Welcome

Status of *Trichoderma* Research and Development in Bangladesh

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Isolation, Identification and efficacy tests of Trichoderma isolates in Bangladesh

Isolates	Organization involved
130 isolates collected, 5 effectively control various seedling diseases	Research organization (BARI)
55 isolates collected by Universities, 3 effectively control various seedling diseases	BAU, BSMRAU

Basic studies with *T. harzianum* isolate(s) conducted by Universities and Research institutes of Bangladesh

Study area	Results	References
Temperature, pH & compatibility to fungicides	30°C best for growing pH was 6.5, Ridomil and Rovral.	Begum and Bhuiyan (2004)
For formulation: Bran's from soybean, maize, seasame, rice, wheat, black gram and sawdust + peat soil as carrier of *T. harzianum*	Black gram was proved to be the best combined with peat soil	Ali and Meah, (2007)
Compatibility of *T. harzianum* with Vitavax	Vitavax 200 as soil drenching was found to be most effective against foot and tube rot of tuberose	Begum and Bhuiyan (2007)
Growth and storability study with 5 isolates of *T. harzianum*	(1) Growth was best for Teh-3 and TG-2 at 24 and 48 hrs; (2) Conidia production was higher for TBg-1 and Teh-3; (3) (3) Conidial they germinated 100% after 3 months of storing at 30C.	Sultana *et al.* (2001)

Efficacy of different isolates in controlling diseases of various crops in Bangladesh

Crops	*Pathogen*	Disease	Tested isolates	References
Tomato	*Meloidogyne*	Root-knot	W-108, W120, W-127, TB-1, TK and TY	Faruk *et al*., 1999
Bush bean	*Sclerotium rolfsii*	Foot rot	5 effective isolates	Faruk *et al*., 2002
Potato	*Sclerotium rolfsii*	Stem and tuber rot	6 effective isolates	Dey *et al*., 2004
Tuberose	*Sclerotium rolfsii*	Foot and Tube rot	18 isolates, R1 from rice found best	Islam and Bhuiyan. 2006
Eggplant	*Pythium spp.* *Sclerotium rolfsii* *Rhizoctonia spp.*	Damping off Foot rot Seedling blight	one isolates	Ali and Meah, 2007
Tomato	*Rhizoctonia solani* *Fusaium solani*	Seedling blight	5 effective isolates	Rahman., *et al* 2001

Production of Tricho-compost at BARI, Bangladesh

Material used
Cow dung
Poultry refuse
Waterhyacinth
Vegetable waste
Sawdust
Maize bran
Molases

Spore suspension of *T. harzianum* = 3x107/ml water

After loading the compost is ready to use at 42 days

Leachate flow by the whole

Composting house at BARI, Bangladesh

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Nutrient status of Tricho-compost at BARI, Bangladesh

Nutrient	Amount
pH	8.6
Organic Carbon (OC)	10.83 %
Total nitrogen (N)	1.11%
C:N	9.7:1
Phosphorus (P)	0.67%
Potassium (K)	1.15%
Sulpher (S)	0.2%
Calcium (Ca)	2.50%
Magnessium (Mg)	0.6 %
Copper (Cu)	0.03 %
Iron (Fe)	0.05 %
Manganese (Mn)	0.02%
Zinc (Zn)	0.03%
Boron (B)	0.015%
Nickel (Ni)	3.51 ppm
Lead (Pb)	11.75 ppm
Chromium (Cr)	12.75 ppm
Cadmium (Cd)	6.0 ppm
Arsenic (As)	1.504 ppm
Inert material	<1%

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After 42 days the compost and after sieving the compost dust with 16% mosture

IPM Package for Cabbage Production in Farmers' Field

Objective:

1. Raising healthy seedlings
2. Decrease pesticide use and Increase Production

Treatment:

