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

SEP 2 1987

OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

Memorandum

Subject: Triphenyl Tin Hydroxide (TPTH): Response to Registration Standard; Review of Field Studies for Peanuts, Sugar beets, Pecans, Potatoes, and Carrots. MRID Numbers 401493-01, -02, -03, -04, and -05; RCB No. 2264.

From: Francis B. Suhre, Chemist
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Thru: Edward Zager, Section Head
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M&T Chemical Inc., on behalf of Griffin Corp., has responded to the TPTH Registration Standard by submitting protocols and field histories for residue field trials on peanuts, sugar beets, pecans, potatoes, and carrots. Residue field trials on carrots (Accession No. 263218), sugar beets (Accession No. 263221), potatoes (Accession No. 263219), and peanut hulls (Accession No. 263220) were previously reviewed by S. Hummel (memo of 9-4-86); while similar studies on peanuts (Accession No. 266045) and pecans (Accession No. 266046) were reviewed by F. Suhre (memo of 5-1-87). Numerous deficiencies were cited; many of these deficiencies dealt with poor documentation of the field studies.

This submission includes the following reports:

Vol. I - 171-4 Residue Chemistry - Triphenyltin Hydroxide Protocols and Field Histories for Residue Field Trials on Peanuts. (MRID No. 401493-01).

Vol. II - 171-4 Residue Chemistry - Triphenyltin Hydroxide Protocols and Field Histories for Residue Field Trials on Sugar beets. (MRID No. 401493-02).

Vol. III - 171-4 Residue Chemistry - Triphenyltin Hydroxide Protocols and Field Histories for Residue Field Trials on Pecans. (MRID No. 401493-03).

Vol. IV - 171-4 Residue Chemistry - Triphenyltin Hydroxide Protocols and Field Histories for Residue Field Trials on Potatoes. (MRID No. 401493-04).

Vol. V - 171-4 Residue Chemistry - Triphenyltin Hydroxide Protocols and Field Histories for Residue Field Trials on Carrots. (MRID No. 401493-05).

Tolerances are established (40 CFR 180.236) for triphenytin hydroxide, per se, in or on peanut hulls at 0.4 ppm; carrots and sugarbeet roots at 0.1 ppm; pecans, peanuts, and potatoes at 0.05 ppm; and kidney and liver of cattle, goats, hogs, horses, and sheep at 0.05 ppm. Tolerances are pending for residues of TPTH on rice (PP#0F2340), soybeans (PP#3F2833/ FAP#3H5384), and eggs, milk, meat, fat, and meat by-products of cattle, goats, hogs, horses, and sheep (PP#0F2340).

A TPTH Registration Standard was issued 4-11-84. Two major residue chemistry data gaps were identified, as follows: (1) the tolerance expression does not include the TPTH metabolites of concern (diphenyltin oxide and monophenylstannoic acid); and (2) the available residue data do not support the established tolerances.

Four TPTH formulations are registered for use on food and feed crops, they are: (1) a 47.5% wettable powder, (2) a 40% flowable liquid, (3) a 19.7% flowable liquid, and (4) a flowable mixtures containing 40.9% sulfur and 5.1% TPTH.

Conclusions

1. The metabolic nature of Triphenyltin Hydroxide in plants and animals is adequately understood. The residues of concern are the parent compound, per se, and its di- and monophenyltin hydroxides (or oxides).

2a. Method TA-47, "Separation and Determination of Phenyltin Species ($Ø_aSnX_4$-a) in Carrots, Sugar beets, and Potatoes by Liquid Chromatography/Atomic Absorption Spectroscopy" (Accession No. 263222) appears adequate for assaying a total TPTH residue (negligible residue, expressed as TPTH equivalent) in or on carrots, sugar beets, and potatoes at 0.04 ppm total TPTH equivalents. The registrant must provide a "non-confidential" copy of Method TA-47 so that a Method Try-Out (MTO) can be performed; ultimately a method must be available for enforcement of established tolerances.

2b. Method TA-48, "Separation and Determination of Phenyltin Species ($Ø_aSnX_4$-a) in Peanuts Hulls by Liquid Chromatography/ Atomic Absorption Spectroscopy" (Accession No. 263220) appears adequate for assaying a total TPTH residue (negligible residue, expressed as TPTH equivalent) in or on peanuts hulls at 0.2 ppm. The registrant must provide a "non-confidential" copy of Method TA-48 so that a Method Try-Out (MTO) can be performed; ultimately a method must be available for enforcement of established tolerances.

2c. Method TA-49, "Separation and Determination of Phenyltin Species ($Ø_aSnX_4$-a) in Peanuts and Pecans by Liquid Chromatography/ Atomic Absorption Spectroscopy" (Accession No. 266045) appears adequate for assaying a total TPTH residue (negligible residue, expressed as TPTH equivalent) in or on peanuts and pecans at 0.2 ppm. The registrant must provide a "non-confidential" copy of Method TA-49 so that a Method Try-Out (MTO) can be performed; ultimately a method must be available for enforcement of established tolerances.

3. Storage stability data for carrots, sugar beets, potatoes, pecans, peanuts, and peanut hulls are required, reflecting the actual condition of sample storage from harvest until analysis. If all of the samples were frozen immediately after harvest, storage stability data on soybeans or peanuts and storage stability data on a root crop would be sufficient.

