

Training cum exposure visit on natural farming for the master trainers

Natural farming inputs: Jeevamrit, Ganajeevamrit, Beejamrit etc.



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Sustainable Agriculture



Natural Farming aims to promote Integrated Farming /production systems through practices such as Concoctions prepared from livestock and plants, inter/mixed cropping, mulching and other practices.



Four Wheels of Natural Farming



Microbial seed coatingEnhance soilGround to be keptFast buildup of soilthrough cow urine andmicrobiome throughcovered with crops & humus through ZBNFdung -basedan 'inoculum' ofcrop residues asleading to soilformulationscow dung, cowmulchingaeration and waterurine and othervapor harnessing

ingredients



Preparation of Concoctions





Concoctions used under natural farming

- Bijamirt
- Jeevamirt
- Gnanajeevamirt
- Saptdhanya ankur ark
- Panchagavya
- Arappu buttermilk karaisal
- Amutham solution
- Fish fermented extract
- Egg fermented extract
- Effective micro-organisms



Beejamrit

Ingredients

- 1. Water 20 l
- 2. Cow dung 5 kg
- 3. Cow urine 5 l
- 4. Handful of soil
- 5. Lime 50g



- Take 5 kg of cow dung in a cloth and bound it by small rope as a small bundle and hang it for a night (12hr.) in 20 l of water
- In another container dissolve 50 g of lime in 1 l of water and keep it for a night
- Next day morning squeeze the cow dung in water add handful of soil and stir well
- ***** To the solutions add 5 l of cow urine and lime water and stir well





Drying of seeds after Beejamrit treatment

Metagenomic analysis of Beejamirt

Beejamirtham





Ingredients

- 1) Water 200 I
- 2) Cow dung 10 kg
- 3) Cow urine 10 I
- 4) Jaggery 2 kg
- 5) Pulse flour 2 kg
- 6) Handful of fertile soil



Take 200 I of water in a barrel/tank & add the ingredients one by one, first cow dung followed by jaggery, pulse flour, cow urine & collected soil

Jeevamrit

- After adding each material stir well in clock wise direction
- Keep the barrel in shade covered with wet jute bag
- Stir the prepared solution twice a day
- Dosage: 200 litres/ac



Ingredients

- Cow dung 50 kg
- ➢ Cow urine 10 I
- ➢ Jaggery 2 kg
- Green Gram powder 2 kg
- ➢ Fertile Soil

Preparation: These ingredients are mixed together & make a ball like structure. While preparing the lumps should not be formed. Shade dry it & store for 6 months.

Ganajeevamrit

Usage: 100 kg / acre







Saptdhanya ankur ark : Tonic for plants made from seven sprouted grains

Ingredients

- Water (typically prepare using 200 litres of water).
- Cow urine 5 %
- Each 100 g of following seeds in 1 litre of water
 - Black Sesame (Sesamum indicum- til)
 - Green gram (*Vigna radiata-* moong).
 - Black gram (*Vigna mungo* Urad)
 - Cowpea (*Vigna unguiculata-* chawli)
 - Moth beans (*Vigna aconitifolia-* matki / nari payaru)
 - Chickpea (*Cicer arietinum-* harbara)
 - Wheat (*Triticum aestivum-* gehu) or Ragi



Preparation

Step 1: Soak black sesame seeds (2 days)

Step 2 : Soak the seeds for 24 hours

Step 3: Next day take all the 7 types of seeds tie it in cloth and hang it in shade.

Step 4: After the seeds are sprouted (1 cm) crush them using wooden mantle.

Step 5: Take water & pour cow urine in it. Put the seeds pulp in the solution & mix it

properly. Keep the solution for 2 hours

Step 6: After 2 hours filter the solution and use it within next 24 hour





Panchagavya

Ingredients

- 1) Cow dung -
- 2) Cow urine -
- 3) Cow milk -
- 4) Cow curd -
- 5) Cow ghee -
- 6) Jaggery
- 7) Tender coconut 3 litres
- 8) Banana 1 kg

- 5 kg
- 3 litre
- 2 litre
- 2 litre
- 1 kg
- 3 kg





Panchagavya



- 5 kg of fresh cow dung with
- 1 kg of ghee in a clean plastic drum
- After three days
- 3 liters of cow urine and
- All ingredient

