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Chapter 1 : Economic Importance of Insects

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This article was written by Dr. Much of the winter wheat in Oklahoma is sown with the intent of being used as a dual-purpose crop. In a grain-only system, wheat is generally planted in October, but in a dual-purpose system wheat is planted in early to mid-September to maximize forage production. WCMs and these viruses survive in crops such as wheat, corn, and sorghum as well as many grassy weeds and volunteer wheat. In the fall, WCMs spread to emerging seedling wheat, feed on that seedling wheat, and transmit virus to the young wheat plants. Given this disease cycle, it is easy to see several factors that determine the incidence and severity of these diseases. First, controlling volunteer wheat and other grassy weeds that serve as alternative hosts for the mite and the viruses is imperative to help limit these diseases. Often an infected field of commercial wheat is growing immediately adjacent to a field left fallow during the fall and winter Figure 2. Wheat infected in the fall will be severely damaged the next spring. Wheat infected in the spring also is damaged, but not as severely as wheat infected in the fall. Hence, it is imperative to do yourself and your neighbors a favor by controlling volunteer wheat and grassy weeds in fields left fallow â€” especially, if they are adjacent to commercial wheat fields. A second factor linked to the severity of these mite-transmitted virus diseases is planting date. Early planting dates associated with grazing provides for a much longer time period in the fall for mites to spread to and infect seedling wheat. Planting later in the fall after October 1 in northern OK and after October 15 in southern OK and controlling volunteer wheat are the two practices that can be employed to help manage these diseases. Thus, completely killing or destroying volunteer wheat for a period of at least two weeks prior to emergence of seedling wheat will greatly reduce mite numbers in the fall. The incidence and severity of these mite-transmitted virus diseases as affected by planting date can be illustrated by the number of samples that tested positive for WSMV and HPV in compared to For a number of reasons, the planting date of wheat across Oklahoma in the fall of was significantly later than the fall of I believe this helped to lower incidence and severity of the mite-transmitted viruses in Oklahoma in compared to Regarding resistant varieties, there are several winter wheat varieties that have resistance to either WSM or the curl mites, but the adaptation of these varieties to Oklahoma is limited, and the resistance is not typically an absolute resistance to the disease. Hence, severe and continuous disease pressure especially at higher temperature greater than about 75 F can overcome the resistance. Three Virus Diseases of Wheat in Oklahoma at: Viruses that cause BYD are transmitted by many cereal-feeding aphids Figure 3. BYD infections that occur in the fall are the most severe because virus has a longer time to damage plants as compared to infections that occur in the spring. Several steps can be taken to help manage BYD. First, a later planting date after October 1 in northern Oklahoma and after October 15 in southern Oklahoma helps reduce the opportunity for fall infection. Second, some wheat varieties e. Third, control aphids that transmit the viruses that cause BYD. This can be done by applying contact insecticides to kill aphids, or by treating seed before planting with a systemic insecticide. Unfortunately, by the time contact insecticides are applied, aphids frequently have already transmitted the viruses that cause BYD. Systemic seed-treatment insecticides containing imidacloprid or thiamethoxam can control aphids during the fall after planting. This may be particularly beneficial if wheat is planted early to obtain forage. Be sure to thoroughly read the label before applying any chemical. Hessian fly Figure 4 infestations can occur in the fall and spring. Fall infestations arise from over-summering pupae that emerge when climate conditions become favorable. However, such a planting date does not apply in Oklahoma because Hessian fly can emerge in Oklahoma as late as December Figure 5. This is because smaller, supplementary broods of adult flies emerge throughout the fall and winter. Some wheat varieties are either resistant e. Hessian fly infestations can be reduced somewhat by destroying volunteer wheat in and around the field at least two weeks prior to emergence of seedling wheat. Seed treatments that contain imidacloprid or thiamethoxam will also help reduce fly fall infestations, especially if combined with delayed planting and volunteer destruction. Root and foot rots: These are caused by fungi and include several diseases such as dryland Fusarium root rot, Rhizoctonia root rot sharp eyespot , common root rot, take-all, and eyespot strawbreaker Figure 6. During the late spring of and , several samples of wheat were received that were diagnosed as being affected by take all and other root rots. In , the incidence and severity of root rots across Oklahoma dramatically increased. This increase likely resulted from weather conditions that favored the root rots. Dryland Fusarium root rot was the most common root rot observed, and caused significant damage to wheat in southwestern, western, northwestern OK as well as the panhandle. Controlling root and foot rots is difficult. There are no resistant varieties, and although fungicide seed treatments with activity toward the root and foot rots are available, their activity usually involves early-season control or suppression rather than control at a consistently high level throughout the season. Later planting after October 1 in northern Oklahoma and after October 15 in southern Oklahoma also can help reduce the incidence and severity of root rots, but planting later will not entirely eliminate the presence or effects of root rots. For some root rots, there are specific factors that contribute to disease incidence and severity. OSU soil test recommendations factor in this phenomenon by reducing lime recommendations when continuous wheat is the intended crop. Another practice that can help limit take-all and some of the other root rots is the elimination of residue. However, elimination of residue by tillage or burning does not seem to affect the incidence or severity of eyespot strawbreaker. Control of bunts and smuts, including common bunt also called stinking smut and loose smut. The similarity of these names can be confusing. All affect the grain of wheat, but whereas common bunt and flag smut spores carryover on seed or in the soil, loose smut carries over in the seed. If common bunt stinking smut was observed in a field and that field is to be planted again with wheat, then planting certified wheat seed treated with a fungicide effective against common bunt is strongly recommended. If either common bunt or loose smut was observed in a field, grain harvested from that field should not be used as seed the next year. Enhance seedling emergence, stand establishment and forage production by suppressing root, crown and foot rots. This can be achieved by using a seed treatment containing an insecticide. Be sure that the treatment includes an insecticide labeled for control of aphids. Control fall foliar diseases including leaf rust and powdery mildew. Seed treatments are effective in controlling foliar diseases especially leaf rust and powdery mildew in the fall, which may reduce the inoculum level of these diseases in the spring. However, this control should be viewed as an added benefit and not necessarily as a sole reason to use a seed treatment. Suppression of early emerged Hessian fly. Research suggests that some suppression can be achieved, but an insecticide seed treatment has little residual activity past the seedling stage.

