SRI LANKA STANDARD 453 : 2001

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SPECIFICATION FOR
MOSQUITO COILS
(SECOND REVISION)

SRI LANKA STANDARDS INSTITUTION

SPECIFICATION FOR MOSQUITO COILS (SECOND REVISION)

SLS 453 : 2001

(Attached AMD No. 1 and 2)

Gr. 12

SRI LANKA STANDARDS INSTITUTION
17, Victoria Place,
Elvitigala Mawatha
Colombo 08
SRI LANKA

Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

This standard does not purport to include all the necessary provisions of a contract.

SRI LANKA STANDARD
SPECIFICATION FOR MOSQUITO COILS
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FOREWORD

This Sri Lanka Standard was approved by the Sectoral Committee on Chemicals and Polymer Technology and was authorized for adoption and publication as a Sri Lanka Standard by the Council of Sri Lanka Standards Institution on 2001-11-22.

This specification was first published in 1979 and revised in 1989. In this second revision pyrethrins, synthetic pyrethroids including prallethrin, allethrin and its isomers have been recommended as active ingredients.

This specification is subject to the provisions of Control of Pesticides Act No. 33 of 1980 and the regulations framed thereunder.

For the purpose of deciding whether a particular requirement of this specification is complied with, the final value, observed or calculated, expressing the result of a test or an analysis, shall be rounded off in accordance with **CS 102**. The number of significant places retained in the rounded off value shall be the same as that of the specified value in this specification.

In the preparation of this specification the assistance obtained from the following publications is gratefully acknowledged :

IS 13438 : 1992 Indian Standard Specification for Mosquito Coils
KS 03 – 654 : 1987 Kenya Standard Specification for Mosquito Coils
MS 23 : Part 1 : 1998 & Part 2 : 1996 Malaysian Standard Specification for Mosquito Coils

1 SCOPE

1.1 This specification prescribes the requirements and methods of test for mosquito coils.

1.2 Any other forms of products for the control or repulsion of mosquitoes is not covered in this specification.

2 REFERENCES

CS 102 Presentation of numerical values.
SLS 428 Random sampling methods.

3 DEFINITIONS

For the purpose of this specification, the following definitions shall apply:

3.1 knock-down : The rapid paralysis of insects by an insecticide causing them to fall down and remain in a state such as to be incapable of co-ordinated movement and apparently dead. For test purposes, it is assessed as the proportion of test insect population observed to be in this state, under test conditions.

3.1.2 *KT 50 value* **:** Knockdown time for 50 per cent of test insects under test conditions

3.1.3 *KT 90 value* **:** Knockdown time for 90 per cent of test insects under test conditions.

3.2 moribund : Test insects in a dying state showing signs of life which are incapable of locomotion.

3.3 mortality : Number of insect deaths in a given period.

4 REQUIREMENTS

4.1 General requirements

Mosquito coils shall be in the form of single or easily separable multiple coils.

4.2 Active ingredients

Mosquito coils shall contain pyrethrins or synthetic pyrethroids including prallethrin, allethrin and its isomers approved by Registrar of Pesticides. Recommended levels of pyrethrins and the approved synthetic pyrethroids are listed in Table **1**.

TABLE 1 - Active ingredients of mosquito coils

Sl No. (1)	Active ingredient (2)	Active ingredient content per cent by mass, min. (3)	Method of test (4)
i)	Pyrethrin	0.35	Appendix **B**
ii)	Allethrin	0.50	Appendix **C**
iii)	d-allethrin	0.20	
iv)	d-trans allethrin	0.10	
v)	s-bioallethrin	0.10	
vi)	Prallethrin	0.05	Appendix **D**

NOTE

Any active ingredient other than above registered under the Control of Pesticides Act shall also be permitted at the prescribed level, for use in the manufacture of mosquito coils.

4.3 Biological efficacy

The biological efficacy of the mosquito coils shall be equal to or better than the efficacy displayed by the standard coil containing 0.20 per cent (m/m) of d-allethrin, when tested as prescribed in Appendix **E**.

4.4 Mass and burning time

The mass of a mosquito coil and the corresponding burning time shall be in accordance with Table **2**.

TABLE 2 – Mass and burning time

SI No. (1)	Mass, min (2)	Burning time, min (3)
i	12 g	7 ½ h ± 30 minutes
ii	15 g	10 h ± 30 minutes

NOTE

Mosquito coils when lit, in a draught free atmosphere shall burn continuously for the stipulated time.

4.6 Moisture

Moisture content of a mosquito coil shall be not more than 10.0 per cent (m/m) when tested by the method prescribed in Appendix **F**.

4.7 Strength

A mosquito coil shall be able to withstand a minimum load of 90 g when tested as prescribed in Appendix **G**.

