

FORMAT 1 – Commercialization of Technology

It is kindly requested to fill in this format with the necessary information under the following **heads** for the purpose of commercialization.

1. **Seed and Planting material**
2. **Diagnostics, Vaccines and Biotechnological Products**
3. **Farm implements and Machinery**
4. **Post Harvest Engineering and Value Addition**

Head

Technology Profile for (Name) : **Bioorganic for control of Softrot of Ginger**

1	Name of the Institution	ICAR Research Complex for NEH Region
2	Address	Umroi Road, Umiam – 793103, Meghalaya
3	Name of P.I & Co.P.I	Dr. RAJESH KUMAR
4	Description of technology	Herbal formulation for controlling softrot of Ginger
5	Flow chart of technology / process	
6	Area of application :	
7	Patent number & Date of filing	N/A
8	If patent is not filed, mentioned in which year the technology was developed?	2007
9	Did any entrepreneur has shown interest on this technology ? If yes, please provide the name, address of the entrepreneur	Enclosed
10	Equipment required	Autoclave, Boiler, Grinder, Chopper, Bottle sealing machine
11	Space requirement	3000 Sq.feet
12	Plant set up cost	Rs. 50 lakhs
13	Raw material and production cost	Rs 100 / liter of formulation
14	Risks / opportunities involved in adopting the technology	The technology is suitable for both organic and conventional agriculture, potential to generate employment for local farmer.
15	Cost of available alternate technologies to similar products	None
16	Expected cost of technology	Rs 150 – 200 / liter
17	Details of benefits of the technology / process developed	
18	Any suggestion from Project leader for commercialization this technology	Kindly refer to Point No. 14

Photographs : Enclosed

Project leader Name: Dr Rajesh Kumar
Designation: Senior Scientist (Agronomy)

Bioorganic for ginger: GF₁

Ginger is the leading cash crop in Northeastern hilly states. The area under ginger cultivation in the region is 33.2 thousand ha with 191.0 thousand tones of production. The average productivity is 5.8 t ha⁻¹. Meghalaya is the highest ginger producer in the northeastern states followed by Mizoram and Arunachal Pradesh. Soft rot or rhizome rot of ginger is one of the major disease problem faced by the growers, on an average yield loss owing to soft rot disease ranges from 20-30 %. Sometime 50% or more of the crop will be affected by the disease resulting in massive loss to the growers



The disease is caused by soil borne fungus (*Pythium aphanidermatum* and *Pythium myriotylum* mostly). The species multiplies with increase in soil moisture especially with the onset of cloudy rainy season. Young sprouts are more susceptible. Infection starts at the collar regions of pseudostems and progresses upwards as well as downwards. The collar region of affected pseudostem becomes water soaked and rotting spreads to the rhizome resulting in typical soft rot. At a later stage root infection is also noticed. Foliar symptoms appear as light yellowing of the tips of lower levels, remain green while the margin becomes yellow, yellowing spreads to all leaves of the plants from bottom upwards and followed by drooping, withering and drying. The disease spreads very fast especially when the soil temperature reaches 27-32 °C and the relative humidity exceeds 90%. On an average it takes 10-20 days from the onset to total loss of the affected clumps.

Soft rot is a serious problem in ginger cultivation in other parts of India and the world also. Nevertheless, serious damage is not a regular feature owing to higher temperature (more than 40°C) and its regulated pathogen population, in context with northeastern states, temperature rarely exceeds 35 °C with perpetually high humidity, making it very conducive for pathogens to have enough population for regular attack.

Considering the dimension of loss and the misery of the growers, an attempt was made in the weed science laboratory of Agronomy Division at ICAR Research Complex, Umiam Meghalaya during year 2004. A total of 180 plant extracts were tested under controlled conditions to isolate promising phytochemicals for managing soft rot of ginger. Based on the experimental results, a formulation was developed named as GF₁. The formulation is an aqueous extract, thermostable having a self-life of one year at room temperature.

