

Hand-held pressurized aerosol dispensers against houseflies

Part 2. Method for determination of insecticidal efficiency

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Chemicals Standards Policy Committee (CIC/-) to Technical Committee CIC/49, upon which the following bodies were represented:

British Aerosol Manufacturers' Association
British Pest Control Association
Consumer Policy Committee of BSI
Consumers' Association
Health and Safety Executive
Ministry of Agriculture, Fisheries and Food
Rothamsted Experimental Station
Royal Society of Health
Scottish Home and Health Department

This British Standard, having been prepared under the direction of the Chemicals Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 February 1993

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First published as BS 4172, June 1967
Second edition, as BS 4172 : Part 2, February 1993

The following BSI references relate to the work on this standard:
Committee reference CIC/49
Draft for comment 89/55808 DC

ISBN 0 580 20912 1

Amendments issued since publication

Amd. No.	Date	Text affected

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Foreword

This Part of BS 4172 has been prepared under the direction of the Chemicals Standards Policy Committee. Together with BS 4172 : Part 1 : 1993, it supersedes BS 4172 : 1967, which is withdrawn.

The principal changes to the method are as follows.

- a) The reference formulation has been altered and a method for determining the content of the new active components has been included.
- b) The droplet size distribution and spray pattern for the reference aerosol have been more closely defined.
- c) The number of test flies has been reduced and the time for their release has been delayed.
- d) Check tests have been introduced for test chamber contamination, fly vigour and sex ratio.
- e) The criteria for assessment of insecticidal efficiency have been changed: a statistical treatment of results has been adopted, whereby the performance of the candidate is rated in accordance with confidence criteria.

Compliance with a British Standard does not of itself confer immunity from legal obligations. In particular, attention is drawn to the provisions of the Control of Substances Hazardous to Health Regulations 1989.

Method

Introduction

A new reference dispenser has been prescribed in this revision of this Part of BS 4172. Experience has shown that changes in the volatility of the solvent system may have profound effects on the knockdown performance of an aerosol. Consequently, technical isododecane, a material which is readily defined in terms of composition, has been selected as the solvent. This policy has been extended to the choice of active ingredients which are single isomer pyrethroids. Similarly, the composition of the propellant system is rigidly but realistically defined. After much deliberation, use of chlorofluorocarbons has been maintained, since they are available in pure form, and the associated technology has been thoroughly investigated. It is acknowledged, however, that the reference formulation may be subject to future alteration due to market movements or other trends. The use of chlorofluorocarbons in the reference formulation does not constitute an approval, by the Technical Committee, of their use in retail products. The reference dispenser is further controlled by a designated valve/actuator system. The reference formulation has been maintained as an oil-based formulation to avoid the heterogeneities of a two-phase system.

The time of release of the flies has been set at 20 s after the start of discharge of the aerosol spray. An earlier release has been shown to exaggerate the knockdown performance of aerosol sprays containing large droplets. A dispenser producing such a coarse spray has been also found to give reduced performance only a short time after discharge due to loss of the spray by fallout. Following collaborative work, it has been recognized that there is variation in the absolute performance of the reference dispenser under the range of conditions found in testing laboratories. Therefore the comparison of results for the reference dispenser and the candidate is now made on a statistical basis.

1 Scope

This Part of BS 4172 describes a method for determining the insecticidal efficiency of hand-held pressurized aerosol dispensers (hereafter referred to as 'dispensers') for indoor use as space sprays against houseflies. The method does not apply to metered-valve or total-release dispensers.

NOTE. This method may be adapted for space sprays against other flying insects.

2 References

2.1 Normative reference

This Part of BS 4172 incorporates, by reference, provisions from a specific edition of another publication. This normative reference is cited at the appropriate point in the text and the

publication is given on the inside back cover. Subsequent amendments to, or revisions of, this publication apply to this Part of BS 4172 only when incorporated in it by updating or revision.

2.2 Informative reference

This Part of BS 4172 refers to another publication that provides information and guidance. The edition of this publication current at the time of issue of this standard is given on the inside back cover, but reference should be made to the latest edition.

3 Definitions

3.1 knockdown

A measure of the inability of flies to fly or walk in a coordinated fashion, including dead and moribund flies, often in relation to the time of counting such flies, or to the percentage proportion of such flies in the population.

3.2 dispenser

A container, incorporating an aerosol valve, holding a product kept under pressure greater than atmospheric by means of a propellant, from which the product is discharged when the valve is opened. It is intended to be discarded when exhausted and not to be refilled.

3.3 study

Tests required to compare the performance of the candidate(s) with that of the reference dispenser.

3.4 candidate

A dispenser under test.

3.5 block

A group of dispensers comprising one reference dispenser and one dispenser per candidate.

