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Manual for Farmwomen to reduce Pesticidal Hazards

Compilation

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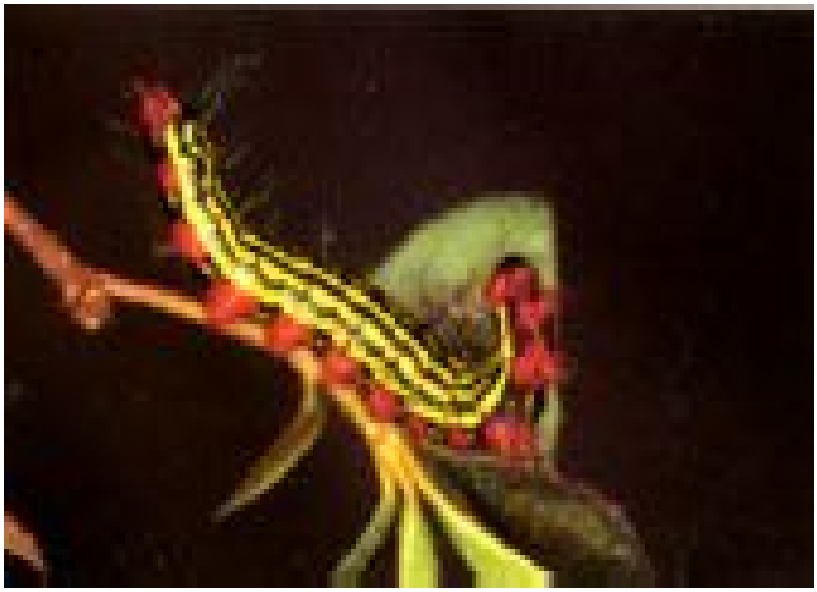

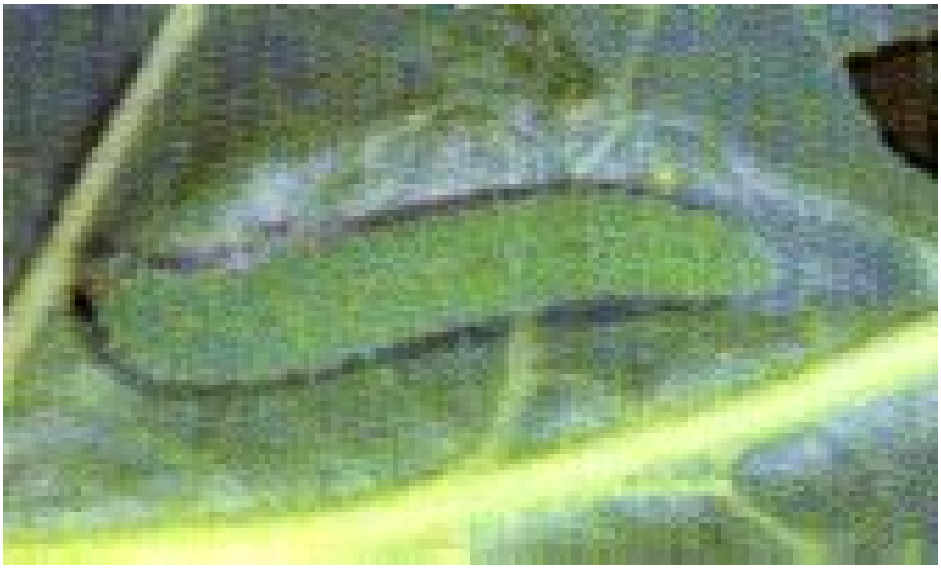

Manual for Farmwomen to reduce Pesticidal Hazards

Raising crop production by increasing the area under plough no longer appears to be possible in India. Available alternatives left from these areas to enhance crop intensity and productivity per unit area as well as per unit time is owing to the adoption of the improved scientific crop production and

protection technologies for achieving food target to feed the rapidly growing global human population. Plant protection is an essential input for sustaining the agricultural production by protecting crop damage due to pests by judicious use of pesticides. Women in India play a prominent role in agriculture. Seventy eight percent of economically active women are engaged in agriculture. Population of farmwomen in Bangladesh, Bhutan and Nepal is up to 90%. Farmwomen are best equipped with strength, determination and indigenous knowledge but are not aware of modern technological innovations especially judicious use of pesticide applications. Therefore they are often exposed to various ill effects of pesticides. When using pesticides, safety is critical. Always read and follow pesticide label directions exactly. The label is a legal document. Using pesticides in ways other than listed on the label may result in legal action.

