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First Edition

Textiles - Agro shade nets - Specification - Part 1: Nets made from tape yarns

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Foreword

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This African Standard was prepared by ARSO TC 53, Textile products and accessories

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Introduction

Agro shade nets play a crucial role in modern agricultural practices, particularly in shade houses and greenhouses, where they help regulate environmental conditions to enhance crop growth and yield. These nets are designed to provide controlled shading, reducing excessive sunlight exposure while allowing sufficient light penetration for photosynthesis. By mitigating the effects of wind, hailstones, and pests, agro shade nets contribute to the protection of crops, reducing physical damage and minimizing losses.

Additionally, they help regulate temperature and humidity levels within the cultivation area, creating an optimal microclimate that promotes healthy plant growth. One of the key benefits of agro shade nets is their ability to conserve water by reducing evaporation, thereby enhancing irrigation efficiency and supporting sustainable water management practices in agriculture.

Agro shade nets made from tape yarns are manufactured using high-density polyethylene (HDPE) granules, which are extruded into flat tape filaments before undergoing a warp-knitting process to form a durable, flexible, and lightweight mesh structure. The density and weave pattern of these nets vary depending on the specific shading requirements for different crops and environmental conditions. These nets are designed to be water-permeable, allowing the passage of rainwater and irrigation from sprinklers or drip systems, ensuring adequate moisture retention for plant hydration. Their UV-stabilized composition enhances durability and resistance to degradation from prolonged sun exposure, making them suitable for long-term agricultural applications.

1 Scope

This Draft African Standard specifies the requirements, test methods, and sampling for shade nets made from tape yarns intended for use in agriculture

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 3801, *Textiles — Woven fabrics — Determination of mass per unit length and mass per unit area*

ISO 13934-1, *Textiles — Woven fabrics — Determination of breaking load and extension*

ISO 105-B01, *Textiles — Tests for colour fastness — Colour fastness to light Daylight*

ISO 22198, *Textiles - Fabrics - Determination of width and length*

ISO 139, *Textiles – Standard atmospheres for conditioning and testing*

3 Terms and definitions

For the purpose of this Draft African Standard, the following terms and definitions shall apply:

ISO and IEC maintain terminological databases for use in standardization at the following addresses:
— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
shading factor
percentage of light not transmitted through the shade net.

3.2
shade net
Woven or knitted material structured to allow required sunlight, moisture and air to pass through the gaps.

3.3
bundle
quantity of shade nets tied or wrapped up together

4 Requirements

4.1 General requirements

4.1.1 Heat shrinkage
The heat shrinkage of the tape at 60°C shall not exceed 5% and shall not exceed 8% at 95°C.

4.1.2 fabric
The fabric used in the manufacture of shade nets shall be knitted or woven and shall have a minimum width of 3mm.

4.1.3 Types

Based on the shading factor, the material is classified as follows:

a) Type I, having shading factor of 50 per cent;

b) Type II, having shading factor of 75 per cent; and

c) Type III, having shading factor of 90 per cent.

4.2 Specific requirements

4.2.1 Dimension

The dimensions of the shade nets shall be as declared, with a tolerance of ±3% for knitted and ±1% for woven when measured in accordance with ISO 22198.

4.2.2 The shade net fabric shall confirm to the requirements specified in Table 1.

Table 1 Requirements of Shade Nets Made from Tape Yarns

S/N	Parameters	Requirements			Test Method
		Type I	Type II	Type III	
1	Mass per unit area, g/m^{2,} *Min*	70	80	130	, ISO 3801
2	breaking strength of shade fabric (Ravelled strip method, 325mm x 70mm), Minimum a) Warp b) Weft	 180 180	 240 240	 270 270	ISO 13934-1
3	Shading factor , per-cent	45 to 55	70 to 80	85 to 95	Annex A
4	Retention of breaking strength after UV exposure, N, *Min*	← 85 per cent of original actual value (fabric) →			ISO 13934-1
5	Bursting pressure, kgf/cm^2, *Min*	5	6	9	Annex B
6	Colour fastness to artificial light (applicable for coloured shade nets only), Min	4	4	4	ISO 105-B01

5 Packaging

Shade nets shall be packed in suitable materials that prevents it from damage, contamination during handling, storage and transportation.

6 Labelling

Shade nets shall be legibly and indelibly labelled with the following information

a) manufacturer's name and physical address

b) registered trade mark if any;

c) Material composition;

d) type of shade nets and shading factor;

e) declared length and width of the shade nets;

f) mass per unit area (g/m^2) of the shade nets;

g) batch number and date of manufacture; and

h) Instruction for disposal;

i) Country of origin.

7 Sampling

Sampling shall be done in accordance with ISO 2859-1.

