TECHNICAL PROTOCOL UNDER MKSP

Name of PIA: **M S SWAMINATHAN RESEARCH FOUNDATION**

	Agro Climatic Zone	**Central Vidarbha Zone**
	Major Crops	Kharif: Cotton, Soybean, Pigeon pea, Jowar Rabi: Wheat, Bengal gram, Jowar, Maize, vegetables (Brinjal, Tomato, Okra, Spinach etc.)
	Major Agricultural Seasons	Kharif and Rabi
	Pattern of Agriculture	**Kharif** Cotton + Pigeon pea (5:1) Soybean+ Pigeon pea (5:1/ 9:1) Cotton Soybean **Rabi** Wheat Bengal gram
1	**Pre cultivation**	
	Crop selection	Medium to Heavy Soils: **Year Kharif Rabi** 1 Cotton, Wheat, Jowar, Gram, Maize Cotton+ G. gram/B. gram 2 Soybean Wheat, Jowar, Gram, Maize 3 Cotton Wheat, Jowar, Gram, Maize Light Soils: **Year Kharif Rabi** 1 Jowar Wheat, Gram, 2 Soybean Wheat, Jowar, Gram, Maize 3 Jowar Wheat, Gram,
2	**Seed selection**	Selection of good quality seed with respect to true to type, healthy, free from inert material and weed seed(Cleaning case of farmers seed) ,good germination percentage(Seed germination test), uniform(grading in case of farmers seed) and free from seed born disease(seed treatment)
3	**Seed rate**	Hybrid cotton: 1 Kg/acre Improved cotton: 4-5 Kg/acre Desi cotton: 1.5 Kg./acre Soybean:30 Kg./acre Pigeon pea: 10-12 Kg./acre Jowar: 3-4 Kg./acre Green gram: 5-6 Kg./acre Black gram: 5-6 Kg./acre Wheat: 40 Kg./acre

		Bengal gram: 30 Kg./acre
4	**Seed Treatment**	100 gm cow dung+ 100 gm soil slurry paste + 100 gm jaggery + 200 ml of urine for 1 Kg of seed for treatment after application dry under shade before sowing. Application of (bio fertilizer)25 gm *Azatobacter/Rhizobium (*as per crop monocot or dicot *)*+ 25 gm of PSB + 5 gm. *Trichoderma virideae* (bio-fungicide)
	Land Preparation	Stubble collection of previous crop, Once in three year summer ploughing, Harrowing and Farm bunding
	Spacing	Soybean: 45 x 5 cm or 30 x 8 cm to get plant population 4-4.5 lac. /ha. Cotton: Hybrid cotton: 120 x 90 cm heavy soil Improved cotton: 60 x 30 cm for heavy soil : 60 x 15 cm for medium to light soil Desi cotton : 60 x 45 cm Bengal gram : 30 x 10 cm Wheat : 23 x 5 cm for timely sowing 15 or 18 cm x 5 cm for late sowing Green gram/ Black gram: 30 x 10cm: 45 x15 cm
	Sowing/ Transplanting	Cotton : Sowing by Dibbling on appropriate sowing : Sown with intercrop of Pigeon pea (5:1) Soybean: Sowing by seed drill with intercrop of Pigeon Pea (6:1/9:1) Pigeon pea : dibbling /Seed drill Jowar: seed drill **Crops sown as inter crops :** Pigeon pea, green gram, black gram occasionally Jowar , cow pea and sesame **Crops sown as trap crop**: Marigold, Cow pea, castor, Deccan hemp(Ambadi), **Crops sown as Border crops:** Jowar, Maize and castor
	Inter cultural operations	Two hoeing followed by hand weeding in all crops other than cotton In cotton two to three hoeing followed by hand hoeing. Opening of ridges and furrows during last hoeing by tying of rope to hoe for earthing up and in situ soil and water conservation.
	Water conservation and water management	Farm bunding and contour bunding on required land in summer. Opening of ridges and furrows during last hoeing by tying of rope to hoe for earthing up and in situ soil and water conservation.