Procedures

- Mix the formulation at a rate 20 ml per liter of water.
- Treat mother rhizomes for 10-12 hrs. in solution before sowing. The same solution can be used for 2nd and 3rd lots of ginger rhizomes. Discard the leftout solution after 30-36 hrs. Normally for one liter of solution one kg of planting material can be treated.
- If the rhizome is not treated at the time of planting, still the formulation can be used by way of soil drenching by applying around the plant base. 60-70 ml of ready solution should be applied to individual plant.
- Avoid rainy days as for effective results 10-12 hrs of dry spell is needed.
- The formulation is currently recommended for ginger crop only. Therefore it should not be applied to any other crops.

Precautions

- Once the bottle uncorked, use whole content.
- The product is natural & safe for human skin, however, avoid prolong contact.
- The formulation is made with plant extracts without adding any chemicals. Therefore it can be used for organic ginger cultivation.

Performance

Early sprouting: Treated rhizome responded very well and under field condition juvenile sprouts emerged 10-12 days ahead as compare to non-treated (control) rhizome



Non-treated ginger rhizome

GF₁ treated ginger rhizome

More pseudostems: GF₁ treated ginger had significantly higher number of pseudostems. Normally 30-40% more number of pseudostems appears in treated crop field



Comparison in local ginger

Untreated ginger field

GF₁ treated ginger field

Higher biomass: After 70 days of sowing GF₁ treated ginger accumulate more than 30 % biomass as compare to without treated crop



Untreated crop



GF₁ treated ginger

Higher root growth: GF₁ treated ginger generate much higher root growth. Normally treated rhizomes have 55-60% more root growth. Length of the root increased by 20-25% in bioorganic treated ginger



Root in GF₁ treated ginger



Root in untreated ginger

Soft rot disease scoring: Rhizome treated (10-12 hrs) before sowing performed far superior than untreated crop. 90 % of GF₁ crop had no symptom of soft rot and the plant were having lustrous green leaves. Whereas, in untreated crop 28-45% of plants were affected by the disease. In soil drenching with GF₁ also performed better and only 15% of plants affected by the disease.



GF₁ treated ginger



Untreated crop

Yield advantage: GF₁ treated ginger had significantly higher yield (30-35%) over untreated crop. The rhizomes harvested out are better and having shining scales as compare to non-treated crop. Overall ginger growers could be greatly benefited by the formulation



Formulations ready for distribution



Scientist interacting with farmers

Contacts

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2. Head, Division of Agronomy, ICAR Research Complex, Umiam-793 103 Meghalaya, Phone – 0364- 2570 306

Ginger cultivation with bioorganic (GF₁) formulation

Bioorganic (GF₁) formulation: A noble herbal formulation developed at ICAR Research Complex using vegetations available in the region. The product is highly effective for controlling soft rot of ginger and upto 85-90% of crop can be saved from ravage of soft rot disease. Also, the formulation helps in early sprouting and establishment of crop. On an average 30-50 % more pseudostems appears in treated crop. The harvested rhizomes are free from disease and having superior self life

Productivity in farmers' fields

Average yield: 10-12 t ha⁻¹

Average selling price: Rs 10 /kg

Average cost of production: Rs 27,000

Average net income: 73,000-95,000

Productivity of ginger with help of bioorganic (GF₁) treatment

Average yield: 13-15 t ha⁻¹

Average selling price: Rs 10 /kg

Average cost of production: Rs 28,500

Average net income: 1,0,1500-1,2,1500

Cost of bioorganic: Rs. 150 / liter

Bioorganic/ha : 10 liters

Potential of the developed Technology

Ginger is the one of most important cash crop grown in the Northeastern hilly states having acreage of 30.4 thousand hectares. The present technology, which is developed for ginger cultivation, control soft rot of ginger, enhanced productivity and improve the self-life of the harvested ginger. It is estimated that on an average 30-40% of cultivated crop affected by this disease causing a loss of Rs 20,000-25,000 /ha. If we introduce this technology to farmer can augment their income by Rs.15, 000-20,000/ha. The botanical also help in improving the productivity of ginger as it is found to be excellent growth promoter and on an average 20-25% extra yield of ginger can be obtained. Therefore, even crop will not be affected by the soft rot will be quite profitable to use the product. Another potential benefit of the developed product is that it enhances the self-life of the harvested ginger and also protects the rhizome from various pest and diseases. In terms of economy the earning from using this technology would be Rs 450 lakhs in the northeaster region only.