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JAN 26 1994

OFFICE OF  
PREVENTION, PESTICIDES AND  
TOXIC SUBSTANCES

MEMORANDUM:

SUBJECT: Atrazine, Reregistration and Special Review. Submitted Residue Data on Sugarcane.  
MRID No. 43016503. No CBRS No. No DP Barcode No.

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In response to a reregistration Data Call-In of 10/90, registrant Ciba-Geigy Corporation has submitted additional data on the nature of the residue in sugarcane (MRID 43016503). This submission will be reviewed as part of a more extensive assignment (CBRS No. 12889). However, full review is expected to take some time, and it seems appropriate at this time to report residue data provided by registrant. The data provided indicate that previous estimates of dietary risk from atrazine use on sugarcane, based on residue data only, are not expected to change significantly.

Tolerances are established for residues of the herbicide atrazine, 2-chloro-4-ethylamino-6-isopropylamino-s-triazine, in or on agricultural commodities (40 CFR 180.220(a)), and for combined residues of atrazine and its metabolites 2-amino-4-chloro-6-ethylamino-s-triazine,



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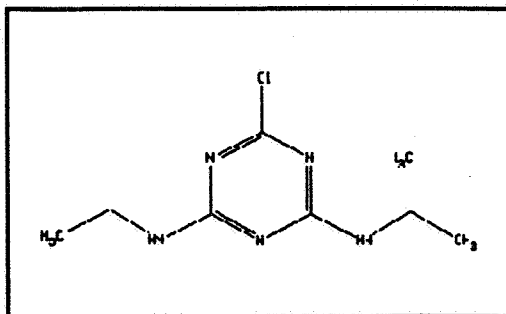
2-amino-4-chloro-6-isopropylamino-*s*-triazine, and 2-chloro-4,6-diamino-*s*-triazine, in or on specified plant commodities (40 CFR 180.220(b)). Atrazine is a List A Chemical. The Residue Chemistry Chapter was issued 7/25/83; the Registration Standard (Guidance Document) was issued 9/85; a Second Round Review (SRR) Residue Chemistry Chapter was issued 10/18/88.

### Background

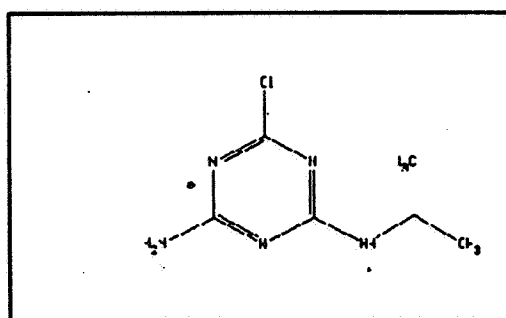
The Residue Chemistry Chapter (7/25/83) concluded that the metabolism of atrazine in plants was adequately understood. Identified metabolites included 2-chloro-4,6-diamino-*s*-triazine (G-28273), 2-amino-4-chloro-6-ethylamino-*s*-triazine (G-28279), 2-amino-4-chloro-6-isopropylamino-*s*-triazine (G-30033), and 2-ethylamino-4-isopropylamino-6-hydroxy-*s*-triazine (hydroxyatrazine, G-34048). The Second Round Review Residue Chemistry Chapter (10/18/88) reported the additional hydroxy metabolites GS-17791, GS-17792, and GS-17794, and concluded that high levels of polar and insoluble residues in mature tissues had not been adequately characterized, and additional data were required depicting the total terminal residue of radiolabeled atrazine in corn. Structures of parent atrazine and its chloro metabolites only are indicated in Figure 1.

A subsequent review (DEB No. 5783, 5/3/90, M.S. Metzger) noted that all metabolites containing the intact triazine ring were now considered of toxicological concern, and data requirements should be revised such that all metabolites which contain the intact triazine ring are determined for all commodities for which atrazine is registered; this review also determined revised anticipated residues for atrazine. The Agency subsequently issued a DCI, received by registrant in 10/90, which superceded the residue chemistry data requirements of all previous DCIs and any other agreements entered into with the Agency pertaining to such requirements. The DCI requirements included data depicting the total terminal residues of radiolabeled atrazine in corn, rye, sugarcane, sorghum, wheat, and pineapple. Registrant Ciba-Geigy's response to this DCI was reviewed and recommendations for conducting studies were provided (CBRS No. 9167, 1/22/92, M.S. Metzger).

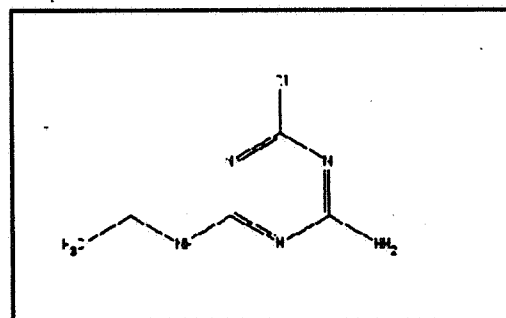
The HED Metabolism Committee addressed issues related to triazine chemicals at a meeting of 7/9/92 (Memo, 8/7/92, M.S. Metzger). The Committee noted that in the absence of data on the toxicity of triazine metabolites, all metabolites containing a triazine ring with a substituent would be assumed toxicologically equivalent to the parent compound. Should data be reviewed and accepted which indicate that hydroxyatrazine is not carcinogenic,



