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Методичні вказівки до роботи над англомовними текстами

для здобувачів третього освітньо-наукового рівня вищої освіти

спеціальності *202«Захист і карантин рослин»*

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Методичні вказівки складено відповідно до програми навчальної дисципліни «Англійська мова за професійним спрямуванням». Вказівки містять практичні завдання і призначені як для аудиторної, так і для самостійної роботи здобувачів над мовним матеріалом.

Призначено для здобувачів третього (освітньо-наукового) рівня вищої освіти спеціальності 202 «Захист і карантин рослин».

STRUCTURE AND DEVELOPMENT OF INSECTS. PESTS

TEXT 1

INSECTS

No other terrestrial group of animals has as many members as the class Insecta. More than 800, 000 species of insects have been described – about 300, 000 of these alone are beetles (order Coleopreta) – and there are many thousands more yet to be identified and named. The success of this group is due partly to its tremendous adaptability and huge variation in life styles – insects live in almost every habitat, from steamy tropical jungles to cold polar regions. The ability to fly has allowed them to spread to new, unexploited habitats and, many millions of years ago, to escape from terrestrial predators. It also helped them to disperse and has enabled greater access to food and more desirable environments.

It is possible that the great increase in the numbers and variety of flowering plants during the Cretaceous period also contributed to the enormous success of insects. Most flowering plants are dependent upon them for pollination.

Many insects are of benefit to humans. The silk moth (Bombyx mori), for example, provides silk. It is obtained from the caterpillars of this moth, which are farmed in huge numbers and fed on mulberry leaves. At pupation, they begin to exude fluid silk and spin a silken cocoon. To extract the thread, the caterpillar must be killed, and the cocoon unwound – each one yields about half a mile of fine silk fibers.

Another beneficial insect is the honey bee, which is often domesticated and kept in specially constructed hives, from which honey and beeswax are obtained.

Fruit trees, shrubs, and flowering plants depend upon insects for pollination, and great care has to be taken when spraying such plants to ensure that insects are not killed by the chemicals. Many other insects are useful because of their function as biological pest controllers. Many ladybugs (family Coccinellidae), for example, feed on aphids, which can severely damage both ornamental and food plants, particularly citrus fruits.

Unfortunately, there are some insects that are pests; swarms of grasshoppers can lay bare vast fields of crops, and the boll weevil (Anthonomus grandis) attacks cotton plants. But some insects are also dangerous because they are the vectors of disease. Malaria, for example, is transmitted by Anopheles mosquitoes. Other diseases transmitted by insects include yellow fever, elephantiasis, sleeping sickness, and typhus. In attempting to control these insects and the diseases they cause, the cost of drugs, vaccines, and eradication programs is enormous.

EXERCISES

I. Answer the following questions using the information given in the text:

1. How many species of insects have been described?
2. What is the success of insects due to?
3. Why are most flowering plants dependent upon insects?
4. What insects are of benefit to humans?
5. What does the silk moth provide?
6. What is obtained from hives?
7. What insects are biological pest controllers?
8. What kind of damage can swarms of grasshoppers do?
9. What plants does the boll weevil attack?
10. Are there any insects which spread diseases?
11. What diseases are transmitted by insects?

II. Read the text one more time and speak about:

a) the reasons of insects success;
b) beneficial insects;
c) pests.

TEXT 2
ANATOMY OF INSECTS

The exoskeleton, which covers the entire insect body, is composed of chitin and hardened by proteins. It is made up of several parts: the tergum, covering the back; the sternum, on the underside; and two pleurae, which link the tergum to the sternum. The pleurae are considerably thinner than the rest of the cuticle and generally contain spiracles – the openings to air tubes (tracheae).

The body is clearly divided into a head, thorax and abdomen. The head consists of five or six segments, but they are fused together and are not obvious in the adults. Typically, the insect head bears a single pair of sensory antennae, one pair of compound eyes, which may be colour sensitive, and one more ocelli (clusters of light-sensitive photoreceptors).

The thorax is composed of three segments, each bearing a pair of walking legs; this characteristic is unique to insects. The legs are modified in different species for grasping, swimming, jumping, or digging. The winged insects (subclass Pterygota) also bear a pair of wings on the dorsal surface of each of the second and third thoracic segments, whereas those of the subclass Apterygota are primitively wingless. The abdomen is made up of 10 ore 11 segments connected by flexible membranes. The eighth and ninth segments (also the tenth in males) bear the genital appendages (See Fig. 1).

All insects have a heart that lies dorsally within the thorax and, in most species, in the first nine abdominal segments. The blood circulates in a blood space (called the hemocoele) and bathes all the tissues.

Respiration in most insects takes place by means of a system of internal tubes called tracheae, which open to the exterior via paired spiracles. Oxygen diffusion along the trachea is sufficient to meet the demands of the insect at rest. During activity, however, air is pumped in and out of the tracheal system by expanding and collapsing air sacs (enlarged parts of the tracheae), which are controlled by movements of the body. The spiracles have closing structures for water conservation.

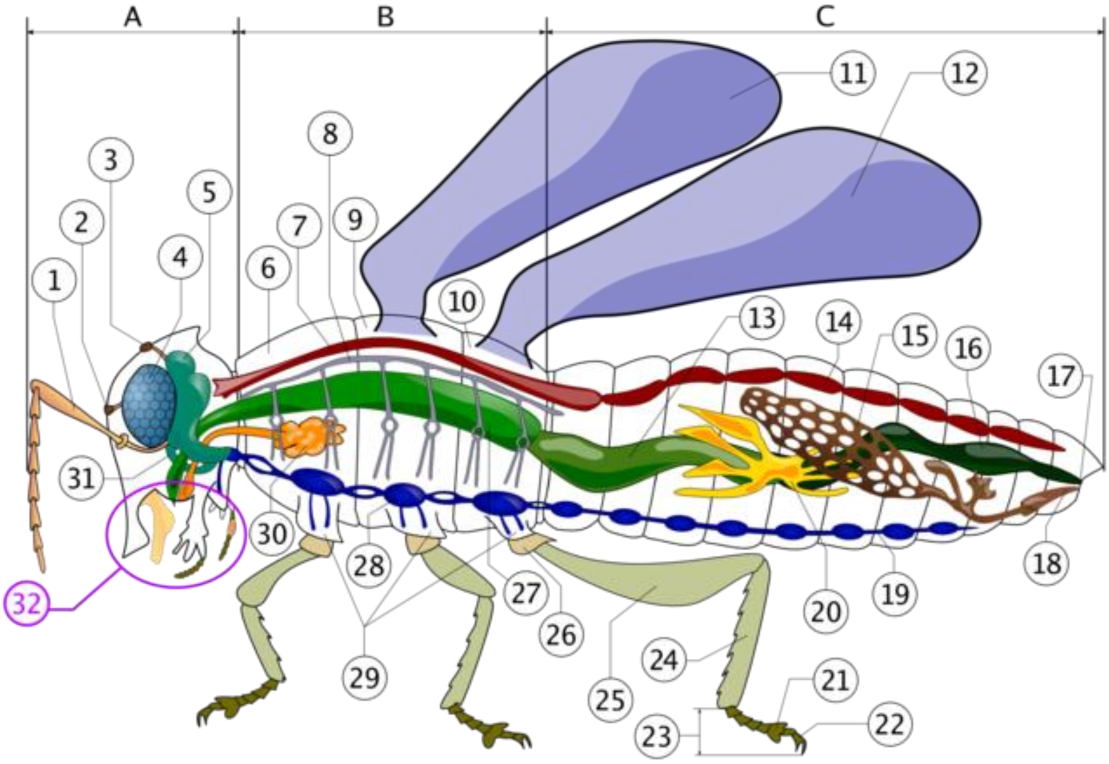

Fig 1. Insect anatomy scheme

A- Head B- Thorax C- Abdomen

1. antenna – вусик
2. ocelli (lower) – прості очі (нижні)
3. ocelli (upper) – прості очі (верхні)
4. compound eye – складне око

17. anus – задній прохід, анус
18. vagina – вагіна
19. nerve chord (abdominal ganglia) – нервові зв'язки

5. brain (cerebral ganglia) – мозок, (церебральні, мозкові) нервові вузли
6. prothorax – проторакс (передня частина грудної клітини)
7. dorsal artery – спинна артерія
8. tracheal tubes (trunk with spiracle) – трахеальні трубочки
9. mesothorax – мезоторакс
10. metathorax – метаторакс
11. first wing – переднє крило
12. second wing – заднє крило
13. mid-gut (stomach) – серединна кишка (шлунок)
14. heart - серце
15. ovaryя – яєчник
16. hind-gut (intestine, rectum & anus) – задня кишка (кишка, пряма кишка та задній прохід)
20. Malpighian tubes – Мальпігієві трубочки
21. pillow – подушечка
22. claws – пазурі
23. tarsus – лапка
24. tibia – тібіа, гомілка
25. femur – стегно
26. trochanter – вертлюг
27. fore-gut (gizzard) – передня кишка (передшлунок)
28. thoracic ganglion – тораксальний (грудний нервовий вузол)
29. coxa – кокса, тазик
30. salivary gland – слинна залоза
31. subesophageal ganglion – під стравохідний нервовий вузол
32. mouthparts – ротові частини

The principal excretory organs of insects are Malpighian tubes, which open into the hindgut and the rectum. Uric acid, dissolved salts, and water are drawn from the hemocoele; the fluid in the tubes then passes into the rectum where useful salts and water are extracted before the waste products; are excreted with the feces.

The insect nervous system is much like that of other arthropods, with a brain and a system of linked individual and fused ganglia connected to a ventral nerve corn. Apart from the eyes, sense organs, such as chemoreceptors and tactile hairs, occur all over the body, but are most concentrated on the appendages.

EXERCISES

I. Read and translate the text.

II. Describe the insect body basing on verb schemes:

… covers the entire insect body.
… is composed of chitin.
… covers the back.
… is on the underside.
… link the tergum to the sternum.
… contain spiracles.
… consists of five or six segments.
… are fused together and are not obvious in the adults.
… bears a single pair of sensory antennae and eyes.

… may be colour sensitive.
… is composed of three segments, each bearing a pair of walking legs.
… are modified in different species for grasping, swimming, jumping, or digging.
… bear a pair of wings.
… are on the dorsal surface of each of the second and third thoracic segments.
… are connected by flexible membranes.
… bear the genital appendages.
… lies dorsally within the thorax.
… circulates in blood space.
… open to the exterior via paired spiracles.
… open into hindgut and the rectum.
… excrete waste products.
… are connected to a ventral nerve cord.
… are most concentrated on the appendages.

