Spatial application mosquito repellents —
Specification —
Part 8:
Liquid detergents for hard surface cleaning
In order to match with technological development and to keep continuous progress in industries, Standards are subject to periodic review. Users shall ascertain that they are in possession of the latest edition.
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## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword</td>
<td>v</td>
</tr>
<tr>
<td>1 Scope</td>
<td>1</td>
</tr>
<tr>
<td>2 Normative references</td>
<td>1</td>
</tr>
<tr>
<td>3 Terms and definitions</td>
<td>1</td>
</tr>
<tr>
<td>4 Requirements</td>
<td>3</td>
</tr>
<tr>
<td>4.1 General requirements</td>
<td>3</td>
</tr>
<tr>
<td>4.2 Active ingredient</td>
<td>3</td>
</tr>
<tr>
<td>4.2.1 Natural repellents</td>
<td>3</td>
</tr>
<tr>
<td>4.2.2 Synthetic repellents</td>
<td>4</td>
</tr>
<tr>
<td>4.3 Specific requirements</td>
<td>5</td>
</tr>
<tr>
<td>4.4 Stability</td>
<td>5</td>
</tr>
<tr>
<td>4.5 Biological efficacy</td>
<td>5</td>
</tr>
<tr>
<td>5 Packaging and labelling</td>
<td>5</td>
</tr>
<tr>
<td>5.1 Packaging</td>
<td>5</td>
</tr>
<tr>
<td>5.2 Labelling</td>
<td>5</td>
</tr>
<tr>
<td>Annex A (normative) Determination of DEET content</td>
<td>7</td>
</tr>
<tr>
<td>A.1 General</td>
<td>7</td>
</tr>
<tr>
<td>A.2 Apparatus</td>
<td>7</td>
</tr>
<tr>
<td>A.3 Preparation of calibration curve</td>
<td>7</td>
</tr>
<tr>
<td>A.4 Procedure</td>
<td>7</td>
</tr>
<tr>
<td>A.5 Calculation</td>
<td>8</td>
</tr>
<tr>
<td>Annex B (normative) Determination of permethrin</td>
<td>9</td>
</tr>
<tr>
<td>B.1 Reagents</td>
<td>9</td>
</tr>
<tr>
<td>B.2 Apparatus</td>
<td>9</td>
</tr>
<tr>
<td>B.3 Operating conditions</td>
<td>9</td>
</tr>
<tr>
<td>B.4 Procedure</td>
<td>9</td>
</tr>
<tr>
<td>B.5 Calculation</td>
<td>10</td>
</tr>
</tbody>
</table>
Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

DRS 393-8 was prepared by Technical Committee RSB/TC 015, Pharmaceutical Products.

DRS 393 consists of the following parts, under the general title: Spatial application mosquito repellents—
Specification:

— Part 1: Coils
— Part 2: Spray
— Part 3: Candles
— Part 4: Papers
— Part 5: Liquid vaporizers
— Part 6: Matt vaporizers
— Part 7: Tablets
— Part 8: Liquid detergents

Committee membership

The following organizations were represented on the Technical Committee on Pharmaceutical products (RSB/TC 015) in the preparation of this standard.

National Industrial Research and Development Agency (NIRDA)

National Pharmacy Council (NPC)

University of Rwanda/College of Sciences and Technology (UR/CST)

Pharmacie NOVA

Rwanda Development Board (RDB)

AGROPY LTD
IKIREZI NATURAL PRODUCTS
HORIZON/SOPYRWA

Rwanda Social Security Board (RSSB)
Pharmavie

University of Rwanda/College of Medicine and Health Sciences (UR/CMHS)

Rwanda Biomedical Center/ Malaria and Other Parasitic Diseases Division (RBC/MOPDD)

Society for Family Health (SFH) – Rwanda

Rwanda Biomedical Center/Medical Procurement and Production Division (RBC/MPPD)

Institut d’Enseignement Superieur (INES) - RUHENGERI

Rwanda Standards Board (RSB) – Secretariat
Introduction

Insecticides are used either for killing or controlling harmful insects. The insecticides which are applied for repelling insects are termed as “Repellents”. Mosquito is one of the most harmful insects for mankind. To destroy them, many preparations are available on the market in various recipes like pest killer spray, soap, oil, powder, repellent etc. Out of these, mosquito repellent is the most popular as it has germicidal and disinfectant properties and is able to repel mosquitoes and is convenient to use.

