INHANA BIOSCIENCES'S RESEARCH FOR

ENERGIZED SOIL SYSTEM

NOVCOM COMPOST

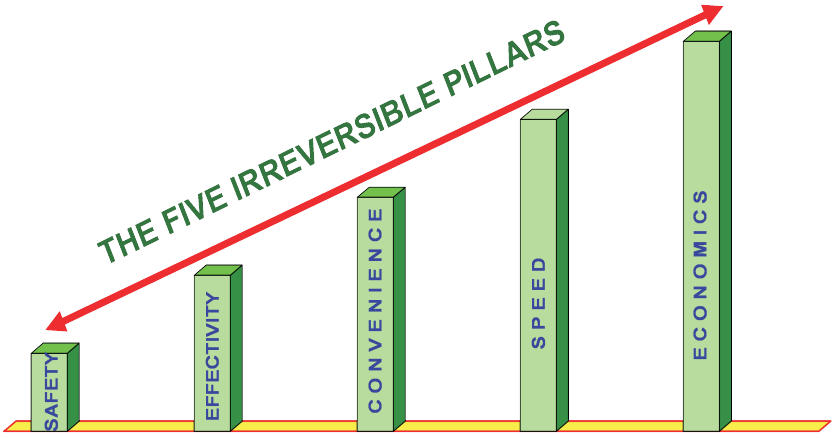
AN IDEAL EXOGENOUS SOIL INOCULATION

The ecological crisis and the threat to life support system posed by destruction of natural resources has awakened the 'Global Organic Movement'. Soil today does not function as an ideal support system, it is an inert material on which plants are forced to grow with the external support of various chemical salts. The chemical fertilization concept was so unscientific & destructive that it virtually ruined the thousands years old treasure in just few decades.

Now, going back to nature harnessed farming is considered to be the only remedy for the sustenance of the human being as food toxicity & environmental degradation has reached to an alarming height. But how to start the process or what is the ideal process is unknown, as traditional farming was never documented scientifically. Moreover the cycle is so vicious today, where on one hand the sustainability in the present chemicalized agriculture is under a threat but at the same time available organic alternative is supposed to be under more threat. Under this circumstance Inhana Biosciences came out with **Rational Farming® Technology** the only organic crop management system where science & ecology are uniquely blended. **Rational Farming® Technology** has been developed to assure & ensure both ecological & economical sustainability through Energization of Plant System & Energization of Soil System .

Energization of soil system is achieved through NOVCOM compost, while various potentized botanical solutions are applied for energization of plant growth. If you are thinking of moving towards nature friendly farming or organic practice, adoption of NOVCOM composting method could be the starting step. NOVCOM compost will give a glimpse of the plethora of knowledge on which **Rational Farming® Technology** is developed. NOVCOM **compost should not be compared with any organic manure for its uniqueness, effectivity & science. But most importantly it ensures the end product at 20 percent of the cost of vemi compost but convincingly far more superior quality - seemingly impossible proposition but a dire truth.**

Five Pillars for an Effective Composting



SAFETY

The high temperature (observed up to 75^{0}C) generated in an intense, rapid as well as desired manner during the Novcom composting process ensures the total destruction of weed seeds and all harmful pathogens. At the same time, performance of various stages of biodegradation in the programmed manner ensure a **safe end product for both human handling and soil environment.**

CONVENIENCE

Novcom composting method is a convenient system of bio-degradation. It **does not require construction of pits or any specific infrastructure.** It is not raw material specific & various types of raw materials can be used for compost production.

SPEED

Novcom composting method perhaps ensures the **speediest biodegradation - about 21 days,** which is shorter in certain raw materials i.e. cow dung, poultry litter etc.

EFFECTIVITY

Novcom compost ensures both **ready nutrient supply** post soil application as well as its **high microbial status** with adequate energy sources works towards restoration of soil quality and soil dynamics.