4a. The field trial locations for peanuts, sugar beets and carrots do not adequately reflect their geographical production in the United States. For peanuts, additional data are required from TX; for sugar beets, additional data are required from CA, ID, WA, NE, WY, and MI; and for carrots, additional data are required from OR/WA. Additionally, much of the submitted residue data do not refect the minimum label PHIs for sugar beets (14 days), potatoes (7 days), carrots (14 days), and peanuts (14 days). The registrant must provide additional residue data reflecting a minimum PHI for peanuts, sugar beets, and potatoes. Alternatively, the minimum PHI on the registered label may be changed to reflect the submitted residue data.

4b. Samples 18CA-0301, -0302, -0303; and 20CA-0101, -0102, -103, -0201, -0202, and -0203 (see, Accession No. 263218 page 54b.) are not discussed in the study protocol/sample history for carrots (Accession No. 401493-05). Supporting documentation is required for these samples before we can include them in our review.

5. The residue field trials submitted for peanuts, sugar beets, pecans, potatoes, and carrots do not reflect aerial application of Supertin 4L. Furthermore, the potato field trials do not reflect sprinkler irrigation application. If these uses are to remain registered, appropriate residue data will need to be submitted.

6a. Data from peanut field trials indicate a total TPTH residue of 0.2 ppm (N) in or on peanut meat and hulls as a result of 8 ground spray applications of Supertin 4L at (1x) 0.24 lbs. ai/A (1.92 lbs./A/season) and a PHI of 14-22 days days. The established tolerance for TPTH residues in or on peanut hulls (0.4 ppm) should not be exceeded, however, the established tolerance in or on peanut meat (0.05 ppm) may be exceeded as a result of the proposed use. Based on the submitted residue data, the PHI must be 22 days.

6b. Data from sugar beet field trials indicate a maximum total TPTH residue of 0.04 ppm (N) in or on sugar beets as a result of 5 ground spray applications of Supertin 4L at (1x) 0.29 lbs. ai/A (1.45 lbs. ai/A/season) and a PHI of 14-18 days. No finite residues were found at an exaggerated rate of 2x. The established tolerance for TPTH residues in or on sugar beets (0.1 ppm) should not be exceeded as a result of the proposed use. Based on the submitted residue data the PHI should be 18 days.

6c. We consider a restriction against feeding sugar beet tops to livestock, practical; therefore, no residue data on beet tops are required, provided the feeding restriction appears on the label.

6d. Data from pecan field trials indicate a maximum total TPTH residue of 0.2 ppm (N) in or on pecans as a result of 7 ground spray applications of Supertin 4L at (1x) 0.38 lbs. ai/A (2.66 lbs. ai/A/season) and PHIs of 50 to 78 days. No finite residues were found at an exaggerated rate of 10x. The established tolerance for TPTH residues in or on pecans (0.05 ppm) may be exceeded as a result of the proposed use.

6e. Data from potato field trials indicate a maximum total TPTH residue of 0.05 ppm (N) in or on potatoes as a result of 11 ground spray applications of Supertin 4L at (1x) 0.29 lbs. ai/A (3.19 lbs. ai/A/season) and PHI of 11 days. No finite residues were found at an exaggerated rate of 2x. The established tolerance for TPTH residues in or on potatoes (0.05 ppm) should not be exceeded as a result of the proposed use.

6f. Data from carrot field trials indicate a maximum total TPTH residue of 0.05 ppm (N) in or on carrots as a result of 8 ground spray applications of Supertin 4L at (1x) 0.24 lbs. ai/A (1.94 lbs. ai/A/season) and PHI of 14 days. The established tolerance for TPTH residues in or on carrots (0.1 ppm) should not be exceeded as a result of the proposed use.

7a. The established tolerances for residues of TPTH in or on peanuts at 0.05 ppm (N) and pecans at 0.05 ppm (N) should be changed to reflect a total TPTH residue (expressed as TPTH) of 0.2 ppm (N). This conclusion is based on the analytical method's 0.05 ppm limit of detection for each of the 3 TPTH residues of concern in these commodities and may be reevaluated after review of the balance of the required residue data.

7b. The established tolerances for residues of TPTH in or on carrots at 0.1 ppm and sugar beets at 0.1 ppm should be changed to reflect a total TPTH residue (expressed as TPTH) of 0.05 ppm (N). This conclusion is based on the analytical method's 0.01 ppm limit of detection for each of the 3 TPTH residues of concern in these commodities and may be reevaluated after review of the balance of the required residue data.

7c. The established tolerances for residues of TPTH in or on potatoes at 0.05 ppm and peanut hulls at 0.4 ppm are appropriate and need not be changed at this time. Our conclusion may be reevaluated after our review of the balance of the required residue data.

8. Processing studies were not submitted for any rac. Processing studies (or a waiver from the requirement) for peanuts, sugar beets, and potatoes are required.

Recommendation

We recommend that the registrant (1) be informed of our conclusions; and (2) be advised to resolve the deficiencies, as stated in conclusions 3, 4a., 4b., 5, 6c, 7a, 7b and 8 above. We recommend that the registrant be sent a copy of our review.

cc: R.F., Circu., F. Suhre, TPTH S.F., TPTH SRF (Hummel), Reg. Std. file, PMSD/ISB.
RDI:SH:9/1/87:RDS:9/1/87
TS-769:FBS:fbs:Rm.814:CM#2:557-1883:9/2/87

DETAILED CONSIDERATIONS

DIRECTIONS FOR USE

Registered uses on peanuts, sugar beets, pecans, potatoes and carrots are discussed in the TPTH Registration Standard. No label has been included with this submission. A summary of these uses, as presented in the TPTH Reg. Std., appear below:

Peanuts: TPTH may be applied in the form of a wettable powder containing 47.5% ai. Initial application is made 6 weeks after planting or as signs of leaf spot appear. Treatment of 2.4 to 3.8 ozs. ai/A are made (in 10-100 gallons of water per acre using ground equipment, or 3 to 10 gallons of water per acre using aircraft). Treatment is repeated at 10 to 14 day intervals. The maximum number of applications is not specified. The minimum PHI is 14 days. Use restrictions include: do not allow hogs to feed on peanuts in treated fields; do not use vines as feed; and do not use in combination with emulsifiable concentrate or oil spray formulations.

Sugar beets: TPTH may be applied in the form of a wettable powder containing 47.5% ai. Application is made as a water spray for full foliar coverage of sugar beets when leaf spot condition appears or when the disease is in the area. Treatments of 1.9 to 4.75 ozs. ai/A are made (in 15 gallons of water per acre using ground equipment or 5 to 10 gallons of water per acre using aircraft). The maximum number of applications per season is not specified. The minimum PHI is 14 days Typically, 3 to 5 applications at intervals of 10 to 14 days are made per season. Use restrictions include: do not add surfactants, spreaders, or stickers; do not feed beet tops to livestock; and do not graze dairy or meat animals in treated areas.

Pecans: TPTH may be applied in the form of a wettable powder containing 47.5% ai. Application is made as a delayed dormant spray when leaves are unfolding or as a foliar spray when small nuts are forming. Aerial application may be made at the rate of 0.36-0.71 lbs. a.i./A. Ground application may be made at a rate of 1.5-4.5 ozs. /100 gal with full coverage spray. The maximum number of applications is not specified. Use restrictions include: repeat application as often as every two weeks, but no applications should be made after the shucks begin to open; do not graze dairy or meat animals in treated areas.

Potatoes: TPTH may be applied in the form of a wettable powder containing 47.5% ai. Application is made as a water spray for full coverage of potato foliage during blight season. 2.38 to 4.75 ozs. ai/A are applied (in 15 gallons of water per acre using ground equipment or 3 to 10 gallons of water per acre using aircraft). TPTH may also be applied

to potatoes in sprinkler irrigation water at a rate of 2.85 to 4.75 ozs. ai/A. The maximum number of applications per season is not specified. The minimum PHI is 7 days. Typically, 5 applications at intervals of 7 days are made per season. Use restrictions include: do not add surfactants, spreaders, or stickers; and do not graze dairy or meat animals in treated areas.

Carrots: TPTH may be applied in the form of a wettable powder containing 47.5% ai. Application is made 6 weeks after planting or as soon as the first signs of disease appear. Repeat applications are made at intervals of 7 days as needed. 1.9 to 3.8 ozs. ai/A are applied in 25 to 100 gallons of water per acre using ground or aerial spray equipment. The maximum number of applications per season is not specified. The minimum PHI is 14 days. Use restrictions include: do not use tops as feed for livestock; do not add surfactants, spreaders, or stickers to sprays; and do not graze dairy or meat animals in treated areas.

PLANT AND ANIMAL METABOLISM

The following information on the plant and animal metabolism of TPTH is restated from a prior review (F. Suhre, memo of 5-1-87).

Tolerances were initially established for the parent compound only, however, upon review of additional information provided in connection with PP#0F2340 (E. Leovey, RCB, memo of 9-17-80) and PP#3F2823/FAP#3H5384 (K. Arne, RCB memo of 7-14-83 and J. Doherty, TOX, memo of 10-28-83), the Agency now considers the residues of concern in plants and animals to be intact TPTH, and its di- and monophenyltin hydroxides (or oxides). This conclusion is expressed in the TPTH Registration Standard as follows:

"In addition to the parent compound the metabolites di- and monophenyltin hydroxides (oxides) should now be included in all residue tolerances (see J. Doherty, TOX Branch memo on PP#3F2823/FAP#3H5384 dated October 28, 1983). The existing tolerances are expressed in terms of parent compound, TPTH alone."

ANALYTICAL METHODOLOGY

Method TA-47, "Separation and Determination of Phenyltin Species ($Ø_aSnX_4$-a) in Carrots, Sugar beets, and Potatoes by Liquid Chromatography/Atomic Absorption Spectroscopy" (Accession No. 263222); Method TA-48, "Separation and Determination of Phenyltin Species ($Ø_aSnX_4$-a) in Peanut Hulls by Liquid Chromatography/ Atomic Absorption Spectroscopy" (Accession No. 263220); and Method TA-49, "Separation and Determination of Phenyltin Species ($Ø_aSnX_4$-a) in Peanuts and Pecans by Liquid Chromatography/

