PESTICIDES

Introduction : Since the dawn of human civilization, man has been trying to improve the agriculture. Modern agriculture employs a number of chemicals for enhancing crop yield and protecting the same. Synthetic fertilizers are added to replenish the various nutrients and maintain the soil fertility. We have already discussed various fertilizers that provide nitrogen, potassium and phosphorus to crops in India. These chemical fertilizers are added to the soils in order to overcome the deficiency of minerals and to provide extra chemicals required for proper growth of high yielding varieties. Plant development pattern is highly modified by addition of plant growth regulators. Growth regulators or hormones stimulate or retard the plant growth and affect several other characters. Growth regulators are required in low concentrations. Many growth regulators like malic hydrazide, methyl ester of naphthalene acetic acid (NAA) prolong storage. Still others like 2/4D and 2, 4, 5T prevent premature fruit drop and are widely used as weedicides. Ethylene induces early ripening of fruits. Some other physiological effects of growth regulators are rooting of stem cuttings, enhanced vegetative growth, prevention of flowering etc.

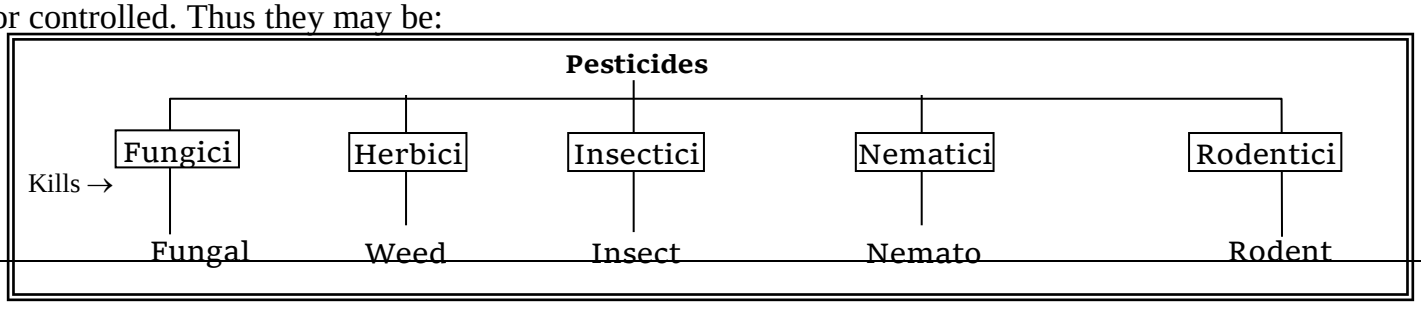
Agricultural crops are mainly destroyed by insects. Various types of fungi and bacteria cause diseases in plants. According to an estimate, there is an annual loss of 30 percent in agricultural production due to insect pests and plant diseases. If only 50 percent of this loss could be saved from pests, the food problem of our country can be solved to a great extent. A pest may be defined as any organism that causes an economic loss or a damage to the physical well being of human beings. It may destroy our crops, cause diseases in them or in human beings etc.

3.3.1 Pesticides

There are a number of chemicals which can kill or destroy these pests. These chemicals are called as **pesticides** (*cides* means *to kill*). Pesticides are sprayed over crops, human dwellings etc. Few familiar pesticides are baygon spray, finit (flit), DDT, BHC which are widely used in houses to kill mosquitoes, flies, ants, cockroaches etc. During the Second World War, two synthetic pesticides *i.e.* DDT (dichloro diphenyl trichloroethane) and 2-4 D (2, 4 dichlorophenoxy acetic acid) were mainly used.

The first pesticide i.e. **Bordeaus mixture** was developed by Prof. Millardet in 1882. The mixture consists of copper sulphate and lime (calcium hydroxide) in a 4 : 4 ratio dissolved in 50 gallons of water. Prof. Millardet from University of Bordeaux (France) noticed in 1878 that downy mildew disease of grapes caused by *Plasmorora viticola* was absent on grape vines where sprays were made of mixture containing copper sulphate and lime.

