



NUI Galway
OÉ Gaillimh

Pesticide use and its implications for pollinators

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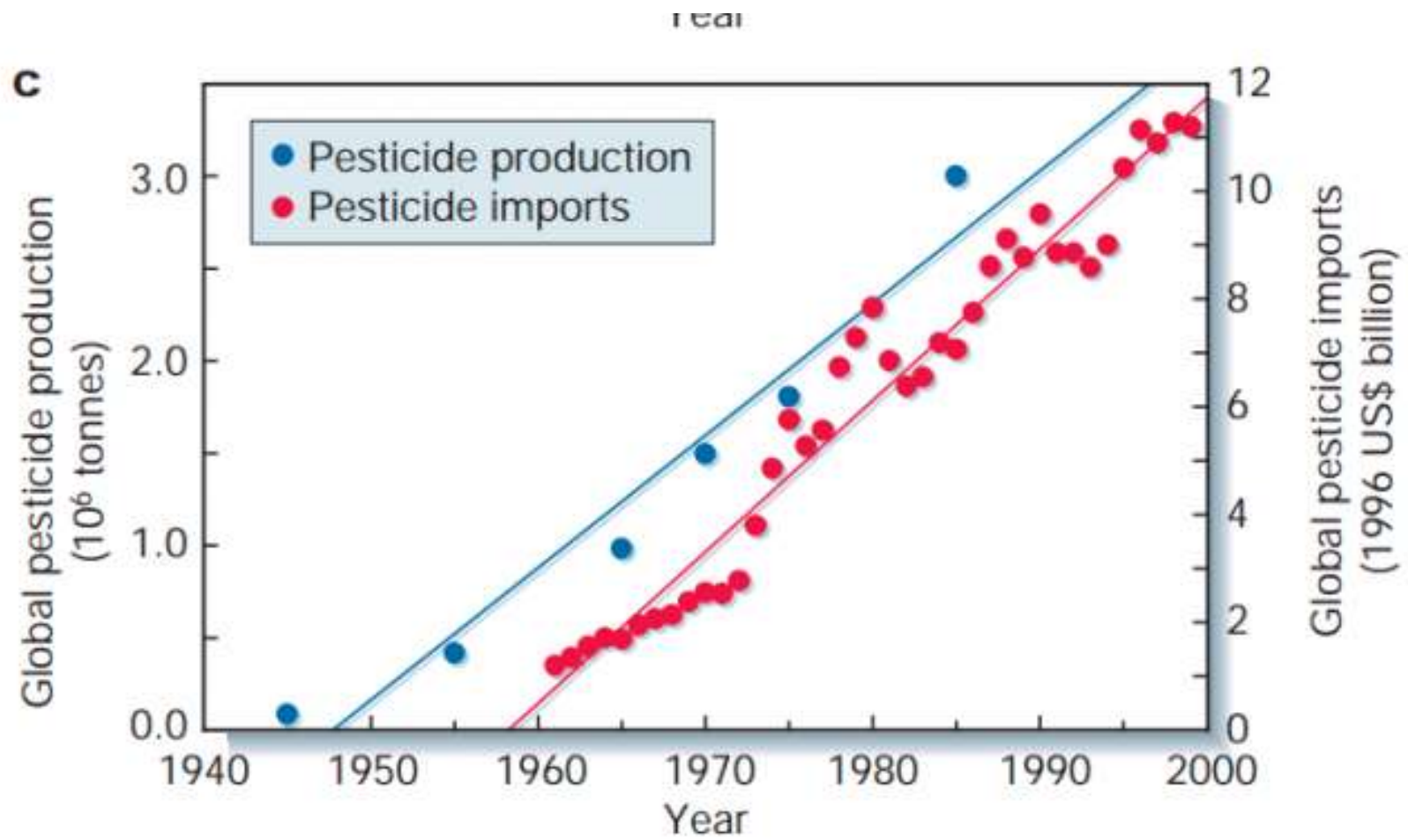
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Introduction