Atomic Absorption Spectroscopy" (Accession No. 266045) were recently reviewed by RCB (S. Hummel memo of 9-4-86, and F. Suhre memo of 5-1-87). Please refer to those reviews for a detailed discussion of these Methods. In summary, all three methods are designed to assay triphenyltin hydroxide, its degradation products (tetraphenyltin, diphenyltin oxide and phenylstannoic acid), and inorganic tin (as tetrabutyltin). Following extraction and cleanup, the tin compounds are converted to their corresponding tetraorganotin species by reacting with BuMgCl. Triphenyltin hydroxide ($Ø_3SnOH$) converts to triphenylbutyltin ($Ø_3SnBu$), diphenyltin oxide ($Ø_2SnO$) converts to diphenyl dibutyltin ($Ø_2SnBu_2$), phenyl stannoic acid ($ØSnOOH$) converts to phenytributyltin ($ØSnBu_3$), and inorganic tin (Sn) if present is converted to tetrabutyltin (Bu_4Sn). Tetraphenyltin ($Ø_4Sn$) if present will remain as tetraphenyltin since it is already in the tetraorgano form. After conversion, the organotins are separated by reverse phase HPLC (C-8) and their respective fractions (1.5 mL) are collected and assayed for elemental tin by Graphite Furnace Atomic Absorption Spectroscopy. The methods' limits of sensitivity for TPTH/ Metabolites, were 0.05 ppm for carrots, peanuts, and pecans; and 0.01 ppm for sugar beets and potatoes. Recovery of TPTH/ Metabolites, from these commodities fortified at the methods limit of detection ranged from 79 to 127%.

STORAGE STABILITY DATA

Storage stability data for carrots, sugar beets, potatoes, pecans, and peanuts were not provided.

The criteria for a storage stability study are discussed in § 171-4 (c)(1)(ii.) of the Residue Chemistry; Pesticide Assessment Guidelines; Subdivision O, as follows:

"Accepted procedures for maintaining sample integrity should be followed after taking the sample. Normally samples should be frozen as soon as possible and kept frozen until analysis. Information should be furnished on how the samples are shipped and stored until analyzed. If samples are likely to be held in storage, storage stability data should be obtained by fortifying control samples, and analyzing at the end of the storage period. It is always advisable to have spiked storage stability samples available to allow for unforseen delays in analysis, and to verify results of analysis of check samples should reanalysis be necessary to verify possibly aberrant results."

RESIDUE DATA

Residue field trials on carrots, sugar beets, potatoes, peanuts, and pecans were previously reviewed (S. Hummel memo of 9-4-86, and F. Suhre, memos of 5-1-87 and 9-2-87). Many of the deficiencies cited in those reviews dealt with incomplete documentation of field studies. The reports provided with this submission address many of those deficiencies, therefore, we will repeat the review of these field trials in light of this additional data.

Peanuts:

Data provided with this submission:

Triphenyltin Hydroxide Protocols and Field History For Residue Field Trials on peanuts (401493-01).

Data provided with previous submissions:

1) Validation of a Method for the Separation and Determination of Phenyltin Species ($Ø_aSnX_4$-a) in Peanut Hulls By liquid Chromatography/Atomic Absorption Spectroscopy Plus Crop Residue Analyses. (Accession No. 263220).

This material was previously reviewed by S. Hummel (memo of 9-4-86).

2) Validation of a Method for the Separation and Determination of Phenyltin Species ($Ø_aSnX_4$-a) in Peanuts By liquid Chromatography/ Atomic Absorption Spectroscopy Plus Crop Residue Analyses. (Accession No. 266045).

This material was previously reviewed by F. Suhre (see, memo of 5-1-87)

A review integrating all three submissions follows:

Residue data from 5 Field trials on peanuts conducted in GA (2), AL (1), VA (1), and Unknown (1) were provided in Accession No. 266045 and 263220. The peanut protocol/field history report (MRID No. 401493-01) identifies only the 4 known study sites, therefore, we will ignore the data from the unknown site in our review. These 3 states accounted for ca 67% of the 1984 peanut production in the United States (Agricultural Statistics, 1985). For adequate geographic representation additional data from TX are required.

These field trials reflect initial application of Super Tin 4L (4 lbs. TPTH ai./gallon) 38 to 56 days (5 to 6 weeks) after planting with repeat applications made at 10 day intervals and terminating 14-22 days before harvest. It is noted that only one location (VA) had samples harvested 14 days after the last application. A total of 8 to 9 applications

were made during the treatment period. Super Tin 4L was applied at rates of 7.6 ozs. (1x) to 15.2 ozs. (2x) per acre (0.24 to 0.48 lbs. ai) in ca 11 gallons of water utilizing ground spray equipment. Maximum treatment was 4.32 lbs. ai/A/season. The experimental design called for use of 3 plots (6 rows x 25 ft.) per treatment site. Control plots were sufficiently isolated to prevent contamination.

These field studies do not reflect aerial application of Super Tin 4 L. If the product is to be registered for aerial application to peanuts, residue data reflecting that use will be required.

At harvest, three 5 lb. samples (kernels in hulls) were taken from each plot (9 samples per site) for a total of 36 samples. All samples were immediately frozen and shipped (in dry ice) to M&T Chemicals, Inc. within 9 days of harvest for analysis. No storage stability data were provided, therefore, the effects of the nine day storage period on TPTH residues in or on peanuts is unknown. All samples were placed in frozen storage upon receipt by the laboratory and removed just prior to analysis. Peanut hulls and meat were assayed for TPTH residues using Analytical Method TA-48 and TA-49, respectively.