Annex A
(Normative)
Test method for determining shading percentage of shade nets

A.1 Principle

A sample of the shade nets is mounted in Shade-O-Meter tester and the amount of light transmitted or passed through the sample is measured with the help of Photo-synthetically Active Radiation (PAR) sensor, in W/m^2. The relative measurement of light transmitted with and without sample is considered for calculating the percentage of shade nets.

A.2 Sampling

A.2.1 Laboratory Sample

For the laboratory sample take a swatch extending the full width of the product, of sufficient length along the selvage from each sample roll so that the requirements of A.2.2 can be met.

A.2.2 Test Specimens

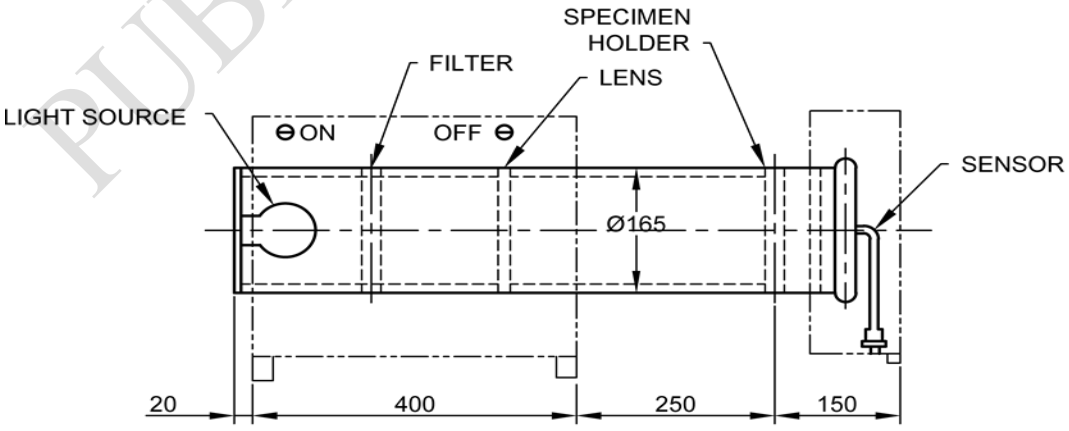
From the laboratory sample, cut at least 10 samples each having dimensions of 180 mm x 180 mm. Space the specimens along a diagonal on the unit of the laboratory sample. Take no specimens nearer the selvedge or edge of the shade nets. The selected test specimens shall not have any creases or folds.

A.3 Conditioning

Bring the specimens to moisture equilibrium in the atmosphere for testing shade nets (65 ± 5 per cent relative humidity and 25 ± 2°C temperature). Equilibrium is considered to have been reached when the increase in the mass of the specimen, in successive weightings made at intervals of not less than 2 h, does not exceed 0.1 per cent of the mass of the specimen.

A.4 Apparatus

The instrument used for measurement shall meet the geometric and spectral requirements. The schematic diagram of the apparatus is given in Fig. 1.



All dimensions in millimetres

Figure 1. SCHEMATIC DIAGRAM OF SHADE-O-METER

A.4.1 The Shade-O-meter tester shall have a flat base with total approximate dimensions as given below
Length x Diameter x Height = 970 mm x 350 mm x 325 mm.

A.4.2 Apparatus shall consist of a chamber in which arrangement for placement of light source filters, sample holder and sensor shall be provided. The inside surface of chamber shall be painted with black paint and shall be highly reflecting throughout the visible spectrum. The light transmitted through the shade nets sample shall be measured by light sensors.

A.5 Test procedure

A.5.1 Instrument shall be switched on and the reading for PAR without sample shall be taken on the sensor. This shall be recorded as T_1.

A.5.2 Shade nets sample (see **A-2.2**) shall be mounted in the slot of specimen holder. The reading of PAR measurement with sample shall be taken from the sensor. This shall be recorded as T_2.

NOTE: Test specimen shall be properly mounted in the specimen holder so that it shall not be very tight or very lose in the specimen holder.

A.6 Calculation

A.6.1 Shading percentage shall be calculated from the following formula:

Shading percentage = $T1 - \frac{T2}{T1} X100$
Where;

T_1 = reading of transmitted light, in W/m^2 (without sample); and
T_2 = reading of transmitted light, in W/m^2 (with sample).

A.6.2 Calculate the arithmetic mean of the measured values of shading percentage of ten samples.

Annex B
(Normative)
Determination of Bursting Strength and Bursting Distension of Fabrics Diaphragm Method

B.1 Principle

A specified area of the sample of fabric under test is clamped over an elastic diaphragm by means of a flat annular clamping ring, and an increasing fluid pressure is applied to the underside of the diaphragm until the specimen bursts. The operating fluid may be either a liquid or a gas.