TEXT 3
LIFE CYCLES AND DEVELOPMENT

Most insects lay eggs. Once hatched the primitive wingless insects do not metamorphose – they gradually mature through a series of molts. The winged insects, however do metamorphose. They are divided into two groups: the Endopterygota, such as flies and butter flies, whose larvae do not resemble the adult and whose wing development internal (the derivation of their name appearing only in the final stage of metamorphosis); and the Exopterygota, such as cockroaches, grasshoppers, and some bugs, which hatch as miniature versions of the adults having external wing buds but without being sexually mature, and gradually develop by incomplete metamorphosis (hemimetamorphosis).

The basic life style of insects can be modified by various factors; aphids for example, exhibit parthenogenesis in favourable weather conditions. Unfertilized eggs laid in the autumn hatch into wingless ovoviviparous Inmates, which do not lay eggs but give birth to broods of similar females. The cycle continues until conditions deteriorate, when one generation produces winged females and males, which mare.

Many insects have complicated life cycles – especially parasitic insects. Parasitic wasps, for example, have a form of reproduction called polyembryony, in which the embryonic cells give rise to more than one embryo. This means that from one egg deposited in the body of a host many larvae can be formed, and the resulting embryos can use the host's body as both a refuge and a food source.

A great variety of parasitic insects exist, from blood-sucking ectoparasites that live permanently on a host during their adult lives to the parasites that visit a host only to feed. Some, such as mud daubers, are parasitic in the larval stage only. The egg-laid female wasp finds a spider which it paralyzes with its sting; it then builds a nest of mud into which it puts the spider. Finally, it lays an egg and seals up the nest. When the egg hatches, the larva has a ready source of food until it pupates.

EXERCISES

I. Answer the following questions using the information given in the text:

1. Do most insects lay eggs?
2. Do the primitive wingless insects metamorphose?
3. Do the winged insects metamorphose?
4. What groups are the winged insects divided into?
5. What insects belong to the Endopterygota group?
6. Do the larvae of flies and butterflies resemble the adults?
7. When do the wings of the insects belonging to the Endopterygota group appear?
8. What groups do cockroaches and grasshoppers belong to?
9. Do cockroaches and grasshoppers hatch as miniature versions of the adults?
10. What factors influence the basic life style of insects?
11. How do parasitic insects exist?

II. Find the terms in the text which describe the following:

- they do not metamorphose;
- their larvae do not resemble the adults;
- they hatch as miniature versions of the adults;
- they hatch into wingless ovoviviparous females which do not lay eggs but give birth to broods of similar females;
- they give rise to more than one embryo;
- they live permanently on a host during their adult lives;
- it paralyzes a spider with its sting.

III. Describe parasitic insects basing on verb schemes:

… have complicated life cycles.
… is called polyembryony.
… give rise to more than one embryo.
… can be formed from one egg deposited in the body of a host.
… is used as both a refuse and a food source.
… live permanently on a host during their adult lives.
… are parasitic in the larval stage only.
… is built of mud.
… is put inside the nest.
… lays on egg.
… seals up the nest.
… has a ready source of food until it pupates.

IV. Speak about:

1) the differences between winged and wingless insects;
2) influence of weather conditions on the basic life style of insects;
3) parasitic insects.

TEXT 4
PESTS

Plant pests include the arthropods (such as insects and mites), slugs, snails, sowbugs, and pillbugs. Only a small proportion of insects are plant pests with the most conspicuous being the butterflies and moths. The larvae (caterpillars) of butterflies and moths cause severe damage by feeding on foliage until they pupate. The adults rarely feed on foliage. The most common butterfly pest in North America is the cabbage white, which is seen in great numbers in the summer. Beetles also damage plants as both larvae and adults chew on plant tissue. The Colorado potato beetle is the most notorious of these pests. Juvenile (nymphs) and adult grasshoppers are also foliage-eating insect pests. Larvae of flies feed and burrow into roots, bulbs, and stems of plants and thus cause considerable damage.

The least conspicuous insect pests are those that pierce the stem or leaf and suck nutrients from the plant. Nymphs and adults of aphids, leaf hoppers, stink bugs, and plant bugs cause extensive damage in this manner and, as well, they carry plant pathogens, especially viruses, from plant to plant. Insects called thrips also pierce plant parts and are important in transmitting viruses.

Mites differ from insects, as the adults have four pairs of legs (versus six for insects) and lack an antennae. Larvae of mites feed and molt to form sixlegged nymphs before becoming adults. The mites that feed on plants have rasping and sucking mouth parts that damage plants and they also transmit plant pathogens as they feed. Both thrips and mites are very small and, as a result, often avoid detection until the plant growth is visibly affected.

Damage to plants caused by slugs and snails is very obvious, but is generally limited to crops growing in very damp situations and those, such as strawberries, in contact with the soil. Slugs and snails glide on an obvious slime trail of secreted mucus and feed at night, or on very cloudy days, to avoid drying out. Also at home in damp environments are the sowbugs and pillbugs. These oval (pill-sized) bugs have a small head, two pairs of antennae, and seven pairs of legs. These species are more important as decomposers of rotting vegetation than as plant pests.

Crop management to reduce damage by diseases and pests is based on integrated control strategies involving exclusion, eradication, and protection. Whenever possible, growers attempt to exclude the pathogen or pests from their land by purchasing pathogen- and pest-free planting material (seeds, seedlings, grafting material, tubers, and bulbs). When a pathogen or pest is present in fields or orchards, every effort is made to eradicate it by cultivation practices designed to "starve" the organism, for example, by planting a crop on which it can not obtain nutrients. When such methods fail, pesticides may be required to reduce pathogen populations; for example, nematocides to kill root-knot nematodes. Many pests and pathogens (for example, apple scab and wheat stem rust fungi, fire blight bacterium) are, however, so widespread and so readily distributed from field to field that exclusion and eradication are impossible. Ideally, for these problems, plant varieties that are genetically resistant to the pathogen or pest are available.

Alternatively, growers may be able to reduce crop losses by cultural practices that make the environment unfavourable for the agent; for example, spacing plants to prevent the high humidity conducive to plant disease. If such methods are unsuccessful, the grower may be required to use biological control (for example, the bacterium *Bacillus thuringiensis* for moth and beetle control) or chemical pesticides (fungicides to control late blight of potato, or insecticides to control grasshoppers). Bioengineering techniques are enhancing researchers' ability to produce genetically resistant crop plants, and this technology will eventually decrease reliance on chemical pesticides.

EXERCISES

I. Answer the following questions using the information given in the text:

1. What do plant pests include?
2. How do larvae of butterflies and moths cause severe damage?
3. Do butterfly adults feed on foliage?
4. How do larvae of flies damage plants?
5. What insect pests are the least conspicuous?
6. How are viruses and pathogens spread?
7. What is the difference between mites and insects?
8. What factor limits crops which are damaged by slugs and snails?
9. What bugs are more important as decomposers of rotting vegetation then as plant pests?
10. What is crop management to reduce damage by diseases and pests based on?
11. How can growers reduce crop losses by cultural practices

II. Match the following words on the left with their definitions on the right:

1. Blight	a) mushroom, toadstool, or allied plant including moulds, cryptogamous plant without chlorophyll feeding on organic matter, spongy morbid growth or excrescence.
2. Snail	b) young, youthful, suited to, characteristic of youth.
3. Butterfly	c) morbid poison, poison of contagious disease.
4. Juvenile	d) disease of unknown or atmospheric origin affecting plants, plant disease caused by fungoid parasites, mildew, rust, smut.

5. Virus	e) kinds of slimy slow-creeping gasteropod mollusc, most of them with spiral shell & horns or retractile eye-stalks, some used as food esp. in France.
6. Fungus	f) diurnal erect-winged insect with knobbed antennae.

III. Make a plan to the text and retell it according to it.

TEXT 5
WHEAT STEM SAWFLY (PART I)

Wheat stem sawfly *(Cephus cinctus)* is native to North America and lives in grasses, mostly the wheatgrasses *(Agropyron)* and annual grass family crops (Fig. 2).

Cultivated hosts of the wheat stem sawfly include wheat, rye, triticale and some varieties of barley.

Durum is often severely attacked by wheat stem sawfly. Oats and broad-leaved crops are immune**.** Female sawfly will lay eggs in barley, but the larvae seldom cause yield losses. Plant age is important to egg-laying females. Plants that have not reached the jointing (stem elongation) stage are not acceptable to females.

The sawfly larva feeds within the stem and burrows down to or below ground level by the time the wheat heads begin to ripen. The larva then turns around, heads upwards and cuts most of the way through the stem at a point somewhere between soil level and about 2 cm above the ground, seals the end above itself, spins a cocoon in the stem and passes the winter as a larva in diapause (hibernation).

Overwintering larvae pupate within their cocoons in May; adults begin to emerge in early summer from stubble fields and native grasses. As is common for many insects, males start to emerge first followed within a few days by females. Sawfly adults appear from late June to early July. They are rather inactive insects that drift from plant to plant and spend most of their time resting on grass stems.

Figure 2.

Wheat stem sawfly has one generation per year (univoltine).

There are nine known parasites of wheat stem sawfly; only one species, however, provides significant control. *Bracon cephi*, a native braconid wasp, is one of the few insect parasites that can move from grass to crops with the sawfly. When weather conditions delay crop maturation and sawfly larval development, *B. cephi*, by producing another generation, can increase its control of the wheat stem sawfly population.

The sawflies are all plant-eaters. Wheat stem sawfly is best known as a pest of wheat and has caused extensive losses to wheat in the northern Great Plains.

Changes in farming practices have affected the abundance of wheat stem sawfly. Tractor farming increased the relative abundance of wheat and decreased the proportion of oats grown. In addition, as strip farming gained acceptance, sawflies spread easily from stubble and native grasses to wheat. As stubble farming of wheat on wheat stubble increased, so did wheat stem sawfly.

The sawfly larva bores down inside the stem and makes a discoloured tunnel from about the top joint to the root. The most diagnostic evidence of sawfly feeding is the presence of sawdust-like frass inside the wheat stem. The greatest losses occur around the margins of fields.

Wheat stem sawfly losses are of two types. Larvae feed within the stem of the plant and reduce both yield (a 5 to 15 per cent decrease in total seed weight) and quality of grain (from reduced protein and kernel weight). Larvae also cut stems and cause stems to break in the wind, fall to the ground and become unharvestable. These effects of feeding by larvae usually go unnoticed until the plants are toppled by wind and the weight of maturing heads. Mature larvae chew part way through and all around the inside of the stem just before cocoon formation in late summer.

