioner stated that a storage stability study has been initiated and will be submitted in a separate report upon completion. In the interim, the petitioner cited the storage stability data submitted in conjunction with a sorghum metabolism study (MRID 44184814). These data indicate that the metabolic profiles of select sorghum extracts are reasonably unchanged after 25 months of freezer storage. The petitioner has also cited the available storage stability data (MRID 41258601) for corn matrices which indicate that residues of DEA and DAA are stable for at least 24 months. A summary of the residue data from the sorghum field trials with propazine is presented below in Table 4.

TABLE 4. Summary of Residue Data from Sorghum Field Trials with Propazine.

Commodity	Analyte	Total Applic. Rate (lb ai/A)	PHI (days)	Residue Levels (ppm) [1]						
				n	Min.	Max.	HAFT[2]	Median (STMdR[3])	Mean (STMR[4])	Std. Dev.
Sorghum forage	Propazine	1.47-2.43	69-117	26	<0.05	<0.05	<0.05	<0.05	<0.05	0.0
	DEA			26	<0.05	<0.05	<0.05	<0.05	<0.05	0.0
	DAA			26	<0.05	0.087	0.078	0.05	0.052	0.008
	Total			26	<0.15	<0.187	<0.178	0.150	0.152	0.008
Sorghum grain	Propazine	1.47-2.43	85-152	26	<0.05	<0.05	<0.05	<0.05	<0.05	0.0
	DEA			26	<0.05	<0.05	<0.05	<0.05	<0.05	0.0
	DAA			26	<0.05	<0.05	<0.05	<0.05	<0.05	0.0
	Total			26	<0.15	<0.15	<0.15	<0.15	<0.15	0.0
Sorghum stover	Propazine	1.47-2.43	86-152	26	<0.05	<0.05	<0.05	<0.05	<0.05	0.0
	DEA			26	<0.05	<0.05	<0.05	<0.05	<0.05	0.0

TABLE 4. Summary of Residue Data from Sorghum Field Trials with Propazine.

Commodity	Analyte	Total Applic. Rate (lb ai/A)	PHI (days)	Residue Levels (ppm) [1]						
				n	Min.	Max.	HAFT[2]	Median (STMdR[3])	Mean (STMR[4])	Std. Dev.
	DAA			26	<0.05	<0.05	<0.05	<0.05	<0.05	0.0
	Total			26	<0.15	<0.15	<0.15	<0.15	<0.15	0.0

[1] For the determination of minimum, maximum, HAFT, median, mean, and standard deviation values, the LOQ (<0.05 ppm) was used for residues reported as nonquantifiable (NQ).
[2] HAFT = Highest Average Field Trial.
[3] STMdR = Supervised Trial Median Residue.
[4] STMR = Supervised Trial Mean Residue.

860.1520 Processed Food and Feed

Table 1 of OPPTS 860.1000 lists flour as a processed commodity of grain sorghum. At this time, residue data on sorghum flour are not needed since this item is used exclusively in the U.S. as a component for drywall, and not as either human food or a feedstuff. However, because 50% of the worldwide sorghum production goes toward human consumption, data may be needed at a later date.

860.1650 Submittal of Analytical Reference Standards

Analytical standards for propazine are currently available at the National Pesticide Standards Repository. However, standards for the chlorometabolites G-30033 and G-28273 are not available and are required. Analytical reference standards of propazine and its chlorometabolites must be supplied and supplies replenished as requested by the Repository. The reference standards should be sent to the Analytical Chemistry Lab, which is located at Fort Meade, to the attention of either Theresa Cole or Frederic Siegelman at the following address:

USEPA
National Pesticide Standards Repository/Analytical Chemistry Branch/OPP
701 Mapes Road
Fort George G. Meade, MD 20755-5350
(Note that the mail will be returned if the extended zip code is not used.)

860.1850 Confined Accumulation in Rotational Crops

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The nature of propazine residues in rotational crops is adequately understood. The propazine residues of concern in rotational crops, for the purposes of tolerance establishment and risk assessment, are those identified by HED in the 1/11/96 Memorandum of Understanding. The Executive Summary of the submitted confined rotational crop study DER is reproduced below.

Griffin Corporation has submitted a confined rotational crop study with propazine. The radiolabeled test substance, [^{14}C]propazine (labeled uniformly in the triazine ring, specific activity of 49.42 mCi/mmole), was mixed with formulation blank and applied to bare sandy loam soil in three planting containers at 2.39 lb ai/A. Lettuce, turnip, and spring wheat were planted in the treated soil as rotational crops at plantback intervals (PBIs) of 29, 120, and 365 days. The in-life phase was conducted by PTRL East, Inc. (Richmond, KY), and the analytical phase was conducted by PTRL West, Inc. (Richmond, CA).

