An Assignment on “Zoo & Cup method to Study the various insects, their life cycle, and feeding behavior.”

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Topic: Study of various insects, their life cycle, and feeding behavior by cup and zoo method.

Objectives:

1. Understand the life cycles of the insects in a controlled environment.

2. Investigate the feeding preferences, behaviors, and damage potential of each species.

3. Document the complete metamorphosis, from egg to larva, pupa, and adult stage.

4. Assess the impact of these insects on agricultural crops, specifically citrus, maize, and other susceptible plants.

Materials required:

1. Petri plate
2. Small plastic container
3. Record book
4. Smartphone or camera to capture the observations.
5. Hand lens

Observations:

S.N.	Date	Activity	Observation
1.	2080/04/14	Surveyed NARC maize research field	Found larva of maize stem borer.
2.	2080/04/14	Isolated larvae in petri dishes with maize stem	Noted vigorous feeding behavior of the larvae on the provided maize stems.
3.	2080/04/14 to 2080/05/07	Conducted routine observations on larvae	Observed larvae tunneling into the maize plant's stems, consuming inner tissues for sustenance.
4.	2080/05/08	Continued regular observation of larva + placed maize stem	The larva exits the maize plant and begin the pupation process.
5.	2080/05/15	Monitored pupation process consistently	Witnessed metamorphosis, as the pupa emerged into adult moth.
6.	2080/04/17	Visited NARC maize research field again	Found third instar larva of fall armyworm with light brown coloration and longitudinal stripes along the body
7.	2080/04/23	Provided succulent maize stems to the larvae	Larvae progressed to the fourth instar, growing larger and more robust, displaying dark stripes and increased feeding.
8.	2080/04/29	Continued regular observation + Maize succulent stem is given to the larva	Developed into fifth instar larva featuring a dark head capsule and prominent lateral stripes.
9.	2080/04/31	Maintained regular observation of larva + placed maize stem	After completing the fifth instar, larvae entered the pupal stage and formed protective cocoon.

10.	2080/05/8	Observed pupal stage on a regular basis	Fall Armyworm emerged as an adult moth from the pupal case.
11.	2080/04/18	Explored the field behind the canteen	Discovered dark-colored lemon butterfly larvae and transferred it to petri plate.
12.	2080/04/18 To 2080/04/25	Placed some succulent lemon leaves inside petri plate.	Witnessed voracious feeding by the larva, upto 4 leaves in a day.
13.	2080/04/20	Regular observation on the larva	Noticed a transition in larval coloration from dark to green, with a cylindrical body shape.
14.	2080/04/26	Continued regular observation + lemon leaves kept inside the petri plate	Observed larvae undergoing pupation.
15.	2080/05/04	Maintained regular observations	Witnessed the emergence of adult lemon butterflies from their pupal cases.

Insect parameters:

S.N.	Insect Species	Egg Duration	Larval Duration	Pupal Duration
1.	Lemon Butterfly	3-5 days	2-3 weeks	1-2 weeks
2.	Maize Stem Borer	4-7 days	4-6 weeks	1-2 weeks
3.	Fall Armyworm	2-3 days	2-3 weeks	10-14 days

Observed feeding behavior from the study:

1. **Maize Stem Borer:**

- The maize stem borer larvae are destructive pests that primarily feed by burrowing into the stems of maize plants.
- They tunnel inside the stems, consuming the inner tissues of the plant.

2. **Fall Armyworm:**

- Fall armyworm larvae are known for their voracious appetite and are a significant threat to maize and other crops.
- They feed on succulent maize stems and leaves, causing substantial damage to the plant.
- As they progress through larval instars, their feeding intensity increases, leading to more severe crop destruction.

3. **Lemon Butterfly:**

- Lemon butterfly larvae have a strong preference for feeding on the leaves of lemon trees and other citrus plants.
- They exhibit voracious feeding behavior, consuming multiple lemon leaves in a day.
- As they feed, their coloration changes from dark to green, reflecting their developmental stages.