Global modern pesticide use



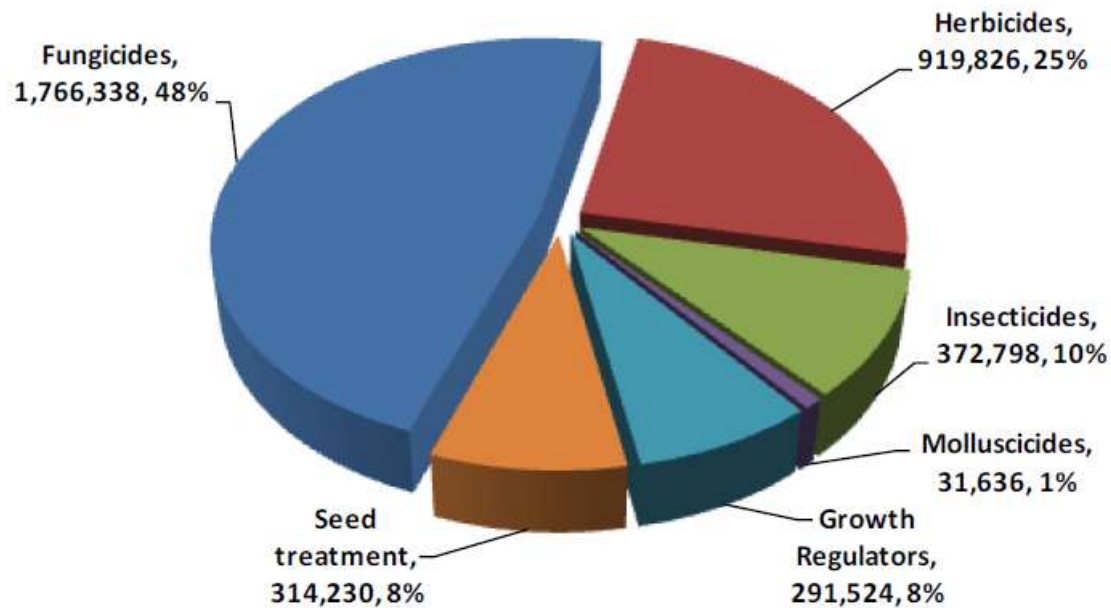
Pesticides

- Insecticides
- Herbicides
- Fungicides
- Rodenticides, Plant Growth Regulators, Miticides, Acaricides etc....



Pesticide use in Ireland

Figure 7: Pesticide usage (spha) on arable crops treated in Ireland, 2012.



Pesticide use in Ireland



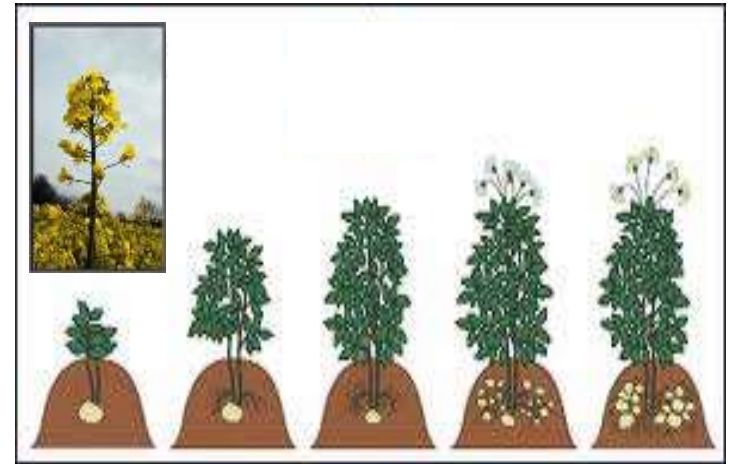
How pesticides are applied

Sprays (e.g. pyrethroid)



Topical exposure

Seed dressing (neonicotinoid)