		Mulching of green gram and black gram for main crop after harvesting of pods.
	Method of irrigation	Drip irrigation, Sprinkler irrigation and Flood irrigation in irrigated situation
	Plan of irrigation	In irrigated situation irrigation during dry spell after sowing or at reproductive stage of crops (In soybean during pod formation, in cotton ball formation). In gram at pod formation, In wheat 18-20 days interval after sowing mainly on 18-20 days after sowing and 40-45 days after sowing.
	Soil fertility management/soil health enrichment and crop nutrient management	
	Bio fertilizer/Organic manure	Bio fertilizers: Rhizobium, Azatobacter, Phosphate Solubilising Bacteria , Jivamrut, Amritpani, Plat growth regulator (30 Kg Cow dung+ 3 lit. cow urine+ 500 gm Jaggary mixed in 100 lit. water), Organic manure: Vermi-compost, FYM, Mixed fertilizer, compost.
	Method of application /practices	Bio fertilizers: Bio fertilizers are applied by Seed treatment mixed in moist organic manure in case of lack of organic manure mixed with moist soil then applied to the crop two to three times in moist soil condition. Organic manure: Applied at the time of sowing/transplanting and if available to crop by broad casting or top dressing in moist soil condition.
	Duration/ Scheduling of application	Bio fertilizers: At seed treatment and in vegetative stage of crop. Organic manure: Mostly at the time of sowing/transplanting and as per availability in vegetative phase of crop.
	Method of enhancement of soil bio mass	Green Manuring: Green manuring crops: Manuring crops like Sun hemp or dhencha is sown before main crop and buried in soil before sowing Green manuring plants: Foliage of green manuring plants i.e., Gliricidia, Subabool is decomposed in manure to enrich the nutrient status of manure then Organic manure is applied to crops. Aro green: for 1 acre 10 Kg of various grain crops crops in proportion of 6 Kg. Di-cot grains (1200 gm Pigeon pea, 1200 gm black gram, 1200gm green gram seed, 1200 gm cow pea and 1200 gm Matki) + 3 Kg. Mono-cot grains(800 gm Jowar , 2 kg maize and 200 gm Bajara) + 1 Kg of oil seed (950 gm of Soybean, cotton, ground nut, sun flower+ 50 gm. Sesame) sown and buried in soil after 45 days at flowering , it helps to reduce control the weed population and increase the nutrient status and physical property of soil. Plantation of plants on bunds: Plantation of plants rich in nutrients like gliricidia on bunds bunds
	Crop Nutrient Management	Integrated Nutrient Management comprise of Soil test based nutrient management (Nitrogen, Phosphorus, Potash and micro nutrient) with better utilization of farm resources like FYM and compost as per recommendations . Various methods/Practices: Integrated application of FYM, Compost, Vermi-compost, Bio fertilizers, Green manuring with soil test based nutrient management. Details is mentioned in INM annexure

	Insect/Pest/Management	
	Insect/ Pest control methods/P ractices (E.G. If NPM, please specify particular method of control under NPM)	Integrated application of four approaches to the use of chemicals 1. Cultural 2. Mechanical 3. Biological and as a last option over economic threshold level 4. Chemical
	Insect pest control substances (bio pesticide/ others etc.)	Numerous substances can be used for insect pest management, details are mentioned in annexure IPM
	Disease Management	
	Disease control methods/ Practices	Integrated application of four approaches to the use of chemicals 1. Cultural 2. Mechanical 3. Biological and as a last option over economic threshold level 4. Chemical
	Disease control substance(Bio fungicide/ others)	Numerous substances can be used for insect pest management, details are mentioned in annexure IDM
	Harvesting	
	Method of harvesting	Harvesting of Crop at right Maturity stage of Crop: Cotton: Three to four manual pickings of dry and clean cotton from fully matured and opened boll. Three to four pickings. Soybean: When 70-80 percent plants turns yellow with pods of tan brown coloured, leaves of plants starts shading, the crop is harvested at this stage the grain moisture percent becomes 15-17. Crop is harvested by manual cutting the plants close to ground. Pigeon pea: When green pods of crop turns to tan brown to black colour, Pod become dry and give rattling sound on shaking. The plants are manually cut close to ground when 80 percent of pods show above maturity sign. Harvested plants are scattered on soil for complete drying for 3-4 days. Green/Black gram: The fully grown, yellow to brown coloured matured pods are manually harvested in two to three picking. Pods are dried on floor for 5-6 days. Wheat: When Wheat whole crop turn from green to brown colour, the crop is harvested timely to avoid shattering of grains. Harvesting is done manually or by combined harvester. Probably harvesting suggested by manually as in combined harvested straw get wasted. Bengal gram: Harvested when plants and pods turns from green to brown in