Life cycle:

1. **Maize Stem Borer** (*Chilo partellus*)

1. Egg Stage:

- The life cycle begins when a female Maize Stem Borer moth lays small, oval-shaped eggs on the leaves or stems of maize plants.
- The eggs are usually laid in clusters and are attached to the plant's surface.

2. Larval Stage:

- Once the eggs hatch, the larvae emerge.
- These larvae feed on the leaves and then bore into the stems of maize plants, where they cause damage by tunneling and feeding.
- The larval stage typically consists of several instar stages, during which the caterpillar grows and develops.

3. Pupa Stage:

- After completing their development within the maize stems, the mature larvae exit the stems and burrow into the soil.
- In the soil, they form a pupa or chrysalis, where they undergo metamorphosis.
- Inside the pupa, the transformation from larva to adult moth takes place.

4. Adult Moth Stage:

- The adult Maize Stem Borer moth emerges from the pupa.
- These moths are typically nocturnal and have a brownish or grayish appearance with mottled wings.

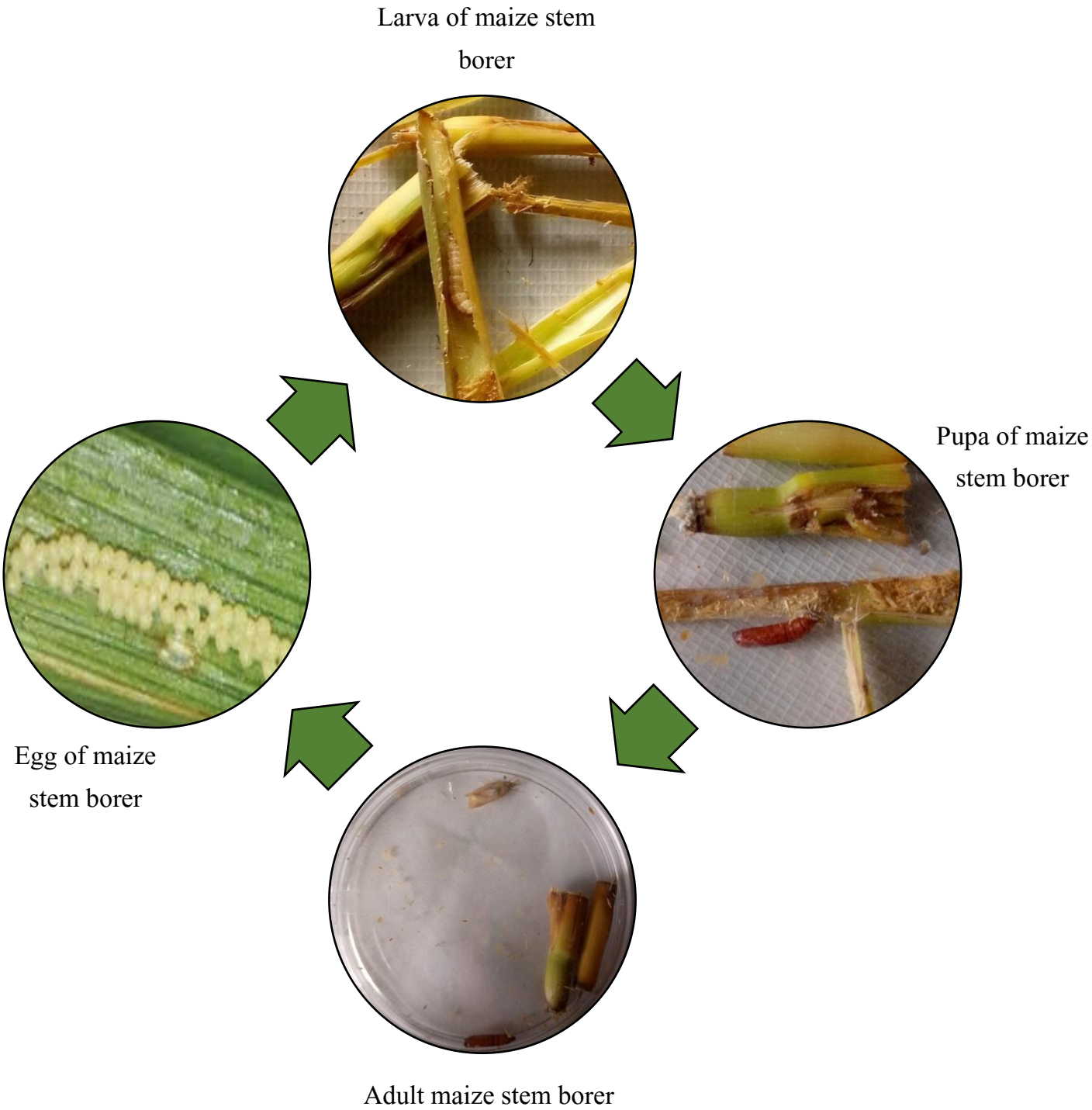

Fig: Life cycle of maize stem borer

2. **Fall armyworm** (*Spodoptera frugiperda*)

1. Egg Stage:

- The eggs are laid in clusters, and each cluster can contain a couple of hundred eggs.
- The eggs are small, round, and flat, and they are usually laid on the undersides of leaves.

2. Larval Stage:

- Once the eggs hatch, they give rise to the larva stage, which is the most damaging stage for crops.
- The larva are voracious feeders and can quickly defoliate plants.
- They go through several instars during this stage, molting and increasing in size with each instar.

3. Pupal Stage:

- After the final instar, the larva pupates. Pupation usually occurs in the soil, where the larva burrows to form a pupal chamber.
- The pupa is a non-feeding, resting stage where the larva/caterpillar undergoes metamorphosis to transform into an adult moth.

4. Adult Stage:

- Once the metamorphosis is complete, the pupa emerges as an adult moth.
- The adult moth has a wingspan of about 3.8 to 5 cm and is brown with distinctive markings, including a white spot on each forewing.

