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ABSTRACT

STUDIES ON THE SPIDERS AS POTENTIAL BIOLOGICAL CONTROL AGENTS IN AGROECOSYSTEMS

Firstly, the attractiveness of potentially beneficial flowering plants to spiders and other insect natural enemies was investigated in an agricultural field cultivated organically at Kiire, Kagoshima City, Japan, in 2013 and 2014. In 2013, five plant species, *Salvia farinacea* Benth., *Mentha spicata* L., *Foeniculum vulgare* Mill., *Fagopyrum esculentum* Moench and *Anethum graveolens* L. were compared for their attractiveness to spiders using a direct count method. *S. farinacea* attracted significant numbers of Thomisidae and *M. spicata* attracted Theridiidae, while the other flowering plants attracted fewer numbers of spiders. In 2014, another set of five flowering plant species, *Salvia farinacea* Benth., *Matricaria recutita* L., *Achillea millefolium* L., *Petunia atkinsiana* D. Don ex Loudon, and *Alyssum maritimum* (L.) Desv. were compared for their attractiveness to natural enemies; Thomisidae, Ichneumonoidea, Chalcidoidea, Anthocoridae, and Syrphidae. Samples were collected weekly from each plant species using a sweeping net. Crab spiders and predatory bugs clearly preferred *S. farinacea* compared to other plants in this study, whereas chalcidoid wasps preferred *S. farinacea* and *A. Millefolium*. This study may be the first to investigate the attractiveness of *S. farinacea* and *M. spicata* to thomisid and theridiid spiders in an agricultural field.

Secondly, this study was aimed to identify the treatment that increases the populations of spiders. In 2013 and 2014, two different treatments, organic fertilizer and chemical fertilizer treatments were applied to the experimental eggplant field and in 2014, I surrounded organic fertilizer plots with the flowering plants *Salvia farinacea* Benth., *Mentha spicata* L., and *Ocimum basilicum* L. Repeated measures ANOVA revealed significant influences of fertilizer type on the numbers of linyphiid spiders and Collembola in 2013. In 2014, the numbers of Collembola, thrips, and lycosid and linyphiid spiders were higher in organic fertilizer with flowering plants treatment comparing with the chemical fertilizer treatment. Moreover, the numbers of *Henosepilachna vigintioctopunctata* (F.) were significantly lower in the organic fertilizer with flowering plants treatment than in chemical fertilizers treatment. I expect that Thysanoptera and Collembola were important alternative prey for linyphiid and lycosid spiders and the use of organic fertilizer and flowering plants enhanced the density of these spiders, and may increase their effectiveness in suppressing the populations of *H. vigintioctopunctata* (F.).

Finally, analysis the gut content of *Pardosa* spiders by polymerase chain reaction (PCR), to detect the DNA of cotton aphid (*Aphis gossypii* Glover), played as an essential tool to check the probability of predation in the open field. Thirteen of total eighty individuals of these field samples of *Pardosa* spider were positive for DNA of cotton aphids. These results confirmed that *Pardosa* spiders are a very important predator and deserve more attention in biological control of cotton aphid.