ORGANIC FARMING

Principles and Practices.

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What is organic farming?

- Organic farming is a system of agriculture designed to provide the consumer with fresh, tasty and authentic food by respecting natural life-cycle systems. In short, the produce is of natural origin.
- To achieve this, organic farming relies on a number of objectives, principles and common practices that will:
- -Minimize the human impact on the environment,
- -Ensure the agriculture system operates as naturally as possible.

PRINCIPLES *of* ORGANIC AGRICULTURE

Principle of HEALTH

Organic Agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible.

Principle of ECOLOGY

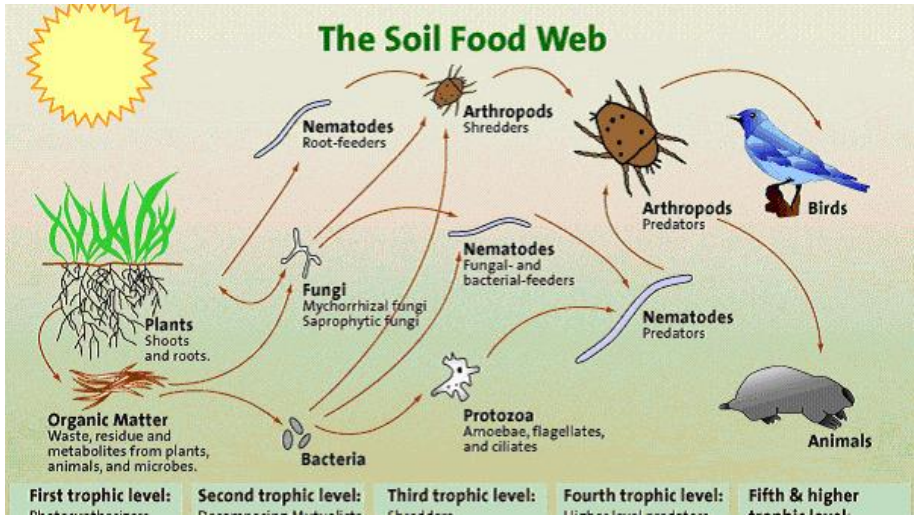
Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.

Principle of FAIRNESS

Organic Agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities.

Principle of CARE

Organic Agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.



Status of rich and live organic soil

- A **fertile organic soil** ideally should have the following:
- Organic Carbon between 0.8-1.5%.
- Total microbial load (bacteria, fungi and actinomycetes) should be above 1 x 10^8 /gm of soil.
- At least 3-5 earth worms/cubic ft of soil.
- There should be enough quantity of small life forms and insects such as ants etc.
- Must be a living soil.

Organic farming practices

- **Crop rotation** practiced for efficient use of on-site resources like nitrogen fixing bacteria etc.
- Very **strict limits on the use of synthetic chemicals**, livestock antibiotics, food additives, processing aids and other inputs.
- Using **on-farm resources**, such as livestock manure for fertilizer or feed produced on the farm.
- Choosing plant and animal **species that are resistant to diseases** and adapted to local conditions.
- Raising live-stock in open-air system, **providing organic feed** and treating them as per practices appropriate to the livestock species.

Soil and water conservation

- Top soil - top 2” to 8” depth of soil. contains organic matter and micro organisms.
- Minimize tillage and plant tall trees around field to reduce wind erosion.
- Contour bunds and cover crops arrest soil erosion due to floods.
- Mulch fields with biomass to conserve soil moisture and control weed growth

Fig. 3.6. Contour farming.

Management of Temperature-
Biological Mulch

Surface mulch can conserve soil moisture and improve water use efficiency.

