Contribution ID : **71** Type : **not specified**

Dual Stochastic Resonance Enhances Sexual Communication in Stink Bugs Nezara Viridula

Tuesday, 10 June 2025 15:15 (30)

Stochastic resonance (SR) phenomena provide insight into the behavior of complex biological sys- tems. Furthermore, a method for characterizing SR-type behavior in excitable systems with ape- riodic and arbitrary inputs, such as broadband signals, has been developed and termed aperiodic stochastic resonance (ASR). It was discovered that noise can enhance the response of a sensory neu- ron to a subthreshold aperiodic input signal, suggesting a functional role for input noise in sensory systems. The simple addition of noise enhances a system's sensitivity, improving its ability to dis- criminate weak signals. The southern green stink bug, Nezara viridula (L.), is a cosmopolitan and highly polyphagous insect prevalent in many tropical and subtropical regions, representing one of the most significant pentatomid pests worldwide. Acoustic communication during mating is fundamental to this species' reproductive behavior and offers a promising avenue for population control through traps that emit acoustic signals. In this study, we demonstrate how environmental noise can enhance intersexual communication by analyzing behavior using the source-direction movement (SDM) ratio. Our findings reveal that the SDM exhibits a nonmonotonic trend with two distinct maxima, suggesting the presence of a "double" behavioral stochastic resonance. Fur- thermore, the external noise intensity values employed in laboratory experiments closely match those observed in open-field measurements. These results confirm that environmental noise plays a crucial role in the acoustic communication of N. viridula during the mating period.

Role

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Session Classification : Session 3