		colour, care is to be taken to harvest before pods become hard dry to avoid shattering evening during harvesting. Harvesting by manually.
	Post Harvesting Practices	
		Primary practices: Cotton: Cotton should be collected in cotton cloth and not in plastic/gunny bags. Wet/moist, cotton from infested or infected boll, and of last picking should be stored separated from clean cotton picked. Cotton of different hybrid variety is to be harvested and stored separately. **Threshing :** Soybean: At the time the moisture should be 13-15%. The speed of threshing machine drum shall be 350-400 rpm, so as to avoid grain damage and deteriorate quality. Pigeon pea : At the time the pod moisture should be 12% pod splitting shows the indication at drying. **Grading:** Produce of all crops must be graded before storage and marketing **Storage:** Cotton: Cotton is to store in dry and clean place, 0.5 feet above ground. Soybean: For storage the grain should not have the moisture percentage more than 12. Pigeon pea: To ensure seed viability in storage the moisture content should be 8% to store in gunny bags while 7% to store in plastic bags.

Annexure: Integrated Nutrient Management

Integrated Nutrient Management in Cotton

1. FYM or Compost application 5 t /ha in rain fed and 10 t/ha in irrigated condition.
2. Seed treatment of seed with bio fertilizers Azotobacter 5 gm/ Kg of seed + PSB 5 gm/Kg seed before sowing.
3. On harrowing before sowing is done for weed management that increases the nutrient efficiency.
4. For irrigated cotton Soil test based for Bt cotton as per RDF the 40 Kg of Nitrogen + 60 Kg of P_2O_5 + 60 Kg K_2O per hector of which ½ of N and full P and K at sowing while remaining ½ N is to applied in two split doses first after 30 days after sowing and second after 60 after sowing.
5. For rain fed cotton soil test based as per RDF 30 Kg of Nitrogen + 30 Kg of P_2O_5 + 30 Kg K_2O per hector of which ½ of N and full P and K at sowing while remaining ½ N is to applied 30 days after sowing .
6. As per the Micro nutrient deficiency occurred the Micro nutrients are to be applied or soil application of micro nutrients at 25 Kg/ha.
7. Foliar application of 2% urea at flowering stage and 2% DAP at boll formation stage.

Integrated Nutrient Management in Soybean

Application of 5 tonnes of farm yard manure or compost per hectare.
To improve the Organic Carbon content and physical property of soil green manuring crops should be taken in the field.
An application of 20-30 kg nitrogen per hectare as a starter dose will be sufficient to meet the nitrogen requirement of the crop in the initial stage in low fertility soils having poor organic matter.

The soil should be tested for the availability status of phosphorus and other nutrients to meet the requirement of the crop.

In the absence of soil test, 30 kg K2O per hectare should be applied. The fertilizers should preferably be placed, at sowing time, about 5-7 cm away from the seed at a depth of 5-7 cm from seed level

Nutrient Supply

5 t FYM or compost/ha + 30 Kg N (Nitrogen fertilizer) + 75 Kg P_2O5 (Phosphorus fertilizer) +30 Kg K_2O (Potash) fertilizer per hector.

½ of nitrogen + full dose of Phosphorus fertilizer and potash fertilizer applied at the time of sowing while ½ of nitrogen is applied in two split doses at an interval of one month.

Seed treatment
Microbial: About 500 g/75 kg seed *Rhizobium* culture + PSB/500 g/ 75 Kg seed

For effective use of nutrients:
One harrowing shall be done before sowing.
Two hoeing, first after 15 days after sowing and second after 30 days after sowing followed by 1-2 hand weeding.

