

Tanzania Standard.

**Textile – Specification for mosquito nets:
Part 2: net made from 100% polyethylene yarn**

TANZANIA BUREAU OF STANDARDS

Textile – Specification for mosquito nets:

Part 2: net made from 100% polyethylene yarn

0. FOREWORD

0.1 This Tanzania standard specifies the requirements of two types of Mosquito nets made out of 100% polyethylene yarn incorporated with permethrin insecticide.

0.2 Mosquito nets can be categorized according to their sizes and design. In determining the quality of this item, more emphasis should be given not only to the netting fabric and stitching quality, but also to the active ingredient of insecticide incorporated in the fibre structure of the net during the manufacturing process. In that case shape, size, dimensions and active ingredient loading are very important. This Tanzania standard which outlines requirements for manufacture and workmanship of mosquito nets will be guidance for manufacturer and protect the buyer.

0.3 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 TZS 4:1979.

The number of significant places retained in the rounded off value shall be the same as that of the specified value in this specification.

0.4 In the preparation of this Tanzania standard the valuable assistance derived from the following organizations are gratefully acknowledged.

- WHO approved specifications published by World Health Organization.
- SUMITOMO CHEMICALS, manufacturers of long lasting OLYSET Net brands,
- IS 9886:1981 – Specification for mosquito nets published by the Bureau of Indian Standards.
- SLS 1061:1995 – Specification for mosquito nets published by the Sri-Lanka standards Institution.
- Company standards from local manufacturers.

1. SCOPE

1.1 This draft Tanzania standard prescribes the requirements of two types of mosquito nets namely rectangular mosquito nets and circular or conical shaped mosquito nets. These may be bleached or dyed as specified in the contract or order.

2. REFERENCE

- a) TZS 21:1979 Textiles – Determination of mass per unit length and per unit area of knitted or woven fabric
- b) TZS 26:1979 Textiles – Determination of conductivity, pH, water soluble matter, chloride and sulphate in aqueous extracts.
- c) TZS 40:1979 Textiles – Determination of colour fastness – colour fastness to daylight.
- d) TZS 44:1979 Textiles – Determination of length and width of fabrics
- e) TZS 139:1981 Textiles – Determination of linear density of yarn removed from fabric free from added matter.
- f) TZS 137:1981 Textiles – Determination of dimensional change of woven and knitted fabric and garments – machine method.
- g) TZS 167:1979 Textiles – Determination of colour fastness colour fastness to washing – Test 3.
- h) TZS 265:1985 – Test method for testing strength of yarn from packages.
- i)

3. REQUIREMENTS

3.1 Manufacture

3.1.1 Netting Fabric

The fabric used for the manufacture of mosquito nets shall conform to constructional and performance requirements prescribed in Table 1.

3.1.2 Defects

The mosquito nets shall be free from defective holes having diameter more than the normal hole size of the netting), stitching defects, stains and observable defects.

3.1.3 The Colour

The fabric shall be in white or any colour which is agreeable between the purchaser and supplier.

3.1.4 Sizes and dimensions

The mosquito net shall be of any of the following sizes and dimensions as described in tables 2.

3.1.5 Colour fastness

The colour fastness of mosquito netting and attachments shall conform to the requirements given in Table 3.

3.1.6 pH value

The Ph value of mosquito netting shall be as described in tables 1.

3.1.7 Active ingredient.

The active ingredient shall be as described in table 1.

3.1.8 Dimensional change

The dimensional change of mosquito shall be as described in tables 1.

3.2.1 Workmanship

The mosquito net shall be rectangular or conical in shape unless otherwise agreed between the manufacturer and the purchaser. The body of the mosquito net shall be made of not less than two pieces assembled together to obtain the required shape of the mosquito net.

3.3.1 Net Attachment.

The net shall be provided with suitable number of suspension points to attach string or cord, of which the width is not less than 10 mm fixed at the top at 6 places equally spaced to tie the net to the hanging frame for a rectangular net or a center loop with an insertion for the cord to hold a ring for a conical net.

