

Sustainable Agriculture with Provincial resources

Organic Manures, Plant Extracts,
Decoctions/Concoctions

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FOREWORD

Utilization of locally available resources is in agricultural practices since generations. These practices have become obsolete due to the proliferation of chemical intensive modern agriculture. But in the recent days farmers are showing interest in practices that utilize local natural resources as a result of their perception of the bad effects of chemical fertilizers and pesticides. This book is an effort to compile the re-introduction of good old available practices which utilize local resources and make them available to farmers, people and organizations involved with farmers. Some of them are in use since ages and the rest of practices are newly added. The methods mentioned in this book are at least 2 yr old practices followed by the farmers and are approved by research. The details of the place the information was collected from, organization and authors are given as and when required. It is advised that the farmers experiment these methods initially in their own fields in limited areas before final implementation.

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SOIL FERTILITY MANAGEMENT PRACTICES

Integrated crop management practices are taking a big leap in the agriculture sector. Lot of locally available material is utilized as fertilizers, pesticides and fungicides.

The leaves, fruits, roots, bark and twigs that are collected from locally available plants, crop residues and animal wastes can be utilized either directly or by mixing with other materials, directly or by fermenting. There are different types of application to enhance fertility, control pests and diseases.

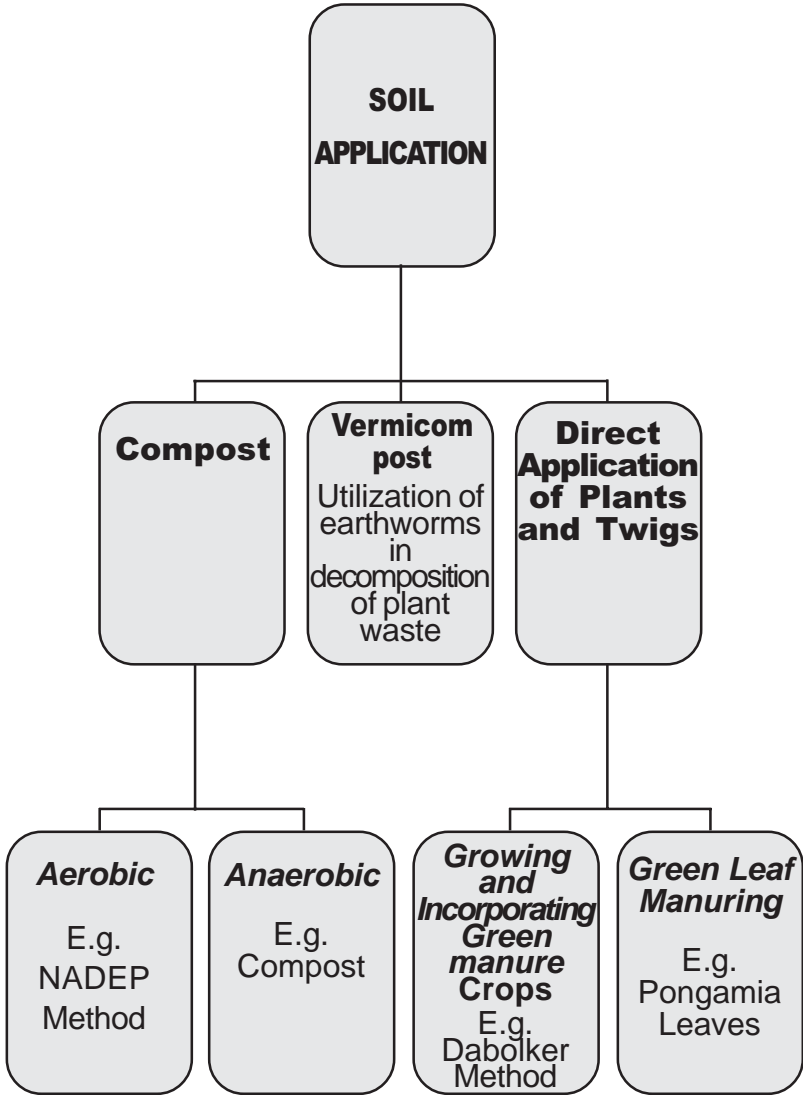
We will be discussing them in detail.

SOIL APPLICATION

Plant residues and animal wastes are used as soil applicators which contribute in building organic material.

Organic material not only holds the essential plant nutrients but supply them to growing plant needs. The different forms of soil applicators are depicted in the following diagram.

Different forms of soil application



1. Compost

The compost material is broadly categorized to two different types:

a) Plant Material:

The breaking down of organic material by microorganisms is called composting. The first method of composting is the utilization of plant organic material. It is the key ingredient of organic farming. The process takes months.

The modern method of composting process can be quickened by shredding the plant material and closely monitoring the process with measured supply of water, air and other necessary inputs.



The favorable conditions for composting are based on the selection of the plant materials and their carbon and nitrogen content. The decomposition of the material will be quicker if the carbon to nitrogen ratio of the material is low and vice-versa.

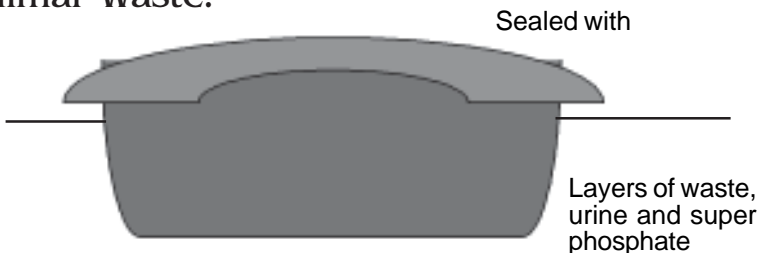
Examples of material with less C:N ratio are: Grass clippings, tender stems of *Gliricidia*, leaves, food material, leaves of

flowering plants, parts of stems, cow dung. Whereas in wood, saw dust and rice straw the C: N content is more and will take more time to decompose. Hence, it is desirable to choose the material with more nitrogen content which will aid in quick decomposition.

Some of the important bulleted items to consider while selecting the compost material are as follows:

- a) Nitrogen Content: Adding dry twigs will aid composting as the dry twigs have greater nitrogen content. Likewise, by spraying the composting pit with nitrogen rich cow urine also aids in quick decomposition of the material
- b) Size: Breaking down of the material into smaller pieces will aid in decomposition
- c) Moisture: It is essential to maintain the moisture content of the compost pit. It aids in the proliferation of microorganisms which aid in decomposition. On the other hand it is essential to see that there is no stagnation of water in the pit which might impede aeration. When the anaerobic conditions persist, there is a possibility for the pathogens to proliferate in the pit which can cause bad odour. To avoid this always line the pit with stones, pebbles, dry twigs and select a location under the shade to prevent loss of moisture.

a) Animal Waste:



The second method of composting is by utilization of animal waste. Heaping them up at one place will lead to loss of nutrients from the animal waste by dry heat and leaching. An organic

compost pit for animal waste can be dug with 2 meter's width, 1 meter depth, appropriate length and lining it with 6" of waste material. Then layer it with cow dung, urine, super phosphate liquid and repeat the layering in the same order till the pit is above soil level and seal it with dung in order to avoid aeration. It is also essential to make sure that the moisture level of the pit is 60 per cent. The organic material will be decomposed by the microorganisms and the compost will be ready within 90-100 days. The thermophile microorganisms that thrive in this pit will aid in destruction of pests and pathogens.

Other Organic Manures:

1. Sheep Manure.

It is been an old practice to shelter the sheep in the empty fields after harvest of the crops in many areas. This is a best way of getting a minimal amount of all nutrients required by the crops. The habit of grazing on different leaves of the sheep, their manure might boost plant immune system. To attain quick results from the sheep manure, it is advised to till the soil to incorporate all the sheep waste into soil after sheltering the sheep herd in the field.

2. Poultry Manure.

Poultry business is an expanding business in our state. Poultry manure contains 1.5% nitrogen, 1.5% phosphorus, 0.5 – 0.8% potassium and some extent of micronutrients. The best method to utilize the poultry manure is to heap them for 3—60 days after collect them from the poultry farms. By doing this the nutrient content increases by organic decomposition.

3. Manure from Biogas.

These plants, also called as 'Gobar gas' plants are being established at farmers' homes with the support of government programs. Cow dung is the essential component of this plant. The dung is composted anaerobically and produces thick

sledge which can be dried and used in the fields, seed beds and orchards. This manure contains 1.5% of N, 1.5% of P, 1% of K and other micronutrients.

Apart from cow dung other wastes from biomass, manure, sewage, municipal waste, green waste and plant material can be used to produce this manure. Because of the simplicity of implementation and low cost of raw materials, this is very popular. Some design to use 'Vermiculture' (which we will discuss later in detail) to further enhance the slurry produced in the plant for use as compost.

Table 1. Solution's for Problems found during Composting

CIRCUMSTAN CE	PROBLEM	REASONS	SOLUTIONS
1.Heated pit	Lack of growth of the microorganisms in the pit	<ul style="list-style-type: none"> • Raw material might be either wet too wet or dry. • Aeration in the pit may to either too high or low • Improper Carbon to Nitrogen ratio <p>Too much soil in the pit</p>	<ul style="list-style-type: none"> ✓ Wet the pit either with animal urine or water ✓ Stir the contents of the pit ✓ Add high nitrogen content material to the pit like green leafy material or cow dung
2.Pit gets too cold	Impeded de-composition of the material	<ul style="list-style-type: none"> • The raw materials in the pit may be too dry • Low content of Nitrogen in the pit 	<ul style="list-style-type: none"> ✓ Wet the pit either with animal urine or water ✓ Add high nitrogen content material to the pit

3.Mold on pit	Mold formation in the pit	<ul style="list-style-type: none"> •The raw materials in the pit may be too dry •Lack of stirring of the material in the pit 	<ul style="list-style-type: none"> ✓ Stir the contents of the pit completely ✓Wet the pit either with animal urine or water ✓ Add high nitrogen content material to the pit
4.Contents of the pit turned to dark green or black color	Foul smell from the pit	<ul style="list-style-type: none"> •Pit is devoid of air •The raw material might have more nitrogen content •Too much water •Improper stirring of the pit 	<ul style="list-style-type: none"> ✓ Remake the pit by adding carbon rich material ✓ Stir the contents of the pit when there is a rise in temperature

2. Vermicompost

This is another form of composting facilitated by 'Mother Nature' through earthworms. Worms turn the organic waste into nutrient rich fertilizer. These worms are a tiny but formidable force, eating their way through organic matter and leaving a trail of rich humus in their wake. This process also facilitates retention of water in the soil.



The increased use of fertilizers casted ill effects on the worms. The earthworm numbers in the chemically fertilized soils started dwindling. Farmers have realized the importance of these worms and started the production of the earthworms. It is very essential to regain and retain the earthworm population in our soils. Some of the uses of the vermicompost are:

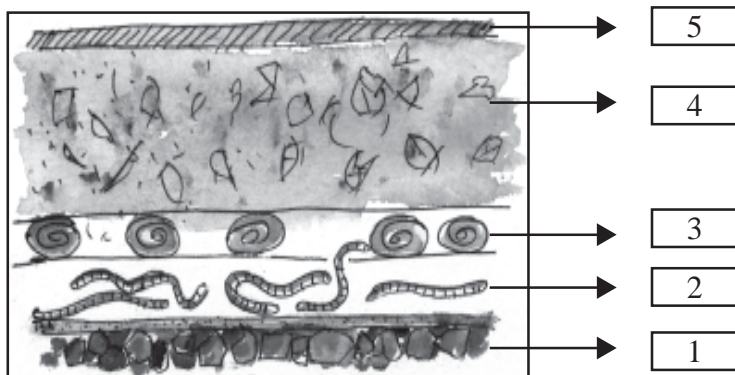
1. Vermicompost contains high content of nitrogen, phosphorus, potassium and micronutrients like iron, magnesium, zinc, calcium, manganese and copper etc.
2. The hormones and antibiotics in the vermicompost attributes to high plant immunity
3. Vermicompost is another organic farming which reduces soil pollution attributed by chemical fertilizers
4. Reduces farmers investment as they can produce this by themselves

5. Increases soil fertility
6. The taste of crops and yields increase
7. Vermicompost aids in water retention by making the soil porous
8. It also aids in proliferation of crop benefitting microorganisms in the soil.