Look specifically for the following:

- plants that may be treated;
- application rates and timing;
- application methods;
- toxicity level: warning, caution, danger;
- precautions to take when applying;
- danger to other animals or nearby vegetation;
- environmental concerns;
- timing relative to harvest;
- instructions to physicians when poisoning occurs;
- disposal and cleaning of clothing used during application;
- disposal and storage of all pesticide chemicals.

Pesticide Toxicity

Pesticide toxicity is measured most often by LD_{50}. This is the dose of a toxic substance required to kill 50% of a test population of animals. It is an estimate of toxicity. LD_{50} is the abbreviation for "median lethal dose."

The lower the LD_{50}, the more toxic the substance. A high LD_{50} means that more of a substance is required to make a toxic dose. Rotenone has an LD_{50} of 132. Malathion's LD_{50} is 1,375, while table salt has an LD_{50} of 3,750. From this you can see that rotenone, an "organic" pesticide, is much more toxic than malathion or salt.

LD_{50} only indicates the acute toxicity or immediate effect of a substance. Also of concern are the long-term effects, called chronic toxicity. This is of much greater concern to applicators handling chemicals on a daily basis.

The hazardous effects of pesticides among farmwomen may be reduced by their skill development following various precautions described in present bulletin.

Precautions during purchase of pesticides

- Every pesticide container is marked with different colour of toxicity triangle. Note that red stands for extremely toxic; yellow for highly toxic; blue for moderately toxic and green stands for slightly toxic.
- Purchase only required quantity for single application in specified area or purchase only the amount you will use in one growing season.
- Avoid purchase of pesticides without proper labels.
- Do not purchase pesticides after expiry date.
- Do not purchase leaking containers, loose, unsealed or torn bags.

Precautions during storage of pesticides

- Avoid storage of pesticides in house premises.
- Do not touch with naked hand and keep them away from children and livestock
- Never keep them together with food or feed/fodder.
- Keep only in original container with intact seal.
- Do not transfer pesticides to other containers.
- Do not expose to sunlight or rainwater
- Do not store weedicides along with other pesticides.
- Pesticides should be stored in their original containers in a locked cabinet. The storage location should not be exposed to heat or cold. Liquid pesticides should never freeze.

Precautions during handling of pesticides

- Read the label on the pesticide container and leaflet carefully and follow the instruction written there.
- Never carry/transport pesticides alongwith food materials.
- Avoid carrying bulk-pesticides (dusts/granules) on head, shoulders or on the back.
- Prepare spray solutions as per requirement. Avoid mixing of two or more insecticides.
- Arrange the equipments required for application well in advance including personal protective equipment viz. clothing that cover arms, legs, nose and head; gloves and boots that cover hand feet; hats and handkerchiefs or clean cloth as face masks to protect the hairs, eyes and nose and respirations to avoid breathing mist or vapor.
- Never work alone while handling of extremely and highly toxic pesticides bearing red and yellow toxicity triangle.
- Never leave pesticides unattended, children or animals may be affected.
- Measure and mix required quantities accurately.
- Never eat, chew drink, smoke, rub eyes or face while working with pesticides.
- Do not use the mouth to siphon a pesticide from the container.
- Use clean water for preparing spray solution in order to avoid clogging of nozzle.
- Do not mix granules with water.
- Do not smell the pesticides.
- Concentrated pesticide must not fall on hands or other body parts while opening sealed containers.
- Avoid spilling of pesticide solution while filling the sprayer.
- If you are exposed to pesticides during mixing or application, wash immediately and follow label instructions. Pesticides contacting the eyes, nose or ears should be rinsed with water.

