

Studies on the nymphal aggregation pheromone of Malagasy
Migratory Locust, *Locusta migratoria capito* (Saussure, 1884) and its
effects on adult maturation.

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ABSTRACT

The Malagasy migratory locust, *Locusta migratoria capito* (Saussure, 1884), is the most destructive pest in the Malagasy agricultural production system. The recent plague between 1996 and 2000 during which economic losses amounting to *ca.* US\$ 50 million mainly in rice fields, were recorded, is an indication that, the locust menaces is far from being resolved in Madagascar. Control operations against locusts have focused entirely on large-scale application of synthetic chemical insecticides. Given that Madagascar has a unique and rich biodiversity; such spraying has negative effects on the environment and non-target beneficiary organisms.

Recent research on the desert locust, *Schistocerca gregaria* (Forskäl) by the *icipe* team for over the last fifteen years has revealed the importance of pheromonal mediation in the aggregation behaviour of adult and nymphal stages and in gregarizationsolitarization dynamics. The aim of this study was to provide basic information on the role played by volatiles in the aggregation of nymphs of *L. m. capito* and to explore possible applications of the chemical constituents for preventive control.

The aggregation response of fifth instar nymphs to their own volatiles was investigated using a single-chamber olfactometer. When locust nymphs were reared together with their adult conspecifics, they aggregated weakly to their own volatiles. However, when the male and female nymphs were tested separately, nymphs of each sex responded negatively to the volatiles. Nymphs reared separately from adult locusts showed strong avoidance to their own volatiles. The same pattern of responses was observed for the body extract.

To identify the constituents, volatiles were collected using Super-Q and analysed using Gas Chromatography (GC), coupled Gas Chromatography-Mass Spectrometry (GCMS), and coupled Gas Chromatography-ElectroAntennographic Detection (GC-EAD).

The results revealed the presence of the following electrophysiologically active compounds: 2,3-butanediol, hexanal, benzyl alcohol, nonanal, phenylacetonitrile and two unidentified compounds from live nymphs; 2,3-butanediol, anisole, guaiacol, phenylacetonitrile, beta ionone and one unidentified compound were identified from volatiles derived from the faeces. There were no sexual differences in the production of volatiles, both qualitative and quantitative.

The identified compounds were further used in bioassays to assess the aggregation responses of the nymphs. The results showed that, the synthetic full blend elicited the same response as the crude volatiles from live nymphs and fresh faeces. However, exclusion of each compound at a time from the full blend modified the response of the nymphs from avoidance to attraction.

In another experiment, the effect of the nymphs on the sexual maturation of young adults was evaluated using a double-storey bioassay and aluminium standard cages. The results showed significant delay in both mating and ovipositing time when young adults were exposed to nymphs in the presence of visual, tactile and olfactory cues. In contrast, the nymphal volatiles alone did not cause retardation of sexual maturation of young adults with regard to the above parameters. The results are discussed in terms of the relative concentration of the compounds in the volatiles