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KAP Making Plant



Cabbage Armyworm (Larvae)

Generally speaking, the organophosphorous insecticide has a strong insect killing power and a wide variety of applications against harmful insects. It has contact, stomach and gas poisoning effect. Besides, it has strong permeability and osmosis. It is thus exceptionally effective against insects harmful to rice, fruits and other agricultural crops which can hardly be destroyed by other insecticides.

KAP, developed by Monte Catini of Italy, belongs to the dithiophosphoric acid type of organophosphorous insecticide. Because parathion, the typical organophosphorous insecticide, is harmful to men and animals though it has an extensive insecticidal effect, KAP was developed as parathion's replacement with reduced poisoning effect of parathion. KAP is about one tenth of prathion in toxicity.

KAP has contact and stomach poisoning effect, thus having applications against a wide variety of crop pests.

Products and Specifications

The chemical name of KAP is 0,0-dimethyl-S-(α -ethoxycarbonylbenzyl)-phosphorodithioate. But it is usually called by the name of Cidial, Elsan, Papthion or PAP.

Table 1. Specification and Available Formulations

Technical grade

Active ingredient Appearance Odor	90% min. Reddish yellow oily liquid Aromatic
Density	$d_4^{25} = 1.22$
Melting point (pure) Boiling point Solubility	17.5 ± 0.5°C 70-80°C (2.5x10 ⁻⁵ mm Hg) Soluble in methanol, ethanol, benzene and most organic solvents, soluble 0.02% in water at 20°C
Corrosivity	Corrosive to iron, non-corrosive to aluminium and polyethylene coated iron

o Formulation available

KAP			60% Emulsifiable concentrate
KAP KAP			50% Emulsifiable concentrate 40% Wettable powder
KAP	3	\mathbf{D}	3% Dust
KAP	2	D	2% Dust

It is aromatic, oily liquid, and easily soluble in alcohol, aceton, ether and benzene but hardly soluble in petroleum and more hardly in water. Its structural formula is as follows:

$$\begin{array}{c|c} \operatorname{CH_3O} & \overset{\operatorname{S}}{\underset{P-\operatorname{S-CH-COC}_2 \operatorname{H}_5}{\circ}} \\ \operatorname{CH_3O} & \overset{\operatorname{S}}{\underset{P-\operatorname{S-CH-COC}_2 \operatorname{H}_5}{\circ}} \end{array}$$

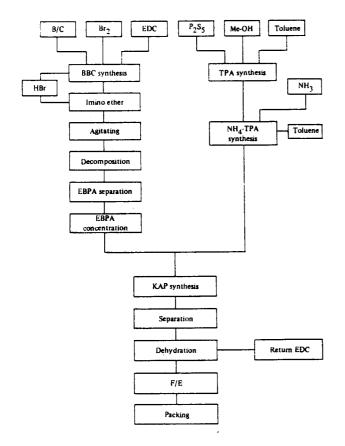
KAP is available in 2% and 3% powder or 40%, 50% and 60% emulsifiable concentrate. Their available formulations and specifications are shown in table 1.

Contents of Technology

1) Process Description

Benzyl cyanide and benzene are fed into a reactor for reaction with brome and nitrogen to obtain bromo benzyl cyanide (BBC). The HBr gas resulting from this process is acted upon by caustic soda to produce NaBr, which is also acted upon by HC1 to recover brome.

KAP Manufacturing Process Block Diagram



The BBC thus synthesized is mixed with sulfuric acid and ethanol to obtain ethyl bromo phenyl acetate (EBPA). In the meantime, P_2S_5 is dissolved in toluene, and the solution is further mixed with methanol to obtain 0,0-dimethyl dithiophosphoric acid (TPA). The H_2S gas resulting from this process is acted upon by caustic soda.

The TPA thus obtained is acted upon by NH₃ gas to obtain ammonium salt of TPA, which is further acted upon by EBPA in methanol solution for the production of EAP. This is then refined into the finished product

2) Equipment and Machinery

SUS reactor

Vacuum pump

Centrifuge:

Vacuum dehydrator

Dryer

Reactor (glass)

Condenser (glass)

Condenser (carbon)

Condenser (SUS 304)

Receiver (SS + GL)

Receiver (SUS 304)

Filter SS-Teflon

Steam ejector

Purification equipment

3) Raw materials and Utilities

Raw materials and utilities	Requirement (per ton of product)
EBPA	0.89 ton
P_2S_5	0.715ton
с́н _з он	0.7 ton
Toluene	0.35 ton
Electric power	800 kwh
Fuel	400 L
Water	10 tons

Example of Plant Capacity and Construction Cost

1) Plant capacity: 500mt/year

* Basis: 24 hours/day, 250 days/year

2) Estimated Equipment Cost

o Manufacturing machinery : US\$2,428,000
o Utility facility : US\$ 220,000
o Installation cost : US\$ 810,000

Total : US\$3,510,000

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3) Required Space

o Site area : 1,000 m²
o Building area : 480 m²

Total : 1,480 m²

4) Personnel Requirement

o Manager : 1 persons
o Engineer : 2 persons
o Operator : (15/shift) persons

Total : 48 persons

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