Precautions in the use of equipment

- Different types of plant protection equipments are generally used viz; hand sprayers and atomizers hand compressed sprayer, knapsack sprayers, tractor mounted sprayer, motorized knapsack mist blowers, ultra low volume or controlled droplet applicators, fogging machines,

hand carried dusters, hand carried granule applicators, power duster, aerial applicators (aircraft sprayers), injectors and fumigation equipments. Hence, it is essential to select appropriate kind of equipment according to need.

- Use the correct applicator. The label will provide specific instructions. You must have separate sprayer equipment for herbicides and insecticides. Herbicide residues in a sprayer used to apply insecticides or fungicides may damage plants.
- Do not use a leaky, defective equipment.
- There are various types of hydraulic energy nozzles used in sprayers viz; cone jet nozzles used for foliage sprays; flat pan nozzles-used for spraying in flat surfaces and in aerial spraying impact nozzle or floor jet-mainly used for herbicide application; adjustable nozzle and swirl nozzles-used for spraying in two different directions. Therefore, select the right type of nozzle according to requirement.
- Do not blow or clean clogged nozzle with mouth. Use old toothbrush tied with the sprayer and then cleans with water.
- Do not use same sprayer for weedicide and insecticide.
- Clean the equipment after use with soap water.
- Check pump, nozzles etc. before going to the field for spraying.
- Equipments should be washed thoroughly with plain water and add some oil to any type of sprayer pump before storage.
- Grease and lubricants should be applied to joints and surface wherever required to protect rust.
- All spraying equipments should be kept locked and away from children, food items and farm animals. Proper care should be taken to prevent rats from nibbling at hoses and other parts.

Precautions during application of pesticides

- Identify and count the ratio of beneficial insects before the application of insecticides.
- Learn the Economic threshold Level (ETL) of pests in various crops, because it is the level of pest population, which can cause considerable damage and required control measure. Population, below ETL needs not to be controlled.

- Never use lower or higher dose and dilution of pesticide. Apply only at recommended dose and dilutions.
- Wear protective clothing when applying pesticides. This includes long-sleeve shirt, long pants, shoes, socks, rubber or neoprene gloves, protective eye gear and a respirator or dust mask when necessary.
- Avoid dusting or spraying during peak visiting hours of pollinators.
- Do not apply on hot sunny days or strong windy days. To avoid exposure to pesticides, apply when there is no wind that will cause pesticide DRIFT.
- Mix only enough of a pesticide to complete the job. Mixing exposes the applicator to the most concentrated form of the pesticide. Special care is required. Carefully measure concentrates with measuring spoons or cups reserved and labeled for that use only. No chemicals should be mixed together unless the label says they are specifically compatible.
- If more pesticide is mixed than is needed, it should be applied to plants that are on the label. Never pour a pesticide down the drain or storm sewer. Rinse the sprayer with fresh water, applying the rinse water to plants that are listed on the label. A second and third rinse is recommended.
- Do not apply just before or after the rains.
- Perform dusting in early morning and spraying in afternoon in non-windy and sunny period.
- Spraying or dusting in should be done in the windward direction, taking care to see that there are no animals, people or animal feed nearby.
- To avoid contact with the spray or dust walk in the field through non-treated crops . Backward movement in field is safer during application of pesticides.
- Avoid entry of children, workers and animals in field immediately after the spray. Demarcate the field applied with pesticides.
- Learn about the waiting period of each insecticide. Fruits, fodder and vegetables should not be picked before waiting period.
- Containers, drums, buckets etc. used for mixing pesticides should not be used for domestic purposes.
- Use metal seed dresser or earthen pots or polythene bags for seed dressing.
- Do not open the lid or the cover of polythene bags, earthen pots immediately after seed treatment in order to avoid the inhalation of pesticides.