4.8 Separation of coils

Mosquito coils shall be properly 'stamped' so as to facilitate easy separation when tested as prescribed in Appendix **H**.

5 PACKAGING AND MARKING

5.1 Mosquito coils shall be packed in a manner to prevent undue contamination and breakage of the coil in normal handling and transportation.

5.2 Each package containing not less than 10 coils shall contain a mosquito coil stand. The mosquito coil stand shall be made from a thin metal plate or any other suitable non-flammable material which is so designed as to be able to support a mosquito coil by itself. It shall be stable and the burning end shall not touch the surface beneath.

5.3 Each package shall be legibly and indelibly marked with the following :

a) Name of the product ;
b) Name and address of the holder of the licence under the Control of Pesticides Act No. 33 of 1980;
c) Registered trade mark/trade name, if any ;
d) Batch or code number ;
e) Date of manufacture ;
f) Number of coils in the package ;
g) Common name of the active ingredient and its percentage;
h) Minimum burning time of a coil ;
i) Directions for use ; and
j) Shelf life.

5.4 A number of such packages shall be suitably packed in a carton. Each carton shall be legibly and indelibly marked with the following :

a) Name of the product ;
b) Name and address of the holder of the licence under the Control of Pesticides Act No. 33 of 1980;
c) Registered trade mark/trade name, if any; and
d) Number of packages.

NOTE

Attention is drawn to the certification facilities offered by the Sri Lanka Standards Institution. See the inside back cover of this specification.

6 METHODS OF TEST

6.1 Tests shall be carried out as prescribed in Appendices **B** to **H** of this specification.

6.2 During the analysis, unless otherwise stated, reagents of recognized analytical grade and distilled water or water of equivalent purity shall be used.

APPENDIX A
COMPLIANCE OF A LOT

The sampling scheme given in this appendix should be applied where compliance of a lot to the requirements of this standard is to be assessed based on statistical sampling and inspection.

Where compliance with this standard is to be assessed based on manufacturer's control systems coupled with type testing and check tests or any other procedure, appropriate scheme of sampling and inspection should be adopted.

A.1 LOT

In any consignment all the packages of mosquito coils belonging to one batch of manufacture or supply shall constitute a lot.

A.2 SCALE OF SAMPLING

A.2.1 Samples shall be tested from each lot for ascertaining the conformity of the lot to the requirements of this specification.

A.2.2 The number of packages to be selected from a lot shall be in accordance with Column **1** and Column **2** of Table **3**.

TABLE 3 Scale of sampling

Number of packages in the lot (1)	Number of packages to be selected (2)	Size of the sub-sample (3)
Up to 100	07	02
101 to 300	08	03
301 to 1 200	10	05
1 201 to 3 200	13	07
3 201 to 10 000	20	10
10 001 and above	30	13

A.2.3 If the packages are in cartons, 10 per cent of the cartons subject to a minimum of two (02) cartons shall be selected and as far as possible an equal number of packages shall be selected from each carton so selected to form a sample as given in Column **2** of Table **3**.

A.2.4 The cartons and packages shall be selected at random. In order to ensure randomness of selection, tables of random numbers as given in **SLS 428** shall be used.

A.3 NUMBER OF TESTS

A.3.1 Each carton selected as in **A.2. 3** shall be inspected for marking requirements.

A.3.2 Each package selected as in **A.2.2** or **A.2.3** shall be inspected for packaging and marking requirements.

A.3.3 A set of coils from each package selected as in **A.2.2** or **A.2.3** shall be examined for separation of coils.

A.3.4 One coil from each package selected as in **A.2.2** or **A.2.3** shall be examined for mass.

A.3.5 One coil from each package selected as in **A.2.2** or **A.2.3** shall be tested for the requirement given for strength.

A.3.6 A sub-sample of size as given in Column **3** of Table **3** shall be selected from the coils examined as in **A.3.4** and each coil in the sub-sample so selected shall be tested for burning time.

A.3.7 Three coils shall be selected from the coils examined as in **A.3.4** and tested separately for biological efficacy.

A.3.8 Two coils selected from the coils examined as in **A.3.4** shall be tested separately for active ingredients.

A.3.9 Required number of coils shall be selected (see Note) from the packages selected as in **A.2.2** or **A.2.3** and tested for moisture content.

NOTE

Only one coil to be taken from a package.

A.4 CRITERIA FOR CONFORMITY

A lot shall be declared as conforming to the requirements of this specification if the following conditions are satisfied:

A.4.1 Each carton inspected as in **A.3.1** satisfies the marking requirements.

A.4.2 Each package inspected as in **A.3.2** satisfies the packaging and marking requirements.

A.4.3 Each set of coils examined as in **A.3.3** satisfies the separation of coils requirement.