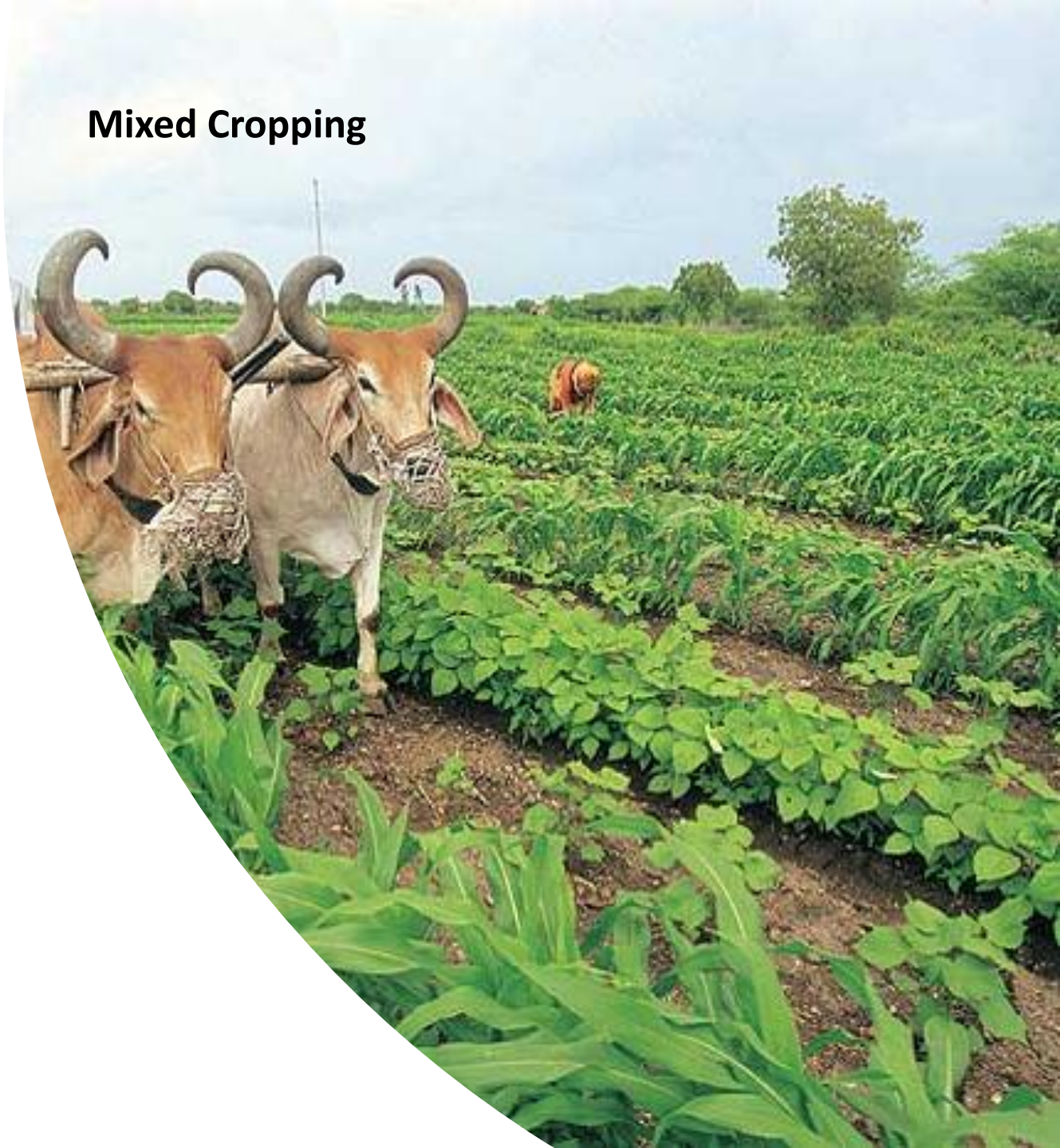
Temperature control can also be achieved by planting different types of trees like neem, amla, tamarind, zizipus bushes, gliricidia on bunds.

Protection to all life forms

- **Mulching with biomass residue will ensure the protection to all life forms in soil.**
- **Earthworms makes the soil porous and decompose organic residue and release nutrients into soil.**
- **Beneficial micro organisms helps in recycling of nutrients, nitrogen fixation, phosphate solubilization and photosynthesis activity.**

Manuring and soil enrichment

- **<u>Crop rotations:</u>**
- **Practice crop rotations. Grow cereal crops and leguminous crops and other crops in rotation instead of practicing monocropping.**
- **This improves soil fertility and reduces pest incidence by breaking pest life cycle.**
- **<u>Mixed cropping</u>:**
- **Enriches soil, reduces pest incidence due to increased presence of natural enemies of pests in the biodiverse field.**
- **This also provides additional income and act as insurance against failure of main crops due to adverse conditions.**



Green manuring and cover crops

- Grow green manure crops like Sesbania, daincha and other leguminous crops and plough them into the soil. (30 kg seeds/ac)
- The cover crops can protect the soil from soil erosion and moisture loss. This can be ploughed back into soil.
- Crop residues and other biomass collected from the farm can be used as green manure to enrich the soil.

Soil enrichment – basic items.

- **Many organic inputs - used for feeding the microbes in the soil. Soils rich in micro organisms takes care of the crop nutrient requirement.**
- **<u>On-farm inputs</u>: Green manure, crop residues, biomass, Farm Yard Manure (FYM),Compost, enriched compost, biodynamic compost and vermicompost etc.**
- **<u>Off-farm inputs</u>: Oil cakes, poultry manure, biofertilizers, lime, rock phosphate, bone meal etc.**
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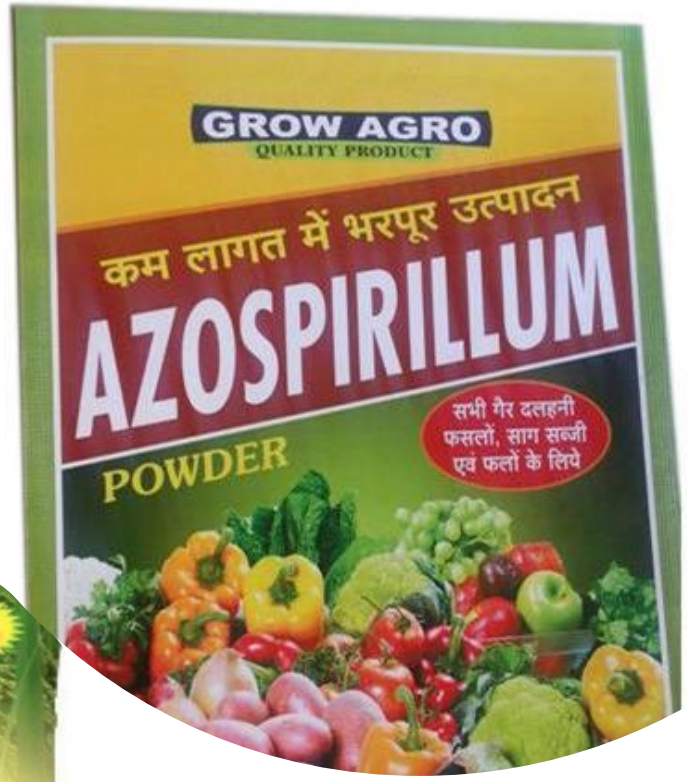
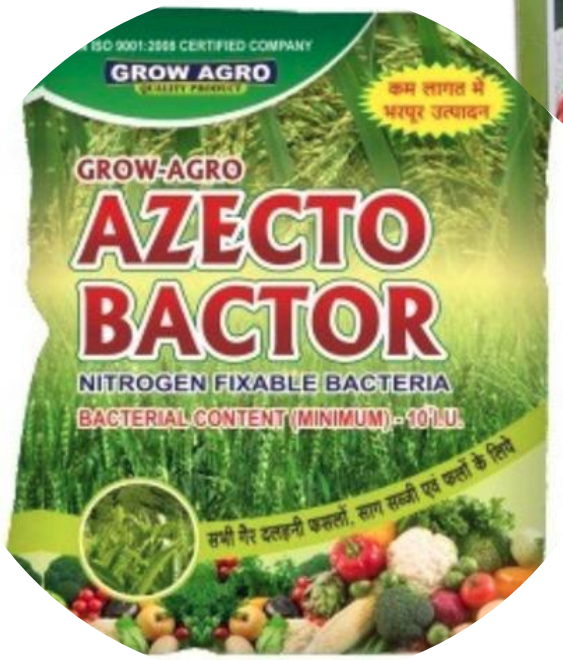
Bio-fertilizers.

