Sustainable Practices for EU Wine Growers

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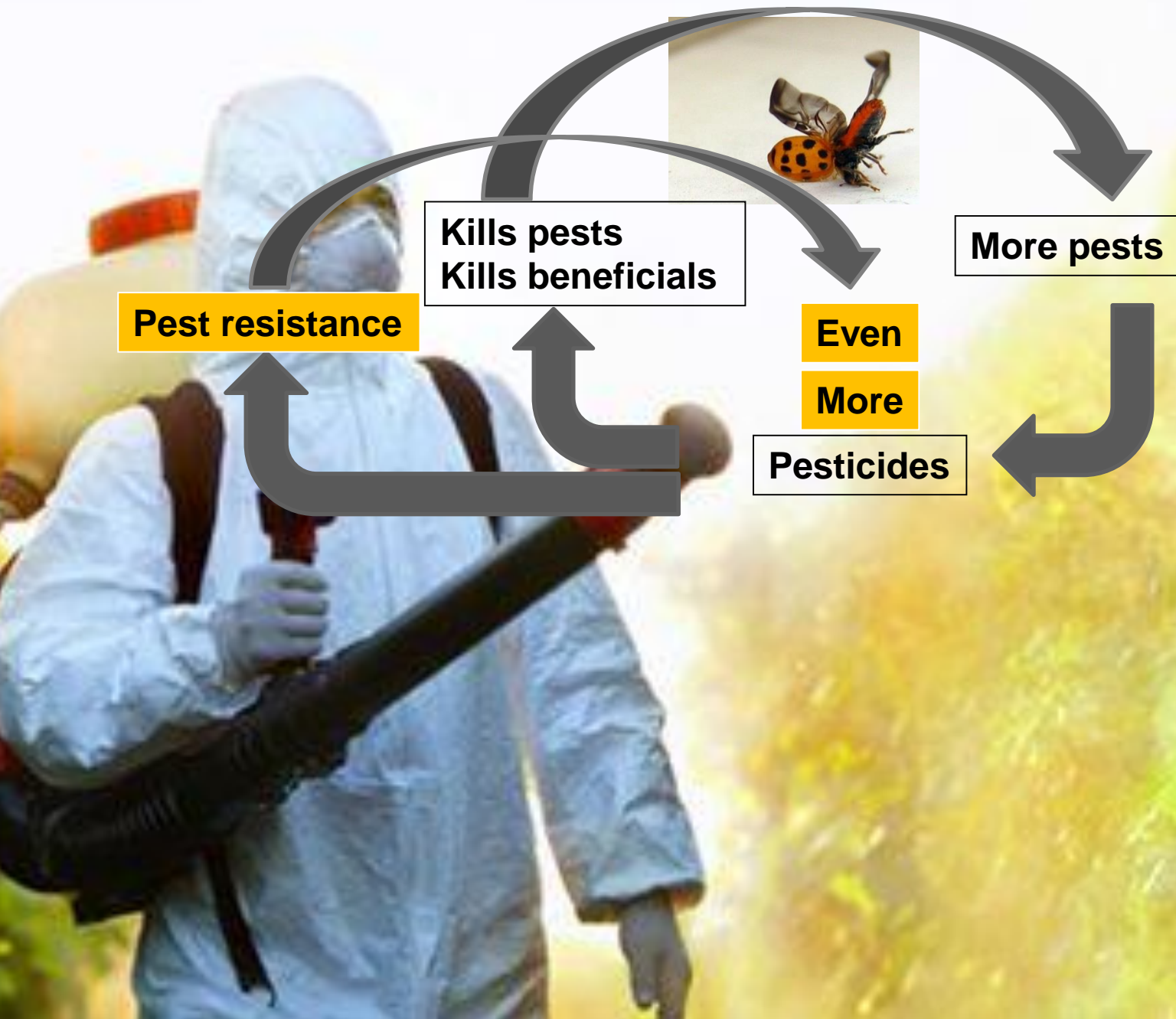Director R&D, Biobest Group
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Chemical Pest Control: A Negative Spiral

