

Helen C. Earnshaw, Samantha Softley and Geraldine Wright

**Background:** The neonicotinoid, imidacloprid, is currently the most widely used insecticide in the world. It is an insecticide that is systemically applied to seeds to treat all plant tissues. For this reason, it also contaminates floral nectar and pollen. Recently, this pesticide has been controversially banned by the European Union for use on several flowering crops. The European Commission identified "high acute risks" for bees due to pesticide residue in pollen and nectar in crops like oilseed rape and sunflower. Here, we tested whether low doses of imidacloprid previously reported from floral nectar in the field have an impact on the learning and memory of honeybees when honeybees perform a simple olfactory learning and memory task. The proboscis extension reflex (PER) is when a bee extends her tongue as a reflex to antennal stimulation by sugar solution (Fig 1).

**Methods:** Each bee was trained to associate the odour, 1-hexanol, with a reward of 0.7M sugar solution or 0.7M sucrose containing the pesticide, imidacloprid. Bees were trained at two intertrial intervals (ITI) to test whether the pesticides affected learning (Fig 2). We also tested how pesticides influenced short and long term memory by testing with the conditioned odour (1-hexanol) and with a novel odour (2-octanone).



Figure 1. PER of a honeybee.

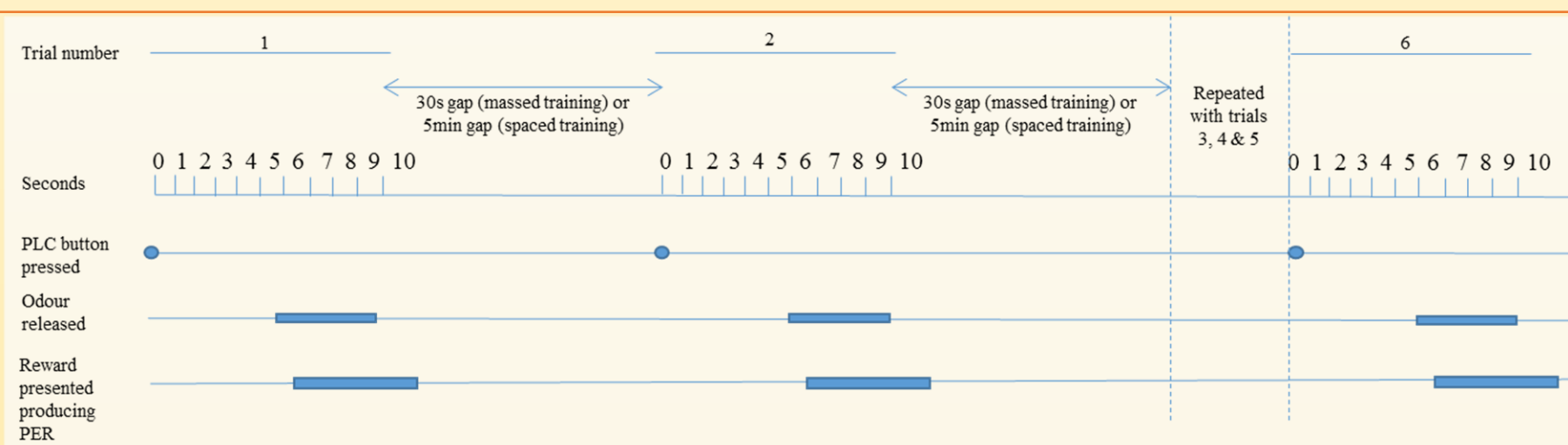


Figure 2. Training diagram showing the timing of PER conditioning, using either massed or space learning.

**Result 1:** Bees treated with 10 nM imidacloprid learned significantly slower than bees treated with control in both tasks (Fig. 3).

