

Plant Protection in Natural Farming

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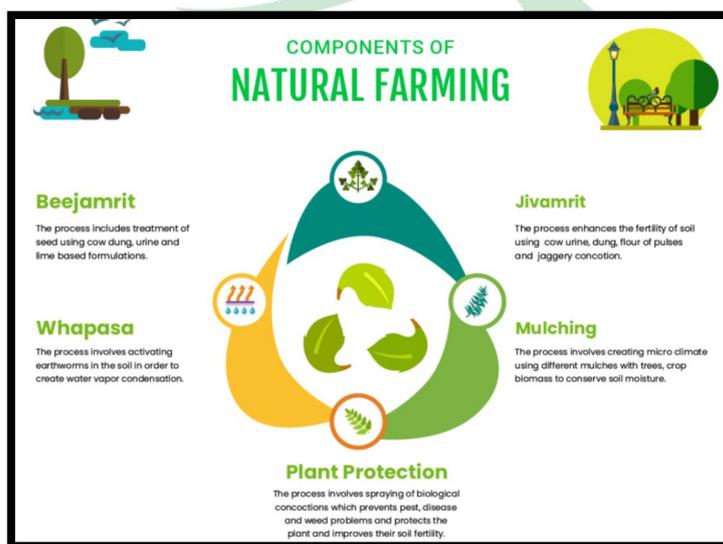
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Natural farming in India

Natural Farming is a chemical free traditional farming method mainly based on conservation agriculture with four pillars jeevamrutha, beejamrutha, Acchadana, Whapasa respectively. It is considered as agro ecology based diversified farming system which integrates crops, trees and livestock with functional biodiversity. Internationally, Natural Farming is considered a form of regenerative agriculture—a prominent strategy to save the planet. It has the potential to manage land practices and sequester carbon from the atmosphere in soils and plants, where it is actually useful instead of being detrimental.

In India, Natural farming is promoted as Bharatiya Prakritik Krishi Paddhati Programme (BPKP) under centrally sponsored scheme- Paramparagat Krishi Vikas Yojana (PKVY). BPKP is aimed at promoting traditional indigenous practices which reduces externally purchased inputs. It is largely based on on-farm biomass recycling with major stress on biomass mulching, use of on-farm cow dung-urine formulations; periodic soil aeration and exclusion of all synthetic chemical inputs.



natural farming will reduce dependency on purchased inputs and will help to ease smallholder farmers from credits burden. NITI Aayog along with Ministry of Agriculture & Farmers welfare had convened several highlevel discussions with global experts on Natural farming practices. It is roughly estimated that around 2.5 million farmers in India are already practicing regenerative agriculture. In the next 5 years, it is expected to reach 20 lakh hectares- in any form of organic farming, including natural farming, of which 12 lakh hectares are under BPKP.

Beejamruth

Application of Beejamruth as seed treatment mixture prepared from cow dung, cow urine, lime and a handful of soil. Naturally occurring beneficial microorganisms are found in cow dung. These microorganisms are cultured in the form of Beejamruth and applied to the seeds as inoculum. It is reported that seed treatment with beejamruth protects the crop from harmful soil-borne pathogens and also helpful in producing IAA and GA.

Jeevamruth

Soil microorganisms play an active role in soil fertility as they involve in the cycle of nutrients like carbon and nitrogen, which are required for plant growth. They are responsible for the decomposition of the organic matter entering the soil and therefore in the recycling of nutrients in soil. PGPR, cyanobacteria and mycorrhiza constitute soil microorganisms. These microorganisms, which improve the fertility status of the soil and contribute to plant growth. They may also show antagonism (biological control) to pathogens. Jeevamruth is either sprayed/sprinkled on the crop field or added to the irrigation tank in regular interval of 15 days until the soil is enriched.

Key elements used for plant protection in natural farming

- **Agniastra**

Natural insecticide prepared from pulp of neem leaves, tobacco powder, green chilli, garlic paste and turmeric powder. It is used to control all sucking pests and caterpillars like Leaf Roller, Stem Borer, Fruit borer, Pod borer.

- **Brahmastra**

This is a natural insecticide prepared from leaves of neem, karanj, custard apple and datura which have specific alkaloids to repel pests. It controls all sucking pests and hidden caterpillars that are present in pods and fruits.

- **Neemastra**

Neemastra is used to prevent or cure diseases, and kill insects or larvae that eat plant foliage and suck plant sap. This also helps in controlling the reproduction of harmful insects. Neemastra is very easy to prepare and is an effective pest repellent and bioinsecticide for Natural Farming.