A.4.4 Each coil examined as in **A.3.4** satisfies the mass requirement.

A.4.5 Each coil tested as in **A.3.5** satisfies the strength requirement.

A.4.6 Each coil tested as in **A.3.6** satisfies the burning time requirement.

A.4.7 Each coil tested as in **A.3.7** satisfies the biological efficacy requirement.

A.4.8 Each coil tested as in **A.3.8** satisfies the active ingredients requirement.

A.4.9 The coils tested as in **A.3.9** satisfies the moisture requirement.

APPENDIX B
DETERMINATIN OF PYRETHRINS

B.1 PRINCIPLE

Pyrethrin is extracted with methanol in a soxhlet extractor, from the coil and then determined by gas chromatograph equipped with flame ionization detector (FID)

B.2 APPARATUS

B.2.1 Blender or Vibrating mill

B.2.2 Balance weighing accurately up to l mg or less

B.2.3 Soxhlet extractor

B.2.4 Water bath, maintained between 85 ^{o}C and 90 ^{o}C

B.2.5 Micro – litre syringe

B.2.6 Gas chromatograph, equipped with flame ionisation detector and a strip chart recorder or a chromatographic data processor. Chromatographic conditions are as follows;

Detector : *flame ionisation detector with an electrometer setting at range 10^{-10} A / mV and attenuation 4.*

Column : *2 m x 2 mm (i. d) glass column packed with 10 per cent SE – 30 on silylated Gas chrom Q 80 to 100 mesh*

Temperature : *Column oven -150 ^{o}C ; Injector -210 ^{o}C ; Detector - 270 ^{o}C*

Gases : *Carrier gas N_2 – 30 ml / min ; H_2 30 ml / min ; Air 300 ml / min*

B.3 REAGENTS

B.3.1 Aceton

B.3.2 Methanol

B.3.3 di - n - butyl phthalate

B.3.4 Pyrethrin of known purity

NOTE

Operating parameters of the GC could be changed provided that validation is done with reference materials / standards.

B.4 PROCEDURE

B.4.1 Preparation of internal standard solution

Weigh, to the nearest milligram, approximately 0.125 g of di -n - butyl phthalate into a 100-ml volumetric flask and dilute to the mark with acetone.

B.4.2 Preparation of standard pyrethrin solution

Weigh, to the nearest milligram, approximately 0.125 g of pyrethrin into a 25-ml volumetric flask and dilute to the mark with acetone.

B.4.3 Preparation of working standard solution

Pipette 10 ml of pyrethrin standard solution (**B.4.2**) into a 25 ml volumetric flask. Add 5 ml of internal standard solution (**B.4.1**) by a pipette and dilute to the mark with acetone.

B.4.4 PREPARATION OF SAMPLE SOLUTION

Crush and grind two mosquito coils into a fine powder. Weigh, a portion of the powdered sample to contain 25 mg of pyrethrin. Extract with 110 ml to 130 ml of methanol for 4 hours in a Soxhlet extractor on a water bath maintained between 85 ^{o}C and 90 ^{o}C. When the extraction is complete, evaporate off the solvent in a rotary-evaporator. Transfer the extract into a 25-ml volumetric flask containing 5 ml of internal standard solution (**B.4.1**) and dilute to volume with acetone. Inject 3 µl to 5 µl of the sample solution and working standard solution (**B.4.3**) into the gas chromatograph.

Carry out duplicate injections of working standard solution and sample solution and record the peak heights/areas.

B.5 CALCULATION

B.5.1 Calculate the relative response factor for each injection of the working standard solution and take the mean.

$$\text{Relative response factor} = \frac{A}{B \times m_1 \times P}$$

where,

A is the peak height/area of pyrethrin I, in the working standard solution;

B is the peak height/area of di-n-buty1 phthalate, in the working standard solution;

m_1 is the mass, in grams, of pyrethrin, in the working standard solution ; and

P is the percentage purity of analytical standard.

B.5.2 Total pyrethrin content of the sample is calculated by assuming that pyrethrin I and pyrethrin II are present in equal amounts.

B.5.2.1 Pyrethrin I content

$$\text{Pyrethrin I content, per cent by mass} = \frac{E}{R \times D \times m_2}$$

where,

E is the mean peak height/area of pyrethrin I, in the sample solution ;

R is the mean relative response factor ;

D is the mean peak height/area of di-n-buty I phthalate, in the sample solution ; and

m_2 is the mass, in grams, of the sample taken.

B.5.2.2 Total pyrethrin content

Total pyrethrin content, per cent by mass = Pyrethrin I content (per cent by mass) x 2

APPENDIX C
DETERMINATION OF ALLETHRIN AND ITS ISOMERS

C.1 PRINCIPLE

Allethrin is extracted with a mixture of toluene and formic acid from the coil and then determined by a gas chromatograph equipped with a flame ionisation detector (FID).