Producers need to determine the percentage of plants infested by sawfly before harvest. This objective can be accomplished by cutting open the wheat plants and looking for the characteristic sawdust-like frass inside the stem.

EXERCISES

I. Answer the following questions using the information given in the text:

1. What do plant pests include?
2. How do larvae of butterflies and moths cause severe damage?
3. Do butterfly adults feed on foliage?
4. How do larvae of flies damage plants?
5. What insect pests are the least conspicuous?
6. How are viruses and pathogens spread?
7. What is the difference between mites and insects?
8. What factor limits crops which are damaged by slugs and snails?
9. What bugs are more important as decomposers of rotting vegetation then as plant pests?
10. What is crop management to reduce damage by diseases and pests based on?
11. How can growers reduce crop losses by cultural practices

II. Match the terms on the left with their definitions on the right:

a) Cocoon	a) spend the winter (of animals) in torpid state (of persons) in mild climate.
b)Grass	b) (piece of) ground, esp. one used for pasture or tillage, and usu. bounded by hedges.
c)Stem	c) insect from time of leaving egg till transformation into pupa, grub; immature form of other animals that undergo some metamorphosis.
d)Root	d) any plant of the family Gramineae, characterized by joined stems, sheathing leaves, flower spikelets and fruit consisting of a seedlike grain or caryopsis.

e)Larva	e) part of plant normally below earth's surface and serving to attach it to earth and convey nourishment from soil to it.
f)Hibernate	f) main body of stalk (usu. rising into light and air but sometimes subterranean) of tree, shrub, or plant; slender stalk supporting fruit, flower or leaf, attaching it to main stalk or branch or twig.
g)Field	g) silky case spun by larva to protect it as chrysalis.

III. The stages of wheat stem sawfly life cycle are mixed up. Put them in the correct order according to the text:

- larvae pupate within their cocoons
- female sawfly lays eggs
- larva turns around, heads upwards and cuts most of the way through the stem
- adults emerge
- larva seals the stem end above itself
- the pests drift from plant to plant and spend most of their time resting on grass stems
- larva spins a cocoon in the stem
- sawfly males and sawfly females mate
- sawfly larva passes the winter in hibernation

TEXT 6
WHEAT STEM SAWFLY (PART II)
MANAGEMENT STRATEGY

Most fluctuations in populations are caused indirectly by weather. The success of the natural enemy *Bracon cephi* is strongly favoured by cool, wet August weather that delays the wheat harvest. With an extended harvest period *B. cephi* is able to fully complete a second generation. When the second generation is successful, a ten-fold increase in the level of parasitism occurs. Under drought conditions and earlier harvest, the second generation is largely wasted and fewer sawfly are attacked.

Sawfly population changes are largely due to the effectiveness of the natural enemies over a period of years. Wheat stem sawfly is a weak flier and will not take flight readily during cool, rainy or windy weather. Sunny, calm weather during the egg-laying period will promote dispersal of wheat stem sawfly.

A number of practices reduce losses caused by this insect. More than any other practice, the use of resistant varieties has reduced sawfly damage.

Tolerance to wheat stem sawfly is closely related to the stem solidness trait that has been bred into wheat varieties.

It is important to understand that solid stem wheat is tolerant to sawfly damage and not resistant. Some sawfly may still survive and cause cutting damage to solid stem varieties. Research has also shown that female sawflies that emerge from solid stem wheat are smaller and lay fewer eggs than sawfly that emerges from hollow stem wheat. When solid stem wheat elongates in rainy, overcast conditions, the stems tend not to be as solid as when elongation takes place in bright, sunny conditions. When elongation occurs in the former situation, the level of control is affected, and increased cutting by sawfly can occur.

To reduce sawfly populations, producers need to plant crops that are immune or resistant to wheat stem sawfly. Oats is immune to wheat stem sawfly. Sawfly does not survive in any broadleaf crops, and these crops are good options to consider when sawfly populations are high. Sawfly larvae can survive in barley, but usually do not thrive. Fewer acres in wheat mean fewer sawflies.

Plants that attract adults can be used to collect a sizeable portion of the population. The plants are then harvested, mowed or cultivated before the larvae move to the base of the plant (before mid-July).

Delayed seeding in spring produces a crop that is unattractive to females at egg-laying time, although this option is likely not a good idea due to yield and grade losses associated with late seeded wheat. Late maturing varieties help to allow the production of two generations of parasites, which results in fewer sawflies the following year.

Producers can summerfallow infested stubble and then cultivate in early June in an attempt to kill the sawfly by drying them out as they pupate. However, more damage is done to beneficial insects than the sawfly, so the net benefit is usually negative. Tillage also increases the risk of soil erosion.

Burning infested stubble may reduce sawfly numbers, but it also greatly reduces parasite numbers and the benefits of returning stubble to the soil. In view of other cultural control options available and concerns about soil erosion, burning is not recommended.

Beneficial insects in the sawfly system are favoured by a reduction in tillage. A study completed at Montana State University showed no appreciable increase in sawfly survival, but a much higher level of parasitism and a net reduction in infested wheat stems in reduced tillage systems as compared to conventional tillage systems.

Producers should swath sawfly-infested wheat as soon as kernel moisture drops below 40 per cent to save infested stems before they fall.

Harvest early before sawfly damage occurs and preferably before larvae have moved below the cutting height. Cutting for forage or silage are options.

Large block fields tend to suffer less sawfly damage than strip fields, especially in conditions of low to moderate populations.

Parasitic insects are an important regulator of sawfly populations. Reductions in infestations have been attributed to heavy parasitism in the same or in the immediately preceding years.

Initially, sawflies in grain fields were apparently free of parasites; over time, the number of parasitized sawflies gradually increased. Different parasite species vary in their effects on sawfly populations, depending on whether the infested host plant is in a native or cultivated habitat. One parasite, *B. lisogaster*, prefers grasses over cereals.
Bracon cephi has become very effective in parasitizing sawfly in wheat fields. Recent research has shown that *Bracon cephi* is very effective in parasitizing sawfly that survive in solid stem wheat, making the biological control a valuable addition to the over control strategy.

EXERCISES

I. Read the text and summarize the main points under the following headings:

a) favourable weather conditions for dispersal of wheat stem sawfly;
b) influence of wheat varieties on laying eggs by females of wheat stem sawfly;
c) control methods which enable to reduce sawfly population.

II. Match the following terms on the left with their definitions on the right:

a) Harvest	a) (highly nutritious seeds of) kinds of corn-plant bearing dense four-sided spike of grain.

b) Enemy	b) outlive, be still alive or in existence after the passing away of, come alive through or continue to exist in spite of.
c) Survive	c) cutting and gathering of grain and other food crops; quantity obtained.
d) Wheat	d) hostile person (animal, bird, insect), opponent.
e) Thrive	e) (ground) ploughed and harrowed but left uncropped for a year; uncultivated (land).
f) Fallow	f) prosper, flourish, grow rich.

TEXT 7
WHEAT APHID

The wheat aphid is a small pale green insect with an elongated, spindle-shaped body that may be covered with a powdery coating of wax. It can be distinguished from all other cereal aphids by a second tail-like process (supracaudal process) located directly above the cauda, giving it a twin-tailed appearance when viewed with a hand lens. While easily seen in wingless aphids, in very small or winged forms the supracaudal process may be difficult to see. Wheat aphid survives the summer on a variety of grasses and migrates to cereals in late fall as summer hosts die. It is tolerant of cold weather and can survive sub-freezing temperatures.

In most areas of California, it appears that wheat aphid builds to damaging levels sporadically, much like the population cycles of bird cherry-oat aphid. The reasons probably involve natural enemies, pathogens, environmental conditions, and crop management techniques.

DAMAGE

Damage is restricted to specific members of the grass family. Wheat and barley are the most susceptible; rye and triticale, while susceptible, are usually less damaged; and oats appear to sustain little or no injury. Wheat aphid does not attack corn, sorghum, or rice. While feeding, wheat aphid injects a toxin into the plant. This toxin is responsible for many of the damage symptoms, the most characteristic of which are white, longitudinal streaks on the leaves and sometimes the stem. Heavily infested plants are stunted, and sometimes exhibit a flattened appearance with tillers lying almost parallel to the ground. Occasionally, particularly during cold weather, plants show a purple color. Infested leaves curl up like a soda straw and remain in a rigid upright position rather than assuming the typical drooping posture. The tightly curled, upright leaves resemble onion leaves. If the awns are trapped in the curled flag leaf, the head is usually distorted and assumes a fish hook appearance. Improperly timed applications of phenoxy herbicides may cause similar injury.

MANAGEMENT

Biological Control

The effectiveness of biological control agents has not been fully evaluated. Wheat aphid is attacked by several predators and parasites commonly associated with other aphid pests of small grains. Efforts should be made to conserve these natural enemies as they are of great importance in controlling other cereal aphids and may reduce wheat aphid populations as well.

Cultural Control

Destroy and remove volunteer cereals to help reduce or delay the buildup of wheat aphid populations. Plants stressed for water or nutrients are more susceptible to and suffer greater damage from wheat aphid, so maintain adequate soil moisture and fertilization.

Monitoring and Management Decisions

The best management strategy in areas where wheat aphid is a problem is early planting, avoiding water stress, and isolation from riparian or permanent pasture. The major problems generally occur in late-planted grains. In the high desert, most growers no longer plant highly susceptible barley. Instead, they plant oats or an oat/wheat/barley mix. Wheat aphid is frequently found on the barley and wheat plants in such mixes, but good forage yields can be obtained.

Check fields regularly following seedling emergence. Wheat aphids are often difficult to find, particularly when present in low numbers. Look for the characteristic white stripes on the leaves and stem. The earliest infestations are often found on the edge of the field, particularly the upwind side. Aphids rapidly spread across the entire field after their initial establishment. Treatment thresholds have been developed for irrigated wheat; while thresholds for irrigated barley may be similar, they are probably not the same. Thresholds for dryland wheat or barley have not been developed.

EXERCISES

I. Answer the following questions using the information given in the text:

1. What is wheat aphid?
2. How can it be distinguished from all other cereal aphids?
3. What temperatures is white aphid tolerant of?
4. Which crops are the most susceptible to damage?
5. Which crops does wheat aphid not attack?
6. What does wheat aphid inject while feeding?
7. What is the toxin responsible for?
8. What is the biological control?
9. What is the cultural control?
10. What is the best management strategy?