Annexure: Integrated Pest Management

Integrated Pest Management in Cotton

Methods of IPM for Cotton

Cultural, Mechanical, Biological, Chemical

Cultural Practices:-

- ✓ Summer deep ploughing to expose soil inhabiting / resting stages of insects, Pathogen and nematode population
- ✓ Growing cotton after cotton should be avoided. Adopt proper crop rotation.
- ✓ Select healthy seeds of resistant / tolerant varieties
- ✓ Only certified seeds should be used.
- ✓ Seed treatment to control soil and seed borne diseases should be followed.
- ✓ Sowing should be done timely within 10 to 15 days in a village or block in the season.
- ✓ Adopt proper spacing, irrigation and fertilizer management. Avoid application of high nitrogenous fertilizers to boot the crop. Use neem cake with oil content @ 5 quintal /ha in termite / nematode infested fields.
- ✓ The crop should be maintained weed free for at least 8 – 9 weeks after sowing till canopy stars closing in by timely inter – culture. A hoeing in between crop rows is to be given 18 – 20 days after emergence of cotton seedlings to control primary perennial weeds.
- ✓ Remove and destroy weeds as alternate hosts viz. Sida sp., Abutilon sp., Logascaemollis and other malvaceous plants in the cultivated area.
- ✓ The following inter – cropping system is recommended for Central Zone to colonize the bioagents fauna such as lady bird beetles, chrysopa and syrphid flies :
    - Cotton + Cowpea,
    - Cotton + Soybean.
    - Cotton + Groundnut
    - Cotton + Pulses (Green gram / Black gram)
- ✓ Use of trap crops like okra, Canabinus, castor, marigold (Tagets), early Pigeon pea, coriander, Jowar, maize crops is recommended. Insects feeding on these crops must
- ✓ be removed and destroyed.
- ✓ Do not extend the normal crop period and avoid rationings.
- ✓ Grazing by animals after last picking is recommended for checking the carry over population of bollworms.
- ✓ Remove and make use of crop residues after last picking as FYM or in Paper Industry.
- ✓ Staking the cotton stalks near the field should be avoided. Destroy opened bolls on the plant.

B) Mechanical Practices

- ✓ Hand picking and destruction of various insect stages, affected plant parts and rosette flowers.
- ✓ Clipping of terminal shoots on 90 – 110 days of crop growth depending upon cultivars.

c) Bio control Practices

Seed treatment:

- ✓ Seed treatment with Trichoderma spp. @ 4 gm per kg. of seed for soil and seed borne diseases

Conservation:

- ✓ Conservation of predators (lacewings, lady bird beetles, staphy linids, predatory wasps, surface bugs like Geocoris, Anthocorid, Nabids, Reduviids, Spiders, parasitoids like Apanteles, Bracon, Rogas, Agathis, Campoletis, Eriborus, Trichogramma, Telenom Trichogramma, Telenomu by growing two rows of maize / sorghum or cowpea along the border
- ✓ Collection of Spodoptera egg masses and putting them in perforated cage

- ✓ Install 8 – 10 bird perches per ha. for the benefit of predatory birds after 90 days of crop growth like black drango, king crow, orange Myna and Blue jay.

D. Chemical Control Measures

- ✓ Need based, judicious and safe application of pesticides are the most vital tripartite segments of chemical control measures under the ambit of IPM.
- ✓ It involves developed IPM skills to play safe with environment by proper crop health monitoring, observing ETL and conserving natural bio control potential before deciding in favour of use of chemical pesticides as last resort

IPM for Soyabean

Monitoring for Pest & Disease

- Undertake community level monitoring to know change in distribution and abundance of pest.
- Organise regular pest monitoring and assess bio control potential at every 15 days interval.
- Install pheromone trap for early deduction of S. litura @ 10 traps/ha for mass trapping.
- Light trap with 125 watts mercury vapour lamp can be operated for two hours in the evening to observe phototropic insect pests.

Pre-sowing stage

- Deep ploughing in summer.
- Pre-monsoon sowing MUST BE avoided.
- Narrow row spacing (20 cm) + higher seed rate (125 kg/ha)

Sowing stage

- Use insect/disease tolerant varieties.
- Use optimum seed rate (70-100 kg/ha).
- Avoid pre monsoon sowing.
- Do not cultivate when the foliage is wet.
- Avoid excess nitrogenous fertilizers.
- Application of potash fertilizers should be ensured.
- Intercrop soybean either with (early maturing) Pigeon Pea variety or maize or sorghum in the sequence of 4:2 should be practised.
- Plant seeds relatively free of the pathogen.
- Rotate soybean with crops not susceptible to the pathogen.
- N, P, K, and S should be applied as pre recommendation and soil testing.
- Crop should be maintained weed-free initially for 30-45 days by resorting to two hand hoeing /weedings.

Seed treatment with Rhizobium japonicum and Phosphate Solublizing Bacteria (PSB) @ 5 + 5 9 /kg seed.

Rogue out Sclerotium affected seedlings.

Vegetative stage

- Collect and destroy girdle beetle infested plant parts, egg masses and gregariously caterpillar feeding larvae of hairy caterpillar and tobacco caterpillar.

