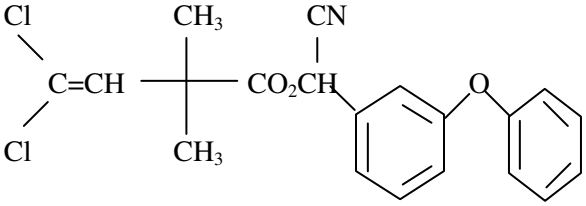
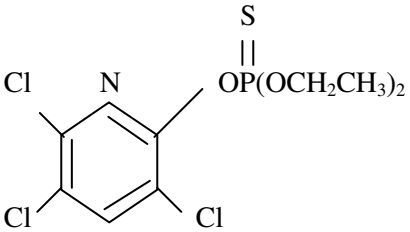
MSDS of SPINE
Chlorpyriphos 50% + Cypermethrin 5% EC

1. Name and address of the manufacturer/ Formulator	:	M/s Jai Shree Rasayan Udyog Ltd.; M-4, Aradhana Bhawan, Commercial Complex, Azadpur, Delhi (INDIA)
2. Common name / Descriptive name		:CHLORPYRIPHOS 50% + CYPERMETHRIN 5% Emulsifiable Concentrate
3. Chemical name (IUPAC nomenclature)	:	Cypermethrin : (RS)-α-cyano-3-phenoxy benzyl (1RS)-Cis-trans-3-(2,2-dichlorovinyl) 2, 2-dimethylcyclopro-panecarboxylate Chlorpyriphos : O, O-diethyl O-3,5,6-trichloro -2-pyridylphosphorothioate
4. Structural formula	:	**Cypermethrin**  **Chlorpyriphos** 
5. Empirical formula and molecular weight	:	Empirical formula: Cypermethrin : $C_{22}H_{19}Cl_2NO_3$ Chlorpyriphos : $C_9H_{11}CI_3NO_3PS$ Mol. Weight Cypermethrin : 416.3 Chlorpyriphos : 350.6
(1) Identity / Appearance (colour)	:	Homogenous stable liquid with negligible sediment and/or suspended matter. On dilution with water, it shall readily form an emulsion suitable for spray.
(2) Odour	:	Odorless
(3) Type of formulation	:	Emulsifiable Concentrate (EC)

(4) Content of active ingredient(s) : Chlorpyriphos 50% + Cypermethrin 5% w/w.

6. Composition of active "SPINE":
(Chlorpyriphos 50% + Cypermethrin 5% EC w/w.)

S. No.	Ingredients	%age	CAS No.
1	Cypermethrin Technical (a.i.)	5.00 % w/w	52315-07-8
2	Chlorpyriphos Technical (a.i.)	50.00 % w/w	2921-88-2
2	Emulsifiers A and B (Mixture of Ethylene oxide condensate of Alkyl-phenol and Sulphonated alkyl benzene)	11.20 % w/w	68412-54-4 and 26264-06-2
3	Solvent (Xylene)	47.75 % w/w	1330-20-7
	Total:	100.00 % w/w	

7. Water content / Moisture (above relevant). : Negligible

8. Specific gravity : 1.07

9. Viscosity : The product is a free flowing liquid.

10. Low & High Temp. storage stability (in respect to composition and physical properties related to use). : The product is stable for 24 months from the date of manufacture under normal storage conditions.

11. Impurities : Not applicable

12. Flammability : Flash point : >24.5 ^{o}C

13. Acidity : 0.15% w/w (max.) as H_2SO_4

14. Alkalinity : Not applicable

15. pH value : 6 - 8

16. Other properties may in certain cases need evaluation. : None

17. Carrier materials : Nil

18. Persistent foam (for formulation applied in water). : Negligible

19. Emulsion stability (for emulsifiable concentrates). : Any separation including creaming at the Top and sedimentation at the bottom of 100 ml of emulsion prepared in standard hard water with 2.0 ml of EC for agricultural use, shall not exceed 2.0 ml.

20. Corrosiveness (when necessary) : Product is non-corrosive

21. Known incompatibilities with other products, e.g., pesticides, fertilizers. : The product is compatible with commonly used insecticides and Fungicides.

