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Venom toxicity and deployment method as means of biotic resistance

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Venom could play an essential role in invasions and give the invader a substantial advantage against native species. However it might also support biotic resistance against an invader, if native species are venomous. One ant genus that has repeatedly been reported to successfully withstand other competitively strong ant species is *Monomorium*. We tested whether the co-occurrence patterns of four *Monomorium* species with the invasive Argentine ant, could be related to venom toxicity, deployment method or behavioural interactions. We analysed Argentine ant survivability when treated with a range of venom concentrations from four *Monomorium* species and compared them with mortality rates in arena fights between *Monomorium* and Argentine ant workers. Venom toxicity was not directly linked with co-occurrence patterns in the field and survival in arena fights did not meet the expected correlation with venom toxicity. We further investigated how venom is utilized by different *Monomorium* species, since using the venom as a repellent to keep hostile workers at a distance might bear less risk of injury than physically engaging them. We found that three of the tested *Monomorium* species displayed significant variation in venom usage depending on increasing numbers of Argentine ant workers they encountered in the arena fights. Lastly we explored how aggressive interactions influence the survival rate of the species engaging Argentine ants. We found significant differences in worker mortality for *Monomorium* and Argentine ant workers, depending on the *Monomorium* species. High levels of aggression were displayed by the species which have not been found to co-occur in the past. We conclude that the three factors toxicity, venom utilization and aggressiveness towards an invader play a role in forming ant communities and influence the establishment success of an invasive species.