Couple of earthworm production processes is described below.

a) Eco Science Research Foundation Method:

This process suggests the utilization of indigenous species of earthworms like *Perionyx Lampito* in the dung or compost pits. They enhance manure formation, if introduced into the pits after the material starts decomposing and after the heat phase of decomposition is passed. The production earthworms in this method can be done in a pit or ditch or raised beds.



1. Layer of bricks or sand
2. Earthworms on a layer of soft sand
3. Moist cow dung or animal waste balls
4. Decomposed farm/ animal waste up to 0.7 meter
5. Moist jute bags, which will be moistened often

The pit should be protected from ants and other parasites

a) Two Tank Method

This method of production is suitable for families whose garbage/ waste production is up to 150-200 g per day.

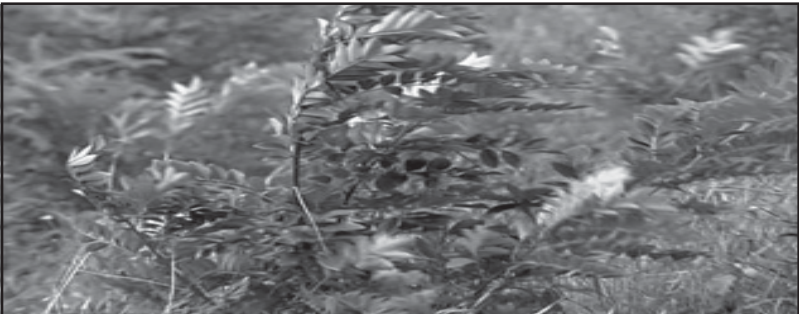


1. Make two compartments side by side in a brick tank
2. Start filling dung in one tank.
3. Once the tank is full, cover it with polythene sheet
4. Remove the cover after 15-20 days and let it cool. Add 150-200 earthworms into the tank
5. Fill the second tank with waste/ garbage
6. Once the second tank is filled, cover it with polythene sheet
7. The worms migrate from one tank to the other
8. This method takes 45-60 days to produce vermicompost.

3. Direct Application of Plants and Twigs

Green manures are basically parts of crops and plants grown and applied to the fields primarily to add nutrients and organic matter to the soil.

a) **Green Manuring in Situ:** Typically, cover crops which require low resources are grown in the field for a specific period, plowed under at the stage of flowering and incorporated into the soil (In situ cultivation). It is beneficial to grow those 2 months ahead of the major crop. The incorporated crop decomposes within 2-3 weeks, and the released nutrients will be supplied to the seed beds of the major crop. Some of the crops used for this purpose are, Sun hemp, green gram, black gram, cow pea, horse gram.



b) Green Leaf Manuring: If it is not feasible to raise the crops, the nutrient rich leaves and stems of the trees can be used to supply nutrients to soil. If these trees are grown as the fence crops for the fields, serves the dual purpose of fence and nutrients. The crops that can be used for this purpose are Gliricidia, Pongamia (gaanugu), Mothuka, Sitafal, and Vempalli.

In rice fields some of the following green manure crops can be used

Pulse Crops: Green gram, Cowpea, Soya bean, Ground nut, chick pea, Pigeon pea.

Forage Crops: Siratro, Clytoria, Desmanthus, Sun hemp, Beans.

Green Manure Crops: Sun hemp, Jiluga.

4. Other Forms of Resources

The other forms of nutrient management include different form of cropping methods and utilization of some microorganisms.

a) Mixed Cropping

Traditionally, farmers grow single crops in Kharif and Rabi season. The yields are prone to losses due to gambling with nature, pest and disease infestation. To avoid this situation, it is beneficial to grow some crash crops with the main crop as well. The method of growing multiple crops at the same time is called mixed cropping. There are quite a few advantages with this method of farming

- There is a possibility of recovering the loss of one crop from another.
- Multiple yields from the same field.
- Soil nutrients can be used efficiently.
- Efficient use of land and reduces weeds.
- Efficient crop disease management. E.g. Cotton + Soya beans, Cotton + Cowpea.
- Increased crop and soil nutrient.

Some of the techniques of mixed cropping are:

- ❖ The crops used to mix have a combination of deep rooted and shallow rooted crops so that they will not compete for nutrients. E.g. Groundnut + Pigeon Pea
- ❖ The combination of crops should be in such a way that they should not compete for natural resources like nutrients, water and sunlight
- ❖ Growing crops of different duration, pulse crops will yield nutritious and healthy crops. E.g. Pigeon Pea and maize
- ❖ Mixed cropping is beneficial in hosting natural predators of one crop on the other. E.g. Cotton + Black gram/ Green Gram, Cow Pea (Spiders and Epilachana

beetles(Akshintala purugu) will develop well before which can control cotton pests like leaf sucking insects and aphids)

- ❖ Utilizing organic manure will enhance the soil fertility and will enhance the yields or crops
- ❖ Seeding based on the proper ratio of major and secondary crops will reduce the wastage of seeds
- ❖ Proper water management will result in good yields.

b) Biofertilizers

Some microorganisms aid plants in the uptake of nutrients and hence called biofertilizers. They are not fertilizers by themselves but break down the naturally available nutrients into plant available forms. These microbes can be grown in the lab environment and supplied in the form of powder. Some of the most popular bio fertilizers are:

- 1) Rhizobium
- 2) Azatobacter
- 3) Azospirillum
- 4) Psuedomonas
- 5) Azolla
- 6) Mycorhiza

Rhizobium belongs to the family of a bacterial that forms a symbiosis with pulse crops. They form nodules on the roots of the cops like groundnut, pigeon pea, green gram, black gram, cow pea, bean and soya bean. This supplies only 'Nitrogen' to the plants, which is one of the important nutrients for plant growth. Nitrogen is abundant in nature, up to 70 % in the atmosphere. But it is not that prevalent in the soil. These microbes absorb the Nitrogen from atmosphere and store in the nodules of the plant roots. The bacteria like Rhizobium, Azatobacter proliferate fast, die fast as well and release nitrogen from the decomposed cells which will be utilized by the plants.

- ✓ The Rhizobium species in the groundnut and pigeon pea are not the same, they are of different species.

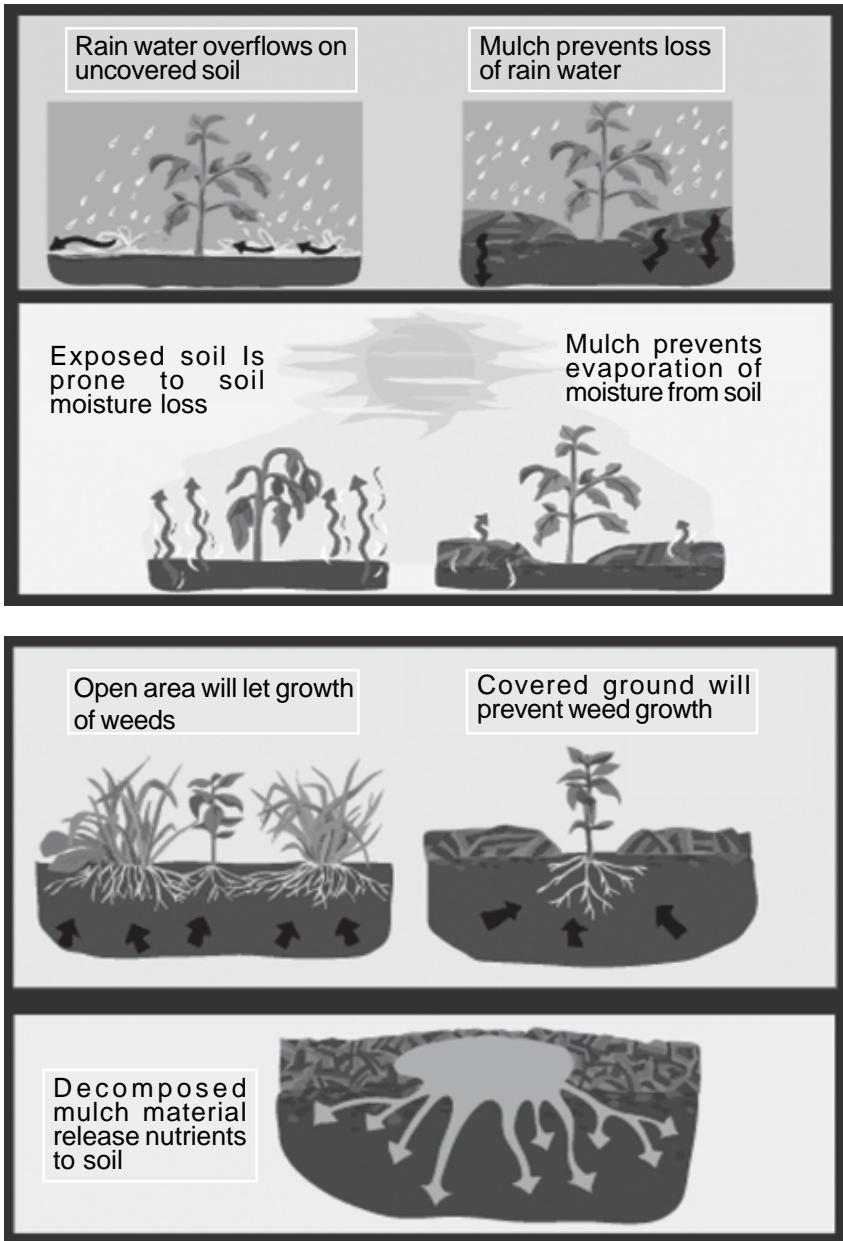
It is essential to choose the right one based on the crop.

- ✓ These crops will have high nitrogen content and hence can be incorporated into the soil when harvested will decompose and supply nutrient to the soil.
- ✓ Azospirillum and Azatobacter supply nitrogen to plant varieties other than the pulse crops
- ✓ Pseudomonas, Bacillus, Penicillin, Aspergillus on the other hand dissolves the water insoluble phosphorus into soluble form to facilitate plant uptake by utilizing the enzymes present in them
- ✓ On the other hand Mycorhiza belongs to fungal group which proliferates on and beyond plant roots. Because of that proliferation, they can absorb more water and nutrients and supply to plants.

c) Mulching

The mulch is a protective cover of plants, twigs over the soil to reduce erosion, retain moisture, suppress weed growth and provide nutrients.

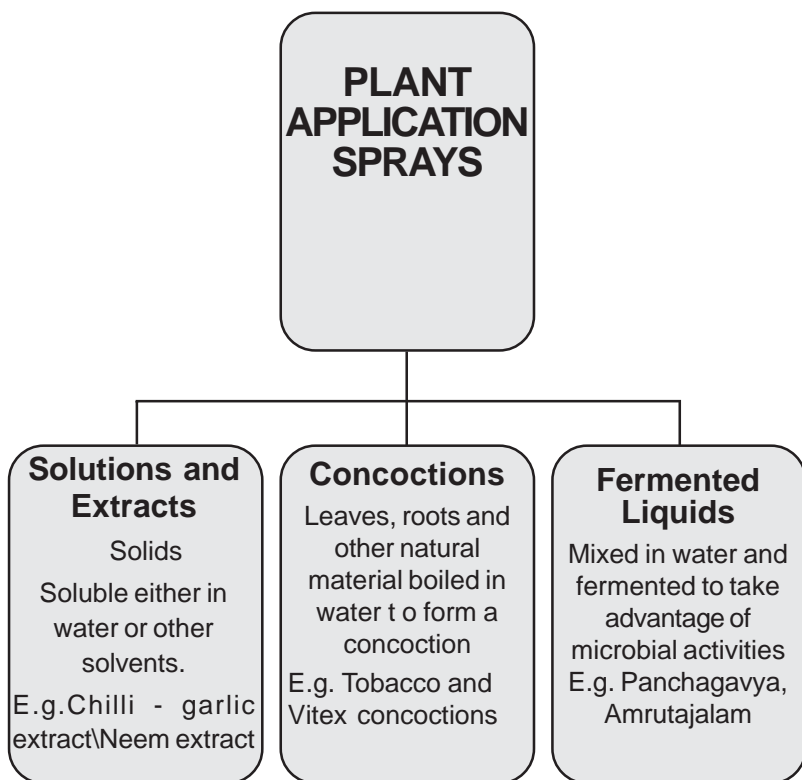
- ✓ Mulching reduces loss of moisture from soil and hence supply of moisture to the microorganisms in the soil
- ✓ Prevents soil erosion caused by excessive rains
- ✓ Enables deep percolation of rain water into the soil
- ✓ The decomposition of organic material used for mulching releases nutrients upon decomposition.



PLANT APPLICATION SPRAYS

Different forms of plant applications

The other form of plant management can be done



applying sprays on the plants. These can be to supply nutrients or to control pests and diseases. Sprays can be formulated from different natural material. The rest of the document details the different extracts, concoctions etc. The following are the details of some of such sprays.

5. PANCHAGAVYA

Dosage:

5% or 5 liters in 100 liters of water and spray per acre of rice field

For other plants – 3% or 3 liters in 100 liters of water.

Required Material:

Cow Dung	5 Kg
Cow Urine	3 Liters
Yogurt made from cow milk	2 Liters
Cow Milk	2 Liters
Ghee made from cow milk	½ kg
Coconut water	3 Liters
Toddy	3 Liters
Ripened Bananas'	12
Water	3 Liters
Black Jaggery	1 Kg

Method of Preparation:

Mix ghee and cow dung. Mix it every morning and evening in a clay pot to get incorporate the ghee smell to the cow dung. On the 5th day mix milk, cow urine, yogurt, toddy, coconut water and jiggery well. Then mash and add the ripened bananas to this mixture. Secure the opening of the pot or the drum with a cloth to prevent flies and insects. After 15 days, filter the mixture through a muslin cloth. This mixture can be stored and used up to 6 months. If the mixture becomes dry, add some water. Panchagavya is not only enhances plant growth but also prevents plant diseases caused by pathogens. This mixture can be used on all crops and is beneficial on seed beds.

6. JEEVAMRUTHAM



Dosage: 200 liters is applied per acre through irrigation water or soil spray.

Equired Material:

Cow Dung	10 Kg
Cow urine	10 Liters
Black Jaggery	2 Kg
Besan (Chick Pea flour)	2 Kg
Plastic Drum	200 Liters Capacity.

Method of Preparation:

Take 200 liters of water in the drum. Add 10 kg of cow dung to it and mix well. Add powdered jiggery and chick pea flour, mix it well. Cover the drum with jute bag and let it ferment for a week by mixing every two days. This mixture can be used within 2-3 days of mixing.

After a week, the microbes develop in this mixture which can be used with irrigation water, sprinkler system or drip system. If a large container is not available, this mixture can be made in the soil by digging a hole enough to hold 200 liters, coating with cow dung and drying for 24 hrs before use.

7. AMRUTHAJALAM

Dosage: 200 Liters per acre is applied either through irrigation water or soil spray.

Required Material:

Cow Dung	10 Kg
Ghee made of cow milk	250 g
Honey / Black Jaggery	500 g



Method of Preparation:

Mix cow dung in a clay pot with ghee and mix thoroughly for 2 hrs. Add honey or jaggery with half a liter of water and mix the contents for another 2 hours. Add water up to 200 liters and mix it for 3- 4 hours. This can be sprayed on the soil or applied to the field with irrigation water.

8. EM CONCOCTION (for Microbial Proliferation)

Required Material:

Ripened Bananas'	3 Kg
Papaya (Deseeded)	3 Kg
Pumpkin (Gummadi- peel off skin)	3 Kg
Coconut water	300 ml
Eggs	2
Water	10 Liters.

Method of Preparation:

Mix ripened bananas, papaya and pumpkin in a pot. Add 10 liters of water, 2 eggs and 300 ml of coconut water to the mixture. Cover the pot with a cloth and leave it for 45 days in a shade. Mix the contents in between. Add 5 liters of water to this concoction and filter it through a muslin cloth. This mixture can be added to 100 liters of water and spray in 1 acre of land.

Details:

This mixture has lot of microbes in it which will help in enhancing the soil nutrients and hence aiding in proper plant growth. This mixture can be sprayed 1-2 times.

9. FISH-JAGGERY ONCOCTION (Aids in plant growth)

The amino acids produced by microbes in this mixture aids in plant growth.

Required Material:

Fish scraps (bones, gills, skin etc)	1 Kg
Jaggery	1 Kg

Method of Preparation:

Mix 1 kg of fish waste and 1 kg jiggery with water. Place it in a pot and tie it with a cloth. Let the contents ferment for 10 days.

Mix the contents well. After 10 days, filter the mixture and mix with 100 liters of water. This can be used as a spray on plants.

Suggestions:

- Efficient if sprayed for 1-2 times on plants
- Can be used in all crops including orchards
- This concoctions cannot be stored, should be used immediately after fermentation.

OTHER SOIL FERTILITY MANAGEMENT PRACTICES

Soil fertility management is an important component of sustainable agriculture. By following some simple steps, the fertility of the soil can be sustained.

1. DOUBLE DIGGING METHOD:

In general the top layer (6 inches) of the soil where the microorganisms and other living forms that are required by crops thrives is fertile. As we go down the layers, soil fertility decreases and a hard unfertile layer is found at the bottom. The deeper layers of soil can also be made fertile and granular with the help of microbes and other living organisms. This method is called double digging.

This method is particularly suitable to nurseries and deep rooted crops e.g. tomato, Jowar, chillies. This method is useful in increasing yields and quality. This method gave positive results to farmers in many countries.

Method: 1

- The selected area should be cleared of gravel, weeds and any other objects
- Area should be divided into small blocks (2x2 ft size)
- Top 6" layer is removed and kept aside
- After removal of the top soil, dig the bottom soil from all sides using crowbar. This makes soil granular which facilitates air and water circulation.

- To this portion of the soil add well decomposed compost or waste material and sprinkle cow dung solution.
- Next, fill it with 6" top layer soil that was taken from the block.
- In a similar way, prepare all the blocks.
- Sprinkle water on the blocks daily in the morning and evening.
- If well decomposed compost is used, these soil blocks can be used for sowing the next day. If wastes are used, it can be used after 15 days
- The soil prepared in this manner becomes fertile and supports the root growth, quality and higher yields.

Method 2:

- The aforementioned mentioned double digging method can be practised by dividing the soil in a circular manner.
- This method is useful for home and kitchen gardens
- Clean the soil of the backyard and mark circles of 1-2m. These circles are again divided into 6-8 portions
- As explained above, take out the soil from each division and fill it with compost/wastes
- Sprinkle with cow dung, water and then cover with soil
- Sprinkle water often on this circle to keep the soil moist.
- If well decomposed compost is used, these soil blocks can be used for sowing the next day.
- If wastes are used, it can be used after 15 days.



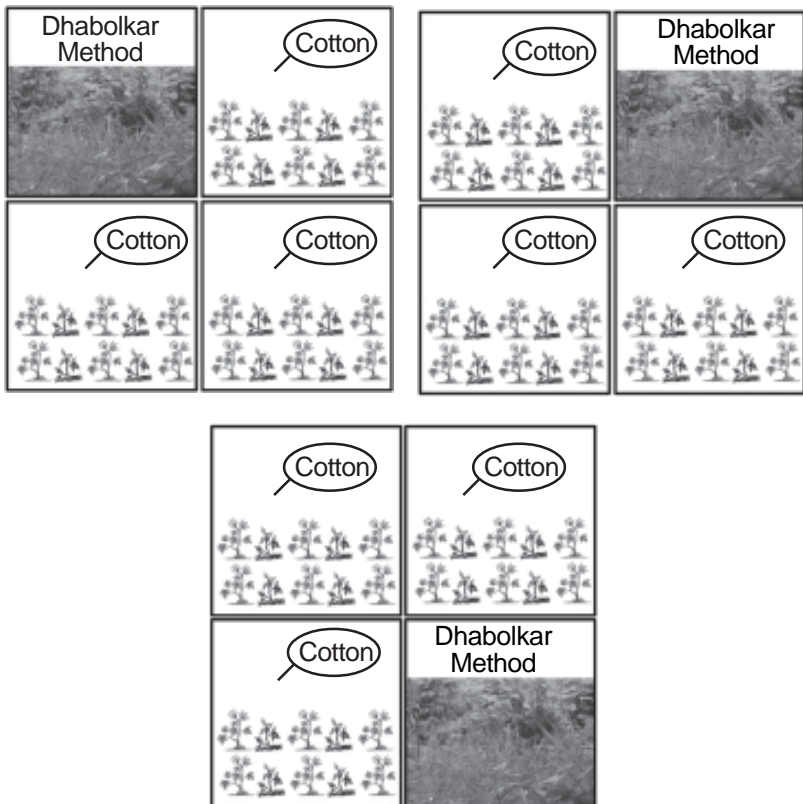
Suggestions:

1. The above two methods can be practiced at any time of the year particularly by the farmers when they are at leisure.

When used for various vegetable crops, farmer gets quality vegetables throughout the year. E.g. the best way to plant them is to put the short duration ones like radish, onion, garlic, carrot on the borders. In the middle of the field chilli, tomato, brinjal, beans, methi, amaranthus, spinach, coriander, bhendi can be sown. (4 ft X 25 ft = 100 sq ft). The vegetables grown in this area is sufficient for one person for one day (200g) throughout the year.

3. Many farmers are achieving good results with double digging method in their own fields. When practiced in backyards vegetables are available throughout the year and favorable for nutritional security.

10. DHABOLKAR METHOD



This method was developed by a scientist, Dhabolkar of Maharashtra to improve the soil fertility. According to his method, the following are required:

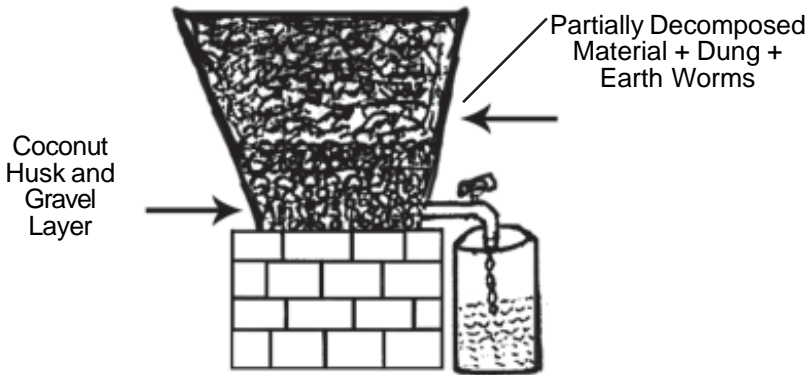
Cereals	: 5 Kgs (Maize, Jowar, Bajra, Ragi etc)
Pluses	: 5 Kg (Black gram, Green gram, Red gram etc)
Oilseeds	: 5 Kg (Sesame, Ground nut, Castor, Sunflower, etc)
Spices	: 5 Kg (Mustard, Fenugreek, Coriander, Curry leaf etc)
Green manure seeds	: 5 Kg (Dhaincha, Jute, Gliricidia etc)

All the above mentioned seeds can be mixed and sown after ploughing. Allow these crops to grow upto 30-40 days and then incorporate the plants into the soil.

If the farmer thinks that he will lose one season for growing these crops, alternative is also available for them. Farmer can divide the field into small parts and this method can be practiced in one part followed by other parts in the following years.

11. VERMIWASH

Take 10 lit of mud pot or plastic container for preparation of vermiwash. Arrange a tap for it at the bottom. Then place 10 cm gravel or broken bricks at the bottom. Spread coconut husk upto 4 cm. on this. Place partially decomposed agricultural waste material and dung and moisten the material with water. After wetting the material for 2 days, release two dozen earthworms. In 2 weeks the wastes get transformed into black compost. At this stage pour 3 litres of water. After 24 hrs, 2 lit Vermiwash can be collected through the tap. Continue this method for one week, remove the compost from the container and it can be used as manure. Again refill the container as explained above and prepare vermiwash.



Method of application:

- 10 lit. Vermiwash is mixed in 100 liters of water and sprayed on an acre of crop.
- Vermiwash can be used on all crops, nurseries and fruit crops.
- Can be sprayed 1-2 times during crop duration to get good results.
- By spraying Vermiwash controls micronutrient deficiencies to some extent.

12. TRADITIONAL SEED TREATMENT PRACTICES

The other fertility methods implemented will aid in proper germination of seeds by treating them with some methods mentioned below:

1. SEED TREATMENT WITH COW URINE

Soaking the seeds in water before sowing will improve the germination percentage. Duration of soaking is depends on the nature of the seed coat. We can improve the disease resistance by soaking these seeds in magic compost mixture or in cow urine.

Required Soaking Time:

Paddy : 12 hours soaking in water and drying of seed under shade for 4-5 hrs

Maize : 24 hrs

Wheat : 7

Ground nut : 1-2 hrs

2. Other methods:

1. A mixture of cow milk and water in the ratio of 1:9 can be sprayed on seeds and dried under shade.
2. Sprinkling of ash and water mixture and drying under shade
3. Sprinkling ash of cow dung cakes can control various pests. Application of ash on fruit trees will supply the Potash. 5 Kg of ash is required for one acre.

CONCOCTIONS / DECOCTIONS
USED IN
PEST MANAGEMENT OF
CROPS

13. TOBACCO DECOCTION

Tobacco Decoction Preparation Method



Boil 1 KG Tobacco leaves in 10 L of

Stir the Boiling Mixture

Cool, filter and add 100 g soap powder

Tobacco Decoction

Mix with 100 L water and spray in 1 acre



Organic farming and sustainable agriculture emphasize in reducing the harmful chemicals and use of more natural materials. This will reduce the pesticide accumulation in crops, soil and water. Certain Concoctions/ decoctions can be prepared from different naturally available material and used for this purpose.

The following are some of the available concoctions that can be made easily by the farmers.

- Nicotine in Tobacco control the pests through contact
- Tobacco decoction can be used against Whitefly and other sucking pests.

Required Material:

Tobacco waste – 1 Kg

Soap powder – 100 gm

Method of Preparation:

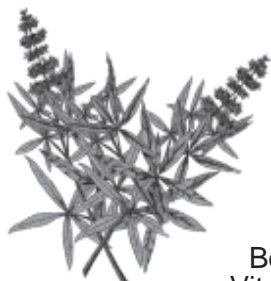
- Boil 1 Kg Tobacco waste in 10 L of water for 30 minutes
- Add water regularly
- Cool the decoction and filter it through a thin cloth
- Add 1000 L of water to the above decoction, it is sufficient for 1 acre and apply it in the evening time.

Precautions:

- Tie a cloth to nose while making the decoction
- Cover entire body while spraying
- Apply only once on a crop, other wise friendly insects may die
- Never store the decoction.

14. VITEX DECOCTION

Vitex Decoction Preparation Method



Boil 5 Kg
Vitex leaves
in 10 L of
water



Mix the
decoction in
100 L water and

Mix the
boiling
mixture



Filter the boiled
mixture and add



Vitex Decoction

- Presence of many alkaloids makes Vitex as an effective pesticide and fungicide.

Required Material:

- Boil 5 Kg of Vitex in 10 L of water for 30 min
- Stir the boiling solution regularly
- Cool the solution and filter through a thin cloth
- Add 100 gm soap powder to the decoction
- Add 100 L of water to the decoction to spray in 1 acre
- Spray the decoction in the evening time.

Precautions:

- Tie a cloth to nose while making the decoction
- Depending on the crop stage and pest intensity, this can be applied for two to three times
- Never store the decoction

Note:

- We can also make a decoction with leaves of custard apple. This decoction also effectively works against the above mentioned pests.

15. COW DUNG AND URINE SOLUTION

Cow Dung, Urine Solution Preparation



Mix cow dung, cow urine and water in the ratio of 5:5:5 in a container



Close the container and ferment the liquid for 4



Mix the liquid

Mix this mixture in 100 L of water and spray in an acre



Filter the mixture after 4 days and add 150 gm of



- Large number of microbes present in the cow dung and urine are useful in controlling many fungal diseases
- Nutrients present in the solution are useful for effective plant growth
- This can be applied for two to three times in a crop period

Required Material:

- Cow dung – 5 Kg
- Cow urine – 5 L
- Lime – 150 gm

Method of Preparation:

- Store 5 Kg cow dung, 5 L of cow urine and 5 L of water in a tub
- Cover the tub and allow the solution to ferment for 4 days
- Stir the solution with a stick every day
- After 4 days filter the solution and add 150 gm of lime to it
- Add 100 L of water to the solution to spray it in 1 acre

Precautions:

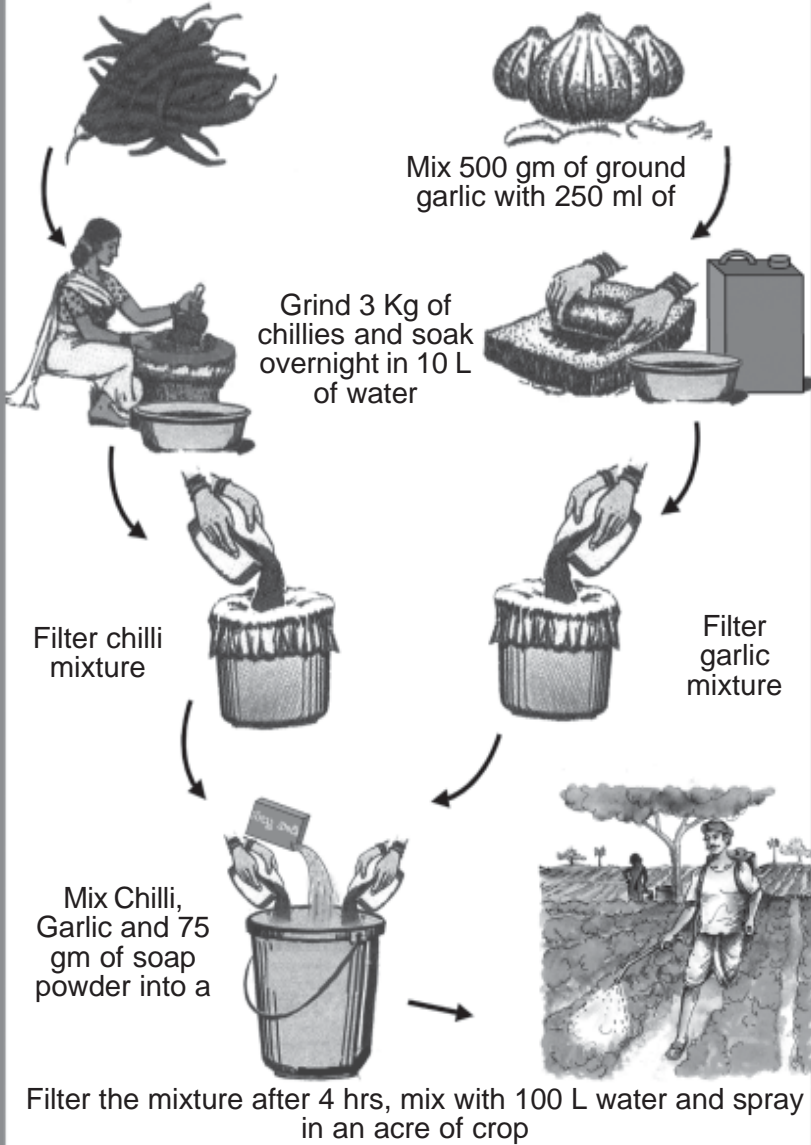
- As this solution is thick use a mesh or gunny bag to filter the solution (first time)
- After that add water and filter through a thin cloth
- We can store the solution for 1 or 2 days (farmer's experience)

Note:

- ❖ This solution will improve the resistance power of the crops
- ❖ Spraying of this solution will improve the drought resistant capacity.

16. CHILLI - GARLIC SOLUTION

Chilli – Garlic Solution Preparation Method



Alkaloids like Capsaicin and Allicin present in chillies and garlic respectively will act through contact. These will create tingling effect on the insects and will make them fall from the tree and die.

Required Material:

1. Green Chillies - 3 Kg
2. Garlic - ½ Kg
3. Kerosene – 250 ml
4. Soap powder – 100 gm

Method of Preparation:

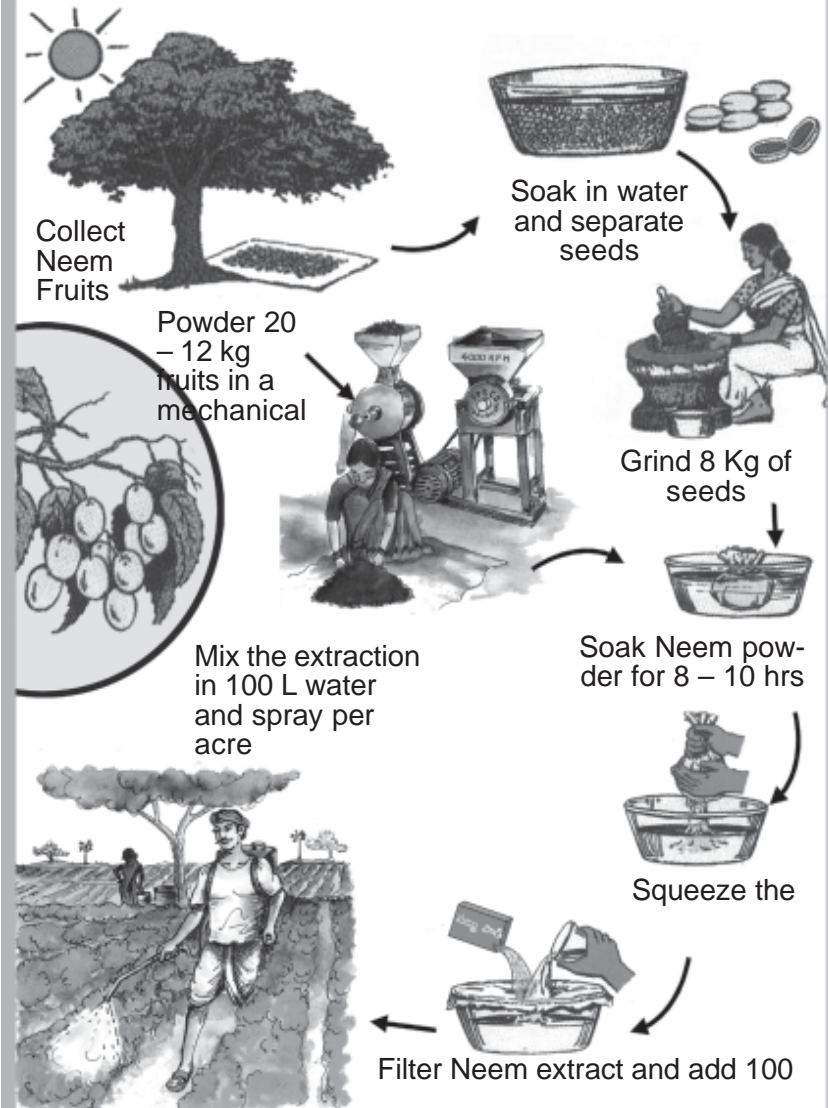
- Grind the chillies after removing the petioles and add 10 L of water to it. Keep this solution overnight.
- Grind the 1/2 kg garlic and add 250 ml kerosene and keep overnight
- Next day morning filter the chilli solution through a thin cloth
- Do the same for garlic solution
- Mix chilli solution, garlic solution and soap powder thoroughly and make a mixture
- Add 100 L of water to the above solution. This can be applied for one acre

Precaution:

- Apply oil to the body while preparing this decoction
- Cover the body while spraying
- Apply this solution only one or two times during the cropping season.