A= Nursery

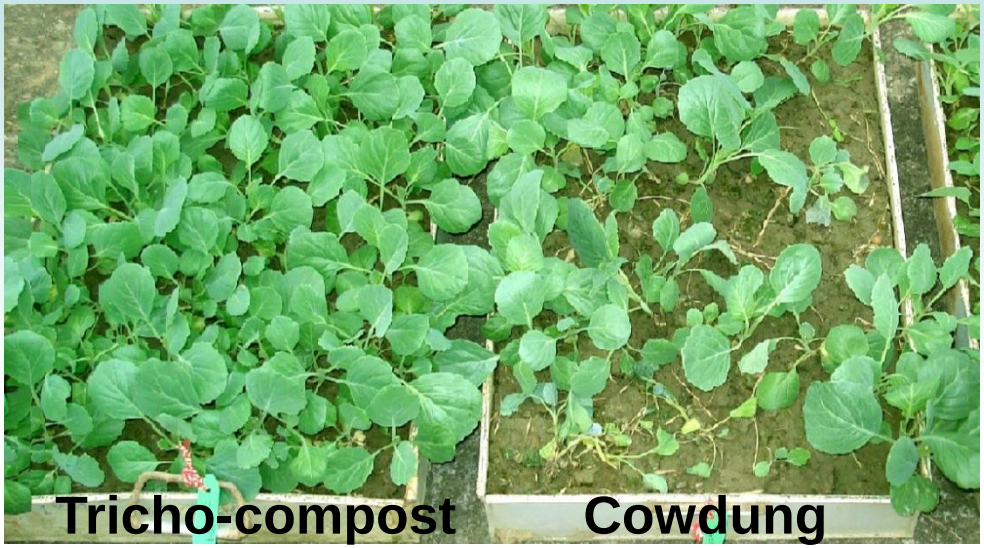
T_1=Tricho-compost @1.0 t/ha,
T_2= T1=Tricho-compost @1.5 t/ha,
T_3= T1=Tricho-compost @2.0 t/ha,
T_4= Framer's practice (Cowdung @ 5 t/ha + TSP @ 100kg/ha)

B= Main field

T_1= Tricho-compost @ 2.0 t/ha + ¾ $N_{180}P_{70}K_{120}S_{20}Zn_4B_2Mo_1$,
T_2 = Tricho-compost @ 2.5 t/ha +¾ $N_{180}P_{70}K_{120}S_{20}Zn_4B_2Mo_1$
T_3 = Tricho-compost @ 3.0 t/ha +¾ $N_{180}P_{70}K_{120}S_{20}Zn_4B_2Mo_1$
T_4 =Full recommended dose of $N_{180}P_{70}K_{120}S_{20}Zn_4B_2Mo_1$.

Pheromone trap for Spodoptera and hand picking of insect larvae twice a week

Efficacy of Tricho-compost in controlling seedling mortality



Pathogen *(Sclerotium rolfsii)* was inoculated in soil

Cabbage seedling

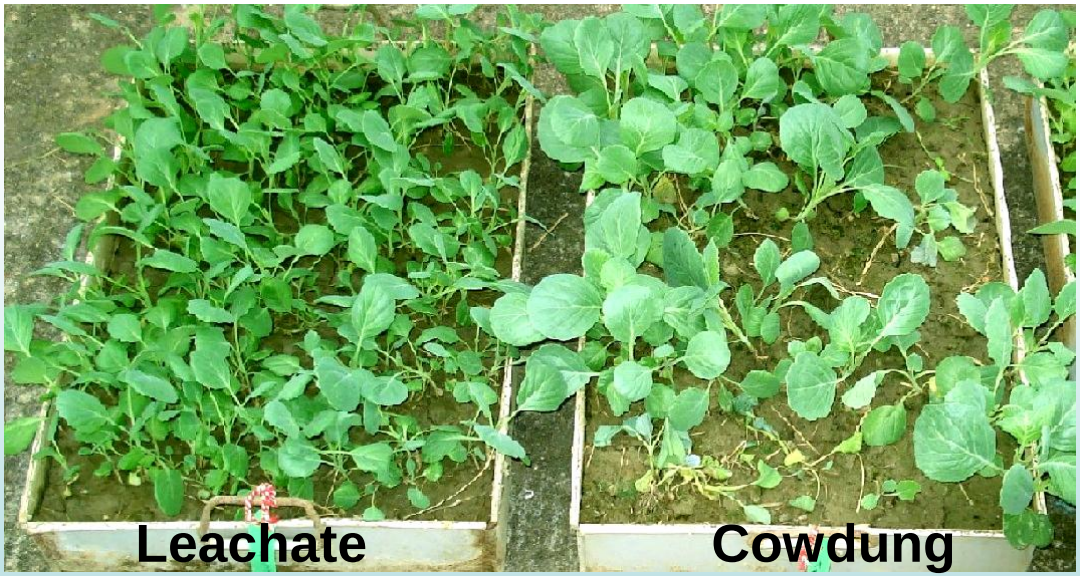


Table 1. Seedling mortality of cabbage under different treatments at farmers' field, Bogra

Treatment	Seedlings/ m^2	Dead seedlings /m^2	Mortality (%)	Mortality reduction (%)
T_1=Tricho-compost @ 1.0 t/ha	386.2	72.5	18.8	9.70
T_2=Tricho-compost @ 1.5 t/ha	394.5	62.2	15.8	12.7
T_3=Tricho-compost @ 2.0 t/ha	401.3	58.6	14.6	13.9
T_4= Cow dung @ 5 t/ha + TSP @ 100 kg/ha (Farmers' practice)	345.2	98.6	28.5	-

Table 2. Effect of different treatments on growth characteristics of cabbage seedlings

