

US EPA ARCHIVE DOCUMENT

125301

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JAN 6 1983

TO: Frank Gee
Product Manager
Registration Division (TS-767)

From: Emil Regelman, Acting Chief
Review Section No.1
Environmental Fate Branch



Attached please find the environmental fate review of:

Reg./File No.: 35977-EUP-E

Chemical: Ethyl[2-(p-phenoxyphenoxy) ethyl] carbamate

Type Product: Insect growth regulator

Product Name: MAAG RO 13-5223 1% Bait

Company Name: MAAG Agrochemicals

Submission Purpose: EUP to control fire ants

ZBB Code: Sec 5

ACTION CODE: 700

Date in: 10/26/82

EFB # 33

Date Completed: 1/6/83

TAIS (level II) Days

52

5

Deferrals To: _____

_____ Ecological Effects Branch

_____ Residue Chemistry Branch

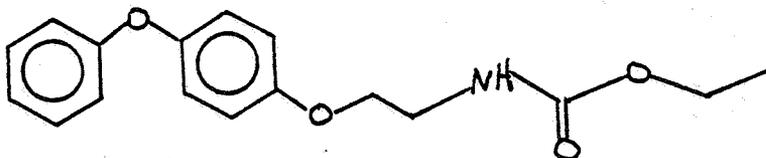
_____ Toxicology Branch Date Out:

1.0 INTRODUCTION

Chemical Name and Type of Pesticide: Ro 13-5223, ethyl[2-(p-phenoxyphenoxy)ethyl]carbamate, 1% ai, insecticide.

Trade Name: Ro 13-5223 1% Bait

Chemical Structure:



Maag Agrochemicals is requesting a one year experimental use permit (EUP) for use on non-cropland to control fire ants. The areas to be treated include airport grass areas, golf courses, athletic fields, building grounds, non-grazed pasture land, etc. Five thousand (5000) acres will be treated in the states of TX, LA, AR, MS, AL, GA, and FL using a total of 6250 lbs of 1% bait or 62.50 lbs ai.

2.0 DIRECTIONS FOR USE

Proposed program and label for EUP is attached.

3.0 DISCUSSION OF DATA

3.1 HYDROLYSIS

3.1.1 Hydrolysis study with the radiolabelled insecticide Ro 13-5223/024, Dieterle P. and R. Kaufmann, 25 May 1982, Report No. 041/2922, p. 103, Acc. # 248411.

Experimental Procedure

Ro 13-5223/024, ^{14}C -labeled in the dioxyphenyl ring was used in the study in buffer solutions of pH 3.0 (0.1M KH_2PO_4), pH 7.0 (0.1M $\text{KH}_2\text{PO}_4/\text{Na}_2\text{HPO}_4$), and pH 9.0 (0.2M sodium borate/HCl). A typical procedure for the hydrolysis of a.i. at pH 3.0/1 ppm/35°C is shown below.

A 100 ml Sovirel screw-cap bottle containing 50 ml pH 3.0 buffer solution was sterilized by autoclaving (120°C, 20 minutes), then thermostatted at 35°C. Acetonitrile (1.0 ml)

and an aliquot of the radioactive dosage solution (0.5 ml = 4.0×10^6 dpm = 50 ug a.i.) were added to give an a.i. concentration of 0.97 ppm. The flask was capped, shaken vigorously and incubated in the dark at 35°C in a thermostatted oven.

Duplicate samples were worked up at various time intervals (at 35°C incubated samples after 0,3,4,7, and 10 weeks; at 50 °C incubated samples after 0,2,3,5, and 7 weeks) by extracting three times with ethyl acetate (90 ml; 80 ml). The ethyl acetate extracts were filtered through sodium sulphate, the sodium sulphate washed with ethyl acetate (20 ml) and the radioactivity in the extracted aqueous phase and in the combined ethyl acetate phases determined by LSC. The ethyl acetate extract was evaporated to dryness, redissolved in acetonitrile (2 ml) and analysed by LSC. The nature of the radioactivity in each of the duplicate samples was investigated by radio-HPLC.

Results

Table 1 summarizes the results of the study under the various test conditions. Even under extreme temperature (50°C) and time (7 weeks), only traces of radioactivity that did not correspond to Ro 13-5223 (less than 9%) were present.