II. Match the terms on the left with their definitions on the right:

1) Cauda	a) a stiff bristle, especially one of those growing from the ear or flower of barley, rye, and many grasses
2) Cereal	b)
3) Pathogen	c) a grain used for food, for example wheat, maize, or rye
4) Damage	d) is any organism which can cause disease in a person, animal, or plant
5) Toxin	e) a substance that provides nourishment essential for the maintenance of life and for growth
6)	f) the action or process of applying a fertilizer to soil or land
7) Awn	g) the area behind the anus of an animal; tail
8) Predator	h) any of various poisonous substances produced by microorganisms that stimulate the production of neutralizing substances (antitoxins) in the body
9) Nutrient	i) an animal that naturally preys on others.
10) Fertilization	j) physical harm that impairs the value, usefulness, or normal function of something.

III. Speak about wheat aphid management using the following words and expressions:

to survives the summer; to migrate to cereals; natural enemies; crop management techniques; longitudinal streaks; curled flag leaf; biological control agents; predators and parasites; volunteer cereals; highly susceptible; late-planted grains.

CROPS DISEASES, THEIR CLASSIFICATION AND SYMPTOMS

TEXT 8
PLANT DISEASES, THEIR CLASSIFICATIONS AND SYMPTOMS

Plants as well as animals are susceptible to injurious and often fatal diseases. Some of these disorders can be attributed to inanimate and nonparasitic factors such as adverse environmental conditions; unfavourable temperature or humidity; unsuitable soil and light conditions; excess or deficiency or minerals needed for proper plant growth; and presence of poisonous substances in the air or in the soil. Furthermore, physical and mechanical damage brought about by violent storms, improper cultivation practices, etc. besides being disastrous in themselves may prepare the way for widespread infection by other disease agents.

Among living agents such animals as insects besides often interfering directly with plant metabolism, frequently serve as carriers in transmitting other disease agents from plant to plant. Larger animals (slugs, birds, rabbits, etc) also may be carriers of disease agents, though they are of far less importance in this regard than are insects.

A great number of disease-causing plants are found among bacteria and fungi; a few algae are responsible for some relatively unimportant tropical plant diseases. Several slime molds (organisms bordering the animal and plant kingdoms) and numerous viruses (organized particles bridging life and nonlife) also are important agents of plant diseases.

Classification of plant diseases commonly is based on causal agent: nonparasitic, virus, bacterial, fungus, etc. Classification also may be made according to plants affected. Host indices (lists of diseases known to occur on certain hosts) are valuable; e.g., when a new disease is found on a known host, a check into the index for the specific host may often lead to identification of the causal agent. Classifications according to symptoms have been tried, but they fail in many detailed approaches because one causal agent may induce several different symptoms which often intergrade.

The symptoms of plant diseases, though they may be quite variable, are frequently helpful in diagnosis. Among the more important symptoms are the following:

1. Change in colour. Instead of the normal green, leaves frequently are pale green or yellow (chlorotic) or spotted. Coloured spots vary – between red, green, yellow, brown and black. In some cases a separation of the epidermis of a leaf from the tissue below may cause "silvering".

2. Shot hole in leaves. Certain fungi and certain toxic agents induce in leaves many small holes, as though the leaf had been hit by shotgun pellets.

3. Wilt. Plants often droop and lean or fall over, usually from lack of water but sometimes from injury to the supporting stems or roots.

4. Death of the entire plant or of a part is called necrosis, a common symptom.

5. Stunting or failure to develop. This may involve the whole plant or only leaves and flowers.

6. Galls. An increase of size of cells is called hypertrophy. An increase in the number of cells is called hyperplasia. Often they occur together in galls.

7. Transformations occur when parts are replaced, as in ergot of grain, in corn smut or when flower petals develop as abortive green leaves.

8. Mummification involves the shriveling and drying of fruits.

9. Alterations in growth habit and in normal symmetry involve many changes in the stems, leaves and flowers.

10. Destruction of organs through changes in flowers and seeds, as in loose smuts of cereals.

11. Dropping of leaves, blossoms and fruits.

12. Production of malformations. They are of many kinds, including abnormal hairs, blisters, warts galls, cankers, witches' brooms, hairy root, curling, fusion of plant parts (fasciation) and deformation of fruits.

13. Extrusion of liquid or oozes. Examples are the sticky exudate in fire blight, slime flux of trees, formations of masses of gum, production of resin and exudation of milky sap.

14. Rots. The soft rots usually are watery and have a bad odour. They commonly are associated with soft tissue, dry rots with woody structures. Often the rots are characterized as root rots, stem rots, bud rots, fruit rots, wood rots and so on, depending upon the part affected.

EXERCISES

I. Speak about plant diseases and their symptoms using the following words and word-combinations:

symptoms of diseases helpful in diagnosis; change in colour, colored spots; shot hole in leaves; fungi and toxic agents; wilting; death of an entire plant or its part; stuting or failure to develop; hypertrophy and hyperplasia; transformation; mummification; alterations in growth habit; destruction of organs; dropping of leaves; blossoms and fruits; production of malformations; extrusion of liquid and oozes; rots.

II. Make up questions for the following answers concerning classification of plant diseases:

1. **A:**…

B: Certainly. Plants as well as animals are susceptible to many diseases.

2. **A:**…

B: As far as I know, classification of plant diseases is based on different principles: on causal agent, on disease symptoms and others.

3. **A:**…

B: According to the text they may be caused by nonparasitic factors and by living agents.

4. **A:**…

B: Well, non-parasitic factors include unfavourable temperature or humidity, unsuitable soil and light conditions, excess or deficiency of minerals, etc.

5. **A:**…

B: Judging from the text among living agents we distinguish bacteria, fungi, viruses.

III. Read the text one more time and be ready to answer the following questions:

1. What factors induce plant diseases?
2. When can chemicals provoke different plant damages?
3. How do high or low temperatures influence the plant development?
4. What are the causes of black heart in stored potatoes?
5. What in the reason of appearing apple scald?
6. What plant diseases can drought provoke?
7. How does the intensity of light influence the development of plants?
8. What elements do plants require for their normal growth?

TEXT 9
NONPARASITIC AGENTS

Injuries which occur because of "accidents", poisons or defects in the environment often result in diseased tissues. In addition, these injuries may enable microorganisms to enter secondarily and cause still further damage. The cause of such disease is sometimes obvious *(e.g.,* lightning or drought), but often it is obscure to untrained eyes. Only when the cause is known an intelligent search for a remedy or a means of prevention can be conducted.

Fire, water, frost, higher animals, insects and machinery as well as poor agricultural techniques may cause serious damage to crops and permit invasion by disease agents. Graft knots often follow badly fitted grafts on apple trees grown from piece-root grafts. Waste products such as noxious gas, smog, dust and smoke may provoke injuries.

Many chemicals are profitably used alone or in combinations to prevent damage by insects and microorganisms or to kill weeds. However, when these materials are applied improperly, serious physiological diseases may result. Such injuries are fairly common from improperly used sprays, seed treatments, fumigation, soil treatment, fertilizers, herbicides and hormones.

Plants in unfavourable environments may vary so far from their normal growth habits that they are considered diseased. In addition, such plants often are unusually subject to attack by microorganisms.

Too high temperatures may cause sun scald and death in the tips and margins of leaves. In some small plants, cankers develop at the soil surface where the temperature in direct sunlight may greatly exceed the air temperature. Frost injury is relatively common, but even low temperatures above freezing may cause damage, such as net necrosis in potatoes.

Drought often accompanies high temperatures and causes stunting, wilting and burning. On the other hand, if water covers the roots too long they may be damaged because of insufficient oxygen. An excess of water, if it falls on a warm day followed by a cool night, may induce flooding of the tissue with liquid. Such diseases result as water core of apples, celery heart rot and tomato blossom end rot. The last two often lead to invasion by secondary microorganisms. Abundant moisture usually favours infection by bacteria and fungi.

Both the intensity of light and the hours of daylight may have strong influences on the development of plants. With insufficient light, sun-loving plants may become chlorotic. In certain greenhouses a short day may combine with a high temperature. These conditions promote rapid but relatively succulent growth. Spindly growth thus formed may be more susceptible to attack by pathogens than normal growth is.

Poor aeration may cause black heart in stored potatoes. An accumulation of certain gases from the respiration of apples in storage may cause apple scald.

Plants require various essential elements for their normal growth. The classic ones include carbon, hydrogen, oxygen, nitrogen, sulfur, magnesium, iron, calcium, potassium and phosphorus; chlorine also has been listed as essential. In addition, many other trace elements are necessary, among them boron, zinc, copper and manganese. Characteristic symptoms occur with an excess or deficiency of mineral salts.

Thus a considerable group of nonparasitic or physiological diseases occur when, for one reason or another, the plant's physiology departs critically from the normal. In addition to their influences on the host plants, these environmental factors often affect the activities of pathogens, as well as interactions that result between hosts and pathogens.

EXERCISES

I. Answer the following questions using the information from the text:

1. What factors induce plant diseases?
2. When can chemicals provoke different plant damages?
3. How do high or low temperatures influence the plant development?

4. What are the causes of black heart in stored potatoes?
5. What in the reason of appearing apple scald?
6. What plant diseases can drought provoke?
7. How does the intensity of light influence the development of plants?
8. What elements do plants require for their normal growth?

II. Look through the text and finish the following sentences:

1. Plants in unfavourable environments …. .
2. Too high or low temperatures may cause …. .
3. Drought causes….
4. An excess of water may induce….
5. Poor aeration may lead to….
6. Plants require various essential elements for….
7. Environmental factors often affect….

III. Discuss the text "Nonparasitsc Agents" using introductory phrases for text discussion. Work in pairs:

1. **A:** What factors of environment can cause plant injury?
   B: According to the text ….
2. **A:** Can you explain the causes of appearing the following plant diseases: black heart in stored potatoes, apple scald, celery heart rot?
   B: As far as I know….
3. **A:** Does the improper application of chemicals cause diseases of plants?
   B: Judging from the text: … .
4. **A:** Plants require various elements for their normal growth: hydrogen, oxygen, phosphorus, iron and others. Can excess or deficiency of minerals bring the injury to plants?
   B: In my opinion….
5. **A:** Did you get any new information from the text? Can you apply it in your practical work?
   B: I think I could use this information in….

TEXT 10
VIRUSES

A number of infectious diseases result from viruses, particles visible only in the electron microscope and small enough to pass through a filter that excludes ordinary bacteria. Tobacco, potato, sugar beet, peach, orange and elm is only to begin the list of economic plants which are affected by viruses.