Chapter 2 : Insects Pests of Wheat | Agriculture Information Bank

*Essay on the Insects and Diseases Injurious to the Wheat Crops (Classic Reprint) [H. Y. Hind] on calendrierdelascience.com *FREE* shipping on qualifying offers. Excerpt from Essay on the Insects and Diseases Injurious to the Wheat Crops The essay to be furnished to the Bureau by the 15th day of January next; and to be designated by a mot-to.*

All insects have natural enemies which, in addition to weather and food supply, limit their populations. This process, unaided and often unrecognized by man, is termed natural control. It is important to recognize the impact of natural control factors and, where possible, encourage their action. Biological control is the use of natural enemies to control insect pests. The ancient Chinese distributed nests of predatory ants among citrus trees to control caterpillars and borers. Today, biological control is an increasingly important component of integrated pest management IPM programs for agriculture as well as for urban environments. Biological control does not present the human health and environmental concerns associated with chemical pesticide use. Nor is there much chance pests will develop resistance to natural enemies, as commonly occurs with insecticides. However, there should be different expectations for biological control than for chemical control. Natural enemies are living organisms with specific environmental requirements and behaviors. While insecticides often produce rapid, uniform control of insect pests, weeks, months or even years may be required before natural enemies effectively control pests. As biological control takes effect and pests become scarce, their natural enemies may leave the area. Adverse weather conditions or changes in crop production practices also can reduce populations of natural enemies. In both cases, pest outbreaks may recur. Using biological control effectively requires a good understanding of the biology of the pest and its natural enemies, as well as the ability to identify their life stages in the field. Frequent field scouting also is necessary to monitor natural enemies and evaluate their impact on pest populations. These practices include cultural control, planting pest resistant varieties and using selective insecticides when other practices fail to keep pest numbers below the economic threshold. Parasites are insects that require only one host to complete their development. The adult typically lays her egg in or on the host. The parasite larva feeds on the host, eventually killing it. Parasites often attack only one or a few related pest species. Many important parasites are small wasps and flies. Predators are the lions and wolves of the insect world. During their life cycles they eat many insect pests. Predators usually feed on a greater variety of insect species than do parasites. Lady beetles and lacewing larvae are common insect predators. Insects are subject to diseases caused by viruses, bacteria, nematodes and fungal pathogens. Disease outbreaks can rapidly reduce the populations of pest species when conditions favor infection and transmission. Some pathogens are commercially cultured and sold, and can be used much like an insecticide for pest control. Importation is the release of natural enemies into areas where they do not occur naturally. Some pest species have been accidentally brought into the U. If successful, the natural enemy will establish permanent populations and control the pest without the need for further releases. Conservation is the protection and encouragement of existing populations of natural enemies. It is important to recognize natural enemies in the field and be aware of their beneficial actions. Natural enemies can be protected by minimizing insecticide treatments and, when possible, selecting products less toxic to beneficial insects. It is sometimes possible to modify cultural practices so that they favor the development of natural pest enemies. Augmentation is the purchase and periodic release of natural enemies that do not naturally occur in sufficient numbers to provide pest control. As an example, parasitic wasps and predatory mites are commercially reared and sold for the control of pests in greenhouses. Augmentative releases may be designed to "seed" natural enemy populations by releasing a few insects in the hope that they will increase rapidly to effective numbers inoculative releases. Or, they may involve the release of large numbers of natural enemies to rapidly reduce pest infestations inundative releases. Augmentative releases are often used much like an insecticide. However, because natural enemies are living organisms, their effects are much more complex and variable than those of chemical insecticides. Release programs may fail if too few beneficial insects are released, weather conditions are unfavorable for their survival or reproduction, releases are not properly timed, the beneficials leave the field, or the species released is not adapted to the particular pest or crop situation. Important questions to ask when considering an augmentation program include: Has research shown that a release program is effective for the particular pest, crop and local situation? Are the proposed release rates sufficient to protect crop yields? Will the species of natural enemy to be used attack the target pest? Are releases compatible with the need to apply insecticides for other crop pests and with other crop production practices? Are the natural enemies alive and active when released? What quality control practices does the company use? What directions and assistance does the company provide regarding the handling, release and evaluation of the natural enemy? Discuss your pest situation with several different companies to determine which seems most knowledgeable about its product and your pest problem. It is important to recognize beneficial insects and consider their impact on pest infestations when making pest control decisions. Using insecticides only when necessary based on field scouting and economic thresholds helps conserve natural enemy populations. Exotic natural enemies of greenbugs and the Russian wheat aphid have been imported. Parasites from the Midwest also have been released to help control Hessian fly in Texas. There is little information on the effectiveness of augmenting natural enemies for control of insect pests in wheat. Until definitive information is available what natural enemy is effective, release rate, timing, etc. These include the parasitic wasps, several species of lady beetles, lacewings and damsel bugs. These beneficials help keep greenbug populations from increasing to damaging levels in many years. Although the adult wasps are not commonly seen, wheat producers should be able to recognize the distinctive parasitized greenbug mummy which remains attached to the wheat leaf. Greenbug mummies parasitized by L. Greenbug mummies killed by A. Lysiphlebus testaceipes Aphelinus varipes Diaeretiella rapae.