22. Application with dosage rate :

Crops	Pests	Application rate Per 20 L water	Pre-harvest Period
Tomatoes, eggplants, pepper, potatoes, cucumber, squash, cabbage, cauliflower, beans, peas, lettuce, carrot, melons, lettuce, Spanish, celery	Aphid, Wire worm, Cabbage moth, Thrips, Cut worms, leaf miners, leaf hoppers, Tomato fruit worm, potato tuber moth, Psylla, Cut worms, Army worm, Leaf and Fruit worms, whiteflies, thrips, Colorado beetle, agrotis	15 – 20 ml	7 days
Apples, pears, quince Plums, peaches, almonds, apricots, cherries	Aphids, leaf miners, pear psylla, wooly aphid, apple fruit worm, plum fruit worms, leaf piercing insect, spider mites, codling moth, scale insects, white fly, Leaf miner, leaf worms, leaf rollers,	15 – 20 ml	14 days

	caterpillar,		
Grapes	Grape berry moth	15 – 20 ml	14 days
Olives	Olive scale insects	15 – 20 ml	14 days
Citrus	Aphids, psylla, Red scale insect, black scale insects, mealy bug, brown scale insects, citrus flower cut, white fly, thrips	15 – 20 ml	14 days
Tobacco	Aphids, whitefly	15 – 20 ml	14 days
Ornamentals	Aphids, thrips, whitefly, beetles, Aphids, scale insects, cut worms, Leaf miner, leaf worms, leaf hoppers, leaf rollers, bugs	15 – 20 ml	---

23. Toxicology data :

a) Acute Oral
Rate : **Cypermethrin**: 449 mg/kg (rats)
Chlorpyriphos: 101 mg/kg (rats)

Mice :

b) Acute Dermal
Rate : **Cypermethrin**:>3000 mg/kg (rats)
Chlorpyriphos: >4000 mg/kg (rats)

c) Acute Inhalation
Rate : **Cypermethrin :** 2.5 mg/l (rats) [a.i.]
Chlorpyriphos: >0.2 mg/l (rats) [a.i.]

d) Acute
Other routes, e.g., intraperitoneal :

e) Skin irritation : **Cypermethrin:** Very slightly-irritant (rabbits)
Chlorpyriphos: Non irritant (rabbits)

f) Eye irritation : **Cypermethrin:** Minimally irritant (rabbits)
Chlorpyriphos: Mildly irritant (rabbits)

g) Short term : **<u>CYPERMETHRIN</u>**
Oral administration

Rats: Groups of 6 male and 6 female rats were fed diets containing 0,25,100,250,750 or 1500 mg/cypermethrin kg feed for 5 weeks. In the 1500 mg/kg group, reduced body weight gain and food intake, nervousness, in coordinated movement, increased liver weight and increase in blood urea and haemoglobin concentrations were observed, but there were no pathological

changes. No changes were detected in the groups receiving 750 mg/kg or less.

Dogs: Beagle hounds (4 of each sex per dose level) were fed diets containing 0,5,50,500 or 1500 mg cypermethrin/kg diet for 13 weeks. At 1500 mg/kg, severe signs of intoxication consisting of diminished food intake, weight loss, diarrhea, anorexia, licking and chewing of the paws, whole body tremors, a stiff exaggerated gait, ataxia were observed. However, no effects were seen at 500 mg/kg feed.

CHLORPYRIPHOS

Rats: Cholinesterase inhibition in plasma and erythrocytes was evident of dietary levels of 100 ppm and above. No symptoms of toxicity were evident at 100 ppm.

Dogs: Gross cholinergic effect was evident in dogs fed 600 and 200 ppm for 16 and 45 days respectively. At 60 and 20 ppm for 88 and 77 days respectively, retardation in growth and reduction of cholinesterase activity was the only abnormality.

h) Short term Sensitizing effects :

i) Toxic effects of metabolies, breakdown products or impurities. : Metabolites, break down products or impurities does not produce any toxic effects of both Cypermethrin and Chlorpyriphos when used as per the recommendation.

j) Metabolic-studies :

CYPERMETHRIN

In Animals: Three rats of each sex were given a single oral dose of 0.5 mg (C 1.2 mg/kg b.w. for males and 2.1 mg/kg b.w. for females) of a cis/trans mixture of 14C-cyclopropyl labeled cypermethrin. Three days after dosing, low concentrations of radioactivity were found for both sexes in the kidneys, muscle, brain and blood. The level in the liver of male rats was 3 times higher than those in the male rats. Urinary excretion of the compound was rapid in both sexes; approximately 50-60% of the dose being excreted in 48 h. Elimination via the faeces was slower, the mean rate being approximately 30% of the dose in 3 days.

In Plants: 14C-cyclopropyl products Cypermethrin was applied to lettuce twice under outdoor conditions at a rate equivalent to 0.3 kg/ha and harvested for analysis 21 days after the last treatment. Most of the residue was in the form of unchanged cypermethrin (33% of the

total label present) and polar materials (54%), which are shown to be mainly conjugates of trans-cypermethrin. The major metabolite was identified as the glucose ester.