Treatment	Shoot height (cm)	Shoot height increased (%)	Fresh weight (g)	Fresh weight increased (%)	Dry weight (g)	Dry weight increased (%)
T_1=Tricho-compost @1.0 t/ha	15.56	20.4	21.03 b	16.63	1.78 a	24.5
T_2=Tricho-compost @1.5 t/ha	16.36	26.6	24.69 a	36.9	1.93 a	34.9
T_3=Tricho-compost @ 2.0 t/ha	17.03	31.8	26.02 a	44.3	1.98 b	38.5
T_4= Farmers' practice (Cow dung @ 5 t/ha + TSP @ 100 kg/ha)	12.92	-	18.03 c	-	1.43 c	-
p=0.05	NS		**		**	

Table 3. Plant mortality, head damage and yield of cabbage different treatments at farmers' field, Bogra

Treatment	Mortality due to pathogen (%)	Head damage due to insect (%)	Total biomass per head (Kg)	Marketable yield per head (Kg)	Yield (t/ha)	Yield increase over control (t/ha)
T_1=Tricho-compost @ 3.0 t/ha+ ¾ Chemical fertilizer	2.4 b	5.70 c	3.53	2.37 a	75.8	19.8
T_2=Tricho-compost @ 2.5 t/ha + ¾ Chemical fertilizer	4.1 c	6.90 c	2.84	2.12 ab	67.8	11.8
T_3=Tricho-compost @ 2.0 t/ha + ¾ Chemical fertilizer	5.2c	7.2b	2.31	1.98ab	63.3	7.3
T_4= Only Chemical fertilizer	17.9 a	8.50 a	2.1	1.75 b	56.0	-
P=0.05	*	**	NS	**		

Table 4. Cost benefit analysis for summer cabbage at farmers' field, Bogra

Treatment	Yield (kg/ha)	Gross return (Tk)	Fixed Cost (Tk)	variable cost (Tk)	Total cost (Tk)	Net Return (Tk)	BCR
T_1	75800	909600	25000	99000	124000	785600	7.3
T_2	67800	813600	25000	93000	118000	695600	6.9
T_3	63300	759600	25000	87000	112000	647600	6.6
T_4	55000	660000	25000	84000	109000	551000	6.0

Tk.12.0/kg of cabbage, Chemical fertilizer=$N_{180}P_{70}K_{120}S_{20}Zn_4B_2Mo_1$

T_1: Tricho-compost @ 3.0 t/ha+ ¾ Chemical fertilizer,
T_2: Tricho-compost @ 2.5 t/ha + ¾ Chemical fertilizer,
T_3: Tricho-compost @ 2.0 t/ha + ¾ Chemical fertilizer,
T_4: (Farmer's practice) =Only Chemical fertilizer.

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Head damage by Spodoptera and catch of insect by Pheromone trap

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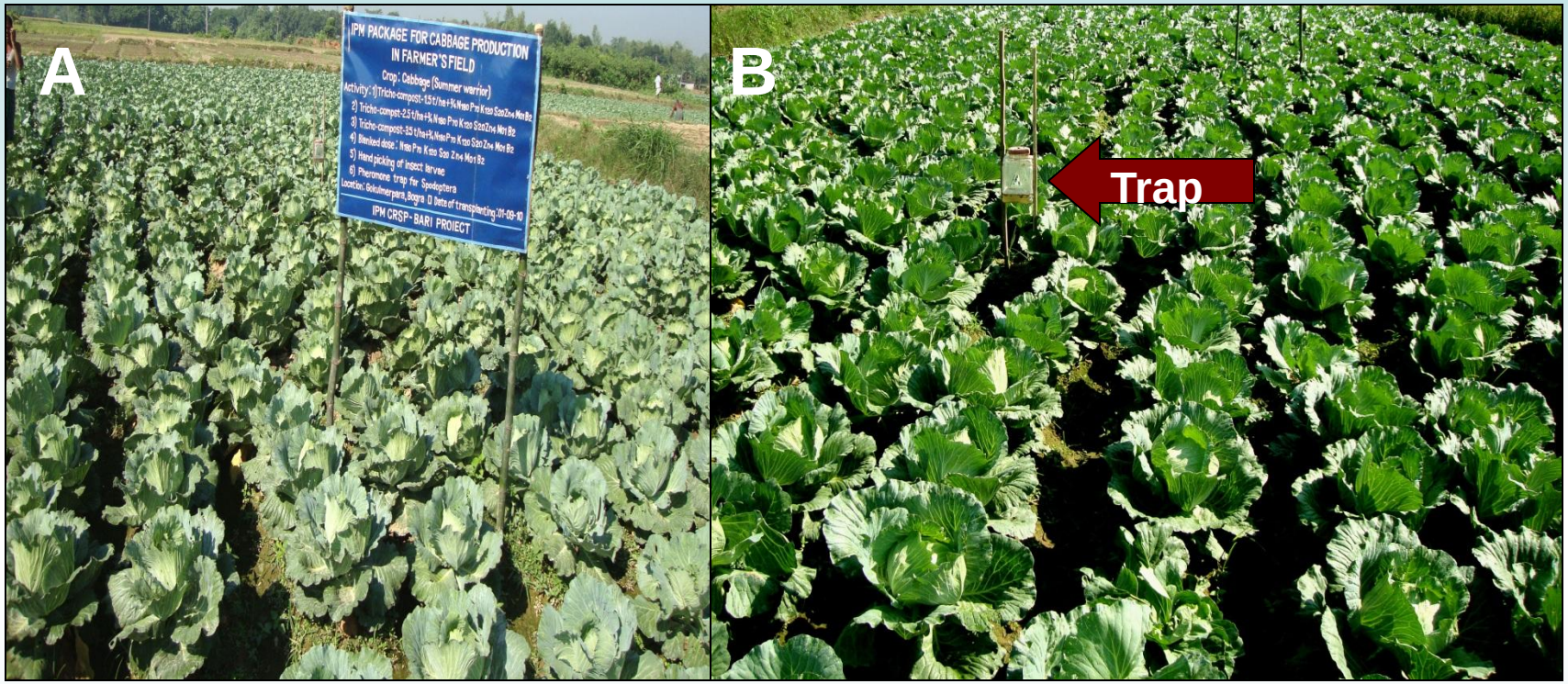

