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Evaluation of the human-baited double net trap and BG trap as an alternative to human landing catches for collecting outdoor *Aedes albopictus* in China

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Objective: Monitoring the density of *Aedes*(*Ae.*) *albopictus* was very important in evaluating the efficiency of vector management, especially when *Aedes*-borne diseases break, like Dengue fever, Chikungunya fever and Zika. Human landing catch (HLC) is regarded as the “gold standard” for *Aedes* monitoring, but it is unsafe and unethical since it potentially expose field professionals to a series of pathogens. In this study, we compared HLC with human-baited double net (HDN) and BG trap for field *Aedes albopictus* monitoring. The study aims to find an effective and safe alternative method to HLC in monitoring *Ae. albopictus*, especially in emergency monitoring.

Methods: Latin square design was used, and three sites in Hangzhou city, Zhejiang province, China, were chosen to conduct outdoor HLC, HDN and BG trap catches in June. The tests were performed at three periods: a morning period (8:30-10:00), an afternoon period (15:00-16:30), and an evening period (16:30-18:00). Then a table with 81 elements was made to compare the efficiency of these three methods.

Results: A total of 80, 138 and 78 adult *Ae. albopictus* was captured by HDN, BG trap and HLC, respectively. Among these three catches, BG trap showed the best efficacy in captured *Ae. albopictus* adults. The mosquitoes caught by HLC and BG trap were nearly the same at all three time series, but the density of mosquitoes caught by HDN at 16:30-18:00 was 2 times the density at 8:30-10:00 (4.44 vs 2.22 per hour). In this study, significant positive correlation between HLC and BG trap of *Aedes albopictus* female density was found ($r=0.921$, $P<0.001$). However, no statistical significant correlation between HLC and HDN, BG trap and HDN of *Ae. albopictus* female density was found ($r=-0.46$, $P=0.820$; $r=0.019$, $P=0.923$, respectively). Besides, the human-bait attraction bias of HLC catches might be more apparent than BG trap and HDN catches.

Conclusions: According to our study, with high efficiency, less human-bait attraction bias, and significantly positive correlation with HLC in catching *Ae. albopictus* females, BG trap could be a sensitive and safer alternative to HLC for outdoor *Ae. albopictus* monitoring. It also showed strong potential in emergency monitoring when *Aedes*-borne diseases break.

Keywords: *Aedes albopictus*; Human landing catch; Human-baited double net trap; BG trap; Monitoring


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