*Running head: generalist predators for biocontrol*

**Biocontrol efficacy of arthropod generalist predators increases with crop stage in organic and conventional farms**

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**Supporting Information**

Appendix S1: Table S1. Trophic guild assignments of major arthropod families / genera in this study.

|  |  |
| --- | --- |
| **Trophic guild** | **Family / Genus** |
| Rice herbivore | Alydidae / *Leptocorisa* |
|  | Cicadellidae / *Nephotettix* |
|  | Delphacidae / *Nilaparvata* |
|  | Hesperiidae |
|  | Lygaeidae / *Pachybrachius* |
|  | Pentatomidae / *Scotinophara* |
|  | Pyralidae |
|  | Pyrgomorphidae / *Atractomorpha* |
| Tourist herbivore | Acrididae |
|  | Chrysomelidae |
| Detritivore | Chironomidae |
|  | Chloropidae |
|  | Ephydridae |
|  | Muscidae |
|  | Sciomyzidae |
|  | Stratiomyidae |
|  | Tetrigidae |
| Predator | Araneidae |
|  | Clubionidae |
|  | Coccinellidae |
|  | Oxyopidae |
|  | Tetragnathidae |
|  | Thomisidae |

Appendix S1: Table S2. Trophic discrimination factor (TDF) (mean ± SD) of carbon (Δ13C) and nitrogen (Δ15N) for each prey source in the mixing model. TDFs were estimated from the diet-dependent discrimination equation proposed by Caut et al. (2009).

|  |  |  |
| --- | --- | --- |
| **Source** | **Δ13C** | **Δ15N** |
| Rice herbivore | 1.08 **±** 0.50‰ | 2.41 **±** 0.59‰ |
| Tourist herbivore | 0.68 **±** 0.48‰ | 2.05 **±** 0.71‰ |
| Detritivore | 0.82 **±** 0.26‰ | 1.42 **±** 0.85‰ |

Appendix S1: Table S3. Summary of predators’ diet composition in organic and conventional farms over crop stage. *n* represents the sample size for each farm type-crop stage combination. Note that the discrepancies in *n* were due to insufficient predator samples for model estimation in some farms.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Farm type | Crop stage | Prey source | | | | | | *n* |
| Rice herbivore | | Tourist herbivore | | Detritivore | |
| Mean | SD | Mean | SD | Mean | SD |
| Organic | Tillering | 0.342 | 0.109 | 0.271 | 0.115 | 0.387 | 0.174 | 7 |
| Flowering | 0.616 | 0.106 | 0.165 | 0.075 | 0.219 | 0.119 | 6 |
| Ripening | 0.899 | 0.039 | 0.054 | 0.009 | 0.046 | 0.035 | 5 |
| Conventional | Tillering | 0.553 | 0.182 | 0.183 | 0.064 | 0.264 | 0.120 | 7 |
| Flowering | 0.814 | 0.107 | 0.090 | 0.041 | 0.096 | 0.067 | 6 |
| Ripening | 0.934 | 0.027 | 0.046 | 0.011 | 0.020 | 0.016 | 7 |

Appendix S1: Figure S1. Stable isotope signatures (δ13C and δ15N) of primary producer (rice, *Oryza sativa* L.) and prey sources (rice herbivore, tourist herbivore and detritivore) in rice farms (mean ± SE). Arthropod samples were pooled across all study farms. The isotope values of prey sources were corrected for trophic discrimination factors (TDF) estimated from the diet-dependent discrimination equation proposed by Caut et al. (2009). Note that the primary producer samples were collected from six (three organic and three conventional) of the 14 study farms during a preliminary survey in 2017.

Biplot.tiff

Appendix S1: Figure S2. Relative abundances of prey sources in organic and conventional farms over crop stage. Samples within each farm type (organic vs. conventional) were pooled and relative abundances were calculated as the proportion of each prey source to the total abundance of all prey sources.

**Relative.Abd_Or.Cv.tiff**

Appendix S1: Figure S3. Scatterplot showing the relationship between rice herbivore consumption by predators and relative abundance of rice herbivores. Points represent predators’ consumption for each individual farm-crop stage combination. The lines were fitted with beta regression models individually for organic (dashed, *Z* = 2.52, *P* = 0.01), conventional (dot-dashed, *Z* = 4.60, *P* < 0.001), and both farms combined (solid line, *Z* = 4.41, *P* < 0.001).

Rel.Abd_Prop_beta.tiff

**Literature Cited**

Caut, S., Angulo, E. & Courchamp, F. (2009) Variation in discrimination factors (Δ15N and Δ13C): the effect of diet isotopic values and applications for diet reconstruction. *Journal of Applied Ecology* 46, 443-453.