Severe phytotoxicity occurred with the 29-day PBI lettuce and turnip and 365-day PBI turnip crops, and samples were not collected. It was noted that chlorosis was also observed on the tips of immature wheat from the 29-day PBI. The petitioner attributes the better survival of the 120-day PBI crops to the growing environment, because the 29- and 365-day PBI rotations were initiated and mostly maintained outdoors, while the 120-day PBI rotation was conducted entirely in the greenhouse creating a less stressful condition.

Total radioactive residues (TRR) accumulated at ≥0.01 ppm in/on all rotated crops planted 29, 120 or 365 days following treatment. TRR were highest in wheat straw, grain, and forage. Generally, TRR decreased in wheat crop matrices with increased plantback intervals (PBIs); however, the TRR actually increased from the 120-day to 365-day PBI in wheat forage and lettuce. At the 29-day PBI, residues were 1.298, 1.680, and 5.787 ppm in wheat forage, grain, and straw, respectively; lettuce and turnips were not sampled at this plantback interval. At the 120-day PBI, residues were 0.355, 0.928, and 1.987 ppm in wheat forage, grain, and straw, respectively, and 0.057-0.179 ppm in lettuce, turnip tops, and turnip roots. At the 365-day PBI, residues were 0.450, 0.245, and 1.028 ppm in wheat forage, grain, and straw, respectively, and 0.209 ppm in lettuce; turnips were not sampled at this plantback interval.

Extraction with methanol and methanol/water released the majority of the TRR (65-99% TRR) from rotational lettuce, turnip tops and roots, and wheat forage; the majority of the radioactivity was released with the initial methanol extraction. Extraction with methanol and methanol/water was variable in wheat grain and straw: ~50-79% TRR from 29- and 120-day PBI grain and straw and ~16-18% TRR from 365-day PBI grain and straw. Subsequent acid extraction, mild and strong acid hydrolysis, and/or base hydrolysis released ~7-21% TRR in lettuce, ~11-18% TRR in turnip tops and roots, ~14-26% TRR in wheat forage, ~23-61% TRR in wheat grain, and ~19-55% TRR in wheat straw; the majority of the radioactivity in mature wheat matrices (grain and straw) was tightly bound and mostly released with strong acid and base hydrolysis. Nonextractable residues remaining following extraction/hydrolysis accounted for ≤8% TRR in all rotational crop matrices, except for 365-day PBI wheat straw which had 13% TRR (0.135 ppm) as nonextractable residues. A separate subsample was extracted with methanol and methanol/water and partitioned with chloroform to aid in identifying and quantitating residues. The extraction procedures extracted sufficient residues from rotational crop matrices from all PBIs. Accountabilities were ~74-114%.

The petitioner did not provide the dates of sample extraction and analysis; however, based on the study initiation and completion dates, samples may have been stored for up to ~2 years.

Re-analysis of the methanol/water extract of 120-day PBI wheat grain indicated that propazine had degraded (from 0.117 ppm to 0.042 ppm) to more polar compounds within 4 months of frozen storage. Re-analysis of the methanol/water extract of 120-day PBI wheat straw indicated a slight decrease in propazine and a corresponding increase in the metabolites, especially atrazine des-ethyl 2-hydroxy within 4 months of frozen storage.

Total identified residues ranged 27-88% TRR in all rotated crop commodities, except in 365-day PBI wheat grain and straw for which only 4-5% TRR was identified. Propazine and the hydroxy metabolite, atrazine des-ethyl 2-hydroxy (GS-17794), were identified in all rotational crop matrices from all plantback intervals. The chlorometabolite atrazine des-ethyl (G-30033) was identified at significant levels in 120-day turnip tops, and 29- and 120-day PBI forage but was a minor component in 120- and 365-day PBI lettuce, 120-day PBI turnip roots, 365-day PBI wheat forage, 29- and 120-day PBI wheat grain and straw; atrazine des-ethyl (G-30033) was not detected in 365-day PBI wheat grain and straw. Another hydroxymetabolite, propazine 2-hydroxy (GS-11526), was identified only in 120-day PBI turnip tops, 29-day PBI wheat forage, 29- and 120-day PBI wheat grain, and 29-day PBI wheat straw. The petitioner states that since propazine 2-hydroxy (GS-11526) was detected only in the earlier plantback intervals, it is likely metabolized further to such compounds such as atrazine des-ethyl 2-hydroxy (GS-17794), which was present at all plantback intervals. The remaining radioactivity was mostly polar in nature and did not co-elute with any of the reference standards; most individual peaks were present at <10% TRR or <0.05 ppm. Unknowns from several acid or base hydrolysates could not be further identified because of large matrix co-extractives.