Conclusion

Ro 13-5223 is stable to hydrolysis. The study is acceptable

3.2 PHOTOLYSIS

- 3.2.1 Photolysis of ^{14}C -Ro13-5223/024 in solution and on soil surfaces, P. Dieterle and R. Kaufmann, 16 July 1982, Report No. 041/3061, Acc.# 248411.

This parameter is not an EUP data requirement and will only be briefly reviewed here. A complete review will be done when application is made for full registration.

The photolytic half-life in distilled water was 5.7 hour. Degradation produced 3.5% volatile organics, as well as two isomers that were less than 3% of the total radioactivity.

3.3 AEROBIC SOIL METABOLISM

- 3.3.1 Half year Interim Report of the one year aerobic soil metabolism study with ^{14}C -Ro 13-5223/024, P. Dieterle and R. Kaufman, 21 June 1982, Report No. 041/2977, Acc. #248411

Although aerobic soil metabolism is a data requirement for an EUP, this is an interim report, so only a summary of the data will be given.

Ro 1-5223, ^{14}C -labeled in the dioxyphenyl ring, was used to treat three, apparently foreign, soils, the characteristics of which are:

1. Commugny soil, "Sandy loam," pH 7.2, 2.1% humus, 15.6% clay,
2. Dielsdorf soil, "sandy loam," pH6.9, 4.3% humus, 14.7% clay, 30.8% silt.
3. Steinmaur soil, "loam," pH7.5, 5.6% humus, 24.6% clay, 36.3% silt.

It is not known what the characteristic "percent humus" refers to.

Test soils came from outdoor, grass-covered plots that had not been treated with pesticide in 3 years. Soil was dried, sived, added to flasks, and conditioned at 25% maximum water capacity. Soils were then treated with 5 ppm a.i. Soils were sampled at 0,1,2, and 7, days, 2 and 3 weeks, and 1,2,3,4 and 6 months, and extracted with acetonitrile/ buffer. Analysis was by LSC, HPLC, and TLC.

After the six months incubation period 5%, 18% and 10% of the initially applied radioactivity were identified as unaltered Ro 13-5223 in Commugny, Dielsdorf and Steinmaur soils, respectively. For these 3 soils, the half-lives, calculated from a program that provides statistics for decline of residues, were 73.7, 127.7, and 85.7 days, respectively. Up to four metabolites were observed in trace amounts. The production of $^{14}\text{CO}_2$ was in the range of 18.0 - 22.8% for all three soils indicating extensive metabolism of a.i. The amount of extractable radioactivity decreased from 95.2% and 98.4% ($t = 0$) to 16.7%, 27.9% and 19.2% at $t = 6$ months.

Below is a listing of the studies that were submitted, but have not been summarized. They will be reviewed when application is made for full registration.

3.4 ANAEROBIC SOIL METABOLISM

- 3.4.1 Laboratory Aerobic Soil Metabolism Study with ^{14}C -Ro 13-5223/024, P. Dieterle and R. Kaufmann, 28 April 1982, Report.. No. 041/2841, Acc. #248411.

- 3.4.2 Laboratory Sterile Soil Metabolism with ^{14}C -Ro 13-5223/024, A. Pryde and M. Etterli, 5 March 1982, Report No. 041/2677, Acc. # 248411.

3.5 LEACHING

- 3.5.1 Laboratory Leaching Studies with ^{14}C -Ro 13-5223/024, A. Pryde and M. Etterli, 16 April 1982, Report No. 041/2830,

3.6 ADSORPTION/DESORPTION

- 3.6.1 Freundlich Adsorption and Desorption Constants for ^{14}C -Ro-13-5223/024 in four soils, A. Pryde and M. Etterli, 4 March 1982, Report No. 041/2674, Acc # 248411.

3.7 FIELD DISSIPATION

- 3.7.1 Field dissipation study of Ro 13-5223 when applied to pasture grass as a fire ant bait. J. Fyler, 15 Sept 1982, p. 211, Acc.# 248411.

3.8 FISH ACCUMULATION

- 3.8.1 Ro 13-5223/024 (^{14}C); bioconcentration factor and metabolism study in fish, A. Pryde and M. Etterli, 22 June 1982, Report No. 041/2986, Acc.# 248411.

4.0 CONCLUSION/RECOMMENDATION

- 4.1 The data requirements for this EUP have been partially satisfied: the hydrolysis study is acceptable and indicates no degradation occurs; half-year interim report on aerobic soil metabolism shows considerable degradation in the test soils.
- 4.2 EFB concurs with the proposed use on fire ants under the EUP because of restriction to non-cropland areas and the low application rate.
- 4.3 The proposed experimental program seems adequate.

Notes to PM: The fish accumulation study employed Bitterling fish. Our data requirements suggest Bluegill sunfish or channel catfish. When application for full registration is made, the use of Bitterling fish would have to be justified. Laboratory soil studies must use soils with the same characteristics as representative soils in the United States. They must be matched as to soil class, % organic matter, pH soil, ratio of bacteria, to fungi to actinomycetes. Field studies are to be conducted in the United States.

Herbert L. Manning
Herbert L. Manning, Ph.D.
Review Section #1
Environmental Fate Branch
Hazard Evaluation Division (TS-769)

TABLE I Summary of the hydrolysis results with Ro 13-5223/024

(Values are percentages of initially applied radioactivity)

Conditions	Ro 13-5223 1) 2)	in water phase 1) 3)	Radioactive recovery 1)
pH 3.0 / 35 °C 4)	100 ± 4	0.1 ± 0.1	103.8 ± 3.3
pH 3.0 / 50 °C 5)	100 ± 3	0.3 ± 0.2	105.7 ± 1.2
pH 7.0 / 35 °C 4)	99 ± 4	0.2 ± 0.0	103.4 ± 2.6
pH 7.0 / 50 °C 5)	101 ± 3	0.2 ± 0.1	105.8 ± 3.0
pH 9.0 / 35 °C 6)	97 ± 4	0.4 ± 0.1	101.4 ± 4.5
pH 9.0 / 50 °C 5)	98 ± 4	0.4 ± 0.1	104.0 ± 4.8
distilled water/ 35 °C 7)	96 ± 4	0.2 ± 0.0	101.0 ± 4.1
distilled water/ 50 °C 5)	99 ± 6	0.2 ± 0.1	104.2 ± 5.2

1) Values are expressed as mean ± standard deviation (n=5) for the 5 time points analysed

2) Analysed by radio-HPLC of the ethyl acetate phase

3) Water soluble radioactivity not extracted into ethyl acetate

4) Samples were incubated for 0, 15, 27, 46 and 70 days

5) Samples were incubated for 0, 13, 24, 34 and 51 days

6) Samples were incubated for 0, 20, 27, 46 and 70 days

7) Samples were incubated for 0, 27, 39, 46 and 70 days

ENVIRONMENTAL FATE SUMMARY

Evaluation of the environmental fate of Ro 13-5223 indicates that this compound shows low environmental mobility and a fairly rapid dissipation. Field trials to further determine the environmental behavior of Ro 13-5223 will be carried out during the EUP.

In water Ro 13-5223 is soluble to 6 ppm. When hydrolysis was measured using ^{14}C -Ro 13-5223, no hydrolysis was observed over a 70 day period. On the other hand, the photolytic 1/2 life of ^{14}C -Ro 13-5223 in distilled water is 5.7 hours without sensitizer and 5.0 hours with acetone as a sensitizer indicating that Ro 13-5223 would not be expected to persist for long periods of time in natural waters.

The soil mobility of Ro 13-5223 has also been examined. Leaching studies show that this material shows little or no potential to move in the soil profile. Studies were performed in two soil types, Steinmaur loam soil (5.6% organic matter) and Wallis sandy loam soil (1.4% organic content). Soil columns (30 cm) were eluted with 393 ml of water, equivalent to 200 mm of rainfall, over a period of 2 days. All but traces of the radioactivity recovered were in the top 5 cm of the soil column for both soils, indicating little or no leaching of Ro 13-5223. In the Steinmaur loam soil, about 60% of the recovered radioactivity was extractable and about 40% was bound to the soil. For the Wallis sandy loam soil, about 85% of the recovered radioactivity was extractable and about 15% was bound to the soil. Only trace amounts of metabolites were detected in the extracted radioactivity; most of the extracted material was in the form of parent compound. However, the presence of bound residues in both soils would indicate that some metabolism was taking place. Similar results were obtained with residues of Ro 13-5223 which had been aged in Steinmaur loam soil for 30 days prior to leaching. When the aged residue was placed in a column of Steinmaur soil and leached over a period of 40 days, 93.6% of the applied radioactivity was recovered in the top 5 cm of the column, showing no leachability. A small amount of the applied dose, 1.8%, was recovered in the 5-10 cm section of the column, indicating that small amounts of the aged residue had a very limited ability to leach. In this experiment, about 80% of the recovered radioactivity was extractable and about 17% remained bound to the soil. These results would indicate that aged residues of Ro 13-5223 behave in a similar fashion to unaged Ro 13-5223 residues.