3 days

15 days



The mixture is allowed to ferment for about 15 days

Dosage: Foliar spray @ 3 % Soil application @ 50 lit/ha





Detailed characterization of inputs

Source of ingredient	Material	NF inputs prepared	
Native breed cow	Urine and dung (NB)	Beejamrit = 3 types	
Holstein Friesian cow	Urine and dung (HF)	Ghanjeevamrit = 3 types	
	Mixed urine and dung of Native and HF breeds	Jeevamrit = 3 types	





Ghanjeevamrit and Jeevamrit (Gir, HF and Mixed)

Ghanajeevamrit





Actinomycetes (x10³CFU)/g



Jeevamrit Fungi (x10⁴CFU)/ml



Actinomycetes (x10³CFU)/ml





Characterization of Natural farming Inputs



Jeevamrit

a. Free living N fixersb. P-SBsc. K-SBs

🔲 0 hr

🔲 0 hr

48 hrs

168 hrs

🔲 0 hr

Ghan Jeevamrit

48 hrs

168 hrs

48 hrs

168 hrs

Bacillus arvabhattai Peudomonas protegens Aeromonas salmonicida Ochrobactrum haematophilum Bacillus subtilis Pseudomonas azotoformans Bacillus subtilis Pseudomonas azotoformans Bacillus cereus Pseudomonas aeruginosa Bacillus paramycoides Bacillus circulans Lysinibacillus macrolides Lysinicaillus spp



Nutritional status of concoctions

Concoctions	N (%)	P (%)	K (%)	
Beejamirt	0.72-2.38	0.12-0.14	0.23-0.49	
Jeevamirt	0.25-1.40	0.13-0.42	0.26-0.31	
Ghanjeevamirt	1.05-1.80	0.16-0.30	0.68-0.85	
Panchagavya	0.023-0.24	0.018-0.025	0.023-0.135	

Metagenomic analysis



Heat-map @ Phylum level shows an interactive view of phylum composition & abundance among different samples



Genus level : Heat-map shows an interactive view of genus composition & abundance



á la chuir a c	Gana Jeevamirtham	Jeevamirtham	1401
K_Bacteria; P_Firmicutes; C_Bacilli; O_Lactobacillales; F_Lactobacillaceae; G_Secundilactobacillus			
K_Bacteria; P_Firmicutes; C_Bacilli; O_Lactobacillales; F_Lactobacillaceae; G_Lacticaseibacillus			
K_Bacteria; P_Proteobacteria; C_Alphaproteobacteria; O_Rhodospirillales; F_Acetobacteraceae; G_Acetobacter			
K_Bacteria; P_Proteobacteria; C_Alphaproteobacteria; O_Rhodospirillales; F_Acetobacteraceae; NA			
KBacteria; NA; NA; NA; NA; NA; NA			
K_Bacteria; P_Proteobacteria; C_Gammaproteobacteria; O_Moraxellales; F_Moraxellaceae; G_Acinetobacter			
K_Bacteria; P_Firmicutes; C_Bacilli; O_Bacillales; F_Alicyclobacillaceae; G_Tumebacillus			
K_Bacteria; P_Firmicutes; C_Bacilli; O_Lactobacillales; F_Lactobacillaceae; NA			
K_Bacteria; P_Firmicutes; C_Clostridia; O_Eubacteriales; F_Clostridiaceae; G_Clostridium			
K_Bacteria; P_Proteobacteria; C_Gammaproteobacteria; O_Alteromonadales; F_Shewanellaceae; G_Shewanella			
K_Bacteria; P_Firmicutes; C_Bacilli; O_Lactobacillales; F_Enterococcaceae; G_Enterococcus			
K_Bacteria; P_Firmicutes; C_Bacilli; O_Lactobacillales; F_Lactobacillaceae; G_Weissella			
K_Bacteria; P_Firmicutes; C_Clostridia; O_Eubacteriales; F_Peptostreptococcaceae; G_Romboutsia			Abundance
K_Bacteria; P_Firmicutes; C_Bacilli; O_Lactobacillales; F_Aerococcaceae; G_Ruoffia			
K_Bacteria; P_Firmicutes; C_Bacilli; O_Lactobacillales; F_Aerococcaceae; NA			1
K_Bacteria; P_Actinobacteria; C_Actinomycetia; O_Micrococcales; F_Promicromonosporaceae; G_Cellulosimicrobium			0
K_Bacteria; P_Proteobacteria; C_Gammaproteobacteria; O_Xanthomonadales; F_Xanthomonadaceae; G_Stenotrophomonas-			-1
K_Bacteria; P_Firmicutes; C_Bacilli; O_Lactobacillales; NA; NA:			-
K_Bacteria; P_Bacteroidetes; C_Flavobacteriia; O_Flavobacteriales; F_Weeksellaceae; G_Faecalibacter-			
K_Bacteria; P_Bacteroidetes; C_Flavobacteria; O_Flavobacteriales; F_Weeksellaceae; G_Empedobacter			
K_Bacteria; P_Firmicutes; C_Bacilli; O_Bacillales; F_Planococcaceae; NA			
K_Bacteria; P_Bacteroidetes; C_Sphingobacterila; O_Sphingobacteriales; F_Sphingobacteriaceae; G_Sphingobacterium			
K_Bacteria; P_Proteobacteria; C_Betaproteobacteria; O_Burkholderiales; F_Comamonadaceae; G_Comamonas			
K_Bacteria; P_Firmicutes; C_Bactili; O_Lactobaciliales; F_Streptococcaceae; G_Streptococcus		-	
K_Bacteria; P_Proteobacteria; C_Deltaproteobacteria; O_Desultovibrionales; F_Desultovibrionaceae; G_Malinella-			
K_Bacteria; P_vertucornicrobiota; C_vertucornicrobiae; O_vertucornicrobiales; F_Akkermansiaceae; G_Akkermansia			
K_Bacteria; P_Bacteria; A_Bacteria; P_Firmicutes; C_Bacilii; NA; NA; NA;			
K			
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n_bacteria, r_rinnicutes, 0_bactili, 0_lactobactiliales, r_Aerococcaceae; G_Aerococcus:			

