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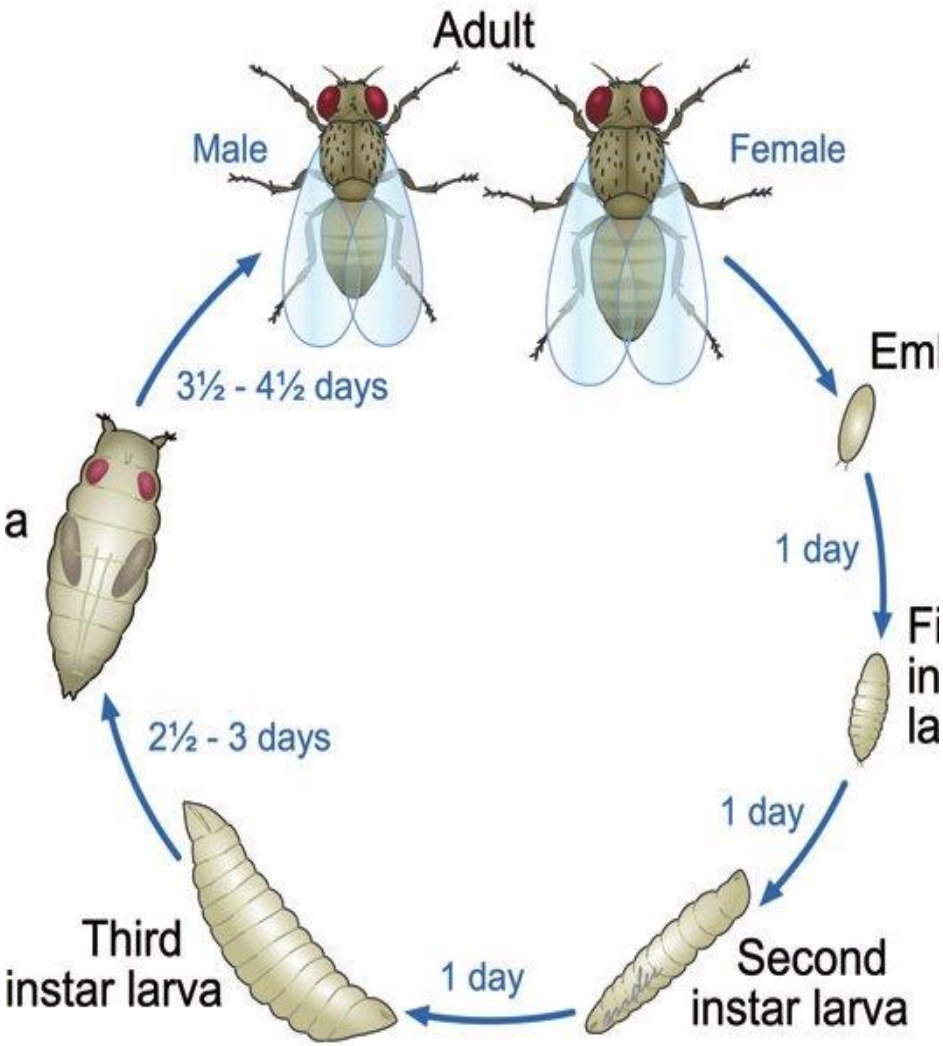

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Fruit flies are holometabolous insects; that is, they undergo complete metamorphosis during their life cycle. The life cycle consists of four distinct stages: egg, larva, pupa, and adult. The rate of development is dependent on temperature, being more rapid at higher temperatures. For instance, at 20°C, the life cycle is completed in 14 or 15 days, but at 25°C, the cycle lasts about 10 days.

Mating: Mated females store sperm to fertilize eggs that are subsequently laid. Female flies are unable to mate for several hours after they have enclosed as adults from their pupal cases. Therefore, virgin females can be obtained by clearing all of the flies from a vial and collecting all newly-enclosed females several hours later. These virgin females can be kept separated from males for several days until needed for crosses.

Oviposition by the female starts as early as the second day after its emergence from its pupal case. It increases for about a week until a female adult may be laying 50-75 eggs per day for a total of approximately 400-500 eggs in 10 days.

Egg: The egg is ovoid, covered outside with a thin but strong envelope (chorion) from which project anteriorly two thin stalks whose terminal portions are each flattened into a spoon-like float. The latter serve as "water-wings" to prevent the egg from sinking and drowning in a semiliquid medium. At the anterior end of the egg is a minute pore (micropile) through which the spermatozoa enter the egg as it passes down the oviduct into the uterus.

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Larva: The larva is a white, segmented, worm-shaped burrower with black mouth parts (jaw hooks) in the narrower head region. For tracheal breathing it has a pair of spiracles (air intakes) at both the anterior and posterior ends. Since insect skin will not stretch, the young small larvae must periodically shed their skins (cuticle) in order to reach adult size. There are two such molts in *Drosophila* larval development that are accompanied by shedding of the mouth parts as well as the skins. During each period between molts, the larva is called an instar, i.e. the first instar is between hatching and the first molt. Both the size of the larva and the number of teeth on the dark colored jaw hooks are an indication of which instar the larva has reached. After the second molt, the larva (now third instar) feed until ready to pupate. At this stage, the larva crawls out of the food medium onto a relatively dry place, ceases moving, and everts its anterior breathing spiracles.

Pupa: Soon after everting its anterior spiracles, the larval body shortens and the cuticle becomes hardened and pigmented. A headless and wingless prepupa form. This stage is followed by the formation of the pupa with everted head, wing pads, and legs. The puparium (outer case of the pupa) thus utilizes the cuticle of the third larval instar. The adult structures that seem to appear first during the pupal period have actually been present as small areas of dormant tissues as far back as the embryonic stage.

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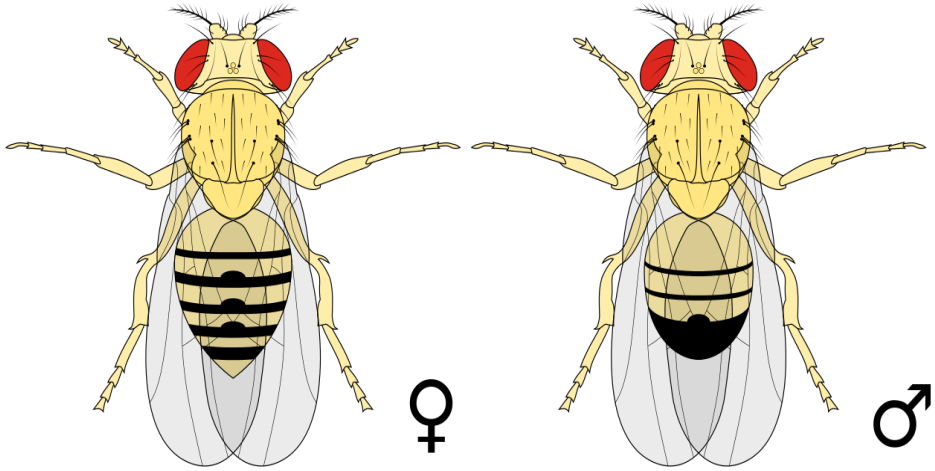