- Do not add water in any type of seed dresser.
- Do not use left over treated seed either for human or animal consumption. Therefore, treat the seed only in required quantity.
- Do not take up spray or dusting work with empty stomach.
- Do not spray or dust more than four hours at a time in a day.
- During nausea, tiredness, headache, giddiness, and vomiting one should must stop spraying or dusting immediately.
- Wash the hand and face with soap immediately after application.
- Change the clothes immediately after application of pesticide and take a bath in fresh water. Decontaminate personal protective equipment before another application of pesticide.
- Clothing exposed to pesticides should be washed in detergent and hot water. Wash protective clothing separately from other laundry.
- Keep records of pesticide applications for reference should problems arise. This also helps you remember the date of application for the days before harvest in edible crops.

Precautions for disposal of empty container and unused pesticides

- Empty containers should be crushed with a stone or stick and buried deep into the soil away from water resources so as to prevent contamination of surface water or groundwater.
- Empty containers should never be used for any purpose.
- Left over spray solution should never be drained in ponds, well, irrigation canals or water lines. Throw it in to a barren isolated area.

Precautions for pesticidal poisoning

- The fundamental principle of safety in the use of pesticides is to prevent poisoning by exercising aforementioned precautions. But the importance of taking safety precautions while handling and applying pesticides is often under estimated by the farmwomen resulting pesticidal poisoning. Nervousness, headache, dizziness, dilated eyes, giddiness, nausea, blurred vision, weakness, cramps, diarrhea, sweating, excess salivation, vomiting, rapid heart beat , discomfort in

chest, fatigue and weakness are major symptoms of pesticidial poisoning.,

- Pesticide poisoning occurs from direct contact with the pesticide. This includes absorption through the skin, mouth, nose and eyes. Pesticides will soak into clothing and cause prolonged skin contact if the clothing, including leather or canvas shoes and gloves, are not removed immediately.
- During any symptoms of poisoning drink one glass of warm water with two spoonful salt or one gram zink sullphate or inject 1/10 gram Acomorphene Hydrochloride followed by vomiting under medical supervision.
- After cleaning of stomach by vomiting use any one antidote viz; Atropine Sulphate or Diactetayal Monohexane or Pyridine aldizymate for organophosphate or carbamate poisoning; Vitamin-K for anticoagulant poisoning; calcium gluconate for organochlorine poisoning and amyl nitrate for poisoning of calcium cyanide and hydrogen cyanide under the supervision of a registered medical practitioner.
- During senselessness do not try for vomiting and contact with Doctor for stomach cleaning. After cleaning of stomach force to drink one table spoonful with water the following Universal Antidote

(i)	Powder of burned Double Roti (Charcoal)	-	2 Part
(ii)	Concentrate tea (Tannic acid)	-	1 Part
(iii)	Milk of magnesia	-	1 Part

Some Important information in Tabular form is given below for Farmwomen in order to reduce the Pesticidal Hazards.

According to recent report of DARE Govt. of India, following surprising results of pesticide residues have been found.

Name of commodity	Sample percentage
Vegetable	61%
Fruits	48%
Species	40%
Vegetarian human food	11%
Non veg human food	15%
Cow milk	65%
Honey	51%
Ground water	59%
Surface water	65%

Govt.of India has banned the use of 30 pesticides and restricted the use of 7 pesticides as detail given below.