Pest resistance

**Kills pests
Kills beneficials**
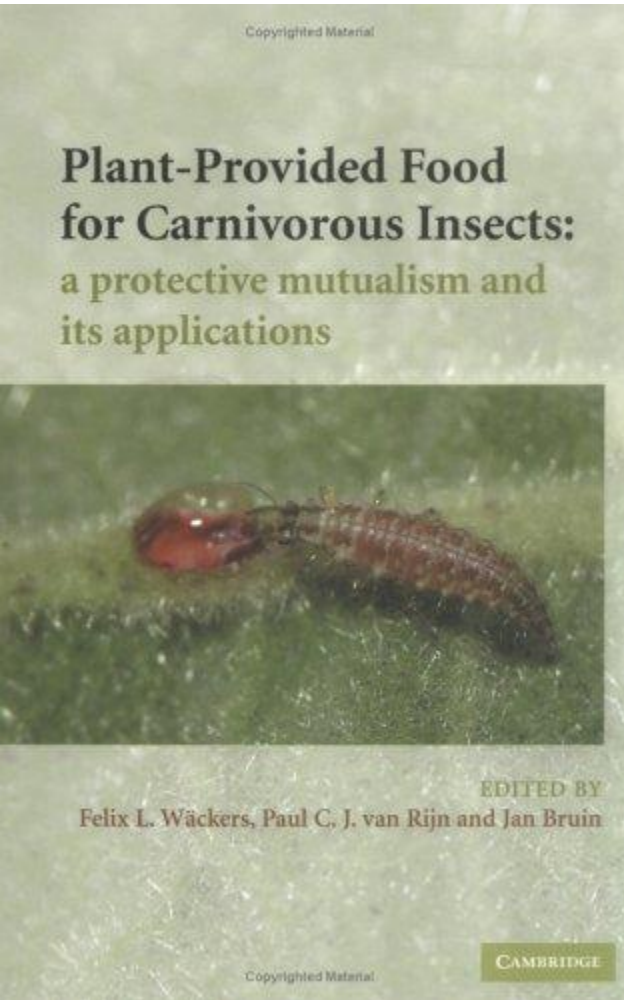
More pests

Even

More

Pesticides

Alternatives?

Biological control agents depending on nectar/pollen feeding.

Type	Plant-feeding stage	Arthropod examples can be found within:		Type of plant food utilised
Life-history omnivory	adult	Neuroptera: Diptera: Hymenoptera: Coleoptera:	Chrysopidae (green lacewings) Syrphidae (hoverflies) Cecidomyiidae (gall midges) Tachinidea (parasitoid flies) Ichneumonidae, Braconidae, a.o. (parasitoid wasps) Vespidae (social wasps) Formicidae (ants) Meloidae (blister beetles)	nectar, pollen nectar, pollen nectar nectar nectar nectar nectar, fruit nectar nectar, pollen
	juvenile	Heteroptera:	Pentatomidae (stink bugs)	plant-juice
Temporal omnivory	adult	Hymenoptera: Coleoptera:	Ichneumonidae, Braconidae, a.o. (host feeding parasitoids) Cicindelidae (tiger beetles)	nectar seeds
	juvenile	Araneae:	Araneidae (orb web spiders)	pollen
Permanent omnivory	adult & juvenile	Acari:Mesostigmat Heteroptera: Neuroptera: Thysanoptera: Coleoptera:	Phytoseiidae (predatory mites) Pentatomidae (stink bugs) Miridae (mirid bugs) Geocorinae (big-eyed bugs) Anthocoridae (flower bugs) *Chrysopa,* Hemerobiidae (brown lacewings) Aeolothripidae, Phlaeothripidae Coccinellidae (ladybirds) Carabidae (ground beetles)	nectar pollen plant juice plant juice plant juice pollen nectar, pollen leaves, pollen nectar pollen seeds

Plant-Provided Food for Carnivorous Insects: a protective mutualism and its applications

EDITED BY
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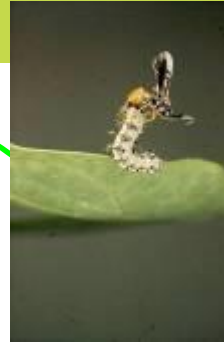
CAMBRIDGE

Does Biodiversity work?

Attractive

Accessible nectar

Aegopodium podagraria Vicia sativa

Inaccessible nectar

Leucanthemum vulgare Galium mollugo

Select to optimize BC benefits

Non-attractive

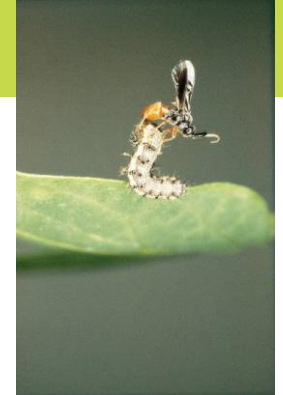Daucus carota Trifolium pratense Medicago lupulina Trifolium repens

Origanum vulgare Erigeron annuus Achillea millefolium

How to optimize Biocontrol?