Economical Yield

Base crop equivalent yield (kg/ha)



Base crop equivalent yield (kg/ha) Cotton + greengram -sorghum + chickpea





Quantified effect of different pillars				
Concoctions	7.8 to 25.8 %			
Mulching	11.0 to 25.7 %			
Intercropping	9.1 to 67.7 %			
Whapasa	2.3 to 6.5 %			

Soil Organic Carbon (%)





Scientific validation of natural farming inputs

S. No.	Parameters	Beejamirth	Jeevamirth	Ghanjeevamrit
1.	рН	7.08	5.01	7.20
2.	EC (d S m ⁻¹)	8.26	2.32	2.68
3.	Organic Carbon (%)	0.93	1.53	17.29
4.	Total Nitrogen (%)	2.38	0.90	2.00
5.	Total Phosphorous (%)	0.13	0.15	0.46
6.	Total Potassium (%)	0.49	0.35	0.10
7.	Sodium (%)	0.02	0.05	0.15
8.	Calcium (mg/l / mg/kg)	549	100	132
9.	Magnesium (mg/l)	12.00	54.2	61.75
10.	Sulphate (mg/l)	0.12	245	112
11.	Copper (mg/l)	0.03	BDL	0.13
12.	Manganese (mg/l)	0.08	1.11	2.03
13.	Zinc (mg/l)	0.66	0.81	0.99
14.	Iron (mg/l)	1.23	2.00	34.30

S. No.Compound name (Fatty Acid)Activity of compound1.PinocembrinAntimicrobial, antifungal2.4-tert-butylcalix[4]axeneHerbicidal3.Mevastatin, gitoxigeninBioconversion, repellents4.Columbianetin, lomatinIncreases seed longevity5.DibutoxyanthracinePesticidal6.EnterolactoneAntimicrobial7.PrednacinoloneInsecticidal8.Ubiquinol, dupicalAntioxidant property9.4-methoxychalcone, cicloprofenAntimicrobial11.Erioflorin, nagilactone aPlant growth regulators and herbicida12.TrimegestoneAntibotic14.Clupanodonic acidPlant defense15.EldecalcifolInsecticidal16.Petrosaspongiolide m, hyatolide aLipid signaling path way17.CatalpolPlant defense			
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	17.	Catalpol	Plant defense



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Egg Fermented Extract

ngredients			
•	EGG	10 nos	
	LIME	20 nos	1990 B
	JAGGERY	250 gm	
Preparation :			
	Place 10 e	ggs in Air tight container	
		+	
	Add the lime juice	until all the eggs are immersed	
		+	(ASS-STUD)
	Allow for 10 days fe	rmentation until shells dissolved	
	•	+	
	Add 250g jaggery	y powder in the same container	
		+	
	Smash the	e content and Close it tightly	
		+	
	ŀ	Allow for 10 days	

Dosage: 2 % as foliar spray







Fish Fermented Extracts

INGREDIENTS :