A. Chemical Fertilizer + Insecticide,

B. Application of Tricho-compost + *S. litura* Pheromone

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IPM Practice **Farmer's practice**

Farmers are happy and interested to use IPM technology

Development works

Two organizations

1. MCC and its Partner organization

2. GKSS at Bogra

Production of Tricho-Compost by GKSS

House for Tricho-compost production

House at BARI

Size: 5 ft x 10 ft x 4.5 ft

House at Bogra,
NGO's - MCC & GKSS

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Poultry refuse

Water hyacinth

Trichoderma

Molases

TRICHO-COMPOST

- **Raw materials in Tricho-compost**

  Cowdung, poultry refuse, water-hyacinth, vegetable waste, Sawdust, Maize bran and molasses were mixed in a definite proportion.

- **Spray of spore suspension ($3x10^7$cfu) of *Trichoderma* @ 1L/ t**

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After 40-45 days

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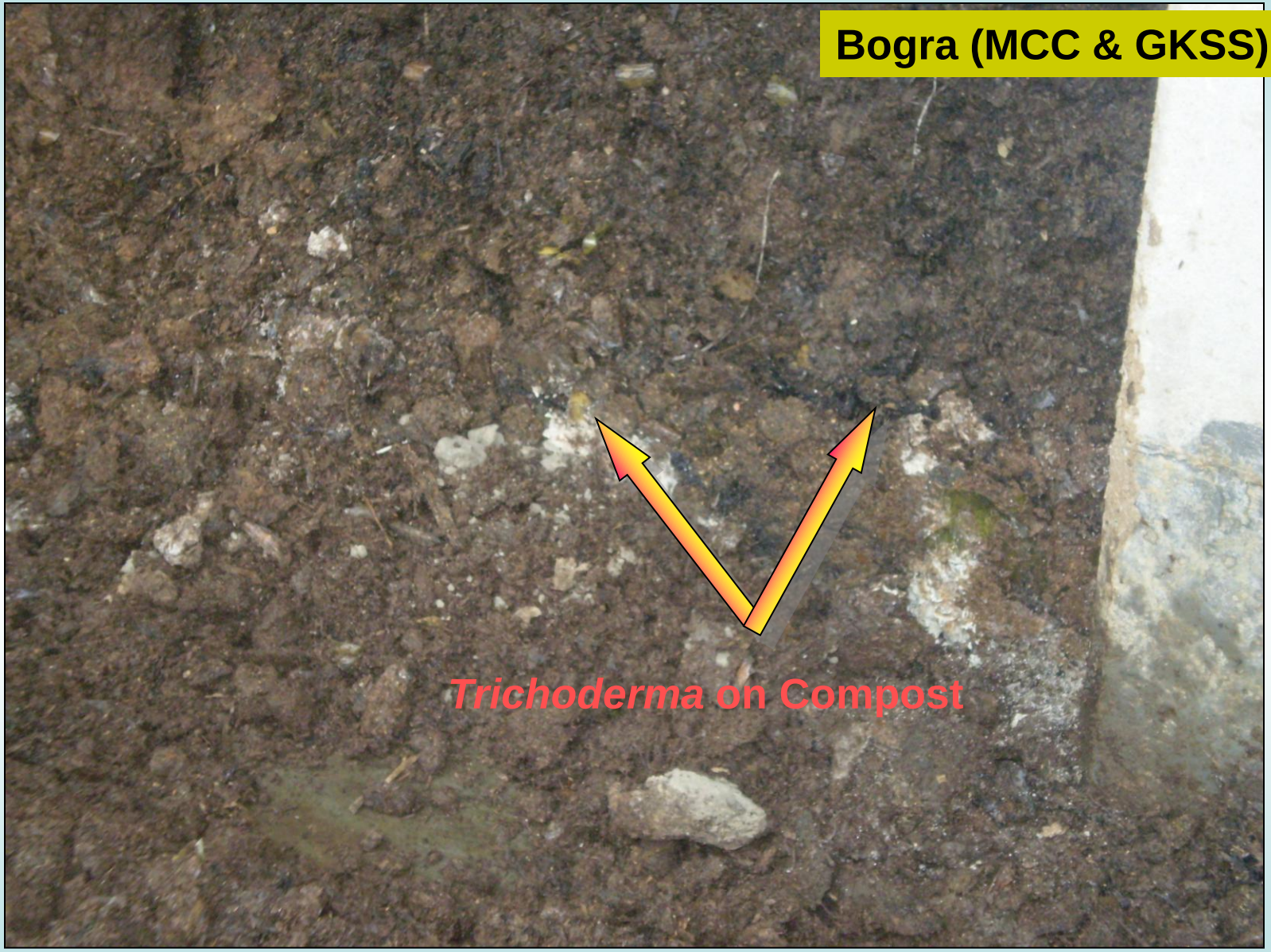