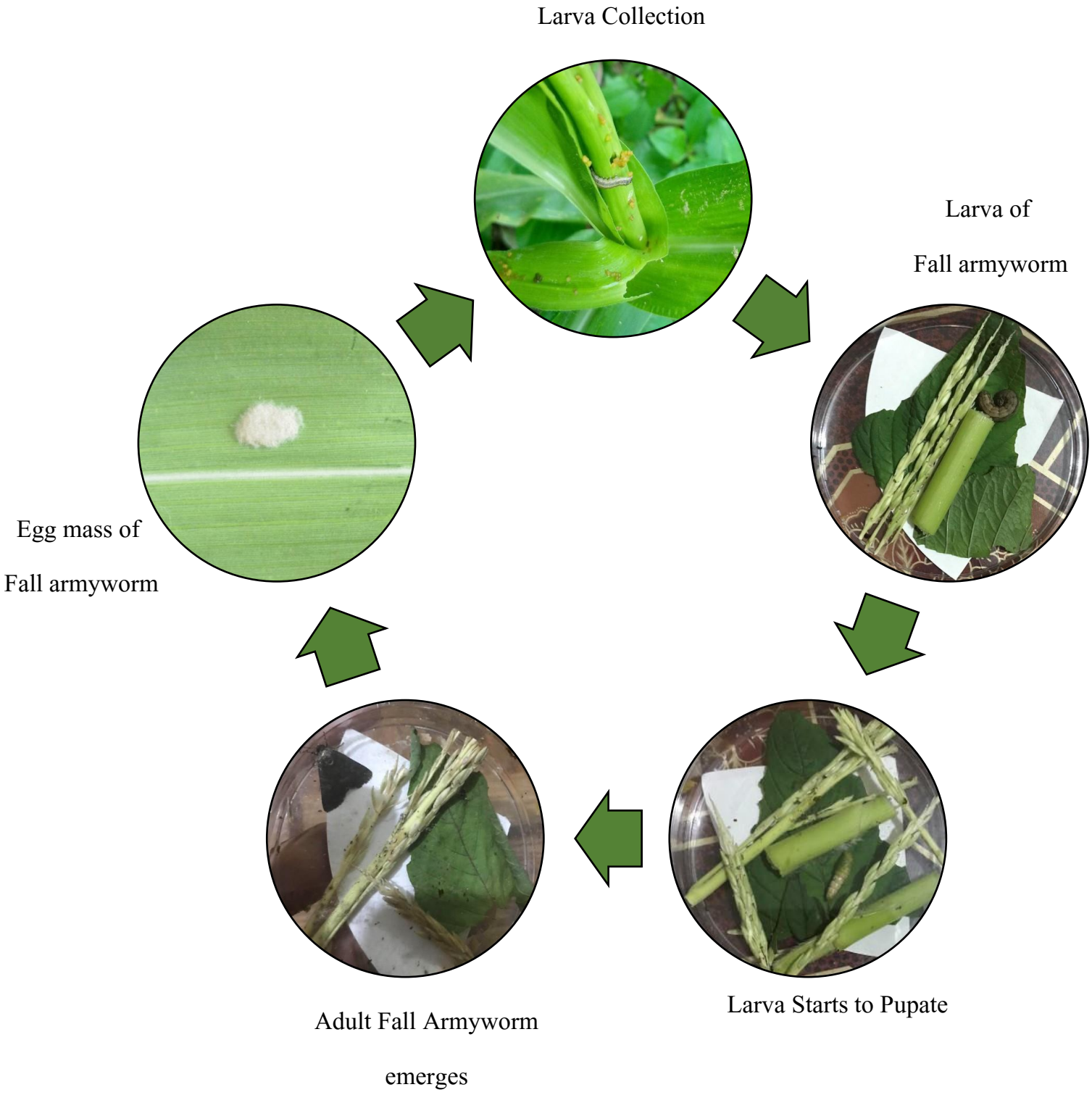

Fig: Life cycle of Fall Armyworm

3. **Lemon butterfly** (*Papilio demoleus*).

1. Egg Stage:

- Duration: 3-5 days
- The female butterfly lays tiny, pale green eggs on the leaves of citrus plants or other host plants.

2. Larval Stage:

- Duration: 2-3 weeks
- The hatched caterpillar is green with black bands and yellow spots.
- It feeds voraciously on the host plant (lemon) leaves.
- As it grows, it goes through several instars before reaching full size.

3. Pupa Stage:

- Duration: 1-2 weeks
- The caterpillar attaches itself to a leaf or stem and forms a pupa.
- The pupa is usually green with brown markings and resembles a leaf.
- Inside the pupa, the caterpillar undergoes metamorphosis, transforming into a butterfly.

4. Adult Butterfly Stage:

- Duration: 1-2 weeks
- The adult lemon butterfly emerges from the pupa.
- It has striking wings with black borders, white spots, and a vibrant lemon-yellow coloration.
- This stage completes the life cycle, and the cycle starts over when the female lays eggs on host plants.

