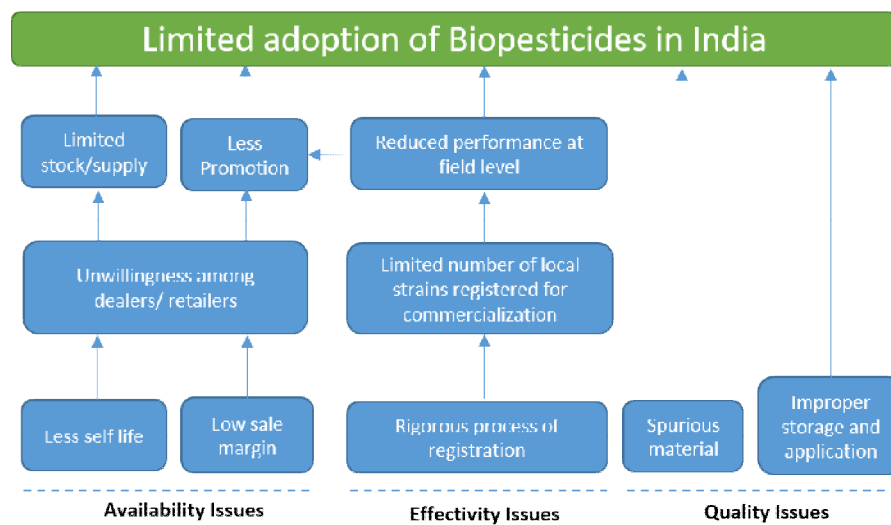


Title	Go Green with <i>Trichoderma</i>
Category	Biological control of plant diseases
Challenge	<p>Agriculture in present generation seems to be treading a difficult path due to indiscriminate and non-judicial use of agro-chemicals. There is an urgent need of ensuring continuous supply of organic inputs to the farming community to save the mother earth and its beloved children from the growing ill effect of these chemicals. To our good fortune and for the prosperity of entire mankind, God has already created a handful of beneficial microorganisms to fight against each of the harmful ones. These biological inputs are essentially needed to be nurtured further for the flourishing of environment friendly farming.</p> <p>In the district of South 24 Parganas, there is a growing intensity of soil borne fungal pathogens causing root rots, stem rots, vascular wilts and alsoof several insect pests. Chemical pesticides are used as sole weapon against these pest and diseases, thus affecting the farmers' economy and the consumers' health and hygiene. Added to these are the environmental issues like selection pressure on pests and pathogens due to indiscriminate use of chemical pesticides. This artificial selection pressure helps the pests and pathogens to develop pesticide resistance more often than developing any new pesticide molecules by us.</p> <p>But there are some proven Bio-pesticides that can manage the above pest-disease problems along with taking care of the issues faced both by the growers, consumers and environment. Bio-pesticides are either microbial in nature, like <i>Trichoderma sp.</i>, <i>Pseudomonas fluorescens</i>, <i>Metarhizium anisopliae</i>, NPV, <i>Bacillus thuringiensis</i>, etc., or may be some beneficial insects, like <i>Trichogramma</i>, or any botanical products like Azadirachtin (Neem oil).</p> <p>However, bio-control agents are very delicate and sensitive to their ecological preferences in terms of temperature, moisture, salinity etc. Hence adaptation of bio-control agents to any new environment (apart from where it has been isolated) is a challenge. It has been noticed that a bio-control agent giving a very good performance under <i>in vitro</i> condition often fails to do so under field condition, especially under the saline and submerged conditions of South 24 Parganas.</p> <p>Hence it becomes necessary to identify and isolate some local strains of bio-control agents and screen them against the pests or pathogens of this particular region. Such an identified strain of bio-control agent will adapt well to the local situation and give a better protection under field condition.</p> <p>Though it is easy for any research organization to identify any region specific strain of bio-control agent, it becomes quite difficult to take it to commercial level of</p>

production. Because, any bio-control agent has to undergo the same processes of registration as like any chemical pesticide which is quite cumbersome, time taking and costly also.