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US team visisting GKSS , Gabtali Bogra

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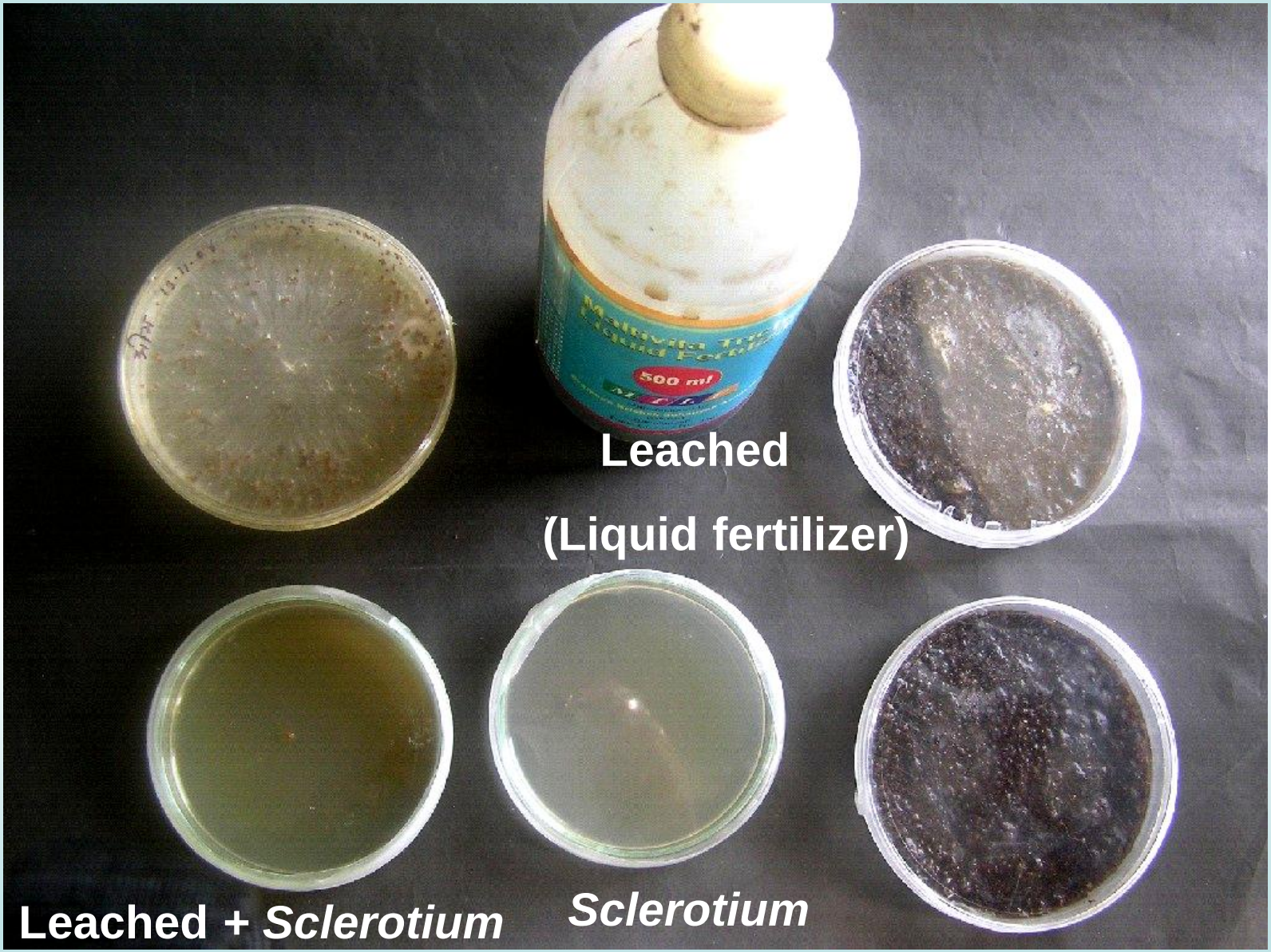