- **Biofertilizers are microbial preparations.**
- **Use of Rhizobium, Azotobacter, Azospirillum, Phosphate Solubilizing Bacteria ,Potash Mobilizing Bacteria, Pseudomonas- are effective tools for biological nutrient mobilization in soils.**
- **Efficiency of such microbial formulations is greater where there is no chemical use. Hence it is perfect fit for Organic cultivation**





Seed treatment

- Take 200 gm each of Azatobactor /Azospirillum/Rhizobium and PSB in 300 ml of water and mix thoroughly.
- Pour this slurry on 10 to 12 kg of seed and mix by hands.
- Dry the treated seeds in shade and sow immediately.
- For acidic and alkaline soils use 1 kg of slacked lime or gypsum powder - coat the wet biofertilizer treated seeds.

Beejamruth Preparation

- (A) Tie 5 kg cow dung in a cloth bag and dip it in water
- (B) Soak 50gm lime in 1 lit water Allow 12-16 hours
- (C) Squeeze cow dung extract from (A) + Lime water from (B) + cow urine 5 lit + virgin soil 5 kg + 20 lit water
- (D) Incubate the mixture (C) 8 to 12 hours
- (E) Filter the preparation (D)
- (F) Use this Beejamruth for seed dressing. (By sprinkling the solution on seeds and drying them in shade)


Seedling dipping with biofertilizer

Seedling root dip treatment

- Add 1-2Kg Azotobacter/ Azospirillum and PSB into 5-10 lit water. Dip the roots of seedlings in the suspension for 20-30 min before transplanting.
- For paddy make a bed (2mt x 1.5mt x 0.15mt) in the field, fill it with 5 cm of water and add 2 kg each of Azospirillum and PSB and mix. Dip the roots of seedlings in this bed for 8-12 hours (overnight) and then transplant.