The mosquito repellent is used for warding off mosquitoes which is the most harmful insect. Nowadays, mosquito repellents are used for controlling mosquito and are complimenting other mosquito destroyers gradually. With the rise in the standard of living, increasing urbanization and population, the demand of mosquito repellent mat is constantly increasing particularly in tropical places. It is a convenient method for protection against mosquito, so it has a tremendous market potential. Thus there is a very good scope for development of such units in the country.

Spatial repellent are chemical products designed to be ‘active’ (requiring heat or electricity) or ‘passive’ (requiring no heat or electricity) and release volatile chemicals into the air within the treated space. Product examples that are currently available include mosquito coils, candles among others; however, many more types of spatial repellent products are waiting to be developed.

Spatial repellents elicit ‘spatial repellency’ which refers to a range of insect behaviors induced by airborne chemicals that result in a reduction in human-mosquito contact. These behaviors include: movement away from a chemical stimulus, attraction-inhibition and/or, and feeding inhibition.
Spatial application mosquito repellents — Specification — Part 8: Liquid detergents for hard surface cleaning

1 Scope

This Draft Rwanda Standard prescribes the requirements, sampling and test methods for liquid detergents for hard surface cleaning formulated and prepared as mosquito repellents.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

RS EAS 383, Synthetic organic liquid detergent for household use — Specification

RS 191, Refined pyrethrum concentrate — Specification

CIPAC 741, Determination of transfluthrin content

CIPAC 743, Determination of prallethrin (etoc) content

CIPAC 993, Determination of Metofluthrin (S1264)

CIPAC 742, Determination of d-allethrin

CIPAC 977, Determination of Meperfluthrin

CIPAC 760, Determination of picaridin

DRS 394-2, Mosquito repellents — Performance test guidelines — Spatial repellents

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply.

3.1 liquid detergent

product specially formulated for cleaning through the process of detergency.
3.2
mosquito

any of numerous arthropod animals of the class mosquito, having an adult stage characterized by three pairs of legs and a body segmented into head, thorax, and abdomen and usually having one or two pairs of wings.

3.3
mosquito repellent

substance applied to skin, clothing, or other surfaces which discourages mosquito (and arthropods in general) from landing or climbing on that surface

3.4
natural repellents/biopesticides

repellents that contain natural, plant-based active ingredients

3.5
synthetic repellents

c conventional repellents containing synthetic chemical active ingredients and carrier synthetic chemical compounds as approved by a competent authority conventional.

3.5
picaridin

1-(1-methylpropoxycarbonyl)-2-(2-hydroxyethyl) piperidine or 2-(2-hydroxyethyl)-1-piperidinecarboxylic acid 1-methylpropyl ester

3.6
transfluthrin

(1R,3S)-3-(2,2-Dichlorovinyl)-2,2-dimethyl-1-cyclopropanecarboxylic acid (2,3,5,6-tetrafluorophenyl)methyl ester

3.7
etoc

Prallethrin. (S)-2-methyl-4-oxo-3-prop-2-ynylcyclopent-2-enyl(1R)-cis, trans-2,2-dimethyl-3-(2-methylprop-1-enyl) cyclopropanecarboxylate
3.8
metofluthrin

$\text{C}_{18}\text{H}_{20}\text{F}_3\text{O}_3$, 2,3,5,6-Tetrafluoro-4-(methoxymethyl)benzyl 2,2-dimethyl-3-(prop-1-en-1-yl) cyclopropanecarboxylate

3.9
d-Alethrin

(RS)-3-allyl-2-methyl-4-oxocyclopent-2-enyl (1R)-cis, trans-chrysanthemate

3.10
meperfluthrin

$\text{C}_{17}\text{H}_{16}\text{Cl}_2\text{F}_4\text{O}_3$, [2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl (1R,3S)-3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropane-1-carboxylate

4 Requirements

4.1 General requirements

4.1.1 The product shall consist of a synthetic organic liquid detergent that is formulated as mosquito repellent and shall be essentially a product which has active ingredient(s) added at a certain level.

4.1.2 The product shall meet all the requirements prescribed in RS EAS 383.

4.2 Active ingredient

4.2.1 Natural repellents

4.2.1.1 Active ingredients used in natural repellents shall be natural plant based active ingredients such as essential oils or any other plant extract approved as mosquito repellents.

4.2.1.2 The manufacturer shall provide adequate data on the repellence/efficacy of such ingredients/product.

4.2.1.3 The manufacturer shall have adequate data justifying the proportion of ingredient(s) for which claims are made, used in the product.

