

COURSE CODE: ZOO 462
COURSE TITLE: APPLIED ENTOMOLOGY
NUMBER OF UNITS: 3 Units
COURSE DURATION: 2 Hours per week

COURSE DETAILS:

Course Coordinator: Dr O.A. Oke. B.Sc., M.Sc., Ph.D.
Email: olubodeoke@yahoo.com
Office Location: AMREC Building
Other Lectured: Dr O.K. Ademolu

COURSE CONTENT:

History of Entomology, Paleontology, Life-cycles and Problems/Habits. Attack and defense by insects. Economic importance, chemical and biological control of insects. Collection and Preservation of insects.

COURSE REQUIREMENTS:

This is a compulsory course for all zoology students in the University. Students are expected to participate in all course activities and have a minimum of 75% attendance to be able to write the final examination.

READING LIST:

1. Imms. A text-book of Entomology. Vol 1 and 2
2. Ross. A text-book of Entomology
3. Fros. A textbook of Entomology
4. Anthony Youdeowei. *A Laboratory Manual of Entomology*. Ibadan, Oxford University Press. 1977.

LECTURE NOTES

HISTROY OF ENTOMOMLOGY AND PALENTOLOGY

Palentology is the study of insect evolution through the examination of character and fossil record i.e all data (fossil and extant)to form a single estimate of phylogeny .

PROBLEMS AND HABIT OF INSECT

STORED PRODUCT ENTOMOLOGY

This area of study is of tremendous importance to us in Nigeria because most of our product are stored and they are dried. This is because of our feeding pattern i.e. eating relatively dehydrated forms and most especially we do not have facilities that are required for long term storage of perishable food. But in advance countries, most food are stoered in cold forms and sell in fresh form.

During storage and when in transit for sales, such food are invested by pests especially coleopteran (beetles and coleoptera). Many of this pest develop and reproduce in the stored food deriving all the nutrients from the grain. The same nutrients that the pest required is the one that man required and hence in this way they compete with man.

Damage of food resources by storage pest may be as great as those in the field that is, the growing crop. However, the field crop is apparent whereas that in the stored food is concealed. Internal infestation of the grain might not be detected except with some techniques. Insect damage to the field crops may be compensated for by partial recovery of the damage crop that is, the plant will survive or having more yield by an increase in the yield of the survivor.

On the other hand, damage to the storage food is final and irrevocable.

Under tropical condition characterized by high temperature, high relative humidity, insect development and rate of turnover is high. The presence of insect and onset of damage is closely and greatly monitored in advanced countries. In those countries, pure food lawe are in operation that is, there are certain laws that make it illegal for anybody to sell food containing more than certain impurities. Both governments

and commercial industries in these countries cooperate to develop the food of these countries by minimizing these losses.

In developing countries for example Nigeria, the selling of food crops with insects still persists and the insects, their bodies, fragments, feces constitute what we pay for.

FOOD DAMAGING

The adverse effect of insect pest:

DIRECT DAMAGE CAUSED BY INSECT PEST

1. Loss of weight which results from the consumption of the grain kernel by the adult and developing stages of the insect. It is also known that some insects preferentially feed on the germs or embryos while some others feed on the endosperm, while others feed indiscriminately on both the germ cell and endosperm.
2. Through the loss or conversion of nutrients, loss in nutritive value or alteration in the biochemical composition of the grain as a result of the feeding or other metabolic activities of the insect. In the case of oil grains for example, groundnut, the degradation of the constituents lipids leads to an increase in the free fatty acid and an increase in the oxidative rancidity (change in taste), off flavor. The fatty acid (FFA) value of oil can be measured and give the index to which the oil has been deteriorated and hence increase in FFA means an increase in biological deterioration called **INCREASE OF BIODETERIORATION**.
3. Reduction in the germinative capacity of the seed which is seed germinability. Seeds that are attacked by insects are unable to germinate and if they do, they do not grow properly. The loss in weight caused by preferential feeding on the germ causes the inviability of the seeds.

