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**INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

WS/T 693-2020

**Guide to mosquito biological control technology Bacterial
larvicides
(English Translation)**

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

Drafting organizations of this standard. Institute of Microbiology and Epidemiology, Academy of Military Medicine, Chinese Academy of Military Sciences, Beijing Municipality Prevention and Control Center, Jiangsu Provincial Center for Disease Control and Prevention.

1 Scope

This standard specifies the principle of using bacterial larvicides (*Bacillus thuringiensis* subsp. *Israel* and *Bacillus sphaericus*) to control mosquito larvae, Insecticidal spectrum, formulation, application method and effect evaluation.

This standard applies to the use of bacterial insecticides (*Bacillus thuringiensis* subsp. *Israel* and *Bacillus sphaericus*) to control mosquito larvae.

2 Normative references

The following documents are indispensable for the application of this document. For dated reference documents, only the dated version applies to this document.

For undated references, the latest version (including all amendments) applies to this document.

GB/T 23797 Vector density monitoring method for mosquitoes

3 Terms and definitions

The following terms and definitions apply to this document.

Bacillus thuringiensis Israel subspecies *Bacillus thuringiensis israelensis*; Bti Belongs to gram-positive bacilli, which produce insecticidal parasporal crystal protein called delta-endotoxin during the sporulation process.

Mosquito larvae such as Mosquitoes and Anopheles have stomach poisoning effects and are a kind of bacterial insecticide.

Bacillus sphaericus; Bs it belongs to aerobic bacillus that forms subterminal expanded sporangia and spherical spores. 9 of the 49 flagellar serotypes have been found Strains of type (H1, H2, H3, H5, H6, H9, H25, H26 and H48) have a certain toxic effect on mosquito larvae and are a kind of bacterial killing Insect repellent.

Biological activity unit it is the unit of biologically active substance of *Bacillus thuringiensis* subsp. Israel and *Bacillus sphaericus*, expressed as ITU/mg.

4.1 *Bacillus thuringiensis* subsp. Israel

The parasporal crystals of *Bacillus thuringiensis* subsp. Israel are degraded by the alkaline environment in the midgut of mosquito larvae and released by enzymatic hydrolysis of intestinal proteases Toxic peptides are released, paralyzing the larvae, destroying the potassium ion (K) balance in the mosquito larvae and poisoning to death.

4.2 *Bacillus sphaericus*

The toxic effect of *Bacillus sphaericus* on different mosquito larvae is mainly realized by the toxin protein it produces. It has been proven that in its growth Two types of toxin proteins can be produced during the breeding process, one is the crystal toxin protein that exists in all highly virulent strains; the other is Low-virulence strains neutralize the Mtx toxin protein in some high-virulence strains.

5 Insecticidal spectrum of bacterial juveniles

5.1

Bacillus thuringiensis subspecies *Israel* is the most toxic to *Aedes* larvae. The toxic effect to *Culex* larvae is second, and the toxic effect to *Anopheles* larvae the effect is poor.

5.2

Bacillus sphaericus has a relatively narrow mosquito-killing spectrum. It has a good toxic effect on the larvae of *Culex* and *Anopheles*, but it has a good effect on the larvae of *Aedes*.

The effect is poor.

6.1.1 Suspending agent

Applicable to various water bodies, suitable for open water bodies and water bodies without aquatic vegetation.

6.1.2 Water dispersible granules

This formulation can be used to spray large areas of liquid on typical hidden larval breeding sites in open water bodies, water bodies with little or no aquatic vegetation.

fog. Directly control water accumulation in artificial or natural containers. For the types of surface activities such as *Anopheles*, in actual operation, the treatment is repeated the timing is 4th instar larvae.

6.1.3 Wettable powder

This type of dosage form has a variety of biologically active units prepared, and water should be mixed before use.

6.1.4 Granules

This type of dosage form has a variety of substrates, and has the characteristics of being able to release *Bacillus thuringiensis* subspecies *Israel* into the water to the maximum extent. Granule bleaching the shift is smaller, it can target the most targets, and has a better effect of penetrating water vegetation than liquid spray.

6.1.5 Block

The biologically active unit of this type of dosage form varies with the manufacturer and technical matrix, and generally depends on the type of block and the biological activity that can release *Su Bacillus aureus* subsp. *Israel* is 30 days to 180 days, and its effect will not be changed due to moisture and dryness. For both permanent and temporary breeding

grounds Suitable for. The block has a ring shape and usually floats, and a brick shape usually sinks to the bottom. This type of formulation is less effective in open water, and the wind may blow it to the edge. Therefore, it is generally used in small water bodies, such as ponds, pools, and sinks. Blocking agent is easy to form lumps in sewage, so it should be used Relatively clean water.

6.2 *Bacillus sphaericus*

The dosage forms that can be used include granules (generally bioactive unit is 50 BslTU/mg), water dispersible granules (generally labeled bio the unit of material activity is 650 BslTU/mg). Suspending agents, blocks and water-soluble granules are also used.

6.3 Mixing agent

The dosage form mixed with *Bacillus thuringiensis* subsp. Israel and *Bacillus sphaericus* can be used in the breeding grounds of all larvae.

7.1.1 Liquid spray

Suspending agents, water dispersible granules, and wettable powders can be used for liquid spraying. The spray speed depends on the type, efficacy, Vector mosquito species and breeding grounds. The suspension can be used diluted or undiluted, and the treatment interval is determined according to the volume of the water body and the coverage area of the breeding ground (7 d ~ 14 d). Water dispersible granules are usually mixed with water before use. For artificial or natural containers, use them directly without mixing water beforehand.

The treatment interval is 7 to 14 days, and the *Aedes* mosquitoes are controlled in the container. The treatment interval is 3 months. Wettable powders need to be in water for all water bodies Medium mixing, interval treatment is generally 7 d to 14 d. All dosage forms can use manual compression pumps or other sprayers, aiming at world health the recommended dosage of *Bacillus thuringiensis* water dispersion recommended by the organization is 125 g/ha~750 g/ha for open water and 1 mg~5 mg/L for container.

7.1.2 Spreading granules

Manually or with a portable blower to release into the water body, according to the World Health Organization recommended dose of *Bacillus thuringiensis*, open water recommendations the dosage is 5 kg/ha~20 kg/ha, and the interval treatment is generally 7 d~14 d.