17. 5% NEEM SEED KERNEL EXTRACTION

5% Neem Extract Preparation Method



- “Azadirachtin” present in the Neem will affect different stages of the pest life cycle. It will act through stomach and on contact

Required Materials:

Neem seeds – 5 Kg

Soap powder – 100 gm

Method of Preparation:

- Good quality 5 Kg Neem seeds dried under shade
- This powder can be packed in cloth and kept in 10 L of water for 10-12 hrs
- Extract the decoction by pressing the cloth pack for 10-15 min
- Filter this solution through a thin cloth
- Add 100 gm of soap powder to the filtered solution
- Add 100 L of water to the solution and spray it in 1 acre during evening time

Note:

- ❖ 5-10 Kg of Neem powder is required (depending on the crop stage and pest intensity)
- ❖ This solution cannot be stored
- ❖ Depending on the crop stage and intensity increase the dosage
- ❖ This solution can be used on all crops and nurseries
- ❖ This solution can be used in orchards to get better yields
- ❖ Instead of soap powder we can use 500 gm of soap nut

Uses of Neem seed kernel extract:

- It affects egg and larva stages of the crop pests. Larvae can not feed on the leaves, as the Neem extract coated leaves taste bitter

- “Azadirachtin”, which is present in the Neem, affects the lifecycle of the pests. The pest will die as larvae or pupae
- This solution will not affect human health, friendly insects and environment
- “Lemonoids” present in Neem will help in keeping the crop healthy

Other products of Neem:

1. Neem oil:

- Generally Neem oil is available in the market. Pure Neem oil can be used in pest control
- 5% solution of Neem oil is effective in pest control (5 ml of Neem oil in 1 L water and prepared to 100 L of solution can be used per one acre)
- As Neem oil is insoluble in water, acts as a spreading agent by mixing 100 grams soap solution.
- Depending on pest intensity spray 100-150 L of solution.

Pests controlled:

Sucking pests, fruit borers and leaf folders can be controlled with this solution.

2. Neem powder:

- Neem powder or Neem cake can be obtained after extracting Neem oil
- Neem powder contains 5.2% to 5.6% of Nitrogen, 1.1% of Phosphorus, 1.1% of Potash
- 1-2 q of Neem cake can be applied per 1 acre
- It is effective against soil borne pests
- It can be applied at the time of ploughing
- It can be applied before sowing the seeds in nurseries

Pests controlled:

Soil borne nematodes and root grubs

Precautions for storing Neem seeds:

Do's

- a) Collect ripened and dropped fruits in June and July.
- b) Remove seeds from fruits regularly.
- c) Dry the seeds under shade.
- d) Store the seeds in gunny bags.

Don'ts

- 1) Don't store the seeds more than one year
- 2) Don't dry under sun light
- 3) Don't store in polythene bags

Note: If seeds are stored in large quantities add 500 g mixture of Sulphur and lime in 1:10 ratio per quintal of seeds.

18. HERBAL TEA

Required Material

Tulasi

Tulasi

Palakodisa (Cleistanthus collinus)

Tuttura – Benda (Abutilon indicum)

Tobacco

Bougan villea

Neem

Teak Leaves

Aloe Vera

Papaya

Cow urine

Animal Dung

Jaggery

Method of Preparation

- Take about 5 Kg of the leaf mixture mentioned above
- Mix the leaves with 5 Kg cow dung and 100 g jaggery
- Let it sit in a pot by mixing it every day
- After 7 days the herbal tea will be ready
- Add 5 L water to the mixture and filter it
- Mix the tea mixture with 100 L water and spray per acre.

How it Works:

The aforementioned leaves have different 'alkaloids' which aids in controlling pests and diseases.

19. 5% PONGAMIA SOLUTION

5% Pongamia Solution Preparation Method



7 Kg Pongamia



Deseed and make 5 kg seed

Soak seeds in water for an hr and make to a paste



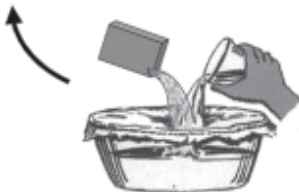
The paste is placed in a cloth and soaked for another 10 -12 hrs



Mix the extract with 100 L water and spray



Extract solution by squeezing the cloth



Filter the extract through a cloth and add 100 g soap powder

- Presence of “Karingin” and other alkaloids in the Pongamia seeds are useful in controlling pests and diseases.

Required Materials:

Pongamia seeds – 5 Kgs

Detergent – 100 grams

Method of Preparation:

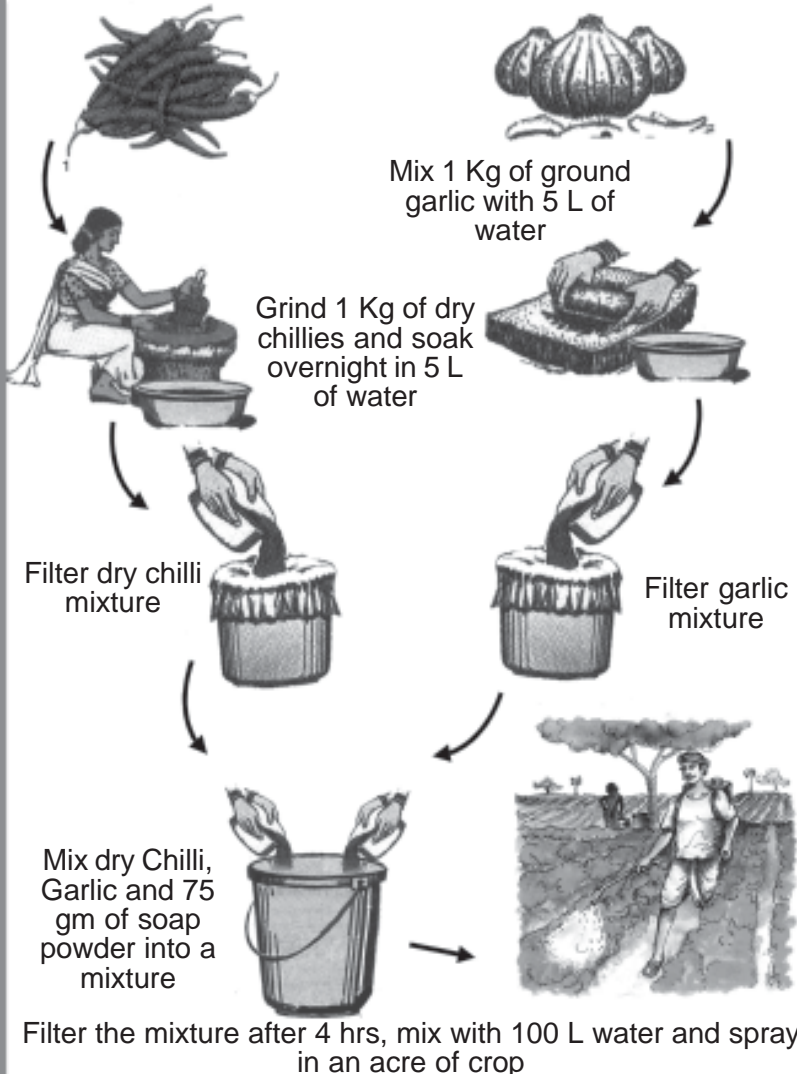
- Separate the seed from the hard coat and soak 5 Kg of seed for an hour in water
- Make a paste out of the soaked seeds
- Tie the paste in a cloth tie it and soak in a container of water for another 10 – 12 hr
- Extract the Pongamia solution by squeezing the solution for 15-20 minutes
- Add 100 g of soap powder to the extract
- Mix the mixture in 100 L of water and spray in an acre.

NOTE:

- ❖ Depending on the stage of the crop and the intensity of damage, this can be sprayed 2-3 times per season
- ❖ Soap powder can be substituted with Soap nut powder or Sheekai powder (500 g)
- ❖ This extract cannot be stored
- ❖ This is used in all kinds of crops.

20. DRY CHILLI – GARLIC SOLUTION

Dry Chilli – Garlic Solution Preparation



Required materials:

1. Drychillies – 1Kg
2. Garlic – 1Kg

Method of Preparation:

- Grind 1 Kg dry chillies and add 5 liters of water and keep the solution over night
- Take one kg of garlic (remove top layer) and grind it to make paste and add 5liters of water and keep it over night
- Next day mix the two solutions and filter it through a thin cloth
- Keep the mixture for four hours and add 100 lts of water
- This can be sprayed on one acre of Paddy field

Precaution:

- This decoction can be applied only twice in a crop period
- Don't store the decoction, spray immediately
- Apply oil to the body while preparing the solution
- Cover the entire body while applying this decoction.

21. N.P.V VIRUS SOLUTION

N.P.V. Virus Solution Preparation



Insects infected with virus die and hang down from the plants



Collect dead pests infected with the N.P.V virus from



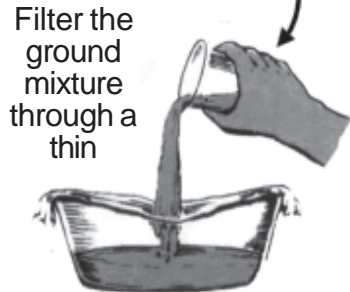
Spray this in evenings in an acre of land



Grind the dead pests with water



To the extract add 100 g Indigo powder and 100 L water



Filter the ground mixture through a thin

Pests controlled:

Three types of N.P.V viruses exists

1. Against Helicoverpa – HNPV
2. Against Spodoptera – SNPV
3. Against Red Hairy caterpillar – RHNPV.

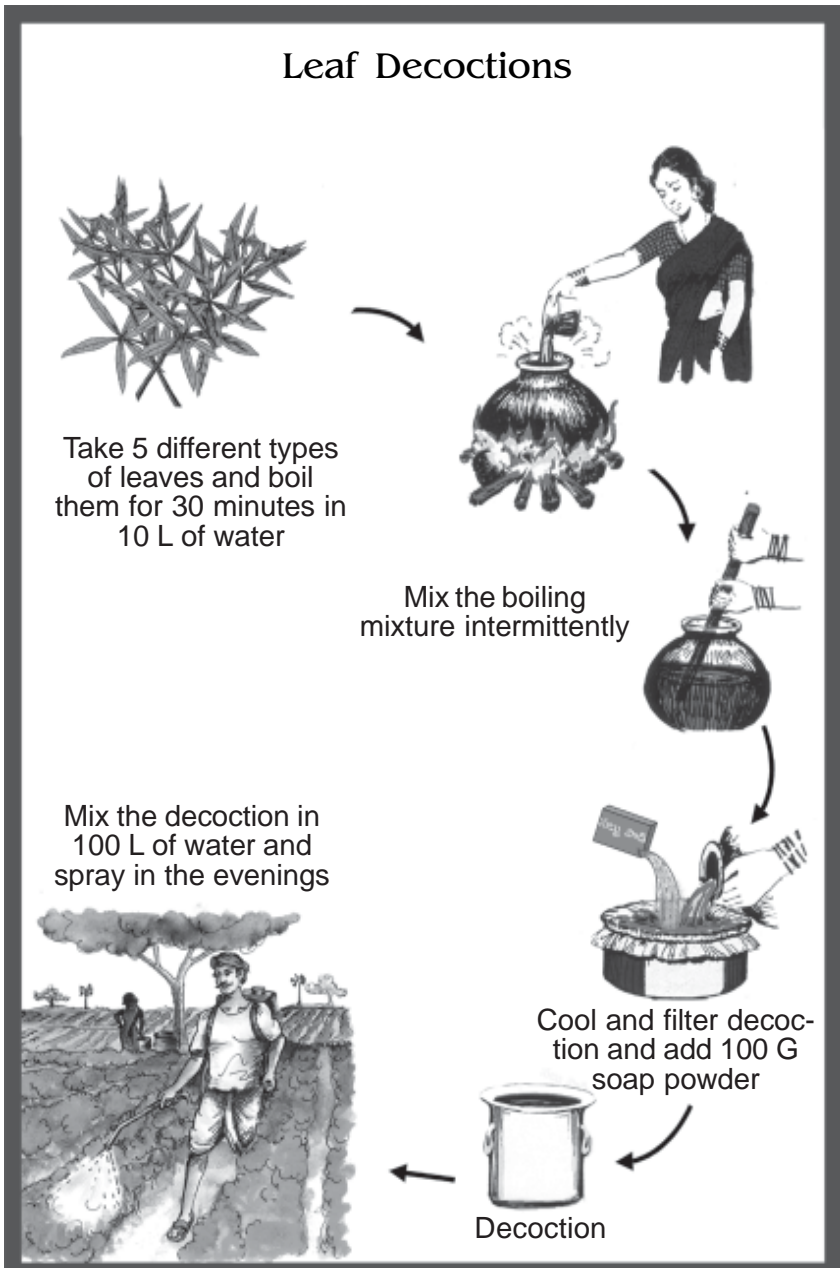
How it works:

Pests affected by NPV virus will die. The dead worms hang down from plants and shrivel. Collect these insects and grind them. This mixture will consist of NPV virus material. Spraying of this mixture on crops will spread the virus among the crop pests. In this way the virus will spread and kill the insects that harm the plants.