C.2 APPARATUS

C.2.1 Blender or Vibrating mill

C.2.2 Centrifuge with 50 ml tubes

C.2.3 Mechanical shaker

C.2.4 Micro-litre syringe, 5-10µl capacity

C.2.5 Magnetic stirrer

C.2.6 Balance weighing accurately up to 1 mg or less

C.2.7 Gas Chromatograph

Equipped with a flame ionisation detector and coupled to a printer or an integrator or a data processor or a computer. Indicative operating parameters are as follows ;

Column : *Glass, 1 meter in length and 3 mm i.d, packed with 10 per cent OV 101 on Chromosorb WHP (80-100 mesh)*

Temperature : *Column oven – 200 ^{o}C ; Injector – 260 ^{o}C; Detector - 260 ^{o}C*

Gases : *N_2 – 30 ml/min ; H_2 – 30 ml/min ; Air – 300 ml/min*

NOTE

Operating parameters of the GC could be changed provided that validation is done with reference materials/standards.

C.3 REAGENTS

C.3.1 Toluene AR grade

C.3.2 Formic acid 99 per cent (V/V)

C.3.3 Sodium sulphate, anhydrous

C.3.4 Activated charcoal

C.3.5 Internal Standard-Dibutyl phthalate AR grade

C.3.6 Reference Standard-d-Allethrin or relevant allethrin isomer of known purity

C.4 PROCEDURE

C.4.1 Preparation of Internal Standard Solution

C.4.1.1 For d-allethrin (or relevant isomer except d-trans allethrin)

Weigh accurately about 0.5 g of dibutyl phthalate in a 100-ml volumetric flask, dissolve and dilute to volume with toluene. This will give a solution of 5 mg/ml of dibutyl phthalate.

C.4.1.2 For d-trans allethrin

Weigh accurately about 0.625 g of dibutyl phthalate in a 250-ml volumetric flask, dissolve and dilute to volume with toluene. This will give a solution of 2.5 mg/ml of dibutyl phthalate.

C.4. 2 Preparation of Standard Allethrin Solution

C.4.2.1 For d-allethrin (or relevant isomer except d-trans allethrin)

Weigh accurately 0.5 g of d-allethrin (or relevant isomer) in a 100-ml volumetric flask, dissolve and dilute to volume with toluene. This will give a solution of 5 mg/ml of d-allethrin (or its isomer).

C.4.2.2 For d-trans allethrin

Weigh accurately 0.125 g of d-trans allethrin in a 50-ml volumetric flask, dissolve and dilute to volume with toluene. This will give a solution of 2.5 mg/ml of d-trans allethrin.

C.4.3 Preparation of Reference Standard Solution

C.4.3.1 In a 25-ml volumetric flask add 2 ml of internal standard solution (**C.4.1**) and 2 ml of standard allethrin solution (**C.4.2**), dilute up to the mark with toluene and mix well.

C.4.4 Preparation of Sample Solution

C.4.4.1 Crush the mosquito coil in a blender or a vibrating mill. Weigh accurately 5 g of finely powdered mosquito coil sample into a 250-ml conical flask. Add 25 ml of toluene, 2 ml of internal standard solution (**C.4.1**) and 5 ml of formic acid into the flask and stir for 20 minutes in a magnetic stirrer. Add 10 g of sodium sulfate and 1 g of activated charcoal and shake for 15 minutes on a magnetic stirrer at high speed. Transfer the contents to a 50-ml centrifuge tube and centrifuge at 2500 r.p.m. for 10 minutes. Alternatively transfer the clear supernatant to a test tube and stand for 5 minutes to settle any residual matter and then inject the clear solution directly into GC.

C.4.5 Estimation

Inject a known volume (1 µl) of the standard solution and the sample solution. Measure the peak heights/areas of the internal standard and allethrin both in the standard and sample solutions.

C.5 CALCULATION

$$\text{d-allethrin (or its isomer) content, per cent by mass} = \frac{M_1 \times A_1 \times A_3 \times P}{M_2 \times A_2 \times A_4}$$

where,

M_1 is the mass in g of reference standard d-allethrin (or its isomer);

A_1 is the peak area of internal standard in the reference standard solution injected;

A_3 is the peak area of d-allethrin (or its isomer) in the sample solution injected;

M_2 is the mass in g of mosquito coil sample taken for test;

A_2 is the peak area of d-allethrin (or its isomer) in the reference standard solution injected;

A_4 is the peak area of internal standard in the sample solution injected; and

P is the per cent purity of standard d-allethrin (or its isomer).