3.3.1.1 The top support ring shall be of any suitable material e.g. rust proof wire which has sufficient strength to withhold the net when it is hung at the required position.

3.3.1.2 A suspension ring made out of any suitable material and fixed to the upper centre of the top or any other suitable measures shall be provided to hang the net during its usage.

Table 1. Requirements for high density polyethylene (monofilament fibre) Rectangular or conical mosquito netting.

S/NO.	Characteristic	Requirement	Test Method
1.	Material	100% high density polyethylene (monofilament fibre) yarn.	TZS265:1985
2.	Linear density (den) min	150 denier.	TZS139:1981
3.	Hole number(scale, physical counting). min.	8 holes/cm ²	Manual
4.	Mass per unit area. g/m ² , min.	43±5	TZS 21:1979
5.	Bursting strength, kPa (min)	350 (see figure 1)	See Appendix A
6.	pH	6.0 - 8.5	TZS 26: 1979
7.	Dimensional change to washing: (Length and width)	±10%	TZS 137:1981
8.	Active ingredient: <i>Permethrin</i>	1.8 - 2.2(w/w%).	See Appendix B

Table 2 – Sizes and dimensions of mosquito nets :

a) Rectangular.

Description	Width	Length	Height
Double	100cm	180cm	210cm
Family	130cm	180cm	210cm
Large Family	160cm	180cm	210cm
Extra Family	190cm	180cm	210cm

b) Conical.

Description	Circumference	Height	Roof(diameter).
Small	850cm	220cm	56cm
Medium	1050cm	220cm	56cm
Large	1250cm	250cm	65cm

Note – The sizes and dimensions mentioned above are for guidance purposes only. They should not be considered as prime requirement of this specification.

Table 3 – Requirements for colour fastness

S/no.	Colour fastness to:	Minimim Rating	Test Method
1.	a) daylight	4	TZS 40:1979
2.	b) washing	4	TZS 167:1979

4. PACKING AND MARKING

4.1 Packing

Each mosquito net shall be packed in a polythene bag

4.2 Marking

The following information shall be marked or labeled legibly and indelibly on each individual package:

- a) Name of the product
- b) Size of the net
- c) Name and address of the manufacturer
- d) Brand name if any
- e) Batch identification mark.

5. SAMPLING

5.1 Lot

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

5.2 Scale of sampling

5.2.1 Samples shall be tested from each lot for ascertaining its uniformity to the requirements of this specification.

5.2.2 The number of pieces to be selected from a lot shall be in accordance with Table 4.

Table 4. – Scale of sampling

No. of pieces in the lot	No. of pieces to be selected
Up to 8	2
9 to 15	3
16 to 25	4
26 to 50	5
51 and above	7

5.2.3. To test the bursting strength of seams (table 1), up to 5 seams may be tested, avoiding intersections, to provide a total of 5 measurements.

Appendix A : Sampling for Bursting strength test.

