**INTRODUCTION & OBJECTIVES**

The spined soldier bug, *Podisus maculiventris* (Hemiptera: Pentatomidae), is a generalist predator native to North America which feeds on many important pests of various crops (McPherson 1980). The brown marmorated stink bug, *Halyomorpha halys* (Hemiptera: Pentatomidae), is an invasive phytophagous pest causing considerable damage to field crops and fruit orchards in North America (Hoebeke and Carter 2003). Currently, *H. halys* management heavily relies on pesticides, and thus identification of potential natural enemies of *H. halys* is an important strategy for integrated pest management. Our field observation suggested the potential of *P. maculiventris* as a biological control agent against *H. halys*. This study was conducted to (1) determine which life stages of *P. maculiventris* can effectively kill *H. halys* life stages and (2) describe the feeding behavior of *P. maculiventris*.

**MATERIALS AND METHODS**

**Experiment 1.** *P. maculiventris* life stages feeding on *H. halys* life stages: A laboratory experiment was conducted to assess which life stages of *H. halys* are most vulnerable to *P. maculiventris* feeding. One adult *P. maculiventris* was introduced into a 55-mm petri dish with each of seven different *H. halys* stages as treatment: one *H. halys* egg cluster (an average of 24.4 eggs/cluster), a group of 1st instar (an average of 20.5 *H. halys*), five for each of 2nd, 3rd, 4th, and 5th instars and adults. All *P. maculiventris* used in this study were starved for 24 hours prior to experiment. After 24 hours of *P. maculiventris* introduction, sunken *H. halys* eggs from feeding were counted, mortality of *H. halys* from predation was recorded. The same experiment was repeated with 3rd and 5th instar *P. maculiventris*. Each experiment was replicated ten times per *P. maculiventris* and *H. halys* life stage combination (i.e. a total of 21 treatment x ten replications).

**Experiment 2.** Feeding Behavior of *P. maculiventris* on *H. halys* Eggs and 1st Instar: An observational study was conducted to investigate feeding behavior of *P. maculiventris* (3rd and 5th instar) on *H. halys* eggs and 1st instar. One 1st instar or three eggs of *H. halys* were introduced into a 55-mm petri dish. One *P. maculiventris* (3rd or 5th instar) was placed into the same petri dish. From the video footage searching and feeding behavior of *P. maculiventris* was analyzed. All *P. maculiventris* used in the study were starved for 48 hours before the experiment. *P. maculiventris* 3rd instar and *H. halys* egg repeated 24 times, *P. maculiventris* 3rd instar and *H. halys* 1st instar repeated 18 times, *P. maculiventris* 5th instar and *H. halys* egg repeated 12 times, *P. maculiventris* 5th instar and *H. halys* 1st instar repeated 12 times.

**RESULTS & DISCUSSION**

**Experiment 1.** *P. maculiventris* life stages feeding on *H. halys* life stages: We found that *P. maculiventris* 3rd instar, 5th instar, and adult were unable to kill *H. halys* 4th instar, 5th instar and adult (Table 1). *P. maculiventris* adult and 5th instar killed significantly more *H. halys* eggs (df = 2, F = 11.37, P < 0.05), *H. halys* 1st instar (df = 2, F = 17.07, P < 0.05), *H. halys* 2nd instar (df = 2, F = 13.22, P < 0.05) and *H. halys* 3rd instar (df = 2, F = 4.00, P < 0.05), than *P. maculiventris* 3rd instar (Table 1).

**Experiment 2.** Feeding Behavior of *P. maculiventris* on *H. halys* Eggs and 1st Instar: We observed that *P. maculiventris* intermittently pierced and then retracted its stylet from the egg or 1st instar *H. halys*. This behavior was repeated multiple times before sustained feeding started. *P. maculiventris* positioned stylet into the side or underneath of the egg mass or 1st instar (Figs. 1-3). We also observed that *P. maculiventris* fed on multiple eggs one at a time before moving onto the next egg within the cluster; generally, outer eggs were eaten first. When *P. maculiventris* fed on the 1st instar *H. halys* it lifted the 1st instar off the surface using its stylet (Fig. 3). *P. maculiventris* also used its stylet to rotate the *H. halys* during feeding (Fig. 4). The body of *H. halys* 1st instar became concave during feeding and then shriveled and curled in from the ventral side (Fig. 5).

**CONCLUSION**

*P. maculiventris* has the ability to kill eggs and younger instars (1st, 2nd, and 3rd instars) of *H. halys* effectively (Table 1). However, *P. maculiventris* could not kill 5th instar and adult *H. halys*, which inhibits their potential to control *H. halys* adults emerging from overwintering sites or moving into an orchard or field crop early in the season. Additional field tests and choice tests should be conducted in order to assess the potential of *P. maculiventris* as a biological control agent against *H. halys* in the field.

**LITERATURE CITED**


**ACKNOWLEDGEMENT**

We thank S. Baek, J. Goldner, and V. Kondo for their help with experiments and suggestions for the study. This study was supported by USDA OREI and WVU SURF Program.