

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	90% min.
Appearance	Reddish yellow oily liquid
Odor	Aromatic
Density	$d_4^{25} = 1.22$
Melting point (pure)	$17.5 \pm 0.5^\circ\text{C}$
Boiling point	$70-80^\circ\text{C}$ (2.5×10^{-5} mm Hg)
Solubility	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

○ Formulation available

KAP 60 EC	60% Emulsifiable concentrate
KAP 50 EC	50% Emulsifiable concentrate
KAP 40 WP	40% Wettable powder
KAP 3 D	3% Dust
KAP 2 D	2% Dust

$$\begin{array}{c} \text{CH}_3\text{O} \\ \diagdown \\ \text{P} \begin{array}{c} \text{S} \\ \parallel \end{array} \text{S} \text{---} \text{CH} \text{---} \text{C} \begin{array}{c} \text{O} \\ \parallel \end{array} \text{C}_2\text{H}_5 \\ \diagup \\ \text{CH}_3\text{O} \end{array}$$

Contents of Technology

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

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graph TD
    B_C[B/C] --> BBC[BBC synthesis]
    Br2[Br2] --> BBC
    EDC --> BBC
    HBr[HBr] --> Imino[Imino ether]
    Imino --> Agitating[Agitating]
    Agitating --> Decomposition[Decomposition]
    Decomposition --> EBPA_sep[EBPA separation]
    EBPA_sep --> EBPA_conc[EBPA concentration]
    P2S5[P2S5] --> TPA[TPA synthesis]
    MeOH[Me-OH] --> TPA
    Toluene1[Toluene] --> TPA
    TPA --> NH4_TPA[NH4·TPA synthesis]
    NH3[NH3] --> NH4_TPA
    Toluene2[Toluene] --> NH4_TPA
    EBPA_conc --> KAP[KAP synthesis]
    NH4_TPA --> KAP
    KAP --> Separation[Separation]
    Separation --> Dehydration[Dehydration]
    Dehydration --> F_E[F/E]
    F_E --> Packing[Packing]
    Dehydration --> Return_EDC[Return EDC]
  
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The TPA thus obtained is acted upon by NH_3 gas to obtain ammonium salt of TPA, which is further acted upon by EBPA in methanol solution for the production of MAP. This is then refined into the finished product.

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

Raw materials and utilities	Requirement (per ton of product)
EBPA	0.89 ton
P ₂ S ₅	0.715 ton
CH ₃ OH	0.7 ton
Toluene	0.35 ton
Electric power	800 kwh
Fuel	400 l
Water	10 tons

Total : US\$3,510,000

3) Required Space

o Site area	:	1,000 m ²
o Building area	:	480 m ²
Total	:	1,480 m ²

4) Personnel Requirement

o Manager	:	1 persons
o Engineer	:	2 persons
o Operator	:	(15/shift) persons
Total	:	48 persons

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