- Fish waste 1 kg
- Jaggery 1 kg

PREPARATION: 1 kg native fish pieces + 1 kg Jaggery powder + Allow for 20 days fermentation + Filter & use

APPLICATION:

- Apply 2% in water as spray to any crop.
- It helps in plant growth









Nutritional status

Parameters	Fish fermented extract	Egg fermented extract	Panchagavya	
N %	0.501	0.382	0.122	
P %	0.067	0.056	0.045	
К %	0.038	0.03	0.016	
Ca%	0.031	0.02	0.028	
Mg%	0.403	0.252	0.269	
S%	0.254	0.161	0.074	
Fe (ppm)	15.65	17.05	18.05	
Zn (ppm)	7.4	11.15	9.85	
Cu (ppm)	0.1	0	0.3	
Mn (ppm)	0.45	0.35	2.2	
B (ppm)	1.35	1.55	1.45	
Ni (ppm)	1.1	0.95	0.75	
Cd (ppm)	0.1	0	0	
Cr (ppm)	0.7	0.7	0.65	
Pb (ppm)	0.75	0.95	0.9	

Metagenomic analysis



Relative abundance plot was formed based on distribution of available genus in taxonomy





Relative abundance @ genus level

	Egg Fermented Extract	Fish Fermented Extract	
100			Genus
			G_Acetobacter G_Acinetobacter G_Alcaligenes G_Anaerococcus
			G Anaerocolumna G Bifidobacterium G Blautia G Brachybacterium
			G_Brevibacterium G_Brevundimonas G_Carnobacterium G_Cetobacterium
75			G_Clostridium G_Comamonas G_Companilactobacillus G_Coprobacillus
			G_Corynebacterium G_Dermatobacter G_Desulfovibrio G_Dietzia
			G Enterococcus G Evtepia G Exiguobacterium G Faecalibacterium
			G_Fusicatenibacter G_Glutamicibacter G_Hathewaya G_Kocuria
			G Lacipirellula G Lacrimispora G Lactobacillus G Lactococcus
% 50			G Lawsonella G Leucobacter G Ligilactobacillus G Luteimonas
			G Macrococcus G Methylocystis G Methylorubrum G Mobilicoccus
			G_Nitrolancea G_Nocardioides G_Ostreibacterium G_Paeniclostridium
			G Paraclostridium G Paracoccus G Parasynechococcus G Parvivirga
25			G Prediococcus G Phenylobacterium G Propioniciclava G Protofrankia
			G Pseudochrobactrum G Psychrobacter G Rhodococcus G Romboutsia
			G_Ruminococcus G_Sabulicella G_Staphylococcus
			G_Streptococcus G_Streptomyces G_Synechococcus
			G_Tumebacillus G_Vagococcus G_Weissella
0			

Amudham Solution

Ingredients :

- Cattle urine 1 L
- Dung 1 Kg
- Jaggery 250 gm
- Water -10 L

Preparation:

Mix dung thoroughly in Water Add urine and mix well **Powder Jaggery** Add to the above and mix well Incubate for 24 hours **Application:** Add 1 L of solution to 10 L of water and spray









Coconut buttermilk solution

Ingredients :

- Buttermilk 5 L
- Tender coconut -1 L
- Coconuts -1 to 2
- Juice from waste fruit 500 ml to 1 L

Preparation:

Collect tender coconut water in a vessel + Add buttermilk to this and mix well + Grate the coconut and fruit in juice mix with butter milk solution + Allow the solution for ferments seven – ten days

Application

Mix 10 L of water with 300 -500 ml solution and spray, used in irrigation at the rate 5 to 10 L /acre









Arappu-buttermilk Solution

Butter milk	5 lit	Buttermilk & tender coconut in vesse		
Tender coconut	1 lit	Crushed leaves + fruit juice in hylon mess		
Arappu leaves	1-2 kg leaves or	Immerse in the buttermilk solution		
(Albizia amara)	500 g powder	Ferment for 15 days		
Juice from waste fruit	500ml- 1 lit	3 – 5 % as foliar spray		



Aattottam

Ingredients:

- 1. Goat dung (soaked in water overnight)
- 2. Goat urine (fresh)
- 3. Green gram after grinding (soaked in water overnight)
- 4. Goat Milk
- 5. Curd from goat milk
- 6. Banana (ripened)
- 7. Tender coconut water
- 8. Fermented coconut water
- 9. Sugarcane juice

PREPARATION:



Apply 270 III water as spray of any crop.