The petitioner provided a summary of the extractability and metabolite identification in the methanol/water extracts of lettuce, turnips, and wheat forage, grain, and straw, which is presented below without alteration (MRID 44184810). Additional minor amounts of propazine, atrazine des-ethyl (G-30033), propazine 2-hydroxy (GS-11526), and/or atrazine des-ethyl 2-hydroxy (GS-17794) were identified in the acid and/or base hydrolysates of wheat forage, grain, and straw.

Summary of Extractability and Metabolite Identification in the Methanol-Water Extracts of Lettuce, Turnip, and Immature Wheat Crops

Sample	TRR (ppm)	Extractability %	Chloro-Residues (ppm)	Hydroxy Residues (ppm)
Group II Lettuce	0.103	E = 77.8 TE = 98.5 TR = 99.7	P = 0.021 (4) ADE = 0.010 (4) TC = 0.031	2-OH = 0.000 ADE OH = 0.043* (8) TOH = 0.043
Group III Lettuce	0.209	E = 64.6 TE = 73.3 TR = 75.0	P = 0.022 (10) ADE = 0.016 (10) TC = 0.038	2-OH = 0.000 ADE OH = 0.051* (10) TOH = 0.051
Group II Turnip Tops	0.179	E = 96.5 TE = 107.3 TR = 109.2	P = 0.077 (15) ADE = 0.022 (15) TC = 0.099	2-OH = 0.013* (19) ADE OH = 0.046* (19) TOH = 0.059
Group II Turnip Tops	0.057	E = 71.6 TE = 89.4 TR = 96.3	P = 0.006 (21) ADE = 0.003 (24) TC = 0.009	2-OH = 0.000 ADE OH = 0.021* (21) TOH = 0.021
Group I Immature Wheat	1.298	E = 98.7 TE = 112.7 TR = 113.6	P = 0.510 (27) ADE = 0.137 (29) TC = 0.647	2-OH = 0.148 (29) ADE OH = 0.338* (35) TOH = 0.486
Group II Immature Wheat	0.355	E = 72.7 TE = 98.4 TR = 100.1	P = 0.118 (37) ADE = 0.053 (42) TC = 0.171	2-OH = 0.000 ADE OH = 0.065* (43) TOH = 0.065
Group III Immature Wheat	0.450	E = 73.4 TE = 92.5 TR = 94.8	P = 0.058 (45) ADE = 0.013* (48) TC = 0.071	2-OH = 0.000 ADE OH = 0.154* (49) TOH = 0.154
General	Low levels of residues based on TRR in lettuce and turnip. In immature wheat TRR was higher. Pathways of degradation/metabolism are via dealkylation/hydroxylation. Good extractability of residues was observed.			
Comparison	The degradation of propazine appears to be identical to other s-triazine herbicides such as atrazine and simazine.			

E = Extracted with Methanol-Water, TE = Total extracted, TR = Total Recovered (TE + % Unextracted).

P = Propazine, ADE = Atrazine des-ethyl, 2-OH = Propazine 2-hydroxy, ADE OH = Atrazine des-ethyl 2-hydroxy,.

TC = Total chloro-residues, TOH = Total hydroxy residues.

( ) Numbers in parentheses refer to Figure numbers on which the quantitations are based.

* Assignments were made based on chromatographic comparison with reference standards by only one method.

Summary of Extractability and Metabolite Identification in the Methanol-Water Extracts of Mature Wheat Crops

Sample	TRR (ppm)	Extractability %	Chloro-Residues (ppm)	Hydroxy Residues (ppm)
Group I Wheat Heads	1.680	E = 78.7 TE = 101.9 TR = 103.1	P = 0.257 (51) ADE = 0.090 (53) TC = 0.347	2-OH = 0.050 (54) ADE OH = 0.414* (60&62) TOH = 0.464
Group II Wheat Heads	0.928	E = 62.6 TE = 102.6 TR = 108.3	P = 0.117 (64) ADE = 0.045 (67) TC = 0.162	2-OH = 0.016 ADE OH = 0.063* (67) TOH = 0.079
Group III Wheat Heads	0.245	E = 17.7 TE = 78.4 TR = 86.2	P = <0.001 (77) ADE = 0.000 TC = <0.001	2-OH = 0.000 ADE OH = 0.012* (77) TOH = 0.012
Group I Wheat Straw	5.787	E = 49.5 TE = 90.4 TR = 93.5	P = 0.915 (79) ADE = 0.152 (81) TC = 1.067	2-OH = 0.176 (82) ADE OH = 0.384* (82&89) TOH = 0.560
Group II Wheat Straw	1.987	E = 72.5 TE = 91.0 TR = 96.4	P = 0.423 (93) ADE = 0.040 (96) TC = 0.463	2-OH = 0.000 ADE OH = 0.352* (97) TOH = 0.352
Group III Wheat Straw	1.028	E = 15.6 TE = 70.9 TR = 84.0	P = 0.006 (104) ADE = 0.000 TC = 0.006	2-OH = 0.000 ADE OH = 0.025* (104) TOH = 0.025
General	Relatively high levels of residues based on TRR in mature wheat crops. Pathways of degradation/metabolism in wheat are via dealkylation/hydroxylation. More residues were conjugated and resistant to extraction in the 365 DAT (Group III) mature wheat crops.			
Comparison	The degradation of propazine appears to be identical to other s-triazine herbicides such as atrazine and simazine.			