Chapter 3 : Monitoring insects and other crop pests | Agriculture and Food

Essay on the insects and diseases injurious to the wheat crops / Title Variants: Alternative: Hind's essay on insects and diseases injurious to wheat crops.

In this article we will discuss about the economic importance of insects. Insects which produce honey, wax, lac, dyes and silk are commercially beneficial. Some insects are very helpful in destroying injurious insects. Apis, the honeybees produce millions of tons of honey every year, it also gives bees wax from its combs. Benefits of bees are cosmopolitan, not only in producing honey and wax, but also in bringing about cross-pollination of many fruits and flowers without which these plants could not exist. Tachardia, the lac insect secretes commercial lac produced from integumentary glands as a protective covering by females, shellac is made from lac in India. Dactylopius, the cochineal insect of Mexico is found on cacti, dried bodies of females of this scale insect are used for making cochineal dyes. Bombyx and Eupterote are silk moths, they are reared in India, China, Japan and Europe, their larvae called silk worms spin cocoon of raw silk, the silk fibre is reeled off and used for making silk. In Asiatic countries over 25 million kilograms of silk are produced annually. Dried elytra of two beetles, Lytta and Mylabris are used for making cantharidin, a powerful aphrodisiac. The larvae of two flies, Lucilla and Phormia are used in healing such wounds of bones which do not respond to medicines, the larvae are put in wounds of bones and bone marrow, they clear away suppurating and dead tissues, prevent bacterial growth and excrete allantoin which heals the wounds. Some insects are predaceous, they feed upon and destroy a large number of injurious insects. Stagomantis, a mantis is voracious, it feeds on flies, grasshoppers and caterpillars, some of which are injurious to crops. The larvae and adults of Chilomenes, a lady-bird beetle, feed on aphids which infect cotton plants. Novius, a lady-bird bettle, destroys scale worms which are pests of orange and lemon trees. Epicauta is a blister beetle, it deposits eggs where locusts occur, the larvae on hatching enter egg capsules of locusts and eat up masses of eggs. Calasoma, a ground beetle preys upon many kinds of lepidopterous larvae which destroy cereals and cotton. Some insects parasitise injurious insects, they usually lay eggs in the bodies of larvae and adults of harmful insects; the young on hatching from eggs finally kill their hosts. The larvae of Tachina and related flies are parasites of injurious lepidopterous larvae, such as army-worms which are injurious to cereals. Larvae of hymenopteran flies and carnivorous wasps devour aphids in large numbers. Chalcids and ichneumon flies are parasitic, laying eggs in cocoon and larvae of phytophagous Lepidoptera. Apanteles, a hymenopteran fly lays eggs in army-worms and boll worms, the parasitic larvae gnaw their way through the skin of the host. Some insects are scavengers, they eat up dead animal and vegetable matter, thus, they prevent decay. Some ants and larvae of some flies can devour entire animal carcasses. Compared with beneficial insects the number of injurious insects is very large. Many types of mosquitoes, flies, fleas, lice and bugs transmit diseases to man and domestic animals, they have been described earlier in insects and diseases. Human food is spoiled by cockroaches, ants, flies and weevils. Tinea, Teniola and Trichophaga are clothes moths, they lay eggs on warm clothes, the larvae on hatching eat and destroy clothes, they also feed on furs, carpets and dry fruits. Anthrenus is a carpet beetle, it is a scavenger eating decaying animal matter, but its larvae destroy carpets and preserved biological specimens. Tenebrio is the mealworm beetle, its larvae are mealworms, they eat meal, flour and stored grains, such as rice. Lepisma, the silver fish and Liposcelis, the book louse live in and destroy books and old manuscripts. Termites, the white ants cause untold destruction of books, carpets, furniture and wood-work of buildings. Injurious to Domestic Animals: Glossina, the tsetse fly transmits Trypanosoma brucei which causes nagana in horses. Tabanus and Stomoxys, the blood sucking flies inject Trypanosoma evansi into horses and cattle which causes surra in India. The larvae of Hypoderma, the warble fly bore below the skin of oxen and make holes for breathing, then they pass through the gullet and again pierce the skin on the sides of the spine to form swellings, they not only injure the hide but also reduce the meat and milk supply. Gasterophilus, the bot-fly lays eggs on hair of horse, the larvae enter the stomach in large numbers.