4. Downgrading of grain and lowering of the market value, even in countries of our own where little or no care is taken about the infested grain still bring about lower monitoring value instead of selling for #2, you sell for #1 and which in the case of farmer, this is a bad market.
5. Aesthetic (beauty) violation and contamination of food. The existence of insects or even the developmental stages (egg, larva, pupa) and the different parts thereof make the food unattractive and cause aesthetic violation also exoskeleton, cast, skins, egg cases, pupa cases, all this when present in food causes contamination, also faecal matter e.g. uric acid, frass i.e. powdered form of the grain. All this from insect activity e.g. feeding or boring (fine powdery materials), all this amount to contamination. The odour that comes out of this insect is another form of aesthetic violation and contamination. The odour emanating from insect activity e.g. lesser grain borer *Rhizopeta domonica* germinate certain odour.
6. Webbing also causes aesthetic violation. Insect webs are also present during development e.g. India moults and all this made the food unattractive causing aesthetic violation.
7. Damage to structure and containers. This has to do with boring and tunnelling dooming structures, this brings about damages to the structures and containers in which the grains are stored e.g. the last instar larva of *Dermestes maculatus* (beetle) has the habit of boring into wooden doors and windows of warehouses when it wants to pupate and in boring it, it weakens the structure necessitating replacement.

INDIRECT DAMAGES CAUSED BY INSECT PEST

1. Heating the grain which result from metabolic activities within the grains which causes spoilage by affecting the translocation of moisture within the grain stores and this type of translocation of moisture may affect the growth of fungi and fungi association. The presence of fungi or moulds and other micro-organisms in food or grains will introduce into them other danger such as mycotoxin (toxin produced by fungi). Moulds present in groundnuts produce Aflatoxin which is a chemical that cause carcinogen (causes cancer).

2. Transmission of parasites to man. It is well known that certain parasites use their intermediate host to man. Customer resistance causes loss of good will between the traders and the buyers (also in international trade) and this means loss of money.
3. Insect attack on food will necessitate control by insecticides which will cause high cost, hiring of personnel and other materials needed for prevention.
4. Insecticide residues. Insecticide treatments themselves have the effect of insecticide residue which is left-over and this insecticide residue has a toxic effect on man.

BIOLOGY AND ECOLOGY OF STORED PRODUCT

INSECT DEVELOPMENT

Insects and mites are the two major arthropods that damage stored food. Beetles (Coleoptera) and moths (Lepidoptera) are responsible for most of the damages. There are other groups that we consider e.g. silverfish, Thysanura. The cockroaches (Dictyoptera); some Orthoptera (mainly the house cricket, Dermaptera (Earwigs), Psocoptera (book lice), Hemiptera (bugs).

In addition to the ones we've considered (Coleoptera and Lepidoptera), any of these can cause damage to food both indoors and warehouses.

They are usually nocturnal in habits. They are also cryptozoic (hiding) in habits under crevices or back of trees. All members of this group are adapted for living in dark, warm conditions.

Order Coleoptera

These are pterygote insects with strong biting or chewing mouth-parts. Their mandibles are strong and may be greatly enlarged. The head may be normal or prolonged forward into a snout. The head may be erect (prognathous) or may be hypognathous. The eyes are conspicious and highly developed. The distinguishing features of the coleopteran is that their forewings are modified into

horny or leathery elytra(on) which meet along the mid-dorsal line which may or may not cover the abdomen. The hind wings are membranous with few veins and they are folded below the elytra when at rest. The prothorax is large and mobile , the meso thorax is much reduced. The abdomen is usually ten segmented but all the abdomen sterna are not visible. The terminal abdomen are rectfactile and may form ovipositor in female.

Among the beetles metamorphosis is complete, sometimes complex. The larva is campoideiform e.g. tiger beetles or may be scarabejform in scarabaeidae or apodous as seen in some weevils, some bruchidae and curculionidae.

\The pupae are adecticous and exarate.

Hyper-metamorphosis may occur in which case the insects pass through two or more markedly different larval instars during its development. Thus for instance, in the family Moidae, the first instar larva is campodeiform and this latter develop into an eruciform larva that later changes to apodous form.

METHODS OF CONTROL OF STORED PRODUCTS INSECTS

Stored Products Pest Control or Management is measures used to keep pest damage below economic injury level.

Main Criteria

1. The agents to be used should eliminate only the pest.
2. The controlling agent should not contaminate the environment.
3. The method should be sufficiently cheap to make it economical.

No single pest control method can combine the three criteria.

We can recognize three types of pest control:

1. Chemical methods.
2. Biological methods.
3. Physical methods.

Or Simply Chemical and Non-Chemical methods.

However, Chemical methods still prevail in pest management probably because they give dramatic or spectacular results.