The plant disease symptoms caused by viruses include: (1) change in colour such as yellowing, mottling and vein clearing (becoming translucent); (2) malformations such as distortion, rosetting (close, tight whorls of leaves), proliferation and little or no leaf development between the veins: (3) necrosis such as leaf spots, rings, streak, wilt, droop and internal death, especially of phloem tissue; and (4) stunting. In some cases infected plants may carry the virus and show no disease; thus they are symptomless carriers which provide a source of inoculum for other host plants.

Transmission of viruses from one plant to another in some cases involves only touching a diseased plant and then touching a healthy one but in others it occurs less easily. Many viruses are carried by insects, especially aphids and leafhoppers. Transmission of a virus disease is practically assured by budding or grafting. Certain viruses have been able to persist in the soil. Seed transmission has not been common, but it has occurred, for example, with certain large-seeded legumes, melons and squash, stone fruits (*Primus* species), lettuce, barley and elm.

In many cases a single virus may infect a number of different kinds of plants, and a single kind of plant may be infected by a number of different viruses.

Control of viruses has been accomplished by using resistant plants, by destroying infected plants, by inspection and certification of disease-free stock, by quarantine and by other special means. Infected peach twigs and sugar cane shoots have been heat-treated for a short time so that the new plants developed from them and were free from viruses.

There are numerous virus diseases of plants, caused by the tobacco mosaic virus (TMV). Besides affecting many members of the night shade family (Solanaceae), which includes tobacco, tomato and potato, TMV occurs on some 30 species of plants in 14 other families. The symptoms characteristically appear as dark green spots irregularly elevated and scattered on the tobacco leaf. The remainder of the leaf becomes more and more pale green and some times yellow in colour. The name "mosaic" derives from these variable small blotches of different colours. The effects from TMV often are similar to those caused by the cucumber mosaic virus.

TMV, like some other viruses, is resistant to many unfavourable conditions. It has been the subject of many important fundamental researches on viruses that have led to a better understanding not only of plant viruses but also of animal and human viruses.

EXERCISES

I. Match the terms on the left with their definitions on the right:

1. Grower	a) a bacterium, virus or other microorganism causing diseases
2. Virus	b) the upper layer of the earth in which a plant grows
3. Leaf	c) an organism harmful to agriculture
4. Infection	d) an infective agent
5. Soil	e) that part of a plant or tree that contains the seeds and is used as food
6. Necrosis	f) one of the expanded, usually green, organs borne by the stem of a plant
7. Pest	g) death of a circumscribed piece of tissue or of an organ
8. Pathogen	h) a person who grows a particular type of a crop

II. Reread the text "Viruses". Ask your partner as many questions as possible and use them to make up a dialogue.

III. Say what special terms from the text can you use if you have to describe virus as a disease pathogen? Make a list of terms and learn them.

TEXT 11
BACTERIAL PLANT PATHOGENS AND SYMPTOMOLOGY

Bacteria are microscopic prokaryotic (a cell in which the nuclear material is not enclosed by a nuclear membrane) and, for the most part, single-celled microorganisms. A single teaspoon of healthy topsoil contains about a billion bacterial cells. The genetic material of bacteria consists of a single DNA molecule suspended in the cells cytoplasm. Bacteria do not have a true nucleus as do animals, plants and fungi. Some bacteria also have small gene-carrying entities within their cytoplasm called plasmids. They can be of different shape: coccus (spherical), bacillus (rod shaped) and spirochetes (spiral). Most phytopathogenic bacteria are rod shaped bacillus the only exception being *Streptomyces* (family Actinomycetes) which is a filamentous bacteria. Also, most of these bacteria have flagella which are whip-like structures projecting from a bacterium that functions as an organ of locomotion. Some species of bacteria have only one flagellum or a tuft of two or more flagella at one end of the cell. These are called polar flagella. Other species will have flagella distributed over the entire surface of the cell.

Over 150 different bacterial species incite diseases in plants. In general these diseases fall into the following categories: galls, wilts, local spots or lesions, scabs extensive lesions and soft rots. All these symptoms may grade into one another. Sometimes two or more bacteria, bacteria and insect or bacteria and fungi combine to produce a much more damaging disease than may be produced by one alone. After bacterial and fungus pathogens have entered a plant, saprophytic organism usually follow closely and assist in the disintegration of the injured or killed tissue.

Bacterial Galls: bacterial galls can be produced by the genus *Agrobacterium* and certain species of *Arthrobacter*, *Pseudomonas*, *Rhizobacter* and *Rhodococcus*. *Agrobacterium tumefaciens*, *A. rubi* and *A. vitis* alone are responsible for galls in over 390 plant genera worldwide. Galls of these genera have been referred to as crown gall, crown knot, root knot and root gall. Species of these bacteria are thought to be present in most agriculture soil. A wound in the host is required for the pathogen to gain entry into the host tissue. Gall tissue is composed of disorganized, randomly proliferating cells that multiply in the intercellular (between the cells) spaces in the vicinity of the wound. In the presence of the pathogen rapid and continuous cell division (hyperplasia and hypertrophy) of the plant tissue persists. Gall damage can be benign to deadly. Crown gall first appears as small, whitish, soft round overgrowths typically on the plants crown or at the main root. The colour of galls caused by *A. tumefaciens* can be orange-brown and as it enlarges the surface can become convoluted and dark brown.

Bacterial Vascular Wilts: Vascular wilts caused by bacteria primarily affect herbaceous plants such as vegetables, field crops, ornamentals and some tropical plants. The causal pathogen enters, multiplies in, and moves through the xylem vessels of the host plant and interferes with the translocation of nutrients and water by producing gum. The pathogen will often destroy parts of the cell wall of the xylem vessels resulting in pockets of bacteria, gums and cellular debris. The symptoms of bacterial wilt disease include wilting and death of the aboveground parts of the plant. In some cases bacterial ooze seeps out through stomata or cracks onto the surface of infected leaves. Usually this ooze does not occur until the infected plant tissue is dead.

Bacterial Soft Rots: Primarily the bacteria that cause soft rots in living plant tissue include *Erwinia spp*., *Pseudomonas spp*. *Bacillus spp*. And *Clostridium spp*. Many soft rots are caused by non- phyto pathogenic bacteria which are saprophytes that grow in tissue that has been killed by pathogenic or environmental causes. Soft rots attack a large number of hosts and are best known for causing disease in fleshy plant structures both above and below ground. These bacteria are almost always present where susceptible plants under stress are in the field or in storage. Soft rot pathogens enter the host through wounds. After entering the host tissue these bacteria produce enzymes that break down the middle lamella causing separation of the cells at the site of the infection. The cells die and disintegrate. Rotting tissue becomes watery and soft and bacteria will form a slimy foul smelling ooze that will ooze out of infected tissue. Bacterial ooze is diagnostic of soft rot diseases.

Bacterial scabs: bacterial scabs primarily infect belowground parts of plants such as potatoes. Common scab of potato is caused by Streptomyces scabies which cause localized scabby lesions on the outer surface of the tuber. Typically corky tissue will form below and around the lesion. Rot patogens can gain entrance into the host tissue through these lesions and further degrade the host.

EXERCISES

I. Look through the text and find biological terms of Latin origin. Give the context of their usage.

II. Look at the text for information and complete these sentences:

1. Bacterial galls can be produced… .
2. A wound in the host plant… .
3. Gall damage can be… .
4. Vascular wilts caused by bacteria… .
5. The causal pathogen… .
6. The symptoms of bacteria wilt… .
7. Bacteria, causing soft rots… .
8. Bacterial scabs primarily infect… .

III. Speak about the biology of a bacterium using the following words and expressions:

single-celled microorganism; bacterial cell; single DNA molecule; genetic material; gene-carrying entity, different shapes of bacteria; one, two or more flagella, to be termed as, coccus, bacillus, spirochetes.

TEXT 12
POWDERY MILDEW OF WHEAT

Powdery mildew, caused by Blumeria graminis f. sp. tritici, is widely distributed throughout the world, particularly in humid regions. Over the past 20 years, powdery mildew has been the most common disease of wheat in USA. It is most damaging in years with relatively mild weather during April and May. Mild temperatures, high relative humidity and dense stands of wheat favour mildew development. It is most prevalent on the lower leaves of susceptible varieties in late April or early May when wheat is in the joint to flag-leaf stage of development. This disease results in reduced kernel size and test weight, and ultimately lower yield. The earlier in the spring mildew begins to develop on the plant and the higher on the plant it develops by flowering the greater the yield loss. Greatest yield losses occur when the flag leaf becomes severely diseased by heading. Losses up to 45 percent have been documented on susceptible varieties when plants are infected in April and weather conditions are favourable for spread of the fungus throughout the growing season.

Powdery mildew can be recognized as fluffy white mold growth on leaf surfaces during cool, humid weather.

Figure 9.

Powdery mildew is characterized by a powdery white to grey fungal growth on leaves, stems and heads. The fluffy white pustules are first detected on the lowest leaves of plants in early to mid April. As the plant matures, the white powdery growth changes to a grey-brown colour. The leaf tissue on the opposite side of the leaf from the white mold growth becomes yellow, later turning tan or brown. Small, black fruiting bodies (cleistothecia) develop on leaves as plants mature in June. Cleistothecia are recognized as distinct round, black dots within older, grey colonies of powdery mildew. Cleistothecia contain spores (ascospores) that serve to infect wheat.

Most years, wheat becomes infected with powdery mildew in the fall soon after planting. Autumn infections on newly planted wheat result from spores produced on volunteer wheat plants or spores developing within cleistothecia. The mildew fungus survives over winter as cleistothecia on wheat straw or as mycelium on infected wheat. Conidia produced on wheat plants are wind dispersed. Conidia germinate and infect plants under cool, moist conditions. Infection does not require free water on the plant surfaces, but high relative humidity (near 100 percent) favours infection. Optimum development of powdery mildew occurs between 59 and 71 degrees F and is retarded above 77 degrees F. Under optimum conditions, a new crop of conidia are produced every 7 to 10 days. Mildew is more severe in dense stands of heavily fertilized wheat. Plants are most susceptible during periods of rapid growth, especially from stem elongation through heading growth stages. Some recommendations to be observed to control this disease.

1. Growing mildew resistant varieties is the most economical way to control powdery mildew. Wheat varieties vary in their resistance to powdery mildew and new races of the fungus develop that attack

previously resistant varieties. Therefore, it is important to get current information on the varieties with effective resistance to powdery mildew.

2. Powdery mildew thrives where high rates of nitrogen have been used. Nitrogen not only promotes tiller formation, causing dense stands, but also increases the susceptibility of the crop.

3. In fields with persistent disease problems, the wheat stubble and other residues should be tilled into the soil to permit disease causing fungi to die out before another wheat crop is planted.