TPTH residues found on peanut hulls and meat are summarized in tables 1 and 2:

Table 1. TPTH Residues in peanut hulls:

Site	lbs. ai/A/appl. (Total)	PHI in Days	Residue in ppb				
			$Ø_4Sn$	$Ø_3SnOH$	$Ø_2SnO$	$Ø_1SnOOH$	Inorg. Tin Bu_4Sn
GA	Control		ND[a]	ND	ND	ND	ND
GA	0.24(2.16)	17-22	ND	ND	ND	ND	ND
GA	0.48(4.32)	17-22	ND-71	ND-55	ND	ND	ND
AL	Control		ND	ND	ND	ND	ND
AL	0.24(2.16)	22	ND	ND	ND	ND	ND
AL	0.48(4.32)	22	ND	ND-98	ND-169	ND	ND
VA	Control		ND	ND	ND	ND	ND
VA	0.24(1.92)	14	ND	ND	ND	ND	ND
VA	0.48(3.84)	14	ND	ND	ND	ND	ND

a. ND <0.05 ppm

The above data indicate that total TPTH residues (TPTH, $Ø_3SnOH$, plus its metabolites $Ø_2SnO$ and $Ø_1SnOOH$, expressed as TPTH equivalents, see calculation below) in or on peanut hulls will not exceed 0.20 ppm as a result of ground application of Super Tin 4L at 2.16 lbs. ai/A/season (1x) and a PHI of 17 days. The established tolerance for TPTH on peanut hulls (0.4 ppm) should not be exceeded, based on the submitted data. However, additional residue data from TX are needed, and residue data from aerial application is needed, if that use is to be registered.

Calculation of total residue as TPTH equivalents:

TPTH ($Ø_3SnOH$): 0.05 ppm (N) x 1 = 0.05 ppm

Diphenyl metabolite ($Ø_2SnO$): 0.05 ppm (N) x 1.3 = 0.07 ppm

Monophenyl metabolite ($Ø_1Sn$): 0.05 ppm (N) x 1.6 = 0.08 ppm

Total TPTH Residue = 0.05 ppm + 0.06 ppm + 0.08 ppm = ca 0.20 ppm

Treatment of peanuts at a 2x exaggerated rate (4.32 lbs. ai/A/season) and a 22 day PHI resulted in a maximum total TPTH residue of 0.32 ppm in or on peanut hulls.

Data reflecting TPTH residues in or on peanut vines and hay were not provided. Since these feed items are under the control of the grower, restrictions against their use as animal feed may be placed on the product label and the requirement for data may be waived. A current product label for Supertin 4L must be submitted which shows this restriction.

Table 2: TPTH residue data on peanut meat.

Site	lbs. ai/A/Appl. (Total)	PHI in Days	Residue in PPb				
			$Ø_4Sn$	$Ø_3SnOH$	$Ø_2SnO$	$Ø_1SnOOH$	Inorg. Tin Bu_4Sn
GA	Control		ND[a]	ND	ND	ND	ND
GA	0.24(2.16)	17-22	ND	ND	ND	ND	ND
GA	0.48(4.32)	17-22	ND	ND	ND	ND	ND
AL	Control		ND	ND	ND	ND	ND
AL	0.24(2.16)	22	ND	ND	ND	ND	ND
AL	0.48(4.32)	22	ND	ND	ND	ND	ND

Table cont. on next page

Table 2: TPTH residue data on peanut meat, Cont

Site	lbs. ai/A/Appl. (Total)	PHI in Days	Residue in PPb $\emptyset_4Sn$	$\emptyset_3SnOH$	$\emptyset_2SnO$	$\emptyset_1SnOOH$	Inorg. Tin Bu_4Sn
VA	Control		ND	ND	ND	ND	ND
VA	0.24(1.92)	14	ND	ND	ND	ND	ND
VA	0.48(3.84)	14	ND	ND	ND	ND	ND

a. ND <0.05 ppm

The above data indicate that total TPTH residues (TPTH, $\emptyset_3SnO$, plus its metabolites $\emptyset_2SnO$ and $\emptyset_1SnOOH$, expressed as TPTH equivalents) in or on peanut meat will not exceed 0.20 ppm (N) as a result of ground application of Super Tin 4L at 1x and 2x the proposed use rate (2.16 to 4.32 lbs. ai/A/season) and a 14-22 day PHI. Additional geographically representative data are needed for a 14 day PHI, or the PHI may be increased to 22 days. The established tolerance for TPTH in or on peanut (0.05 ppm) may be exceeded. A tolerance of 0.2 ppm is needed, based on the submitted data. However, additional data are needed from TX, and additional data from aerial applications, if that use is to be registered.

A peanut processing study was not submitted. Processed peanut commodities include: meal, crude oil, soapstock, and refined oils. If no residues are found on a raw agricultural commodity resulting from a residue field trial treated at the theoretical concentration factor or up to 5x, then no feed/food processing studies are required. The theoretical concentraction factor can be calculated by dividing the amount (weight or volume) of the processed commodity into the the amount of raw agricultural commodity from which it was produced. The largest theoretical concentration factor for a processed commodity used for food or feed is the minimum number by which the use rate must be multiplied to determine the acceptable exaggerated rate. Experience indicates that exaggerated rates above 5x are not useful in reflecting the normal residue burden on a crop. A 2x exaggerated rate is not sufficient to waive the requirement of a peanut processing study.

Sugar beets:

Data provided with this submission:

Triphenyltin Hydroxide Protocols and Field History For Residue Field Trials on Sugar beets (401493-02).

Data provided with previous submissions:

Validation of A Method for the Separation and Determination of Phenyltin Species ($Ø_aSnX_4$-a) in Sugar Beets by Liquid Chromatography/Atomic Absorption Spectroscopy Plus Crop Residue Analyses. (Accession No. 263221)

This submission was previously reviewed by S. Hummel (see, memo of 9-4-86).

