Benefits of Natives on the Farm

Maree McCarthy (Secretary-*Australian Plants Society, Newcastle*) Ph: 0410405815

Introduction

Amazing results have been achieved by farmers in Australia using native plants for -

- *disease control*
- *insect ecology balancers*
- *weed suppressant*
- *soil conditioners*
- *salinity prevention*
- *soil protectors*

This native fly is a snail parasite. It needs native plants.

For many years, increasing natural biodiversity has been observed to reduce crop pests. *Pliny the Younger* (23-79AD) wrote in his *Naturalis Historiae* that when rape (Brassica *napus* L.) and vetch (Vicia *sativa* L.) were grown together, many insects that occurred normally on these plants were not found.

Studies

In recent years, all over the world, researchers have noted that crops seem to be less attacked by herbivorous insects in general when plant diversity is increased. For example, controlled, and field experiments on 8 types of insect pests of cabbage have found that there were significantly fewer pest species of all 8 of the pest species when the cabbages were simply surrounded by a green living mulch, eliminating the need to apply insecticide, fungicide or herbicide.

Interestingly, plants of different odour profiles, and those specifically selected for their pungent odours including sage, thyme and onions, failed to deter the insect pests.

Insect habits are a clue

Many reasons for the decrease in pest insects have been suggested. However, the 'Appropriate/ Inappropriate Landings' theory has been most widely accepted: the insect must accumulate more positive host-plant stimuli each time it lands to induce it to lay eggs.

Characteristic volatile chemicals drive the herbivorous insects towards the host plant but their actual landings are governed by visual stimuli. The insects land indiscriminately on green surfaces avoiding brown surfaces, such as soil. Hence, host plants growing in bare soil are colonized by more insects than similar plants growing amongst green non-host plants.

The foliage of both plants should be about the same height. Also need to make sure the non-crop does not become a weed, take excessive nutrients and water from the crop, or adversely affect the crop in terms of other pathogens.

Native insects / Native Plants / Native Birds

Insects are a particularly nutritious primary food source, and high in valuable energy; and contain far more vitamins, minerals and protein than beef of the same weight.

There are studies that have shown that native plants produce over 4x more insect biomass and 3x insect species than exotic plants. This is because the native insects evolved separately for over 160million years and cannot eat foreign plants. Native plants also have 35x more butterflies and moth caterpillar biomass - the preferred food for birds with young. Even generalist insect species prefer native plants as they were found to be twice as thick (more biomass) on native plants compared with exotics.

Insect hosting capacity of plants in different lands: (*Note also*: less insects = less native birds)

Plant species	Number of species it offers food for in home country	Number of species it offers food for when introduced
Eucalyptus stellulata	in Australia - 48 species	in Nth America - 1 species
Melaleuca quinquenervia	in Australia - 409 species	in Nth America - 8 species
Phragmites australis	in Australia -170 species	in Nth America - 5 species

A large percentage of the world's fauna (such as birds) depends entirely on insects to access the energy stored in plants. Native ecologies are critical for species survival all around the world.

Tomato Spotted Wilt Virus (TSWV)

Studies on vectors of TSWV found that native plant species had a very low likelihood of hosting exotic thrips species and suggest that judicious choice of surrounding vegetation has potential to be an important component of IPM (Integrated Pest Management) while increasing biodiversity conservation.

Of the many plant taxa that are known hosts for pest thrips and TSWV, most are exotic to Australia and regarded as weeds. However, there was little evidence of TSWV in Australian native plants, with only one positive sample (from the Lilliaceae) out of 42 species and 1,590 samples tested.

Evidence now shows that using native plants as horticultural revegetation for reduction of thrips-related disease (as opposed to the current 'bare-earth' strategy) can provide an opportunity for thrips management with other potential benefits, such as reducing long-term management of weeds and revegetated areas, minimise top-soil erosion, increase and preserve biodiversity, increase public amenity/aesthetic values and, most importantly, improved sustainability.

Criteria for Native Plant IPM:

- Relatively unattractive to pest
- Unable to harbour the disease
- Taxonomically distant from the crop plant
- Provide habitat for a diversity of natural enemies of pests, so they are available for early colonisation into the crop
- Compatible with agronomic practices

- Native to the region.

Secondary criteria may include native plants that provide an additional source of income for the farm, such as native foods, cut flowers and revegetation seeds.

Native plants and Leafminers

As has happened overseas, authorities are soon expecting the introduction of the highly polyphagous invasive pest Agromyzid Leafminers. To develop a pre-emptive control strategy to deal with exotic leafminer outbreaks the first step is to identify and study Australian Leafmining Flies, their plant hosts and their parasitoids. So far, many native parasitoids (beneficial wasps) have been found that control these Flies, but they are dependent on native vegetation. Of two species of host specific leaf miners, ten species of native parasitoids (all Hymenoptera) where found to attack one and two native parasitoids attacked the other. Findings from the survey suggest an opportunity to plant purpose-designed refuges that could play a role in conservation biological control as part of an IPM (Integrated Pest Management) strategy.