ECONOMY

Novcom composting method is an economical process, which does not require any investment on infrastructure, needs minimum labour deployment and does not require any specific raw material. The technology cost is also very low. **Under this method 1 ton of compost can be produced at a low rate of Rs. 1.00 to 1.50/-**

NOVCOM SOLUTION

Novcom® solution is a research product of Inhana Biosciences, (a R&D organization based in Kolkata, India). The solution contains biologically activated and potentized extract of ***Cynadon dactylon***., ***Sida cordifolia*** **L.** and ***Ocimum bascilicum.***

Novcom® solution is made in customized manner considering the raw materials for getting quality compost.

Novcom solution does not contain any microbial culture or any chemical catalytic agents. It only provides the necessary energy component to create a favourable environment for rapid, intense and prolific generation of microbes during composting, that too in a programmed manner.

Novcom method only follows the natural steps of biodegradation and just intensify each step and their succession. Unlike the facilitation of any particular step or addition of any converters or conversion mechanism of complex components of the organic material being followed in all other methods. Only **Novcom solution is made in the customized manner according to the composting of each organic raw materials.** Therefore Novcom is effective to biodegrade of all organic waste.

Personnel from CFC-TBI Observed Large Scale Novcom Composting Activity at Maud T.E. under FAO-CFC-TBI Project for Developing Pathway for Sustainable Organic Tea Cultivation.

NOVCOM COMPOST - *METHOD OF PREPARATION*

Raw Material

Any kind of organic waste (i.e. green matter, leaf litter, vegetables waste and cow dung, etc). **Ideally the proportion of cow dung and green matter should be at a minimum ratio 20:80,** but in case of non-availability, the quantity of cow dung can be further reduced but **it should not be at zero level**. Similarly in case of more availability the quantity of cow dung can be increased. In case of many other organic waste cow dung may not be required. ***In NOVCOM Method Cow dung is recommended not for its nutrient status but as the receptor of Solar Energy.***

Dilution : 5 ml of NOVCOM solution / litre of water.

Dosage :

1st application **: 100 ml of NOVCOM Solution /20 litre of water / ton of waste.**

2nd application**: 75 ml of NOVCOM Solution /15 litre of water / ton of waste.**

3rd application**: Same as 2nd application**

Total 250 ml of NOVCOM Solution is required for 1 ton of raw material. The water requirement may vary according to the moisture content of the raw material & weather condition. However total moisture content in compost heap should be around 60 %.

Day 1

Spread chopped green matter to make base layer of dimensions 10 ft X 6 ft with thickness of 1 ft - 1.5 ft.

Sprinkle this base layer thoroughly with 3-3.5 litre water containing NOVCOM solution at the rate of 5ml/litre of water.

Over this layer, put a layer of cow dung (3 inches thickness) and repeat the process till the total height reaches to about 5½ to 6 ft. The top most layer of the heap should be of chopped green matter only. On each layer of green matter diluted NOVCOM solution (5ml/lt) is to be sprayed. The heap should be compressed downwards from the top & inwards from the sides so that it takes the shape of more or less a compact square or rectangle.

Method of Preparation

Day 1 .....

For the production of 1-1.25 ton NOVCOM compost, the compost pit at initiation should have the approximate dimension of 7-8 ft (length) X 5-6 ft (breadth) X 5.5-6 ft (height).

After 2-3 days of compost initiation the temperature starts increasing and may reach upto 75°C. This increase in temperature is absolutely essential for the complete destruction of any weed seeds and harmful pathogens and for the rise of thermophilic bacteria.

Day 7

Upturn & churn the compost heap properly and then sprinkle NOVCOM solution (5ml/lt) as earlier. The volume of the compost decreases due to progress in decomposition process. The heap should be remade and compacted as earlier. Maintain the height of compost heap at 5½ to 6 ft by adjusting the surface area. This time the area of the stack will be lesser than Day 1 but the height must be maintained as before. Plain water should be sprinkled to moisten the compost pit if it appears to be in dried condition

Day 15

Repeat the process as on Day 7 and compact the heap as done earlier. This time the area of the stack will be lesser than day 7 but the height should be maintained at 5½ to 6 ft.