NOTE:

- This solution can be sprayed 1-2 times in crop a period, based on the intensity of pest incidence
- Select the proper Virus extract based on the type of infestation
- Dosage for HNPV is 250 LE, for Spodeptera it is 100 L.E and for Red Hairy caterpillar it is 200 L.E
- Store this mixture in cool place or in refrigerator.

22. DECOCTION FROM LEAVES



Required Material:

- | | | | |
|------------------|---------|------------------|---------|
| 1. Neem leaves | : 1 Kg. | 2. Jatropha | : 1 Kg. |
| 3. Vitex | : 1 Kg. | 4. Custard apple | : 1 Kg. |
| 5. Mint (Pudina) | : 1 Kg. | 6. Eucalyptus | : 1 Kg. |
| 7. Lantena | : 1 Kg. | | |

Method of Preparation:

- Take any 5 types of aforementioned plant leaves
- Keep all these leaves in a pot and add 10 L of water
- Keep them for whole night
- Next day boil the water
- Keep on stirring the solution and boil the water until the solution becomes 5 L decoction
- Cool the decoction.
- Filter the solution and add 100 g of soap powder.
- Mix this solution to 100 -150 L of water to spray in one acre.

Precaution:

- Add 0.5 L of decoction to 10 L tank
- Add 0.75 L of decoction to 15 L tank

Pests controlled:

- Sucking pests
- Small larvae
- Grass hoppers
- Fruit borers

How to use:

- This decoction can be applied to all crop types
- Based on the intensity of pest it can be used for one – two times in a crop period

Precaution:

- Cover your nose with a cloth while preparing the solution

- For effective results spray this solution during evening time
- Don't store the solution
- Don't spray this solution during early stages (30-45 days) of the crop
- Don't spray this solution on nurseries

How it works:

- Presence of different alkaloids makes this decoction effective in pest control.

23. PEST REPELLENT DECOCTION

<u>Name of the leaf</u>	<u>Quantity</u>
Neem	250 g
Picchi thulasi	250 g
Palakodisa	250 g
Thuthuru benda	250 g
Tobacco	250 g
Bougan villea	250 g
Teak leaves	250 g
Alloevera	250 g
Papaya	250 g
Cow urine	5 L

Method of Preparation:

- Grind the above mentioned leaves
- Add 5 L of cow urine and 2 L of water to the mixture
- Keep the pot with cover and stir the solution with a stick for 10 days
- Filter the solution after 10 days through a thin cloth
- Add 100 liters of water to the solution and spray it on one acre of land.

CONCOCTIONS / DECOCTIONS
USED IN
DISEASE MANAGEMENT OF
CROPS

23. GREEN CHILLI – NEEM – GARLIC – TOBACCO CONCOCTION

Green Chilli – Neem – Garlic – Tobacco Concoction



Green Chilli, Garlic, Neem and Tobacco waste



Grind chilli, garlic and Neem to a paste



Mix the mixture with tobacco waste and soak in cow urine for 10 days



Mix the concoction in 100 L water and spray in one acre of crop area



Filter the concoction through a

- Presence of Alkaloids makes this concoction effective in pest control
- This decoction is effective against *Helicoverpa*, *Spodoptera* and Red hairy caterpillar.

Required Material:

1. Neem leaves – 2 Kgs
2. Tobacco waste – 1 Kg
3. Garlic – 1 Kg
4. Green chillies – 1 Kg
5. Cow urine – 5 L

Method of Preparation:

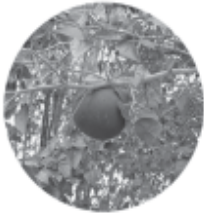
- Grind all the above mentioned materials except tobacco waste.
- Add tobacco wastes to the mixtures and add 5 L of cow urine and store it for 10 days.
- Stir the solution every day.
- Filter this solution after 10 days and add 100 L of water and this can be sprayed in 1 acre of land.

Precaution:

- This can be applied on 1-2 times during a crop period to get maximum benefits.
- Don't store the solution.
- Apply oil to your body while preparing the solution.
- Cover your body while spraying the solution.

24. BEAL (*Aegio marmorales*) DECOCTION

Beal Decoction Preparation Method



10 Kg of Beal leaves
boiled in 10 L of water



Mix the decoction
intermittently



Cool, filter
and add 100
g detergent
to it



Mix with 100 L water
and spray in an acre in
the evenings



Beal Leaf

- Presence of many Alkaloids in Bael leaves will help
- in disease management
- This decoction is effective in controlling blast and sheath blight in Paddy

Required Material:

1. Bael leaves – 5 Kg
2. Detergent – 100 g

Method of Preparation:

- Take 5 Kg of Bael leaves and boil them in 10 L of water for 30 minutes and stir it with a stick regularly
- Filter the solution after cooling
- Add 100 g of detergent
- Add 100 L of water to the solution and spray the solution in one acre during evening time

Precaution:

- This decoction can be used 1-2 times during a crop period
- Spray the decoction on the field immediately after preparation
- Don't store the solution
- Cover your nose with a cloth while preparing the decoction

25. BASIL DECOCTION

Basil Decoction Preparation Method



5 – 6 Kg basil leaves
boiled in 10 L of water
for 30 minutes



Mix the contents
intermittently



Cool, filter and add
100 g detergent



Mix the decoction in
100 L of water and
spray in the field in the
evening



Basil Decoction

- Presence of Alkaloids in Basil makes it effective in disease management
- This decoction is effective against leaf-spots and Alternaria leaf spots.

Required Material:

Picchi thulasi (Basil) leaves – 5 Kgs

Detergent – 100 g

Method of Preparation:

- Take 5 Kg of Basil leaves and add 10 liters of water and boil it for 30 minutes
- Stir the solution regularly
- Cool the decoction and filter it through a thin cloth
- Add 100 g of detergent
- Add 100 L of water and spray it in the evening.

Precaution:

- This decoction can be sprayed only 1-2 times during a crop period.
- Don't store the decoction.

26. COW DUNG – URINE – ASAFOETIDA CONCOCTION

Cow Dung – Urine – Asafoetida Concoction



5 Kg dung, 5 L urine is mixed in a container



Close the container and ferment for 4 days



Mix the content intermittently



After 4 days filter, add 150 g of lime and 200 g of asafoetida to the mixture

Add the concoction to 100 L water and spray in an acre of field



- Mixing of 200 g of Asafoetida in cowdung and urine make it a strong fungicide. This solution is effective against Blast in Paddy.
- It is also effective against bacterial diseases in Paddy
- Presence of Sulphur in Asafoetida makes this solution as a fungicide.

How it Works:

The fermentation process of cow dung and urine will develop microorganisms which controls the spread of the pathogens from one plant to the other.

27. PRICKLY PEAR (*Achyranthes aspera*) DECOCTION

Decoction made out of this is effective against *Botrytis*. This decoction prevents germination of spores.

28. LEMON GRASS DECOCTION

This decoction is effective against soil born fungal diseases. This is effective against *Macrofomina* faselous which causes rot in plants.

28. BASIL DECOCTION

Many alkaloides present in Basil will be useful in controlling many fungal diseases. Alkaloids from this plant will act as vapours and control many fungal diseases.

29. VIPPA PUVVU (Mahuva) DECOCTION

Mahuva nuts are available in plenty in our forests. These nuts will play a key role in disease management. Presence of many alkaloides in Mahuva makes it an excellent fungicide. This decoction prevents growth of fungal hyphae and prevents spread of diseases.

30. NEEM LEAF DECOCTION

Take 10 Kg of Neem leaves and grind them. Take juice from these leaves and add soapnut solution to it. This decoction is effective against *Alternaria* leaf spot.

31. ONION DECOCTION

Presence of many Alkaloids will help in controlling diseases.

This decoction prevents growth of fungal hyphae and germination of fungal spores.

32. NIGHT or CORAL JASMINE (Parijatham) DECOCTION

Decoctions from this flower are effective in controlling bacterial diseases.

33. GANGA RAVI (*Thespesia populnea*) DECOCTION

This decoction is effective against *Rhizoctonia* rot. This decoction prevents growth of this fungus.

34. GARLIC DECOCTION

This decoction not only controls insects, but also diseases. 500 g of garlic is ground into a paste and soaked in 1 L of kerosene overnight by placing in a cloth. Extract the concoction and mix it in 100 L of water before spraying in the fields. The alkaloid *Allicin* present in garlic helps in controlling the fungal growth.

35. ATTA KODALU (*Lantana camara*) DECOCTION

This plant is widely available. It has white and red flowers. The decoction made out of the leaves controls *Alternaria* and *Botrytis* diseases.

36. BASIL – BETEL – CORAL JASMINE DECOCTION

Vinnie Peora mentioned in ‘Tending the Earth’ that the decoction made out of these leaves were used to control diseases in rice.

37. POMEGRANATE SKIN CONCOCTION

1 Kg of pomegranate skin ground and soaked in water was found to control blast disease by the scientists.

38. 10% ACACIA LEAF DECOCTION

This decoction controls lot of diseases especially, the leaf diseases.

39. 10% VITEX DECOCTION

Vitex is found in abundance not only controls insects but also diseases. 10 Kg Vitex leaves are boiled and the decoction is filtered after cooling. Add soap nut powder to it and mix in 100 – 150 L of water before use. This is used to control many diseases in rice crop.

40. 10 % BEAL LEAF DECOCTION

10 Kg of Beal leaves are boiled, extracted and filtered. The decoction can be used to control rice blast and other diseases.

41. EUCALYPTUS LEAVES OR ATTA KODALU

(Lantana camara) DECOCTION

10 kg of Eucalyptus or Lantana leaves are boiled in 15 L of water. Filter the decoction after leaving it over night to cool and use after mixing in 150 L of water. This decoction can be stored up to 15 days by adding 1 Kg of jiggery. The decoction controls most of the diseases.

42. BOTANICAL OILS

Neem oil or Jatropa oil can be used in management of many diseases. These oils spread like a layer over the leaves. Fungal hyphae try to germinate through these layers and will die as they are unable to penetrate into these layers. These oils reduce the moisture content on the leaves and create an adverse conditions for fungal spores to germinate.

MANAGEMENT OF VIRAL DISEASES

Many viral diseases spread through vectors and the best way to them is to control these vectors. The viral cells are spread through white flies, bugs and other insects. Integrated pest

management includes methods like below in controlling these viral diseases.

43. 5% NEEM DECOCTION

Spray 5 % neem decoction immediately after observing symptoms of viral diseases. In addition to spraying neem decoction removal of the affected plants is recommended.