Oral exposure

Pesticides in crops

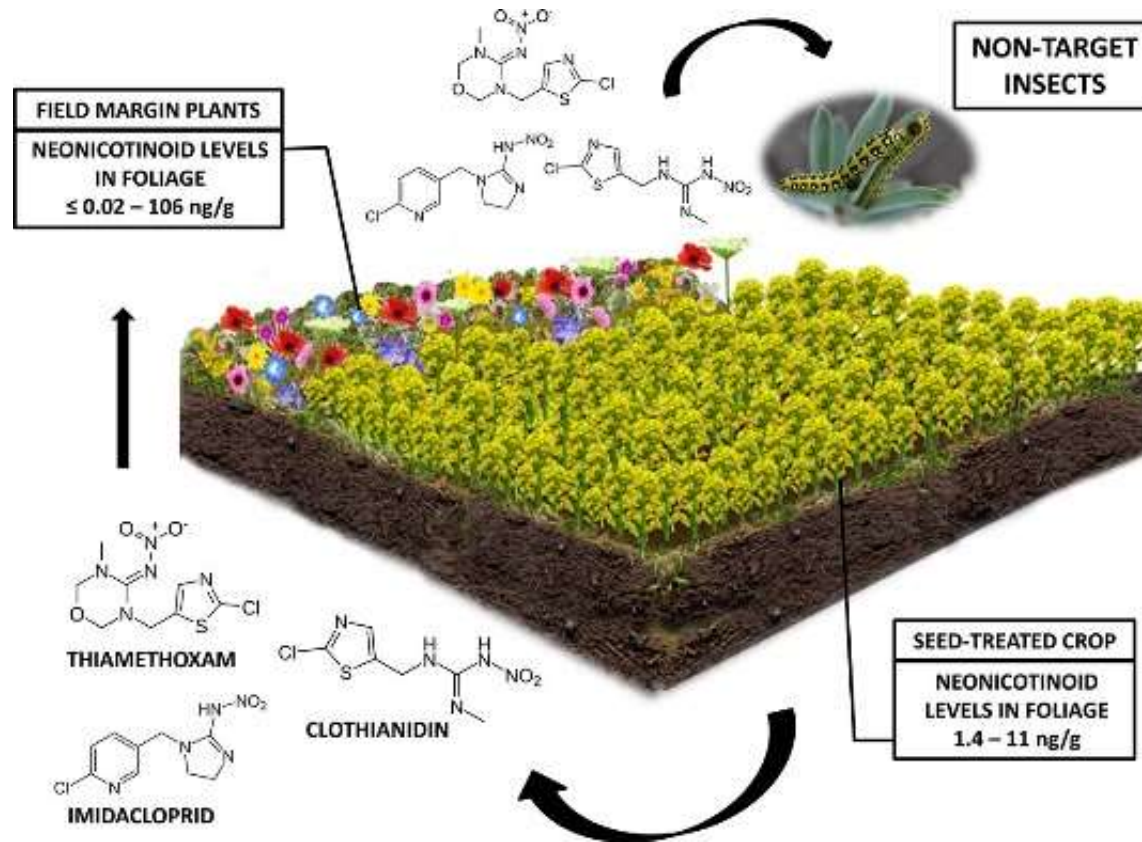


Stewart (2014). *Environmental Science & Technology*, 48, 9762-976