A review integrating both of these submissions follows:

Data from 4 field trials on sugar beets conducted in MN (2) and ND (2) were provided in Accession No. 263221, supporting documentation was provided in Accession No. 401493-02. MN and ND accounted for ca 30% of the U.S. sugar beet production during 1984 (Agricultural Statistics, 1985). For adequate geographic representation data from CA, MN/ND, ID, WA, NE, WY, and MI are required.

These field trials reflect application of Super Tin 4L begining at the onset of disease conditions, continued at 10 days intervals, and terminated 14 days before harvest. It is noted that only one location (MN) had samples harvested 14 days after the last application. A total of 4 or 5 applications were made during the treatment period. Super Tin 4L was applied at rates of 9.5 ozs. (1x) to 19.0 ozs. (2x) per acre (0.29 to 0.58 lbs. ai) in ca 59 gallons of water utilizing a boom sprayer. Maximum treatment was 2.9 lbs. ai/A/season. The experimental design called for use of 3 plots (6 rows x 25 ft.) per treatment site. Control plots were sufficiently isolated to prevent contamination.

These field studies do not reflect aerial application of Super Tin 4 L. If the product is to be registered for aerial application on sugar beets, residue data reflecting that use will be required.

At harvest, three 5 lb. samples (roots) were taken from each plot (9 samples per site) for a total of 18 samples. All samples were immediately frozen and shipped (in dry ice) within 24 hours of harvest to M&T Chemicals, Inc. for analysis. All samples were placed in frozen storage upon receipt by the laboratory until just prior to analysis. No storage stability data were provided, therefore, the fate of TPTH residues during storage and shipment is unknown.

Sugar beet roots were assayed for TPTH residues using Analytical Method TA-47 (Accession No. 263221). Residues found on sugar beet roots are summarized in Table 3:

Table 3. TPTH Residues in or on sugar beet roots:

Site	lbs. ai/A/Appl. (Total)	PHI in Days	Residue in PPb $Ø_4Sn$	$Ø_3SnOH$	$Ø_2SnO$	$Ø_1SnOOH$	Inorg. Tin Bu_4Sn
MN	Control		ND[a]	ND	ND	ND	ND
MN	0.29(1.45)	14	ND	ND	ND	ND	ND
MN	0.59(2.95)	14	ND	ND	ND	ND	ND
MN	control		ND	ND	ND	ND	ND
MN	0.29(1.16)	18	ND	ND	ND	ND	ND
MN	0.58(2.32)	18	ND	ND	ND	ND	ND
ND	Control		ND	ND	ND	ND	ND
ND	0.29(1.45)	18	ND	ND	ND	ND	ND
ND	0.58(2.32)	18	ND	ND	ND	ND	ND

a. ND < 0.01 ppm

The above data indicate that total TPTH residues (TPTH, $Ø_3SnO$, plus its metabolites $Ø_2SnO$ and $Ø_1SOOH$, expressed as TPTH equivalents) in or on sugar beet roots will not exceed 0.05 ppm (N) as a result of ground application of Super Tin 4L at 1.48 and 2.95 lbs. ai/A/season and a 14-18 day PHI. Additional geographically representative data are needed for a 14 day PHI, or the PHI may be increased to 18 days. The established tolerance for TPTH residues in or on sugar beets roots (0.05 ppm) should not be exceeded. However, additional data are needed from CA, ID, WA, NE, WY, and MI. Residue data are also needed from aerial applications, if that use is to be registered.

TPTH residue data in or on sugar beet tops, an important feed item, were not submitted. However, since a feeding restriction appears on the label, which we consider practical to enforce, no residue data are required.

A sugar beet processing study was not submitted. Sugar beet processed commodities include: pulp, molasses, and refined sugar. A 2x exaggerated rate is not sufficient to waive the requirement of a processing study (see detailed explanation under peanut residue data).

Pecans:

Data provided with this submission:

Triphenyltin Hydroxide Protocols and Field History For Residue Field Trials on Pecans (MRID No. 401493-03).

Data provided with previous submissions:

Validation of A Method for the Separation and Determination of Phenyltin Species ($Ø_aSnX_4$-a) in Pecans By Liquid Chromatography/Atomic Absorption Spectroscopy Plus Crop Residue Analyses (Accession No. 266046).

This material was previously reviewed by F. Suhre (memo of 5-1-87).

A review integrating both of these submissions follows:

Data from 4 field trials on pecans, conducted in GA (2), AL (1), and TX(1) VA (1), were provided in Accession No. 266046. These 3 states accounted for >71% of the 1984 pecan harvest in the United States (Agricultural Statistics, 1985). The pecan product varies from year to year, but these states represent the major pecan growing areas.

These field trials reflect an initial application of Super Tin 4L (4 lbs. TPTH ai./gallon) from pre-pollination to full canopy, with repeat applications made every 10 days and terminating when the shucks open. A total of 6 to 8 applications were made during the treatment period. Super Tin 4L was diluted with 500 gallons of water and applied at 0.28 to 3.8 lbs. ai./A, utilizing grownd spray equipment. PHI's ranged from 50 to 78 days. Maximum treatment was 26.6 lbs. ai/A/season. The experimental design called for treatment of 3 trees per site. Control trees were sufficiently isolated to prevent contamination.

These field studies do not reflect aerial application of Super Tin 4 L. If the product is to be registered for aerial application to pecans, residue data reflecting that use will be required.