4 Principle

A dispenser is discharged into a test chamber under controlled conditions, with an internationally recognized susceptible strain of the housefly *Musca domestica* L. Knockdown is assessed at up to 15 min and at 24 h after discharge of the spray. The results of replicate determinations for the candidate and calibrated reference dispenser are compared statistically.

5 Materials and apparatus

5.1 Test insects. Adult *Musca domestica* L. of an internationally recognized susceptible strain (e.g. derived from the World Health Organization (WHO) or 'Wellcome' strains), 3 days to 6 days old at the time of test.

NOTE 1. A recommended breeding regime is given in Annex 1.

The average mass of at least three random samples of 100 clean and dry pupae 1 day to 2 days old destined for use in the test shall be between 1.75 g and 2.5 g.

Check the vigour and susceptibility of the test insects at the beginning of the study against a reference dispenser prepared in accordance with annex B. When determined in accordance with clause 7, the mean insecticidal efficiency of the reference dispenser shall be 50 % knockdown in 6.5 min $\pm$ 2 min and 24 h knockdown between 50 % and 99.0 % at a dosage rate of 5.3 g $\pm$ 0.5 g aerosol solution fill/50.0 m³.

If an anaesthetic is used to handle the test insects, allow a 12 h recovery period prior to conditioning.

NOTE 2. It is recommended that carbon dioxide be used as the anaesthetic.

Condition the test insects for at least 3 h before test to a light intensity approximating to that of the test chamber (5.3) at a temperature of 26 °C $\pm$ 2 °C and at a relative humidity of 45 % to 75 %.

NOTE 3. The usual food should be provided.

5.2 Six reference dispensers, prepared in accordance with annex B and conditioned at 26 °C $\pm$ 2 °C for at least 30 min before use.

5.3 Test chamber. The volume of the test chamber shall be not less than 25 m³ and not greater than 60 m³. The ratio of the length to the width shall be not greater than 1.2. The chamber shall be 2.4 m to 2.8 m in height.

Cover the floor with non-glazed paper and replace the paper daily. Other surfaces shall be of a cleanable material or covered by a replaceable lining such as cling film wrap. Illumination shall be by fluorescent lighting sited to eliminate shadows.

Maintain the chamber at a temperature of 26 °C $\pm$ 2 °C and a relative humidity of 45 % to 75 % during the period of testing. Avoid temperature gradients; turn off air-conditioning apparatus and remove, if mobile, before commencing the test. The chamber shall be of such a design as not to give rise to convection currents during the test. Cover the extract vent during the test period to prevent flies gaining access. Ventilate the chamber after each test to ensure a minimum of four complete air changes before the start of a subsequent test.

6 Sampling and treatment of the candidate

6.1 Sampling

Select at random any six dispensers from those available for test.

6.2 Treatment

Ensure that each candidate contains approximately 50 % (m/m) to 60 % (m/m) of its declared contents, the estimation for which shall be made by weighing against previously weighed empty can and valve assemblies of similar size. Attain this level of fill by discharging the dispenser repeatedly, for periods individually not exceeding 10 s. Shake the dispenser to restore equilibrium before discharge.

Condition the candidate for at least 30 min at 26 °C $\pm$ 2 °C then calibrate the candidate for its discharge rate by weighing before and after discharge over a known time interval of between 5 s and 10 s.

7 Procedure

CAUTION. Operators discharging dispensers in test chambers should be equipped with fully effective personal protective equipment.

7.1 Test chamber contamination checks

Check the test chamber for insecticidal contamination before the commencement of the study and at the end of every day.

Release at least 100 test insects (5.1) of mixed sex and leave them in the test chamber for 15 min with the ventilation turned off and the extract vent covered. Collect and hold the test insects in accordance with 7.3.4 and 7.3.5. If there is more than 5 % knockdown within 15 min, or more than 10 % after 18 h $\pm$ 6 h, clean the chamber, repeat this procedure and invalidate all results of tests carried out during the previous 24 h period.

7.2 Conduct of study

Perform one valid determination (see 7.1) for each of the reference dispensers (5.2) and candidates (see clause 6) in the study. Use a randomized block design to determine the order of testing within each day. Ensure that the study is complete within 42 days.

NOTE. This block design ensures that the same number of candidates and reference dispensers are tested on each day. It also ensures that the ordering 'CCCCRR', which has potential for bias, never occurs.

Two possible randomizations are given below for the case of six determinations per day:

- CR RC RC (with one candidate);
- C₁RC₂ RC₁C₂ (with two candidates).

7.3 Determination

7.3.1 Weigh the reference dispenser (see 5.2) and the candidate (see 6.2) to the nearest 0.1 g.

7.3.2 Discharge the reference dispenser at a rate of 5.3 g $\pm$ 0.5 g/50.0 m³. Discharge the candidate at the dosage rate recommended on the product label, or by the manufacturer.