(i) **Types of pesticides :** Pesticides are of several types depending upon the types of pests killed or controlled. Thus they may be:



About 30% of agricultural produce in India is lost every year due to pests and diseases. Chemical pesticides are toxic chemicals used in killing pests. On the basis of chemical structure, major pesticides are grouped into : (a) Organochlorines, (b) Organophosphates, (c) Carbamates (d) Pyrethroids and (e) Triazines.

(a) **Organochlorines :** These are basically organic compounds that have been chlorinated. Organochlorines are **lipophilic** and show much affinity for fatty tissue of animals. Organochlorines have very low bio-degradation, get accumulated in environment posing serious problems. Important examples of organochlorines are (1) DDT, (2) BHC, (3) Aldrin and (4) Endosulphan.

(1) **DDT (Dichlorodiphenyl trichloroethane) $C_{14}H_9Cl_5$ –**

DDT was first synthesised by a German chemist **Othnar Zeidler** in 1874 and its insecticidal value was discovered by **Paul Muller** in 1939. DDT is the most famous pesticide of the world and is a nonbiodegradable pollutant. Spraying of DDT on crops produces pollution of air, soil and water. In India, as a result of prolonged use of DDT, 13-31 ppm of DDT can be detected in the body fat of the people, highest in the world. DDT concentrates from water into the body and magnified in higher members of the food web. DDT tolerance level is 10 ppm for *Daphnia* (a freshwater crustacean) and this means *Daphnia* will die beyond that concentration. DDT has become ineffective for killing mosquitoes because of the development of adaptive resistance. DDT does not inhibit cholinesterase activity and is relatively non-toxic to mammals, but in oil solution it is absorbed by skin. Pesticide (DDT) is banned now a days.

(2) **BHC (Benzene hexachloride) $C_6H_6Cl_6$:** Benzene hexachloride is incorrect from a chemical standpoint, its correct name is Hexachloro cyclohexane or HCH. BHC was first synthesized by Michael Faraday in 1825 and its insecticidal value was independently discovered by Dupire (1941) in France and Leicester (1942) in England. The most common pesticide used in India is BHC**;** it represents about 50% of total volume of pesticides used in India. BHC is more toxic to insects than DDT and is used mainly in public health programmes.

(3) **Aldrin (Octalene) $C_{12}H_8Cl_6$**

- Aldrin is an insecticide applied to foundations of buildings to prevent termites.
- Aldrin has been successfully used in control of locusts and grasshoppers in India.
- **Aldrin, Dieldrin** and **Endrin** are very poisonous pesticides.

(4) **Endosulphan (Thiodan) $C_9H_6Cl_6O_2S$:** Endosulphan is a pesticide and is useful in the control of aphids, caterpillars, plant bugs and borers.

(b) **Organophosphates :** The insecticidal properties of organophosphates were discovered by **Schrader** in Germany during World War II. Organophosphates are the pesticides most toxic to verterbrates. Organophosphates inhibit cholinesterase, an enzyme essential for transmission of nerve impulse across synapse. Major organophosphates used in India are Malathion, Parathion and Fenitrothion. Malathion is one of the two active ingredients in Flit, the second being Pyrethrin.

Malathion is also employed widely in anti-malarial programmes. Mosquito-repelling coils contain pyrathrin.

(c) **Carbamates :** Carbamates are derivatives of carbamic acid and have an – OCON = group in the molecule. Some commonly used carbamates are Carbofuran (Furadan), Propoxur (Baygon) and Aldicarb (Temik). Derivatives of carbamates are also used as herbicides (phenylcarbamates, thiocarbamates) and Fungicides dithiocarbamates. Carbamates are useful in the control of nematodes and snails. Mode of action of carbamates is quite similar to that of organophosphates. Being structurally similar to acetylcholine, these have high affinity for the enzyme cholinesterase. **Methyl isocyanate gas** which caused **Bhopal gas tragedy** on 3rd Dec. 1984, is used as a raw material for synthesizing Carbaryl (trade name **Selvin**). The ingredient which killed hundreds of people in Bhopal gas tragedy was Methyl isocyanate**.** It is also called MIC gas.