Day 21

The process of composting is over. A highly charged ideal exogenous inoculation for soil is ready to use. It will rejuvenate your soil without any time lag.

Note:

1. In case of dry/ complex raw materials *viz.* rice husk, dry weeds, woody parts etc. the layers of organic matter should be made thinner followed by application of cow dung slurry.

2. In such cases increasing cow dung quantity to 30-40% shall enhance the biodegradation process. 1st and 2nd Turnings are to be done at interval of 10 and 20 days respectively from day of initiation.

3. After completion of heap construction on 1st and 10th days, the outer layers of the heap are to be preferably sprayed with cow dung slurry instead of water. This is important for faster degradation.

The Quickest, Simplest and Most Economic Way of Composting

COMPARATIVE ANALYSIS OF DIFFERENT COMPOST

Quality of Soil Inputs as a Determinant Factor for Post Soil Effectivity – A comparative study from FAO-CFC-TBI Project at Maud T. E., India

Organic soil amendment plays the key role both during conversion and for practicing organic agriculture. However, major limiting factor towards large scale organic agriculture is their huge quantitative requirement on the basis of N, P, K replacement theory. The present study at Maud tea estate (Assam), India under CFC-TBI Project, 2008-2011; aims to evaluate whether good

Fig. 1 : Quality Parameters of Different Organic Soil Inputs Produced at Maud Tea Estate at Assam, India during 2008-2009 to 2009 – 2010 (pooled data of 30 samples).

Sl. No	Parameter	Organic Soil Inputs			
		Vermi Compost	Indigenous Compost	Biodynamic Compost	Novcom Compost
Physical Properties					
1.	Moisture percent(%)	58.52	45.59	56.87	59.91
2.	Bulk density (gcm^{-3})	0.71	0.95	0.62	0.45
3.	Porosity (%)	55.21	52.72	47.18	69.37
4.	WHC (%)	162.6	163.9	177.3	217.8
Physicochemical Properties					
5.	pH_{water} (1 : 5)	6.45	6.67	7.22	7.39
6.	EC (1 :5) dSm^{-1}	1.67	1.36	1.66	2.08
7.	Total Ash Content (%)	51.85	69.26	42.62	47.70
8.	Total Volatile Solids (%)	48.16	30.74	57.38	52.30
9.	Organic carbon (%)	26.75	17.08	31.88	29.06
10.	CEC ($cmol(p^+)kg^{-1}$)	136.8	163.7	176.5	186.9
11.	CMI[1]	1.94	4.06	1.34	1.64
12.	Sorption capacity index	5.11	9.59	5.54	6.43
Nutrient Status					
13.	Total Nitrogen (%)	1.73	1.70	1.74	2.15
14.	Total P_2O_5 (%)	0.66	0.41	0.76	0.67
15.	Total K_2O (%)	0.90	0.40	1.00	1.10
16.	C/N ratio	15.5	10.0	18.4	13.5
Stability Parameters					
17.	CO_2 evolution rate ($mgCO_2$–C/g OM/day)	0.48	1.01	0.84	0.99