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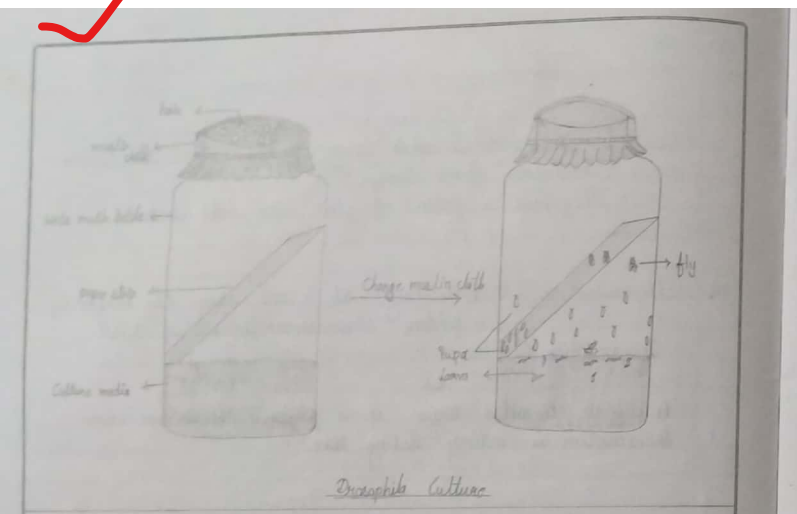
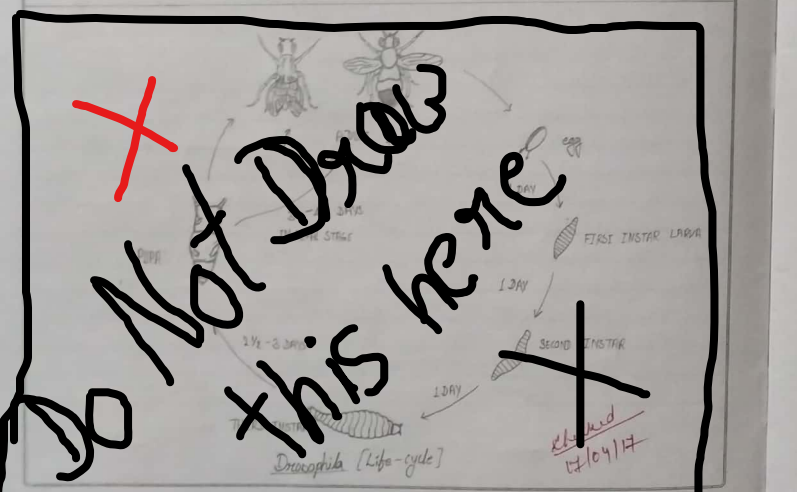
Adult: Adults exhibit a typical insect anatomy, including compound eyes, three-part bodies (head, thorax, and abdomen), wings, and six jointed legs. The various types of bristles and hairs found on the body are characters that we will use to identify different phenotypes of flies.

Difference between male and female drosophila

	Females	Males
Body shape	Pointed abdomen with a "spike" on dorsal surface at rear	Rounded abdomen
Colour	Each abdominal segment carries a narrow dark band	Rearmost abdominal segments almost uniformly dark
Genitalia	Few structures visible	Complex structures visible on ventral surface
Sex combs	None	A short row of thick, closely spaced bristles appearing as a dark mass on the fourth segment of the front legs (often seen best with fly lying on its back)





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AIM ⇒ To prepare Drosophila culture.

Requirement :- Beaker, Muslin cloth, culture medium etc.

Preparation of culture medium :-

- Ripe fruits (Banana, grapes, apple etc) is taken because riped fruits have more sugar content as compared to unripe fruits.
- Mesh the fruits after removing the peal.
- If the mesh consistency is thick then add few ml of fruit juice or distilled water. Adding fruit juice is better to maintain the sugar content of the medium whereas distilled water will dilute its sugar content.
- But if the consistency of the mesh is liquidy, then add oat meal or poha (flat rice) or corn flour or corn meal.

Procedure :-

- Wide mouth bottle or Beaker of glass (250ml or 500 ml) is taken.
- Transfer the culture medium into the Beaker.
- Add few thin strips of the paper (coarse filter paper) at an angle so that one end of the strip touches the medium and the other touches the wall of the container.
- Covers the mouth of the beaker with muslin cloth.
- Tighten the cover with rubber band or string.
- Make small holes on cloth so that flies may enter.
- Keep bottle in a cool or moist place.
- Observe the beaker for 2-3 days to check the consistency of the culture medium.