(d) **Pyrethroids :** Pyrethroids are synthetic derivatives of Pyrethrin, a chemical produced by grinding of flowers of the plant *Chrysanthemum cinerarifolium*. Examples of pyrethroids are Allethrin, Cyclethrin and Barthrin which are quick-acting broad spectrum insecticides. Pyrethroids are highly toxic and quite expensive, not used on a large scale in India at present.

(e) **Triazines :** Triazines (Simazine, Atrazine, etc.) are a group of herbicides derived from urea. Triazines are used for controlling weeds in tea, tobacco and cotton.

(ii) **Bordeaux Mixture :** Bordeaux mixture was discovered by Millardet in France in 1882. Bordeaux mixture is prepared by dissolving 40 *g*. of copper sulphate and 40 *g.* of calcium hydroxide in 5 *litres* of water. Bordeaux mixture is used primarily as a fungicide, it was first used to control downy mildew disease of grape-wine caused by a fungus, *Plasmopara viticola*. The first pesticide to be used commercially was Bordeaux mixture.

(iii) **Mode of Action of Pesticides :** Most insecticides attack the nervous system, interfering with the conduction of nerve impulses. Most herbicides attack the Photosystem II (photolysis of water and oxygen evolution) in photosynthesis and also translocation of organic substance in plants. Pesticides zinc phosphide is used for Rodents

(iv) **Advantages of Pesticides :** High yielding varieties of crops are very susceptible to pests and require the use of pesticides. Pesticides help in improving crop yields and in public health programmes. Pesticides are used to control carriers of vector borne diseases like malaria, filarial, sleeping sickness, dengue fever, yellow fever, etc.

(v) **Hazards of Pesticides :** Being non-specific, pesticides kill 'non-target' species also. Pesticides kill both harmful and useful insects. Most of the pesticides, especially organochlorines, are nonbiodegradable and accumulate in the environment resulting in pollution. Pesticides also enter the food chain; their concentration goes up as they move up in the food chain. This is called biomagnification or bioconcentration.

3.3.2 Biological methods of Pest control

Biopesticides are living organisms of their products used for killing pests of interfering with their biological processes.

(i) **Bioherbicides :** Biological control of weeds involves (a) Utilization of insects which would feed selectively on weeds and (b) use of certain microorganisms which produce diseases in weeds and eliminate them. Much of the work using insects for biological control has been done in North America. In India and Australia, the overgrown of cacti was checked by the introduction of cochineal insect (*Cactoblastis cactorum*). The first bioherbicide was mycoherbicide, based on the fungus *Phytophthora palmivora*, and was developed in 1981.

(ii) **Bioinsecticides :** Bioinsecticides include :

(a) Pathogens, parasites and predators

(b) Sterilization strategy

(c) Insect hormones

(d) Natural insecticides

Aphids have been controlled by the use of ladybugs or praying mantis. Screw-worm was eradicated by releasing sterile males (sterilized by irradiation) at the time of mating to compete with natural fertile population. Introduction of juvenile hormones at inappropriate time results in the early death of insect pests.

Natural insecticides are obtained mostly from plants and occasionally from microbes.

Botanical insecticides and their sources

Insecticide	Source
(1) Nicotine	Tobacco (Nicotiana tabacum)
(2) Pyrethroids	Chrysauhemum cinerarifolium
(3) Rotenone	Roots of Derris elliptica
(4) Sabadilla	Seeds of Schoenocaulom officinale
(5) Ryania	Roots and stem of Ryamia speciosa
(6) Azadirachtin	Seeds of Azadirachta indica (Neem or Margosa)

Rotenone is a natural insecticide.

One of the earliest pesticides employed by human was Margosa (Neem) leaves.