Sl. No	Parameter	Organic Soil Inputs			
		Vermi Compost	Indigenous Compost	Biodynamic Compost	Novcom Compost
Ready Nutrient Supplying Potential					
18.	Water soluble carbon (%)	0.25	0.30	0.12	0.38
19.	Water soluble inorganic N(%)	0.06	0.04	0.02	0.12
20.	Water soluble organic N (%)	0.05	0.05	0.02	0.07
21.	Organic C/N ratio	4.6	6.3	5.8	5.4
22.	Humification ratio	0.01	0.01	0.02	0.004
Microbial Properties					
23.	Total bacterial count[2]	63×10^{12}	71×10^{12}	20×10^{12}	65×10^{16}
24.	Total fungal count[2]	35×10^{10}	80×10^{11}	22×10^{12}	22×10^{16}
25.	Total actinomycetes[2] count	15×10^{10}	15×10^{11}	9×10^{12}	8×10^{16}
26.	Total ammonifiers[3]	6.7×10^{7}	16×10^{8}	16×10^{8}	21×10^{13}
27.	Total nitrifiers[3]	65.0×10^{7}	57×10^{8}	73×10^{8}	32×10^{13}
28.	Microbial biomass carbon(%)	0.46	1.20	1.12	1.26
Maturity & Phytotoxicity Parameters					
29.	NH_4^+ - N (%)	0.03	0.03	0.02	0.02
30.	NO_3^- - N (%)	0.08	0.07	0.07	0.10
31.	NH_4^+ - N : NO_3^- - N	0.38	0.43	0.29	0.20
32.	Seedling emergence (% of control)	97.9	82.7	94.1	116.9
33.	Root elongation (% of control)	100.0	84.6	95.1	116.8
34.	Germination index (phytotoxicity bioassay)	0.98	0.70	0.89	1.37

quality compost in lower dosage can support crop yield without any soil mining through rejuvenation of soil microbial population. Four organic soil amendments viz. vermicompost , indigenous , Biodynamic and Novcom compost were produced using on- farm resources and analyzed for physicochemical and microbiological properties, nutrient content, stability, maturity and phytotoxicity status.

Comparative

Crop performance in terms of green leaf yield was recorded plot wise during each plucking round for the year 2009 and 2010. The yield considered presently is the average of 2009 and 2010, upto the period of 150 days (post compost application). Highest yield was obtained in Novcom plots (3707 $kgha^{-1}$) followed by Indigenous (3340 $kgha^{-1}$), lowest yield was recorded in the control. Novcom, Indigenous, Vermi and Biodynamic applied plots were 25.2, 12.8, 11.6, and 6.4 percent higher respectively. However, significantly higher (CDP= (0.05) value 485) crop yield was obtained only in Novcom treated plots in comparison to control plot.

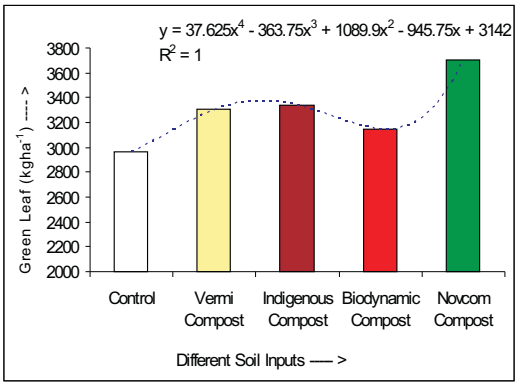


Fig 2 : Comparative crop performance under application of different compost application.

Crop performance has a strong relationship with the status of different forms of N especially readily available- N in soil, as well as with the population of soil- N converters. The N converters in soil are primarily responsible for the maintenance of equilibrium among the different forms of soil- N thereby influencing N uptake vis-à-vis crop performance. Figure 3 represents the interrelation among different soil– N converters and their influence on green leaf yield in the different treatment plots. Polynomial trend line of readily available soil– N converters and the linear representation of green leaf yield showed a symmetric pattern thereby indicating a close inter-relation.

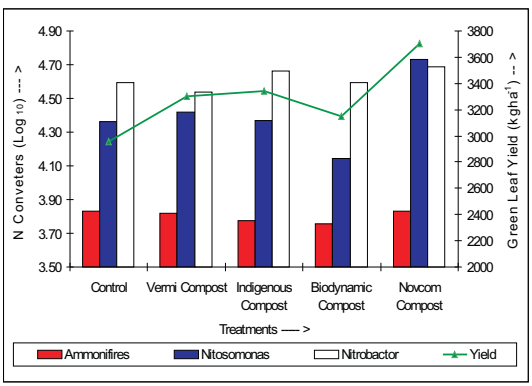


Fig 3 : Comparative crop performance with respect to soil – N converters 150 days post application.