APPENDIX D
DETERMINATION OF PRALLETHRIN CONTENT

D.1 PRINCIPLE

Prallethrin is extracted with a mixture of toluene and formic acid from the coil and then determined by a gas chromatograph equipped with a flame ionisation detector (FID)

D.2 APPARATUS

D.2.1 Blender or Vibrating mill

D.2.2 Centrifuge with 50 ml tubes

D.2.3 Mechanical shaker

D.2.4 Micro – litre syringe, 5 – 10 ml capacity

D.2.5 Magnetic stirrer

D.2.6 Gas Chromatograph

Equipped with a flame ionisation detector and coupled to a printer or an integrator or a data processor or a computer. Indicative operating parameters are as follows;

Column : *Glass, 1 meter in length and 3 mm i.d packed with 5 per cent OV 101 on Chromosorb WHP (80-100 mesh)*

Temperature : *Column oven – 200 ^{o}C ; Injector – 260 ^{o}C; Detector – 260 ^{o}C*

Gases : *N_2 – 30 ml / min ; H_2 – 30 ml / min ; Air – 300 ml / min*

NOTE

Operating parameters of the GC could be changed provided that validation is done with reference materials / standards.

D.3 REAGENTS

D.3.1 Toluene AR grade

D.3.2 Formic acid 99 percent (v/v)

D.3.3 Sodium sulphate, anhydrous

D.3.4 Activated charcoal

D.3.5 Internal Standard – n-benzyl butyl phthalate AR grade

D.3.6 Reference Standard – Prallethrin standard of known purity

D.4 PROCEDURE

D.4.1 Preparation of Internal standard solution

Weigh accurately about 0.05g of n – benzyl butyl phthalate in a 100-ml volumetric flask, dissolve and dilute to volume with toluene. This will give a solution of 0.5 mg / ml of n – benzyl butyl phthalate.

D.4.2 Preparation of Standard Prallethrin solution

Weigh accurately 0.05 g f prallethrin in a 100-ml volumetric flask, dissolve and dilute to volume with toluene. This will give a solution of 0.5 mg / ml of prallethrin.

D.4.3 Preparation of Reference Standard solution

In a 25-ml volumetric flask add 2 ml of internal standard solution (**D.4.1**) and 5 ml of standard prallethrin solution (**D.4.2**), 25 ml of toluene and mix well.

D.4.4 Preparation sample solution

Crush the mosquito coil in a blender or a vibrating mill. Weigh accurately 5 g of finely powdered mosquito coil sample into a 250-ml conical flask. Add 25 ml of toluene, 2 ml of internal standard solution (**D.4.1**) and 5 ml of formic acid into the flask and stir for 20 minutes in a magnetic stirrer. Add 10 g of sodium sulphate and 1 g of activated charcoal and shake for 15 minutes on a magnetic stirrer at high speed. Transfer the contents to a 50-ml centrifuge tube and centrifuge at 2500 r.p.m for 10 minutes. Alternatively transfer the clear supernatant to a test tube and stand for 5 minutes to settle any residual matter and then inject the clear solution directly into GC.

D.4.5 Estimation

Inject a known volume of the standard solution and the sample solution. Measure the peak heights / areas of the internal standard and prallethrin both in the standard and sample solutions.

D.5 CALCULATION

$$\text{Prallethrin content, percent by mass} = \frac{M_1 \times A_1 \times A_3 \times P}{M_2 \times A_2 \times A_4}$$

Where,

M_1 = mass in g of reference standard prallethrin;

A_1 = peak area of internal standard in the reference standard solution injected;

A_3 = peak area of prallethrin in the sample solution injected;

M_2 = mass in g of mosquito coil sample taken for test;

A_2 = peak area of prallethrin in the reference standard solution injected;

A_4 = peak area of internal standard in the sample solution injected; and

P = percent purity of standard prallethrin.

APPENDIX E
DETERMINATION OF BIOLOGICAL EFFICACY

E.1 PREPARATION OF STANDARD MOSQUITO COIL

E.1.1 Formulation of standard coil

Standard coils shall be produced from the following basic components with the stated compositions.

TABLE 4 - Formulation of standard coil

Components (1)	Apperture size (2)	Compositions per cent by mass (3)
Coconut shell powder	100 mesh (150 µm)	34.5
Wood powder	100 mesh (150 µm)	34.3
Incense powder	100 mesh (150 µm)	30.0
Malachite green		0.5
Sodium benzoate		0.5
d- allethrin		0.2

E.2 MANUFACTURE OF STANDARD COIL

Hundred grams of the materials in **E.1.1** is thoroughly mixed in a mortar by the addition of 100 g of distilled water to produce a uniform and homogeneous paste which is then introduced into a cylindrical steel mould of 40-mm internal diameter. The substance is compressed and extruded out as 10-cm long stick. Allow the extruded sticks to air dry or oven dry to about 10 per cent moisture. Cut down the standard coil to pieces weighing 0.5 g. The standard coil so prepared is placed in an airtight plastic material and then stored in a desiccator.