3.3.3 Pest control by Bacteria

The spore-forming bacteria have been particularly useful in controlling certain pests. Bacillus popilliae is used for the control of Japanese beetle. The bacterium Bacillus thuringenesis produces protein toxins. One of these, thurioside, is active against different groups of insects. Sporeine was the first bioinsecticide developed on commercial scale in Germany. Sporeine kills insects by inhibiting ion

transport in the midgut. Genes for some of these toxins have been isolated and transferred to host through recombinant DNA technology (transgenic plants). Transgenic plants of tomato showing resistance to horn worm larvae have been obtained.

3.3.4 Integrated pest Management (IPM)

Integrated pest management is the selection, integration and implementation of pest control based on predicted economic, ecological and sociological consequences. IPM is based on the assumption that no single safe pest control. Method will be successful. IPM, therefore, seeks to use a variety of biological, physical and chemical methods integrated into a cohesive scheme designed to provide long-term protection. Biological methods include using natural predators of pests, using resistant varieties, crop rotation, intercropping, etc. Mechanical methods include manual destruction of eggs of pests, removing weeds, etc. Use of chemical pesticides is carefully timed.

ASSIGNMENT

CHEMICAL PESTICIDES

Basic Level

1. DDT was first synthesized by
   (a) Othnar Zeidler (b) Paul Muller (c) Michael Faraday (d) Schrader
2. Which one is an organophosphate
   (a) DDT (b) Aldrin (c) Endosulphan (d) Parathion
3. The pesticide useful in the control of aphids, caterpillars, plant bugs and borers is
   (a) Aldrin (b) DDT (c) Endosulphan (d) BHC
4. Which are the two active ingredients in 'Flit'
   (a) Malathion and Pyrethrin (b) Carbofuran and Propoxur
   (c) Malathion and Carbofuran (d) Pyrethrin and Propoxur
5. Bordeaux mixture was first used in:
   (a) Germany (b) Japan (c) France (d) USA
6. To which class of pesticides do DDT, BHC, aldrin and endosulphan belong
   (a) Biopesticides (b) Organochlorines (c) Organophosphates (d) Carbamates
7. Baygon contains
   (a) Malathion (b) Propoxur (c) Carbofuran (d) Aldicarb
8. A carbamate pesticide is
   (a) Simazine (b) Atrazine (c) Propoxur (d) DDT
9. Which of the following is dissolved in water to make Bordeaux mixture
   (a) Copper sulphate (b) Calcium chloride (c) Both of these (d) None of these
10. Which one among the following is likely to have the highest levels of DDT deposition in its body
    (a) Seagull (b) Crab (c) Eel (d) Phytoplankton
11. Which of the following pesticides have been successfully used in the control of locusts and grasshoppers in India
    (a) Sevin (b) Aldrin (c) Parathion (d) Temik
12. The pesticide used in foundations of buildings for preventing termite attack is
    (a) DDT (b) BHC (c) Aldrin (d) Endosulphan
13. The pesticide used in public health programmes
    (a) BHC (b) Flit (c) Baygon (d) Tik-20
14. Which is a fungicide
    (a) 2,4-D (b) DDT (c) BHC (d) Bordeaux mixture
15. BHC was first synthesized in 1825 by
    (a) Schrader (b) Zeidler (c) Paul Muller (d) Michael Faraday
16. Malathion, Parathion and Fenitrothion belong to the group
    (a) Organophosphates (b) Carbamates (c) Triazines (d) Pyrethroids

