Integrated Pest and Pollinators Management-IPPM

Pollination and Pollinators of Avocado and Cucurbits

icipe@50 1970–2020 Insects for Life

BMZ Federal Ministry for Economic Cooperation and Development

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

What is pollination?

Pollination is the process by which pollen is transferred from the anther (male part) to the stigma (female part) of the plant, thereby enabling fertilization and reproduction. It is unique to flower-bearing plants. Pollination can be aided by wind or animals (insects).

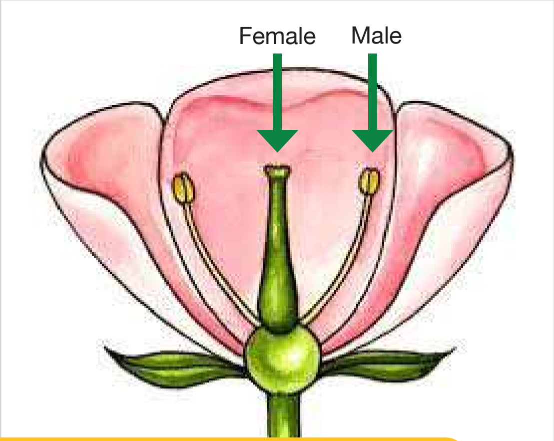

Figure 1: Male and female parts of a flower

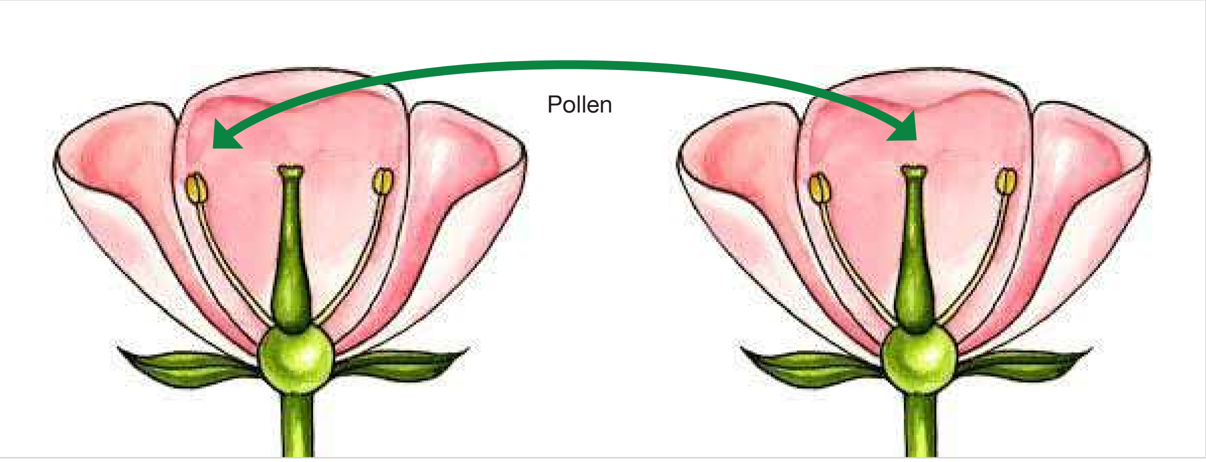

Figure 2: Transfer of pollen from one flower to another

What are pollinators?

All bees and butterflies, as well as some wasps, moths, birds, flies, beetles and small mammals, such as bats, are pollinators. They feed on nectar (sugars) and pollen (protein) from flowers.

Members of the genus *Cucurbita* have separate male and female flowers, they require a pollinator, such as a honeybee, to transfer pollen from male to female flowers. The pollen of cucurbits is heavy and sticky and needs to be transported by insects as it cannot be blown by the wind.

Pollinators

Figure 3: Butterflies and moths

Figure 4: Bees and wasps

Figure 5: Birds

Figure 6: Beetles

Figure 7: Bees

Figure 8: Hover flies

Figure 9: Wasps

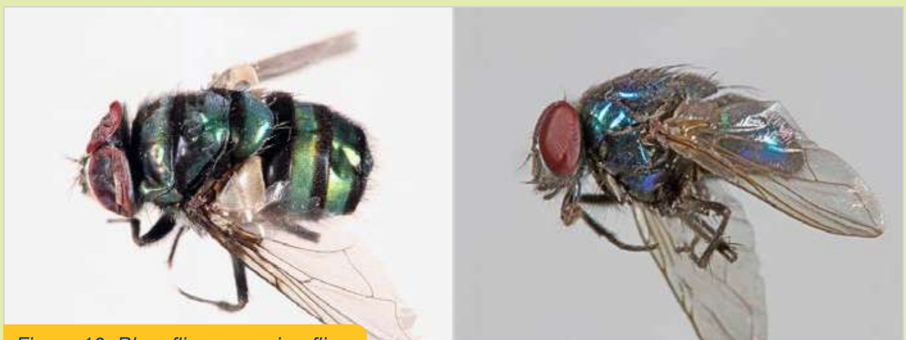

Figure 10: Blow flies or carrion flies

Figure 11: Hairy and bald pollinators

Why are pollinators important?

