

Suppressing vegetable pests on your farm

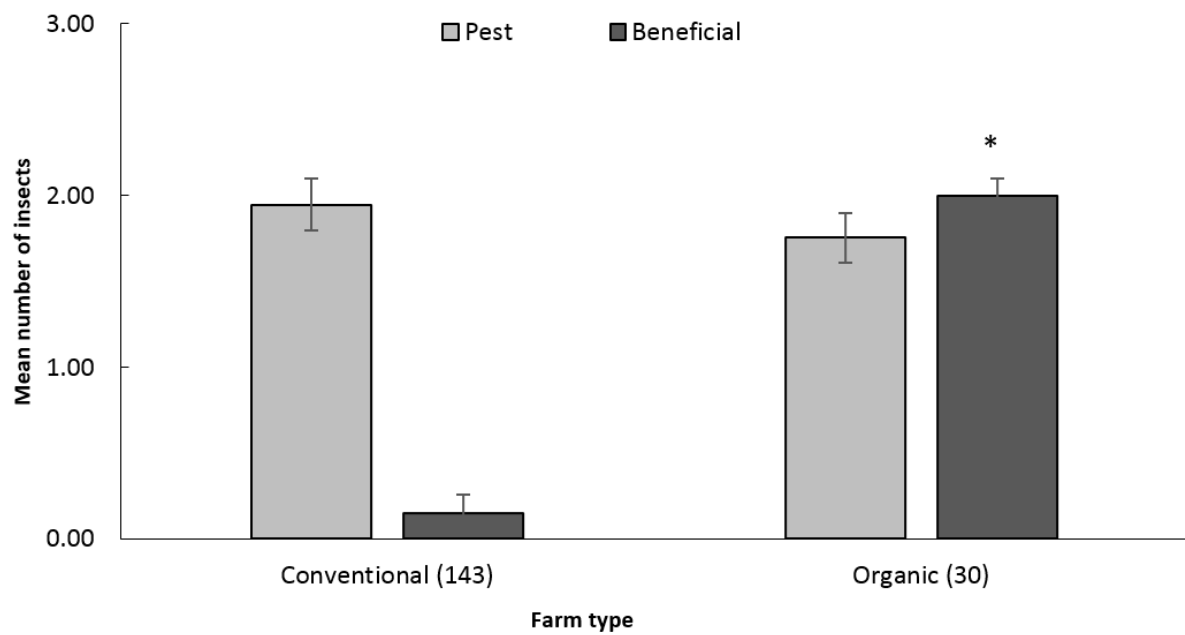
by Geoff Gurr and team

Pressure is mounting to reduce reliance on insecticide spraying to control vegetable pests. Consumer preferences, changes in maximum residue limits in export markets, the reduced availability of insecticide products as a result of registration restrictions, and pests becoming resistant are all drivers for change. A project initiated earlier this year by Hort Innovation aims to help growers rise to this challenge by developing ecological approaches to boost beneficials and check pest build-up. The team led by Prof Geoff Gurr of the Graham Centre for Agricultural Innovation at Charles Sturt University is determined to help growers by developing methods that are simple to implement, compatible with mainstream farming operations and can help drive down costs.



Ladybirds feed on many types of pests. This was one of the most common beneficial insects in surveys of vegetable crops in Australia. (Image courtesy S Rizvi)

The project has already involved surveying insect pests and beneficials (predators and parasites of pests) in corn, lettuce, carrot and brassica crops across South Australia, Western Australia, Tasmania, Queensland and New South Wales. Early results are providing useful pointers as to what factors influence the abundance of beneficials and the pests they attack. First, among the sites that were under organic production, beneficials were much more numerous than in conventional crops where synthetic insecticides were used. This enhancement of beneficials kept pests in check as effectively as insecticide spraying in the conventional crops – it shows the potential of biological control. But organic farming is not for everyone; so what else might farmers try as a more integrated pest management approach?



Numbers of pests and beneficials in vegetable crops under 'conventional' management, i.e. with use of synthetic insecticides and organic production. Pests are no more common in the organic crops than in conventional crops, largely as a result of the significantly greater numbers of beneficial insects (predators and parasites). Here the average numbers are shown for a survey of 174 crop fields in Australia. Stars show where averages are statistically significantly different when comparing 'conventional' and organic beneficial insect means. Numbers in brackets show the numbers of sites of each type of management.



