

found in air, water and soil, even in extreme hot or cold temperatures. They are also present on and in the body of animals.

9. Social aspect

Social insects like, ants, termites, bees etc. show an excellent type of social set up. They also perform division of labor and look after their young ones.

10. Persistence in jobs

The insects show the fixedness of **purpose** in their jobs e.g. a honey bee can visit 2400 flowers in a day to collect nectar.

2.2 HOW INSECTS HAVE BECOME PESTS.

Pest: Any organism that interferes with human interest and cause the economic loss is called a pest e.g. insects feeding on crops, disease causing fungi, crop damaging rodents etc. Insects have become pests due to following reasons:

1. Interference with natural vegetation

Insects were present on this earth before man and were **feeding on** natural vegetation i.e. grasses, field crops, fruits etc. Man started commercial cultivation of plants for his own interest and started replacing the natural vegetations. So, the insects started feeding on cultivated plants and thus became the **pest** of crops e.g. army worm **appeared** first time on cotton in 1970 and rice leaf folder **appeared** in 1980 in "Kallar" rice tract.

2. Reduction in insectivorous animals

The animals which feed on insects keep the population of insects very low. The population of insectivorous animals or birds is decreasing with the passage of time. As a result, the insects have increased in number and have become pests on crops.

3. Provision of suitable conditions for insects

Many insects feed and breed in plant debris, found in crops. There are many insects which hide during winter season in stubbles of various crops like sugarcane, cotton, maize, sorghum, rice etc. If we don't remove the stubbles, these insects increase in number and attack the following crops in the next season. Similarly, by sowing same crop on a large area also favors the multiplication of insects.

4. Introduction of infested plants

By introduction of the infested plants from one locality to another of the same country or

by importing the infested plants from one country to another, introduces the insects of that crop in a new locality e.g. sugarcane pyrilla was introduced in Indo-Pak from Hawaii

5. Through scientific research

Insects are important for the scientists for research purposes but their mishandling creates problems e.g. Gipsy moth was imported from Europe into America for the scientific research. Its eggs from the research laboratories accidentally reached into the field and it became serious pest of apple in America.

2.3 FOUNDATIONS OF INSECT CONTROL.

Followings are the foundations of insect control. Detailed knowledge of these aspects is helpful in controlling the insects.

2.3.1 External morphology

External morphology includes head, thorax, abdomen and their appendages.

A. Head:

Head consists of antennae, compound eyes and mouthparts.

- i. **Antennae** are sensory organs having the receptors for sense of smell and touch. The antennae control attraction or repulsion of insects towards a particular source. So, we can control insects with the help of attractant and repellents.
- ii. **Compound eyes** have perception of light and thus enable different insects to be attracted towards light. We can control insects by putting up light traps.
- iii. **Mouthparts** are generally of two types. Knowledge about mouth parts determine the type of insecticide to be used for the control of particular insect pest.
 - a) Chewing: Stomach insecticides are used for insects having chewing type mouthparts.
 - b) Sucking: Systemic insecticides are used for insects having sucking type mouthparts.

B. Thorax:

The thorax bears locomotory organs (legs and wings). With the help of these organs, the insects move from one place to another. So, it enables insects to either reach towards an insecticide or move away from insecticides with the help of wings or legs. Thus, knowledge about appendages of thorax helps greatly for the control of insects by different methods.

C. Abdomen: