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Advantages of Understanding the Lady Beetle Diet

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Understanding the feeding behavior of lady beetles will help agronomists develop cropping systems that best use these important beneficial insects as biological controls of insect pests, such as aphids and Colorado potato beetles.

Agricultural Research Service entomologist Jonathan Lundgren at the North Central Agricultural Research Laboratory in Brookings, South Dakota, and former ARS entomologist Michael Seagraves were part of a team of ARS and university scientists that examined how lady beetle diets alter their feeding patterns and physiology.

Appreciated for their ability to eat insect pests, lady beetles also consume nectar, pollen, and other plant tissue. Indeed, most beneficial predators eat both prey and nonprey foods, and understanding the factors that affect what they eat is important to using them in biological control of crop pests. The foods they consume determine where and when they can be found in a farm field and whether they decide to eat crop pests.

Also, since many field crops are treated with insecticides, an important step in assessing the risk to beneficial species is to know how much insecticide these insects consume when they feed on plants.

For laboratory feeding tests, the team chose a native lady beetle species, *Coleomegilla maculata.* The results of the tests reveal that this lady beetle consumes two to three times more plant tissue after being fed a prey-only diet than after being fed a mixed diet of prey and plant tissue.

"This suggests that plant material is providing some key nutrients lacking in prey-only diets," says Lundgren. "It is important to recognize that nonprey foods contain different nutrients from insect prey, and predators fed mixed diets are often more fit than those fed only prey."

In a follow-up study, Lundgren and his colleagues looked at sugar consumption by lady beetles in the field. Sugar, whether in a sugar-syrup spray provided by the farmer or in nectar from nearby flowering plants, is an important nutrient, allowing female lady beetles to survive and produce more eggs than those denied this sweet treat. This feeding behavior is known to exist, but its effect on lady beetle physiology is less understood.

"Foods like sugar and pollen are important components of their diets, and it is thought that lady beetles rely heavily on sugar resources in the field, although no one has ever quantified their feeding," says Lundgren. "In this study, we applied sugar sprays to soybeans and quantified the frequency of sugar feeding using gut content analysis of common agronomic lady beetles in South Dakota, Maryland, and Kentucky."

Says Seagraves, "We found that all the lady beetles we tested regularly consumed sugar—like nectar—in soybean fields, even when it wasn't applied as a supplement. However, the sugar-sprayed plots had more lady beetles than the untreated plots, although soybean aphid populations were similar in the two treatments. This research makes the case that sugar-feeding is very important for lady beetle populations in cropland and suggests one way to maintain these beneficial species in agroecosystems."

The research team's findings were reported in the journals *BioControl* and *Biocontrol Science and Technology*.—By **Sharon Durham,** ARS.

This research is part of Crop Protection and Quarantine, an ARS national program (#304) described at www.nps.ars.usda.gov.

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Coccinella septempunctata is a predatory lady beetle introduced in North America to control wheat pests, but its diet also includes pollen and nectar. ARS scientists are studying the lady beetle's feeding behavior to learn how to better use it for insect pest control.