Weeds also indirectly affect crops via their influence on beneficial insects, and by harboring plant and insect diseases. Most insects, including crop pests, are specialists, and pre-adapted to feed only on certain plants, often within a single plant family. Even polyphagous insects often have a distinct preference hierarchy, feeding more widely only when preferred hosts are unavailable.

Replacing weeds with natives is also useful because the science is showing that weeds can leave a legacy of alteration in the native soil, impeding our ability to use the soil in the future for grazing, biofuels, carbon sequestration and other ecosystem services. This is partly due to destruction of soil food webs, soil microbial communities, and mutualistic fungi.

Example of a beneficial native plant on the farm: *Acacia melanoxylon*

Beneficial insects - Like many Acacia species, *A. melanoxylon* provides a bonanza of invertebrate life. It is even host for a rare Australian carnivorous moth!

Medicine - First Australians derive an analgesic from the tree.

Fishing - The tree's twigs and its bark are used to stun **fish** for fishing purposes.

Fire Barrier - amongst other plants, in rural situations is useful as a fire suppressant.

Wood - very good for many uses including furniture, tools, boats, and wooden kegs. About the same quality as walnut and well-suited for shaping with steam. It may also be used for producing **decorative veneers.** The **bark** has a tannin content of about 20%. Plain and Figured Australian Blackwood is used in **musical instrument** making (in particular guitars, drums, Hawaiian ukuleles, violin bows and organ pipes), and in recent years has become increasingly valued as a good sustainable substitute for koa wood.

Black Wattle
Photo: Creative Commons

References / Resources

Capinera, J.L. (2005) Relationships between insect pests and weeds: an evolutionary perspective. *Weed Science* 53, 892– 901.

Finch, S. & Collier, R.H. (2000) Host-plant selection by insects – a theory based on 'appropriate/ inappropriate landings' by pest insects of cruciferous plants. *Entomologia Experimentalis et Applicata* 96, 91–102.

Finch, S., and Collier, R., (2001) Host plant finding by insects - undersowing crop plants with clover reveals the missing link. *Horticulture Research International*, Wellesbourne, Warwick CV35 9EF, UK Corresponding author: stan.finch@hri.ac.uk http://web.entomology.cornell.edu/shelton/diamondback-moth/pdf/2001papers/2001DBM06.pdf

Fiedler, A.K. & Landis, D.A. (2007) Attractiveness of Michigan native plants to arthropod natural enemies and herbivore. *Environmental Entomology* 36, 751–765.

Kogan, M. & Lattin, J.D. (1993) Insect conservation and pest management. *Biodiversity and Conservation* 2, 242–257.

Latham, L.J. & Jones, R.A.C. (1997) Occurrence of tomato spotted wilt virus in native flora, weeds and horticultural crops. *Australian Journal of Agricultural Research* 48, 359–369.

Norris, R.F. & Kogan, M. (2000) Interactions between weeds, arthropod pests, and their natural enemies in managed ecosystems. *Weed Science* 48, 94–158.

Schellhorn, N.A. (2008) Phase II: Native Vegetation to enhance biodiversity, beneficial insects and pest control in horticulture systems. Final Report 2008 *Horticulture Australia Limited* No. VG06024.

Schellhorn, N.A., Nyoike, T.W. & Liburd, O.E. (2009) IPM programs in vegetable crops in Australia and USA: Current status and emerging trends. pp. 575–597 in Peshin, R. & Dhawan, A.K. (Eds) *Integrated Pest Management: Innovation-Development Process,* vol. 1. Dordrecht, The Netherlands, Springer Press.

Schellhorn, N.A., Glatz, R.V. and Wood, G.M. (2010). The relative risk of exotic and endemic plants as hosts for four pest thrips (Thysanoptera: Thripinae). *Bulletin of Entomological Research* 100, 501-510.

Stanton, M.L. (1983) Spatial patterns in the plant community and their effects upon insect search. pp. 125–157 in Ahmad, S. (Ed.) *Herbivorous Insects: Host-Seeking Behaviour and Mechanisms*. New York, USA, Academic Press.

Stephens, C.J., Schellhorn, N.A., Wood, G.M. & Austin, A.D. (2004) Parasitic wasp assemblages associated with native and weedy plant species in an agricultural landscape. *Australian Journal of Entomology* 45, 176–184.

Tallamy, D., (2009) *Bringing Nature Home: How You Can Sustain Wildlife with Native Plants* Timber Press. US.

Wood, G., Siekmann, G., Stephens, C., DeGraaf, H., La Salle, J., and Glatz, R., (2010) Native saltbush (Rhagodia spp.; Chenopodiaceae) as a potential reservoir for agromyzid leafminer parasitoids on horticultural farms. *Australian Journal of Entomology* **49,** 82–90

Photos: M.McCarthy