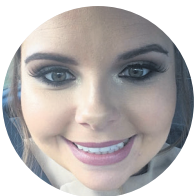


# AGRICULTURAL SCIENCE STUDY GUIDE

## Week 4



### Bees, flowers, pollination and their environment

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# Importance of bees in pollination of food

The bee population is plummeting and this has huge effects on our food supply, agricultural crop growth and an economy

**D**id you ever wonder where our food comes from? Bees pollinate many vegetables and fruits we eat and pollinate food for the animals that we eat. Bees also produce wax and honey.

- One-third of food is pollination-dependent.
- All bees pollinate 70 types of crops.
- A colony of bees contains 50,000 different bee species.
- A colony of bees makes on average 14kg of honey.

#### Structure and function

- Receptacle: supports flower parts.
- Sepals: protects a flower when it is a bud.
- Petals: attracts insects.
- Stamens: contains anther which produces pollen (male gamete) and filament (contains a vascular bundle to bring food and water to anther).
- Carpel: contains stigma (this is where the pollen lands), style (through which the pollen tube grows) and an ovary (contains the ovules).

#### Bees: the perfect pollinator

Bees are adapted to maximise the collection of pollen and nectar from flowers.

- Definition of pollination:** pollination is the transfer of pollen from an anther to a stigma of a flower from the same species.
- Definition of self pollination:** self pollination is the transfer of pollen from an anther to a stigma on the same plant.
- Definition of cross pollination:** cross pollination is the transfer of pollen from an anther to a stigma on a different plant of the same species.

#### Relationship between hay fever and pollen

Pollen acts as an allergen which causes inflammation of the nasal mucous membrane, sneezing, a blocked and runny nose, along with watery and irritated eyes.

Treatment: 1 avoid allergen; 2 decongestant drugs (to clear nose); 3 antihistamines (to reduce inflammation); 4 other drugs (that partially inhibit the allergic response).

#### The future of bees

The population of bees is plummeting due to the increased use of pesticides. This has massive consequences for our food supply, agricultural crop growth and an economy.

#### Three ways to help save the bees

- Plant plants that attract bees and that bees like, eg clover, buttercup and lavender.
- Eliminate garden pesticides.
- Let vegetables go to seed after harvest.

#### Honey production

Honey begins as nectar that bees collect from flowers. This nectar initially acts as a reward for bees and insects.

- Bees collect this nectar by sucking it through their proboscis and then storing the nectar in its honey stomach.
- The bees then regurgitate the nectar and give it to the worker bees in the hives.
- Nectar is converted into honey by evaporating most of the water from the nectar. Bees carry out this evaporation by repeatedly swallowing and regurgitating.
- Honey contains several sugars, eg sucrose and dextrose.
- The flavour and colour of honey depends on flowers from which bees harvest nectar from.

#### Methods of pollination

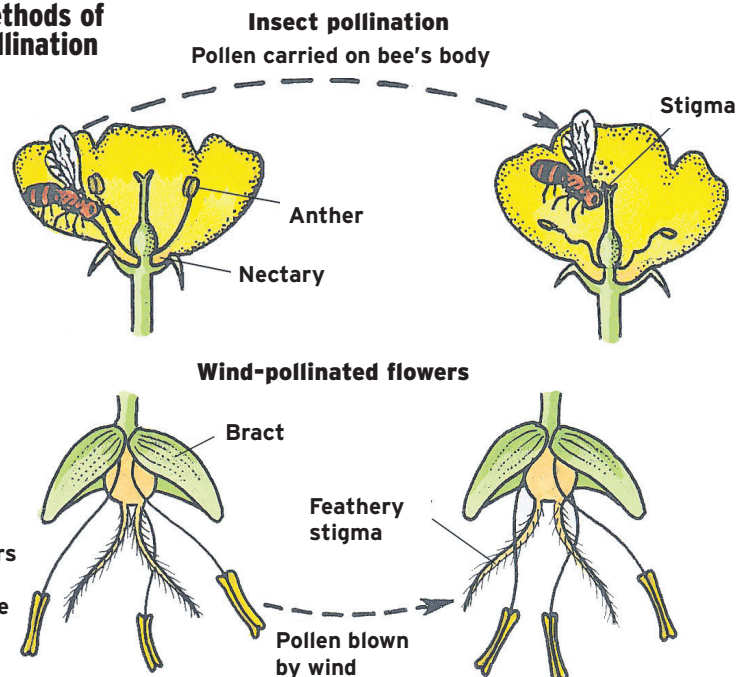


Table 2: Economic importance of bees

Oilseed rape	Clover
27% increase in seeds produced if pollinated by bees	Red clover is pollinated by long-tongued honey bees.
€2.6m increase per year if pollinated by bees	Increase in clover reduces the cost of nitrogen application
1.3 million extra yield if pollinated by bees	
Beekeepers have been advised to set up hives near oilseed rape fields to increase production	

Table 3: Differences between bees

Queen	Drones	Workers
Female.	Male.	Most numerous.
Only member that is able to lay eggs.	Main job is to fertilise the queen's eggs.	Female.
Can produce up to 2,000 eggs per day.	Can be rejected from colony when food levels are low.	Cannot produce fertile eggs.
Lives for up to five years.		They forage for nectar.
		Protect their colony using their sting, death of worker bee then follows after they sting.
		Live for up to six weeks.

#### Location of hives

- Small area needed, eg garden.
- Bees travel up to three miles to forage.
- Hives measure 2ft square; space is needed around the hive for access purposes.
- Avoid placing hives in full sun.
- Entrances to hives should be south-facing to catch morning sun.

#### Management: safety

- Keep antihistamines close in case of bee stings.
- Bee suit and gloves must be worn at all times.
- Two important pieces of equipment are a smoker and a hive tool.

#### What are the differences between a drone, queen and worker bee?

Honey bees are social insects that live in colonies. Honey bee colonies consist of one queen, hundreds of male drones and 20,000 to 80,000 female worker bees. How to increase the number of bees in our gardens can be a simple process if small changes are made. Below is a list of bee-friendly plants and vegetables that will encourage bees to your garden, helping to increase the numbers:

- Clover, dahlias, foxglove, geraniums, marigolds, poppies, roses, sunflowers, bluebells, honeysuckle, blackberries, cucumbers, peppers and strawberries.

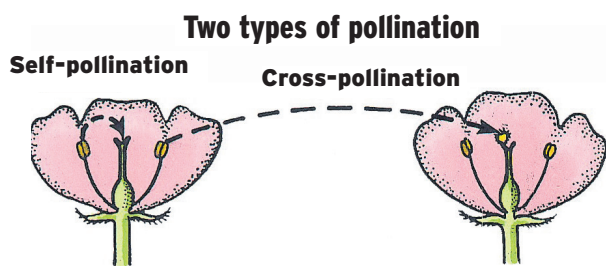


Table 1: Methods of (cross) pollination - wind and animal

Adaptations	Wind pollination	Animal pollination
<b>Petals</b>	Small (or absent) Not brightly coloured (green) No scents No nectaries	Large Brightly coloured, scented Have nectaries
<b>Pollen</b>	Large amounts Light Small Dry Smooth	Small amount Heavy Large Sticky Spiny
<b>Anthers</b>	Large Outside petals Loosely attached to filament	Small Inside petals Firmly attached to filament
<b>Stigma</b>	Large and feathery, outside petals	Usually small and sticky, inside petals