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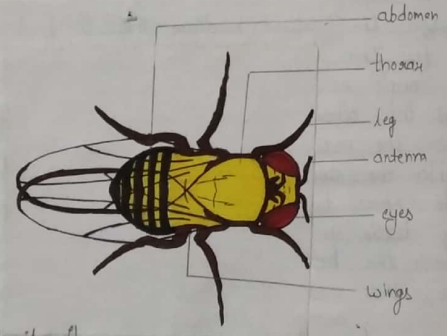
- When the flies are seen into the beaker then change that cloth having holes with the normal muslin cloth.
- Now, transfer the bottle with flies and culture medium to a cool and dark place so that it can give its larva.
- keep a watch for about a week.
- Larval stages and pupae will be seen in the medium.

Observation ⇒

(i) No. of flies ⇒
(ii) No. of larvae ⇒
(iii) No. of Pupae ⇒
} about a week larva, pupa & no. of flies will be observed.

Precautions ⇒ Consistency of culture medium should be appropriate for culturing Drosophila (i.e neither too thick nor too dilute)
- keep watch over the medium and number of flies.
- Handle flies and larvae carefully while transferring it from one medium to another.
- Medium should be changed atleast once a week. There should be no growth of fungi or any presence of contaminations in the culture media.



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Normal fruit fly

Expt. No. 3. Date
Page No. 8

AIM:- The Study of Drosophila Mutants.

Wild type ⇒ An individual having a normal phenotype: that is, the phenotype general population of organism.
Mutant :- An individual having a phenotype that differs from the normal phenotype.

- The Drosophila melanogaster is commonly known as "fruit-fly".

★ Physical appearance of "Wild type" Drosophila :-
- Wild type fruit-flies are yellow-brown, with brick-red eyes and transverse black rings across the abdomen.
- They exhibit sexual dimorphism: females are about 2.5 millimeters long; males are slightly smaller with darker backs.
- Males are slightly smaller with darker backs. easily distinguished from females based on colour differences, with a distinct black patch at the abdomen, less noticeable in recently emerged flies, and the sexcombs (a row of dark bristles on the tarsus of the first leg).
- Furthermore, males have a cluster of spiky hairs (claspers) surrounding the reproducing parts used to attach to the female during mating.

⇒ ALTERED WING STRUCTURES

★ Normal Fruit flies :- These are normal fruit flies, or "Wildtypes". The shape and length of their wings are normal.
- Now we compare them with the other fruit flies.

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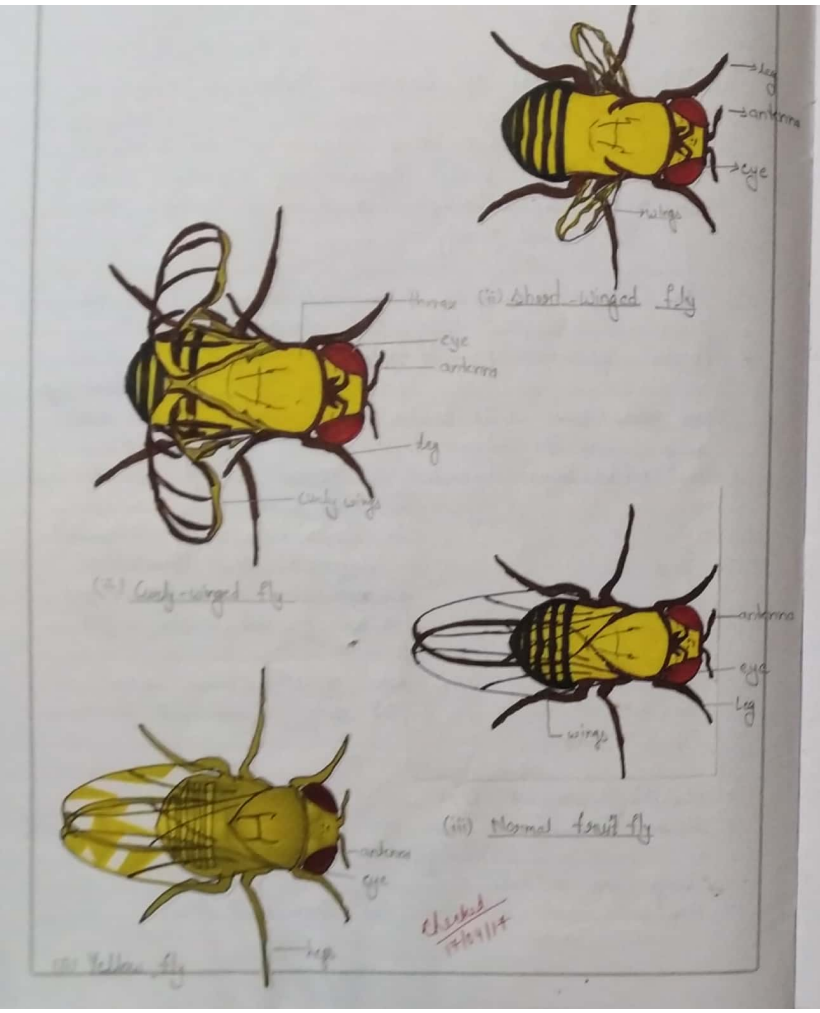