Pesticides Banned

Sl.No	Name of the Pesticide
1.	Aldicarb
2.	Aldrin
3.	Benzene Hexachloride (BHC)
4.	Calcium cyanide
5.	Captafol 80% powder.Use banned w.e.f 17.7.2003
6.	Chlordane
7.	Chlorobenzilate Use banned w.e.f. 17.7.2003
8.	Cicomochloropropane
9.	Coper Acetoarsenite
10.	Dieldrin Use banned w.e.f. 17.7.2003
11.	Endrin
12.	Ethylene Dibromide Use banned w.e.f 17.7.2003
13.	Ethyl Mercury Chloride
14.	Ethyl Parathion
15.	Heptachlor
16	Maleic Hydrazide Use banned w.e.f. 17.7.2003
17.	Menazone
18.	Mehtomyl 12.5%

19.	Mehtomyl 24%
20.	Nicotine Sulphate
21.	Nitrofen
22.	Paraquate Dimethyl Sulphate
23.	Pentachloro nitrobenzene (PCNB)
24.	Pentachlorophenol (PCP)
25.	Phenyl Mecury Acetate (PMA)
26.	Phosphamidon 85% SL
27.	Sodium Methane Arsonate (MSMA)
28.	Tetradifon
29.	Toxafen
30.	Trichloro acetic acid (TCA) use banned w.e.f 17.7.2003.

Restricted Pesticides

Sl.No	Name of the Pesticide
1.	Alumimium phosphide
2.	DDT
3.	Lindane
4.	Methyl bromide
5.	Methyl Parathion
6.	Methoxy Ethyl Mercurious Chloride
7.	Sodium cyanide

Identification of Toxicity Level of Different Insecticides

Sl.No.	Toxicity level	L.D. 50 value mg/kg body weight		Colour of Triangle/ Identification mark on the packing of pesticides
		Oral	Dermal	
1.	Extremely Toxic	1-50	1-200	Human skull in between the cross of two bones Dark Red Triangle
2.	Highly Toxic	51-500	201-2000	Yellow Triangle (Poison)
3.	Moderately Toxic	501-5000	2001-20,000	Dark blue Triangle (Danger)
4.	Slightly Toxic	More than 5000	More than 20,000	Green Triangle (Attention)

Waiting Period of Different Insecticides

Sl.No.	Name of the Insecticides	Waiting Period in Days
1.	Aldrin	10 to 20
2.	Dialdrin	20 to 30
3.	Carbaryl	8 to 10
4.	Chlordane	14
5.	Diazinon	12 to 50
6.	DDVP (Nuvan)	2 to 7
7.	Dimethoate	7 to 14
8.	Endosulfan	12 to 14
9.	Heptachlor	5 to7
10.	Lindane	3 to7
11.	Malathion	10 to 20
12.	Phosphamidon	20 to 30
13.	Phorate	30

Economic Thresholds Level of different pests for different crops

Sl.No.	Name of the Pests	E T L Level
Cotton crop		
1.	Aphids	15% of plants infested.
2.	Jassids	1 nymph per leaf.
3.	Thrips .	1 per leaf or 15-20% of plants infested
4.	Whiteflies	8-10 adults or 20 nymphs per leaf.
5.	Mites	10 per sq cm.
6.	armigera	10 eggs per 20 plants.
7.	*H. armigera*	7 larvae per 20 plants, or 5% damaged plant parts.
8.	Spotted bollworm:	5% damaged plant parts or 10 larval units per 20 plants.
9.	American boll worm	1 egg or larvae/plant
10.	Nematode	1-2 larvae/g of soil
11.	Rodents	15 live burrows/ha