4. Fungicides are available that provide excellent control of powdery mildew. Their application is based on scouting fields for symptoms and assessing disease severity from tiller elongation through flowering stages of growth. It is important to keep the top two leaves of the plant as disease free as possible so that the plant can use its full potential to fill the grain. Fungicides can be applied based on the level of disease in the field, the known susceptibility of the variety, and the selling price of the grain.

EXERCISES

I. Answer the following questions using the information from the text:

1. What patogens is this disease caused by?
2. What climatic conditions are favourable for powdery mildew spreading?
3. What losses (conseqeunces) does this disease bring?
4. What are the symptoms of this disease?
5. What control measures are taken to fight this disease?
6. Where and when do the cleistothecia develop?
7. What do the cleistothecia contain to infect wheat?
8. Under what conditions do conidia germinate and infect plants?
9. When does the optimum development of powdery mildew occur?
10. What recommendations should be observed to control powdery mildew?

II. Speak about powdery mildew symptoms basing on the following verb schemes:

… is caused by … ,

… is distributed … ,
… favour mildew development,
… results in …,
… occur when …,
… is characterized by …,
… changes to …,
… becomes yellow later turning tan or brown,
… develop on leaves,
… are recognized as …,
… survives over winter,
… are wind spread,
… germinate and infect …,
… is more severe in …,
… are most susceptible …. .

III. Discuss in pairs measures used to control powdery mildew of wheat. Use the following expressions in your discussion:

Resistant varieties, to control powdery mildew, disease susceptibility, high rates of nitrogen, to promote tiller formation, to increase the susceptibility of the crop, balanced fertilization program, to permit diseases causing fungi to die out, to lessen the amount of overwintering inoculum in the field, application of fungicidies, to provide exellent control of the disease.

TEXT 13
BACTERIAL LEAF STREAK

Bacterial leaf streak is a pathogen known to infect and damage wheat varieties. The pathogen has also been known to infect other small grain all cereal crops such as rice, barley and triticale. The strains of the pathogen are named differently according to the species they infect. It is one of the most destructive diseases in rice. Resistant wheat cultivars offer the best protection against yield loss, but little is known about the inheritance of resistance. The disease is most common on wheat and can be found on winter and summer wheat varieties.

Symptoms of this pathogen can be seen on the stem, leaves, and glumes. Stem symptoms are not always present, but can be seen as a dark brown to purple discoloration on the stem below the head and above the flag leaf. In the early stages of the disease, translucent water soaked streaks can be seen on the leaves often accompanied by a shiny glaze or clumps of dried bacteria on the leaf surface. These markings turn to brown lesions after just a few days, and may be surrounded by a lime green halo. Lesions can stretch the entire leaf blade. BLS exhibits similar symptoms to those of *Septoria nodorum*, a common fungal infection. A common sign that will distinguish this pathogen from *Septoria nodorum* is the lack of spores on the leaves, which appears as tiny black spots on the leaf surface with a *Septoria* infection. A cream to yellow colored bacterial ooze produced by BLS infected plant parts is also a distinguishing sign of the pathogen. Infected glumes, known as black chaff, are darkened and necrotic. Severe symptoms will result in kernels that are discolored due to black and purple streaks. Plants infected with bacterial leaf streak will exhibit an orange cast from leaf symptoms and suffer yield and quality loss.

Bacterial leaf streak of wheat is a seed-borne disease and is primarily transported by seed, but can also be transmitted by plant-to-plant contact within its lifecycle. Epidemics are typically observed late in the growing season and in wet environments. Moisture facilitates the release of the pathogen from the inoculated seed, which leads to leaf colonization and invasion of tissue. Bacteria on the moist leaf surface enter through leaf openings, such as the stomata or wounds. Under moderately warm weather conditions (15-30 degrees Celsius) bacteria will begin to release and multiply in the plant parenchyma tissue. The bacteria spreads and progresses vertically up the plant. The bacterial masses cause elongated streaks along the veins of the plant. Water collection on leaves also leads to the spread of the organism, increasing the number of lesions on leaves. Rain, wind, insects, and plant-to-plant contact may spread the disease in the season and cause reinfection. After the plant is harvested or dies, the bacteria may overwinter in the soil; although, its survival rate is much greater when crop debris is present. However, the bacteria cannot survive on decomposing matter alone and free bacteria cannot survive for more than 14 days in hot dry weather. Bacteria are primarily spread by infected or contaminated seed. In some cases, the bacterial will overwinter on other perennial plants and weeds. Residual bacteria in the soil, debris or other plants may also cause new infection in clean seed.

Environment

The disease can tolerate warm or freezing temperature, but favorable conditions for the disease include wet and humid weather. Irrigated fields provide a favorable environment for the disease. The disease has become quite prevalent in semi-tropical regions, but can found all over the world where wheat is grown. Strong winds that blow soils help contribute to the spread of disease. When the spread is initiated by wind-blown soil particles, symptoms will be found most readily towards the edges of the field.

Management of bacterial leaf streak

Bacterial leaf streak of wheat is not easily prevented, but can be controlled with clean seed and resistance. Some foliar products, such as pesticides and antibiotic compounds, have been tested for effectiveness, but have proven to have insignificant outcomes on the bacterial pathogen. Using clean seed, with little infection, has yielded effective results for researchers and producers. The pathogen, being seed-borne, can be controlled with the elimination of contaminated seed; however, clean seed is not always a sure solution. Because the pathogen may still live in the soil, the use of clean seed is only effective if both the soil and seed are free of the pathogen. Currently, there are no successful seed treatments available for producers to apply to wheat seed for the pathogen. Variety resistance is another option for control of the disease. Using integrated pest management techniques such as tillage to turn over the soil and bury the infection as well as rotating crops may assist with disease management.

EXERCISES

I. Answer the following questions using the information from the text:

1. What is bacterial leaf streak?
2. What is known about the inheritance of resistance?
3. Which plants is the disease most common?
4. What are the symptoms of this pathogen?
5. What is a common sign that will distinguish this pathogen from *Septoria nodorum?*
6. How is bacterial leaf streak transported?
7. What do the bacterial masses cause?
8. Can the bacteria survive on decomposing matter alone?

9. How are bacteria primarily spread?
10. What is the environment for the disease?
11. What is the management of bacterial leaf streak?
12. Are there any successful seed treatments available for producers to apply to wheat seed for the pathogen?

II. Match the following terms on the left with their definitions on the right:

1) Species	a) an amount produced of an agricultural or industrial product.
2) Cultivar	b) a very large group of microorganisms comprising one of the three domains of living organisms. They are prokaryotic, unicellular, and either free-living in soil or water or parasites of plants or animals.
3) Yield	c) the preparation of land for growing crops.
4) Resistance	d) a plant variety that has been produced in cultivation by selective breeding.
5) Glumes	e) any structural change in a bodily part resulting from injury or disease.
6) Symptom	f) the cellular tissue, typically soft and succulent, found chiefly in the softer parts of leaves, pulp of fruits, bark and pith of stems, etc.
7) Lesion	g) each of two membranous bracts surrounding the spikelet of a grass (forming the husk of a cereal grain) or one surrounding the florets of a sedge.
8) Parenchyma	h) a physical or mental feature which is regarded as indicating a condition of disease, particularly such a feature that is apparent to the patient.
9) Bacteria	i) a group of living organisms consisting of similar individuals capable of exchanging genes or interbreeding.
10) Tillage	j) the ability not to be affected by something, especially adversely.

III. Make a plan to the text and retell the text according to your plan.

PLANT PESTS AND DISEASES CONTROL

TEXT 14
CONTROL

Control of plant diseases covers a broad, highly technical and rapidly developing field of study. A technique effective with one disease may be ineffective for another. Also, the effective method for a disease in one situation may be ineffective for the same disease in other circumstances. Furthermore, with continuing research, improved procedures keep developing.

Various preventive measures are possible at each of the stages in the life history of plant pathogens.

The entrance of a microorganism into the host may be opposed, for example: (l) by employing chemical preventives such as sprays, dusts, disinfectants and wound dressings; (2) by using disease-escaping or resistant varieties; (3) by removing the host from the contaminating organism, as through the selection of disease-free seed and through rotation with other nonhost crops; and (4) by reducing the inoculum with available sanitary measures or with environmental conditions such as soil character, soil reaction, moisture and temperature that are unfavourable to the microorganism.

Establishment and multiplication of a pathogen in the host may be lessened, for example, by employing sprays which burn out initial mild infections, by pruning or excising diseased parts, by using resistant varieties and by providing environmental conditions unfavourable for the microorganism.

Exit of the pathogen from the host may be prevented by various sanitary measures including excision of diseased plant parts or destruction of diseased plants, removal of agents of distribution, such as insect vectors, and disinfection of contaminated tools.

Transfer or distribution of the causal agent may be reduced by various means, such as prevention of exit or entrance, removal of alternate and weed hosts, control of insect vectors, disinfection of tools, shipping containers and other contaminated materials, use of disease-free or disinfected seed, use of chemical or other sanitation procedures and enforcement of inspection and quarantine measures.

Control measures have been classified in various ways: they include the use of inhibiting agents, proper cultural practices, repulsion of disseminating insects and development of disease-resistant varieties.

Applications of inhibiting agents are effective preventive measures for certain diseases. Diseased seed may be treated in some cases by hot water and in others by various disinfecting solutions, slurries or dusts. Hot water has been effective for loose smut of barley, and various chemicals have controlled smut of oats and bunt or stinking smut of wheat. Seed treatments may be considered wherever the pathogen is carried by seed; suitable machines have been developed for treating seed. Sprays on growing plants are important in the control of such diseases as apple scab, cherry leaf spot, cucumber downy mildew and potato late blight. Direct attack on pathogens by eradicant fungicides has shown promise against apple scab. Many of the sprays are combined so that one application acts against both insects and plant pathogens. Large industries have developed to supply both the chemicals and the machinery for applying them.

EXERCISES

I. Answer the following questions using the information from the text:

1. What control measures are described in the text? Are they effective for all the diseases?
2. How may the entrance of a microorganism into the host be opposed?
3. How may we lessen the establishment and multiplication of a pathogen in the host?
4. How may we prevent the exit of the pathogen from the host?
5. How may the transfer or distribution of the causal agent be reduced?
6. How may a diseased seed be treated?
7. What has hot water been effective for?
8. What diseases are controlled with the help of sprays?