Melophagus, the sheep tick and Hippobosca, the forest fly of cattle and horses suek blood of their hosts and often cause haemorrhage. Menopon, the chicken louse sucks blood and causes destruction of fowls. Many insects damage forest trees, growing farm crops, fruits and stored grain, the damage they cause annually runs into millions of rupees. The number of such insects is innumerable, they are mostly Lepidoptera, Coleoptera, Diptera and Hemiptera. Euproctis, the brown tail moth and Lymantria, the gipsy moth are serious pests of shade and foliage trees, their larvae are a menace and destroy forest trees. Myetiola, the Hessian fly is a small sized midge, its larvae damage wheat plants. The larvae of two Lepidoptera Chilo in India, and Diatraea in America bore into stems of sugar-cane and cause a great deal of damage. Pyrilla, a hemipteran sugar-cane leaf hopper sucks the juice of sugar-cane, both as adult and nymph, causing great loss of sugar. Pyrausta is a moth found all over the world, but specially abundant in the tropics, its larvae known as corn borers are notorious for boring into stems and fruits of corn maize. Nephotettix, the Indian rice leaf-hopper and Leptocorisa, the oriental pest of rice and millet are Hemiptera, they attack rice in very large number eating the leaves and ears. The larvae of Schoenobius, a moth bore into the stems of rice plants in India, they kill the plants. Nymphs and adults of Hieroglyphus, an orthopteran eat up the growing shoots of rice plants, thus, preventing formation of grain. Dysdercus, the Indian cotton bug, Oxycarenus, the Egyptian cotton bug, and Anthonomous the cotton-boll weevil are very injurious to cotton, they stain and destroy cotton- bolls, Aphis, a hemipteran is a serious cotton pest in India, the pests often attack cotton plants in large numbers causing the plants to wilt and die. The larvae of two Lepidoptera, Agrotis and Gnorimoschema are potato cut-worms in India, the former feeds on potato leaves and cuts off the stems, while the larvae of the latter eat the potatoes in the field and stores, larvae also attack tobacco and tomatoes. Larvae of Agrotis are also destructive to peas, cabbage, tobacco, ground nuts, wheat and cauliflowers. The larvae of some Coleoptera are called wire-worms, such as Agriotis and Limonius, they are root-feeders and are extremely destuctive to cereals, root crops and grasses. Many insects and their larvae destroy vegetables in India. Siphocoryne is an aphis which feeds on cabbage leaves; Anasa, the squash bug is destructive to cucurbitaceous plants; Earias the spotted bollworm destroys ladyfingers; Aulacophora, the red beetle feeds on pumpkins; the larvae of Bruchus, a beetle bore into pods of beans and peas killing the seed. Many insects attack fruit trees, they damage roots, trunks, stems, leaves, inflorescence and fruit. Drosicha, a mealy bug causes destruction of mangoes, plums, papaya, jack fruit, pears and citrus fruits in India. The nymphs and adults of Ideocerus, a mango leaf hopper attack the inflorescence and suck the sap, thus, they cause tremendous damage by preventing formation of mango fruit. The laryae of Contarinia fly feed on young pears which soon decay. Psylla, an apple bug, lays eggs on apple and pear tree, the nymphs on hatching damage the blossom and shoots; the larvae of Anthonomus, a beetle also destroy apple blossoms and prevent formation of the fruit. Nysius, a bug is very destructive to several kinds of fruit trees. Many moths, caterpillars and beetle cause a great deal of damage to stored grains: Tribolium eats stored wheat and grain. Calandra, a weevil bores through grains of rice and other stored grain in India.

Chapter 4 : Disease and Insect Considerations to Make Before Planting Wheat This Fall Â« World of Whea

The essay to be furnished to the Bureau by the 15th day of January next; and to be designated by a mot-to, a copy of which shall be also forwarded, in a sealed note, with the name and address of the author The prizes will be awarded according to the decision of a committee, to be named by the Board.