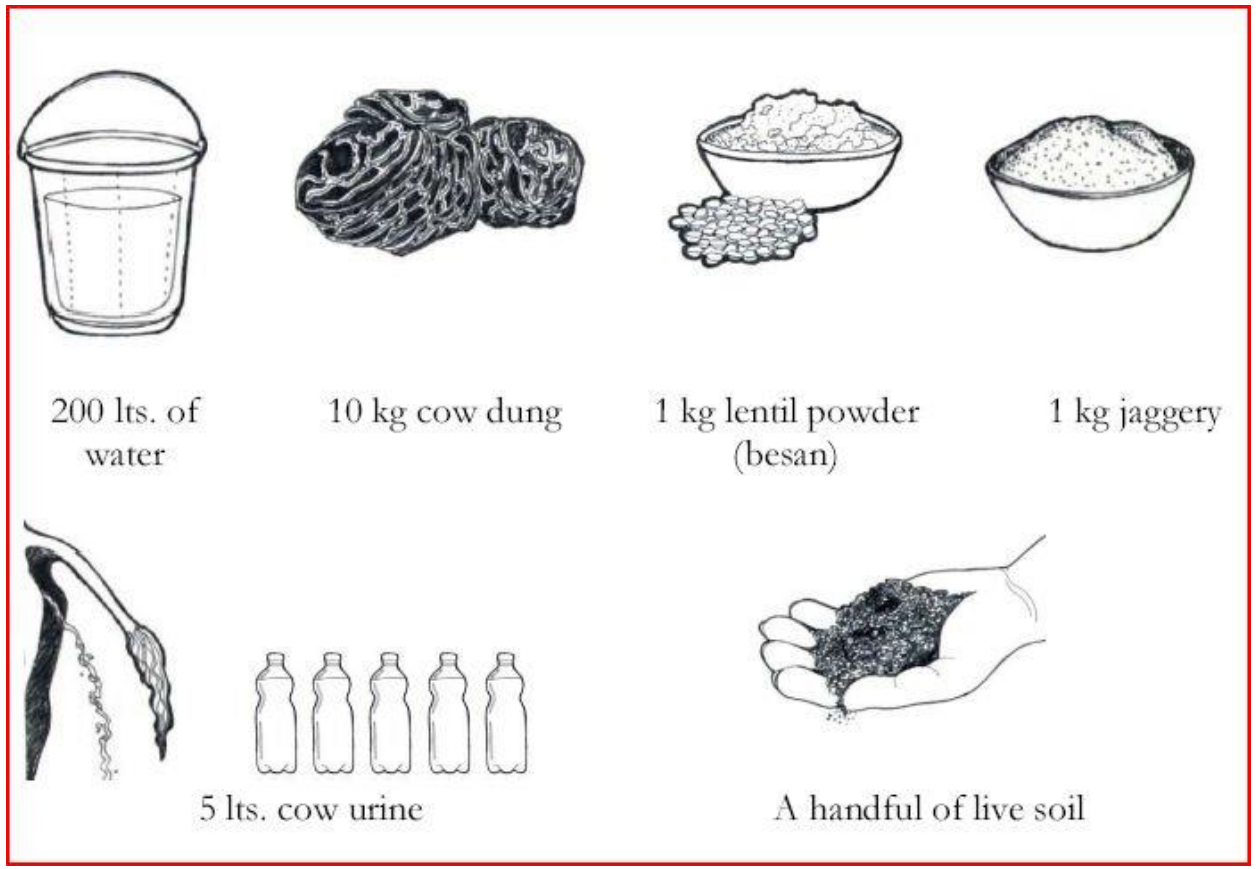
Soil application – 1
Bio fertilizers

- 2 kg of Azotobacter/Azospirillum + 2 kg of PSB required for one acre .
- Mix two types of biofertilizer in 2 liters of water separately
- Sprinkle this suspension on two separate heaps of 50 kg of compost.
- Mix the two heaps separately and leave for incubation overnight.
- After 12 hours, mix the two heaps together.
- If the field has more dense plants, the biofertilizers and water quantity can be doubled
- ……..continued in the next slide.

Soil application-2
Bio fertilizers

- For acidic soils- mix 25 kg lime with this mixture.
- In plantation crops apply this mixture at the root zones by dibbling.
- In field crops the mixture is broadcast evenly before sowing.
- In sugarcane the biofertilizer manure is to be applied in furrows near the root zone, after 30-40 days of planting and covered with soil.
- In potato it is to be applied after 20 days of planting or at the time of earthing-up.

Jeevamruth preparation



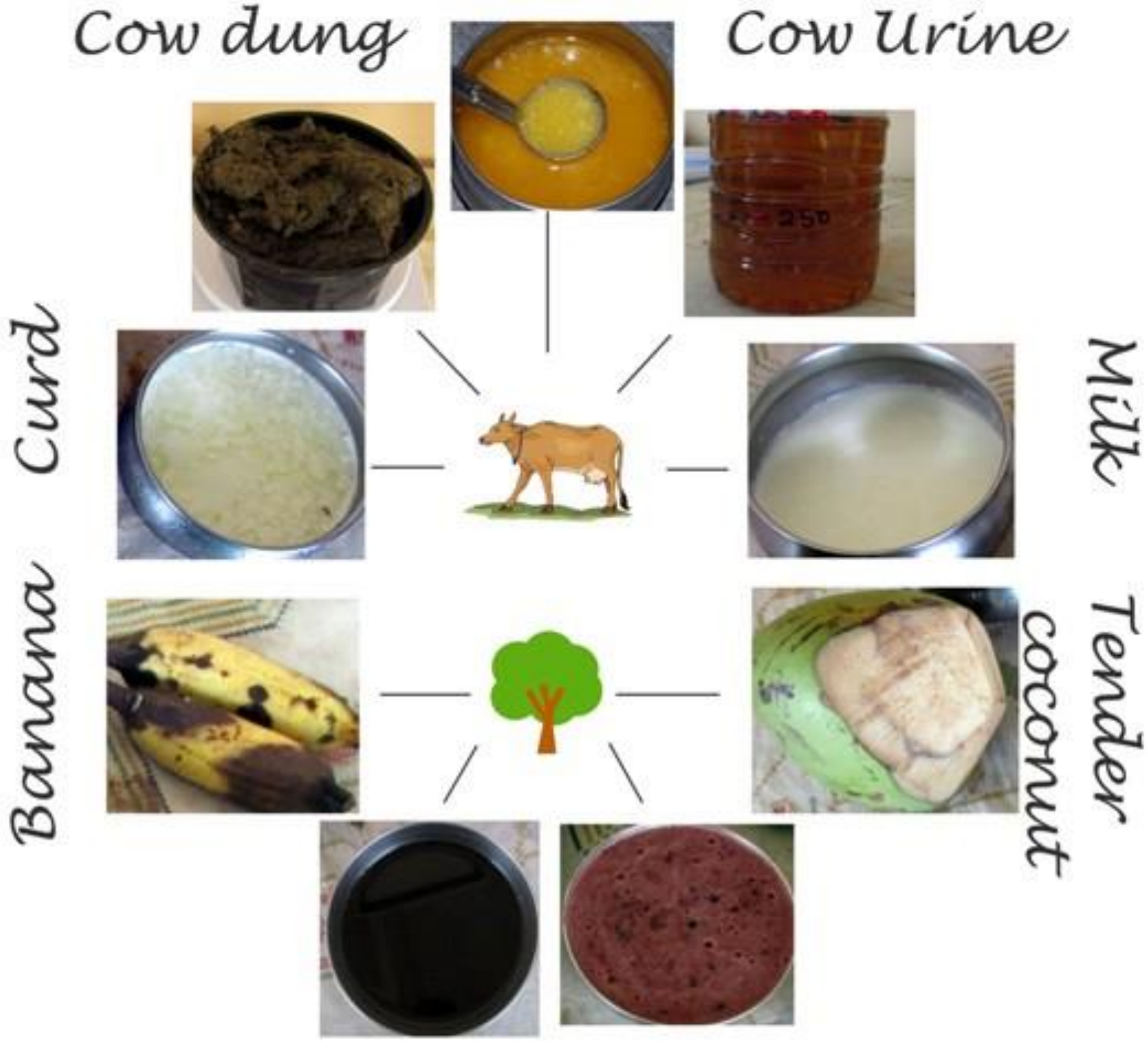
- Mix cow dung 10 kg, cow urine 10 lit, Jaggary 2 kg, any pulse grain flour 2 kg and forest soil 1 kg in 200 lit water. Ferment for 2 days. Stir the solution three times a day. Use in one acre with irrigation water. Or use as foliar spray @ 10% solution.

Panchgavya preparation

- Mix cow dung 5 kg, cow urine 3 lit, cow milk 2 lit, curd 2 lit, ghee 1 kg and close the pot with a cloth and ferment for 7 days.
- Stir twice a day. Dilute 3 lit of Panchgavya in 100 lit water and spray over soil. 20 lit panchgavya is needed per acre for soil application along with irrigation water.

Dasgavya preparation

- Ingredients - cow dung 5 kg, cow urine 3 lit, cow milk 2 lit, curd 2 lit, cow deshi ghee 1 kg, sugarcane juice 3 lit, tender coconut water 3 lit, banana paste of 12 fruits and toddy or grape juice 2 lit. Mix cow dung and ghee in a container and ferment for 3 days with intermittent stirring. Add rest of the ingredients on the fourth day and ferment for 15 days with stirring twice daily



Dasagavya – contd.

- The formulation will be ready in 18 days. Sugarcane juice can be replaced with 500 g jaggery in 3 lits water. In case of non-availability of toddy or grape juice 100g yeast powder mixed with 100 g jaggery and 2 lit of warm water can also be used.
- For foliar spray 3-4 lit Dasgavya is diluted with 100 lit water. For soil application 20 lit Dasgavya is sufficient for one ac. It can also be used for seed treatment

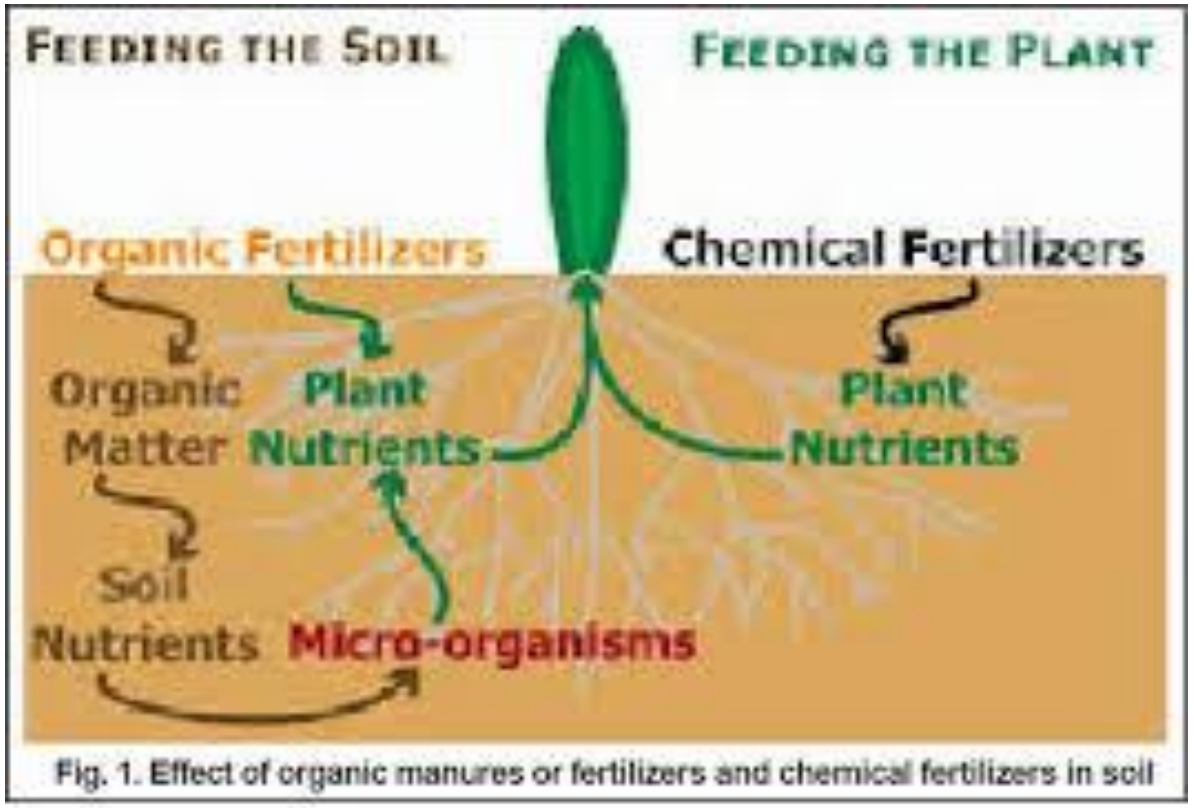


Fig. 1. Effect of organic manures or fertilizers and chemical fertilizers in soil

On-Farm Preparations for Growth Promotion and Plant Protection.

