Quick Notes: Adaptations of Parasites

Adaptation: Any feature of an organism or its part which enables it to exist under conditions of its habitat is called adaptation. They help organisms withstand adverse conditions and utilize the environment effectively.

Parasite: An organism that lives in or on another organism (host) and derives shelter and nutrients, usually harming the host.

1. Structural (Morphological & Anatomical) Adaptations:

- Feeding organs absent in endoparasites.
- Specialized mouthparts in sap-sucking insects (e.g., aphids).
- Piercing devices like stylet in nematodes.
- Locomotory organs absent/reduced (e.g., Fasciola, Taenia).
- Attachment organs: hooks, suckers, rostellum.
- Resistant outer covering against host enzymes (e.g., Fasciola).
- Reduced sensory and nervous system.
- Flattened body form for attachment.
- Muscular pharynx in Ascaris for food absorption.
- Haustoria in parasitic plants (xylem in Loranthus, phloem in Cuscuta).

2. Physiological Adaptations:

- Secretion of hydrolyzing enzymes (e.g., fungi produce cellulase, pectinase).
- Blood-feeding parasites produce anticoagulants (e.g., Hirudinaria).
- High chemo-sensitivity to locate host site.
- Anaerobic respiration capability.
- Nutrients absorbed directly through body surface in some endoparasites.
- Resistance to host toxins and enzymes.
- Evasion of host immunity: antigenic variation, molecular mimicry, masking.
- Anti-enzyme production to neutralize host enzymes.
- Osmotic balance maintained for nutrient absorption.
- Simplified digestive tract due to constant food supply.

3. Reproductive Adaptations:

- Hermaphroditism allows self-fertilization.
- High fecundity: large egg production (e.g., Taenia ~35,000 eggs/day, Ascaris ~200,000 eggs/day).
- Protective thick-coated reproductive bodies.
- Complicated life cycles involving secondary hosts/vectors.
- Polyembryony increases offspring numbers.
- Long survival of reproductive particles outside host.
- Rapid maturation and extended lifespan in many endoparasites.