The low soil mobility of Ro 13-5223 has been confirmed with binding studies using radiolabeled material in four soil types: Steinmaur loam (5.6% organic matter), Dielsdorf sandy loam (4.3% organic matter), Commugny sandy loam (2.1% organic matter), and Wallis sandy loam (1.4% organic matter). To determine binding constants, 4 concentrations of ^{14}C -Ro 13-5223 were shaken with soil for 24 hours. The Freundlich binding constants obtained in these studies are in Table 1. These data indicate that Ro 13-5223 is strongly bound to the Steinmaur, Dielsdorf and Commugny soils. Binding to the Wallis soil was more moderate. These results tend to confirm the low mobility of Ro 13-5223

in soil. This low mobility of Ro 13-5223 combined with its extensive metabolism in soil and low use rates indicate that little environmental hazard will be associated with Ro 13-5223 residues.

Table 1. Binding of ^{14}C -Ro 13-5223 to Four Soil Types

<u>Soil Type</u>	<u>Freundlich Adsorption Constant (K)</u>
Steinmaur loam	77
Dielsdorf sandy loam	49
Commugny sandy loam	77
Wallis sandy loam	18

The soil metabolism of Ro 13-5223 is in the process of being characterized. An aerobic soil metabolism study has been running six months and the first results are quite encouraging. Table 2 summarizes results to date. Ring labeled ^{14}C -Ro 13-5223 is being incubated at 5 ppm in three soil types, Steinmaur loam soil (5.6% organic matter), Dielsdorf sandy loam soil (4.3% organic matter), and Commugny sandy loam soil (2.1% organic matter). These soils represent typical grain and fruit growing soils which have been extensively characterized. Further information will be made available upon request. The six month readings presented here show that Ro 13-5223 is being extensively metabolized to bound metabolites and CO_2 . Since the ^{14}C -Ro 13-5223 is ring labeled, the presence of label in CO_2 would indicate that the Ro 13-5223 is being totally mineralized. Earlier readings during the course of the experiment indicate that the buildup of bound residues and the production of $^{14}\text{CO}_2$ is progressive and increasing with time. The six month readings which have been taken to date confirm this impression indicating the evolution of substantially more $^{14}\text{CO}_2$ than in previous readings. The metabolic origin of the bound residues and CO_2 has been confirmed by running parallel studies on sterilized Steinmaur, Commugny and Dielsdorf soils. Radiolabeled Ro 13-5223 remained stable and extractable in all three soils for the one month duration of the experiment.

Table 2. Aerobic Metabolism of ^{14}C -Ro 13-5223 in Three Soil Types: Distribution of ^{14}C at Six Months

<u>Soil Type</u>	<u>Percentage (%) of Applied Dose Recovered</u>		
	<u>Extractable</u>	<u>Bound</u>	<u>$^{14}\text{CO}_2$</u>
Commugny sandy loam	16.7	37.5	22.8
Dielsdorf sandy loam	27.9	36.8	18.0
Steinmaur loam	19.2	40.6	19.7

Degradation of Ro 13-5223 under anaerobic conditions was much slower; however, some breakdown was still observed. Nevertheless, dissipation of Ro 13-5223 under anaerobic conditions would be expected to be slow.

The rapid dissipation of Ro 13-5223 under field conditions has been confirmed using formulated material. When Ro 13-5223 formulated as a 1% fire ant bait was applied at 20 times the proposed use rate, initial residues in soil and grass were low and dissipation was rapid. This would seem to indicate little potential for environmental persistence, especially since the material was applied at 20X the use rate.