E.3 APPARATUS AND TEST MOSQUITOES

E.3.1 Glass chamber, of 70 cm x 70 cm 70 cm in size (see **Figure 1**).

E.3.2 Test mosquitoes, twenty laboratory-cultured adult sucrose-fed female mosquitoes aged 2 to 10 days, from the established laboratory strains of ***Culex quinquefasciatus.***

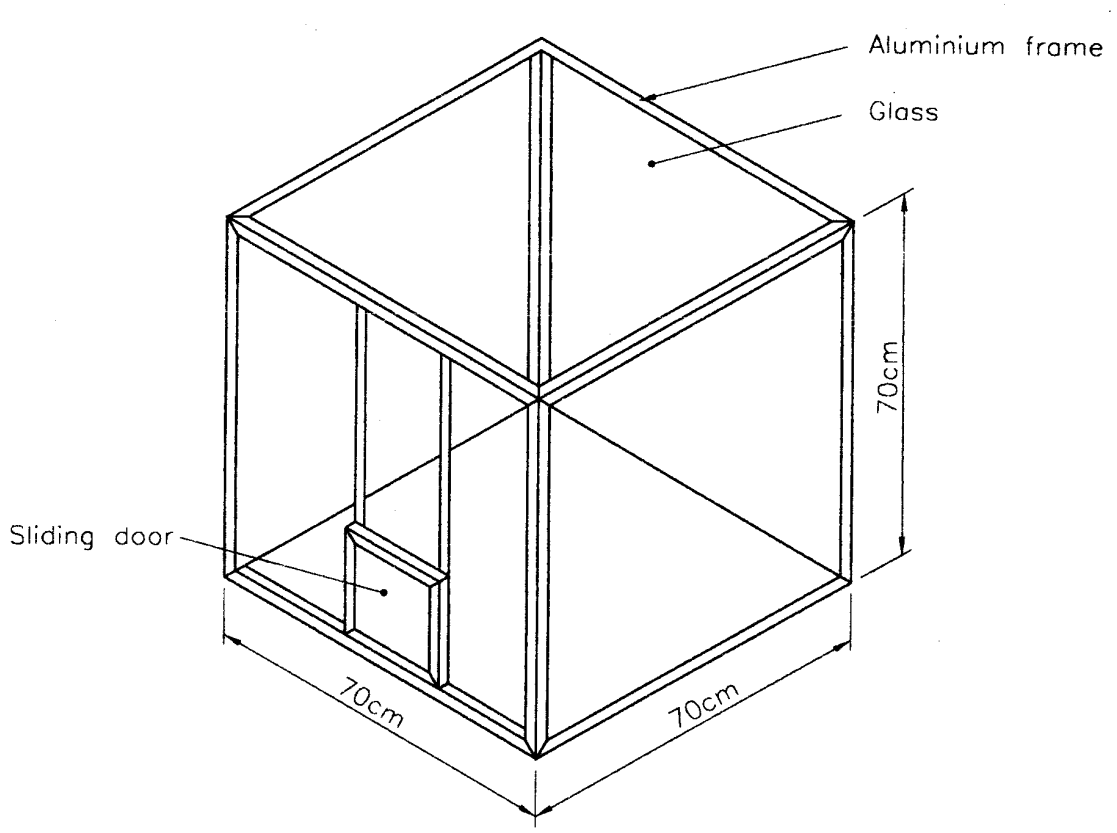

FIGURE 1 - Typical construction and dimensions of glass chamber

E.4 PREPARATION OF APPARATUS

E.4.1 Test chamber

Before a test is started, clean the chamber. Chambers are considered to be contaminated and unsatisfactory for test purposes when test mosquitoes held for a 1 h period with food and water, but without insecticide treatment, knockdown/mortalities in excess of 10 percent within 10 to 20 min after liberation into the test chamber. Periodic contamination observation employing a normal mosquito test group shall be a standard practice.

E.4.2 Test conditions

All tests are to be conducted in an air-conditioned laboratory at temperature of 27 ± 2 °C and humidity of 65 ± 5 per cent.