Rice crop		
1.	Green leaf hopper	1-2 insects / sq.meter at nursery stage
2.	Gallmidge	1 silver shoot (gall)/ sq.meter at nursery stage
3.	Stem borer	1 moth or 1 egg mass/ sq.meter at nursery stage
4.	Blast	5% disease severity at nursery stage in rice
5.	Leaf folder	2 freshly damaged leaves/hill at planting to pre-tillering stage
6.	Yellow stem borer	5% dead-hearts or 1 egg mass or 1 moth/ sq.meter at planting to pre-tillering stage
7.	Gall midge	1 gall/sq meter in endemic areas or 5% affected tillars in non-endemic areas at planting to pre-tillering stage
8.	Brown plant hopper	5-10 insects / hill at planting to pre-tillering stage
9.	Green leaf hopper	10 insects/hill at planting to pre-tillering stage
10.	White backed plant hopper	10 insects/hill at planting to pre-tillering stage
11.	Rice hispa	2 adults or 2 damaged leaves/hill at planting to pre-tillering stage
12.	Leaf folder	2 freshly damaged leaves/hill at mid tillering stage
13.	Stem borer	10% dead heart or 1 egg mass /sq meter at mid tillering stage
14.	Gall midge	5% silver shoots at mid tillering stage
15.	Brown plant hopper	10 insects/hill at mid tillering stage in rice
16.	Green leaf hopper	10-20 insects/hill at mid tillering stage
17.	Hispa	2 adults or 2 damaged leaves/hill at mid tillering stage
18.	Blast	5-10% disease severity at mid tillering stage
19.	Bacterial leaf blight	2-5% disease severity at mid tillering stage
20.	Sheath blight	10% or more affected tillars at mid tillering stage
21.	Tungro	1 affected hill/sq.meter at mid tillering stage
22.	Stem borer	1 egg mass or 1 moth /sq meter at panicle initiation to booting stage in rice
23.	Leaf folder	2 freshly damaged leaves/hill at panicle initiation to booting stage
24.	Green leaf hopper	20 insects/hill at panicle initiation to booting stage

25.	Brown plant hopper	15-20 insects/hill at panicle initiation to booting stage
26.	White backed plant hopper	15-20 insects/hill at panicle initiation to booting stage
27.	Blast	5-10% leaf area damaged at panicle initiation to booting stage
28.	Bacterial leaf blight	2-5% disease severity at panicle initiation to booting stage
29.	Sheath blight	10% or more tillers affected at panicle initiation to booting stage
30.	Brown plant hopper	25-30 insects/hill at flowering and after stage in rice
31.	Climbing cutworm	4-5 larvae/sq meter at flowering and after stage
32.	Gundhi bug	1or2bugs/hill at flowering and after stage
33.	Blast	5% leaf area damaged or 1-2% neck infection at flowering and after stage
34.	Sheath rot or brown spot or slight panicle discolouration	2-5% tillers affected at flowering and after stage
35.	Sheath blight	10% or more tillers affected at flowering and after stage
Pigeon pea crop		
1.	Pod borer	2-3 eggs/5 twigs or 1 larvae/2 plants or 1 larvae/ plant at flowering stage or 5-10% pod damage
2.	Plume moth	5 larvae/10 plants
3.	Spotted pod borer	5 larvae/10 plants
4.	Pod fly	5 larvae/10 plants
Urd and Moong crop		
1.	Blue beetle	4 beetles/meter at seeling stage
2.	Green semilooper	4 larvae/meter at flowering stage
3.	Tobacco caterpillar	10 larvae/meter at pre flowering stage
Groundnut crop		
1.	Defoliators	25% damage on leaf area
2.	*Spodoptera*	2 larvae/plant
3.	White grub	1grub/sq meter
4.	Jassid	15-20 jassids/plant
5.	Leaf miner	2-3 larvae/plant

6.	Rodents	15 live burrows/ha
Sunflower crop		
1.	White fly	8-10 adult /leaf or 20 nymphs/leaf
2.	Jassids	15-20 jassids/plant
3.	Gram pod borer	5-6 moth/ pheromone trap

LD50, Acceptable Daily Intake (ADI), and Maximum Residue Limit (MRL), of Different Pesticides