44. COW URINE – ASAFOETIDA CONCOCTION

To control sucking pests spray solution of 4 L of cow urine and 100 g of Asafoetida and 100 g of calcium. This will prevent spread of viral diseases.

45. CHILLI AND COCONUT LEAF SOLUTION

Take 3 Kg of green chillies and 2 Kg of coconut leaves and grind them to make paste. Keep this paste whole night in a cloth. Next day morning extract the solution in water. This solution can be sprayed in Tomato crop against spotted wilt virus.

46. ATIKA MAMIDI DECOCTION

This decoction is effective against cucumber mosaic disease.

47. COMPOST TEA

Decoction extracted from compost will prevent many viral diseases.

48. LACTIC ACID SOLUTION

- Presence of many microbes in the materials used in this solution will help in controlling many diseases (both viral and fungal)

Required Material:

1. Biyyam kadugu - 5 L (Water collected after washing rice in it)
2. Cow milk – 10 L

3. Jaggery – 1 Kg

Method of Preparation:

- Keep 5 liters of Biyyam kadugu (Rice water) in a pot and keep it for 7 days
- After 7 days add 10 L of cow milk
- Cover the pot and Keep this mixture for 7 days under shade
- Filter this solution and add Jaggery powder to this solution
- Stir the solution with a stick regularly
- Filter the solution and add 100 L of water to spray it in one acre

NOTE:

- ❖ This solution can be used in all crops and orchards
- ❖ For effective results spray 1-2 times in a crop period
- ❖ Don't store the solution.

OTHER PRACTICES USING ORGANIC MATERIAL

49. MAGIC COMPOST

Required Material:

Cow Dung	: 1 kg	
Cow Urine	: 1 L	
Neem leaves,	}	: 1 kg
Pongamia leaves,		
Calotropis leaves		
Jaggery	: 500 g	

Method of Preparation:

The above mentioned leaves are cut into pieces, placed in a pot. Add cow dung and urine to the contents, stir thoroughly, cover the pot with a cloth and place it in a shade for a week. The filtrate of the solution after a week can be sprayed on the crop after mixing water.

- For small plants the filtrate is mixed with 60-70 times with water and big plants 30-40 times.
- This extract is used for seed treatment also.
- It helps in controlling of pests and diseases
- For termite problem mix castor or custard apple leaves and sprayed.

50. EXTRACT TO AID IN PLANT GROWTH

Cow Dung	: 100 L
Cow Urine	: 100 L
Groundnut Cake	: 100 Kg

Mix the above 3 ingredients on a polythene sheet. This is sufficient for 1 acre. Extract should be broadcasted uniformly in the field. With this plants grow healthy as they receive nutrients. This is used for all crops.

51. SOLUTION TO AID FLOWERING IN PLANTS

Required Material:

Coconut water	: 5 L
Butter milk	: 5 L

Method of Preparation:

Mix the above two and spray it on plants after storing for 15 days. This helps in flowering and disease control. In emergencies this can be used as and when required, without storage (Fresh Solution)

52. EXTRACT TO CONTROL LEAF FOLDER DISEASE

Required Material:

Banana Fruit	: 3
Papaya Fruit	: 3
Ash gourds	: 3
Eggs	: 3
Jaggery	: 3 Kg

Method of Preparation: The above mentioned ones are grinded to pieces in a container, add water and kept airtight for 45 days. 500 ml of this extract is mixed in 10 L of water and when sprayed controls leaf folder.

53. APHID CONTROLLING PRACTICES

Aphids are controlled by placing calotropis twigs and leaves in basins at the time of irrigation (Alabhai 1992). Similarly aphids can be controlled by mixing castor oil in water at the time of irrigation (Patel 1991). The dried dung ash when sprayed on plants controls aphids.

54. WHITE FLY CONTROLLING PRACTICES

- Pest can be controlled by placing castor oil soaked or grease soaked papers at 5-6 locations in the field. By blowing air through power sprayer white flies stick to the papers. 90% of the pest is controlled this way in Pondicherry.
- Prepare a solution by mixing 1 kg jaggery in 10 L water. Mix this solution in 100 L water and spray in the evening hours in cotton to control whitefly.

55. BAIT SOLUTION TO CONTROL ADULT WHITE FLIES

Gujarat farmers are using sugar bait solution to control adult pests in cotton. 500 g sugar mixed in 1 litre water and boiled. For a week Shade dry it. Add little oil to this. Pour this solution

in broken coconut pieces and place in between rows of cotton. Adult pests get attracted and fall into solution and die. With this method adult pests of cotton can be controlled.

56. LEAF EATING PEST CONTROL PRACTICES

Amreli, Gujarat farmers are using this method to control leaf eating pests in cotton. 250-300 g of Datura leaves and twigs are cut into small pieces and put in 1 L hot water. After cooling the solution is mixed with 15 L of water and sprayed on crops. In approximately 6-7 hrs duration the leaf eating small larvae are destroyed.

57. BUTTER MILK SOLUTION TO CONTROL LEAF SPOT DISEASES

Gujarat farmers are using this method to control leaf spot in cotton. Fermented butter milk is mixed in water and sprayed. Good results can be obtained when sprayed in early stages of cotton.

58. HERBAL PESTICIDE SOLUTION

This solution is developed by Sri.K.Nagarajan (Tamilanadu) for pest control in cotton. 500 g Neem seed, 1 kg tobacco, 100 g Vasa (*Justicia gendarussa*) 250 g Asafoetida and 50 g soapnut powder all grinded and made into a solution. This is sprayed in 1 acre cotton field to control pests.

59. GOBAR GAS SLURRY AS MANURE

The gobar gas slurry from gobar gas plant is the excellent manure solution. This can be used directly or dried and applied to all crops. This slurry can also be fed to earthworms in Vermicompost preparation.

60. COW URINE AS MANURE

Cow urine is utilized as manure, medicine and in preparation of solid and liquid manures. As cow urine contains many microorganisms they help in improving nutrients and disease

resistance. It is used (5%) to obtain good results on all crops (5 L cow urine and 100 L water).

61. BUTTERMILK SOLUTION TO CONTROL SUCKING PESTS

10 L of buttermilk is placed in a pot and kept airtight. It is stored in compost pit or soil for 15 days. The solution is sprayed on crops by mixing with 100 L of water to control small larvae and sucking pests. This solution can also be used in vegetable crops.

62. CONTROL OF FRUIT BORER INSECTS

In fruit trees and cashew nut plantations, the stem borers make burrows and the trees gradually dry up. Remove the larvae and debris from the holes. Dip a cloth/cotton in neem oil and place it in the hole. Then the hole is plastered with dung, urine and mud paste.

63. CONTROL OF GUM SECRETIONS IN FRUIT PLANTS

In fruit crops due to attack of various fungi gummy secretions are observed and trees gradually dry up. To control, remove the gummy substance and apply neem oil with brush. Tobacco powder should be applied at the base of the plant. The tobacco solution reaches the tree through roots and gradually the secretions will be stopped.

64. CONTROL OF RICE STEM BORER

To control stem borer in paddy prepare a solution by mixing green chillies, onion, tobacco and Asafoetida in 10 L water, mix it with 50 ml buttermilk and sprayed on paddy crop. By placing Calotropis leaves at few locations in paddy field, stem borer can be controlled.

65. CUSTARD APPLE LEAF EXTRACT

2 kg of custard apple leaves are boiled in 10 L of water for half an hour by stirring the contents intermittently. 100 g of soap powder is added to the cooled extract. The extract is mixed with 100 L water and sprayed in one acre during evening hours.

Pests Controlled:

Sucking pests, small larvae

Note:

- ❖ Tie a cloth across nose during preparation
- ❖ Can be sprayed on all crops.
- ❖ Based on pest intensity and crop stage 2-3 sprayings can be taken up.
- ❖ The solution should not be stored.

66. TURMERIC EXTRACT

Make powder of 1 kg turmeric. Add 4 lit of cow urine to this. Mix the solution and filter with a thin cloth and add 100 g soap powder. Add 100 L to this solution and spray in an acre during evening hours.

Pests Controlled:

Aphids, tobacco caterpillar, diamond back moth, paddy stem borer and pests of legumes and storage pests.

Diseases Controlled:

Grey rot in crops.

How it works:

The various alkaloids in turmeric helps in pest and disease control

Note:

- ❖ 2-3 sprays yield good results

67. FERMENTED FRUIT JUICE - SOLUTION

The various microorganisms in rotten fruit juice helps in increasing sugar content.

Required Material:

Rotten fruits: - 1 kg.

Turmeric: - 1 kg.

Method of Preparation:

- Take 1 kg of crushed rotten fruits and add 1 kg powdered jaggery.
- Place this mixture in a pot.
- Tie the pot with a cloth and store in shade for a week.
- This rotten solution will be of 2.5 lit.
- Filter the mixture, add 100 L water and spray in 1 acre.

Note:

- ❖ 1-2 sprays during crop stage yields good results.
- ❖ This can be used on all fruit trees.
- ❖ The solution should not be stored, should be used immediately.

68. FERMENTED FRUIT AND VEGETABLE MIXTURE

Dosage: 50 L per acre

Required Material:

Cow Dung : 25 kg
Water : 50 L
Rotten fruits/vegetables : 20 Kg

Method of Preparation:

Cow dung and water should be placed in a plastic drum and fermented for 4 days. Fruits or vegetables ferment in 4 days when placed in an airtight plastic drum. These are crushed with hands and placed in cow dung water drum. Place the lid loosely. Next day stir it and close the lid. Extract will be ready in 10 days. Filter the extract on 11th day. Apply approximately 50 L of extract per 1 acre field through irrigation or spray on the soil. This aids as food to the microorganisms and earthworms and helps in the healthy growth of plants.

69. KOONAPU JALAMU (MEAT and MILK SOLUTION)

Dosage:

Mixture of 500 ml of Solution in 10 L of water is used. It requires 60 L per acre.

Required Material:

Goat meat	: 1 Kg
Black Gram	: 250 g
Sesame Seeds	: 250 g
Cow Milk	: 1 L
Water	: 5 L
Clay Pot	: 1

Method of Preparation:

Goat meat is cut into small pieces and 5 L of water is added in a clay pot. The contents are boiled till the water content reduces to half by mixing the intermittently. Filter the contents of the clay pot through a cloth and add ground black gram, sesame seeds. Boil the mixture again till it boils. Cool and add cow milk to the contents. Then tie the opening of the clay pot with a cloth and bury the pot either in soil or animal waste heap for 10 days. The contents need to be stirred every day with a stick. On the 11th day filter the contents into another pot and make an air tight seal. Wrap the pot in a polythene sheet and keep in a corner for 10 days. After 11th day the solution can be used on crops. This aids in crop growth and good yield.

70. LEAF MIXTURE CONCOCTION TO CONTROL INSECTS

Dosage:

Mix 1 L of the concoction to 10 L of water. Spray 100 L of the mixture per acre

Required Material:

Leaves inedible by farm animals like Vitex, Addasara 3 Kg.

Milk weed Leaves like Calatropis, Nerium 3 Kg.

Rubber, Lantana leaves that release foul smell 3 Kg.

Bitter fruits of trees like Neem, Pongamia 5 Kg.

Cow Dung and water in 1:3 ratios (Dung 1 Kg, 3 L water)

Cow urine 15 L

Big plastic or clay container

Method of Preparation:

Mix 15 Kg cow dung and 45 L water in a big container and ferment for 4 days by stirring intermittently. On the 5th day, mix the ground fruits to this mixture. Then mix the ground leaves into the container and add 15 L of cow urine and mix well. The leaf remnants will float on the mixture. Mix the contents every morning and evening for 10 -15 days. Filter the mixture and use in the crops as mentioned above.

71. CONTROL OF FUNGAL DISEASES

Dosage:

20 L of mixture mixed with 100 L of water and sprayed in an acre of crop

Required Material:

Aloe Vera leaves : 1 Kg

Custard Apple or Bogainvillea or Papaya leaves (2 types of leaves 1 kg each) : 2 Kg

Turmeric Powder : 200 g

Big clay pot of 30 L capacity

Method of Preparation:

Mix the leaf mixture into 30 L water and add 200 g turmeric powder. Boil it till the contents start simmering. Cool and filter the mixture. Add 100 L of water and spray on crops. For severe infestations, spray two times, once per week.