II. Match the following terms on the left with their definitions on the right:

1. Vulnerable	a) exposed to the possibility of being attacked or harmed, either physically or

	emotionally
2. Pathogen	b) a small arthropod animal that has six legs and generally one or two pairs of wings
3. Prune	c) a bacterium, virus, or other micro-organism that can cause disease
4. Insect	d) a chemical that destroys fungus
5. Slurry	e) offering resistance to something or someone
6. Smut	f) to trim (a tree, shrub, or bush) by cutting away dead or overgrown branches or stems, especially to increase fruitfulness and growth
7. Fungicide	g) a substance used for inoculation
8. Prevent	h) a fungal disease of cereals in which parts of the ear change to black powder
9. Resistant	i) a semi-liquid mixture, typically of fine particles of manure, cement, or coal and water
10. Inoculum	j) keep (something) from happening

III. Make a plan to the text and retell the text according to your plan.

TEXT 15
CHEMICAL PEST CONTROL

All pesticides act alike in blocking some metabolic process. They differ, however, in composition, potency, mode of action, speed of effect, dosage required, and stage of pest against which they may be used. They are often classified according to the type of organism they are principally intended to control as rodenticide, insecticide, acaricide (against mites), nematicide (against roundworms), herbicide (against plants), fungicide, etc.

Insecticides can be classified on the basis of their chemistry, toxicological action, or principal method of penetration. The method of penetration scheme allows insecticides to be listed as stomach poisons, contact poisons, fumigants, or systemics. The distinction between these latter categories is somewhat arbitrary and a given compound may fall into two or more of them.

Stomach poisons are used against insects with biting mouthparts, such as caterpillars, and are toxic only if ingested.

Contact poisons penetrate the skin of the pest and are used against those arthropods, such as aphids, that pierce the surface of a plant and suck out juices.

Fumigants are used mainly for killing insect pests of stored products or nursery stock.

Systemic poisons are absorbed into a plant and later kill sucking insects and mites feeding on it. Absorption into the plant is achieved by spraying the leaves and stems or by applying solutions or granules impregnated with the chemical to the soil, so that intake occurs through the roots.

Because many insecticides also kill mites, the separation of this group of pesticides is somewhat arbitrary.

Repellents repulse animals rather than kill them. They are used mainly against mosquitoes, bloodsucking flies, and chiggers. Dimethyl phthalate is an example of repellents that is used to protect humans from insect attack.

Chemosterilants inhibit reproduction of insect pests rather than killing them directly.

Although considerable effort has been expended in the development of antibiotics as fungicides and bactericides, they have not been used commercially, largely because they may kill desirable vegetation.

Most fungicides are protectants and must be applied before diseases develop although some can arrest the disease if it is already present. Several groups of compounds can be used as fungicides: (1) the inorganics are still widely used; (2) organic mercury compounds are used for the treatment of seeds, bulbs, and corms; (3) dithiocarbamates can be used as a spray or as a soil drench; (4) chlorine-based compounds are used against a wide range of crop diseases.

Herbicides can be broadly divided into nonselective, which kill all plants, and selective, which kill only certain groups of plants. Herbicides are derived from a wide range of chemical groups: inorganic compounds, metal-organic compounds, carboxylic aromatic compounds, aliphatic acid compounds, heterocyclic nitrogen derivatives, aliphatic organic nitrogen compounds, and others.

Because rodents are probably the chief vertebrate pests, many chemicals have been developed to combat them; however, many rodenticides may be used against other vertebrate pests as well. The highly toxic rodenticides are: (1) the inorganics; (2) the botanicals; (3) the anticoagulants; and (4) the fluorides. The insecticide rotenone is also a potent fish poison. Specific poisons have been developed for certain rats and for the lamprey.

EXERCISES

I. Answer the following questions using the information from the text:

1. What is the similarity of pesticides?
2. How do they differ?
3. How can pesticides be classified?
4. When are stomach poisons used?
5. What is the effect of using contact poisons?
6. When do we use fumigants?
7. What are repellents used for?
8. When are fungicides used?
9. What groups of compounds can be used as fungicides?
10. In what groups can we divide herbicides?
11. What are the highly toxic rodenticides?

II. Make up a summary to the text.

III. Match the following terms on the left with their definitions on the right:

1. Rodenticide	a) a substance poisonous to mites or ticks
2. Insecticide	b) a chemical that destroys fungus
3. Herbicide	c) a substance used to kill nematode worms.
4. Fungicide	d) a minute arachnid which has four pairs of legs when adult, related to the ticks. Many kinds live in the soil and a number are parasitic on plants or animals
5. Acaricide	e) the larva of a butterfly or moth, which has a segmented body resembling a worm with three pairs of true legs and several pairs of leg-like appendages

6. Poison	f) a substance that is toxic to plants, used to destroy unwanted vegetation
7. Caterpillar	a poison used to kill rodents
8. Nematicide	g) rodent a gnawing mammal of an order that includes rats, mice, squirrels, hamsters, porcupines, and their relatives, distinguished by strong constantly growing incisors and no canine teeth. They constitute the largest order of mammals
9. Rodent	h) a substance that when introduced into or absorbed by a living organism causes illness or death
10. Mite	i) a substance used for killing insects

TEXT 16
PEST CONTROL

When man hunted animals and foraged for food he shared the natural resources with other organisms in the community. As man's culture developed and his population rose, he made ever-increasing demands on these resources. In order to satisfy these increasing demands, man has modified his environment with little regard for the biological consequences of his actions.

One result of changing the environment has been a great increase in the number of species that are now recognized as competitors of man. These competitors are usually referred to as pests. The definition of pest is, of course, subjective. An ecologist would not necessarily consider several leaf-eating caterpillars on a plant as pests, whereas a gardener who cultivated the plant might very well do so. And only one bat, rat, or mouse is enough to qualify as a household pest. As the term will be used in this text, however, a pest is an animal or plant that occurs in such abundance as to present a distinct threat, economically or medically, to man or his interests.

Natural communities have always contained organisms that were economically significant; locusts, for example, have plagued man throughout history, and grain from Stone Age locations has been found infected with bunt and ergot diseases. Most species that became pests, however, did so because of environmental modification, occasionally from natural causes but usually from the activities of man.

In order to appreciate some of the methods devised to combat pests, it is instructive to consider how advancing technology has increased the number of harmful insect species. The change from natural vegetation to large areas of single-crop (monoculture) agriculture has three consequences. First, given a more uniform plant cover, some plant-eating species increase to large populations. Second, uniform vegetation is easily invaded by attacking pests. Third, the introduction of new crops over large areas results in the transfer of previously harmless insects from scattered native plants to the new and abundant sources of food. Cultural practices such as fertilization, irrigation, and the use of selected varieties as crops enhance still further the ability of pest species to increase rapidly in abundance. Additional reasons for the increase in the number of pest problems include the increasingly higher standards of crop production, and the occurrence of unintended effects in some pest control programs.

Pests are found throughout the plant and animal kingdoms. Weeds are often strong competitors of crop plants. Microorganisms such as fungi, bacteria, and viruses are here considered with the pests even though they are usually thought of as agents of disease. Most animal pests are invertebrates, among them protozoa, flatworms, nematodes, snails, slugs, insects, and mites. Among the vertebrates, rabbits, elk, deer, and many kinds of rodents are sometimes injurious to crops. Because weeds, plant diseases, and arthropods (insects and mites) constitute the chief threats to the welfare of man, the development of pest control has been directed mostly toward restricting the abundance of these forms.

In spite of the immense efforts expended in controlling pests, their significance for man appears to be increasing. Pesticides have contributed toward the evolution of pests that are increasingly difficult to control and have often caused the replacement of one species of pest by another. Toxic materials have polluted biotic communities throughout the world. As a result the effect of these materials on living organisms has become a matter of major concern.

EXERCISES

I. Using the questions given below make up a dialogue:

1. What did a man do to satisfy his increasing demands?
2. What are the competitors of a man?
3. What is the definition of a pest?

4. Why did most species become pests?
5. What are the consequences of the change from natural vegetation to large areas of single-crop (monoculture) agriculture?
6. What are cultural practices?
7. What is a strong competitor of crops?
8. What do you know about invertebrates and vertebrates?

II. Speak about pest control using the following supporting word-groups:

… to satisfy… ,
… has modified… ,
… are referred to… ,
… devised to… ,
… to consider… ,
… is invaded by… ,
… has been directed toward… ,
… have caused … ,
… have polluted… .

TEXT 17
INTEGRATED PEST CONTROL

The term pest management is a summary definition of integrated control practices. Pest management implies both the manipulation of the populations to maintain them at noneconomic levels of abundance and the eradication of a pest species when this is attainable and desirable.

In developing an integrated program there are two groups of facts that must be determined in some detail. These are the structure of the agricultural ecosystem and the population densities of the pests below which little economic damage will occur.

Agricultural ecosystems are usually based on one or a few species of plants and so are relatively simple compared with their natural counterparts. An agricultural ecosystem comprises all of the organisms in a given farm location, together with the physical environment that prevails there. Usually, precise geographic limitations cannot be placed on the extent of such an ecosystem, but a sufficiently large area must be considered so that all of the biotic elements having an effect on pest density are capable of being evaluated. Thus the area surrounding a group of cultivated fields cannot be ignored, for it may harbour reservoirs of pests and their natural enemies. If some of these species are wide-ranging, their biology may require investigation.

An integrated program requires a determination of the density of each pest that will result in economic damage to the crop. This is a difficult task because it involves estimating a series of factors, some biological and some economic.

Many biological factors may alter the evaluation of pest density in relation to pest damage. The susceptibility of a given plant to attack can be modified by variation in the physical environment, stage of development of the plant, irrigation, fertilization, and variety of crop. The type of injury that is sustained by the plant is quite important in determining to what extent a pest may be tolerated before economic injury results.

One important consequence of the concept of an economic threshold of pest damage is the acceptance by growers of noneconomic levels of pest populations in the agricultural ecosystem.

Pesticides are the main tools in pest control, and an integrated program attempts to minimize their disruptive effects on the agricultural ecosystem by making them as selective as possible.

Selectivity of even the broad-spectrum insecticides may be increased by the manner in which they are used. A limited area of pest infestation can be treated. A degree of selectivity can be achieved by applying pesticides at a time when beneficial insects are elsewhere or are protected. Selectivity can be increased by lowering the dosage of a pesticide.

Natural enemies should be fostered as much as possible, and the use of selective pesticides, when available, is an important means of accomplishing this. Food for natural enemies has been provided, in some cases, by maintaining an acceptable population level of pests in special plantings of alternate crops that support the pest or other hosts.