Sl.No.	**Pesticide**	**LD 50(Rats) (mg/kg)**	**ADI (mg/kg/day)**	***MRL (Fruits) (mg/kg)***
1.	Carbaryl	250	0.01	*5.0 - 10.0*
2.	Carbendazim	15000	No ADI	*2.0 - 10.0*
3.	Carbofuran	8 -14	0.003	*0.1*
4.	Chlorothalonil	10000	0.03	*0.05 - 5.0*
5.	Cypermethrin	500	0.006	*1.0 - 2.0*
6.	Deltamethrin	140	0.01	*0.01 - 0.05*
7.	Diazinon	385	0.002	*0.5 - 0.7*
8.	Dimethoate	250	0.02	*1.0 - 2.0*
9.	Dithiocarbamates	>5000	0.005 - 0.02	*1.0 - 5.0*
10.	Endosulfan	45	0.0075	*2.0*
11.	Ethion	208	0.005	*2.0*
12.	Fenitrothion	630	0.004	*0.5 - 2.0*
13.	Fenvalerate	630	0.06	*2.0*
14.	Lindane	12	0.01	*0.5*
15.	Malathion	500-1500	0.02	*0.5 - 2.0*
16.	Monocrotophos	190	0.0006	*0.2 - 1.0*
17.	Methyl parathion	14 - 24	0.001	*0.2*
18.	Phorate	2 - 4	0.0002	*0.1*
19.	Phosphomidon	17 - 40	0.002	0.1 - 0.2

There are number of species of plants which possesses pest control action in many ways and their use may be exploited by the farm women to reduce pesticidal hazards and for the safe environment. Type of pest control action found in plant species and trees with insecticidal activity are summarized below:

Type of pest control found in plants

Sl. No	Pest control action	No. of species of plants	Sl. No.	Pest control action	No. of species of plants
01	Insecticidal	1053	09	Fungicidal	100
02	Antifeedant	230	10	Bactericidal	04
03	Repellent	225	11	Molluscidal	06
04	Growth inhibitor	32	12	Herbicidal	14
05	Attractant	27	13	Antiseptic	35
06	Rodenticidal	29	14	Fish poison	147
07	Acaricidal	02	15	Arrow poison	90
08	Nematicidal	58	16	Poisonous	69

Trees with insecticidal activity and their active ingredients

Tree species (common name)	Plant part(s)/ product(s)	Active principle(s)	Activity
Albizia lebbeck Troll. (Desi Siris)	Seed, leaf, pod, bark and root	Caffeic acid, alkaloids and quercetin	Insecticide
Anacardium occidentale Scarrone (Cashew)	Shell oil	Phenolic compounds	Insecticide
Annona squamosa (Custard apple)	Stem, leaf and semi-ripe fruit	Annnine	Insecticide
Azadirachta indica (Neem)	Leaf, seed and seed oil	Azadiractin, nimbidin, salanin, meliantrol, and other bitter principles (tetranorterpenoids)	Antifeedant, oviposition deterrent, Insect Growth Regulators, insecticide
Butea moneosperma Koen Roxb. (Flame of the forest)	Flower extract	Chalcones and aurones	Termiticidal
Hardwickia binata	Heartwood	Mopanol and	Antifeedant

Roxb. (Anjan)		epicatechin	
Madhuca latifolia Roxb. (Mahua)	Seed and seed oil	Saponins	Repellent, insecticide
Melia azedarach (China tree, Bakain)	Fruit and seed	Meliacin	Antifeedant, insecticide
Pongamia pinnata L. (Pongam; Karanja)	Seed and seed oil	Karanjin	Repellent, insecticide

The National Research Centre for Women in Agriculture (NRCWA), established in 1996 under the aegis of Indian Council of Agricultural Research (ICAR) with its headquarters at Bhubaneswar, Orissa and sub-centre at Bhopal, Madhya Pradesh, in India. The present mandate of the center is "To identify gender issues and test appropriateness of available farm-technologies/ programmes / policies with women perspective for promoting gender mainstreaming in research and extension for empowerment of farmwomen and capacity building of scientists, planners and policy makers to respond to the needs of the farm women."

For any information please write to:
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Biocides("Killersof Life")

- *Insecticides*(For the reductionof Insects, 6 legs)
  - *Acaricides*(For the reductionof Spiders. 8 legs)
  - *Fungicides*(For the reductionof Fungus)

- *Rodenticides*(For the reductionof Rodents)
- *Bacteriacides*(For the reductionof Bacterias)
- *Herbicides*(For the reductionof ”non accepted”vegetation)
- and so on