E = Extracted with Methanol-Water, TE = Total extracted, TR = Total Recovered (TE + % Unextracted).

P = Propazine, ADE = Atrazine des-ethyl, 2-OH = Propaine 2-hydroxy, ADE OH = Atrazine des-ethyl 2-hydroxy,.

TC = Total chloro-residues, TOH = Total hydroxy residues.

( ) Numbers in parentheses refer to Figure numbers on which the quantitations are based.

* Assignments were made based on chromatographic comparison with reference standards by only one method.

A separate subsample of 29-day PBI wheat straw was subjected to an alternate extraction scheme designed to investigate the incorporation of radioactivity to various plant components. The results are presented below and were copied without alteration from MRID 44184810. The extractability indicates that the majority of the radioactivity was not tightly bound, and HPLC analysis of each extract demonstrated that the metabolic profiles were similar to those observed in various extracts of other subsamples of wheat straw.

Extract	% of TRR (ppm)	HPLC Shown in Figure #
Methanol-Water	82.9 (4.796)	106
Phosphate Buffer	6.5 (0.375)	107
Starch Digestion	2.4 (0.140)	108
Protein Digestion	1.9 (0.112)	109
Pectin Extraction	2.3 (0.135)	110
Lignin Extraction	2.0 (0.117)	111
Hemicellulose Extraction	6.1 (0.355)	112
Cellulose Extraction	2.3 (0.131)	113
Post-Extraction Solids	1.0 (0.060)	NA

Based on the results of the confined rotational crop study, the petitioner concluded that the primary metabolic products in rotational crops were similar to those found in a sorghum metabolism study (refer to the DER for MRIDs 44184813, 44184814, and 44287315). Propazine metabolism in plants involves N-dealkylation, hydrolysis, and conjugation with glutathione. The petitioner further states that the study results confirm literature concerning the metabolism of other triazine herbicides, except that propazine and chloro-residues were detected in wheat grain in the subject study and chloro-residues are typically not seen in grain with chloro-s-triazine herbicides.

860.1900 Field Accumulation in Rotational Crops

Two limited field rotational crop trials with propazine were conducted in NC and TX. At each site, a 4 lb/gal flowable concentrate formulation of propazine was applied as a preemergence ground spray to grain sorghum, the primary crop, at a nominal rate of 1.2 lb ai/A (1.0x the proposed single application rate). The primary crop was removed (by cutting) from the plots and approximately 90 days after the test substance application. The following rotational crops were then planted at each field site: radish or turnip (a root vegetable), lettuce or mustard (a leafy vegetable), and winter or spring wheat (a cereal grain). The plantback intervals (PBI) used in the study were 94, 127, and 242/280 days for the NC field site and 97, 120, 195, and 239 days for the TX field site.

The results of the NC trial indicate that residues of propazine, G-30033, and G-28273 were each below the LOQ of 0.0500 ppm in/on all samples of rotational crop commodities (mustard leaves, turnip tops/roots, and spring/winter wheat forage, hay, straw, and grain) at all tested PBIs (94, 127, and 242/280 days). The results of the TX trial indicate that residues of propazine, G-30033, and G-28273 were each below the LOQ of 0.0500 ppm in/on the following rotational crop commodities and plantback intervals: (i) lettuce leaves at a 97-day PBI; (ii) radish root at PBIs of 97 and 239 days; (iii) wheat forage at PBIs of 120 and 195 days; (iv) wheat hay, straw, and grain at PBIs of 97, 120, and 195 days. A few rotational crop commodities from the TX trial, however, showed quantifiable residues including: (i) lettuce leaves at the 239-day PBI (propazine was detected at 0.0505-0.0510 ppm, G-30033 at 0.137-0.139 ppm, and G-28273 at 0.139 ppm); (ii) radish tops at the 97-day PBI (propazine was detected at 0.051-0.052 ppm); and (iii) wheat forage at the 97-day PBI (G-30033 was detected at 0.102-0.107 ppm). These data trigger the need for extensive field rotational trial data, as described under OPPTS 860.1900, to determine appropriate tolerances for inadvertent residues of propazine and its chlorometabolites.

A set of field accumulation in rotational crop studies is required because in the confined rotational crop study propazine and its chlorometabolites were identified in various rotational crops and intervals and quantified at levels greater than 0.01 ppm. Based upon these limited field trials, restrictions of not less than one year for a plant back for propazine are needed on the end-use product labels. Crops selected for these field trials should be selected on the basis of those crop rotations that the registrant intends to support. HED may be contacted to discuss possible reduced sets of field trials to fulfill these requirements. When the required field rotational crop studies are submitted, appropriate plantback intervals and tolerances for inadvertent residues of propazine and its chlorometabolites will be determined.

The Executive Summary of the limited field rotational crop trial DER is reproduced below.

Limited field rotational crop trials

44184811.der.wpd

Griffin Corporation has submitted a limited field rotational crop study with propazine. Two trials were conducted in Regions 2 (NC) and 8 (TX). In each trial site, a 4 lb/gal flowable concentrate (FlC) formulation of propazine was applied as a preemergence ground spray to grain sorghum, the primary crop, at a nominal rate of 1.2 lb ai/A (1.0x the proposed single application rate). The test substance was applied either on the day of planting (NC) or five days after planting (TX).

The primary crop was to be removed (by cutting) from the plots prior to 90 days after the test substance application since the target plantback intervals (PBI) the petitioner initially intended to investigate were 90, 120, and 180 or 210/240 days. However, due to unusually cold and wet weather, the actual plantback intervals used in the study were 94, 127, and 242/280 days for the NC field site and 97, 120, 195, and 239 days for the TX field site. The following rotational crops were planted at the plantback intervals listed above for each field site: radish or turnip (a root vegetable), lettuce or mustard (a leafy vegetable), and winter or spring wheat (a cereal grain). The rotational crops were allowed to grow according to good agricultural practices. It was

reported that extremely cold weather during the winter months impacted the development and yield of some crops at both test sites. Samples of radish (roots and tops), turnip (roots and tops), leaf lettuce (leaves), mustard (leaves), wheat (forage, hay, grain, and straw) were collected at appropriate crop growth stage or at maturity.

A GC/MSD method (CHW 6641-101, Method 1) was used for the analysis of harvested crop commodities for residues of propazine and its two chlorometabolites: 2-amino-4-chloro-6-isopropylamino-s-triazine (desethyl atrazine or DEA; aka G-30033) and 2,4-diamino-6-chloro-s-triazine (diamino atrazine or DAA; aka G-28273). The LOQ for propazine, DEA, and DAA in all RACs is 0.0500 ppm for each analyte. The efficiency of the method was verified by fortifying aliquots of control matrix with propazine and its chlorometabolite DAA, each at 0.05, 0.1, and 0.2 ppm and with the chlorometabolite DEA at 0.0575, 0.115, 0.230 ppm. Average method recoveries ranged 86.8-106% for propazine, 83.3-110% for DEA, and 76.7-98.6% for DAA. The method is adequate for data collection based on acceptable concurrent method recoveries.

Samples were stored frozen prior to residue analysis. The maximum storage intervals, from harvest to analysis, were 129 days (4.2 months) for lettuce, 79 days (2.6 months) for mustard leaves, 100 days (3.3 months) for radish tops and roots, 79 days (2.6 months) for turnip tops and roots, 141days (4.6 months) for wheat forage, 125 days (4.1 months) for wheat hay, and 89 days (2.9 months) for wheat grain and straw. No supporting storage stability data were included in the subject study. In a separate submission for a residue field study on sorghum (MRID 44287316), it was reported that a storage stability study has been initiated and will be submitted in a separate report. It was also reported in a sorghum metabolism study (MRID 44287315) that the metabolic profiles of sorghum extracts did not change 24 months after the initial chromatographic analysis.

A summary of the residue data from the limited field rotational crop trials is presented below in Table 5. The discrepancies of results from the two test locations were attributed by the petitioner to be mainly due the fact that the rotational crops in TX were planted on 10/9/95 which is much later than normal (crops would not typically be planted for commercial production at this time of the year), and the environmental conditions were adverse for plant growth especially for lettuce and radishes.

TABLE 5. Summary of Residue Data in Rotational Crops Following Primary Treatment with Propazine.