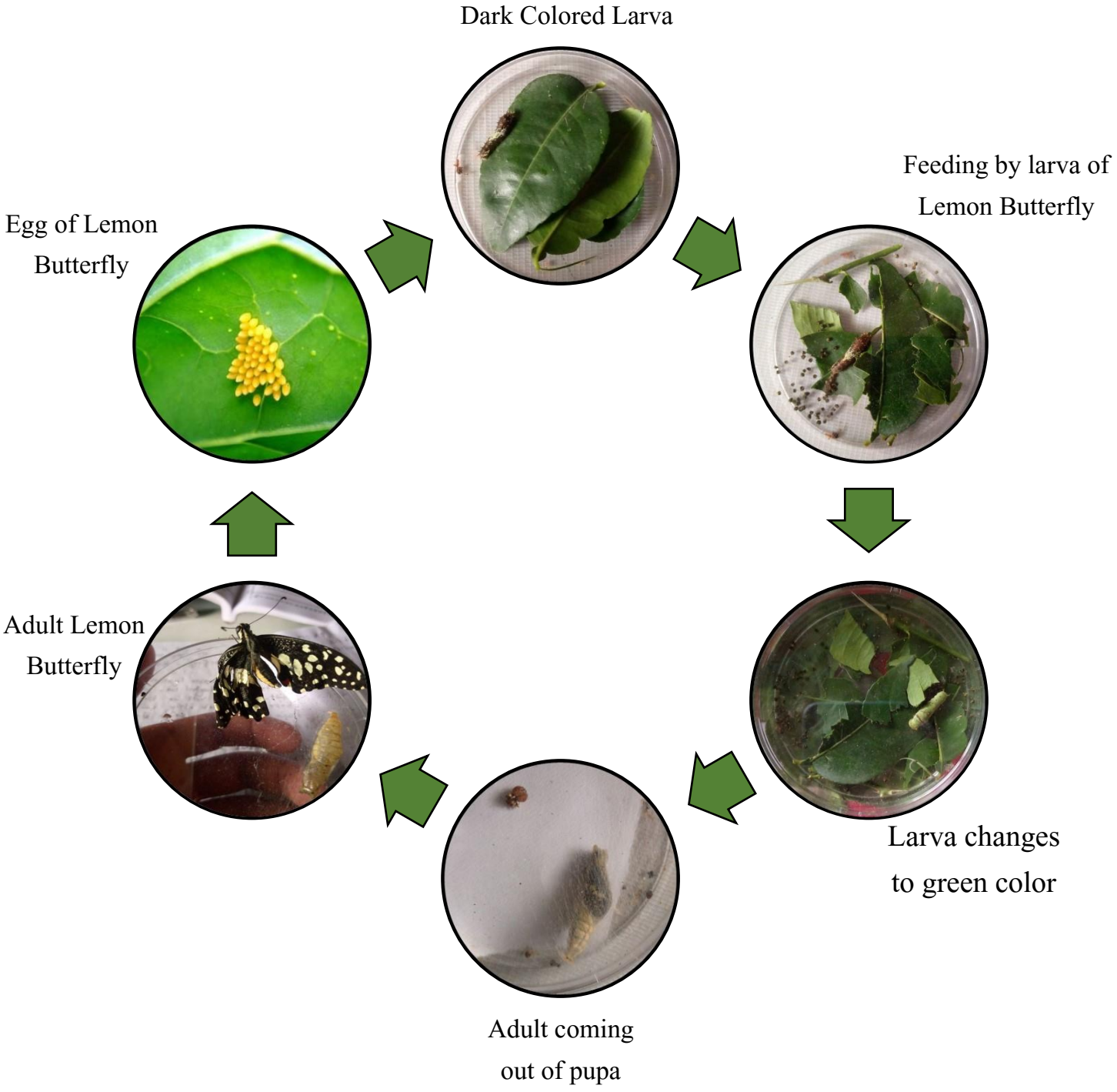

Fig: Life cycle of Lemon Butterfly

Conclusion:

The study of the Maize Stem Borer, Fall Armyworm, and Lemon Butterfly revealed distinct feeding behaviors and life cycle stages. The Maize Stem Borer tunnels within maize stems, weakening the plant. Fall Armyworm larvae exhibit voracious feeding on maize, causing severe crop damage. Lemon Butterfly larvae voraciously consume lemon leaves, undergoing a colorful transformation during their life cycle. Understanding these feeding habits and life cycle stages is crucial for pest management and ecological research. The materials used for observation included petri plates, containers, record books, cameras, and hand lenses, facilitating comprehensive insect studies.