At harvest, a 5 lb. sample of nuts were taken from each of the 3 trees per treatment site. The time from harvest to shipment of the samples to M&T Chemicals, Inc. ranged from 1 to 68 days. Samples stored for 68 days were kept at 45°F prior to storage. Other samples were shipped unfrozen by overnight express. No storage stability data were provided; therefore, the fate of TPTH residues during storage and shipment is unknown. Based on a room temperature storage stability study, residues of TPTH are expected to degrade rapidly.

Pecans were assayed for TPTH residues using Analytical Method TA-49 (Accession No. 266046). Residues found in or on pecans on summarized in table 4:

Table 4: TPTH residue in or on pecan nuts.

Site	lbs. ai/A/Appl. (Total)	PHI Days	Residue in ppb $Ø_4Sn$	$Ø_3SnOH$	$Ø_2SnO$	$Ø_1SnOOH$	Inorg. Tin Bu_4Sn
GA	Control		ND[a]	ND	ND	ND	ND
GA	0.28(2.24)	65	ND	ND	ND	ND	ND
GA	0.56(4.43)	65	ND	ND	ND	ND	ND
GA	0.38(2.66)	50	ND	ND	ND	ND	ND
GA	3.80(26.6)	50	ND	ND	ND	ND	ND
AL	Control		ND	ND	ND	ND	ND
AL	0.19(1.14)	52	ND	ND	ND	ND	ND
AL	0.38(2.28)	52	ND	ND	ND	ND	ND
TX	Control		ND	ND	ND	ND	ND
TX	0.36(2.25)	78	ND	ND	ND	ND	ND
TX	0.72(5.04)	78	ND	ND	ND	ND	ND

a. ND <0.05 ppm

The above data indicate that total TPTH residues (TPTH, $Ø_3SnO$, plus its metabolites $Ø_2SnO$ and $Ø_1SnOOH$, expressed as TPTH equivalents) in or on pecans (meat) will not exceed 0.2 ppm (N) from ground application of Super Tin 4L at rates of 0.28 to 3.8 lbs. ai/A/season and a 50-78 day PHI. The established tolerance for TPTH residues in or on pecans (0.05 ppm) may be exceeded and must be raised to 0.02 ppm. Additional residue data from aerial application are needed, if aerial use is to be registered.

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Potatoes

Data provided with this submission:

Triphenyltin Hydroxide Protocols and Field History For Residue Field Trials on Potatoes (MRID No. 401493-04).

Data provided with previous submissions:

Validation of A Method for the Separation and Determination of Phenyltin Species ($Ø_aSnX_4$-a) in Potatoes By liquid Chromatography/Atomic Absorption Spectroscopy Plus Crop Residue Analyses (Accession No. 263219).

This material was previously reviewed by S. Hummel (memo of 9-4-86).

A review integrating both of these submissions follows:

Residue data from 4 field trials conducted in ME (1), ND (1), WA (1), and ID (1) were provided in Accession No. 263219. These 4 states accounted for 62% of the 1984 fall/winter potato harvest or 55% of the total 1984 U.S. potato harvest. Agricultural Statistics (1985) categories total US potato production during 1984 on a seasonal basis as follows:

Winter	0.66%
Spring	5.5%
Summer	5.6%
Fall	88.25%

Based on these statistics we concluded that the potato field trials conducted in ME, ND, WA, and ID should be adequate, provided the maximum application rate and minimum PHI are the same for treated potatoes harvested in spring/winter and summer/fall (R. Loranger, memo of 6-21-85; and F. Suhre memo of 9-2-87).

These field trials reflect an initial application of Super Tin 4L (4 lbs. TPTH ai./gallon) at the onset of disease with repeat applications made at 7 day intervals and terminating at least 7 days before harvest. It is noted, that only two locations (WA and ID) had samples harvested 7 days after the last application. A total of 3 to 11 applications were made during the treatment period. Super Tin 4L was applied at rates of 0.29 (1x) to 0.59 (2x) lbs. ai./A utilizing a CO_2 backpack sprayer. Maximum treatment was 6.49 lbs. ai/A/season. The experimental design called for use of 4 plots (6 rows x 25 ft.) per treatment site. Control plots were sufficiently isolated to prevent contamination.

The field studies submitted do not reflect aerial and/or sprinkler irrigation application of Super Tin 4 L. If the product is to be registered for those uses, data from residue field trials reflecting aerial and sprinkler irrigation application are require.

At harvest, three or four, 5 lb. samples of tubers were taken from each treatment site. Samples were kept in cold storage until shipped for residue analysis. The time from harvest to shipment ranged from 1 to 75 days (ME & ID 1 day; ND 48 days; WA 75 days). No storage stability data were provided, therefore, the fate of TPTH residues during storage and shipment is unknown. Based on a room temperature storage stability study submitted previously, residues of TPTH are expected to degrade rapidly.