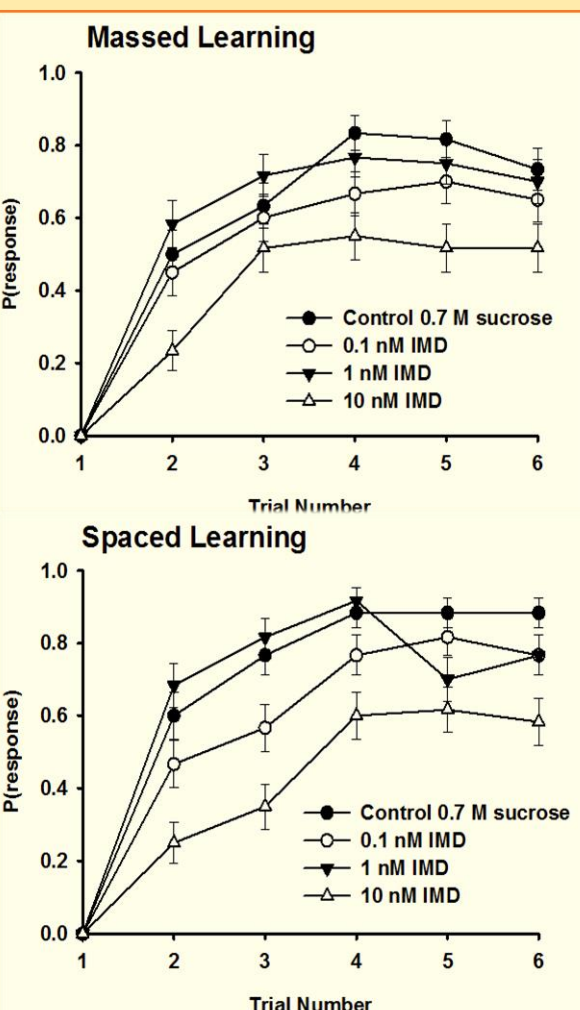


Figure 3. Learning data using PER conditioning over 6 trials

**Result 2:** Bees treated with 10 nM imidacloprid exhibited poorer performance in the short and long-term memory tasks (Fig 4).

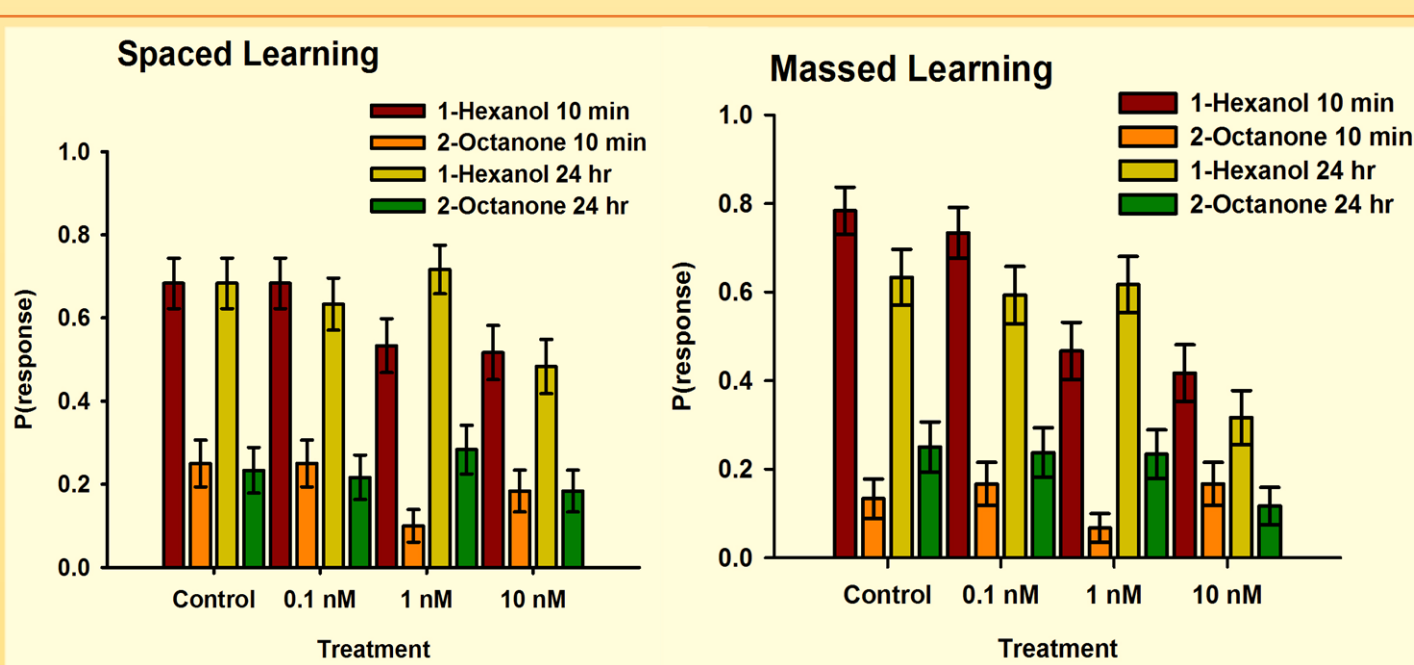
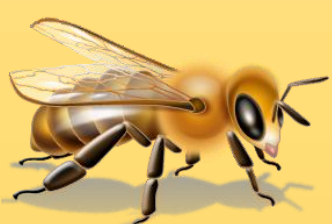


Figure 4. Memory data for short-term and long-term memory



**Conclusions:** Bees are at risk of consuming nectar with imidacloprid when it is used as a seed dressing on crops like oilseed rape. My data show that imidacloprid reduces a honeybee's ability to learn to associate scent with food. This could affect foraging and also affect colony food stores. Therefore, I believe that these data indicate that the EU ban on imidacloprid should be kept in place.



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