17. The pesticides highly toxic and quite expensive are
(a) DDT (b) Triazines (c) Pyrethroids (d) All of these
18. Bordeaux mixture was discovered by
(a) Millardet (b) Bordeaux (c) David (d) Harrison
19. DDT is a
(a) Carbamate (b) Organochlorine (c) Organophospate (d) Triazine
20. Which of the following is a herbicide
(a) Allethrin (b) Triazine (c) Aldrin (d) BHC
21. The most famous pesticide of the world is
(a) BHC (b) Aldrin (c) DDT (d) Baygon
22. Which of the following is not an organo-chlorine
(a) Endosulphan (b) Malathion (c) DDT (d) Aldrin
23. First commercial pesticide was
(a) DDT (b) 2,4-D (c) Burgandy mixture (d) Bordeaux mixture
24. Pick out the correct statement
(a) DDT is more toxic than BHC (b) Aldrin is an organophosphate
(c) DDT is a non-biodegradable pollutant (d) To mammals DDT is highly toxic
25. Zinc phosphide is pesticide for
(a) Killing rodents (b) killing weevils (c) fumigation (d) spraying
26. Which of the following pesticides is employed widely in antimalarial programmes
(a) Aldrin (b) Malathion (c) BHC (d) None
27. Endosulphan is a
(a) Herbicide (b) Weedicide (c) Rodenticide (d) Pesticide
28. BHC is
(a) Benzene hexachloride (b)Benzene hydrochloride
(c) Bromide herbicide (d)Benzene heptachloride
29. The most common pesticide used in India is
(a) Baygon (b) BHC (c) DDT (d) Endrin
30. Mode of pesticide action is similar in
(a) DDT and parathion (b) Organochlorines and organophosphates
(c) Organochlorines and carbamates (d) None
31. The chemical present in Temik is
(a) Malathion (b) Propoxur (c) Carbofuran (d) Aldicarb
32. In India, the most commonly used pesticide BHC is
(a) Carbamate (b) Triazine (c) Organochlorine (d) Antibiotic
33. Herbicide carbamates are
(a) Dithiocarbamates (b) Thiocarbamates (c) Phenyl carbamates (d) Both (b) and (c)
34. Fungicide Bordeaux mixture is
(a) Magnesium hydroxide (b) Copper sulphate + Sodium hydroxide
(c) Copper sulphate + Calcium hydroxide (d) Magnesium sulphate + Calcium hydroxide

35. Endosulphan is
(a) Weedicide (b) Pesticide (c) Rodenticide (d) Herbicide
36. Bordeaux mixture is named after
(a) Scientist (b) Chemical composition (c) Country (d) University
37. A carbamate pesticide is
(a) Propoxur (b) Simazine (c) Atrazine (d) None
38. Which one is an organophosphate
(a) BHC (b) Aldrin (c) Fenitrothion (d) Endosulphan
39. Which is organochlorine
(a) Malathion (b) Parathion (c) Aldicarb (d) DDT
40. The chemical present in flit (finit) is
(a) Malathion (b) DDT (c) BHC (d) Aldicarb
41. Houseflies and mosquitoes have become resistant to the
(a) BHC (b) Aldrin (c) DDT (d) Malathion
42. DDT concentration in the human body is
(a) 0.3-0.7 *ppm* (b) 1.3-3.1 *ppm* (c) 13-31 *ppm* (d) 30-70 *ppm*
43. As insecticides reach at higher trophic level in food chain their concentration
(a) Increases (b) Become irregular (c) Remain constant (d) Decreases
44. Most common pesticides used in the crops are
(a) BHC, aldrin, malathion, pyrethrin
(b) Aldrin, malathion, lead arsinate, sodium fluoride
(c) Aldrin, malathion, sodium arsinate, lead arsiate (d)Cryolite, aldrin, pyrethrin
45. Which of the following pesticide is of lipophilic nature
(a) 2, 4-D (b) DDT (c) BHC (d) All the above
46. Malathion, parathion and fenitrothion belong to the group of
(a) Carbamates (b) Organophosphates (c) Prytheroids (d) Triazines
47. Bordeaux mixture was formulated by
(a) Leeuwenhock (b) Tillet (c) De Bary (d) Millardet
48. Carbamtes used as fungicides are
(a) Thiocarbamates (b) Dithiocarbamates (c) Carbofuran (d) Carbofuran and Aldicarb
49. BHC and DDT belong to
(a) Carbamates (b) Natural insecticides (c) Triazines (d) Organochlorines
50. 2, 4-D is a
(a) Insecticide (b) Weedicide (c) Fungicide (d) Rodenticide
51. Pesticides disturb the ecosystem by eliminating the
(a) Micro-organism of crop (b) Organisms which form the food chain
(c) Organisms which protect the environment (d) None of the above
52. Pesticides cause
(a) Noise pollution (b) Air pollution (c) Aquatic pollution (d) None of the above