- It provides excellent nutrients to the soil.
- It assists in plant growth and increases chlorophyll.
- Improves branching, leafing, flowering and fruiting,
- Excellent plant growth promoter.













Compost Tea

- Compost teas are liquid versions of the solid <u>compost</u> material.
- Contain soluble plant nutrients and a complex community of beneficial microorganisms.
- Liquid teas can be applied as soil drenches, foliar sprays or incorporated into irrigation systems.









Physico-chemical properties of compost tea

Property	Value
рН	6.3
EC (mmhos ⁻¹)	2.4
N (ppm)	165
P (ppm)	20
K (ppm)	150





Impact of compost tea application to suppress soil-borne diseases in various plant species

Brewing method	Crop	Phytopathogens	Disease	Control ¹	Compost type	Brewing duration	Brewing nutrients	Dilution ratio ²
NCT	Eggplant	Ralstonia solanacearum	Bacterial wilt	+	NR ³	7 days	Molasses	1:5 w/v
NCT	Potato	Rhizoctonia solani	Stem canker	+	NR	7 days	Molasses	1:5 w/v
ACT	Turf grass (creeping bentgrass)	Sclerotinia homoeocarpa	Dollar spot	+ -	Mink compost	24 h	0.2 % (v/v) molasses	1:5v/v
ACT	Apple	Complex of pathogens and soil factors	Apple replant disease	+	Wheat straw – chicken-cattle manure compost.	24 h	None	<mark>1 : 10 v/</mark> v
NCT	French bean	R. solani	Root rot	+	Farmyard manure, poultry manure, vermicompost, spent mushroom, and <i>Lantana</i> and urtica composts	10 days	None	1:5v/v
ACT	Irish potato	R. solani	Stem canker	+	Vermicompost made of crop residues, composted horse manure, paper and straw	24 h	Clay, blue- green algae, sugar, yeast, and kelp	NR
ACT	Irish potato	Streptomyces scabiei	Common scab	+	Vermicompost made of crop residues, composted horse manure, paper and straw	24 h	Clay, blue- green algae, sugar, yeast, and kelp	NR
ACT	Rice	Fusarium moniliforme	Foot rot	+	waste used to make compost was not specified	3 days	None	1:6v/v
NCT	Rice	F. moniliforme	Foot rot	+	Waste used to make compost was not specified	7-10 days	None	1:6v/v
AVCT	Rice	F. moniliforme	Foot rot	+	Fruit/vegetable wastes vermicompost	3 days	None	1:6 v/v
NVCT	Rice	F. moniliforme	Foot rot	+	Fruit/vegetable wastes vermicompost	7–10 days	None	1:6v/v
ACT	Bentgrass	S. homoeocarpa	Dollar spot	+	Turkey, mushroom, and cattle, sheep and topdressing composts	⁷ days (N	None Iartin, 20	1:2, 1:3 1:240) 1:5



Vermiwash

Vermiwash is a liquid extract produced from vermicompost in a medium where earthworms are richly populated.





Vermiwash

Characteristics of Vermiwash

pH – 7.80 EC – 3.86 dsm⁻¹ **Organic Carbon – 2.32 %** Total N – 1.51 % Total P – 0.92 % Total K – 0.12 % Total Zn – 0.18 ppm Total Mn – 0.72 ppm Total Fe – 0.1 ppm Total Ca - 0.06 ppm Total Mg – 6.2 ppm Total Na – 11.0 ppm







Vermiwash Collection











EFFECTIVE MICROORGANISM (EM)

Ingredients

- Pumpkin : 3 kg
- Banana : 1 kg
- Papaya : 3 kg
- Jaggery : 3 kg
- Egg : 5 numbers
- Non-chlorinated water : 10 liters

PREPARATION:

- Cut the vegetables into small pieces
- Clean plastic container
- > Mix jaggery in 10 liters of non chlorinated water
- Add the eggs to it
- Mix all the contents
- > Close the container with air tight lid
- > Open after 10 days to release the air
- Mix well again
- Incubate for 45 days





Uses of liquid organic manures

- Seed treatment, seedling dipping, Setts treatment
- Soil rejuvenation
- Improves soil properties and health
- Increases beneficial microbial population
- Promotes nodulation, root proliferation and root biomass
- Enhances microbial decomposition of organic substances in soil
- Promote uptake of nutrients
- Supplements micronutrients to the plants
- Provides growth promoting substances







Time for interaction