In Soil/Environment: In soil, hydrolysis with cleavage of the ester bond occurs within c.16 weeks. Further hydrolytic and oxidative degradation occurs. Under lab conditions, cypermethrin degrades more rapidly in soils low in organic matter. It is stable as a solid but it is readily hydrolyzed in solution under alkaline conditions. Cypermethrin is a non-polar pesticide and readily adsorbed into the soil surface and bound there. Very little cypermethrin would move through the soil profile, although all of the degradation products are more mobile than the parent product.

CHLORPYRIPHOS:

In Animals: The metabolic rate of Chlorpyriphos in animals is oxidative dealkylation or hydrolysis to diethyl phosphorothioate and 3,5,6-trichloro-2-pyridinol being the major route of detoxification. The latter metabolite is conjugated as the glycosides or glucuronides in plants and animals. 90% of the applied dose in rats was excreted in the urine within 48 hours. The major metabolite in the urine was identified as the glucuronide of 3,5,6-trichloro-2-pyridinol. The parent pyridinol and its glycoside were found in lesser amounts.

In Plants: Most studies have shown that the chlorpyriphos, which is taken up by the foliage of plants, is rapidly metabolized to 3,5,6-trichloro-2-pyridinol, which is then sequestered by the plant as glycoside conjugates. Also other metabolite tentatively identified as desethyl chlorpyriphos, di-desethylated compound 3,5,6-trichloro-2-pyridyl phosphate. It is taken up by the foliage of plants & rapidly metabolized to 3,5,6-trichloro-2-pyridinol, which is then sequestered by the plant as glycoside conjugates. Degradation of the major soil metabolites was quite variable among different soils and rapid degradation (half-life <30 d) occurred in 8 of the 15 soils.

In Soil/Environment: It is fairly stable to degradation in soils with half-lives reported over a wide range of 7-120 days (several studies) and with the rate of decomposition being very dependent upon the soil type, degradation was

faster in aerobic conditions than anaerobic by a factor of about two (several studies). Leaching studies have shown chlorpyriphos to have little mobility in soil. Field studies have confirmed this lack of mobility, with chlorpyriphos residues being confined to the upper 12 inches of soils in several trials.

k)Long-term toxicity, including carcinogenicity. :

CYPERMETHRIN:

Rats: Wistar rats (24 of each sex per dose level and 48 of each sex as control) were fed dietary concentrations of 0,1,10,100 or 1000 mg cypermethrin/kg for up to 2 years in a combined long-term/carcinogenicity study. No evidence for carcinogenicity was found in this study.

Mouse : Swiss mice (70 male and 70 femalses) were fed diets containing 0,10,400 or 1600 mg cypermethrin/kg feed for up to 101 weeks. Effects consisted of increased liver weights at 400 and 1600 mg diet and decreased body weight, thrombocytosis and mild anemia at 1600 mg/kg diet. There were no compound-related changes in non-neoplastic histopathology or increases in tumors of types that are not commonly associated with the mouse strain used. Feeding cypermethrin at levels of up to 1600 mg/kg diet to mice for a lifetime did not produce any evidence of Carcinogencity.

CHLORPYRIPHOS

Rats: Groups of rats were fed dietary levels of Chlorpyriphos of 0, 0.01, 0.03, 0.1, 1.0 & 3.0 mg/kg/day for two years. Chlorpyriphos at all dosage levels had no significant effect on behavior, appearance, growth, mortality, hematology, urinalysis, clinical biochemistry, gross or histo-pathology of tissues and organs or the incidence of new plasma.

Dogs: Groups of dogs were fed chlorpyriphos in the diet for up to two years at dose levels of 0, 0.01, 0.03, 0.1, 1.0 & 3.0 mg/kg/day. Inhibition of erythrocyte cholinesterase in males and females were evident at 1.0 and 3.0 mg/kg. Marginal reduction in brain cholinesterase activity was shown at the highest level of feeding. Inhibition of cholinesterase activity was shown at the highest level of feeding. Inhibition of cholinesterase activity was the only abnormality detected.

l) Neurotoxicity :

CYPERMETHRIN:

In a delayed neurotoxicity study on 6 adult

domestic hens, cypermethrin in DMSO did not cause histological lesions in the nervous system (brain, spinal cord and sciatic nerves) or signs of intoxication at an oral dose of 1000 mg/kg body weight per day for 5 days, compared with a positive control group. No delayed neurotoxicity was observed.

