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Abstract

Mosquitoes contribute to malaria transmission by allowing the development to maturity of the malaria-causing Plasmodium parasite. Plasmodium takes 10-14 days in a mosquito depending on temperature to develop fully enough to cause malaria in a human. If a mosquito is less than 10 days old, the chance that it is carrying a full-developed parasite is small. Hence, knowing the age of a mosquito is crucial in evaluating the infectiousness of the Anopheles mosquito population in an area. Currently, the age of mosquitoes is estimated by hand dissection of their ovaries to determine if they have laid eggs. Those found to have laid eggs are assumed older than those who have not laid eggs. This assumption can be misleading as mosquitoes can be old but not have laid eggs and vice versa. The method is also laborious, difficult, and limited to only few experts. As a result, we need a new approach to address these limitations. Near Infrared Spectrometry, which can classify the age of lab-reared mosquitoes into < 7 or ≥ 7 with an accuracy $\geq 80\%$, can be an alternative to hand dissection. The limitation is lack of age-labeled wild mosquitoes with which to train the model. Training a model using labels from hand dissection, results on a model with poor accuracy. Applying a model trained on spectra from lab-reared mosquitoes to estimate the age of wild mosquitoes would be an appropriate only if spectra collected from lab-reared mosquitoes are equivalent to those collected from wild mosquitoes, but no studies have validated that generalization. We performed k-means cluster analysis on a mixture of spectra collected from lab-reared and wild An.arabiensis to determine if there is any significant difference. With age of lab-reared mosquitoes controlled, we found two clusters with average silhouette values of 0.51 and 0.77. The clusters had no significant difference in distribution of spectra collected from lab-reared and wild mosquitoes ($P = 0.245$). We suspect clustering was due to age difference of mosquitoes and not their source. These results strengthen the idea of training the model to estimate the age of wild mosquitoes using spectra collected from lab-reared mosquitoes.