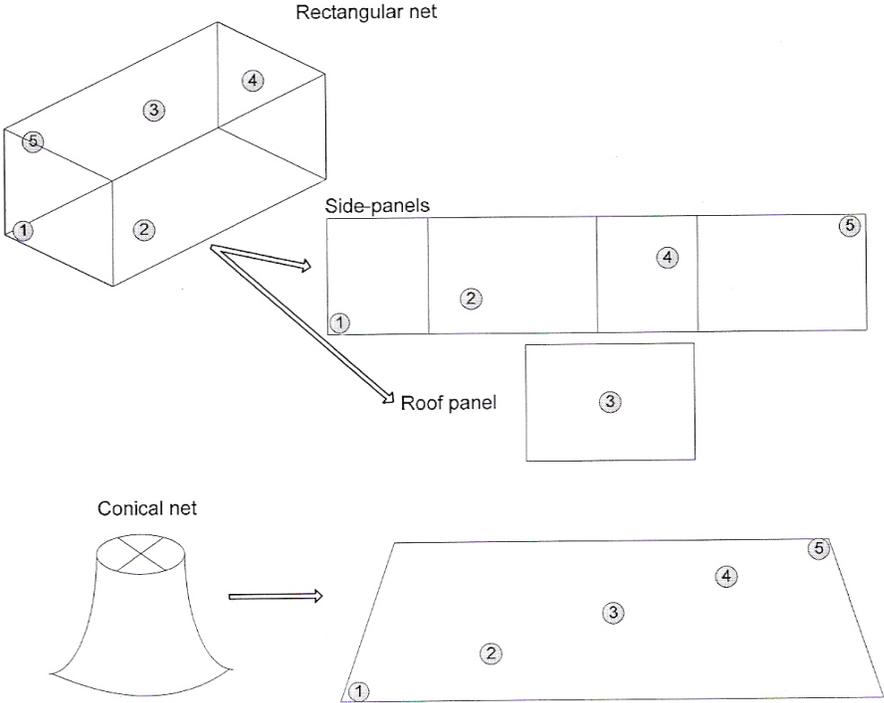
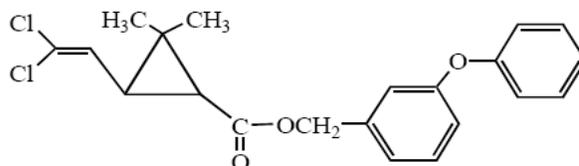


Figure 1: Sampling rectangular and conical nets for Bursting Test;

Appendix B: Test method for active ingredient

PERMETHRIN 331



<i>ISO common name</i>	Permethrin
<i>Chemical name</i>	3-Phenoxybenzyl (1 <i>RS</i>)- <i>cis,trans</i> -3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate (IUPAC); (3-Phenoxyphenyl)methyl 3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropanecarboxylate (CA)
<i>CAS No.</i>	52645-53-1
<i>Empirical formula</i>	C ₂₁ H ₂₀ Cl ₂ O ₃
<i>RMM</i>	391.29
<i>v.p.</i>	2.06 x 10 ⁻⁷ Pa (20°C),••6.82 x 10 ⁻⁷ Pa (25°C), 2.24 x 10 ⁻⁶ Pa (30°C),••6.87 x 10 ⁻⁶ Pa (35°C), 1.93 x 10 ⁻⁵ Pa (40°C)••
<i>Solubility</i>	In water: 11.1µg/l (20±0.5°C/pH7.0-9.3); soluble in organic solvents
<i>Description</i>	Yellow to yellowish brown oil and solidifies on lowering temperature

PERMETHRIN TECHNICAL

331/TC/m/-

1 Sampling. Take at least 100 g.

2 Identity tests

2.1 GLC. Use the GLC method below. The retention time of permethrin for the sample solution should not deviate by more than 1% from that for the permethrin working standard solution and intensities of the permethrin isomers should give the same pattern as in the working standard solution.

2.2 Infrared. Prepare a film between NaCl plates and scan from 4000 to 400 cm^{-1} . The spectrum produced from the sample should not differ significantly from that of the standard.

3 Permethrin

OUTLINE OF METHOD The content of permethrin in the test samples are determined by capillary GC using flame ionisation detection and triphenyl phosphate as internal standard, and the *trans*-isomer ratio is calculated from the chromatogram obtained.

The content of permethrin is the total content of *cis*- and *trans*-isomers.

REAGENTS

Acetone analytical grade

Permethrin working standard technical product of certified purity. Store refrigerated.

Triphenyl phosphate internal standard. Must not show peaks with the same retention times as *cis*-permethrin and *trans*-permethrin.

Internal standard solution. Dissolve triphenyl phosphate (1.0 g) in acetone (100 ml). Ensure that a sufficient quantity of this solution is prepared for all samples and calibration standards to be analysed.

Calibration solution. Homogenise the permethrin working standard. When the permethrin working standard is waxy solid or partly waxy solid homogenise it by warming it to melting and by stirring. Prepare calibration solutions in duplicate. Weigh (to the nearest 0.1 mg) 90 to 110 mg (s mg) of permethrin working standard into a vial or stoppered flask (100 ml). Add by pipette internal standard solution (5 ml) and dissolve completely. Add by measuring cylinder acetone (45 ml) and mix well (Solutions C_A and C_B).