53. What is agent orange
(a) A biodegradable insecticide (b)A weedicide containing dioxin
(c) Colour used influorescent lamp (d) A hazardous chemical used in luminous plants

54. The major drawback of DDT as a pesticides is that
(a) the cost of production is high
(b)it is not readily and rapidly degraded in nature
(c) it is significantly less effective than other pesticides
(d) organisms at once develop resistance to it

55. Pesticides with very low biodegradation but strong affinity for fatty tissues are
(a) Triazines (b) Pyrethroids (c) Organochlorines (d) Organophosphates

56. The concentration or dose of pesticide required to destroy 50% of pests is called
(a) LB 50 (b) LD 50 (c) LE 50 (d) LC 50

57. Pyrethrin is extracted from
(a) *Chrysanthemum cinerarifolium* (b) *Azadirachta indica*
(c) *Derris elliptica* (d) *Ryania speciosa*

58. Which pesticides are lipophilic
(a) Organochlorines (b) Organophosphates (c) Triazines (d) Pyrethroids

59. Which ingredient killed hundreds of people in Bhopal gas tragedy
(a) Carbon tetrachloride (b)Nitrous acid (c) Mustard gas (d) Methyl isocyanate

60. Triazines are derived from
(a) Ammonia (b) Urea (c) Uric acid (d) None

61. The botanical insecticide azadirachtin is obtained from
(a) Tobacco (b) Bacillus (c) Algae (d) Neem

62. 2, 4-D is an effective
(a) Insecticide (b) Herbicide (c) Fungicide (d) Rodenticide

63. Which of the following pesticides are non-biodegradable
(a) Triazines (b) Organophosphates (c) Organochlorines (d) None

64. Methyl isocyanate gas is used for synthesizing
(a) Temik (b) Baygon (c) Flit (d) Selvin

65. Which of the following is cholinesterase inhibitor
(a) Endosulphan (b) Aldrin (c) BHC (d) Malathion

66. DDT and 2, 4-D were Introduced
(a) Towards end of World War II (b) Towards beginning of World War II
(c) During World War I (d) Just after the World War I

67. Organophosphates inhibit
(a) Cholinesterases (b) Enterokinase (c) Urease (d) Carbohydrases

68. Which of the following when dissolved in water make(s) Bordeaux mixture
(a) Copper sulphate (b) Calcium hydroxide (c) Both (a) and (b) (d) None

69. The pesticides used in killing the acquatic pests (including insects) is
(a) DDT (b) BHC (c) Kerosene oil only (d) Kerosene crude oil

70. Fumigants are volatile toxicants
(a) HCN only (b) HCN and CS_2 only (c) BHC (d) Kerosene spray

71. Ratio of $CuSO_4$,$Ca(OH)_2$ and water in *'Bordeaux mixture*' is
(a) 4 : 4 : 40 (b) 4 : 4 : 50 (c) 5 : 5 : 40 (d) 5 : 5 : 50

72. Pyrethoids are of
(a) Synthetic origin (b) Plant origin (c) (a) and (b) both (d) Animal origin

73. Insecticide derived from urea is
(a) Simazine (b) Atrazine (c) Unerin (d) (a) and (b) both

74. Which of the following is a fungicide
(a) Thiram (b) Dichlone (c) Capton (d) All the above

75. Nobel prize was awarded to Paul Muller on the discovery of which of the following pesticides **2001]**
(a) Malathion (b) Parathion (c) Pyrethrum (d) DDT