In addition to pesticide selectivity and enhancement of natural enemies, other components may be added to an integrated program. Resistant varieties may be used to augment control by natural enemies, which may not be completely effective alone. Insecticides can be combined with microbial agents; when this can be done, dosages of each agent can be reduced. Chemicals can be combined with attractants to reduce populations yet limit pesticide distribution. The sterile-insect method works best when pest densities are low; an initial application of an insecticide can produce the necessary low densities.

EXERCISES

I. Match the following terms on the left with their definitions on the right:

1. Damage	a) a person or thing that corresponds to or has the same function as another person or thing in a different place or situation
2. Ecosystem	b) the quality of carefully choosing someone or something as the best or most suitable
3. Counterpart	c) physical harm that impairs the value, usefulness, or normal function of something
4. Selectivity	d) a thing that harms or weakens something else
5. Species	e) the act or procedure of sterilizing or making sterile
6. Enemy	f) a system involving the interactions between a community of living organisms in a particular area and its nonliving environment
7. Investigation	g) a person who grows a particular type of crop
8. Sterilization	h) a group of living organisms consisting of similar individuals capable of exchanging genes or interbreeding
9. Grower	i) any substance used in or resulting from a reaction involving changes to atoms or molecules, especially one derived artificially for practical use
10. Chemical	j) the action of investigating something or someone; formal or systematic examination or research

II. Complete the following sentences with an appropriate word from the list. Make sure you use the correct form:

III. Look through the text and finish the following sentences:

1. Agricultural ecosystems are … .
2. An agricultural ecosystem comprises … .
3. Pest management implies … .
4. An integrated program requires… .
5. Many biological factors may alter… .
6. Pesticides are… .
7. Resistant varieties may be used to… .

IV. Discuss the text "Integrated Pest Control" using introductory phrases for text discussion" .

1. **A:** What is a pest management?
   B: In my opinion …
2. **A:** What is an agricultural ecosystem?
   B: As far as I know…
3. **A:** Is an integrated program an easy task?
   Why?
   B: Just the contrary…
4. **A:** What are the combination methods of integrated control?
   B: As far as I know …
5. **A:** Can you describe each method of integrated control?
   B: It is a common knowledge that …

TEXT 18
ORGANIC PEST AND DISEASE MANAGEMENT

Organic farmers do not usually have major problems with insects and plant diseases in field crops. There are two factors working in the organic farmer's favor. Plant and insect diversity is greater in the more complex agro-ecosystem, and plants fertilized by slow-release compost are more resistant to insects and disease. Problems with insects and disease can usually be traced to either the health of the soil or inappropriate crop rotation.

1. A diverse ecosystem is the first line of defense

A crop grown as part of a rotation will not be as vulnerable to pests. Growing the same crop or those susceptible to the same disease, in the same place, results in the progressive build-up of disease organisms in the soil. Rotations break the life cycle of pest species. For example, corn rootworm is only a problem if corn is grown in the same place two years running.

The vast majority of insects cause no economic damage, and the best form of pest control is to have a balance of pests and predators on the farm. Providing a range of habitats to encourage a diverse population of wildlife on the farm, including spiders, birds, frogs and toads, will help to control pest species.

A range of shelter and food can be provided for the predators and parasites by intercropping (having two crops grow together like grains and legumes, or corn and beans), strip cropping (e.g., strips of row crops alternating with forage species), keeping hedgerows (rows of natural bush surrounding the fields) and even allowing some weeds grow in the field.

Some weeds can have a positive effect on the dynamics of beneficial insects; parasitic wasps for example, are attracted to weeds with small flowers. Research has shown that outbreaks of certain crop pests are more likely in weed-free fields. Obviously, care is needed to avoid weed competition with the crop, and some weeds could favor the pest, so each situation needs to be looked at separately. In some cases, mowing weeds at the field edge results in beneficial moving into the crop where they are needed.

Some plant species act as attractants for certain insects, and growing that plant together with the production crop or around the edge of the field or along the fence rows can benefit your production crop. For example, sawflies prefer to lay their eggs in bromegrass rather than spring wheat, and as the bromegrass also harbors many of the native parasites of the sawfly, few sawflies survive. In cases where a crop is disliked by a pest insect, the crop can be used as a barrier. Planting yellow sweet clover around the edge of a wheat field has been suggested as a means of preventing grasshoppers from moving into the wheat.

2. Maintaining a balance of nutrients in the soil

The importance of a balanced source of fertilizer on the health of the soil cannot be over-emphasized. There is a great deal of anecdotal evidence that organic farms have a lower incidence of disease. One explanation for this is that the slow release of nutrients from compost and green manures maintains the biological balance in the soil.

A disturbed mineral balance in the soil and subsequently in the plants can lead to metabolic disorders in livestock. For example, grass tetany in livestock occurs most frequently when grazing heavily-fertilized pastures. It is caused by low blood magnesium, resulting from deficiencies of magnesium in the forage brought about by high levels of nitrogen and potassium in the soil.

It is important to match crops to the fertility level of the soil. After a high nitrogen plowdown, do not grow oats; plant a crop that is a heavy feeder. Weak crops or crops lush from too much nitrogen are more attractive to pests and fungal disease. The reproductive rates of most pest insects are proportional to the supply of certain amino acids in their diet. Excess fertility increases the supply of these amino acids in plant tissue and the pest numbers increase too rapidly for natural enemies to control. Low levels of soil nitrates reduce the incidence of pest outbreaks.

3. Environmental conditions

Adverse environmental conditions can put crops under stress, making them more vulnerable to pests and diseases. Proper management can modify these conditions or prevent them from arising, making the environment more amenable to crops.

Select the appropriate field for the crop. Moisture – too little or too much – can be a source of stress. If crops are drought-stressed, they are more vulnerable to insects. On the other hand, if alfalfa is planted in poorly drained soil, it will be vulnerable to root rot such as Phytophthora.

Environmental management can provide optimum growing conditions. Plant windbreaks modify air flow, help snow retention and conserve moisture. Research has shown that yields increase 10 per cent in corn and 20 per cent in soybeans in the lee of windbreaks up to a distance of 12 times the height of the barrier on the downwind side and 5 times on the windward side.

4. Preventative management

Other management practices will help in pest control.

• Change the planting date to avoid certain problems. For example, barley yellow leaf is transmitted by aphids. Late planting of winter wheat and early seeding of spring grains will help avoid infection.

• Use sound, clean, high-quality seed from disease-free fields. Seed cleaning is crucial because debris associated with seed, like plant residue and weed seeds, can carry diseases.

• Seeding disease-resistant varieties is helpful but not the final answer. Disease-resistant varieties for many of the rusts and smuts are available

EXERCISES

I. Answer the following questions using the information given in the text:

1. Which are the two factors working in the organic farmer's favor?
2. What is the result of growing the same crop or those susceptible to the same disease, in the same place?
3. What breaks the life cycle of pest species?
4. What helps to control pest species?
5. In which case can the crop be used as a barrier?

6. How can you explain that organic farms have a lower incidence of disease?
7. Why is it important to match crops to the fertility level of the soil?
8. Why are favourable environmental conditions important?
9. How do plant windbreaks help?
10. What are the other management practices which will help in pest control?

II. Find the terms in the text which describe the following:

- they break the life cycle of pest species;
- it is only a problem if corn is grown in the same place two years running;
- strips of row crops alternating with forage species;
- rows of natural bush surrounding the fields;
- it increases the supply of these amino acids in plant tissue and the pest numbers increase too rapidly for natural enemies to control;
- they modify air flow, help snow retention and conserve moisture.

III. Speak about:

1) a diverse ecosystem as the first line of defense;
2) maintaining a balance of nutrients in the soil;
3) environmental conditions for pest and disease management;
4) preventative management.

TEXT 19
PLANT QUARANTINE

Plant quarantine is that branch of law enforcement established by a country to prevent the introduction and distribution of foreign plant pests, principally insects and plant diseases, within its boundaries. The objective is to protect a nation's agriculture and horticulture from injury by any type of foreign plant pest that may be introduced.

Plant quarantine prohibitions and restrictions, applying to both the individual and the commercial shipper of such material, affect the importation of plants and plant products into most countries of the world. Plant quarantine regulations usually provide that before restricted plant material may be brought into the country the importer must apply in writing to the department of agriculture or equivalent agency for an import permit authorizing the entry of the desired items. Such a permit is also known as a certificate of introduction or import license. This application allows the plant quarantine service to determine whether the consignment is prohibited entry may enter under certain safeguards or is entitled to unrestricted entry. An import permit also informs the importer of any requirements for a phytosanitary or health certificate from the department of agriculture or some authorized official of the country of origin, certifying that the material has been officially inspected. Certification may also be required from the country of origin that the area where the material was grown is free of a particular pest, that the material was inspected in the field during the growing season or was grown beyond a certain distance from an area known to be infested by a specified pest, or that the material has been fumigated, disinfected or otherwise treated. The permit may also specify the port through which the material must be entered and the mode of transportation.

Upon arrival under the terms of the import permit, imported material, in general, is still subject to inspection by the plant quarantine service of the country of destination. If found infested or infected by injurious insects or plant diseases the material may require fumigation or other treatment. If such treatment is ineffective, the material may be destroyed or returned to the country of origin. Plant material for scientific purposes may enter under special provisions.

A comprehensive national plant quarantine service provides for the following:

1. Inspection stations at all important maritime, border and air ports of arrival to enforce all plant quarantine prohibitions and restrictions prescribed by the national government.

2. Inspection of surface ships and aircraft and their cargoes, stores and baggage, as well as arriving mail, express shipments and freight, at all ports of entry. In addition, at land ports of arrival, inspections are made of pedestrian, passenger-car and truck traffic, freight cars, passenger trains and dining cars. This inspection is for the purpose of determining whether arriving plant products meet the requirements for entry, or whether they must be treated, destroyed or re-exported.

3. Fumigation or other treatment of any type of carrier, cargo or products, or destruction of infested products or packing materials, when necessary to ensure freedom from injurious pests. Release of an agricultural insecticidal aerosol in foreign aircraft may be required immediately upon landing.

4. Inspection of domestic plants and plant products intended for export and certification of the products to meet the phytosanitary requirements of the country of destination.

EXERCISES

I. Answer the following questions using the information given in the text:

1. What is “plant quarantine”?
2. What is the objective of plant quarantine?
3. What do plant quarantine prohibitions and restrictions affect?
4. What do plant quarantine regulations provide?
5. What does an import permit inform?
6. When may certification be required?
7. Is imported material still subject to inspection upon arrival?
8. What happens if infested or infected material by injurious insects or plant diseases is found?
9. What does national government prescribe?

What is inspected at land ports of arrival?

III. Speak about a comprehensive national plant quarantine service.

IV. Make up a summary to the text.

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