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ii) Shaart-Winged Flies:- This mutation is recessive trait, meaning that the fly won't express the gene unless it gets it from both parents. Unfortunately these fruit flies cannot fly.
- They have a defect in their "vestigial gene" on the second chromosome.
- If only one is mutated, the healthy version can override the defect.

iii) Curly-winged flies:- They have a defect in their "curly gene" which is on the second chromosome.
- Having curled wings is a dominant mutation, which means that only one copy of the gene has to be altered to produce the defect.
- In fact, if both copies are mutated, the flies do not survive.
- These flies are unable to fly but they can hop aroound.

Abnormal Body Colour:-

(i) Normal Fruit fly:- These normal fruit flies, or "wildtypes," have yellow-brown and tan striped bodies.
- Here we compare them with the other fruit flies here.

(ii) Yellow Flies:- These flies are yellower than normal flies.
- They have a defect in their "yellow gene," which is on the x-chromosome. Since
- Since the yellow gene is needed for producing a fly's normal black pigment, yellow mutant flies cannot produce this pigment.
- This mutation is recessive and causes these flies to lack dark pigment. It is similar to albinism.

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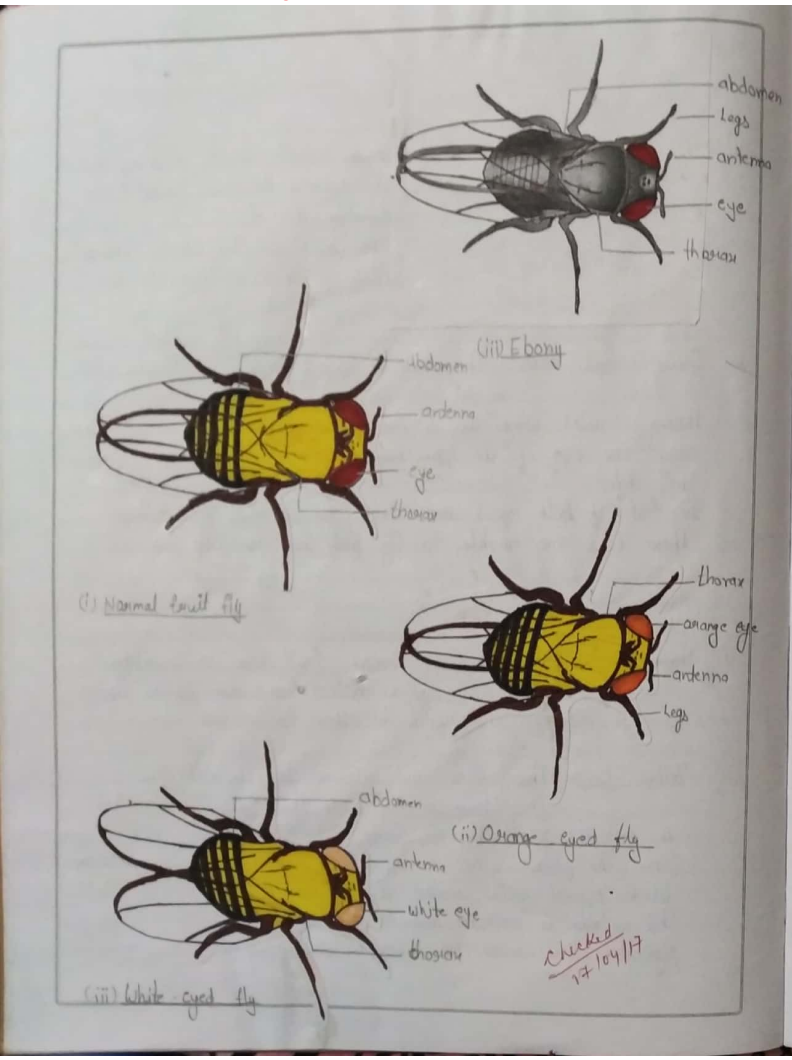