APPARATUS

Gas chromatograph equipped with a split/splitless injection and a flame ionisation detector.

Capillary column fused silica, 30 m x 0.25 (i.d.) mm, film thickness: 0.25 μm , coated with crosslinked dimethyl polysiloxane (DB-1 or equivalent)

Electric integrator or data system

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PROCEDURE

(a) Gas chromatographic conditions (typical):

Column	fused silica, 30 m x 0.25 (i.d.) mm, film thickness: 0.25 μm , coated with crosslinked dimethyl polysiloxane (DB-1 or equivalent)	
Injection system		
Injector	split injection	
Split flow	approximately 100 ml/min	
Injection volume	1 μl	
Detector	flame ionisation	
Temperatures		
Column oven	240°C	
Injection port	265°C	
Detector	265°C	
Carrier gas	helium, 30 cm/sec	
Retention times	triphenyl phosphate:	about 6.5 min
	permethrin:	
	<i>cis</i> -permethrin;	about 12.4 min
	<i>trans</i> -permethrin;	about 12.9 min

(b) *Linearity check.* Check the linearity of the detector response by injecting 1 μl of solutions with permethrin concentrations 0.5, 1 and 2 times that of the calibration solution before conducting analysis.

(c) *System equilibration.* Prepare two calibration solutions. Inject 1 μl portions of the first one until the response factors obtained for two consecutive injections differ by less than 1.0%. Then inject a 1 μl portion of the second solution. The response factor for this solution should not deviate by more than 1.0% from that for the first calibration solution, otherwise prepare new calibration solutions.

(d) *Preparation of sample solution.* Homogenise the sample. When the sample is waxy solid or partly waxy solid homogenise it by warming it to melting and by stirring. Prepare sample solutions in duplicate for each sample. Weigh (to the nearest 0.1 mg) 90 to 110 mg (w mg) of permethrin into a vial or stoppered flask (100 ml). Add by pipette internal standard solution (5 ml) and dissolve completely. Add by measuring cylinder acetone (45 ml) and mix well (Solutions S_A and S_B).

(e) *Determination.* Inject in duplicate 1 μl portions of each sample solution bracketing them by injections of the calibration solutions as follows; calibration solution C_A , sample solution S_A , sample solution S_A , calibration solution C_B , sample solution S_B , sample solution S_B , calibration solution C_A , and so on. Measure the relevant peak areas.

(f) *Calculation of permethrin content.* Calculate the mean value of each pair of response factors bracketing the two injections of a sample and use this value for calculating the permethrin contents of the bracketed sample injections.

$$f_i = \frac{l_r \times s \times P}{H_s}$$

$$\text{Content of permethrin} = \frac{f \times H_w}{l_q \times w} \text{ g/kg}$$

where:

f_i = individual response factor

f = mean response factor

H_s = total peak area of permethrin (*cis*-permethrin + *trans*-permethrin) in the calibration solution

H_w = total peak area of permethrin (*cis*-permethrin + *trans*-permethrin) in the sample solution

l_r = peak area of the internal standard in the calibration solution

l_q = peak area of the internal standard in the sample solution

s = mass of permethrin working standard in the calibration solution (mg)

w = mass of sample taken (mg)

P = purity of permethrin working standard (g/kg)

Repeatability r = 9 g/kg at 953 g/kg active ingredient content

= 9 g/kg at 951 g/kg active ingredient content

Reproducibility R = 23 g/kg at 953 g/kg active ingredient content

= 18 g/kg at 951 g/kg active ingredient content

(g) Calculation of *trans*-isomer ratio.

$$\text{trans-Isomer ratio} = \frac{H_{wt}}{H_{wc} + H_{wt}} \times 100 \%$$

where:

H_{wt} = peak area of *trans*-permethrin in the sample solution

H_{wc} = peak area of *cis*-permethrin in the sample solution