The accumulation of Ro 13-5223 through food chains is unlikely based on its low leachability, extensive metabolism in soil and animals, and rapid excretion. Static bioaccumulation studies on ^{14}C -Ro 13-5223 using Bitterling (Rhodeus sericeus amarus) indicate a level of bioaccumulation consistent with the compound's low solubility in water. Fish exposed to 0.152 ppm of labeled material reached a plateau of 14.5 ppm in one day. After four days, all of the radioactivity present in the aquarium was shown to be present in metabolized form. Depuration was rapid when fish were placed in fresh water, giving a half-life of 2 days. None of the excreted radioactivity was in the form of the parent compound, indicating that Ro 13-5223 was extensively metabolized by Bitterling. The rapid metabolism of and excretion of Ro 13-5223 by fish would suggest that food chain bioaccumulation will not be a problem in aquatic systems.

Proposed Experimental Program

Ro 13-5223 1% Bait for Control of Imported Fire Ants

- 1. G. L. Benson, MAAG Agrochemicals, will assume responsibility for overall coordination of the experimental permit field program for MAAG Agrochemicals. Additional members of the MAAG organization who will be involved in the program include R. W. Bagley, J. T. Bridges and J. H. Wojciak. Various USDA, university, state and contract personnel will also be involved in application of Ro 13-5223 treatments and evaluation of their effectiveness.

See addendum for qualifications and other information concerning participants.

- 2. Non-cropland sites will be selected in fire ant infested areas. The states, acres to be treated, and amount of material to be used are as follows:

<u>State</u>	<u>Total acres to be treated</u>	<u>Maximum pounds of 1% bait required</u>
Texas	1500	1875
Louisiana	500	625
Arkansas	300	375
Mississippi	500	625
Alabama	500	625
Georgia	850	1062.5
Florida	850	1062.5
Total	5000	6250

- 3. Trials will be established to determine the effectiveness of Ro 13-5223 formulated as a 1% ai bait for control of the red imported fire ant (*Solenopsis invicta*) on non-cropland areas. Sites will be selected on the basis of infestation and accessibility. Possible sites include airport grass areas, golf courses, athletic fields, building grounds, pastureland not to be grazed, non-bearing citrus groves, etc. Applications will be made in the spring of the year with repeat fall applications if necessary to provide control. Some sites will receive only fall applications. Plot size will vary depending upon availability of infested sites. Ideally, non-replicated plots 400-500 A in size will allow the side by side comparison of two carriers

and applied at rates of 4.5 to 5.6 grams ai/A or 1.0 to 1.25 lbs of formulated product/A.

- 4. Objective of the program will be to establish the effectiveness of Ro 13-5223 formulated as a 1% bait on for control of fire ants, and to obtain additional environmental residue information.

It is projected that the non-cropland EUP will be for a period of one year with submission for registration probable in 1983.

INERT INGREDIENT INFORMATION IS NOT INCLUDED

5. Material requirements are based on the treatment rate of 4.5 to 5.6 g ai/A or 1.0 to 1.25 of 1% bait/A. Therefore, maximum requirements are:

$$5000 \text{ A} \times 1.25 = 6250 \text{ lb of 1\% bait}$$

$$= 62.50 \text{ lbs of active ingredient}$$

6. The time period of March 1, 1983, through February 28, 1984, is proposed for the program.
7. Any unused Ro 13-5223 1% bait will be returned to MAAG Agrochemicals, Vero Beach, FL.

DIRECTIONS FOR USE

Apply Ro 13-5223 1% bait when ants are active. This is usually when soil temperatures are above 60°F. Avoid application during excessively hot periods of the day or when grass is wet.

BROADCAST APPLICATION

Ro 13-5223 1% bait should be uniformly distributed over the infested area. Applicators should be accurately calibrated to assure proper dosage.