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iii) Ebony :- This mutation is also recessive and causes these flies to have dark pigment built up all over their bodies.

- These flies have a dark, almost black body.
- They carry a defect in their "ebony gene" on the third chromosome.
- Normally, the ebony gene is responsible for building up the tan-colored pigments in the normal fruit fly.
- If the ebony gene is defective, the black pigments accumulate all over the body.

Odd Colored Eyes

(i) Normal Fruit Flies :- These are normal fruit flies, or "wildtype".
- Their eye colour is bright red.
- Here we compare them with the other fruit flies.

(ii) Orange-Eyed Flies :- This mutation is recessive and does not affect the fly's eyesight.

- They have a defect in their "white gene", which normally produces the red pigments in the eyes.
- In these flies, the white gene only works partially, producing fewer red pigments than it should.

iii) White-Eyed Flies :- This mutation is recessive and on the sex chromosome, meaning that males and females have different numbers of copies of this gene.

- Like the orange eyed flies.
- These flies have normal eye sight, but one of the genes responsible for producing the wild-type red eyes is defective.

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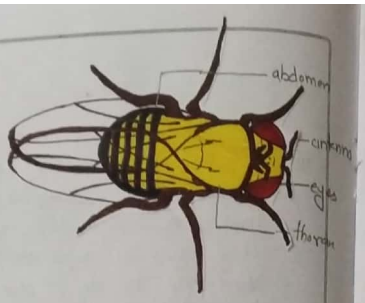
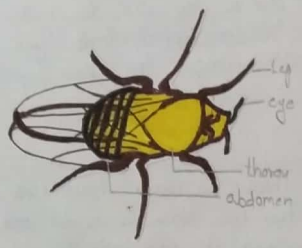
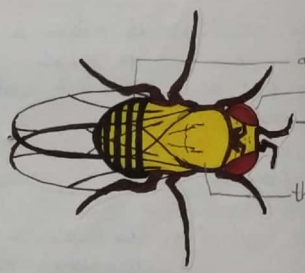


(i) Normal fruit fly



(ii) Eyeless fly



(iii) Antennapedia fly

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Strangely formed Heads:-

(i) Normal Fruit fly :- These are normal fruit flies, or "wildtypes" - notice the antennas sticking out in front of their red eyes.
- Here, we compare these flies to the other fruit flies

(ii) Eyeless Flies :- This mutation is recessive and make the flies blind.
- They have a defect in their "eyes absent gene", which normally instructs cells in the larvae to form an eyes.

(iii) Antennapedia (Leg-Headed Flies) :- This mutation is dominent and may not be obvious at first.
- These flies have abnormal, leg-like antennas on their foreheads.
- But actually these are not antennae, these are an extra set of legs coming out of the fly's head.
- They have a defect in their "antennapedia" gene, which normally instructs some body cells to become legs.
- In these flies, the antennapedia gene falsely instructs cells that would normally form antenna to become legs instead.

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