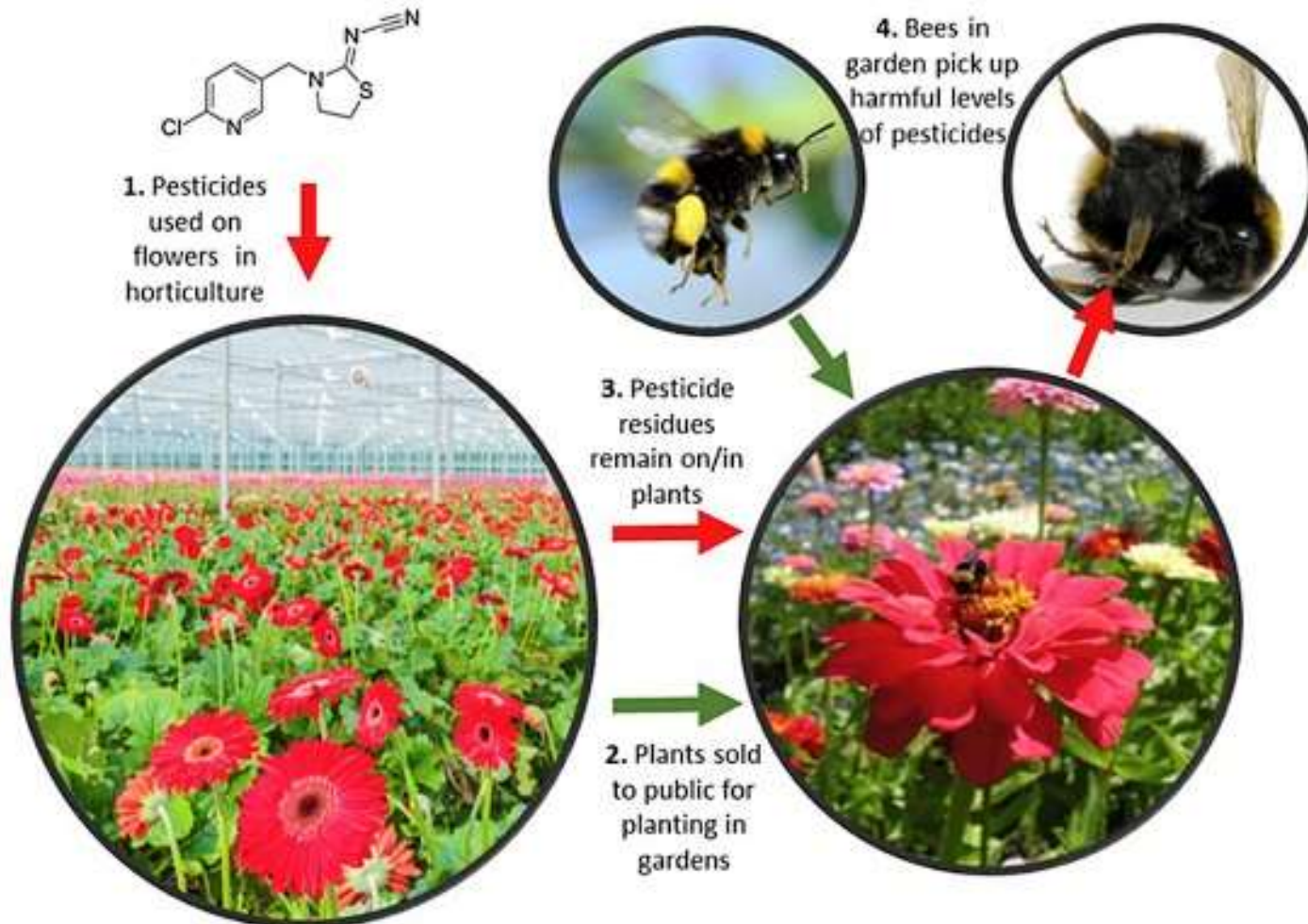
Castle et al. (2005) *Pest Manag Sci*, 61, 75-84.

Rundlöf et al. (2015) *Nature*, 521, 77-80.