Since there is no stability in the effect of bio-pesticides, farmers always look towards them with doubts. Again, due to the living nature of microbial bio-pesticides, several factors like temperatures, moistures, pH, ultraviolet spectrum and soil factors adversely affect their survival.

The dealers and retailers are also least encouraged to promote bio-pesticides due to less self-life of the product, low profit margin and lack of overall demand among farmers. All these together has resulted in limited adoption of bio-pesticides among the farmers.



Initiative

Initiative by Ramkrishna Ashram Krishi Vigyan Kendra, Nimpith:

Under such circumstances RAKVK, Nimpith came out with a novel idea of empowering the rural farmers in producing certain bio-control agents at homestead level. The protocols standardized by National Institute of Plant Health Management (NIPHM), Hyderabad, were followed for this purpose. Accordingly, a project, named "On-farm mass production of microbial pesticides" was prepared by RAKVK, Nimpith and sanctioned by the Department of Agriculture, Govt. of West Bengal, under Rashtriya Krishi VikasYojana (RKVY) for 2015-16 & 2016-17. An amount of Rs.25.60 lakh during 2015-16 and Rs.30.79 lakh during 2016-17 was funded from RKVY

The objective of the 2-year project was to isolate local strains of fungal bio-control agent (*Trichoderma sp.*) and mass production of the promising strain by the farmers for their own use.

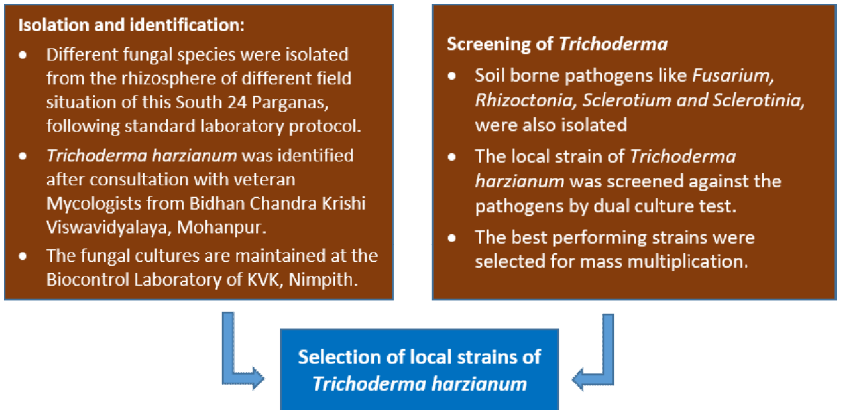
Trichoderma is a non-pathogenic fungi found in soil as well as in association with plants. These green coloured fungi are well known for their anti-fungal and plant-growth-stimulating effects.

For these reasons, several species of *Trichoderma* are used all over the world as biological control agents to combat fungal plant diseases on various crops. Most of these biological control products are from the species - *Trichoderma harzianum*, *T. viride* and *T. atroviride*. Modern research suggests that certain strains of *Trichoderma* can effectively control plant pathogenic Nematodes also.

Each of the *Trichoderma* species again varies from one region to another, based on their adaptability to the particular ecology and effectiveness as a bio-control agent. Simply, a *Trichoderma* isolated from a particular ecosystem finds it easier to thrive in that ecosystem.

As production of bio-control agents for own consumption does not warrant registration, larger number of agro-ecological zones can be covered with zone specific strains without waiting for their registration and commercial production eternally.

Isolation of local strains was done in the bio-control laboratory of the KVK. Such strains with better adaptability to the edapho-climatic situation of the South 24 Parganas District were selected.





Key result/
insight/
interesting
fact





Beneficiary selection and capacity building
Project beneficiaries: 300 farmers, engaged in vegetable and betelvine cultivation were selected from South 24 Parganas, Nadia, Burdwan, Hooghly and Midnapore. Progressive farmers and rural youths, familiar with the use of *Trichoderma* and other biocontrol methods were given priority for successful implementation of the project.

