

24. ORGANOPHOSPHATES – CHARACTERISTICS, PREPARATION AND USE OF PHORATE, PHOSALONE, DIMETHOATE AND QUINALPHOS

a) Phorate (Thimet)

(O, O-diethyl-S-2-ethylthiomethyl phosphoro dithioate)

Derivative of Dithiophosphoric acid.

Phorate is produced by reacting dimethyl dithiophosphoric acid with formaldehyde and ethyl mercaptan at room temperature.

The second method is by condensation of chloromethyl sulphide with sodium dithiophosphoric acid.

Phorate is a clear liquid. B.P. 100°C, highly soluble in most organic solvents. It is unstable to hydrolysis. In acid medium it is more stable. It is easily oxidized to the corresponding sulphoxide which is resistant to hydrolysis and hence persists on plants for long time providing insecticidal action.

Phorate has both systemic and contact insecticidal action and is a very toxic compound. Phorate is absorbed and translocated in plants. It is oxidatively metabolized. Phorate is employed for control of aphids, carrot fly, fruit fly and wire worm in potatoes.

b) Phosalone (Zolone)

(O, O-diethyl-S-(6-chloro-2, 3-dihydro-2 oxobenzoxazol-3-yl) methyl phosphorodithioate).

Derivative of Dithiophosphoric acid

Phosalone is a systemic insecticide and acaricide used in citrus and orchard fruits. It is also used to control aphids in cereals, oilseed, rape and brassicas. It is also used for testing seeds to protect the seedling from insect damage. LD₅₀: 135 mg/kg.

Phosalone is produced by condensation of sodium or ammonium diethyldithiophosphoate with 6-chloro-3 chloromethyl benzoxazolone.

It is practically insoluble in water. It is a white crystalline substance, m.p. 45-17°C. It is relatively stable in acid medium but in alkaline medium it is rapidly hydrolyzed to the 6-chloro-benzenehexazolone diethyl thiophosphoric acid and formaldehyde.

c) Dimethoate (Rogor, phosphamide, cygon)

(O, O-dimethyl-S-methyl carbamoylmethyl phosphoro dithioate).

Derivative of Dithiophosphoric acid

Dimethoate is a systemic and contact insecticides and acaricide, produced by reacting salts of dimethyldithiophosphoric acid with N-methylchloroacetamide in aqueous medium in the presence of some organic solvents.

It is also produced by reacting dithiophosphate with aqueous methylamine at low temperature.

Pure dimethoate is a white crystalline substance with camphor like odour. The technical material is a yellowish brown (amber) coloured oily liquid with sulphurous acid smell. It is highly soluble in water and most organic solvents. Dimethoate is thermally unstable and on heating it decomposes.

d) Quinalphos (Ekalux) or (Bayrusil)

Derivative of Thiophosphoric acid.

Quinalphos (O, O-diethyl-O- (2-quinoxaliny) phosphorothioate) is obtained by condensation of O-phenylenediamine with the hemi-acetal of glyoxylate.

The compound is highly active against biting and sucking insects and has an LD₅₀: 70 mg/kg rat (oral).

Quinalphos developed by Bayer AG (1969) is prepared by reaction of O-phenylenediamine, chloroacetic acid and O, O-diethyl phosphorochloride thioate.

Quinalphos is a broad-spectrum contact and systemic insecticides, applied as spray to control pests in cereals, brassicas and other vegetables. The mammalian toxicity is quite high (LD₅₀: 70 mg/kg) but the compound is degraded in plants within a few days of application.