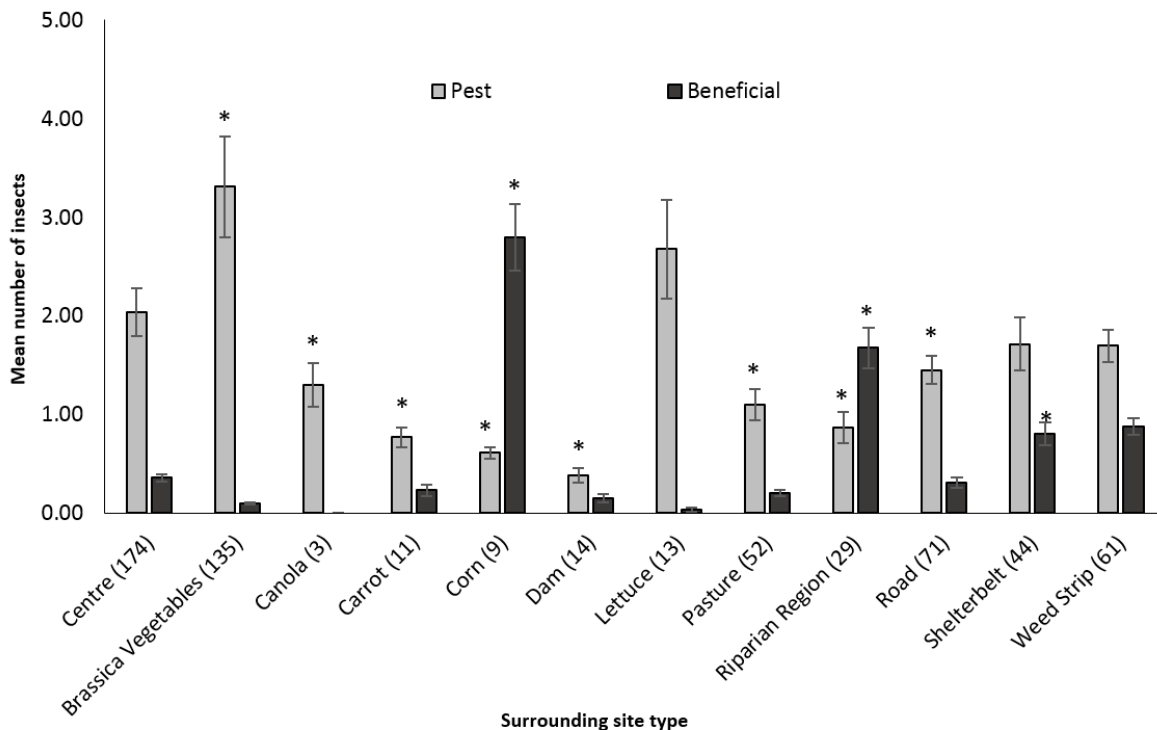
Insect surveys have taken place in vegetable crops in South Australia, Western Australia, Tasmania, Queensland and New South Wales. (Image courtesy G Napier)

The second major finding from the field surveys is that the type of land use immediately adjacent to the crop strongly influences numbers of pests and beneficials in the crop itself; sometimes to the benefit of growers, sometimes to their detriment! This is an important finding because other work, recently published in the American journal, *Proceedings of the National Academy of Sciences*, showed that simply having lots of natural vegetation in the wider landscape was no guarantee of lower pest numbers. (That article can be accessed freely at: <http://www.pnas.org/content/early/2018/08/01/1800042115>.) It seems that local management may be a more important influence on pest numbers than landscape scale vegetation patterns. This is actually good news for farmers because it implies that the things directly under their control – like pesticide use patterns, the layout of crops in relation to each other, and features like roads and dams – are what really matter.



A typical NSW sweetcorn crop is likely to have several different land uses adjacent to its margins and these affect the numbers of pests and beneficial insects in the crop. (Image courtesy S Rizvi)

In the Hort Innovation project, surveys showed that the numbers of beneficials in sweetcorn, brassica, lettuce and carrot crops vary markedly according to the adjacent land use. Compared with densities in field centres (taken to serve as a ‘baseline’ in each field), beneficials were more common in the margins of these crops if adjacent to riparian vegetation, shelterbelts or sweetcorn. Densities of pests in turn were low in the margins of crops adjacent to riparian vegetation or sweetcorn. Pests also tended to be scarce in vegetable crop margins close to canola, carrot, pasture, roads and farm dams. Conversely, pests tended to be more abundant in crop edges adjacent to brassica crops. This preliminary analysis of ‘pooled’ data needs to be interpreted with caution because it covers the period March to August (2017). As a consequence, brassicas were well represented and sweetcorn scarce compared with other crop types. Our final data set will cover all four seasons and give more equal representation of crop types.



Numbers of pests and beneficials in vegetable crops are strongly affected by the type of adjacent land use. Here the average numbers are shown for a survey of 174 crop fields in Australia. Stars show where averages are statistically significantly different to the corresponding average of the centre of the fields. Numbers in brackets show the numbers of sites of each type.

These preliminary results illustrate how the final data set might be used to inform decision making. First, by providing guidance on where it may be best to position a vegetable crop. Assuming you have a choice, it may be better to be better to grow brassicas, sweetcorn, lettuce and carrots well away from brassica vegetables and close to carrot, sweetcorn, canola, pasture, roads, dams or riparian vegetation. Second, these results provide pointers to ecological factors that might be exploited more actively to suppress pests. For example, farm dams and roads might constitute barriers to pest movement into adjacent areas of crops. Other land uses, such as riparian vegetation, may contain perennial vegetation or flowering plants that boost beneficials by serving as shelter or nectar sources. Finally, the reason that some types of crops tend to drive down pest densities in adjacent crops may relate to them maturing earlier so that beneficials move out of them and into adjacent crops. Further work is required to get to the bottom of these types of effects; and that's exactly what the team will be doing in the next phase of the Hort Innovation project. If you'd like to be involved, please contact Geoff Gurr at ggurr@csu.edu.au/ 0417 480375, Mike Furlong at m.furlong@uq.edu.au/ 0418159762 or Olivia Reynolds at olivia.reynolds@dpi.nsw.gov.au/ 0438276803.

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