

Development, assessment and ecotoxicological evaluation of prevention and control measures against the invasive Asian bush mosquito in Hesse and Rhineland-Palatinate, Germany (AJAP)

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The Asian bush mosquito is an exotic culicid species which occurs, among other countries and regions, in Rhineland-Palatinate and Hesse. The species acts as a competent arboviral vector under laboratory conditions, its introduction may have ecological consequences on the native mosquito fauna, and its presence may be a nuisance to humans. We lack knowledge on its biology, i.e. oviposition preference, temperature tolerance or competitive behaviour; most data in these areas were obtained in Northern America. This study aims to gain first insights into the biology of a population of the Asian bush mosquito in Germany. During the project, we obtained data on oviposition preference, feeding under laboratory conditions, ovipositional repellents, temperature limits for development, and temperature tolerance of eggs.

Knowledge on the preferred oviposition containers and therefore breeding habitats of the Asian bush mosquito is essential for preventative measures to limit breeding activity or specifically target larval assemblage for insecticide treatment. Our experiments showed black plastic containers as well as containers made of wood or clay (e.g. water holding flower saucers) being preferred by gravid female mosquitoes for oviposition. In addition, we were able to show that the Asian bush mosquito uses a wide variety of household containers for oviposition. Therefore, discarded, water-filled cups, bags or intentionally placed vases and cans should be avoided. The organic content in the water body can be high without having any negative impact on the larval development.

Essential oils of clove and lavender proved to be efficient in preventing and limiting oviposition. Additionally, these essential oils have a larvicidal effect on the Asian bush mosquito. One important factor influencing the efficiency of insecticides is temperature. Consequently, we studied the temperature-dependent effect of clove essential oil and two additional plant-based substances. The temperature-stable effect of clove essential oil between 17 °C and 25 °C was shown. In a follow-up project, we would like to study the possible development of resistances against clove essential oil and its efficiency under field condition, until clove essential oil can be recommended for application.

Furthermore, we carried out experiments on the temperature tolerance of this species and estimated the temperature limits of possible development from larvae to adult female. The optimal constant temperature for development is 26 °C, the lower limit for development is 7 °C and the upper limit is 31 °C. The egg stage, which is the main overwintering stage, survives up to two weeks at 5 °C and 0 °C, while eggs incubated at 9 °C show larval hatching reduced by 80 % after three days. Thus, we conclude that in cold winters (9 °C) the population size can be drastically reduced. Data on the temperature dependence of life cycle parameters of the Asian bush mosquito can be fed into phenological or epidemiological models which can be the basis of distribution maps or early warning systems.