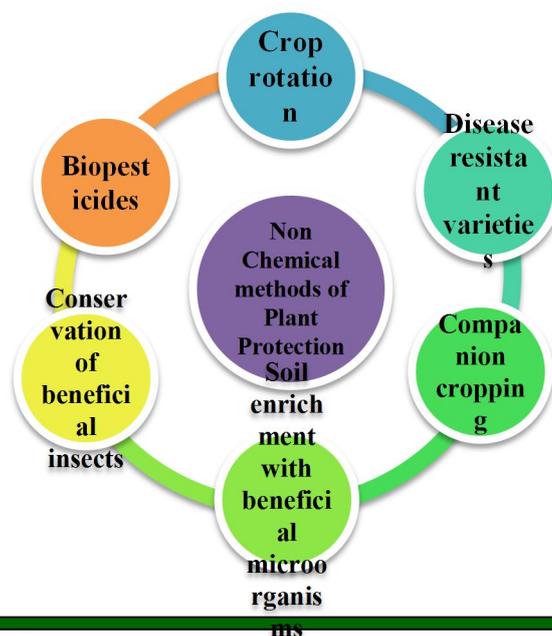
- **Dashaparni ark**

It acts as substitute for Neemastra, Bramhastra, and Agniastra. It is prepared from turmeric powder, ginger paste, Asafoetida, tobacco powder, chilly pulp, garlic paste, ginger paste, any 10 leaves depending on availability. Leaves of the Neem, *Pongamia pinnata*, *Annona squamosa*, Castor, Datura, Rui, Hibiscus, Mango, *Lantana camara*, Guava etc can be used. It is used to control all types of pests and used depending on the level of infestation.

- **Fungicide**

It is prepared with cow milk and curd is found to be very effective in controlling the fungus.

- ✚ **Possible Plant Protection Strategies Useful in Natural Farming**



Managing the ecosystem in natural farming is very challenging. It is made even more complex when factors like insect pests and disease interact. Since the uses of synthetic pesticides are prohibited, the cropping systems rely on the prevention of pest outbreaks rather than coping with them after their occurrence. For successful pest management incorporation of a number of control strategies is must. Cumulative effect of strategies that will target insect and disease separately can be:

Botanicals

Some plant contains chemical components that are toxic to the pathogens. When extracted from the plant and applied on infested crops, these components are called botanical pesticides or botanicals. Plants have limitless ability to synthesize secondary metabolites, most of which show antimicrobial effect and serves as plant defense mechanisms against pathogenic microorganisms. Important subclasses in this group of compounds include phenols, phenolic acids, flavones, quinones, flavonols, flavonoids, and tannins. These compounds are synthesized by plants in response to microbial infection and are often found effective *in vitro* as antimicrobial substance against a wide array of microorganisms. The crude sap, volatile and essential oil extracted from whole plant or specialised plant parts like roots, stem, leaves, flowers, fruits and seeds are widely used in preparing the antimicrobial compounds which are significantly used against the different plant pathogens/diseases

Commonly used botanicals:

- **Plant extracts**

Neem (*Azadirachta indica*, A. Juss), Garlic (*Allium sativum*, Linn., Eucalyptus (*Eucalyptus globulus*, Labill., Turmeric (*Curcuma Longa*, Linn., Tobacco (*Nicotiana tabacum*, Linn., Ginger (*Zingiber officinale*, Rosc.)

- **Essential oils**

Nettle oil (*Urtica* spp.), Thyme oil (*Thymus vulgaris*, Linn.), Eucalyptus oil (*Eucalyptus globulus*, Labill., Rue oil (*Ruta graveolens*, Linn.), Lemon grass oil (*Cymbopogon flexuosus* (Steud.) Wats. and Tea tree oil (*Melaleuca alternifolia*), Gel and latex: *Aloe vera* (Tourn. Ex Linn.).

- **Volatile oils**

Volatiles are small molecular weight organic compounds which play important role in defense system by inhibiting the growth of pathogen. Examples:



Black pepper (*Piper nigrum* Linn.), Clove (*Syzygium aromaticum* Linn.) Merr. & Perry, Nutmeg (*Myristica fragrans* Houtt.), Oregano (*Origanum vulgare* Linn.) and Thyme (*Thymus vulgaris* Linn.)

- **Essential oils**

The potential essential oils viz. Terpenoides and aromatic compounds are fungistatic which can be used against post harvest pathogens. The Component includes carvacrol, thymol, cymene, terpine, phenylpropene derivatives, eucalyptol and anisol Examples: Nettle oil (*Urtica* spp.), Thyme oil (*Thymus vulgais* Linn.), Eucalyptus oil (*Eucalyptus globules* Labill., Rue oil (*Ruta graveolens* Linn.), Lemon grass oil (*Cymbopogon flexuosus* Steud.) Wats.) and Tea tree oil (*Melaleuca alternifolia* Maiden & Betche).

Biological Control

In a healthy, balanced ecosystem, biological control by natural predators is commonly observed. When a cropping system becomes diverse, greater spectrum of insect species and micro-organisms resides within it. This will help in development of more natural predators within the ecosystem. For example, Ladybugs, lacewings, spiders, birds, frogs, toads and a host of other insects are predators of aphids, bertha sunflower beetles, beet webworms, and both grasshopper eggs and adults. Various types of fungi are parasitic to insects and can either kill their insect hosts or reduce their ability to reproduce. Very few biological controls are available to reduce the effects of plant diseases, as most commercial products do not perform well if the disease is already established in the crop. Mycoparasitism is a form of bio-control where one fungus parasitizes another. Among agriculturally important microbes *Trichoderma viride*, *T. harzianum*, *Pseudomonas fluorescens*, and *Bacillus subtilis* are most efficient antagonistic bioagents of plant diseases which produces biologically active metabolites, elicitors and inducers of systemic resistance.