Pesticides in wild flowers



Pesticides in ornamental plants

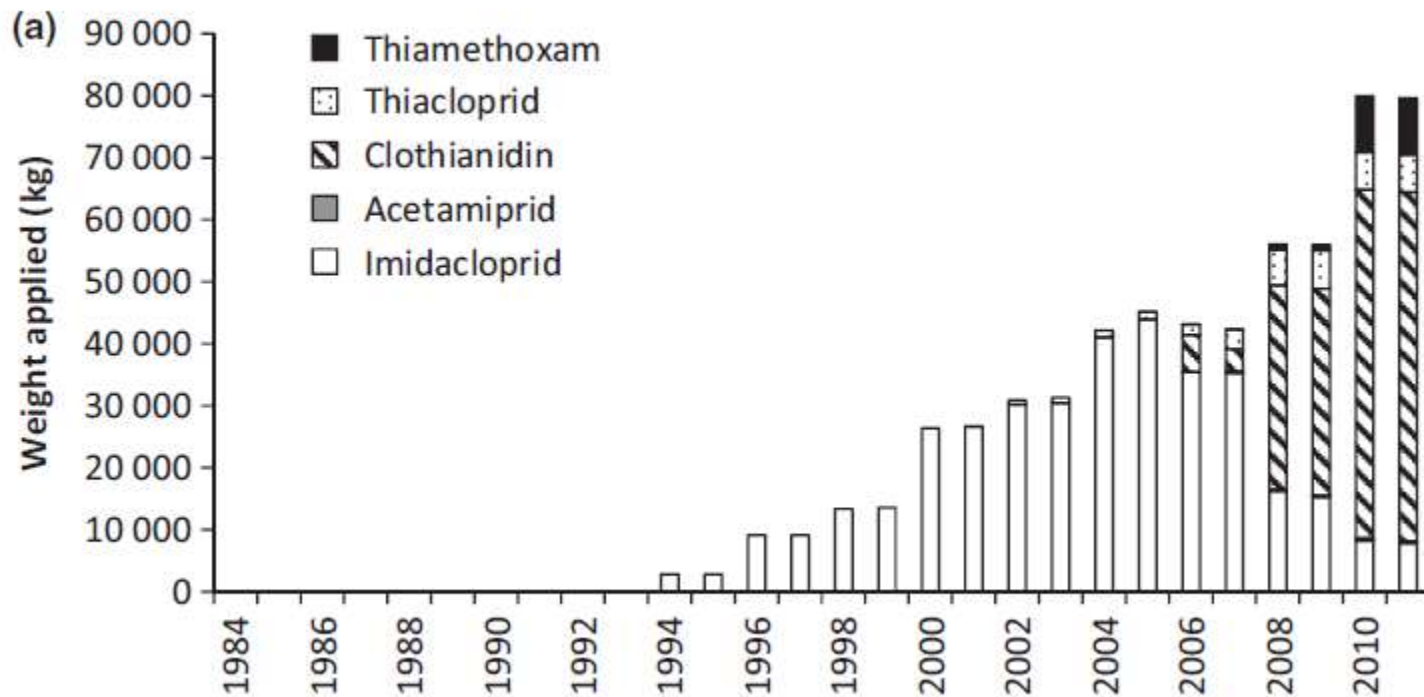


Our work on pesticides

- Neonicotinoid insecticides
- Focus on wild bees
- Do these low, field realistic levels of pesticide have impacts on bees?