One out of every three bites of food we eat exists because of pollinators, including many fruits and vegetables. Healthy ecosystems also depend on pollinators. This includes the pollination of most plant types that help stabilise our soils, clean our air, supply oxygen, and support wildlife.

Figure 12: Plants pollinated by insects

Pollination of avocado and cucurbits

Honeybees (*Apis mellifera*) are the main pollinators of avocado and some cucurbits.

As they carry pollen from the male part of the flower to the female part of the same or another flower, fertilization occurs, producing fruits, seeds and young plants. Pollen sticks on the bodies of pollinators while they are drinking or feeding on nectar in the flower, and is transported from one flower to another as they search for food, shelter, nest-building materials, and even mates.

Figure 13: Pollen on legs

Figure 14: Pollen on body

Why are pollinators in trouble?

Populations of bees and other pollinators are declining around the world for several reasons:

- Agriculture, mining and human development contribute to pollinator habitat loss and fragmentation. In addition, non-native plants often out-compete native species, reducing suitable pollinator habitat.
- Parasites and diseases affect both pollinators and the plants on which they depend.
- Insecticides kill pollinators and may hamper the ability of pollinators to navigate or forage. Herbicides kill important host plants.
- Climate change is modifying the distribution of pollinators and their host plant bloom dates, which affects the availability of food sources.
- Urban waste releases toxic gases such as choloroflourocarbons (CFCs) that build up within the atmosphere and lead to an increase in temperature that eventually interferes with the gaseous setup of the environment and the normal functioning of organisms, including bees.

Figure 15: Pesticide use X

Figure 16: Industrial pollution X

Figure 17: Climate change X

Figure 18: Deforestation X

How to protect bees against pesticides

- Beehives should be located a safe distance from areas where pesticides are being applied. This must be at least 2 – 3 kilometers.
- Spraying should be done late in the afternoon or early in the evening when bees are not flying. The pesticides settle at night hence the bees are not exposed to high pesticide concentrations the next morning.

Figure 19: A signage in one of the learning sites, Muranga County

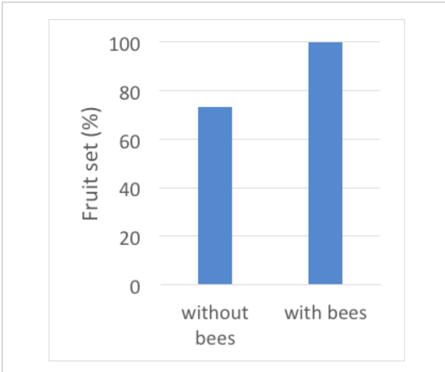

Figure 20: A graph showing effect of farm supplementation with managed pollinators

Figure 21: Beehives installed in Muranga County

What can we do to reduce the risks for pollinators and pollination?

- It may be necessary to apply water to the apiary to keep the colony sufficiently cool during the day. Overheating of a colony of bees may lead to rapid death.
- Small changes in backyards can help pollinators survive and thrive. Provide habitat for many types of pollinators by planting native flowers of different shapes, sizes, colours.
- We can also: 1. use non-lethal methods such as Integrated Pest Management (IPM) to control pests 2. provide nesting sites in living and dead trees, bush and bare ground.
- Increase sensitisation on the effects of insecticides on the surrounding environment and advocating for the uptake of biological control measures, such as introduction of natural enemies.
- Promoting policies that enhance sustainable development ensures conservation of the environment and the reduction of the adverse effects of climate change.
- The uptake of new technologies in waste management increases efficiency and effectiveness of waste control.
- Intercropping promotes good soil health, hence the growth of quality crops that produce high quality pollen.

Supplement farm with managed pollinators:

- Honeybees and stingless bees.
- Smallholder farmers supplemented with two beehives has a 25% higher fruit set.

Figure 22: Integrated Pest Management ✓

Figure 23: Forest protection ✓

Figure 24: Intercropping ✓

X *Discouraged*

✓ *Encouraged/allowed*

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icipe **– Working in Africa for Africa…**

International Centre of Insect Physiology and Ecology (*icipe*) – was established in 1970 in direct response to the need for alternative and environmentally-friendly pest and vector management strategies. Headquartered in Nairobi, Kenya, icipe is mandated to conduct research and develop methods that are effective, selective, non-polluting, non-resistance inducing, and which are affordable to resource-limited rural and urban communities. icipe's mandate further extends to the conservation and utilisation of the rich insect biodiversity found in Africa.

icipe contributes to sustainable food security in Africa through the development of integrated pest management systems for major agricultural and horticultural crops. Such strategies include biological control and use of behaviour-modifying and arthropod-active botanicals. icipe puts emphasis on control approaches that have no detrimental impact on the environment. These options are always designed to fit the needs of the farmers and are developed on-farm and with farmers' participation. In addition to fruit flies, other key areas of icipe's research include pests of tomato, brassicas, beans, and staple food crops such as maize and sorghum.

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