B.2 Sampling

B.2.1 Samples shall be selected so as to be representative of the lot.

B.2.2 Samples drawn in accordance with the procedure laid down in the material specification or as agreed to between the buyer and the seller shall be taken as representative of the lot.

B.3 Test Specimens

B.3.1 From the test sample cut out at least 10 test specimens each 250 x 250 mm or 75 x 75 mm in size, by drawing one test specimen (see Note) from each of the pieces constituting the test sample; these shall constitute the test specimens.

NOTE – More than one test specimen may be cut out of one or more sample pieces to make up for 10 test specimens.

B.3.2 The system of clamping used generally permits tests to be applied without cutting out specimens (which may be resorted to, if desired). The sample of fabric available may sometimes be in one or more pieces but it should be possible to test it at 10 places. The 10 test areas shall be so distributed as to be representative of the sample and avoiding selvedge, creased or wrinkled places, and other such non-representative areas of the sample.

B.4 Atmospheric conditions for conditioning and testing

B.4.1 The conditioning and testing shall be carried out in standard atmosphere at 65 ± 2 per cent relative humidity and 27 ± 2°C temperature.

B.4.2 Prior to evaluation, the test specimens shall be conditioned to moisture equilibrium in the standard atmosphere (see Note).

NOTE: For guidance purposes, it may be noted that, the minimum time required to reach moisture equilibrium for the various types of textile materials having moisture regain less than 5 per cent is about 6 hours while the same for those having moisture regain more than 5 per cent is 24 hours.

B.5 Apparatus

B.5.1 For Test Diameter of 113 mm

B.5.1.1 The bursting strength tester shall have a flat base plate of diameter at least 140 mm, covered by a flat diaphragm of rubber or similar material (of thickness not more than 1 mm). A central hole in the base plate shall allow a controlled increase in fluid pressure to be applied to the underside of the diaphragm, so that the specimen bursts in 20 ± 3 seconds. The rate of flow of fluid through the hole in the base plate shall not vary more than ±20 per cent throughout the test.

B.5.1.2 A clamping ring of internal diameter 113.00 ± 0.03 mm and of external diameter 140 mm (*Min*) shall be provided with a flat lower surface to hold the specimen firmly against the diaphragm at all points.

B.5.1.3 The lower face of the clamping ring may be lined with a thin layer of cork or other compressible material suitable for the fabric under test; if the face is unlined, its inner edge (or inner periphery) shall have a radius of 0.5 mm.

B.5.1.4 Means shall be provided for applying the clamping ring with sufficient pressure to prevent the fabric specimen from slipping during the test. The specimen shall not be damaged by the action of the clamping ring.

B.5.1.5 Provision shall be made for indicating or recording the pressure under the diaphragm at any point in the range in which the machine is used to an accuracy of ± 0.25 mm.

B.5.2 For Test Diameter of 30.5 mm

All conditions shall be the same as B.5.1.1 to B.5.1.5 except that the diameter of the base plate shall be at least 55 mm and the internal and external diameters of the clamping ring shall be 30.50 ± 0.05 mm and 55 mm (Min); respectively.

B.6 Procedure

B.6.1 Place the test specimen or the area of the sample to be tested over the diaphragm so that it lies on a flat tensionless condition. Clamp it securely by means of clamping ring. Increase the pressure smoothly so that the bursting strength of the fabric is reached in 20 ± 3 seconds.

B.6.1.1 Note the bursting strength and the bursting distension of the specimen. If the specimen bursts close to edge of the clamping ring, record this fact and discard the reading, and carry out another test.

B.6.1.2 Repeat the test with other test specimens or at other places on the test sample, as the case may be, to have at least 10 acceptable measurements.

B.6.2 Diaphragm Correction – With the same rate fluid flow as employed in the above test, distend the diaphragm, without the presence of a specimen, but with the clamping ring in position, and note the pressure required to distend it by an amount equal to the average distension of the specimens. The pressure is the “diaphragm correction”.

B.7 Calculation

B.7.1 Calculate the arithmetic mean of the measured values of bursting strength and from this subtracts the diaphragm correction.

B.7.2 Express the arithmetic mean of the bursting distension of the specimens selected for the calculation of bursting pressure to the nearest 2 per cent.

B.8 Test Report

The test report shall include the following information:

a) Mean bursting strength in kilogram force per square centimetre or kilo-newton per square metre
b) Diaphragm correction.
c) Mean bursting distension; and
d) The type and capacity of the machine, the range at which it was operated, and the test diameter of the specimen.

Bibliography

IS 16008 : Part 1: 2016, Agro Textiles - Shade Nets for Agriculture and Horticulture Purposes - Specification Part 1 Shade Nets Made from Tape Yarns (First Revision)