E.5 PROCEDURE

E.5.1 0.5 g of standard mosquito coil is fixed on a stand ignited at both ends in the glass chamber. A small battery-operated fan is placed on the floor of the chamber to provide uniform dispersion of the smoke. Two minutes after the coil is completely burned out, twenty sucrose-fed female mosquitoes are released into the glass chamber. Knockdown mosquitoes are counted every minute up to 10 minutes or until the time to achieve total knockdown. Criteria for knockdown is that the mosquitoes no longer maintain normal posture or are on their backs. The knockdown mosquitoes are left in the chamber for a total of 20 minutes. The knockdown mosquitoes are then picked up and placed in clean containers with lids containing 10 per cent sucrose dip cotton wool. The mosquitoes are kept in a room with a temperature of 27 ± 2 °C and relative humidity of 65 ± 5 per cent. Mortality values is observed 24 hours post treatment. Mortality values represent dead and moribund mosquitoes in each test. A minimum of three tests using 20 female mosquitoes each time should be done to obtain statistically significant values. The above procedure is repeated at least three times on the same day.

E.5.2 The knockdown data obtained are analyzed by probit analysis using computer programmer, or by using probit graph paper for plotting knock down time in minutes versus percentage of knock down insects.

E.5.3 When each test is completed, remove all toxic residues from the glass chamber. Thoroughly clean the inside walls, floor and ceiling of the chamber. Wipe with a clean cloth saturated with alcohol containing 10 per cent acetone, or wash with soap, detergent and water to remove most toxic residues.

E.6 INTERPRETATION OF RESULTS

E.6.1 The results obtained for the mosquito coil under investigation in terms of knockdown values (KT50 and KT90) and 24 hours mortality shall be equal to or more effective in biological efficacy than that achieved by the standard mosquito coil.

APPENDIX F
DETERMINATION OF MOISTURE

F.1 REAGENTS

Toluene or mixture of toluene and xylene.

F.2 APPARATUS

F.2.1 The Dean and Stark apparatus

The apparatus consists of the following :

a) Round-bottomed flask ;
b) Trap ;
c) Condenser ; and
d) Receiving tube, graduated in 0.1-ml.

The above apparatus is joined together by ground glass joints

F.2.2 Source of heat

a) Electric heater with rheostat control ; or
b) An oil bath.

F.3 PROCEDURE

F.3.1 Cleaning of apparatus

Clean the receiving tube and the condenser with chromic acid cleaning mixture. Thoroughly rinse with water and dry in the oven.

F.3.2 Preparation of reagent

Shake a suitable quantity of reagent with a small quantity of water. Separate the water and distill the reagent.

F.3.3 Determination

Weigh to the nearest milligram, approximately 50 g of the material. Transfer it into the round-bottomed flask. If the substance is likely to cause bumping, add enough dry pumice stones. Place about 300 ml of reagent **(F.1)** in the flask. Connect the apparatus and fill the receiving tube with reagent, poured through the top of the condenser.

Heat the flask gently. When the reagent begins to boil, distill at the rate of 2 drops per second until most of the water has passed over. Then, increase the rate of distillation to about 4 drops per

second. Reflux for about 5 hours. Allow to cool and ensure that any droplets of water adhering to the sides of the receiving tube are removed. When the water and the reagent have separated completely, read the volume of the entrained water.

F.4 CALCULATION

$$\text{Moisture content, per cent by mass} = \frac{v \times d}{m} \times 100$$

where,

v is the volume, in milliliters, of entrained water in the receiving tube;

d is the density, in grams per milliliters, at room temperature ; and

m is the mass, in grams, of the sample.

