delivery methods were developed and evaluated in the laboratory. A coating method, involving the application of uniform spore layers on papers, enabled accurate laboratory evaluations, and a rotating spray apparatus could standardize the application of oil suspensions inside clay pots. Clay pots showed potential for use as indoor and outdoor point-source objects to target resting anophelines with fungal spores, and netting for use as house screens to target host-seeking mosquitoes. *Metarhizium* and *Beauveria* spores were effective in infecting anopheline mosquitoes after spray application inside clay pots and on several netting substrates. Both delivery methods offer multiple deployment options and could potentially be used complementary to chemical-based malaria control measures such as insecticide-treated bednets (ITNs) or indoor residual spraying (IRS).

Fungal spores were shown to kill insecticide-resistant anophelines as effectively as susceptible mosquitoes and thus provide a novel control tool for resistant malaria vectors. Insecticide resistance through genetic target-site mutations and/or metabolic mechanisms did not confer resistance to fungal infection. Fungi and insecticides were shown to not only be compatible and effective when used in combination, but also to induce synergistic effects on mosquito survival. Co-exposure enhanced the subsequent fungal virulence and insecticide impact. With fungi and insecticides increasing each other's efficacy, they can be viewed as complementary control tools that would reach the highest disease control benefit when successfully integrated. The development of novel integrated vector management (IVM) strategies based on both biological and insecticidal control could provide a sustainable malaria control approach with potential to be successful especially in areas where insecticide resistance levels are hampering the effectiveness of existing malaria interventions.

Behavioural, ecological and genetic determinants of mating and gene flow in Afican malaria mosquitoes

Kija Ng'habi, Wageningen Universiteit, promotiedatum 25 oktober 2010

Ongoing efforts to control malaria and other vector-borne diseases using contemporary vector control approaches have resulted in commendable successes. However, the emergence of drug and insecticide-resistant parasite and vector strains, respectively, may reverse the benefits already achieved. Thus, development of new approaches to supplement existing control methods has been the forefront option to build on the achieved successes. There are two genetic control approaches proposed, the Sterile Insect Technique (SIT) and genetically modified (GM) mosquitoes. These approaches require the release of genetically altered males to induce sterility within a wild vector population to reduce the size of the vector population or introduce parasite-refractoriness through gene constructs that spread within such populations. The concept of genetic control is not new and successful attempts were made during the last century, particularly with SIT. Despite successes there were also failures and the unsuccessful trials were a result of several factors which were generally related to insufficient knowledge of male mating biology.

Current advances in molecular biology have fuelled interest in genetic control strategies for malaria and other mosquito-borne diseases, some of which are now approaching field implementation. With regard to past experiences, it is clear that a key issue in the success of these approaches is the better understanding of the mating behaviour of the target mosquito species. The mating behaviour of malaria mosquitoes is a complex process as it is suggested to occur in male aggregations (swarms), which are space (marker) and time (dusk) dependent. This makes it difficult not only to locate the swarms but also to understand the factors that govern mating processes such as male-male recognition, male-female recognition and ultimately mating success. Our understanding of the important factors that mediate male mating success in a mosquito swarm is still insufficient to predict the outcome of new genetic control strategies. The research presented in this thesis focused on investigating factors that determine male mating success in natural mosquito swarms besides genetic factors that mediate gene flow within field populations. Given the limited knowledge on the biology of male mosquitoes, initial focus was on investigating ecological and behavioural factors that have been reported to determine reproductive success of female mosquitoes such as body size, survival and energetic reserves. The study of how these parameters determine male mating success in nature is difficult, and was therefore primarily conducted in the laboratory. However, it was also attempted to develop a novel research tool by mimicking natural environmental conditions in an enclosed semi-field system. Also, genetic factors that are responsible for determining gene flow in a field population were determined.

Correctie

Ruud Vis & Hans A. Coene 2010. First record of the female of *Lycaena sichuanica* in Sichuan, China (Lepidoptera: Lycaenidae). Entomologische Berichten 70: 146-149.

Due to an error, the text "trapezium shaped" was printed in figure 7b. However, this text must be part of figure 6b. Figure 6b will be illustrated here in the correct way.