Chemical analysis compost, poultry litter & leachate

Indicator	Tricho-compost	Poultry refuse	Leachate
pH	8.6	6.9	6.4
OC (%)	20	19.0	2.05
Ca (%)	1.71	4.9	-
Mg (%)	0.4	1.7	-
K2O (%)	0.93	0.4	0.50
N (%)	1.2	1.7	0.01
P2O5 (%)	1.41	0.7	0.05
S (%)	0.24	0.4	0.10
B (%)	0.01	0.06	-
Cu (%)	0.01	0.004	-
Fe (%)	0.12	0.23	-
Mn (%)	0.026	0.07	-
Zn (%)	0.02	0.021	0.003

Gabtoli, Bogra

US Scientist

Bogra

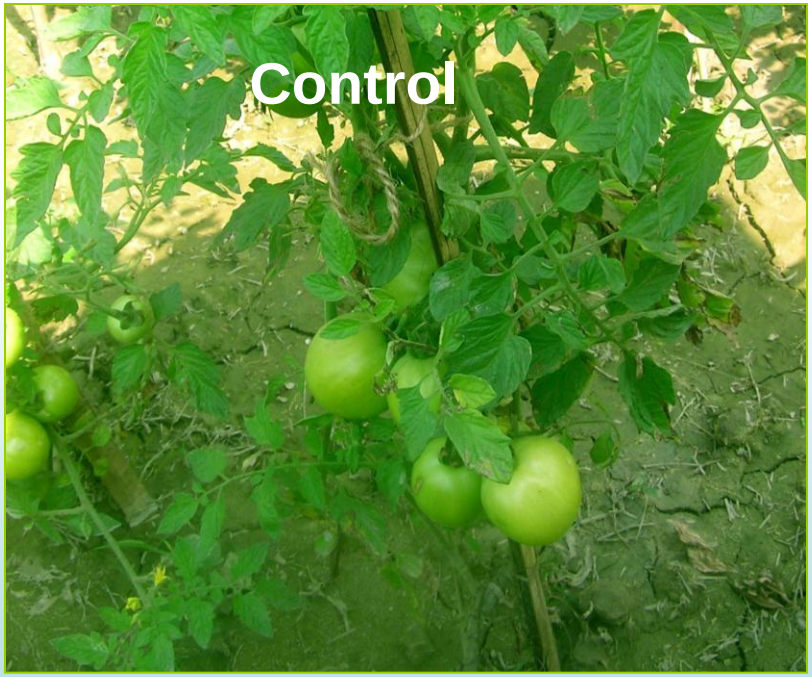
Cabbage production at BARI, Gazipur

Effect of Tricho-compost on weight and diameter of cabbage

Treatment	Diameter (cm)	Head weight (kg)	Biomass weight (kg)
Tricho-compost	14.61	2.01	2.61
Control	12.66	1.44	2.02
"t" test	0.0129	0.012	0.009

Tricho-compost: Tricho-compost @ 3 t/ ha + 1/4 of recommended chemical fertilizers