- Conserve biological control such as spiders, lizards, coccineid, beetles, techanid fly, dragon fly, damsel fly, praying mantis.
- Apply mancozeb 75% WP @ 1500 - 2000 gi11a or hexaconazole 5% EC or propiconazole or triadimefon 80% EC @ 0.1% on the appearance of rust infection.
- Apply triazophos 40% EC @ 625 ml/ha or quinalphos 25% EC @) 1000 ml/ha for controlling defoliators, tobacco caterpillars, stem fly and girdle beetle.
- Apply mancozeb 75% WP (@ 1500-2000 g/ha or hexaconazole 5% EC or propiconazole 25% EC or triadimefon 25% WP @0.1% on the appearance rust infection.

Fruiting stage

- Poison baiting with 2% zinc phosphide at podding and green seed stage preceded by one day pre-baiting or applicationl of bromadiolone 0.005% ready to use at green seed stage for the control of rodents.

Storage

- Seeds should be harvested at field maturity.
- Delayed harvesting should be avoided.
- Seeds should be dried to safe moisture levels soon after harvest (8-10%).
- The dried seeds should be stored in hermetically sealed containers.
- Protect the sealed containers from water, cross contamination and rodents.
- Ensure proper ventilation around seed.
- Completely cover plant residue by clean ploughing the field soon after harvest.

Annexure: Integrated Pest Management

Integrated Disease Management in Cotton

Cultural Control

- ✓ Grow certified acid delinted seeds of resistant varieties.
- ✓ Follow recommended agronomic practices for land preparation, stubble management, seed rate, fertilizers and irrigation management.
- ✓ Do not extend the normal crop period and avoid ratooning.
- ✓ Avoid dense cropping that helps in reducing the disease incidence by allowing free air current.
- ✓ Avoid water logging.
- ✓ Avoid collatoral weeds such as Aristolochia bracteate and Hibiscusdiversifolius
- ✓ Intercrop with moong bean/ragi/ soybean/ groundnut/ maize/ cowpea/ onion.
- ✓ Fields with long history of disease should be avoided for growing the crop.

Mechanical Control

- ✓ Remove and destroy crop residues after last picking..
- ✓ Destroy the infected plant debris..

Biological Control

- ✓ Conserve bio agents (species of Gossypium) like Aspergillus fumigatus, A. niger, Drechslera halodes, Fusarium culmorum, F. moniliforme, Monilia sitophila, Rhizopus stolonifer and Trichoderma viride.

Biological Control for Wilt

- ✓ Treat the seed with 4 g Trichoderma viride formulation/ thiram 3g per kg seed.
- ✓ Apply 2 kg of Trichoderma viride commercial formulation with 50 kg farm yard manure along with the rows.

Chemical control
As a last option

Disease	**Chemical Control**
Alternaria leaf spot Causal Organism *Alternaria macrospora*	Spray mancozeb 2.5 g or copper oxychloride 3g/ litre 4-5 times at 15 days interval. Dress the seeds with vitavax or aureofungin or seedex or difolatan or indofil M-45 @ 2-3 g/kg of seeds. Spraying with 0.2 per cent difolatan (captafol) or mancozeb at 20 days interval from first appearance is effective in managing the disease.
Anthracnose Causal Organism Colletotrichum gossypii	Acid delinted and treat the seeds with carbendazim or benomyl. Spray carbendazim 1.5 g/l; OR benomyl 1.5 g/l; OR Mancozeb 3g/l.
Grey mildew / Areolate mildew Causal Organism *Ramularia areola*	Spray 3 g wettable sulphur OR 1 g carbendazim or benomyl per litre.

	Dusting by 8-10 kg of sulphur powder effectively controls the disease. OR Application of 1% Bordeaux DF. OR Application of 3% copper fungicide Foliar application of sulphur dust/wettable sulphur @ 10 kg/ha or 2-3 g/l at 10 days interval from the day of first appearance, or sulphex 80 WP (0.25%) or benomyl, carbendazim @ of 200-300 g a.i. /ha is effective in controlling the disease significantly.
Fusarium wilt Causal Organism Fusarium oxysporum f. sp. vasinfectum	Spray of 0.4% solution of oxathilin. OR 0.1% solution of organomercuria. Seed treatment with carbendazim @ 2 g/kg seeds should be given Use of nitrogen fertilizers, particularly ammonium nitrate should be discouraged while use of potassium fertilizers should be encouraged