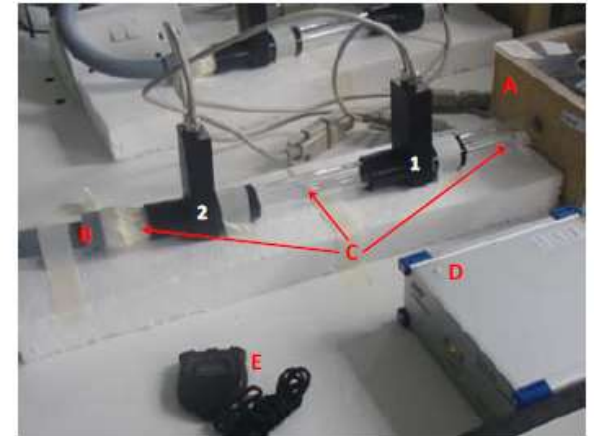
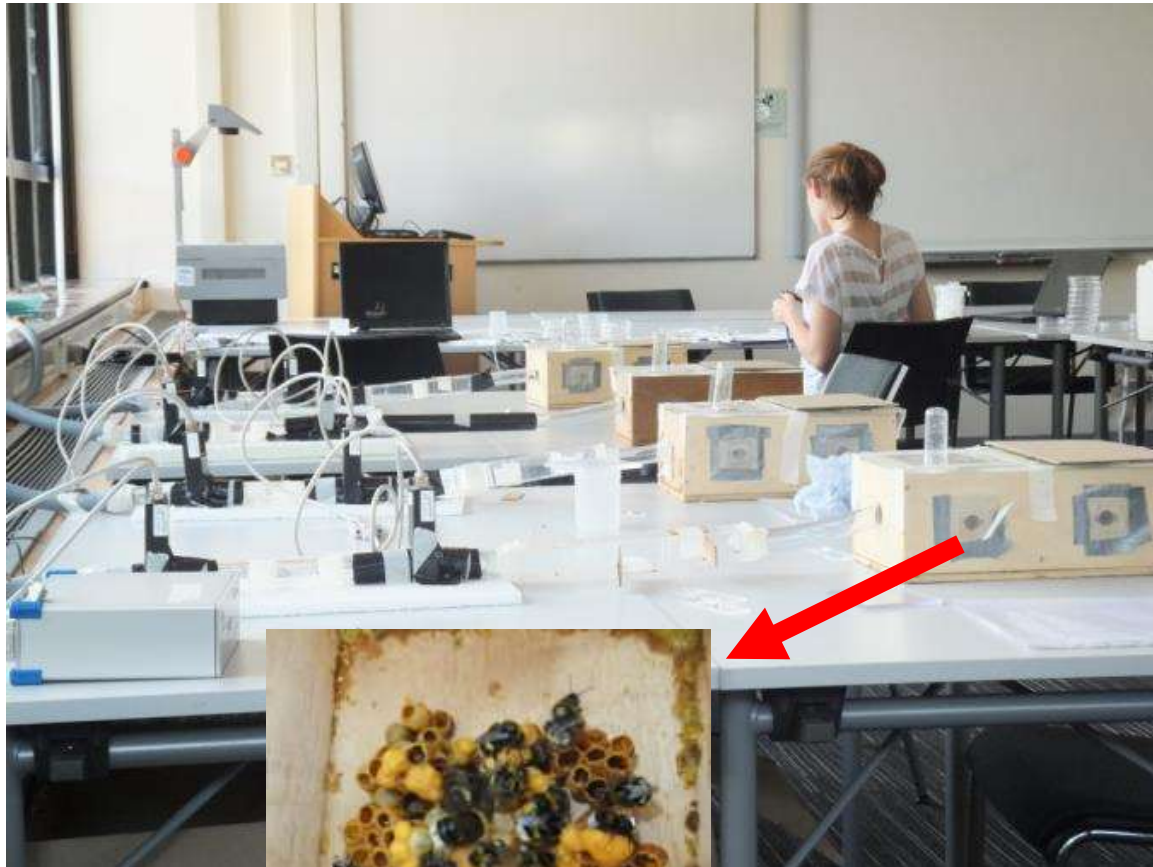
Neonicotinoid usage