Commodity	Analyte	Applic. Rate, (lb ai/A)	PBI (days)	Uncorrected Residue Levels (ppm) [1]						
				n	Min.	Max.	HAFT[2]	Median (STMdR[3])	Mean (STMR[4])	Std. Dev.
Lettuce, leaves	Propazine	1.21	97	2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	–
	DEA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DAA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	Total			2	<0.150	<0.150	<0.150	<0.150	<0.150	--
	Propazine	1.21	239	2	0.0505	0.0510	0.0508	0.0508	0.0508	--
	DEA			2	0.137	0.139	0.138	0.138	0.138	--
	DAA			2	0.139	0.139	0.139	0.139	0.139	--
	Total			2	0.327	0.329	0.328	0.328	0.328	--

TABLE 5. Summary of Residue Data in Rotational Crops Following Primary Treatment with Propazine.

Commodity	Analyte	Applic. Rate, (lb ai/A)	PBI (days)	Uncorrected Residue Levels (ppm) [1]						
				n	Min.	Max.	HAFT[2]	Median (STMdR[3])	Mean (STMR[4])	Std. Dev.
Mustard, leaves	Propazine	1.19	94	2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DEA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DAA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	Total			2	<0.150	<0.150	<0.150	<0.150	<0.150	--
	Propazine	1.19	127	2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DEA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DAA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	Total			2	<0.150	<0.150	<0.150	<0.150	<0.150	--
	Propazine	1.19	242	2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DEA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DAA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	Total			2	<0.150	<0.150	<0.150	<0.150	<0.150	--
Radish, tops	Propazine	1.21	97	2	0.0510	0.0520	0.0520	0.052	0.052	--
	DEA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DAA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	Total			2	<0.151	<0.152	<0.152	<0.152	<0.152	--
	Propazine	1.21	239	2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DEA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DAA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	Total			2	<0.150	<0.150	<0.150	<0.150	<0.150	--
Radish, roots	Propazine	1.21	97	2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	–
	DEA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DAA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	Total			2	<0.150	<0.150	<0.150	<0.150	<0.150	--
	Propazine	1.21	239	2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DEA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DAA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	Total			2	<0.150	<0.150	<0.150	<0.150	<0.150	--
Turnip, tops	Propazine	1.19	94	2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DEA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DAA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	Total			2	<0.150	<0.150	<0.150	<0.150	<0.150	--
	Propazine	1.19	127	2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DEA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DAA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	Total			2	<0.150	<0.150	<0.150	<0.150	<0.150	--

TABLE 5. Summary of Residue Data in Rotational Crops Following Primary Treatment with Propazine.

Commodity	Analyte	Applic. Rate, (lb ai/A)	PBI (days)	Uncorrected Residue Levels (ppm) [1]						
				n	Min.	Max.	HAFT[2]	Median (STMdR[3])	Mean (STMR[4])	Std. Dev.
	Propazine	1.19	242	2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DEA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DAA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	Total			2	<0.150	<0.150	<0.150	<0.150	<0.150	--

TABLE 5. Summary of Residue Data in Rotational Crops Following Primary Treatment with Propazine.

Commodity	Analyte	Applic. Rate, (lb ai/A)	PBI (days)	Uncorrected Residue Levels (ppm) [1]						
				n	Min.	Max.	HAFT[2]	Median (STMdR[3])	Mean (STMR[4])	Std. Dev.
Turnip, roots	Propazine	1.19	94	2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DEA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DAA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	Total			2	<0.150	<0.150	<0.150	<0.150	<0.150	--
	Propazine	1.19	127	2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DEA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DAA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	Total			2	<0.150	<0.150	<0.150	<0.150	<0.150	--
	Propazine	1.19	242	2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DEA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	--
	DAA			2	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	–
	Total			2	<0.150	<0.150	<0.150	<0.150	<0.150	--
Wheat, forage	Propazine	1.19-1.21	94/97	4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DEA			4	<0.0500	0.107	0.105	0.076	0.077	0.032
	DAA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	Total			4	<0.150	<0.207	<0.205	0.176	0.177	0.032
	Propazine	1.19-1.21	120/127	4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DEA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DAA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	Total			4	<0.150	<0.150	<0.150	<0.150	<0.150	0.0
	Propazine	1.19-1.21	195/280	4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DEA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DAA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	Total			4	<0.150	<0.150	<0.150	<0.150	<0.150	0.0

TABLE 5. Summary of Residue Data in Rotational Crops Following Primary Treatment with Propazine.

