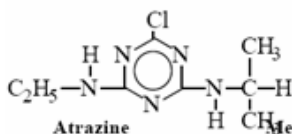


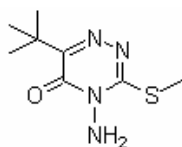
### 1.6.2. Triazines herbicides

Triazine herbicides are the most widely used. Triazines do not bioaccumulate and are moderately soluble in water. Examples include atrazine, simazine, cyanazine, metribuzin.

(structures are only for your information)



Atrazine



Metribuzin

**Atrazine** are widely used on corn and thus, in corn-growing regions, water becomes polluted. Atrazine acts by interfering with photosynthesis.

**Metribuzin** is widely used on soybeans, sugarcane, and wheat.

Atrazine inhibit photosynthesis, thus weeds die, but has no corn and other crop plants. The plants have the ability to change the herbicide into a harmless form. However, weeds do not have this ability and quickly die.

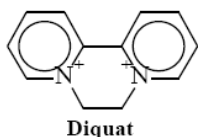
#### Toxic effects:

(i) These are suspected to be carcinogen.

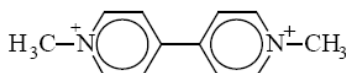
(ii) Atrazin affects amphibians.

### 1.6.3. Bipyridilium herbicides

Examples include diquat and paraquat. (structures are only for your information)



Diquat



Paraquat

#### Toxic effects:

These are highly toxic to humans - Paraquat exposure can occur by inhalation of spray, skin contact, and ingestion. Paraquat can be used safely without ill effects when proper procedures are followed.

## **1.7. Alternative approach to control the pests :**

We can use naturally occurring chemical substances or biological agents to control the pests.

### **1.7.1. Chemical communicating substance:**

For example, by applying PHEROMONES; pheromones can be used to control the insect pests (to trap, monitor or control insect pests). This method is an environmentally attractive approach to control the pests. They are species specific and thus affect only the target pest and are biodegradable, nontoxic and effective at a low concentration. Pheromones are the chemical substances that released by insects and other animals as a means of communication — they are used to indicate the food trails, mark mass meeting places and times, territory and to attract the mates and for more reasons. So, pheromones can be used as insecticides. We can extract these pheromones from insects as well as we can synthesize them in the laboratories.

Pheromones can be used as bait, and it will be kept in a trap; and these traps are coated with a sticky substance. So, insects will be attracted towards the trap and thus insects are trapped. For example, we can use a pheromone *which indicates the presence of food* may be kept in the trap as bait. Alternatively, we can use another type of pheromones — which are used to attract partners. Since these traps are coated with a sticky substance, hence insects are trapped. However, pheromones are difficult to produce and thus they are costly.

### **1.7.2. Biological controls :**

In this method, pest are kept in check by natural enemies including predators, parasites and disease-causing bacteria or viruses.

### **1.7.3. Sterilization :**

Insect sterilization is another option for pest control. In this technique, large numbers of the pest insects are breed and then sterilized by exposed to radiation. These irradiated insects are released in the target area but cannot produce any offspring.

## 1.8. RADIONUCLIDES

Elements with the same number of protons and different number of neutrons are called isotopes. Isotopes have identical chemical properties, but some isotopes are stable and some are unstable (radioactive).

### Sources:

- i) The radionuclides (radioactive isotopes) produced by weapons
  - ii) As waste products in nuclear power plants. Their ultimate disposal is a problem. Radionuclides are produced as fission products of heavy nuclei such as uranium or plutonium.
  - iii) Artificially produced radionuclides are also used in industrial and medical applications, particularly as “tracers.”
  - iv) Furthermore, radionuclides may enter aquatic systems from natural sources — as a result of cosmic ray interactions. Radionuclides are found naturally in air, water and soil. All water on the Earth, including seawater, has some radionuclides in it. Every food has some small amount of radioactivity in it. The common radionuclides in food are potassium 40 ( $^{40}\text{K}$ ), radium 226 ( $^{226}\text{Ra}$ ) and uranium 238 ( $^{238}\text{U}$ ) and the associated progeny. Radionuclides are even found in us, being that we are products of our environment. Every day, we ingest and inhale radionuclides in our air and food and the water. Natural radioactivity is common in the rocks and soil that makes up our planet, in water and oceans, and in our building materials and homes. Radionuclides are present in bedrock minerals such as iron, arsenic, and quartz. They can enter drinking water through erosion or chemical weathering of these natural deposits. Whenever ground water moves through the cracks in bedrock that contains the mineral deposits, radioactive minerals can leach out into the groundwater system and they easily dissolve in and contaminate drinking water supply—when the pH of groundwater is low. It is found in naturally occurring radionuclides in hot spring water
- Radioactive atoms emit radiation (alpha particles, beta particles, Gamma rays). This radiation produces ions when they interact with the materials in their path ie., the radiation is sufficient to remove electrons from other atoms, ie., ions are produced by radioactive isotopes. Therefore, this radiation is known as ionizing radiation.

### **Effects of ionizing radiation :**

- (i) Radiation-induced genetic damage is of great concern.
- (ii) Ionizing radiation can injure any tissue in the human body by initiating harmful chemical reactions in tissues; for example, bonds are broken in the macromolecules that carry out life processes.
- (iii) In cases of acute radiation poisoning, bone marrow which produces red blood cells is destroyed and the concentration of red blood cells is diminished. Such damage may not become apparent until many years after exposure.

Due to their large size, alpha particles do not penetrate matter deeply, but cause/produces an enormous amount of ionization along their short path of penetration. Therefore, alpha particles have little hazard outside the body, but are very dangerous when ingested. Although beta particles are more penetrating than alpha particles, they produce much less ionization per unit path length. Gamma rays are much more penetrating than particulate radiation, but cause much less ionization.