Demonstration Training: In 2015-16, three-long residential trainings were organized at KVK campus for demonstration of *Trichoderma* production technique. During 2016-17, four-long residential trainings were organized to accommodate more time on practice of the



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	<p>techniques by the farmers.</p> <p>Refresher training and review: A one-day refresher training was conducted each year for sharing of experiences and to undertake any further refinement of the technology if required at field level.</p>
<p>Impact</p>	<p>Each beneficiary were visited after the distribution of Training Kit. The process of <i>Trichoderma</i> production was monitored and samples of the finished products were taken to KVK laboratory to study the quality of the product and the extent of contamination.</p> <p>On an average, a 30-day old grain formulation was found to contain 7.1×10^9 colony forming units (CFU) which is thousand times more than the commercial formulations.</p> <p>Care was taken for the proper storage and use of the product. The farmers used the grain formulation of <i>Trichoderma</i> @ 500 g with 100 Kg FYM for soil treatment in 1 bigha area and @ 50g per 10 litre of water for spraying and soil drenching.</p> <div style="display: flex; justify-content: space-around;">   </div>
<p>Lessons learned</p>	<p>From 20 kg grains, 10 kg bio-pesticides can be prepared. From 60 quintal grains (300 beneficiary x 20 kg), 30 quintal bio-pesticides were prepared per cycle. In four cycles in a year, around 120 quintal bio-pesticide were prepared on-farm. At a nominal cost of Rs. 100/- per kg, there were an annual turnover of Rs. 12 lakh during 2016-17.</p> <ul style="list-style-type: none"> • Farmers now don't depend upon pesticide shops mercy for timely supply of quality <i>Trichoderma</i>. • Some of the beneficiaries are acting as master trainer and thus disseminating the technology manifolds in the district • Farmers became enthusiastic in adoption of low cost on-farm mass production of other available bio-control agents like – Entomopathogenic fungi (<i>Metarhizium anisopliae</i>) <p>Considering the paucity and timely un-availability of quality bio-control agents in the markets of remote areas in Sundarbans, this project certainly brought smile to the farmers who are already aware of the malady of chemical farming. And hope this small effort help to take a little step towards sustainability of soil health and production of Green Food in collaboration with the Department of Agriculture, GoWB.</p>

Supporting quotes/images				Mr. Swapan Bhuiya, a veteran Betelvine grower from farthest Sagar Island has converted his entire boroz into organic farming and now has got the technological backup to continue it. Apart from <i>Trichoderma</i> , he has also explored production of <i>Metarhizium anisopliae</i> and mushroom spawn with the help of the training kit very successfully.
				Uttam Purkait from Patharpratima Block of South 24 Parganas district had miserable experience with fungal wilt of Tomato. He got some relief after using <i>Trichoderma</i> for the last one year. The infestation was reduced to 20% from 80% in the previous years. However he faced the problem of timely availability of good quality <i>Trichoderma</i> at the local market. After undergoing this training he is now producing his own <i>Trichoderma</i> on and often, whenever is required. He need not depend upon the pesticide dealer's will.
				Ashim Mondal of Kultali block in South 24 Parganas is now an inspiration to many of the rural youths of his village. Besides meeting his own farm demand, he is also producing <i>Trichoderma</i> for 20-22 neighbouring farmers. Till date he has trained another 5 rural youths in this technology.
				Mr. Amal Choudhury of Memari-I Block of Burdwan used the home made <i>Trichoderma</i> in a portion of his potato field. According to his observation, that particular portion of his potato field maintained a healthy growth against the late blight infested surrounding plots. Seeing this, around 20-25 farmers enquired Mr. Choudhury about the on-farm <i>Trichoderma</i> production technology. Few of them even called up KVK, Nimpith for such training. He also reported this success to the ADA of his Block to receive further encouragement.
Additional information	Parameters	Market available <i>Trichoderma</i> (popular Talc formulations)	<i>Trichoderma</i> produced by the trained farmers at their own farm	
	Accessibility to use of <i>Trichoderma</i> in remote villages	2.5 times per year	12 times per year	
	Cost of <i>Trichoderma</i>	Rs. 200 per kg	Rs. 50 per kg	
	Incidence of root rot, collar rot and fungal wilt diseases	20-30%	5-8%	