Commodity	Analyte	Applic. Rate, (lb ai/A)	PBI (days)	Uncorrected Residue Levels (ppm) [1]						
				n	Min.	Max.	HAFT[2]	Median (STMdR[3])	Mean (STMR[4])	Std. Dev.
Wheat, hay	Propazine	1.19-1.21	94/97	4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DEA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DAA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	Total			4	<0.150	<0.150	<0.150	<0.150	<0.150	0.0
	Propazine	1.19-1.21	120/127	4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DEA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DAA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	Total			4	<0.150	<0.150	<0.150	<0.150	<0.150	0.0
	Propazine	1.19-1.21	195/280	4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DEA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DAA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	Total			4	<0.150	<0.150	<0.150	<0.150	<0.150	0.0
Wheat, straw	Propazine	1.19-1.21	94/97	4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DEA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DAA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	Total			4	<0.150	<0.150	<0.150	<0.150	<0.150	0.0
	Propazine	1.19-1.21	120/127	4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DEA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DAA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	Total			4	<0.150	<0.150	<0.150	<0.150	<0.150	0.0
	Propazine	1.19-1.21	195/280	4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DEA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DAA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	Total			4	<0.150	<0.150	<0.150	<0.150	<0.150	0.0
Wheat, grain	Propazine	1.19-1.21	94/97	4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DEA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DAA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	Total			4	<0.150	<0.150	<0.150	<0.150	<0.150	0.0
	Propazine	1.19-1.21	120/127	4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DEA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DAA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	Total			4	<0.150	<0.150	<0.150	<0.150	<0.150	0.0
	Propazine	1.19-1.21	195/280	4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	DEA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0

TABLE 5. Summary of Residue Data in Rotational Crops Following Primary Treatment with Propazine.

Commodity	Analyte	Applic. Rate, (lb ai/A)	PBI (days)	Uncorrected Residue Levels (ppm) [1]						
				n	Min.	Max.	HAFT[2]	Median (STMdR[3])	Mean (STMR[4])	Std. Dev.
	DAA			4	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.0
	Total			4	<0.150	<0.150	<0.150	<0.150	<0.150	0.0

[1] For the determination of minimum, maximum, HAFT, median, mean, and standard deviation values, the LOQ value for each analyte (<0.0500 ppm) was used for residues reported as <0.0500 ppm. Standard deviation was not calculated for <3 samples.

[2] HAFT = Highest Average Field Trial.

[3] STMdR = Supervised Trial Median Residue.

[4] STMR = Supervised Trial Mean Residue.

TOLERANCE REASSESSMENT SUMMARY

The tolerances established under 40 CFR §180.243 are currently defined for residues of propazine *per se*. Griffin Corporation has filed a petition, PP#7F4837, to amend 40 CFR §180.243, by establishing tolerances for residues of propazine and its two chlorometabolites: 2-amino-4-chloro, 6-isopropylamino-s-triazine (G-30033) and 2,4-diamino-6-chloro-s-triazine (G-28273) in/on sorghum stover, forage, and grain at 0.25 ppm. The results of a sorghum metabolism study indicate that the proposed tolerance expression for plants is appropriate. Therefore, HED is recommending the revision of the residue definition under 40 CFR §180.243 to specify tolerances for the combined residues of propazine and the chlorometabolites G-30033 and G-28273.

Tolerances for propazine residues of concern in meat, milk, poultry, and eggs are not required for the purpose of this petition only. The results of the reviewed ruminant and poultry metabolism studies suggest a Category 3 situation with regard to the need for animal commodity tolerances as per 40 CFR §180.6. There is no expectation of finite residues of propazine and its chlorometabolites in animal commodities as a result of the proposed use on sorghum. Thus, animal feeding studies are not needed, and tolerances need not be established for meat, milk, poultry, and eggs.

The proposed tolerance levels of 0.25 ppm for the combined residues of propazine and the chlorometabolites G-30033 and G-28273 are supported by adequate data pending submission of supporting storage stability data and label revision. Following a single preemergence broadcast application of a representative FlC formulation of propazine at 1.47-2.43 lb ai/A (1.2-2.0x the proposed single application rate), the results of the sorghum field trials indicate the following: In **sorghum forage** harvested at a PHI range of 69-117 days, residues of propazine and G-30033 were each less than the LOQ (<0.05 ppm) in/on 26 treated samples. Residues of G-28273 ranged 0.050-0.087 ppm in/on four treated forage samples but were <0.05 ppm in/on 22 treated samples. In **sorghum grain and stover** harvested at a PHI range of 86-152 days, residues of propazine, G-30033, and G-28273 were each <0.05 ppm in/on 26 treated samples.