4.2.1.4 The essential oils and plant extracts used in natural repellents shall be, but not limited to:

a) Cedarwood oil;
b) Tea tree oil;
c) Geranium oil;
d) Rosemary oil;
e) Lemongrass oil;
f) Citronella oil;
g) Soybean oil;
h) Eucalyptus oil;
i) Cinnamon oil;
j) Neem oil

4.2.1.5 The proportion of single or blended essential oil in natural repellent shall be set by the manufacturer in accordance with specific standard(s) of the essential oil used and records shall be availed.

4.2.1.6 Pyrethrum extracts such as pyrethrins shall be considered in natural repellents. The limits of pyrethrins in natural repellents shall not be less than 0.5 % and the extract used shall meet the requirements of RS 191.

4.2.2 Synthetic repellents

4.2.2.1 Synthetic repellents shall contain synthetic chemical compounds which are able to discourage mosquitoes and send them flying or crawling away.

4.2.2.2 If the synthetic chemical compound is blended with other active ingredient(s), either natural or synthetic, the proportion shall be set by the manufacturer based on scientific research and records shall be availed.

4.2.2.3 Active ingredients and their content in synthetic repellents shall meet the requirements prescribed in table 1.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Active ingredient</th>
<th>Limits (% w/w)</th>
<th>Identification method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DEET</td>
<td>5 – 50</td>
<td>Annex A</td>
</tr>
<tr>
<td>2</td>
<td>Permethrin, max</td>
<td>13</td>
<td>Annex B</td>
</tr>
<tr>
<td>3</td>
<td>Transfluthrin, max</td>
<td>1</td>
<td>CIPAC 741</td>
</tr>
<tr>
<td>4</td>
<td>Etoc</td>
<td>0.5 – 1.5</td>
<td>CIPAC 743</td>
</tr>
<tr>
<td>5</td>
<td>Metofluthrin (S1264), max</td>
<td>1.82</td>
<td>CIPAC 993</td>
</tr>
<tr>
<td>6</td>
<td>d-Alethrin (Pynamin Forte), max</td>
<td>5</td>
<td>CIPAC 742</td>
</tr>
<tr>
<td>7</td>
<td>Meperfluthrin, max</td>
<td>0.05 – 0.1</td>
<td>CIPAC 977</td>
</tr>
</tbody>
</table>
4.2.2.4 Synthetic repellents and their active ingredients shall be approved and registered by competent authority.

4.3 Specific requirements

The product shall also conform to the specific quality requirements given in Table 2 when tested in accordance with the corresponding test methods.

Table 2 — Specific requirements

<table>
<thead>
<tr>
<th>S/N</th>
<th>Parameters</th>
<th>Requirements</th>
<th>Test methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Solubility in water</td>
<td>Completely soluble</td>
<td>RS EAS 383</td>
</tr>
<tr>
<td>2</td>
<td>Rinsing properties</td>
<td>To pass test</td>
<td>RS EAS 383</td>
</tr>
<tr>
<td>3</td>
<td>pH</td>
<td>6.5 – 11.5</td>
<td>RS EAS 383</td>
</tr>
<tr>
<td>4</td>
<td>Total non detergent organic matter, % w/w, max</td>
<td>0.5</td>
<td>RS EAS 383</td>
</tr>
</tbody>
</table>

4.4 Stability

*Stability at elevated temperature.* After storage at 54 ± 2°C for 14 days, the determined average active ingredient content shall not be lower than 95% of the determined average content found before storage and the formulation shall continue to conform to the product requirements.

4.5 Biological efficacy

5.5.1 When tested in accordance with DRS 394-2, the product shall repel 100% of the mosquitoes available in space, within protection time indicated by the manufacturer.

5.5.2 The protection time of the product shall be indicated on the label.

5 Packaging and labelling

5.1 Packaging

The product shall be packaged in a suitable, well-closed container, to protect the integrity of the product.

5.2 Labelling

The container shall be marked legibly and indelibly with the following information:

a) name of the product;

b) manufacturer’s name and physical address;

NOTE The name, physical address of the distributor/supplier and trade mark may be added as required.

c) batch number;
d) name and strength of active ingredients;
e) protection time;

\*\*d) net weight;\*

\*\*d) country of origin;\*

\*\*f) directions for use; and\*

\*\*g) manufacture and expiry dates.\*

\*\*h) storage conditions\*

\*\*i) warning and precaution\*
Annex A
(normative)

Determination of DEET content

A.1 General

The sample is dissolved in carbon disulfide and the difference in absorbance at 14.18 \(\mu\)m and at 14.48 \(\mu\)m is determined. The quantity of meta-isomer is obtained from this value by means of a calibration curve prepared by the use of a reference standard.