Bring fact-checked results to the top of your browser search. Damage to growing crops Insects are responsible for two major kinds of damage to growing crops. First is direct injury done to the plant by the feeding insect, which eats leaves or burrows in stems, fruit , or roots. There are hundreds of pest species of this type, both in larvae and adults, among orthopterans , homopterans, heteropterans , coleopterans, lepidopterans, and dipterans. The second type is indirect damage in which the insect itself does little or no harm but transmits a bacterial, viral, or fungal infection into a crop. Examples include the viral diseases of sugar beets and potatoes, carried from plant to plant by aphids. Although most insects grow and multiply in the crop they damage, certain grasshoppers are well-known exceptions. They can exist in a relatively harmless solitary phase for a number of years, during which time their numbers may increase. They then enter a gregarious phase, forming gigantic migratory swarms, which are transported by winds or flight for hundreds or thousands of miles. These swarms may completely destroy crops in an invaded region. The desert locust Schistocerca gregaria and migratory locust Locusta migratoria are two examples of this type of life cycle. Medical significance Insect damage to humans and livestock also may be direct or indirect. Direct human injury by insect stings and bites is of relatively minor importance, although swarms of biting flies and mosquitoes often make life almost intolerable, as do biting midges sand flies and salt-marsh mosquitoes. Persistent irritation by biting flies can cause deterioration in the health of cattle. Some blowflies , in addition to depositing their eggs in carcasses, also invade the tissue of living animals including humans, a condition known as myiasis. An example of an insect that causes this condition is the screwworm fly Cochliomyia of the southern United States and Central America. In many parts of the world, various blowflies infest the fleece and skin of sheep. This infestation, called sheep-strike, causes severe economic damage. Many major human diseases are produced by microorganisms conveyed by insects, which serve as vectors of pathogens. Malaria is caused by the protozoan Plasmodium , which spends part of its developmental cycle in Anopheles mosquitoes. Epidemic relapsing fever , caused by spirochetes , is transmitted by the louse Pediculus. Leishmaniasis , caused by the protozoan Leishmania, is carried by the sand fly Phlebotomus. Sleeping sickness in humans and a group of cattle diseases that are widespread in Africa and known as nagana are caused by protozoan trypanosomes transmitted by the bites of tsetse flies Glossina. Under nonsanitary conditions the common housefly Musca can play an incidental role in the spread of human intestinal infections e. The tularemia bacillus can be spread by deerfly bites, the bubonic plague bacillus by fleas, and the epidemic typhus rickettsia by the louse Pediculus. Various mosquitoes spread viral diseases e. Malaria, for example, has a different epidemiology in almost every country in which it occurs, with different Anopheles species responsible for its spread. These same complexities affect the spread of sleeping sickness. Some relationships are indirect. Plague, a disease of rodents transmitted by flea bites, is dangerous to humans only when heavy mortality among domestic rats forces their infected fleas to attack people, thereby causing an outbreak of plague. Typhus, tularemia, encephalitis, and yellow fever also are maintained in animal reservoirs and spread occasionally to humans. Aedes aegypti mosquitoAedes aegypti mosquito, a carrier of yellow fever and dengue. This objective has been achieved in numerous cases. For example, in many cities flies no longer play a major role in spreading intestinal infections, and land drainage, improved housing, and insecticide use have eliminated malaria in many parts of the world. Massive outbreaks of the Colorado potato beetle in the s led to the first large-scale use of insecticides in agriculture. These highly poisonous chemicals e. The continued search for effective synthetic compounds led in the early s to the production of DDT , a remarkable compound that is highly toxic to most insects, nontoxic to humans in small quantities although cumulative effects may be severe , and long-lasting in effect. Widely used in agriculture for many years, DDT was not the perfect insecticide. It often killed parasites as effectively as the pests themselves, creating ecological imbalances that permitted new pests to develop large populations. Furthermore, resistant strains of pests appeared. The environmental longevity of many early insecticides was also found to cause significant ecological problems. In the course of developing effective insecticides, the primary emphases have been to reduce their potential to cause human health problems and their impact on the environment. Biological methods of pest management have become increasingly important as the use of undesirable insecticides decreases. The sugar industry in Hawaii and the California citrus industry rely on biological control methods. Although these methods are not consistently effective, they are considered to be less harmful to the environment than are some chemicals. Australian sheep blow fly genomeLearn how genomics can be applied to the control of insect pests, as in the production of a draft genome of the Australian sheep blow fly Lucilia cuprina. The chorion , or eggshell , is commonly pierced by respiratory openings that lead to an air-filled meshwork inside the shell. For some insects e. Insects may pass unfavourable seasons in the egg stage. Eggs of the springtail Sminthurus Collembola and of some grasshoppers Orthoptera pass summer droughts in a dry shrivelled state and resume development when moistened. Most eggs, however, retain their water although they may pass the winter in a state of arrested development, or diapause , usually at some early stage in embryonic development. However, dried eggs of Aedes mosquitoes enter a state of dormancy after development is complete and quickly hatch when placed in water. Polyphemus moth Antheraea polyphemus depositing eggs. Because the larvae feed on a variety of trees and shrubs, site selection for egg deposition is haphazard. The hatching of young larvae is achieved in several ways. Some, such as caterpillars , bite their way out of the egg. Many, such as the flea , have hatching spines with which they cut a slit in the shell. Depending on the species, this may be accomplished either by swallowing air and then constricting muscles in the body to exert pressure on the cap or by having an expandable region on the head many Diptera have a ptilinum that can be extended by hydraulic blood pressure. After hatching, the larva continues to distend itself in this way, although the ptilinum collapses back into the body, until the cuticle hardens. Once formed, the insect cuticle cannot grow. Growth can occur only by a series of molts ecdyses during which new and larger cuticles form and old cuticles are shed. Molting makes possible large changes in body form. Types of metamorphosis In the most primitive wingless insects apterygotes such as the silverfish Lepisma saccharina, there is almost no change in form throughout growth to the adult. These are known as ametabolous insects. Among insects such as grasshoppers Orthoptera , true bugs Heteroptera , and homopterans e. These insects, called hemimetabolous, are said to undergo incomplete metamorphosis. The higher orders of insects, including Lepidoptera butterflies and moths , Coleoptera beetles , Hymenoptera ants, wasps, and bees , Diptera true flies , and several others, are called holometabolous because larvae are totally unlike adults. These larvae undergo a series of molts with little change in form before they enter into complete metamorphosis , which includes molting first into pupae and then into fully winged adults. A molting insect shedding its exoskeleton. The three types of pupae are:

Chapter 5 : Disease or Injury? How to tell the two apart

Title. Essay on the insects and diseases injurious to the wheat crops. By. Hind, Henry Youle, Genre. Book Material Type.