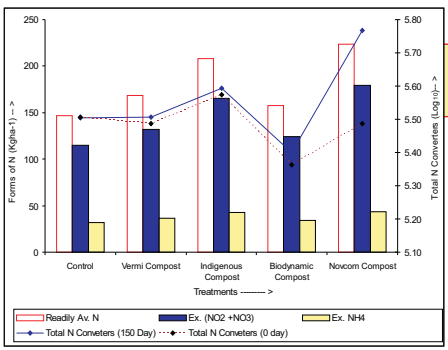


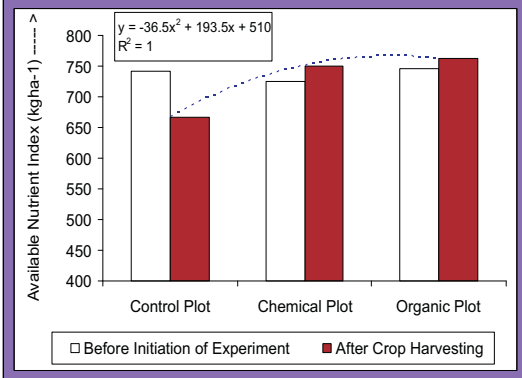
Fig 4 : Comparative study of different forms of N vis - a – vis total N converters 150 days post application.

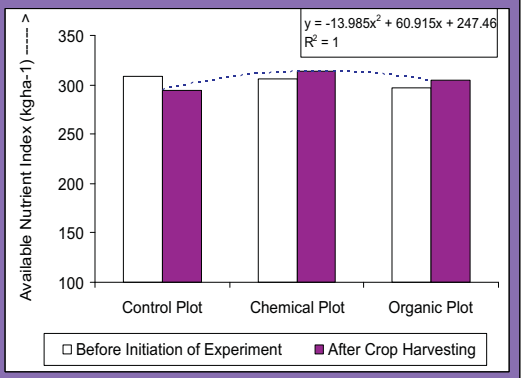
Figure 4 represents the relationship between the different forms of nitrogen in soil and the soil– N converters. Research has indicated that with enhancement in the population of soil– N converters availability of Ex. NH_4 and Ex. NO_2+NO_3 increases in soil & the development was highest in case of Novcom compost applied soil.

Post Soil Effecticity of Novcom Compost - Evaluated by BCKV, State Agricultural University, West Bengal

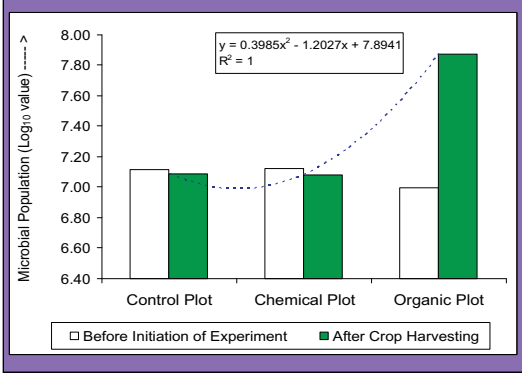
Crop trial using tomato and green gram as test crop was conducted at the Agricultural Farm of Bidhan Chandra Krishi Viswavidyalaya and in the farmers' field at Molebona village, Bankura District of West Bengal. The trial was conducted during September,08 to January,09; for evaluation NOVCOM Composting Method along with post soil effectivity of NOVCOM compost. The following figures indicates development of soil quality post novcom compost application.