A.2 Apparatus

F.2.1 Double-beam infrared spectrophotometer. Perkin-Elmer model 21 or equivalent.

F.2.2 Two equivalent infrared absorption cells, with sodium chloride windows and a path length of approximately 0.4 mm.

A.3 Preparation of calibration curve

F.3.1 Weigh (to the nearest 0.1 mg) into four volumetric flasks sufficient amounts of the reference DEET standard of known purity to give concentrations of approximately 20, 40, 60 and 80 g/L when dissolved in carbon disulfide.

F.3.2 Fill the reference cell with carbon disulfide and the sample cell with each of the standard solutions in turn, and record the spectra. The spectrum may be scanned rapidly, except for the region 12 – 15 \(\mu\)m, where a normal speed should be used. Carry out a blank measurement with carbon disulfide to correct for any inequality in the paired cells and to determine whether a cell correction is required.

F.3.3 Measure the absorbance at 14.18 \(\mu\)m and at 14.48 \(\mu\)m and calculate the difference between these values, \(\Delta A\), for each of the solutions. Plot the values of \(\Delta A\) against the concentration (g/l) of the meta-isomer.

F.3.4 If a cell correction is required, the value of \(\Delta A\) is determined from the formula:

\[
\Delta A = [A_{14.18} - A_{14.48}]_{\text{ref.}} - [A_{14.48}]_{\text{blank}}
\]

Where ref. = determination with reference standard
blank = determination on CS\(_2\) blank

A.4 Procedure

Weigh (to the nearest 0.1 mg) about 0.5 g of the sample, transfer quantitatively to a 10 mL volumetric flask, and make up to the mark with carbon disulfide. Measure the infrared absorption at 14.18 \(\mu\)m and 14.48 \(\mu\)m using the same conditions as described in section A.3. Determine the concentration of meta-isomer by comparing this value with the calibration curve. A standard sample should be run each day to check the calibration of the instrument.
A.5 Calculation

DEET content (g/kg) = $\frac{C_1 \times P}{C_2}$

Where,

$C_1$ = concentration (g/L) of standard DEET found from calibration curve

$C_2$ = concentration (g/L) of sample taken

$P$ = purity (g/kg) of the reference standard.
Annex B
(normative)

Determination of permethrin

Permethrin as one of the active ingredients in this product may be determined using HPLC by injecting a solution of analyte into a chromatograph, followed by separation and comparison of peak areas of the analyte in the sample with that of an external standard.

B.1 Reagents

Cis – Permethrin, 99%

Trans - Permethrin, 99%

Methanol HPLC grade

Water, HPLC grade

B.2 Apparatus

An HPLC equipped with an autosampler, a variable wavelength detector (or equivalent) and a column (phenomena x, 250 x 4.6mm Luna Phenyl 5μ Reverse phase (or equivalent)

B.3 Operating conditions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow rate</td>
<td>1.0mL/min</td>
</tr>
<tr>
<td>Solvent composition</td>
<td>60% : 40% (Methanol: Water)</td>
</tr>
<tr>
<td>Elution</td>
<td>Isocratic</td>
</tr>
<tr>
<td>Column temperature</td>
<td>40°C</td>
</tr>
<tr>
<td>Wavelength</td>
<td>240nm</td>
</tr>
<tr>
<td>Injection volume</td>
<td>25 μL</td>
</tr>
<tr>
<td>Stop time</td>
<td>50 minutes</td>
</tr>
<tr>
<td>Post time</td>
<td>2 minutes</td>
</tr>
</tbody>
</table>

B.4 Procedure

B.4.1 Preparation of standard solution

Weigh about 0.001g (to the nearest 0.0001g) Permethrin standard in beaker, use methanol dissolved and transfer them into a separate volumetric flasks (50 ml), dilute to the mark and mix well.

B.4.2 Preparation of Solution
Weigh about 0.02 g (to the nearest 0.0001g) Permethrin test sample into beaker, use methanol dissolved and transfer them into a separate volumetric flasks (50 ml), dilute to the mark and mix well.

B.4.3 Determination

After the chromatograph is stable, make a minimum of three injections of the standard as well as for the sample and average the area counts. The relative standard deviation between injections should be within 2%.

B.5 Calculation

The % of either cis or trans isomers is calculated as follows:

\[
\%_{\text{cis or trans permethrin}} = \frac{\text{Average sample area} \times \text{weight of std} \times \text{purity (in %)}}{\text{Average std area} \times \text{weight of sample}}
\]

Report the concentration of permethrin as the total of Cis and Trans.
Bibliography