- 1. Sanjivak: For enriching the soil with microorganisms and quick residue decomposition.
- 2.Amirthapani: Promotes growth on Nitrogen and phosphate solubilizing bacteria in the soil.
- 3. Concentrated organic manure: Helps to compensate additional nutrients during conversion period.
- 4. Concentrated poultry manure:
- Useful for high nutrient requiring crops.

On-Farm Preparations
1. Sanjivak.

- **1.Sanjivak** – Mix 100 kg cow dung, 100 lit cow urine and 500 gm jaggary in 300 lit of water in a 500-lit closed drum. Ferment for 10 days. Dilute with 20 times water and sprinkle in one acre or mix with irrigation water.

On-Farm Preparation..

2. Amruthpani

- Mix 10 kg cow dung with 500 gm honey. Add 250 gm of cow desi ghee and mix at high speed. Dilute with 200 lit water. Sprinkle this suspension in one acre over soil or with irrigation water. After 30 days apply second dose in between the row of plants or through irrigation water.

On Farm Preparation ….. Contd.

- 3. <u>Concentrated organic manure</u>
- Rice bran 10 parts
- Fish meal 1 part (bone meal/slaughter house waste
- Oil cake 1 part
- Egg shell 1% of total weight
- Rock phosphate 1-5%
- Molasses & Handful of Forest soil or EM
- Can add 10-12 diff. decomposing bacteria, fungi & actinomycetes -available commercially.
- Partly decomposed compost mixed with butter milk or fermented coconut milk can also be used as micro organism source.

- Process:
- Dilute molasses with water 1:500. Mix all the ingredients and add molasses water to the mixture to get 50-55%. Heap it and cover it with poly sheet.
- Turn over after 24 hrs. Thereafter turn it twice/ day
- Keep temperature at 40-45^{0} ^{C}. Compost will be ready in 4-5 days.
- At the end of 5 days, check for smell. If foul smell is noticed, the compost has to be turned over 3 times a day further.

On-farm preparation …..contd.

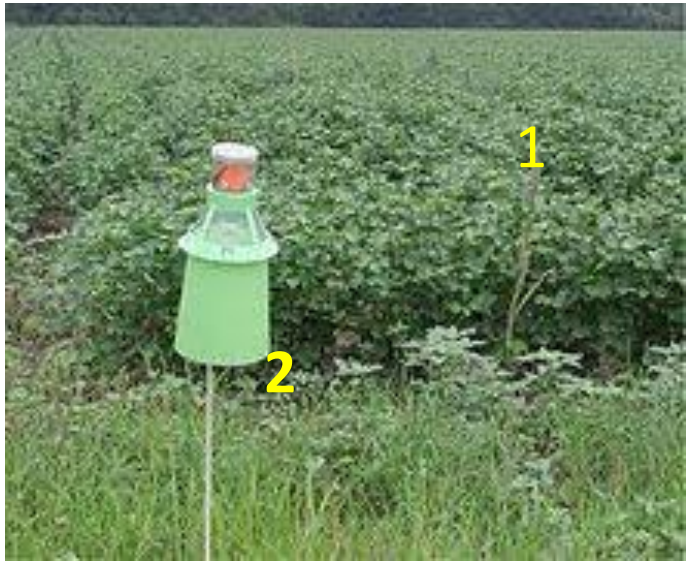
- 4. **Concentrated poultry manure**.
- Mix dry chicken manure, crushed oil cakes, some fresh ashes and rock phosphate in ratio of 10:10:2:2. Grind mixture to a fine powder. Concentrate manure is ready.
- Depending upon the requirement and soil condition ratio can be altered. In acidic soils, some lim

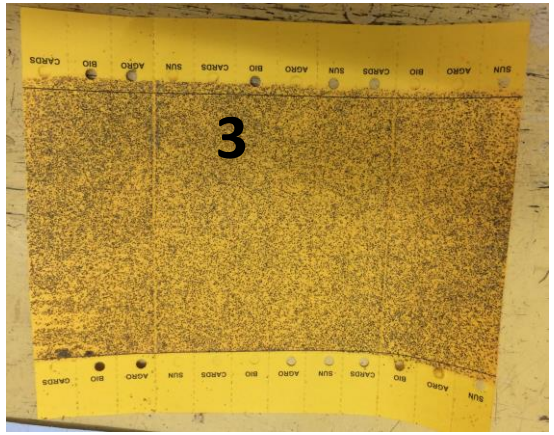
Pest management in organic farming. -1

- **<u>Cultural</u> - Use disease free seed, resistant varieties, maintain biodiversity, crop rotation and mixed cropping.**
- **<u>Mechanical</u> - Remove affected plants, collection & destruction of egg masses and larvae.**

Pest Management in Organic Farming-2

Traps, lures, release of parasitoids and predators.





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Keep yellow sticky traps to monitor adult flies of pests.