Traditional paradigm: **Enhance diversity**

Functional biodiversity: Target plant diversity to support Biocontrol
       Different Insects visit different plants
       Focus on insect groups that provide ecosystem services
       Provide <u>those</u> plants that are suitable nectar and pollen sources

Select plants that optimize biological pest control

| family	species	Floral Nectar depth		Longevity (AFLI)			References parasitoids (species)
				Hoverfly *E. balteatus*	Lacewing *C. carnea*	Parasitoids	
Apiaceae	*Ammi majus*	0					
Apiaceae	*Coriandrum sativum*	0					
Apiaceae	*Daucus carota*	0					
Apiaceae	*Foeniculum vulgare*	0					
Apiaceae	*Heracleum spondylium*	0					
Apiaceae	*Pastinaca sativa*	0					
Polygonaceae	*Fagopyrum esculentum*	0					
Boraginaceae	*Borago officinalis*	0					
Ranunculaceae	*Ranunculus acris*	0					
Caryophyllaceae	*Gypsophila elegans*	1					
Asteraceae	*Matricaria chamomilla*	1					
Asteraceae	*Achillea millefolium*	1					
Asteraceae L	*Cichorium intybus*	1					
Asteraceae	*Chrysanthemum segetum*	2					
Asteraceae	*Anthemis tinctoria*	2					
Asteraceae	*Leucanthemum vulgare*	2					
Asteraceae	*Tanacetum vulgare*	2					
Asteraceae	*Calendula officinalis*	3					
Asteraceae	*Centaurea cyanus* (+EFN)	3					
Asteraceae	*Helianthus annuus* (+EFN)	3					
Asteraceae	*Cosmos bipinnatus*	4					
Malvaceae	*Malva sylvestris*	4					
Boraginaceae	*Phacelia tanacetifolia*	4					
Fabaceae	*Medicago sativa*	4					
Fabaceae	*Vicia sativa* (+EFN)	4					
Fabaceae	*Lotus corniculatus*	4					