CONCOCTIONS / DECOCTIONS SUGGESTED BY Mr. SUBHASH PALEKAR

NEEMASTHRAM

Used against small and sap sucking pests

Mix 5 Kg of ground Neem leaves or 5 Kg of dry leaves or fruits into 100 L water. Add 5 L cow urine and 1 kg cow dung to this mixture and mix well. Let it ferment for 24 hrs and filter through a cloth. Spray in the fields.

BHRAMASTHRAM

Used against big plant insects

Take 10 L of cow urine in a big container. Add 2 Kg of ground Neem leaves, 2 Kg of ground Custard Apple leaves, 2 Kg of ground Datura leaves, 2 Kg of ground Palleru (Achanthospermum) leaves and mix well. Then boil the contents for 30 minutes by closing the container. Let the contents cool for 48 hours and filter through a cloth. This is the Bhramastram. Mix 2- 3 L of this decoction in 100 L of water and spray. This decoction can be stored for 6 months

AGNIASTHRAM

Used against stem and fruit borers

Take 10 L cow urine in a big container. Add 1 Kg ground Tobacco leaves, 5 Kg ground Neem leaves, 1 or 2 Kg of ground green chillies, ½ Kg ground Garlic and boil till it simmers. Let the contents cool for 48 hours. Filter through a cloth and mix 2- 3 L of the decoction with 100 L of water before spraying in the field.

FUNGICIDE

Used against all kinds of blight and blast diseases

Ferment buttermilk for 3 days. Mix 6 L of fermented buttermilk with 100 L of water and spray in the field

DRIED GINGER – MILK DECOCTION

Used against all kinds of diseases

Dried Ginger Powder : 200 g

Water : 2 L

Cow or Buffalo Milk : 5 L

Buttermilk can be substituted for milk

Mix dried ginger powder with 2 L water and boil till the contents become to a liter. Boil milk in another container. Cool both the contents and mix. This makes a decoction

Note:

- ❖ This decoction should be used on the same day and cannot be stored
- ❖ Mix the decoction in 200 L of water and spray per acre of crop

IMPORTANCE OF PLANT EXTRACTS IN INTEGRATED PLANT MANAGEMENT



NAME: Ginger

(Zingiber officinale)

PARTS USED: Tubers

USE: Fragrant oils extracted are used in controlling pest



NAME: Kodisapala

(Holarrhena antidysenterica)

PARTS USED: Leaves

USE: Alkaloids present in the leaves are used in controlling pests



NAME: Kunkudu or Soap nut
(*Sapindus saponaria*)

PARTS USED: Fruits

USE: Resins present in the fruits are used in concoctions and decoction

NAME: Dirisina or Lebbeck
(*Albizia lebeck*)

PARTS USED: Seed. Leaves, Root

USE: Phenols present are used in controlling insects



NAME: Cashew

(*Anacardium occidentale*)

PARTS USED: Seed

USE: Phenols present in seed are used in controlling insects

NAME: Custard Apple

(*Annona reticulata*)

PARTS USED: Leaves, Seed

USE: Alkaloids present in the leaves are used in controlling pests.





NAME: Vippa or Mahua
(*Madhuca indica*)

PARTS USED: Seed oil

USE: Saponin's present in the oils are used in controlling pests

NAME: Vepa or Neem
(*Azadirachta indica*)

PARTS USED: Leaves, Seed

USE: Meliacin, Azidirachtin, present helps in controlling pests and pathogens



NAME: Moduga or Flame of the forest

(*Butea monosperma*)

PARTS USED: Flowers

USE: Chalcones and Mopanols present controls termites

NAME: Lemon Grass
(*Cymbopogana flexosus*)

PARTS USED: Leaves

USE: Essential oils controls ants





NAME: Tulasi or Basil

(*Ocimum tenuiflorum*)

PARTS USED: Leaves

USE: Essential oils and eugenols controls pests

NAME: Billa Ganneru or Periwinkle

(*Littorina littorea*)

PARTS USED: Leaves, roots

USE: Alkaloids controls pests



NAME: Chrysanthemum

(*Chrysanthemum indicum*)

PARTS USED: Flowers

USE: Alkaloids (pyrethrums) controls pests

NAME: Maredu or Beal

(*Aegalm marmalus*)

PARTS USED: Leaves

USE: Beta-Sitosterol present in leaves controls pests





NAME: Avalu or Mustard

(*Brassica juncea*)

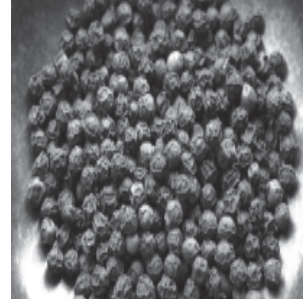
PARTS USED: Leaves, Seeds

USE: Ninhydrin, Vitamin A present in leaves controls pests

NAME: Miriyalu or Black Pepper (*Piper nigrum*)

PARTS USED: Seeds

USE: Alkaloids (Piperine) present in seeds controls pests



NAME: Amudam or Castor (*Ricinus communis*)

PARTS USED: Seeds

USE: Ricin acid present in seeds controls pests

NAME: Chaulmoogra
(*Hydnocarpus alcalae*)

PARTS USED: Seeds

USE: Chaulmoogra acid present in seeds controls bacteria and pests





NAME: Champa or Plumeria
(*Plumeria alba*)

PARTS USED: Flowers, Seeds

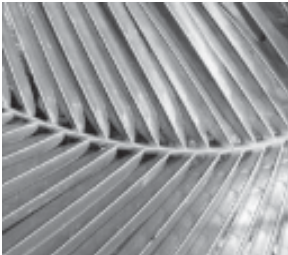
USE: Oils present controls pests

NAME: Tea

(*Camellia sinensis*)

PARTS USED: Leaves

USE: Caffeine, Tanins, Shikimic acid present controls pests



NAME: Kobbari or Coconut
(*Cocos nucifera*)

PARTS USED: Leaves

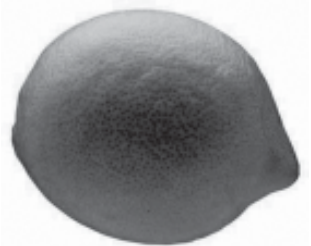
USE: Amino acids, Vitamin B present controls viruses and pests

NAME: Nimma or Lime

(*Citrus limon*)

PARTS USED: Fruit

USE: Terpene's and Esters present controls pests





NAME: Ummetta or Datura

(*Datura Stramonium*)

PARTS USED: Leaves

USE: Alkaloids, Hyoscyamine, atropine present controls pests

NAME: Munaga or Drumstick

(*Moringa oleifera*)

PARTS USED: Leaves, Roots

USE: Moringine and Benzalimin present controls bacteria



NAME: Vellulli or Garlic

(*Allium sativum*)

PARTS USED: Leaves, Bulbs

USE: Amino acids and Allicin present controls pests

NAME: Vulli or Onion

(*Allium cepa*)

PARTS USED: Bulbs

USE: Phenolic acids present controls pathogens





NAME: Menthi or Fenugreek

(*Trigonella foenum-graecum*)

PARTS USED: Leaves

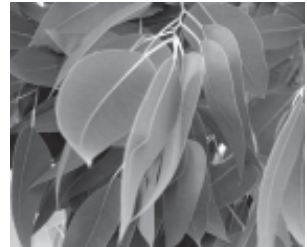
USE: Flavenoids, Saponins present controls pests

NAME: Eucalyptus

(*Eucalyptus occidentalis*)

PARTS USED: Leaves

USE: Essential oils present controls pests



NAME: Grape

(*Vitis vinifera*)

PARTS USED: Seeds

USE: Amino acids and vitamins present controls pests and pathogens

NAME: Ground Nut

(*Arachis hypogea*)

PARTS USED: Leaves

USE: Nitrogen present controls pathogens





NAME: Jama or Guava

(*Psidium guajava*)

PARTS USED: Leaves

USE: Beta – Sitosterol and Maslinic acid controls pathogens

NAME: Sweet Potato

(*Ipomea batatas*)

PARTS USED: Leaves

USE: Minerals and vitamins (A, B, C) present controls pathogens



NAME: Jowar or Sorghum

(*Sorghum bicolor*)

PARTS USED: Leaves

USE: Minerals and vitamins' present controls pathogens

NAME: Janumu or Sunn hemp

(*Crotalaria juncea*)

PARTS USED: Leaves, Seeds

USE: Saponins' and vitamin A present controls pests and pathogens





NAME: Janumu or Sun hemp

(*Cassia auriculata*)

PARTS USED: Leaves, Seeds

USE: Emodin and Quinol Tannins' present controls pests and root rot

NAME: Amaranthus

(*Amaranthus cruentus*)

PARTS USED: Leaves

USE: Minerals and Proteins present controls pathogens



NAME: Gangaravi or Thespesia

(*Thespesia populnea*)

PARTS USED: Leaves, Seeds

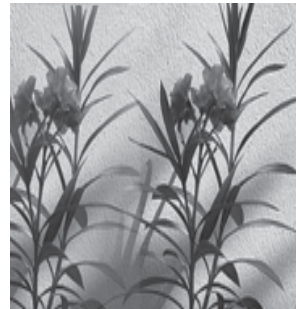
USE: Thevitin and Glycosides present controls pests and pathogens

NAME: Erra Ganneru or Oleander

(*Nerium odorum*)

PARTS USED: Leaves

USE: Oleandrin and Niriodin present controls pests and pathogens





NAME: Benda or Lady Finger
(*Abelmoschus esculentus*)

PARTS USED: Leaves, Fruits

USE: Mucilage and Pectin present controls pathogens

NAME: Euphorbia

(*Euphorbia antiquorum*)

PARTS USED: Leaves, Flowers

USE: Euphorbin and Tetra Phenols present controls pathogens



NAME: Lantana

(*Lantana camara*)

PARTS USED: Leaves

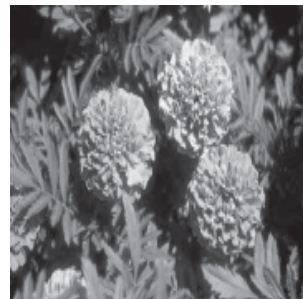
USE: Alkaloids present controls pest and pathogens

NAME: Marigold

(*Tagetes erecta*)

PARTS USED: Flowers

USE: Alkaloids present controls pathogens





NAME: Vavila or Vitex

(*Vitex agnus-castus*)

PARTS USED: Leaves

USE: Alkaloid Nishindin present controls pests

NAME: Papaya

(*Carica papaya*)

PARTS USED: Leaves

USE: Enzyme Carpain present controls pests



NAME: Kanuga or Pomgamia

(*Pongamia pinnata*)

PARTS USED: Leaves

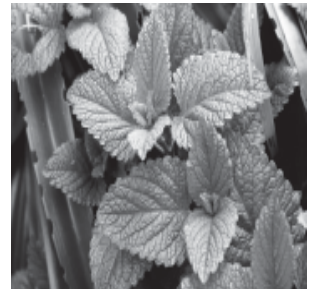
USE: Karinjin and Glabrin present controls pests and pathogens

NAME: Pudina or Mint

(*Mentha spicata*)

PARTS USED: Leaves

USE: Peppermint oil present controls pathogens





NAME: Tobacco

(*Nicotiana tabacum*)

PARTS USED: Leaves

USE: Nicotine present controls pests

NAME: Turmeric

(*Curcuma longa*)

PARTS USED: Rhizome

USE: Curcumin Alkaloid present controls pathogens



NAME: Vakka or Areca

(*Areca catechu*)

PARTS USED: Areca nuts

USE: Aricolin Alkaloid present controls pests and pathogens

NAME: Vasa or Sweet Flag

(*Acorus calamus*)

PARTS USED: Tuber

USE: Essential oils present controls pests