76. *Carbaryl* is a
(a) Carbamate (b) Organophosphate (c) Azide (d) Pyrethoid

77. First pesticides used by man is
(a) Rotenone (b) Pyrethrin (c) Pheromone (d) Thuriocide

78. Gossypleure H.F. is a
(a) Enzyme (b) Synthetic hormone (c) Both (d) None

79. Drinking of mineral water with very low level of pesticides (about 0.02 *ppm*) for long periods may
(a) Produce immunity against mosquito (b) Cause leukemia (blood cancer) in most people
(c) Cause cancer of the intestine
(d) Lead to accumulation of pesticide residues in body fat

80. Most effective pesticides are
(a) Carbamates (b) Organochlorines (c) Organophosphates (d) All the above

81. DDT content in Indian population has touched
(a) 1-12 *ppm* (b) 11-30 *ppm* (c) 25-50 *ppm* (d) 48-98 *ppm*

82. Which one is not matched
(a) Organochlorine-DDT (b) Pyrethroid-Atrazine
(c) Organophosphate-Malathion (d) Carbamate-Carbofuran

83. The most likely reason for the development of resistance against pesticides in insects damaging a crop is
(a) Direct mutation (b) Acquired heritable changes
(c) Random mutation (d) Genetic recombination

84. **Assertion (A) :** Agricultural output increased several times after introduction of DDT
Reason (R) : DDT was the first insecticide used on a wide scale

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion

(b) If both assertion and reason are true but the reason is not the correct explanation of the assertion

(c) If assertion is true statement but reason is false

(d) If both assertion and reason are false

85. The term 'bio-magnification' refers to the

(a) Increase in population size

(b) Increase in the concentration of non-degradable pollutants as they pass through the food chains

(c) Blowing up of environmental issues by man

(d) Growth of organisation due to food consumption

86. The pesticides are the chemicals that kill

(a) Weeds (b) Mites (c) Insects (d) All of these

87. Eutrophication is due to

(a) Air pollution (b) Radiation pollution (c) Water pollution (d) Noise pollution

88. Pesticides with very low biodegradation but strong affinity for fatty tissues are

(a) Organochlorines (b) Organophosphates (c) Pyrethroids (d) Triazines

89. Difference between Burgundy's mixture and Bordeaux mixture is the presence of .....in the former

(a) $CuSO_4$ (b) Na_2CO_3 (c) Both (a) and (b) (d) Water

BIO - PESTICIDES

Basic Level

90. The two natural insecticides used before 1940

(a) Pyrethrum and rotenones (b) Pyrethroids and nicotine

(c) Pyrethrum and azadirachtin (d) Pyrethrum and squill

91. Biocontrol of larva of mosquito is done by

(a) Ladybug (b) Aphids (c) Gambusia (d) Rohu fish

92. Lady bug is used for the control of

(a) Mosquito (b) Aphids (c) Sparrow (d) Parakeet

93. Natural insecticide obtained from neem is

(a) Nicotine (b) Azadirectane (c) Ecdysone (d) All the above

94. The toxicants which kill the pests on coming in direct contact are known as

(a) Surface poisons (b) Contact poisons (c) Fumigants (d) None of the above

95. Stomach poisons are those

(a) When injected are harmful (b) When inhaled and injected are harmful

(c) Which reach the stomach along with food (d) (a) and (c) both

96. Broad spectrum insecticide is

(a) DDT (b) Pyrethoids (c) Bordeaux mixture (d) Aldrin

97. Insecticides kill

(a) Harmful insects (b) Only plant pests

(c) Specific insects (d) Both harmful and useful insects

98. Select the botanical insecticide
(a) Ryania (b) Rotenone (c) Azadirachtin (d) All of these

99. The prickly pear weed (*Opuntia*) menace has been successfully controlled by
(a) Cattle (b) D.D.T. Spray (c) Cochineal insects (d) Destroying its seeds

100. The first bio-insecticides developed on commercial scale was
(a) DDT (b) Organophosphates (c) Sporeine (d) Quinine

101. Cochineal insects have proved very useful for the control of
(a) *Eicchornia* (b) Cactus (c) Weeds (d) *Parathenium*

102. Biological control of agricultural pests, unlike the chemical control, is
(a) Toxic (b) Polluting (c) Very expensive (d) Self-perpetuating