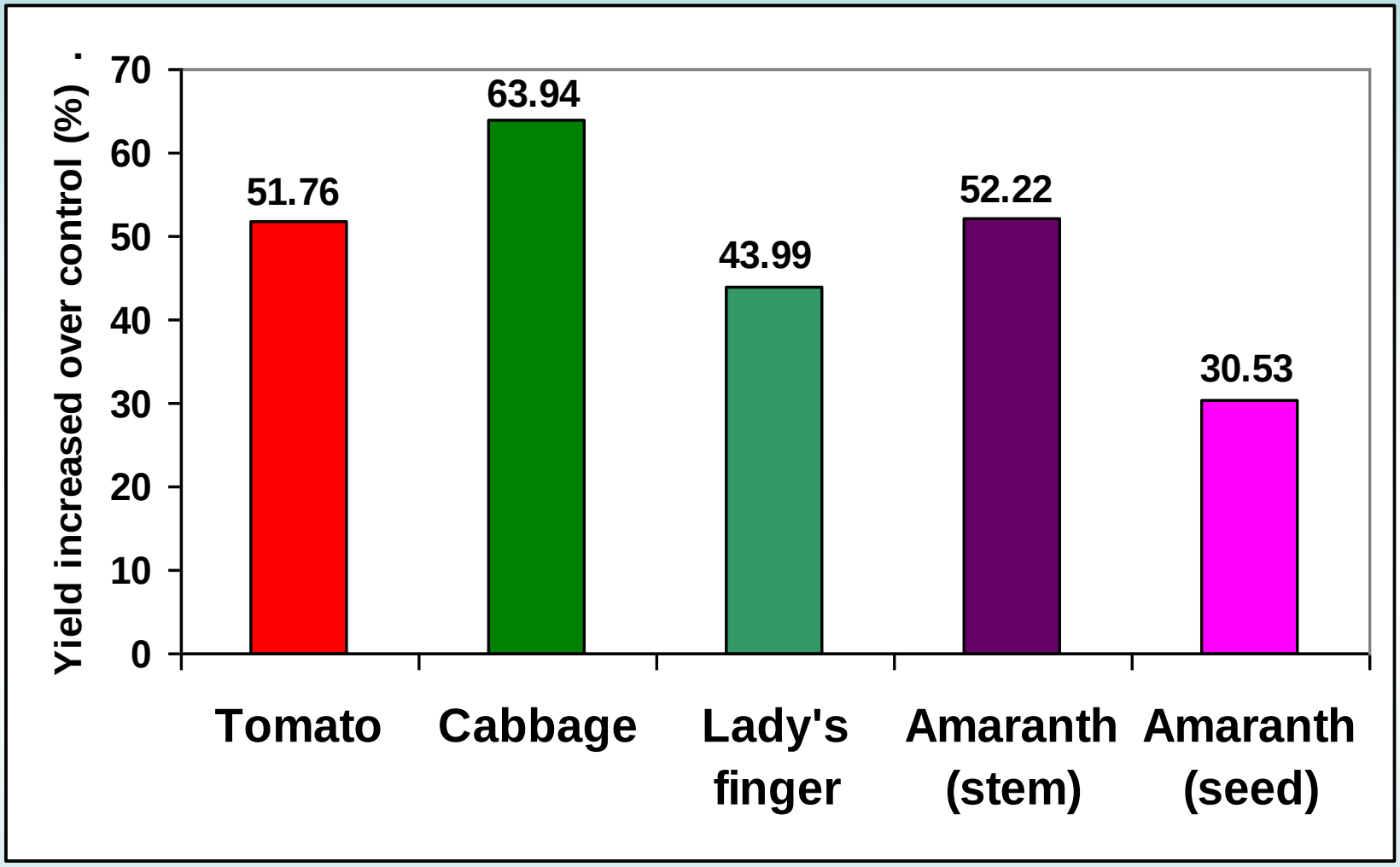
Control: Recommended fertilizer doses



Experimental plot, BARI, Gazipur

Effect of Tricho-compost on yield of some vegetable crops

Treatment	Yield (t//ha)			
	Tomato	Cabbage	Lady's finger	Stem amaranth
Trcho-compost	71.63	70.87	19.75	19.44
Control	47.20	43.23	13.71	13.28
"t" test	0.007	0.006	0.012	0.012



Yield increased over control due to application of Tricho-compost

Conclusion

Tricho-compost reduced disease incidence & increased yield (30 to 60 %) compared to chemical fertilizer treatment

Activities done by MCC Bogra and Its partner organization

Production of compost by farmers (Women) using ring and leachate as secondary product (GUK)

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Compost producing in Pasbibi, Joypurhat by Women farmers

Farmer's level production NGO- MCC activities

Tricho-leachate-compost application fields

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-Activity done by MCC

1. Shahjanpur, Bogra

(Gramin Unnaon Prokalpo)