Pesticides and foraging



Pesticides and foraging



Pesticides and foraging

	Pesticide	Control	significance
Length of foraging bout	1.13 hrs	0.91 hrs	*

Pesticides and pollination



**Without bees they'll
all be off the menu**



Pesticides and pollination



control

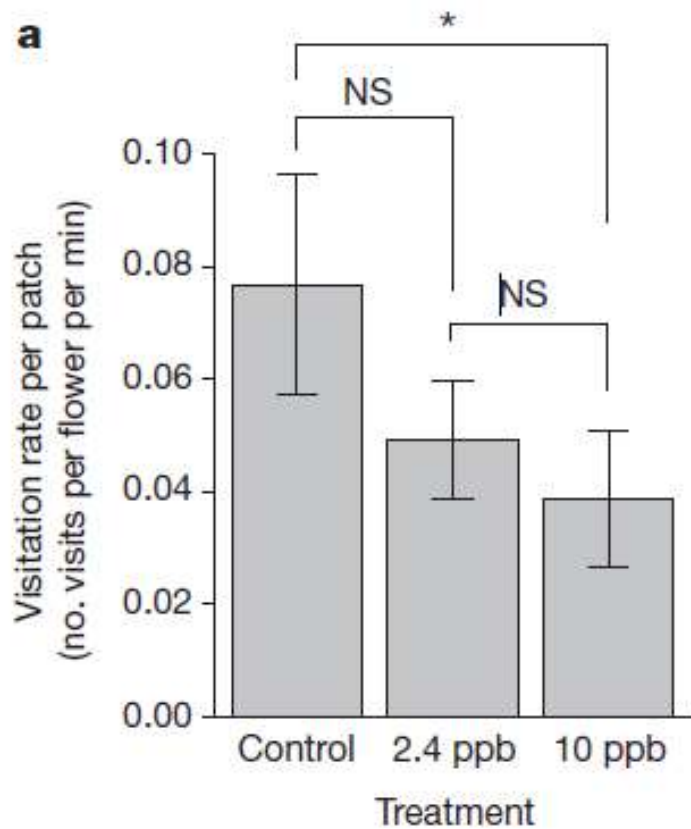


2.4ppb thiamethoxam

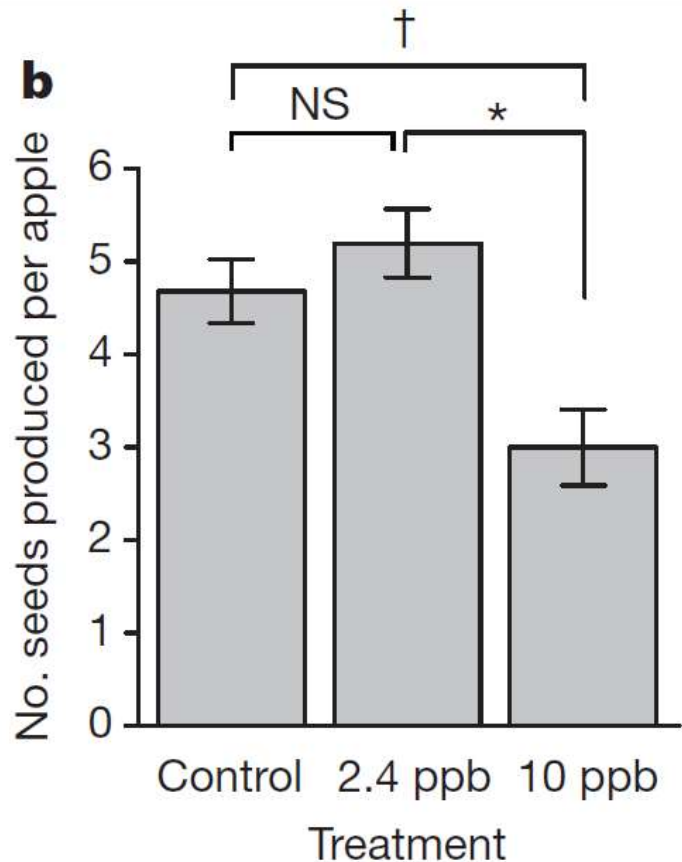


10ppb thiamethoxam

Pesticides and pollination



Pesticides and pollination



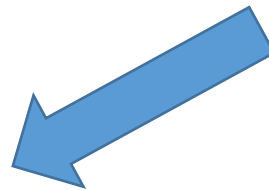
Pesticides and bumblebees



Learning & memory



Foraging and homing ability



Flower visitation



Pollination

Pesticides and reproduction



Solitary bees



Bumblebees



Honeybees



Rundlöf et al. (2015). *Nature*, 521, 77-80.

Woodcock (2017) *Science*, 356, 1393.

Impacts on wider wildlife

- Birds
- Natural enemies, soil communities, freshwater invertebrates
- Water & soil contamination