103. Bio-insecticides includes
(a) Pathogens (b) Parasites (c) Predators (d) All of these

104. Biological methods of pest control include
(a) Crop rotation (b) Intercropping (c) Both (d) None

105. Roots of *Derris* yield
(a) Ryania (b) Nicotine (c) Pyrethroids (d) Rotenone

106. Rotenone is
(a) A bioherbicide (b) A natural herbicide (c) An insect hormone (d) A natural insecticides

107. The first natural insecticides discovered by chinese was
(a) Pyrethrum (b) Nicotine (c) Rotenones (d) Thurioside

108. Full form of IPM is
(a) Integrated pest management (b) Integrated, programme for malnutrition
(c) Indian petroleum management (d) None of the above

109. When a natural predator living being applied on the other pathogenic organisms to control them, this process is called
(a) Biological control (b) Genetic engineering (c) Confusion technique (d) Artificial control

110. Biological control component is central to advanced agricultural production. Which of the following is used as a third generation pesticide
(a) Pathogens (b) Pheromones
(c) Insect repellants (d) Insect hormone analogues

111. IPM involves use of
(a) biological control
(b) mechanical control
(c) modification of cultural practices and carefully planned use of pesticides
(d) all of the above

112. Which one of the following is pest of tobacco
(a) *Tribolium* sp. (b) *Spodoptera* sp. (c) *Pectinophora* sp. (d) *Calandra* sp.

113. Sporeine kills insects by inhibiting ion transport in the
(a) Midgut (b) Foregut (c) Hindgut (d) None

114. The carnivorous fish *Gambusia*, introduced in the lakes, ponds, etc., control a deadly disease in India, feeds on the larvae of
(a) *Nephantis* (b) Dragonfly (c) *Anopheles* (d) All of these

115. Food mixed with toxin to kill insects is called
(a) Pesticide (b) Bait (c) IPM (d) All the above

116. The mode of action of insecticides is through the attack on
(a) Respiratory system (b)Nervous system (c) Muscular system (d) Both A and B

117. Herbicides prevent
(a) Water reabsorption (b)Photolysis of water (c) Transpiration (d) Respiration

118. Most herbicides attack
(a) Photosystem I (b) Photosystem II
(c) Electron transport system (d) All of these

119. Nerve gas causes
(a) Inhibition or respiration (b) Inhibition of PSII
(c) Inhibition of cholinesterase (d) All of these

120. Much work on biological control of insects has been done in
(a) North America (b) Japan (c) Russia (d) U.K.

121. Sporeine was developed in
(a) France (b) Germany (c) Russia (d) USA

122. Thurioside is a proteinaceous toxin which is obtained from
(a) Biofertilizer (b) Farmyard manure (c) Green manure (d) Bacterial origin

123. Which of the following is the first fungicide
(a) 2, 4-D (b) D.D.T. (c) B.H.C. (d) Bordeux mixture

124. Which insect was used to check the spread of cacti
(a) *Cactoblastis cactorum* (b) *Coleus erythaem*
(c) *Neodeprion certifer* (d) All of these

125. Concentration of insecticide in the animals of a species is called
(a) Biomagnification (b) Bioconcentration (c) Both (d) None

ANSWER

ASSIGNMENT (BASIC & ADVANCE LEVEL)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
a	d	c	a	c	c	b	c	a	a	b	c	a	d	d	a	c	a	b	b
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
c	b	d	c	a	b	d	a	b	a	d	c	d	c	b	c	a	c	d	a
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
c	c	a	a	d	b	d	b	d	b	b	c	d	b	c	b	a	a	d	b
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
d	b	c	d	d	a	a	c	c	b	b	b	d	d	d	a	a	b	d	c
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
b	b	c	b	b	d	c	a	b	b	c	b	b	b	c	a	d	d	c	c
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
b	d	d	c	d	d	c	a	a	d	d	b	a	c	b	d	b	b	c	a
121	122	123	124	125															
b	d	d	a	c															

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