Ladybirds thrive on organic aphids

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Ladybird larvae that eat prey raised on organically-grown crops are more likely to survive than those eating aphids raised on crops grown with conventional fertiliser, a new experiment shows.

The study, published in Biological Control, could have important implications for how farmers harness natural predators to control pests.

Many people believe organic food is better for their health. This lab-based study didn't test that idea, but it does suggest it can be better for the health of whatever ends up eating you - if you're an aphid. Ladybird larvae fed on organically-raised aphids were ten per cent more likely to make it to adulthood - a difference that could end up making a big impact on their populations, if it turns out to hold true on farms.

Dr. Jo Staley of NERC's Centre for Ecology & Hydrology (CEH), one of

the paper's authors, says bigger experiments looking at a wider range of predators and prey in real field environments, are needed before we'll know if these relationships work in more complex systems.

'This is just a preliminary study, but we've shown that a simple change of fertiliser in a single crop plant can produce a significant difference to ladybird mortality,' Staley says.

The team fed aphids on plants grown with artificial ammonium nitrate fertilizers, and others on plants grown with organic fertilizers like chicken manure and green manure crops. They then removed these aphids from the plants and fed them to captive ladybird larvae, monitoring the predators' survival rates.

The scientists had the idea that the difference in ladybird mortality they saw might be because the aphids were storing up poisonous chemicals called glucosinolates that the plants make to defend themselves from pests, in order to enhance their own defences against predators. Artificially-fertilised plants can produce more of these chemicals, so the thought was that aphids raised on them would end up more toxic.

But Staley says that doesn't seem to be the explanation for what's happening here. For one thing, the same drop in ladybird survival happened whether the larvae ate aphids that specialise in eating this particular plant, which are known to sequester its glucosinolate toxins in this way, or more generalist aphids which aren't thought to have that ability.
More fundamentally, chemical analysis of the bodies of aphids from the two different groups didn't reveal any significant differences in levels of glucosinolates, the main chemical that the aphids are thought to exploit to defend themselves from predators.

Staley says it's possible that the ladybirds were feeling the ill-effects of

toxin-rich plant material held in the guts of its prey, or that defensive chemicals other than glucosinolates are responsible.

'Biological control' methods, like releasing large numbers of captive-bred ladybirds onto farmland to control aphids, have been gaining popularity in recent years. Likewise, various less extreme approaches aim to improve biological control of pests by increasing the abundance of predators like ladybirds and lacewing larvae, using methods such as leaving field margins uncultivated or building strips of vegetation nicknamed 'beetle banks'. This study suggests such tactics may be more or less beneficial depending on how particular farmers fertilize their crops.

More information: Predator mortality depends on whether its prey feeds on organic or conventionally fertilised plants. JA Banfield-Zanin, et al. *Biological Control*, 2012. dx.doi.org/10.1016/j.biocontrol.2012.05.008

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