The "pest status" of many of species is not always well documented. Aphids various species Symptoms: Aphids are nearly transparent, soft-bodied sucking insects When present in sufficient numbers, aphids can cause yellowing and premature death of leaves. They exude drops of sugary liquid known as "honeydew", which may cause tiny scorch marks on the foliage and tends to encourage the development of sooty molds. The feeding of Schizaphis graminin 57 is especially damaging, resulting in the development of necrotic areas sometimes accompanied by purpling and rolling of the infested leaves. The feeding of Diuraphis noxis produces long white stripes on the leaves 58 , leaf rolling, postrate growth habit, and sterile heads. The life cycle of aphids involve winged alates , wingless apterous , sexual, and asexual forms. When feeding on cereals, the females of most aphid species reproduce asexually without being fertilized , giving rise to nymphs rather than eggs. Species commonly found on cereals throughout the world include: Rhopalosiphum padi bird cherry-oat aphid Schizaphis graminum greenbug R. Aphids are important and widespread pests on cereal crops. When feeding in sufficient numbers, they can cause significant damage. In addition, the species listed above may act as vectors of barley yellow dwarf virus. Stink Bugs various species Symptoms: Adult stink bugs feed on stem tissue or developing kernels Saliva from this insect is toxic to the plant, and a single feeding puncture can kill a stem. Feeding on kernels during the milk dough stage will destroy the kernel, while feeding during later development stages will badly shrivel the grain. Feeding on the developing head may cause partial or total sterility. Adult stink bugs have a shield-shaped body 60 and emit a disagreeable odor when crushed. Stink bugs over-winter as adults and may diapause. They tend to hibernate under dead leaves and grass. In the spring they migrate to cereal hosts, mate, and lay eggs at various places on the plant. These hatch into nymphs that feed on the plant. Mild winters and low rainfall seem to favor outbreaks of the insects. Stink bugs will feed on most cereals and grasses, as well as a large range of weeds depending on the species. Stink bugs are of major economic importance in Asia Minor. Losses due to stink bugs are highly variable and depend on the density of the insects, weather conditions, and duration of the crop growing period. Losses are due primarily to reduced baking quality. Armyworms, Cutworms, and Stalk Borers various species Symptoms: The primary symptom is defoliation of the plant. Larvae feed on leaves, chewing from the edges to the midrib, or on the heads of cereal plants. Heavy infestations can be very destructive; larvae may climb the plant and sever the neck just below the head. Some species may be found feeding at the soil surface, others underground feeding on roots, and still others feeding inside the stem. Adult cutworms 61 and army worms 62 are moths, and the females lay eggs on leaves and leaf sheaths near the ground. These eggs hatch within a few days and initially the larvae 63 , cutworm; 64 , armyworm feed close to where they hatch. The larvae are found in cracks in the soil or under rocks during the day, feeding at night or early in the morning. In damp weather, they may feed all day. Larvae are generally omnivorous in attacking grasses. Species of these insects are found in most cereal-growing areas of the world. Cutworms and armyworms sporadically cause severe damage; when they do, they can devastate large areas. Cereal Leaf Beetle Oulema melanopa Symptoms: Adult beetles are mm long, have a black head, light brown thorax, and a shiny blue-green wing cover with parallel lines of small dots Larvae are a dull to bright yellow color, but soon take on the appearance of a slimy, globular, black mass due to the mound of fecal material they produce and accumulate on their backs 66 ; The most prominent symptom of cereal leaf beetle infestations is the distinct, longitudinal stripes on leaves 68 ; these stripes are produced by the feeding of adult beetles and of larvae. The insect produces one generation per year. Adults begin their feeding activity in the spring. They lay yellow eggs, either singly or in small chains, covering them with a sticky film that the soil and the adults emerge in summer. Adults overwinter underneath plant debris on the soil surface, in leaf sheaths and ears of standing maize, or under the bark of trees. Cereal leaf beetles can be a problem on fall-sown cereals. Wheats with hairy leaves are affected less. Significant yield losses can occur in winter wheat and fall-sown spring wheat. Thrips various species Symptoms: Thrips are small 1 mm long , brown or black insects with a tapering, segmented abdomen. They have piercing and sucking mouthparts and usually have two pairs of narrow wings. They are usually found behind the sheath of the flag leaf, feeding on the stem However, leaves, stems, and heads may be attacked. Adults and nymphs both can cause damage and, if present in large numbers, may cause the tissue on which they are feeding to take on a silver coloration. Eggs are inserted into or attached to host tissue. The generation time is very short, and there may be 10 or more generations per year. Heavy rains will usually destroy a high proportion of they population. Several thrips species live exclusively on cereals, and on forage or weed grasses. Thrips rarely cause serious damage, and it is unusual to find infestations at such a level as to warrant control. Hessian Fly Mayetiola destructor Symptoms: Severe infestations of Hessian flies result in stunting of the plants, thin stands, lodging, and reduced yield. Injury is caused entirely by the larvae, which suck juices from plant tissues If infestation occurs during jointing, infested stems often will break prior to maturity. The Hessian fly is mm long, has a black head and thorax, and a pinkish or yellow-brown abdomen. Adult flies emerge in the spring from pupae that have overwintered in straw or stubble. The minute, oblong eggs are reddish in color and are laid in rows on the upper sides of leaves. The eggs hatch within one week; the white, legless larvae settle behind the leaf sheaths and suck the sap of the plant. They develop into translucent, pale green, slug-like maggots. The reddish brown pupae, commonly called "flag seed" because of their resemblance to the seed of the flax plant, are oval shaped, flattened, taper to a point, and are mm long. They are found behind leaf sheaths, usually at a node. The Hessian fly is mainly a pest of wheat, but it may attack barley, rye, and other grasses. This pest has been reported in most wheat-growing areas of the world. This is one of the most destructive insect pests on cereals. Widespread outbreaks have occurred and, in some locations such as North Africa and the USA , the past recurs annually. Wheat Stem Maggot Meromyze americana Symptoms: When young tillers are attacked in the fall or early spring, the tillers usually die; infested plants show the "white head" condition typically produced by stem-boring insects The adult flies are about 6 mm in length, and pale green to yellow with dark stripes. Wheat stem maggot larvae overwinter in cereal plants or grasses The females lay small white eggs, one per stem, near the sheath of the flag leaf; the larvae burrow into and consume the interior of the stem, killing the upper part of the stem and the head. There are normally three generations per year; one in the spring, one in the summer, and a third in the early autumn that overwinter as larvae. In addition to wheat, host crops include rye, barley, and other grasses. There are a number of other flies in various parts of the world that attack wheat in a similar fashion and produce the same kind of damage. Damage can be severe in some years, but the insect seldom causes widespread damage. However, heavy infestations of individual wheat stands may kill a significant portion of the tillers. Sawfly Cephus cinctus Symptoms: Damage by sawflies includes premature yellowing of the head and shrivelling of the grain. The larvae girdle the stem 73 and, later in the crop cycle, lodging is common. Sawflies produce one generation per year. The larvae overwinter in the straw 74 ; in the spring they pupate. Adult sawflies are small, fly-like wasps and appear from late spring to midsummer. The females deposit small white eggs in the upper nodes of stems just below the heads. Upon hatching, the legless white larvae bore into the stem and tunnel downward, feeding on the pith of the stem. When they have completed their feeding, they descend further and girdle the stem base. Nearly all cultivated cereals and native grasses act as hosts, although wheat is preferred. Fall-sown cereals are more commonly attacked.

