

Hydrocarbons Profiling for Age Determination Using Forensic Important Phorid Flies

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Structured Abstract

Background: Forensic entomology studies provide crucial tool in estimating the post-mortem interval (PMI) of deceased individuals, with insects playing significant role in this process. *Spiniphora genitalis*, a forensically important phorid fly species, has been identified as a potential candidate for PMI estimation due to its abundance and rapid colonization of cadaveric remains. Traditional methods for determining the age of phorid fly larvae, such as morphological analysis and size comparison, can be complicated and inaccurate. This study aims to analyse cuticular hydrocarbons (CHC) compounds present on the cuticle of *S. genitalis* larvae at different ages (Day 1, Day 3, Day 7). The findings of this research will contribute reliable method for age determination of *S. genitalis* larvae, ultimately improving PMI estimation in forensic entomology.

Methods: This study involved rearing *S. genitalis* larvae under controlled conditions and collecting samples at Day 1, Day 3, and Day 7 post-emergence. Cuticular hydrocarbons (CHCs) were extracted from the larvae using hexane and analysed using GC-MS. Principal Component Analysis (PCA) was employed to compare the CHC profiles of larvae at different ages, identifying age-specific patterns.

Results: The results show the significant chemical changes occurring from Day 1, Day 3 and Day 7. The abundance of high of high molecular weight alkanes of C18 and above gradually increased with age. Each stage contain hydrocarbon that is exclusive to the stage. For example, 2-methyloctacosane is only present in Day 1 samples while pentadecane, 2,6,10-trimethyl is only observed in Day 3 samples. With the aid of statical methods PCA, sample were clustered, allowing the larvae age to be established. Day 1 showed clear separation from older larvae, while Day 3 and Day 7 samples showed overlapping distributions, suggesting that distinct chemical profile in early larval development but become less distinct after Day 3.

Conclusion: In conclusion, these results indicate the change in hydrocarbons makeup as larvae age and could potentially be used to determine the age of *S. genitalis*. These findings highlight the applicability of using CHC profiles for age determination in forensic entomology and underscore the need for further research to fine tune the methods for determining specific CHC in larval age for this species.

Keywords: Forensic entomology, *Spiniphora genitalis*, larval instars, cuticular hydrocarbons, GC-MS

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