Annexure

Numerous botanical Substances used for Pest management

1. Pest : Aphids and
other sucking pests.
Ingredients: Tobacco (Nicotiana tabacum),Aloe(Aloe Vera), Buttermilk
Method of preparation :
Take 1 kg tobacco snuff (Nicotiana tabacum) and 2 kg. Aloe (Aloe Vera) Wash both plants properly and chop it finely and boil with 6 litre water at moderate and constant heat till it remains half. Mix 4 liter supernatant of buttermilk.
Direction of Use :
Spray 150 ml. of this formulation per pump. About 6-8 pumps per acre are required to control the infestation.
Spray after 10-12 days if infestation is still there. For best result, use this formulation within 6 months of preparation.
2. Pest : Castor semi looper
Ingredients: Tamarindus indica, (Tamarind), Citrus limona (Lemon)
Method of Preparation :
Around 150ml lemon (Citrus limona) juice and 150 ml tamarind(Tamarindus indica) juice is mixed in 15 liters of water.
Direction of Use :
Spray this formulation in 1 Vigha to control the infestation.Spray after 10-12 days if infestation is till there. For best result, use fresh juice and mix with water at the time of spray.
3. Pest : Larval pest in Pigeon pea
Ingredients :
Capsicum annum (Chilli), Azadirachta indica (Neen), Allium satvium (Garlic)
Method of Preparation :
Take Capsicum annum (Chilli powder, Azadirachta indica (Neem) leaves and fresh Allium sativum (Garlic) in proportion of 1:4:1 respectively. Boil it with 16 times water and keep half (8 times). Filter this solution and use after recommended dilution.
Direction of Use :
Spray 150 ml. of this formulation per pump. About 6-8 pumps per acre are required to control the infestation.
Spray after 10-12 days if infestation is still there. For best result, use this formulation within 6 months of preparation.
4. Pest/Disease : Heliothis in Chick pea
Ingredients :
Adhatoda vasica (Vasaka), Pongamia pinnata (karanja)
Method of preparation :
Take equal amount of leaves of Adhatoda vasica (Vasaka) and Pongamia pinnata (Karanja) Wash both plant material properly in water and chop it finely and boil with 16 times water at moderate and constant heat until the final volume remains half.
Direction of Use :
Spray 150m l. of this formulation per pump. About 6-8 pumps per ac re are required to control the infestation. Spray after 10-12 days if infestation is still there. For best result, use this formulation within 6 months of preparation.
5. Pest : Cotton bollworm and all type of heliothis
Ingredients :
Naffatiyo (Ipomoea fistulosa), Gandhati (Lantana camera), Neem (Azadirachta indica), Tobacco (Nicotiana tabacum)
Method of preparation :

Take 1.5 kg fresh leaves and tender parts of naffatiyo (Ipomea fistulosa) 1kg gandhati (Lantana camera) 1.5 kg tobacco snuff (Nicotiana tabacum) and 1.5 kg neem (Azadirachta indica) in 10 liter water and boil till it remains half. Filter this solution and use after recommended dilution.

Direction of Use :

Spray 150 ml. of this formulation per pump. About 6-8 pumps per acre are required to control the infestation. Spray after 10-12 days if infestation is still there. For best result, use this formulation within 6 months of preparation.

6. Pest: Blight disease in cumin

Ingredients :

Azadirachta indica (Neem), Annona squamosa (Custard apple)

Method of preparation :

Take equal amount of Azadirachta indica (Neem) leaves and Annona squamosa (Custard apple) leaves. Wash plant material properly in water and chop it finely and boil with 16 times water at moderate and constant heat until the final volume remains half.

Direction of Use :

Spray 150 ml. of this formulation per pump. About 6-8 pumps per acre are required to control the infestation. Spray after 10-12 days if infestation is still there. For best result, use this formulation within 6 months of preparation.

7. Pest : Aphid, white fly and other sucking pests, bollworms, caterpillars

Ingredients :

Lantana camara (Gandhati), Ipomoea fistulosa (Naffatiya), Calatropis procera (Arka).

Method of preparation :

Take equal amount of fresh leaves and tender parts of Lantana camara (Gandhati), Ipomoea fistulosa (Naffatiya) and Calatropis procera (Arka). Wash them in water and chop finely and boil with 16 times water at moderate and constant heat until the final volume remains half.