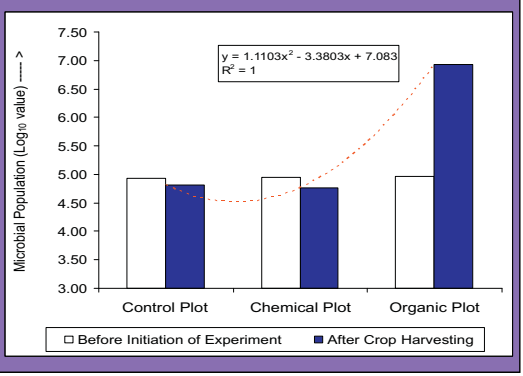
Variation in Available Nutrient Index in Experimental Plots at BCKV Research Farm at Nadia, W.B. & Farmer's Field at Bankura , W.B.





Variation in Microbial Population in Experimental Plots at BCKV Research Farm at Nadia, W.B. & Farmer's Field at Bankura , W.B.





Post-harvest soil analysis showed significant improvement in soil microbial population in NOVCOM compost treated plots, where microbial population increased up to the order of 10^5.

In depth study of this project in two different agro-climatic situations reveals that Novcom Compost has that desired potential to be a path finder for formulation of effective guideline towards organic soil management.

NOVCOM COMPOST - Usefulness in Nursery

Seedling is the most delicate stage of the plant growth cycle, hence soil environment in the nursery should be optimum to desire results. Slight variation in the soil environmental condition might severely affect the germination rate and at the same tome their render seedling death. However, to ensure the most ideal environment for the seedlings, compost can take a very important role. Healthy plants require healthy soil' – This truth is most significant in terms of the nursery bed because healthy seedlings are the future of healthy plants. But to get the desired effectivity in the nursery, the quality of compost should be in highest order. In this regard evaluation of NOVCOM compost in terms of different stability/maturity and phytotoxicity parameters (viz. CO_2 evolution rate, germination index, root growth efficiency, phytotoxicity bioassay etc.) only reveals it's highest standard for optimum suitability of the compost in nursery bed, which ensures effective germination and most healthy growth of seedlings.

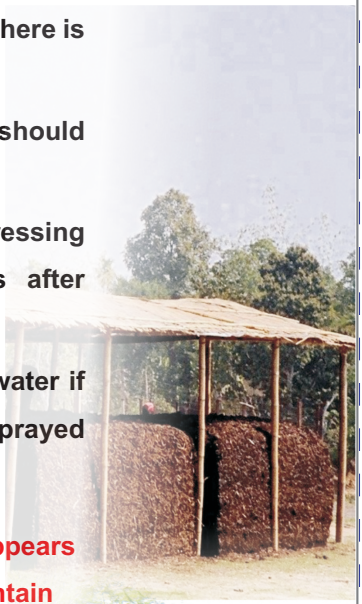
Fig 1:Root Development in tea seedlings with application of Novcom compost at Maud T.E. under FAO-CFC - TBI Project.

Fig 2 : Organic Nursery Developement under FAO-CFC-TBI- Project at Maud T.E. showed promising results using Novcom compost.

Fig 3:Tomato nursery under different treatments under the project at farmer's field at Bankura, W.B.

CHECK POINTS FOR PRODUCTION OF HIGH QUALITY NOVCOM COMPOST

1. Choose an upland area as composting site where there is no problem of water logging.
2. On the 1st day, 7th day and 14th day height of the heap should not be less than 6 ft.
3. The heap should be made compact by be compressing downwards from top and inwards from sides after construction of each layer on the 1st , 7th and 14th day.
4. After application of NOVCOM Solution diluted in water if the layers still appear dry, then plain water can be sprayed to moisten them.



Similarly in between the days of turning if the heap appears dry from outside little watering may be done to maintain proper moisture level.

REMEMBER BOTH OVER (> 60%) & LOW MOISTURE (< 50%) IN THE HEAP SHALL AFFECT COMPOST QUALITY.

4. To judge the moisture percent take out a handful of composting material from inside of the NOVCOM heap. Press hard, if one or two drops of water comes out, then the moisture percent is okay.
5. <u>PROTECT THE COMPOST HEAP FROM RAIN BY USING PLASTIC SHEETS, or MAKE TEMPORARY SHEDS.</u>

PERCOLATION OF RAIN WATER IN THE HEAP DURING COMPOSTING OR IN READY COMPOST SEVERELY AFFECTS COMPOST QUALITY, WHICH CANNOT BE RECTIFIED.