2. Pasbibi, Joypurhat

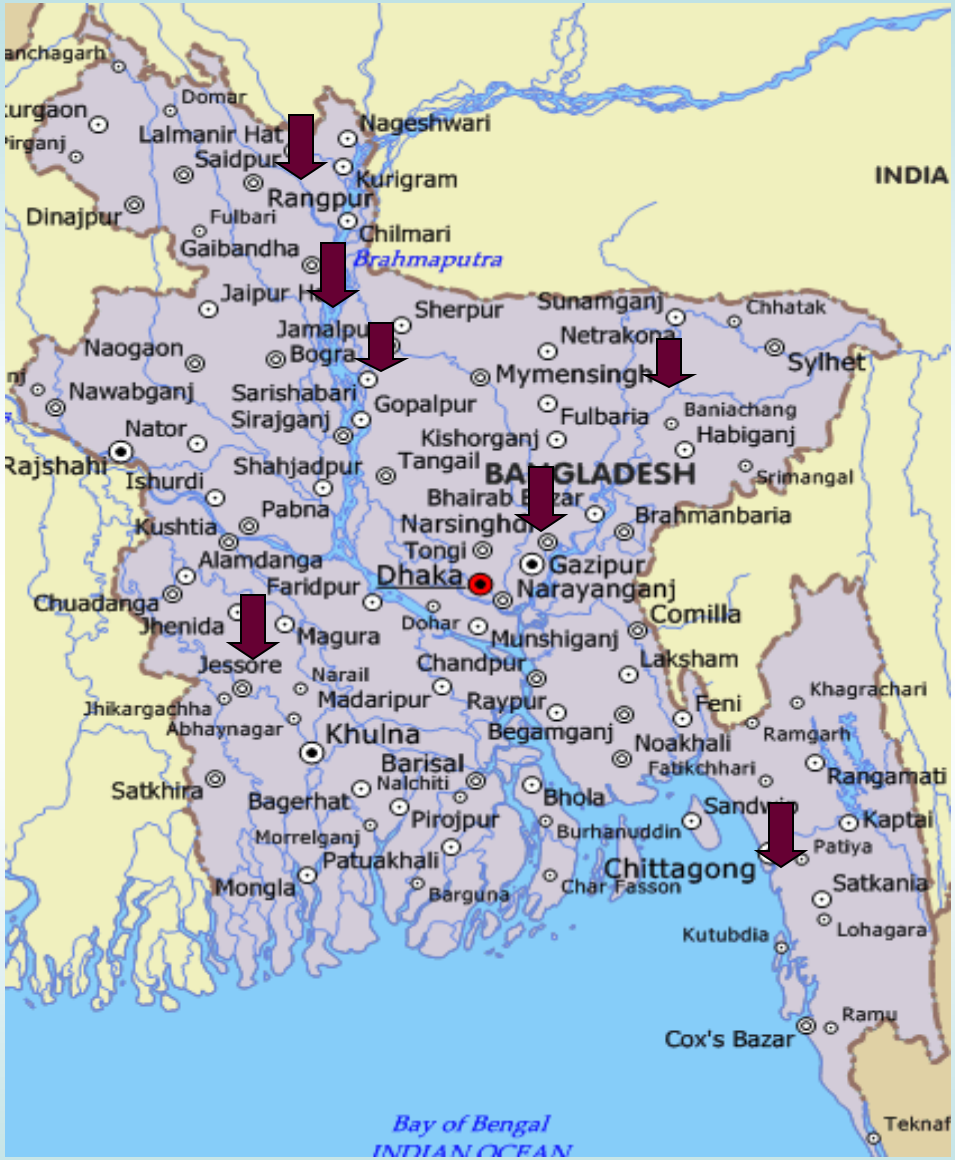
(Pasbibi Upazala Adibashi Multiperpose Divelopment Organization)

3. Pirgonj, Rangpur

(Student& their family)

- IPM BARC

- GKSS



Application of Tricho-compost by farmers at different regions of Bangladesh

Commercial production

(2009- 2011)

Production (ton)	:	607.00
Sale (ton)	:	596.00
Training (person)	:	6880
Farmer use (person)	:	5100
Land covered (ha)	:	1030
Demonstration	:	69

Publications

1. Faruk, M. I., M. A. Bari, **M. A. Rahman**, M. S. Nahar and N. N. Khanam. 1999. Suppression of root-knot *(Meloidogyne*) of tomato using antagonistic isolates of *Trichoderma* species. Bangladesh J. Plant Pathology 15(1&2): 39-42.

2. Faruk, M. I., M. A. Bari and **M. A. Rahman**. 2002. Efficacy of *Trichoderma* as biocontrol agent against foot and root rot of bush bean. Bangladesh J. Agril. Res. 27 (4): 657-662.

3. Nahar, M. S., **M. A. Rahman,** G. N. M. Ilias, M. A. Rahman, L. Yasmin, M. Afroz, A. N. M. Rezaul Karim and S. A. Miller. 2010. Effect of tricho-compost on soil-borne diseases and production of some vegetable crops. Bangladesh J. Plant Pathology 26(1&2):1-7.

4. Nahar, M. S., **M. A. Rahman**, M. Afroz, M, Mahfuz, A. N. M. Rezaul Karim and S. A. Miller. 2011. Tricho-compost and tricho-leachate: bio-products for effective management of soil borne disease pathogens and production of healthy seedlings. In: M. B. Meah (ed.) Proceeding of the 4th International Conference for the Development of Integrated Pest Management in Asia and Africa., held at Mymensingh, Bangladesh, 20-22 January, 2011. 4:140-147.

Thank You