Direction of Use :

Spray 150 ml. of this formulation per pump. About 6-8 pumps per acre are required to control the infestation. Spray after 10-12 days if infestation is still there. For best result use this formulation within 6 months of preparation.

8. Pest : Heliothis larvae in chick pea

Ingredients :

Pongamia pinnata (karanj) Dhatura metal (Dhattura)

Method of preparation :

Take equal amount of fresh plant material of Pongamia pinnata (Karanj) and Dhatura metal (Dhatura) and wash them in water. Chop in fine pieces and boil it with 16 times water in constant heat until it remains half in volume.

Direction of Use :

Spray 150 ml of this formulation per pump. About 6-8 pumps per acre are required to control the infestation. Spray after 10-12 days if infestation is still there. For best result, use this formulation within 5 months of preparation.

Annexure

Numerous botanical Substances used for Disease management

BEEJAMRUTHA

Beejamrutha is a very good plant based pesticide to control seed borne diseases that attack the seeds. Smearing the seeds with Beejamrutha before sowing controls many diseases that attack the plant right from its seedling stage.

Ingredients necessary for Beejamrutha

1. 20-25 kg capacity plastic drum
2. 10 litres indigenous cow urine
3. 10 kgs indigenous cow dung
4. 1 kg jaggery
5. 100 gms lime solution mixed with 50 gms turmeric powder.

Procedure :

Mix 10 litres of cow urine, 10 kgs. of cow dung and 1 kg. powdered jaggery in a clean drum. Add 100 gms of lime solution and 50 gms. of turmeric powder into the drum. Stir the entire content in the drum properly until a paste is formed. This paste is applied to the seeds 30 minutes before sowing and dried under shade (400 grams of beejamrutha is applied to seeds required for one acre land). Tuber crops, banana suckers or other seedlings like chilli, tomato are dipped in this solution before transplantation. This helps to avoid seed borne diseases and other diseases that attack the crop during its growing stage.

Usage :

As Seed Treatment - (400 grams of beejamrutha is appliedto seeds required for one acre land) 30 minutes before sowing and dried under shade.

BIOFERTILIZERS TO CONTROL
DISEASES AS SOIL APPLICATION

Biofertilizers like Trichoderma viridae and Pseudomonas fluorescence are soil borne organisms known to combat against diseases effectively. Application of these microorganism to seeds or soil not only controls the disease but also acts as plant growth promoting substances.

Procedure :

Mix 1 kg Trichoderma and 1 kg. Pseudomonas to 100 kg. already prepared farm yard manure or Vermicompost on a cement floor 15 to 20 days before application to the soil by covering with gunny bags to avoid evapotranspiration and maintaining the moisture level by sprinkling with water. Every week sprinkle the material with water and turn the entire material upside down to maintain moisture and aeration. Keep covering the entire material with gunny sacs. Continue this process upto 3 weeks to complete the process. This manure can be applied twice once during sowing and other during seedling stage for better effectivity.

Usage :

1-2 quintals per acre of this manure can be applied to the soil. Controls plant diseases and provides good nutrition to the seedlings for healthy growth of a plant.

PANCHAGAVYA PREPARATION

Panchagavya is the single organic input that acts as a growth-promoter and immunity booster. Panchagavya has been one such piece of wisdom, meant to safeguard all the human beings, animals, plants and microorganisms that dwell on the earth's surface. It consists of five products from the Cow dung, urine, milk, curd and ghee. When suitably mixed and used, these have miraculous effects.

Ingredients :

1. Cowdung slurry (from gober gas plant) 4 kgs
2. Indigenous cow dung 1 kg
3. Cow urine 3 ltrs.
4. Indigenous cow milk 2 ltrs.
5. Sour Curds 2 ltrs.
6. Ghee from cow 1 kg.
7. Sugar cane Juice 3 ltrs or Jaggery 1 kg.
8. Tender Coconut water 3 ltrs.
9. Over ripe banana 12
10. Toddy (Neera if available) 2 ltrs

20 litres of panchagavya can be prepared from the above mentioned products.

Procedure :

All the above items can be added to a widemouthed mud pot, concrete tank or plastic cans in the order specified above. The container should be kept open but in the shade. The contents are to be stirred twice a day, both in the morning and evening. The panchagavya stock solution will be ready after the 7^{th} day. Care should be taken not to mix buffalo products. The products of local breeds of cow are said to have more potency than exotic breeds.