APPENDIX G
DETERMINATION OF STRENGTH

G.1 APPARATUS

G.1.1 Suitable apparatus as shown in Figure **2**

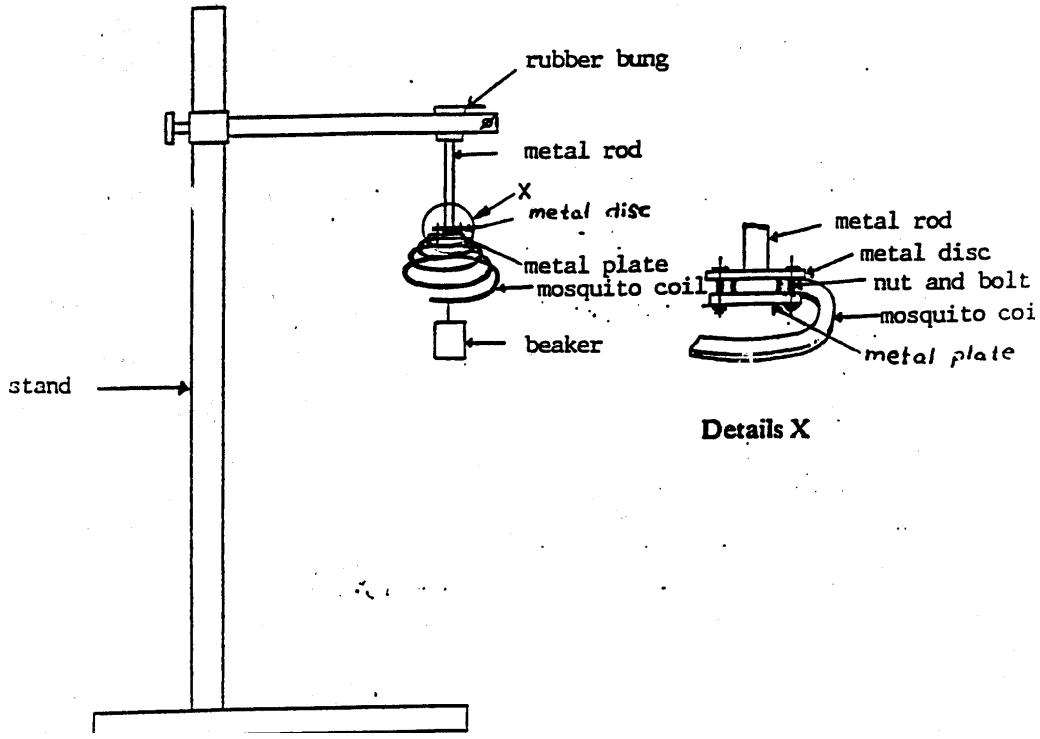

FIGURE 2 - Apparatus for determination of strength of a mosquito coil

G.2 PROCEDURE

G.2.1 Place a mosquito coil horizontally on metal disc (at the head of the coil) as indicated in Figure **2.** Clamp the rubber bung with the coil to a stand (as in Figure **2**).

G.2.2 Hang a small plastic beaker or any other suitable container with the help of a thread, 20 mm away from the tip of the coil. Add small lead shots (or any other appropriate weights) one by one carefully and slowly to the beaker. When the coil stretches downwards reaching the breaking point, add smaller weights.

G.2.3 At the breaking point of the coil, weigh to the nearest 0.1 g, the beaker, thread and the added metal weights

G.2.4 Strength of the coil in grams is the weights obtained in (**G.2.3**)

APPENDIX H
SEPARATION OF MULTIPLE MOSQUITO COILS

PROCEDURE

Hold any two heads/eyes of the multiple coils with the thumbs and forefingers. Gently push the heads/eyes in opposite direction and then pull them apart to separate into single coils. Gentle twisting could be done if necessary. Separation of multiple coils is considered to have been achieved if none of the coils break.

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AMD NO 394

AMENDMENT NO: 01 APPROVED ON 2009-08-26 TO SLS 453 : 2001
SPECIFICATION FOR MOSQUITO COILS

AMENDMENT NO: 01 TO SLS 453 : 2001
SRI LANKA STANDARD SPECIFICATION FOR MOSQUITO COILS
(Second Revision)

EXPLANATORY NOTE

This amendment is issued to exclude the limitation for mass and burning time of the mosquito coil, since the consumer demand has been identified for different burning times such as 2 hours, 5 hours, 7 hours, 12 hours etc. and the mass is immaterial as low weight fillers are used for manufacturing of mosquito coils with the technological development.

AMD 394

AMENDMENT NO: 01 APPROVED ON 2009-08-26 TO SLS 453 : 2001

SRI LANKA STANDARD SPECIFICATION FOR MOSQUITO COILS
(Second Revision)

4 REQUIREMENTS

4.4 Mass and burning time

Delete Clause **4.4**, Table **2**, and foot note under Table **2** and substitute the following.

"**4.4 Burning time**

Mosquito coils when lit, in a draught free atmosphere shall burn continuously for the stipulated time declared by the manufacturer."

Appendix A

A.3 NUMBER OF TESTS

Delete **A.3.4** .

A.4 CRITERIA FOR CONFORMITY

Delete **A.4.4** .

Amendment No: 02 approved on 2013-10-02 to SLS 453 : 2001

SRI LANKA STANDARD SPECIFICATION FOR MOSQUITO COILS
(***Second Revision***)

5 PACKAGING AND MARKING

Delete the text in **5.3 e)** and substitute with the following :

"Month and Year of manufacture"

Delete the text in **5.3 j)** and substitute with the following :

" Shelf life / best before"

SLS CERTIFICATION MARK

The Sri Lanka Standards Institution is the owner of the registered certification mark shown below. Beneath the mark, the number of the Sri Lanka Standard relevant to the product is indicated. This mark may be used only by those who have obtained permits under the SLS certification marks scheme. The presence of this mark on or in relation to a product conveys the assurance that they have been produced to comply with the requirements of the relevant Sri Lanka Standard under a well designed system of quality control inspection and testing operated by the manufacturer and supervised by the SLSI *which includes surveillance inspection of the factory, testing of both factory and market samples.*

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