Fungicide impacts

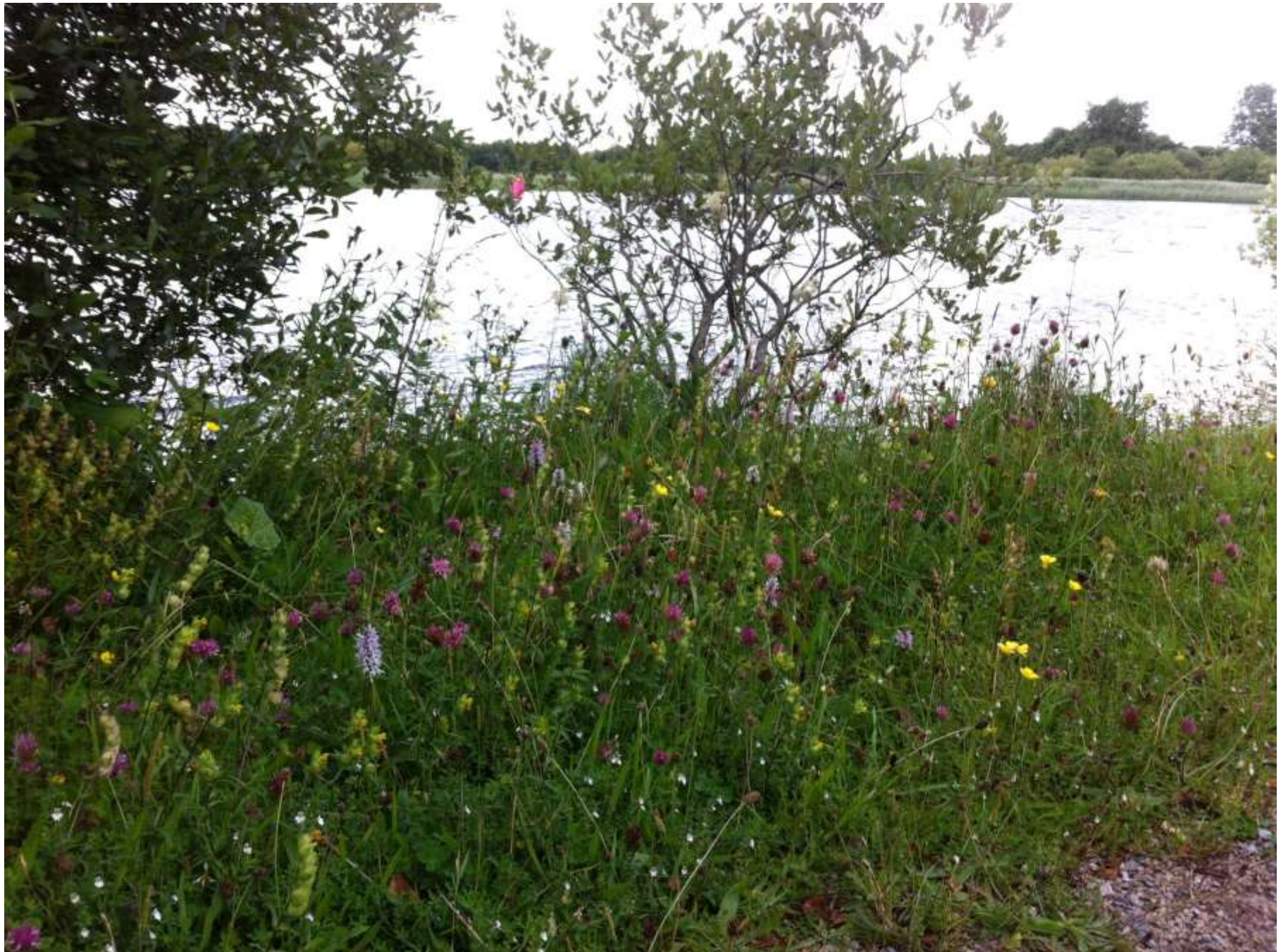
- Known synergistic effects with insecticides
- Effects on gut microbiome



Herbicide impacts

- Direct toxicity – not known, but likely...
- Impacts on availability of flowers for bees





Weeds or wildflowers?

What can we do?

- Reduce or eliminate use
- Reduced use = reduced cost?
- Mechanical control
- Chemical control as last resort – careful spraying, best practice, time of day, weather conditions

E Reduce use of pesticides

Pesticides include insecticides, fungicides and herbicides, all of which can be harmful to pollinators.

Action 19 Reduce or eliminate the use of pesticides (herbicides, insecticides & fungicides)

Action 20 Adopt the pollinator friendly pesticide code

The infographic features a green circular icon with a white 'E' for the main section. Below the text, there are two rows of icons: a green circle with a white minus sign and pound symbol (£), a green circle with a white pound symbol (£), a blue circle with a white sprayer icon, a blue circle with a white sprayer icon, and a yellow circle with a white bee icon. The actions are numbered 19 and 20 in green circles.

Conclusions

- Sublethal impacts of insecticide pesticides on bees
- Fungicides and herbicides also have impacts
- Reduce or eliminate use



Acknowledgements

- All in my lab at NUI Galway
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Thanks for listening!