6. <u>AT THE SAME TIME DURING COMPOSTING THE HEAP SHOULD GET SUFFICIENT SUNSHINE</u>.
7. Maintain temperature record. For effective composting the temperature of the heap should rise above 60^{0}C by 72 hours of heap erection.

Cost components and Total Cost of NOVCOM Composting Method studied at Maud T. E., Assam under FAO – CFC – TBI Project on Finding out Pathway for Sustainable Organic Tea Cultivation.

Parameters	Value
Basic Information	
Size of Heap	360 cft. (10 ft x 6 ft x 6ft)
Total Raw Material used/heap	4500 kg
Duration of biodegradation (composting)	21 - 30 days
Weight of Final Compost	2925 – 3375 kg (Mean 3128 kg)
Recovery (percent)	65 - 75 % (mean 69.5 %)
Total Mandays required/heap	13.2
Various Cost Components of Novcom Compost	
Cost of 3500 kg Green matter (@ Rs. 0.23/kg)	Rs. 805/-
Cost of 1000 kg cowdung (@ Rs. 0.40 /kg)	Rs. 400/-
Cost of total 13.2 Mandays (@ Rs. 71.5/-) (5 mandays for chopping of green matter, 4 man days for 1 st day heap construction, 2 mandays each for 1 st and 2 nd turning, 0.2 mandays for watering and monitoring)	Rs. 944/-
Cost of Novcom solution (@ Rs. 600/ltr.)	Rs. 525/-
Total Cost	Rs. 2674/-
Cost of 1 kg Final Compost (*with chopping*)	Rs. (0.79 – 0.92)/- **(Mean Rs. 0.86/-)**
Cost of 1 kg Final Compost (*without chopping*)	Rs. (0.69 – 0.79)/- **(Mean Rs. 0.74/-)**
Based on market rate as on 1st April, 2011	

Comparative analysis of

NOVCOM COMPOST

VERMI COMPOST & NADEP COMPOST

PARAMETER ↓ / COMPOST →	NOVCOM COMPOST	VERMI COMPOST	NADEP COMPOST
FERTILITY PARAMETER			
Organic Carbon (%)	30.14	30.31	18.09
Total Nitrogen (%)	1.73	1.80	1.50
C:N ratio	18:1	17:1	12:1
Total Phosphate (%)	1.21	1.32	0.30
Total Potash(%)	1.55	1.28	0.67
MICROBIAL POPULATION			
Bacterial count	$188.5X10^{16}$	$2.4X10^{9}$	$298X10^{9}$
Fungal count	$95X10^{16}$	$2.1X10^{9}$	$105X10^{6}$
Actinomycetes count	$24X10^{16}$	$1.9X10^{10}$	$2.5X10^{9}$

NOVCOM COMPOST

World's Most Economical & Quickest Composting Method

Rational Farming® Technology - the truly scientific, organic farming method is a comprehensive technology which recommends NOVCOM compost application as part of the soil management programme. NOVCOM compost being an ideal exogenous soil inoculant rejuvenates the deactivated soil system without any time lag. NOVCOM compost is the only compost in its rank which, achieves the five objectives of an ideal composting system i.e. Safety, convenience, speed, effectivity and economy. NOVCOM solution is designed according to material specificity to enable the most ideal pathway for effective degeneration of any kind of biodegradable waste starting from pressmud to poultry litter, for the achievement of the optimum quality end product. The real strength of NOVCOM compost is its superior microbial potential which are the key players ensuring success even in the most inactive soil environment & at a lowest application rate, as compared to any other quality compost in the world.

INHANA IN HARMONY WITH NATURE INHANA BIOSCIENCES

INHANA BIOSCIENCES

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