Pest Monitoring

Vine Mealybugs

The problem of ant-tending

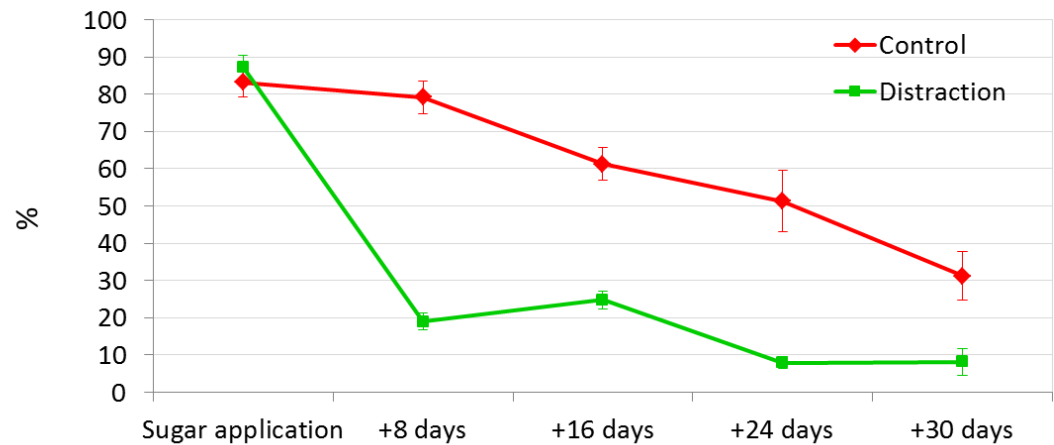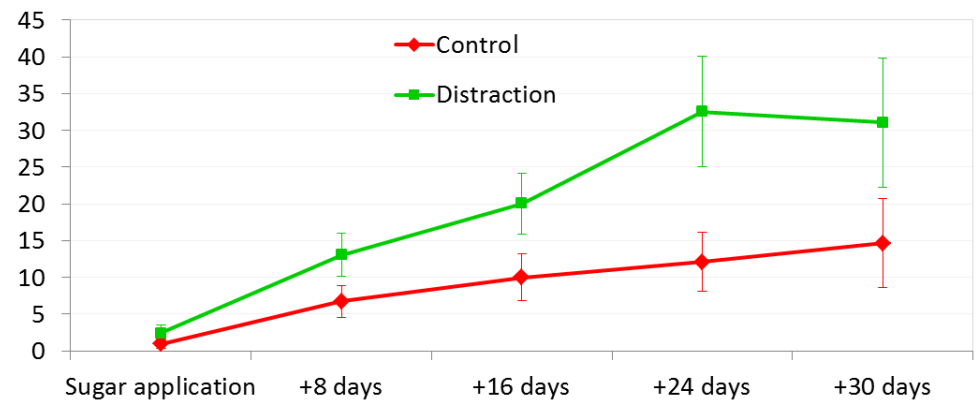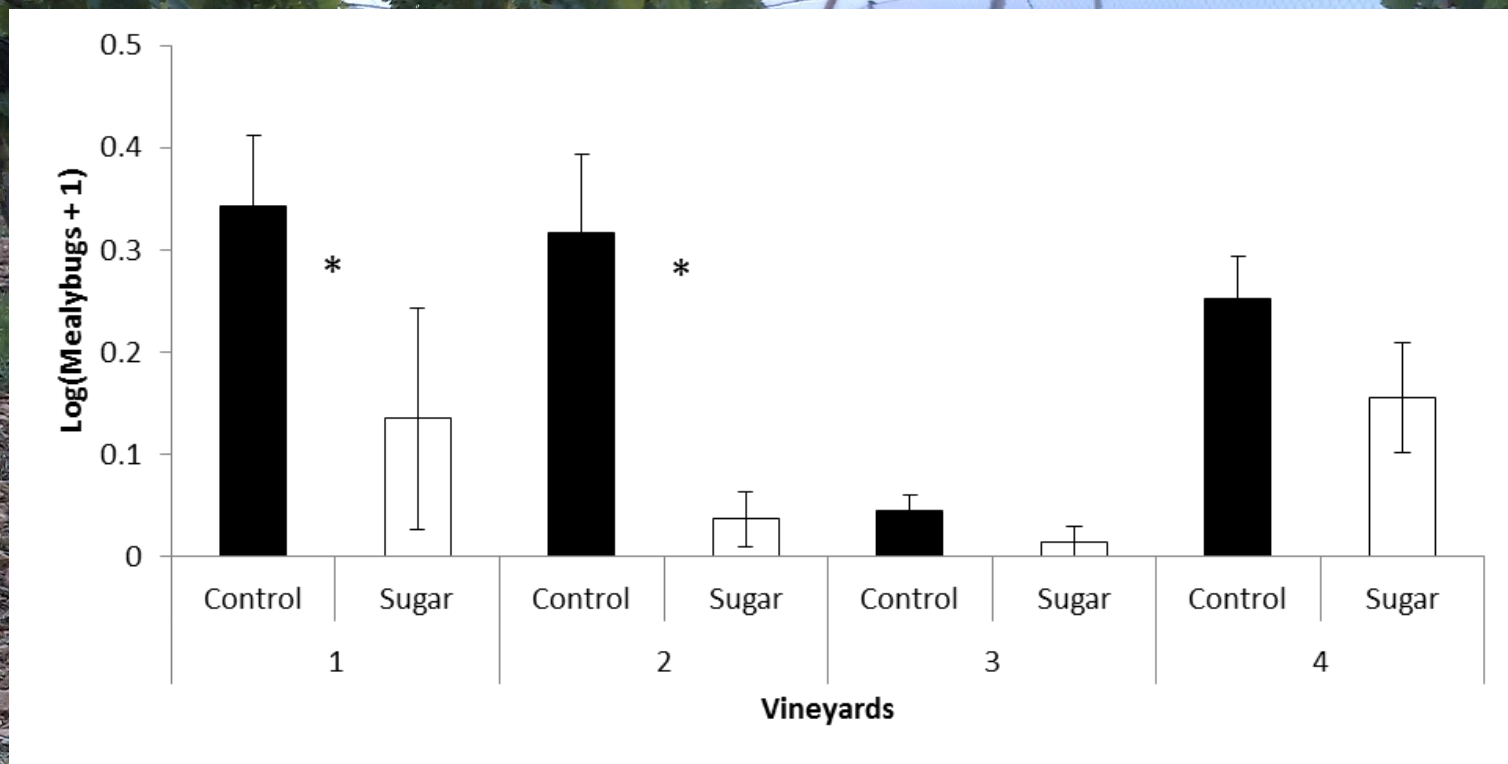Ants as Plant Bodyguards

Ant control

Sugar
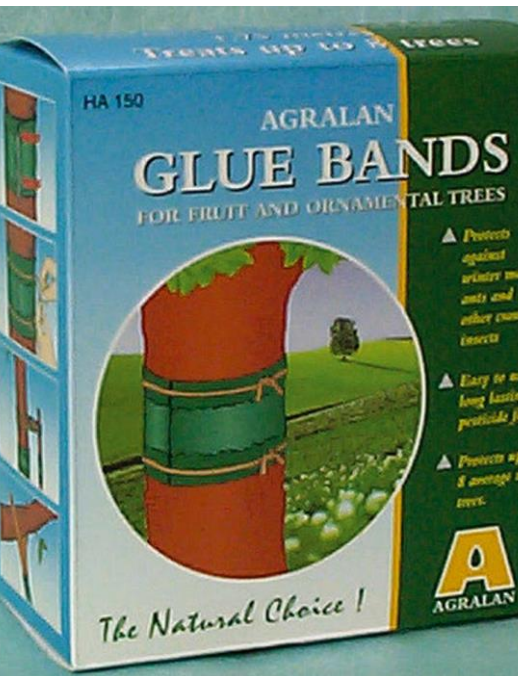
Results

% mealybug colonies occupied by ants

% parasitized mealybugs per colony

Thanks