CHLORPYRIPHOS:

A maximum dose of 150 mg/kg of chlorpyriphos has been administered orally to hens, which were protected by pralidoxime. Surviving birds did not display delayed ataxia or paralysis.

m) Reproduction studies :

CYPERMETHRIN:

30 male and 30 female wister rats were fed at dietary concentrations of 0, 10, 100 or 500 mg/kg for 5 weeks, after which the males and females (10 weeks of age) from each treatment group were mated. Two successive litters were produced from each pair. The study was continued until 2 litters from each of 3 successive generations had been bred. Cypermethrin did not cause any adverse effects on the reproductive performance of the rats or on the survival of the offspring. But in the 500 mg/kg Fo group, one animals showed a squamos cell carcinoma of the skin. However, this was considered not to be related to the compound, because no increase in tumour incidence was found in the long term studies on rats and mice. No changes were observed in rats administered 100 mg/kg diet.

CHLORPYRIPHOS

Current evidence indicates that Chlorpyriphos dose not adversely affect reproduction. In two studies, no effects were seen in animals tested at dose levels up to 1.2 mg/kg/day. No effects on reproduction occurred in a three-generation study with rats fed dietary doses as high as 1 mg/kg/day. In another study in which rats were fed 1.0 mg/kg/day for two generations, the only effect

n) Embryotoxicity, including :

CYPERMETHRIN

Rats: Groups of pregnant rats were administered cypermethrin orally as a 1% solution in corn oil at doses of 0, 17.5, 35 or 70 mg/kg body weight per day, from days 6 to 15 (inclusive) of gestation. Cypermethrin at 17.5mg/kg body weight per day did not affect maternal performance or fetal survival and development. At 70 mg/kg per day, slight to severe neurological disturbances were observed in nearly half of the females. Despite of this

maternal toxicity, there was no indications of any embryotoxic or teratogenic effects of cypermethrin.

Rabbits: Groups of pregnant female-banded dutch rabbits (30 controls and 20 for each dose group) were dosed orally with 0, 3,10 or 30 mg/kg b.w. of the product in corn oil during days 6-18 of gestation. No influence was found on growth, pre-implantation losses, resorptions, fetal deaths, or numbers and sizes of fetuses. No teratogenic effects were found in this study.

CHLORPYRIPHOS

Rabbits: Oral teratology study was done in New Zealand White rabbits with doses of 0, 25, 100 or 250 mg/kg/day. Maternal NOAEL was found to be 100 mg/kg/day and developmental NOAEL is 25 mg/kg/day.

o) Mutagenicity : **CYPERMETHRIN:**

Using bacterial assays, no increase in the reversion rates of Escherichia coli WP2, WPS uvrA, Salmonella typhimurium TA 1535, TA 1537, TA 1538 TA 98 & TA 100 were detected with cypermethrin (concentrations of up to 2 mg per plate) in the presence or absence of a rat liver microsomal activation system. Also No cytotoxicity was observed when the assay was carried out in V79 Chinese hamster cells in the presence of rat hepatocuytes. No evidence of dominant lethality was found when male CDI mice (3 groups of 12 animals and a control group with 36 animals) were given single oral doses of 6.25, 12.5 or 25 mg cypermethrin/kg body weight.

CHLORPYRIPHOS:

It showed no mutagenic activity in the histamine reverse mutation system in five strains of Salmonella typhimurum, the tryptophan mutation system in E. Coli EP2, the mitotic recombination assay in Saccharomyces cereviside D3 and the relative toxicity in E. Coli, Bacillus subtills.

p) Health records, both from :The product has not industry and agriculture.

Produced any single case of poisoning both from industry and agriculture since its first use 4-5 years back.

q)Treatment of poisoning : 1. Atropinise the patient immediately and maintain full atropinisation by repeated doses of 2 to 4 mg at 5 minutes interval for hours together. The need for further atropine

administration is indicated by the continuance of symptoms.

2. Dissolve 1-2 gm of 2 PAM in 10 ml distilled water and intravenously very slowly for 10-15 minutes.

r) First aid measure : 1. Gastric lavage with 5% sodium bicarbonate may be used if swallowed.

2. Wash contaminated skin and irrigate eyes with normal saline.

s) Supplementary treatment : Treat symptomatically.

t) Data on further disappearance on storage, transport, etc. : **CYPERMETHRIN:** Research on the fate of residues in stored grain treated experimentally showed that residues of cypermethrin were relatively persistent. This long-term persistence on grain is very desirable for long-term storage, especially in hot and humid climates.

