

# DISTRIBUTION OF *AEDES (STEGOMYIA) AEGYPTI* AND *AEDES (STEGOMYIA) ALBOPICTUS* (DIPTERA: CULICIDAE) AND THEIR CONTROL IN RUSSIA

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In the last 20 years, two tropical species of mosquitoes - *Aedes (Stegomyia) aegypti* (L.) and *Aedes (Stegomyia) albopictus* (Skuse) (Fig. 1) actively settled in Americas, Australia, and Europe. Both species are vectors of many arboviral diseases, such as yellow, dengue, Chikungunya, and Zika fevers.



Fig. 1. *Aedes aegypti* (at left) and *Aedes albopictus* (at right)

In the territory of the former USSR *Ae. aegypti* mosquitoes found since 1911 in the settlements of the Black Sea coast (Abkhazia and Georgia) and existed there until the 1950-1960s. After the extermination measures *Ae. aegypti* mosquitoes recovered and were identified in Sochi in 2000-2004. *Ae. albopictus* mosquitoes was first registered in Russia (Sochi) in 2011. By 2016, this species has distributed along the Russian Black Sea coast from the border with Republic of Abkhazia to Novorossiysk and also settled inland from the coast to the altitude of 600 meters above sea level [1] (Fig. 2).



Fig. 2. Distribution of *Ae. albopictus* on Russian coast of the Black Sea in 2016

Currently, *Ae. albopictus* populations were discovered in the territory of the Crimean Peninsula [2] and reach to Eysk, Krasnodar, and Maykop [3, 4]. These two species are synanthropic and live in settlements, both rural and urban. Common larval habitats for *Ae. aegypti* and *Ae. albopictus* are small containers both artificial and natural origin filled by water. Some of these habitats presented in Fig. 3. Cemeteries are breeding sites of particular importance because larvae of these species of mosquitoes develop in large numbers in containers with fresh flowers standing near the graves.

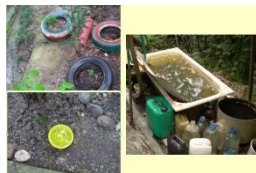


Fig. 3. Common breeding sites of *Aedes aegypti* and *Ae. albopictus* larvae

It is shown that *Ae. albopictus* exhibits higher ecological plasticity at egg, larval and adult stages in relation to temperature and other environmental factors than *Ae. aegypti*. An integrated control program for these species has developed.

For the first time in Russia, a series of experiments carried out to establish the susceptibility level of *Ae. aegypti* and *Ae. albopictus* to insecticides (OPs, carbamates and pyrethroids), as well as biological preparations based on *Bacillus thuringiensis israelensis* [5]. A complex of pest control measures against these mosquito species has been developed, in both places, where larvae and pupae are breeding, and the habitats of adult mosquitoes, depending on the degree of their anthropogenicity [6] (Fig. 4).

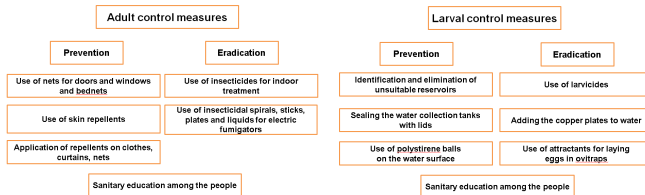


Fig. 4. Control of *Ae. aegypti* and *Ae. albopictus*

A list of compounds effective against these mosquito species has compiled (Table). The invasion of *Ae. aegypti* and *Ae. albopictus* into new regions requires constant monitoring of their population size, identifying and eliminating potential habitats, reducing their populations to the minimum and protecting people from their attacks.

Table. Insecticides and repellents for the control of *Ae. aegypti* и *Ae. albopictus*

Purpose	Formulation	Active ingredient
Larvicides for the treatment of water	Microbiological insecticides	<i>Bacillus thuringiensis</i> var. <i>israelensis</i>
	Chemical insecticides (emulsifiable concentrates)	cypermethrin – 25% chlorofos – 97% fenthion – 50% temephos – 50%
Insecticides for the treatment of premises against adult mosquitoes	Chemical insecticides (emulsifiable concentrates)	cypermethrin – 25% fenthion – 50% temephos – 50%
	Pyrotechnic blocks	permethrin – 5,0-13,0%
	Aerosols	tetramethrin – 0,1-0,16% permethrin – 0,15-0,16% cypermethrin – 0,09-0,25% pyrethrins – 0,3-0,36% pyrethrins – 0,025-0,25%
Repellents for protection humans from adult mosquitoes	Insecticide-impregnated plates and liquids for use with electric fumigators	transfluthrin – 0,1-2,0% prallethrin – 0,5-5,0% ethothrin – 3,0% empenthrin – 3,0-5,0%
	Repellents with aerosol package with and without propellant for the application on skin or clothes	DEET – 27,0-50,0%
Repellents in the form of creams and gels for the application on skin	Repellents with aerosol package with and without propellant for the application on skin or clothes	DEET – 4,7-30,0% IR3535 – 10,0-20,0% Citrepel 75 – 15,0%
	Repellents in the form of creams and gels for the application on skin	aromatic essential oils – 5,4-6,2%

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