Potatoes were assayed for TPTH residues using Analytical Method TA-47 (Accession No. 263219). Residues found in or on potatoes are summarized in Table 5:

Table 5: TPTH residues in or on potatoes

Site	lbs. ai/A/Appl. (Total)	PHI in Days	Residue in PPb $Ø_4Sn$	$Ø_3SnOH$	$Ø_2SnO$	$Ø_1SnOOH$	Inorg. Tin Bu_4Sn
ME	Control		ND[a]	ND	ND	ND	ND
ME	0.29(3.19)	11	ND	ND	ND	ND	ND
ME	0.59(6.49)	11	ND	ND	ND	ND	ND
ND	Control		ND	ND	ND	ND	ND
ND	0.29(0.87)	15	ND	ND	ND	ND	ND
ND	0.59(1.77)	15	ND	ND	ND	ND	ND
WA	Control		ND	ND	ND	ND	ND
WA	0.29(1.74)	7	ND	ND	ND	ND	ND
WA	0.59(3.54)	7	ND	ND	ND	ND	ND
ID	Control		ND	ND	ND	ND	ND
ID	0.29(1.74)	7	ND	ND	ND	ND	ND
ID	0.59(3.54)	7	ND	ND	ND	ND	ND

a. ND <0.01 ppm

The above data indicate that total TPTH residues (TPTH, $Ø_3SnO$, plus its metabolites $Ø_2SnO$ and $Ø_1Sn$, expressed as TPTH equivalents) in or on potatoes will not exceed 0.05 ppm as a result of 3 to 11 ground application of Super Tin 4L at 0.29 to 0.59 lbs. ai/A/season and PHIs ranging from 7 to 15 days. The established tolerance for TPTH residues on potatoes (0.05 ppm) should not be exceeded, based on the submitted residue data. However, only samples from ID and WA had PHI's of 7 days. Residue data reflecting a 7 day PHI are needed from the other states. Furthermore, data from aerial application are needed, if aerial use is to be registered.

A potato processing study was not submitted. Processed potato commodities include granules, chips, and dried potatoes. No detectable residues resulting from a 2x exaggerated rate study is not sufficient evidence to waive the requirement of a processing study (see detailed explanation under peanut residue data).

Carrots:

Data provided with this submission:

Triphenyltin Hydroxide Protocols and Field History For Residue Field Trials on Carrots (MRID No. 401493-04).

Data provided with previous submissions:

Validation of A Method for the Separation and Determination of Phenyltin Species ($Ø_aSnX_4$-a) in Carrots By liquid Chromatography/Atomic Absorption Spectroscopy Plus Crop Residue Analyses (Accession No. 263219).

This material was previously reviewed by S. Hummel (see, memo of 9-4-86).

A review integrating both of these submissions follows:

Residue data from 4 field trials conducted in CA (1), TX (1), MI (1), and Unknown (1), were provided in Accession No. 263218. Samples 18CA-0301, -0302, -0303; and 20CA-0101, -0102, -103, -0201, -0202, and -0203 (see, Accession No. 263218 page 54b.) are not discussed in the study protocol/ sample history for carrots (MRID No. 401493-05). This discrepancy needs to be resolved. In the interim we will disregard these data. CA, TX, and MI accounted for 76% of the 1984 U.S. carrot production (Agricultural Statistics, 1985). CA, TX, MI, and WA/OR would represent the major carrot growing areas in the U.S.; thus additional residue data are needed from OR/WA.

These field trials reflect an initial application of Super Tin 4L (4 lbs. TPTH ai./gallon) at 6 to 8 weeks after planting with repeat applications made at 7 day intervals and terminating at least 14 days before harvest. A total of 6 to 8 applications were made during the treatment period. Super Tin 4L was applied at 0.24 (1x) lbs. ai./A, utilizing a CO_2 backpack sprayer. Maximum treatment was 1.92 lbs. ai/A/season. The experimental design called for use of 4 plots (6 rows x 25 ft.) per treatment site. Control plots were sufficiently isolated to prevent contamination.

These field studies do not reflect aerial application of Super Tin 4 L. If the product is to be registered for aerial application to carrots, residue data reflecting that use will be required.

At harvest, three 5 lb. samples of roots were taken from each treatment site. Samples were immediately frozen and shipped 1 to 7 days after harvest to M&T Chemical, Inc. for analysis. No storage stability data were provided, therefore, the fate of TPTH residues during storage and shipment is unknown.

Carrots were assayed for TPTH residues using Analytical Method TA-47 (Accession No. 263219). Residues found in or on carrots are summarized in Table 6:

Table 6: TPTH residues in or on carrots:

Site	lbs. ai/A/Appl. (Total)	PHI in Days	Residue in PPb				
			$Ø_4Sn$	$Ø_3SnOH$	$Ø_2SnO$	$Ø_1SnOOH$	Inorg. Tin Bu_4Sn
CA	Control		ND[a]	ND	ND	ND	ND
CA	0.24(1.44)	14	ND	ND	ND	ND	ND
TX	Control		ND	ND	ND	ND	ND
TX	0.24(1.92)	14	ND	ND	ND	ND	ND
MI	Control		ND	ND	ND	ND	ND
MI	0.24(1.68)	14	ND	ND	ND	ND	ND

a. ND <0.01 ppm

The above data indicate that total TPTH residues (TPTH, $Ø_3SnO$, plus its metabolites $Ø_2SnO$ and $Ø_1SnOOH$, expressed as TPTH equivalents) in or on carrots will not exceed 0.05 ppm as a result of 6 to 8 ground applications of Super Tin 4L at 0.24 lbs. ai/A/season and a PHI of 14 days. The established tolerance for TPTH residues on potatoes (0.01 ppm) may be exceeded.

A 0.05 ppm (N) tolerance is needed, based on the submitted residue data. Additional data are needed from OR/WA, where 8% of the US carrots are grown. Furthermore, residue data from aerial application is needed, if aerial use is to be registered.