Chapter 6 : Full text of "Essay on the insects and diseases injurious to the wheat crops"

Get this from a library! Essay on the insects and diseases injurious to the wheat crops. [Henry Youle Hind].

Written collaboratively by Emmanuel Byamukama and Ruth Beck. Some parts of the state have had freezing conditions, high winds, and blasting snow. These conditions may have caused injury to crops. How do you tell diseases caused by living agents e. The display of symptoms on affected plants, and the location in the field of affected plants can provide clues. Injury Characteristics For injury caused by living agents biotic , symptomatic plants can be in clusters or randomly distributed in the field. However, the level of severity is going to vary from plant to plant. On the other hand, diseases caused by non-living agents abiotic are going to be in a cluster aggregated pattern and the level of symptoms will be about the same from plant to plant. For example, corn plants affected by fertilizer burn will have a similar level of injury in the same leaf position, and new leaves will be unaffected Figure 1. Corn plants showing fertilizer burn symptoms. Note that every plant has about the same level of symptom severity and similar positions of the leaves are affected. Plants with freeze injury may be found in low spots where there is more moisture or elevated points in the field where wind is likely to have more impact. Plants with mechanical injury caused by wind blasting, fertilizer burn, or hail have increased chances of getting bacterial infection, especially in wheat. Fungal pathogens do not need wounds to initiate infection. Prophylactic applications of fungicides to plants that have sustained tissue damage from adverse weather or another event in the hopes of stopping infections is not recommended, since fungicides do not control bacterial pathogens. Plant parts infected by a fungus sometimes have visible signs like mycelia, spores, or survival structures Figure 2. Fungal symptoms tend to be localized. One characteristic of bacterial infection is water soaking at the edge of the lesion. Bacterial lesions will also not have any mycelia or structures growing on the infected tissue. Sometimes bacterial ooze from the lesion leaves a shiny streak on the leaf surface. Viruses are relatively easy to distinguish from other biotic diseases. They are usually systemic, infecting every part of the plant. Clear symptoms are seen in young leaves near the growing point of the plants. Viruses are associated with general yellowing of plants, stunting, mosaics green and yellow areas on a leaf and can cause distortion and roughness of leaves rugosity.

Chapter 7 : Essay on the insects and diseases injurious to the wheat crops. - CORE

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Wheat yield constraint calculator Monitoring insects and other crop pests Correct identification of insect pests is necessary in order to avoid economic damage being sustained and retain beneficial insects. Often it may be difficult to identify the insects causing the particular damage. If this is the case, the next option available is to examine the symptoms of crop damage. Use the diagnostic tool see link below to help to identify the insect pest causing the damage. Insects can damage crops throughout the growing season but seedlings and podding crops are most at risk. It is also important to assess any crop damage as soon as it is observed, and determine if further damage is likely to occur. Options available for the control of the particular insect pest can then be explored. Procedure for monitoring invertebrate pests There are several methods available for carrying out insect assessments in a crop. Also when treatment has been applied it is important go back and continue monitoring to ensure it has been successful. Insect monitoring procedures Sweep nets Sweep nets are suitable for all insect stages except eggs. It is useful for aphids, budworm, pea weevils and other insects found in the crop canopy when the crop is knee high or taller. The standard sweep net is 38 cm in diameter, 70 cm deep with a cm long handle. Brush the sweep across the top of the crop canopy in a continuous motion in a 2 m arc. Shaking insects off plants Place a length of light coloured plastic or equivalent between rows and vigorously shake or beat the plants over the bag. Collect the insects into a container for identification and counting. Alternatively, gently pull up the plants and shake or bang into a plastic bucket or sweep net. Close examination This is necessary when assessing small insects, especially those that live on or near the ground. It is useful for insects such as red-legged earth mites, webworm, aphids and vegetable weevils. You may need to crawl around looking at the base of plants and among leaf litter. A warm sunny afternoon is often the best time. A magnifying glass may assist. Some pests are difficult to find, especially those that attack plant roots, so it is important to check below as well as above ground during your assessment. Some only emerge at night and require observation then, a pit trap or a cover such as a bag placed on the ground for them to shelter under when daylight. Interpreting the results If insects are identified, determine whether or not the crop is likely to suffer further economic damage. When deciding whether the pest should be controlled take into consideration factors such as:

Chapter 8 : Essay on the Insects and Diseases Injurious to the Wheat Crops

Abstract "To which was awarded, by the Bureau of Agriculture and Statistics, the first prize."""The progress of agriculture "'Includes bibliographical calendrierdelascience.comonic calendrierdelascience.com of access: Internet

Diamondback moth pupa left and larva right Lygus bugs: Some economic levels of Lygus bugs have been reported from the Niverville area. This is an insect that you need to use the sweep net for to determine levels in canola. The following link includes tables to help determine economical levels of Lygus bugs in canola: Soybean aphid levels have been increasing in central Manitoba. There still seems to be some confusion over when it is economical to control soybean aphids. The economic threshold where control is advised to prevent economic damage is not aphids per plant. The economic threshold is when there are on average at least aphids per plant, and the population is increasing, and the plants are in the R1 beginning bloom to R5 beginning seed growth stages. Studies at multiple location have found that the economic injury level level of insects that cause damage equal to the cost of preventing the damage for soybean aphids on soybeans is about aphids per plants. In every field the amount of natural enemies and other factors regulating the population of soybean aphids is going to differ, but if these regulating factors are low the soybean aphids can potentially increase from to in about 7 days. This is why the economic threshold has been set at aphids per plant on average and the population still increasing. If it is not likely to get to per plant on average, then you would spend more controlling the aphids than they will cost you in yield. Every field will be different; some may build to about aphids per plant on average and stay at that level, which would not be economical to control, while populations in other fields may keep advancing beyond the per plant average, in which case your odds of the control being economical are greater. Also note the threshold allows for 7 days for aphids to increase from the economic threshold to the economic injury level. One question that sometimes comes up is if the value of soybeans increases or is high, is it reasonable to lower the economic threshold. Lowering the economic threshold is not the best approach when soybean prices are high. The economic threshold has already been set well below what the economic injury level is. When soybean prices are high, effort should be made to get the control applied quicker than 7 days. The economic injury level is influenced by the value of the crop, and would be lower when the crop value increases. Considering the large gap between the economic injury level and economic threshold, and the fairly long amount of time estimated for aphid populations to get from economic threshold to economic injury level, just make sure to get the insecticide applied shortly after the economic threshold is reached when the price anticipated for the crop is good. The photo below show soybean aphids on a soybean leaf. The 2 slug-like insects on the leaf are both larvae of hover flies, although different species. There are about species of hover flies in Canada these are the bee-like flies you often see hovering in front of flowers and one of the favorite foods of the larvae are aphids. Soybean aphids and hover fly larvae For those scouting soybean fields, please note that it is impossible to accurately count soybean aphids when numbers are high, and would be extremely time consuming. All you can realistically do is try to estimate roughly how many are on a plant. Also note when you are doing your scouting to select plants to do counts on randomly. If you look for plants with lots of aphids on them to do your estimates on, your estimates will not reflect the average population in the field. In many fields there are currently pockets where levels are over per plant, but many plants around these pockets that have very little or no soybean aphids on them. In many of these situations the fields are not above per plant on average. Spider mites on soybeans: A sample of soybeans from the Oak Bluff area, with leaves with brown and yellow speckling, was received at the diagnostic lab last week. The leaves contained spider mites. Spider mite populations can potentially build to noticeable levels in drier years. The species we sometimes get on the soybeans in Manitoba is the twospotted spider mite Tetranychus urticae. In past years when they have been more abundant, we have seen some fairly dramatic edge effects with spider mites, where some of the plants near a field edge had lots of spider mites and feeding, and the interior of the field had very little. At this point this is something else to look for when scouting soybean fields. If you see leaves that have some speckling and webbing, tap them over a tray or solid surface I often take an old camping wash-pan into the fields with me to tap plants over and look for tiny specks that will be moving around. Although the photo below makes them look big, spider mites are only about 0. Twospotted spider mite on soybeans Also note, there is another group of mites that can occur on soybeans called phytoseiid mites, which are predaceous and will eat the spider mites. They will be orange or white but will not have the black spots on either side of the body that the twospotted spider mites have. Surveys and Forecasts Grasshopper Survey: Manitoba, Saskatchewan and Alberta have for many years surveyed grasshopper populations in August to predict the regional risk from grasshoppers the following year. The data is mapped, and this forecast is used by farmers, agronomists, and agricultural retailers to plan for the following season. A reminder to farm production advisors, that counts are done during August, when the majority of grasshoppers are in the adult stage. Agronomists and farmers who would also be interested in estimating grasshopper numbers in the fields they are in and have this information included in the survey are encouraged to see the survey protocol for more details of the survey and where to send data. Estimates of grasshopper levels can be collected during regular farm visits. The grasshopper survey protocol is located at: Counts so far are generally in the low risk category, which is a cumulative count of less than moths, although a few traps in the Swan River valley and Neepawa areas have reached a cumulative count in the uncertain risk category. A trap near Durban has counts in the moderate risk category, having a cumulative count of 1, At most sites the moth counts peaked around mid- July and are now declining. The only report so far of levels of larvae of concern was from the Glenboro area. Agronomists and farmers in the Swan River valley, Neepawa area, and Glenboro area should make sure to scout fields for bertha armyworm. Note that for bertha armyworm or any of the insect pests of canola, no insecticides can be applied within 7 days of swathing. So make sure to scout early enough that if problems are encountered there is time to do something about them. Highest cumulative trap counts for bertha armyworm in Manitoba as of August 2, Location.

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