CHLORPYRIPHOS

Information on the frozen storage stability of chlorpyriphos and 3,5,6-trichloro-2-pyridinol residues in an extensive range of raw agricultural and processed commodities shows that residues were generally stable (>70% remaining) under the test conditions (-18C for 3 months and longer, sample for 4 years).

u) Prediction of potential consumer intake, actual intake studies. : **Cypermethrin :** ADI-0.05 mg/kg (JMPR 1981)
Chlorpyriphos: ADI-0.01 mg/kg (JMPR 1999)

v)Assessment of actual consumer intake : **Cypermethrin :** ADI-0.05 mg/kg (JMPR 1981)
Chlorpyriphos: ADI-0.01 mg/kg (JMPR 1999)

w)Persistence of the product. : As the product is non-systemic in plants, It is not adsorbed from soil via the roots.

24. Prediction of environment effects :
Soil and Ground water :
a) Fate and mobility studies of toxicant : **CYPERMETHRIN**

In soil, hydrolysis with cleavage of the ester bond occurs within c.16 weeks. Further hydrolytic and oxidative degradation occurs. Under lab conditions, cypermethrin degrades more rapidly in sandy clay and sandy loam soils than on clay soils, and more rapidly in soils low in organic matter.

CHLORPYRIPHOS
In soil, chlorpyriphos is degraded at a moderate rate : DT50 (lab) 10-120 d (25 C); field DT50 for soil incorporated applications 33-56 d. for soil surface application 7-15 d. Primary route of degradation is transformation to 3,5,6-trichloropyridin-2-ol, which is subsequently degraded to organochlorine compounds and CO2.

b) water solubility : **Cypermethrin :** 0.004 mg/l (pH7)
Chlorpyriphos : c.1.4 mg/l at 25 C

c) Octanol water partition coefficient : **Cypermethrin :** Kow logP = 6.6
Chlorpyriphos : Kow logP = 4.7

d) Degradation : **CYPERMETHRIN**
In soil, hydrolysis with cleavage of the ester bond occurs within c.16 weeks. Further hydrolytic and oxidative degradation occurs. Under lab conditions, cypermethrin degrades more rapidly in sandy clay and sandy loam soils than on clay soils, and more rapidly in soils low in organic matter.

CHLORPYRIPHOS
It is fairly stable to degradation in soils with half-lives reported over a wide range of 7-120 days (several studies) and with the rate of decomposition being very dependent upon the soil type. Degradation was faster in aerobic conditions than anaerobic by a factor of about two (several studies).

e) Effects on birds : **Cypermethrin a.i.** : Oral LD50
Mallard ducks : >10000 mg/kg
Chickens : >200 mg/kg
Chlorpyriphos : Acute oral LD50
Chickens : 32-102 mg/kg
Mallard ducks : 490 mg/kg
House sparrows : 122 mg/kg
8-days dietary LC50
Bobwhite quail : 423 ppm

f) Effects on fish : **Cypermethrin a.i. :** LC50 (96 h)
Rainbow trout : 0.69 ug/l (a.i.)
Sheepshead minnows : 2.37 ug/l

Chlorpyriphos a.i. : LC50 (96 h)
Rainbow trout : 0.007-0.051 mg/l
Roach : 0.25 mg/l
Bluegill sunfish : 0.002-0.10 mg/l
Fathead minnows : 0.12-0.54 mg/l

g) Effects on fish food species	:	Not effect on fish food species when used as per recommendation.
h) Effects on honeybees	:	**Cypermethrin a.i. :** LD50 Oral : 0.035 ug/bee LD50 Topical : 0.02 ug/bee **Chlorpyriphos a.i.:** LD50 Oral : 360 ng/bee LD50 Contact : 70 ng/bee
i) Degradation product in soil	:	**Cypermethrin:** The major route of degradation was hydrolysis leading to DCVA and 3PBA. The initial product derived from the alcohol moiety was probably the cyanohydrins, which converted into 3PBA, which was oxidized to 3PBA. The formation of bound residue paralleled the release of 14CO2 and was much greater under aerobic conditions. **Chlorpyrifos :** Main degradation product is 3,5,6-trichloropyridin –2- ol, which is subsequently degraded to organo-chlorin compounds and CO_2.
j) Disposal of used, condemned and	:	Packages or surplus materials and washing surplus pesticides and pesticides containers. from machines and containers shall be disposed off in a safe manner so as to prevent environmental or water pollution.
k) Classification during transport.	:	UW 6.1