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Effect of ABO and Rh blood groups on the egg viability and the morphometrics of laboratory-reared *Aedes aegypti*

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Dengue, a prevalent vector-borne disease in Sri Lanka, is primarily transmitted by *Aedes aegypti*, whose desiccation-resistant eggs contribute to its persistence. This study investigated the impact of human ABO and Rh blood groups on *Ae. aegypti* egg viability and morphometrics to facilitate effective vector control strategies. Eight mosquito colonies were established in the insectary at the Department of Zoology and Environmental Management, University of Kelaniya, with each colony (30 mosquitoes; 1:1 sex ratio) fed a different blood group (A^+, A^-, B^+, B^-, AB^+, AB^-, O^+, and O^-) using an artificial membrane feeder. Although *Ae. aegypti* eggs typically hatch sooner, this study employed a 100-day observation period to investigate whether hatching rates differed among blood groups over an extended timeframe. No special desiccation conditions were applied; eggs were kept under standard laboratory conditions to assess viability over time. Egg viability was evaluated by measuring the hatching percentage of 30 randomly selected eggs at eight intervals (4^{th}, 10^{th}, 25^{th}, 40^{th}, 55^{th}, 70^{th}, 85^{th}, and 100^{th} days) after egg laying, with three experimental replicates. Morphometrics of eggs, larvae, pupae, and adults of F_1 generation were examined from 10 individuals randomly selected from each blood group. Analysis of Covariance (ANCOVA) followed by Tukey's test revealed a significant effect of ABO and Rh blood groups on egg viability ($F_{7,183} = 7.76$; $p < 0.05$). The B^- blood group showed the highest egg viability, while the B^+ group showed the lowest during the study period. One-way analysis of variance (ANOVA) followed by Tukey's test was used to determine the effect of ABO and Rh blood groups on the egg volume and morphometrics of *Ae. aegypti* larvae, pupae, and adults. Egg volume was also significantly affected by blood group ($F_{7,72} = 2.84$; $p < 0.05$), with B^- eggs exhibiting the largest volume. B^- larvae were considered the smallest because they were consistently the smallest across thoracic length ($F_{7,72} = 5.49$; $p < 0.05$), abdominal length ($F_{7,72} = 18.20$; $p < 0.05$), and total length ($F_{7,72} = 18.04$; $p < 0.05$). Pupal cephalothorax length and width also varied significantly across blood groups (male length: $F_{7,32} = 3.42$; $p < 0.05$, width: $F_{7,32} = 3.70$; $p < 0.05$; female length: $F_{7,32} = 11.99$; $p < 0.05$, width: $F_{7,32} = 9.75$; $p < 0.05$), with B^- pupae being the smallest and B^+ the largest. This pattern is likely due to individuals hatching from more desiccation-resistant eggs exhibiting smaller larval and pupal sizes. Adult morphometrics, however, were unaffected by blood type. These findings suggest that variations in egg viability, egg volume, larval morphometrics, and pupal morphometrics may be linked to the nutritional composition of different blood groups, particularly the levels of triglycerides and other key metabolites such as glutamine, phenylalanine, and tyrosine that influence *Ae. aegypti* egg development. Further research is required to investigate these relationships and their implications for dengue vector control.

Keywords: ABO and Rh blood groups, *Aedes aegypti*, Dengue, Egg viability, Morphometrics