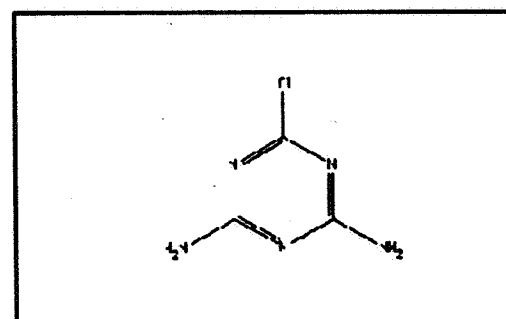
Atrazine



G-30033



G-28279



G-28273

Figure 1. Atrazine and chloro metabolites.

then exposure assessment and tolerance expression for atrazine will include only parent and chloro metabolites. No analytical methods were available to determine total residues of metabolites containing triazine rings with substituents. Field studies using <sup>14</sup>C-atrazine would allow exposure assessment for total triazine ring residues as the total radioactive residue (TRR), because most of the radioactivity remains as triazine-ring containing metabolites; TRR will be assumed to represent all residues of concern. In addition to measuring TRR in the radiolabel field studies, registrant was also required to identify major components of the total radioactivity in crops. If possible, these data will be used to identify appropriate "marker" metabolites to use in developing analytical methods for enforcement purposes and for non-radiolabeled field residue data. The Metabolism Committee recommended that risk assessment should be conducted with the best data available for determining total residues of metabolites containing the triazine ring.

Present Submission

In response to the DCI of 10/90, registrant Ciba-Geigy submitted a study on the nature of atrazine residues in sugarcane (MRID 43016503). We emphasize that review of this document has not been completed. However, we report the data provided by registrant for comparison with residue data used for previous risk assessments. Table 1 summarizes residue data reported for final harvest cane on pages 18 and 20 of the present submission.

Table 1. Summary, Assignment of Residues in Final Harvest Sugarcane.

Residue	Assignment in Harvest Cane:	
	% TRR	ppm
Atrazine	0.3	0.007
G-30033	1.4	0.029
G-28279	0.4	0.009
G-28273	3.0	0.063
Total, parent and chloro metabolites:	5.1	0.108
Total Radioactive Residue (TRR):	100	2.093

Anticipated residues for atrazine in sugarcane were previously determined (DEB 3688-3703, 3756, 9/14/88, M.S. Metzger). Anticipated residues for sugar commodities were determined entirely from field trials and processing studies in which

residues of parent and chloro metabolites only were measured. Anticipated residues on sugarcane forage were translated from data on residues of parent and chloro metabolites only on sugarcane leaves. The following anticipated residues were determined for parent atrazine and chloro metabolites:

sugarcane, whole cane, 0.13 ppm;  
sugarcane molasses, 0.65 ppm;  
sugarcane bagasse, 0.95 ppm;  
refined sugar, 0.16 ppm;

Revised anticipated residues of atrazine were subsequently determined for corn, sorghum, and animal commodities, based on the total residue of toxicological concern (DEB 5783, 5/3/90, M.S. Metzger). The revised anticipated residues in animal commodities were based on hypothetical animal diets of commodities which are widely fed nationally. Sugarcane commodities may represent contributors to local dietary burdens, but are not animal feed commodities widely fed nationally; sugarcane commodities therefore made no contribution to the revised anticipated residues for animal commodities.

#### Potential Effect on Dietary Risk Estimates

Estimates for dietary risk from atrazine residues have been presented to the Assistant Administrator (Briefing Paper, Combined Special Review of the Triazine Herbicides, 7/21/93). The estimated dietary cancer risk from residues of parent and chloro metabolites in sugar commodities, based on the anticipated residues reported above, was  $2.2 \times 10^{-5}$ . Estimated maximum dietary risk from residues of the total triazine ring in sugar commodities was reported as  $4.4 \times 10^{-4}$ , indicating that anticipated residues for the total triazine ring were obtained by multiplying anticipated residues for parent and chloro metabolites only by a factor of 20 (i.e., total maximum triazine ring residues in sugarcane were assumed to be 2.6 ppm). It should be noted that sugarcane represented the individual crop with the highest dietary risk estimate from atrazine use.

Residue data in the present submission provide values for sugarcane that are only moderately different (0.11 ppm for parent and chloro metabolites, and 2.1 ppm for total residues of concern) from values based on previously determined anticipated residues (0.13 ppm for parent and chloro metabolites, and 2.6 ppm for total residues of concern).

#### Conclusions/Recommendations

Review of the present submission on the nature of the residue of atrazine in sugarcane (MRID 43016503) has not been completed. However, a cursory review of the data provided by registrant indicate that based on residue data alone, estimated dietary

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risks from sugar will not change significantly, and the status of sugar as the individual crop with the highest estimated dietary risk from atrazine use is not expected to change.

cc:Circ, Abbotts, RF, Atrazine List A File, SF  
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H7509C:CBII-RS:JAbbotts:CM-2:Rm805A:305-6230: [1/25/94]  
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