Keep pheromone traps to monitor adult flies of pests and take control measures.

Release predator eggs in the field to control pests.

Pest Management in Organic Farming -3

Biological alternatives

Trichogramma spp.

3. *Apanteles* sp

Use of predators and parasitoids is effective in controlling pests.

Release increased numbers of:

Trichogramma sp.@16,000 to 20,000 eggs/ac

Chelonus blackburni @6,000 to 8, 000/ac,

Apanteles sp.@6,000 to 8,000/ac and

Chrysoperla sp.@ 2,000/ac., after 15 days of sowing &

Other parasites & predators after 30 days of sowing..

Beneficial Insects-
Predators and Parasitoids

Predators


Lacewing


Ladybird beetle


Spider


Reduviid bug


Praying mantis


Common mynah

Parasitoids


Trichogramma spp.


Campoletis spp.


Chrysocharis pentheus


Bracon spp.


Chelonus spp.


Encarsia formosa

Biodiversity

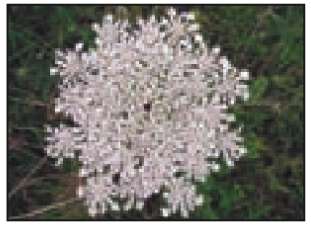
To attract beneficial insects and to repel pests

- Select and plant appropriate companion plants.
- **Attractant plants**: Attracts beneficial insects/natural enemies of pests. Their flowers provide nectar and the plants provide suitable microclimate.
- **Trap crops**: Diverts the pest from main crop and traps and keep them with them.
- **Repellent crops**: Drives away pests from main crop.
- **Barrier or Guard plants**: These tall plants stops the entry of pests from neighbouring fields and from outside.

Biodiversity
Attractant Plants

Plants Suitable for Ecological Engineering for Pest Management

Attractant plants


Carrot


Sunflower


Buckwheat


French bean


Alfalfa


Berseem clover


Anise


Caraway


Dill


Parsley


Mustard


Bishop's weed


Sweet clover


Cowpea


Maize

Biodiversity

Trap plants, Repellent plants and Barrier plants

Trap plants

Castor

Marigold

Repellent plants

Ocimum spp.

Peppermint

Barrier/guard plants

Bajra

Maize

Sorghum

Neem seed kernel extract (NSKE)

- Take 5 kg neem seed – remove the skin- crush the kernels to powder- loosely tie the powder in a cloth-soak it in 10 litre water overnight.
- Next day- filter the solution- You may get about 7-8 lit. Extract.
- Take 1 lit. of extract + 100 ml of Khadi soap solution+9 lit. water (10 lit total- approx.) enough for 1 tank and 20 cents of area field crop
- For 1 acre – 5 tanks- 50 lit water – 5 lit NSKE- 0.5 lit soap solution required.
- 1O% solution of NSKE
- If 5% solution is recommended- 0.5 lit extract in 10 lit. tank (Total NSKE required is only 2.5 lit. About 2 kg neem seed should be enough/ ac.

On-farm preparations for pest control

Brahmastra (5 leaves extract)

- 10 lit desi cow urine + 3 kg crushed neem leaves + 2 kg Custard apple leaves + 2 kg papaya leaves + 2 kg guava leaves + 2 kg pomegranate leaves.
- Boil solution till it reaches 50% vol. Keep it for 24 hrs. filter using cloth and store it in cans or bottles.
- Spray against sucking pests, pod borers and fruit borers. (2 lit/100 lit water).

On-farm preparations for pest control
Agniastra

- **To control pests & diseases**
- **Cow urine 10 lit + Ipomea leaves 1kg + Green chillies 500 gm + Garlic 500 gm + Ginger 500 gm + Neem leaves 5 kg.**
- **Grind the above and mix with 10 lit cow urine and boil for 2-5 times. Keep it for 24 hrs. Filter it with cloth. Store it in glass bottle and use it by mixing with water to control pests and diseases**.

On-farm preparations for pest control

Neemastra

- **For pest and disease control.**
- **Take 5 kg crushed Neem leaves and keep in water.**
- **Add 5 kg cow dung and 5 kg cow urine.**
- **Ferment for 24 hrs with intermittent stirring.**
- **Filter the extract and dilute in 100 lit water.**
- **Use it for 1 ac as foliar spray.**

On-farm preparations for pest control

Dashparni extract.

- **For pest and disease prevention.**
- **<u>Leaves of</u> Neem 5kg+ vitex negundo 2kg+ Aristolochia 2kg+ Papaya 2 kg+ custard apple 2kg + Pongamia 2 kg+ castor 2 kg+ Nerium indicum 2 kg+ calotropis 2kg+ Green chilli paste 2 kg+ Garlic past 250gm+ cowdung 3kg +cow urine 5 lit.**
- **Crush all the above ingredients and ferment in 200 lit water. Keep the drum in shade covered with gunny bag. Stir regularly. Squeeze the extract. Sufficient for 1 acre.**

On-farm preparations for pest control
Liquid Herbal Pesticide

- **Take 10 kg each of leaves of Neem, Ipomea, Lantana, Dhatura and calotropis (aak) + cowdung 5kg+ Cow urine 5lit + sour buttermilk 5 lit+ besan powder 5 g+ jaggery 5 gm+ garlic 1gm+ undisturbed soil 5 gm. keep it in a 200 lit drum and fill it with water.**
- **Stir 2 times/ day and cover with gunny cloth.**
- **Herbal pesticide will be ready in 20-25 days. Mix with water and spray on crops.**

Biopesticides

Seed and planting material treatment

Use **disease free** seed and **resistant varieties.**

Hot water treatment at 53^0C for 20-30 min.

