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Land-use management of invasive species could help prevent spread of mosquitoes borne diseases: Evidence from Kenya

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Climate change is expected to substantially alter biodiversity, leading to alterations in phenology, genetic composition, and species distribution while also affecting species interactions and ecosystem. Invasive alien species (IAS) have threatened the integrity of ecosystems throughout the world. They affect the species diversity of native ecosystems and threaten their biological integrity. Due to increasing movement of people and goods around the world, and with new trade routes opening and enhanced transportation, the number of species being introduced into new areas is rising. IAS reduce agricultural yields, irrigated croplands, grazing areas, and water availability, and contribute to the spread of mosquito-borne diseases. Mosquitoes are widely spread Mosquitoes are widely spread and transmit malaria and several arthropod-borne viruses. A particular example of IAS is *Parthenium hysterophorus* (Asteraceae). It is one of the world's most serious invasive plants that is able to thrive and spread aggressively outside its original geographical areas. Native to the subtropics and tropics of North and South America, Parthenium has negative effects on human, livestock, agriculture and the environment. The aim of this study is to determine the abundance and diversity of mosquito vectors at sites with different degrees of invasive plant infestations in the Rift valley area in Kenya. Currently, the spread of invasive plant species is a major problem in Kenya, where indigenous flora is replaced. The study sites are located in Baringo county. A total of 50000 mosquitoes were captured using a combination of different trapping techniques from six sites, three of them with IAS (Parthenium) and three without. We identified 48 species. A subset of 1000 mosquitoes was analyzed for evidence of recent plant feeding using cold anthrone test. An overall low fructose positivity rate (10.9%) was found. Barcode technique was applied to identify plant food source using specific primers for a locus from the chloroplast genome, ribulose diphosphate carboxylase. The DNA from all trees or shrubs within a 100m radius from the trap was collected to build a barcode reference library. Plant DNA with 55.3% (n = 553) success rate was identified. Sequences were successfully generated from samples, indicating Parthenium plants as the predominant plant fed by mosquito vectors. This survey is an inventory of the mosquito population composition and of the abundance and richness of arboviruses. It provides an insight into how changes in community ecology interact with the main types of land-use change and influence the dynamics of relevant arboviruses in Kenya. Thus, it provides a beneficial knowledge for targeted control.

Keywords

Climate change, land-use changes, agricultural expansion, infectious diseases, mosquito ecology, invasive plants, Parthenium hysterophorus