A set of field accumulation in rotational crop studies is required because in the confined and limited rotational crop study propazine and its chlorometabolites were identified in various rotational crops and intervals and quantified at levels greater than 0.01 ppm. Based upon these limited field trials, restrictions of not less than one year for a plant back for propazine are needed on the end-use product labels. Crops selected for these field trials should be selected on the basis of those crop rotations that the registrant intends to support. HED may be contacted to discuss possible reduced sets of field trials to fulfill these requirements. When the required field rotational crop studies are submitted, appropriate plantback intervals and tolerances for inadvertent residues of propazine and its chlorometabolites will be determined.
The established tolerance for sweet sorghum should be revoked unless propazine use on sweet sorghum is proposed and supporting residue data are submitted.

HED recommends that the designation "(N)" be deleted from the 40 CFR for all tolerance level entries. A summary of propazine tolerance reassessment is presented in Table 6.

Table 6. Tolerance Reassessment Summary for Propazine.

Commodity	Current Tolerance Listed in 40 CFR §180.243 (ppm)	Reassessed Tolerance (ppm)	Comments [*Correct Commodity Definition*]
Sorghum, forage	0.25 (N)	0.25	
Sorghum, grain	0.25 (N)	0.25	
Sorghum, grain, stover	0.25 (N)	0.25	
Sorghum, sweet	0.25 (N)	Revoke	No registered uses on sweet sorghum.

Codex/International Harmonization

There is no Canadian tolerance, Mexican tolerance, or Codex MRL for residues of propazine in/on sorghum; therefore, no compatibility questions exist with respect to the Codex MRL.

Attachments:
Attachment 1: International Residue Limit Status

ATTACHMENT I

INTERNATIONAL RESIDUE LIMIT STATUS

CHEMICAL: Propazine

CODEX NO.

CODEX STATUS:

__ No Codex Proposal
Step 6 or above

PROPOSED U.S. TOLERANCES:

Petition No: PP#7F4837

Agency Reviewer: W. Donovan, G. Kramer

Residue (if Step 8):

Residues Proposed For Inclusion in the Tolerance Expression: Propazine and its two chlorometabolites G-30033 and G-28273

Crop(s)	Limit (mg/kg)	Crop(s)	Limit (mg/kg)
		Sorghum, stover	0.25
		Sorghum, forage	0.25
		Sorghum, grain	0.25

CANADIAN LIMITS:

__ No Canadian limit

Residue:

MEXICAN LIMITS:

__ No Mexican limit

Residue:

Crop(s)	Limit (mg/kg)	Crop(s)	Limit (mg/kg)

NOTES:

RESIDUE CHEMISTRY BIBLIOGRAPHY FROM OPPIN (Sorted by MRID)

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AGENCY MEMORANDA RELEVANT TO THIS RESIDUE CHEMISTRY CHAPTER

CB No.	DP Barcode	ID No.	Date	Reviewer	MRID	Topic
	D310517 D308537		8/31/05	J. Morales & G. Kramer	44184813, 44184814, 44287315, 44184815, 44184816, 44184817, 44287316, 44184810, and 44184811	Propazine (080808), Proposed New Use on Grain Sorghum. Petitioner Griffin Corporation. HED Review of Sorghum, Ruminant, and Poultry Metabolism Studies; Sorghum Field Trials; Confined Rotational Crop Study, and Limited Field Accumulation Trials.
17214	D226108 and D226191		5/28/96	J. Abbotts	None	Propazine (080808), Proposed New Use on Sorghum. Registrant Griffin Corporation. Residue Chemistry Requirements.
16780 and 17099	D222623 and D224749		5/14/96	J. Abbotts	None	Propazine (080808), Reregistration Case No. 0230. Registrant Griffin Corporation. Dietary and Drinking Water Health Hazard Assessment
None	None		3/7/96	J. Abbotts	None	Propazine (080808), Reregistration Case No. 0230. Conversations with Registrant Representative
None	None		1/11/96	M. Metzger	None	Propazine. Response to Meeting (8/2/95) Memorandum of Understanding Submitted by Griffin
12729	D196214		3/23/94	J. Herndon	None	Review of the Proposed Protocols for Conducting the Following Studies Using ^{14}C-Labeled Propazine: Nature of the Residue in Sorghum; Nature of the Residue in Lactating Goats; Nature of the Residue in Laying Hens; and Confined Rotational Crops.
11696	D190115	93TX0014	4/19/93	M. Bradley	None	Section 18 Exemption for Use of Propazine on Sorghum

13544

R114340

Chemical:	**Propazine**
PC Code:	**080808**
HED File Code	**11000 Chemistry Reviews**
Memo Date:	**08/31/2005**
File ID:	**DPD308537**
Accession Number:	**412-06-0007**

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