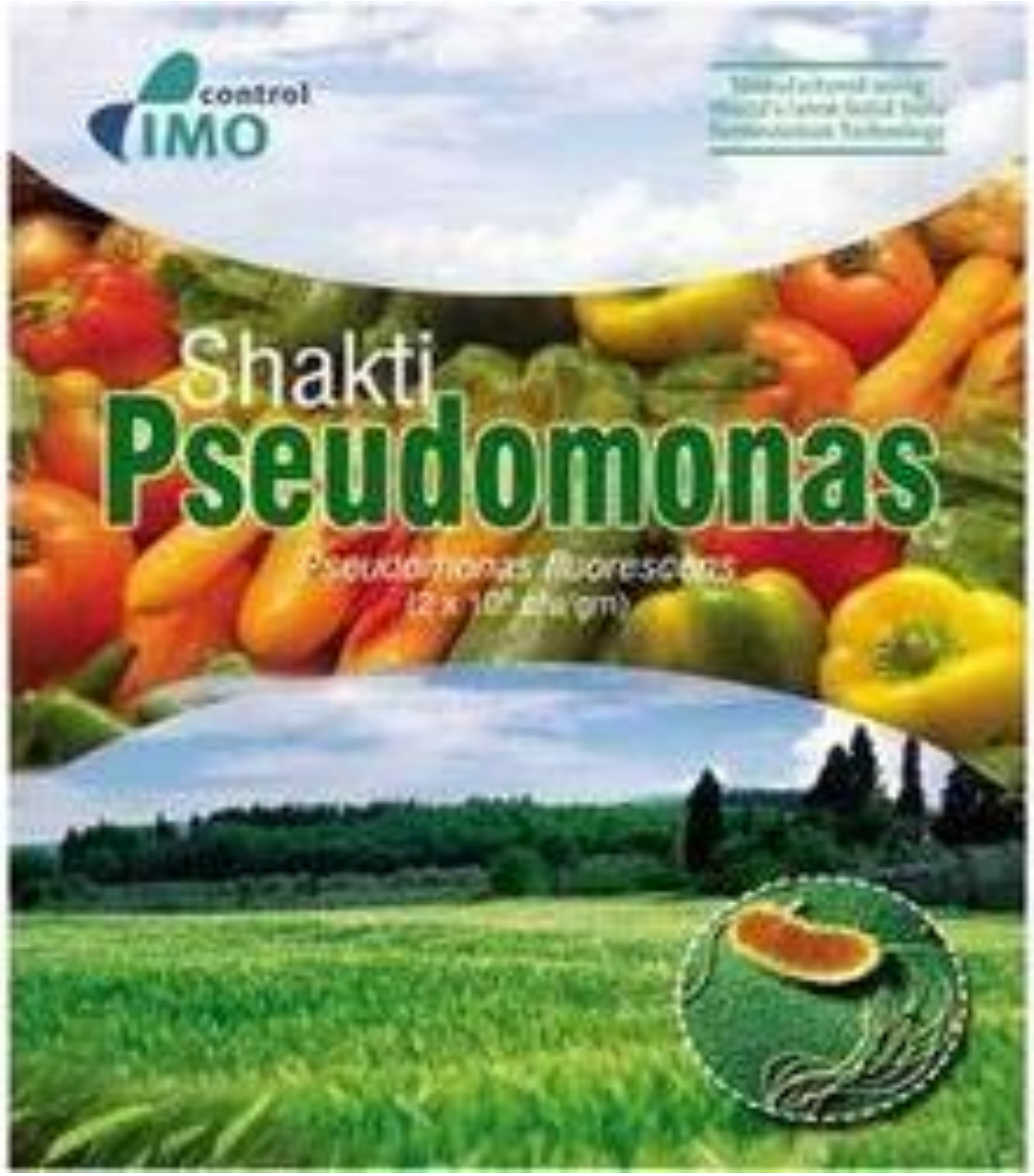
Trichoderma viride (4gm/kg seed) or Pseudomonas fluorescens (10gm/kg seed)

Turmeric powder mixed with cow urine

Biopesticides..contd.

Soil Treatment

- *T.viride, T.harzianum, P.flourescens* and *B.subtilis* can be used for soil treatment.
- For Nursery bed, mix 500 gm of selected biopesticide in water and drench the bed.
- For main field, mix 4-5 kg of bio pesticide in 300-400 kg compost and cover it for 12 hr. and apply.
- In termite infested soil, drench *Metarhizium anisopliae* solution.



Biopesticides..contd.

Foliar Treatment

- *Metarhizium anisopliae, Veticillium lecanii, Beauveria bassiana* and NPV are used.
- Required biopesticide is mixed with 200 lit of water and sprayed
- Khadhi soap may be used as sticker.

Bourdeaux mixture

- **Add copper sulphate 1 kg in 10 lit water –stir it.**
- **Add hydrated lime 1 kg in 10 lit water- stir it.**
- **Add copper shulphate solution to lime solution.**
- **Mix the above 20 lit solution in 80 lit water and use it as foliar spray.**

Reference

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THANK YOU