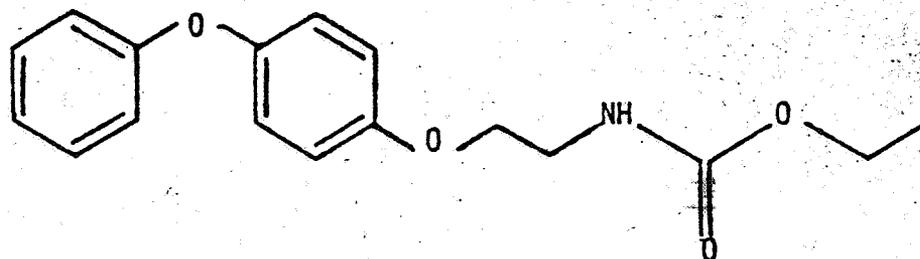
	Rate lb/A	Application
Lawns, turfs and non-crop areas	1.0 to 1.25	broadcast uniformly with air or ground equipment

SINGLE MOUND TREATMENT

Apply 1 to 3 level tablespoons of Ro 13-5223 1% bait per mound by uniformly distributing material 3 to 4 feet around the base of the mound.

PRODUCT CHEMISTRY SUMMARY

As shown below, Ro 13-5223 is a N-phenoxyphenoxy ethyl carbamate. Unlike the N-methyl and N-ethyl carbamates, it shows no ability to inhibit cholinesterase.



Ro 13-5223

Ethyl[2-(p-phenoxyphenoxy)ethyl]carbamate

Technical Ro 13-5223 is a white crystalline solid with no odor, a melting point range of 50 to 53°C, and a vapor pressure of 1.3×10^{-7} Torr at 25°C. The technical material is 97-98% pure. Ro 13-5223 has a low solubility in water, but is highly soluble in many organic solvents. When hydrolysis was measured in water using ^{14}C -Ro 13-5223, no hydrolysis was observed over a 70 day period. On the other hand, the photolytic 1/2 life of ^{14}C -Ro 13-5223 in distilled water is 5.7 hours without sensitizer and 5.0 hours with acetone as a sensitizer indicating that Ro 13-5223 would not be expected to persist for long periods of time in natural waters. (See Environmental Chemistry Physio-Chemical Degradation for studies)

For the proposed fire ant program, Ro 13-5223 is formulated as a 1% bait. The actual formulation contains Ro 13-5223 dissolved

The storage stability of the formulation (ACR 2913 IRB) has been measured over a 20 month period. Under the conditions of this study the 1% bait formulation showed good shelf life.

INERT INGREDIENT INFORMATION IS NOT INCLUDED

FENOXY CARB

Page 15 is not included in this copy.

Pages _____ through _____ are not included.

The material not included contains the following type of information:

- Identity of product inert ingredients.
 - Identity of product impurities.
 - Description of the product manufacturing process.
 - Description of quality control procedures.
 - Identity of the source of product ingredients.
 - Sales or other commercial/financial information.
 - A draft product label.
 - The product confidential statement of formula.
 - Information about a pending registration action.
 - FIFRA registration data.
 - The document is a duplicate of page(s) _____.
 - The document is not responsive to the request.
-

The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.

FOR EXPERIMENTAL USE ONLY

MAAG

Ro 13-5223 1% BAIT

Insect growth regulator for
evaluation in the control of fire ants
in non-crop areas

KEEP OUT OF THE REACH OF CHILDREN

C A U T I O N

See Back Panel for Additional Precautionary Statements

Not for use by any other than a
participant or cooperator of the EPA
approved experimental use program

APPLY THIS PRODUCT ONLY AS SPECIFIED BY THIS LABEL

Active Ingredient..Ethyl[2-(p-phenoxyphenoxy)ethyl]carbamate.....	1%
Inert Ingredients.....	<u>99%</u>
	100%

1 lb contains 0.16 oz active ingredient

EPA EUP NO.

EPA Est No 35977-SW-C1

NET CONTENTS: 5, 25 or 50 lb (to be marked as appropriate)

Distributed By

Maag Agrochemicals, P. O. Box X, Vero Beach, FL 32960

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Ro 13-5223 1% BAIT

HAZARD TO HUMANS AND DOMESTIC ANIMALS

C A U T I O N

May be harmful if swallowed. Avoid breathing dust. Avoid contact with clothing, skin or eyes. In case of contact, flush skin or eyes with plenty of water. Get medical attention if irritation persists. Do not use on food or fodder crops.

ENVIRONMENTAL HAZARDS

Keep out of lakes, streams and ponds. Do not contaminate water by cleaning of equipment or disposal of wastes.

STORAGE AND DISPOSAL

Store away from heat. Protect from freezing. Keep container tightly closed. Do not re-use container.

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