Government of India
Ministry of Agriculture & Farmers Welfare
Department of Agriculture, Cooperation & Farmers Welfare
Directorate of Plant Protection, Quarantine & Storage
Central Insecticide Board & Registration Committee N.H.-IV,
Faridabad-121001 (Haryana)

MAJOR USES OF BIO-PESTICIDES

(Registered under the Insecticides Act,1968)

(UPTO - 30/06/2020)

(Based on certificate issued)

***Disclaimer**: The document has been compiled on the basis of available information for guidance and not for legal purposes.*

BIO-PESTICIDES

1. Major uses of Bio-Fungicides

Name of Crop	Common name of the Disease	Dose/ha		Dilution in water (liter/ha)	Waiting period (Days)
		a.i. (g)	Formulation (g/ml)/%		
Neem oil based EC containing, Azadirachtin 0.030% (300 ppm)					
Bhindi	Powdery mildew	-	02-2.50	500	03
***Pseudomonas fluorescens* 1.75% WP (In house isolated Strain Accession No. MTCC 5176)**					
Wheat	Loose smut	-	05 g/kg seed (Seed treatment)	Mix the required quantity of seeds with the required quantity of *Pseudomonas fluorescens* 1.75% WP formulation and ensure uniform coating. Shade dry and sow the seeds.	-
		-	05 g/litre (Foliar spray)	Dissolve 5 kg of *Pseudomonas fluorescens* 1.75% WP in 1000 litres of water and spray	
***Bacillus subtilis* 1.50% L.F (T Stanes Bs-1 Strain MTCC 25072)**					
Banana	Sigatoka (*Mycosphaerella musicola*)	-	5 Liter/ha (Foliar spray)	750 Liter/ha	-
***Pseudomonas fluorescens* 2.0% AS (Strain No. IPL/PS-01, Accession No. MTCC 5727)**					
Paddy	Bacterial leaf blight (*Xanthomonas oryzae* pv. oryzae)	-	10 ml/litre of water	**Seedling Root Dip Treatment:** Mix 10 ml of	Nil

				Pseudomonas fluorescens 2.0% AS in one litre of water and dip the paddy seedling root for 30 minutes before transplanting followed by foliar application after 40-45 days of transplantation.	
		-	1.87-2.50 litre/ha	**Foliar Spray:** Suspend 1.87 to 2.50 litre of *Pseudomonas fluorescens*2.0% AS in 500 litre of water and spray uniformly after 40-45 days of transplantation over one hectare land 2-3 spray are required depending upon the disease incidence at interval of 10-12 days using a hand operated Knapsack sprayer or power sprayer fitted with a hollow cone nozzle.	Nil
***Bacillus subtilis* 2.0% AS (Strain No. IPL/BS-09, Accession No. MTCC 5728)**					

Paddy	Bacterial leaf blight (*Xanthomonas oryzae* pv. oryzae)	-	10 ml/litre of water	**Seedling Root Dip Treatment:** mix 10ml of *Bacillus subtilis* 2.0% AS in one litre of water and dip the paddy seedling root for 30 minutes before transplanting followed by foliar application.	Nil
		-	1.87-2.50 litre/ha	**Foliar Spray:** Suspend 1.87 to 2.50 litre of *Bacillus subtilis* 2.0% AS in 500 litre of water and spray uniformly after 40-45 days of transplantation over one hectare land 2-3 spray are required depending upon the disease incidence at interval of 10-12 days using a hand operated Knapsack sprayer or power sprayer fitted with a hollow cone nozzle.	Ni
***Pseudomonas fluorescens* 0.5% WP (TNAU Strain Accession No. ITCC BE 0005)**					
Groundnut	Late leaf spot	-	10 g/kg seed	**Seed Treatment:**	-

				Mix the required quantity of seeds with the required quantity of *Pseudomonas fluorescens* 0.5% WP formulation and ensure uniform coating. Shade dry and sow the seeds.	
		-	1 kg/ha	**Soil Treatment:** 01 kg of *Pseudomonas fluorescens* 0.5% WPspread uniformly over 1 hectare of land (foliar spray @ 2%).	-
Rice	Leaf and neck blast (*Pyricularia oryzae*)	-	10 gm/kgseed	**Seed Treatment:** Mix required quantity of the seeds with the required quantity of *Pseudomonas fluorescens* 0.5% WP.	Nil
		-	1 kg/ha	**Soil Treatment:** Broadcast 1 kg *Pseudomonas fluorescens* 0.5% WP by mixing with 2.5 kg organic manure in one	-

				ha area.	
		-	1 kg/ha	**Foliar spray:** Spray 0.5% WP @ 1 kg/ha	-
Chili seedlings	Damping off (*Pythium aphanidermatum*)	-	10 g/kg seed	**Seed Treatment:** Mix required quantity of the seeds with the required quantity of *Pseudomonas fluorescens* 0.5% WP and ensure uniform coating, shade dry and sow	Nil
Tomato	Wilt (*Fusarium oxysporum* F.sp.)	-	10 gm/kg of seeds	**Seed Treatment:** Mix required quantity of the seeds with the required quantity of *Pseudomonas fluorescens* 0.5% WP and ensure uniform coating, shade dry and sow	Nil
			2.5 kg/ha	**Soil Treatment:** 2.5 kg of *Pseudomonas fluorescens* 0.5% WP Spread uniformly over a hectare of land	Nil
Cotton	Bacterial Leaf blight	-	10 g/kg seed	Seed treatment- Mix required	Nil

				quantity of the seeds with the required quantity of *Pseudomonas fluorescens* WP and ensure uniform coating with 0.2% Foliar spray, shade dry and sow	
***Pseudomonas fluorescens* 1.5% WP (BIL-331 Accession No. MTCC5866)**					
Paddy	Bacterial Leaf blight (*Xanthomonas oryzae*),Blast (*Pyricularia oryzae*),Leaf spot (*Helminthosporium oryzae*)	-	5 gm/kg of seed	**Seed Treatment:** Make a thin paste of required quantity of *Pseudomonas fluorescence* 1.5% WP with min. volume of water and coat the seed uniformly, shades dry the seeds just before showing.	Nil
		-	2.5 kg /ha	**Soil Treatment:** Mix 2.5 kg of *Pseudomonas fluorescens* 1.5% WP with 50 kg FYM or and broadcast uniformly over hectare of land 30 days after planting.	Nil
***Pseudomonas fluorescens* 1.0% WP (IPL/PS-01 Accession No. MTCC5727)**					

Tomato	Wilt (*Fusarium oxysporum*), Damping Off (*Pythium aphanidermatum*), Root rot (*Rhizoctonia* spp.)	-	5 gm/kg of seed	**Seed Treatment:** Make a thin paste of required quantity of *Pseudomonas fluorescens* 1.0% WP with the minimum volume of water & coat the seed uniformly, shade dry the seed just before sowing.	Nil
		-	2.5 kg/ha	**Soil Treatment:** Mix 2.5kg of *Pseudomonas fluorescens* 1.0% WP with 62.5 kg FYN and broadcast uniformly over a hectare of land.	Nil
		-	10gm/litres of water	**Seedling Root Dip Treatment:** Mix 10 gm of *Pseudomonas fluorescens* 1.0% WP in one litre of water and dip the tomato seedling root rot for minutes.	Nil
***Pseudomonas fluorescens* 1.0% WP (Strain No. IIHR-PF-2 Accession No. ITCCB0034)**					
Tomato	Wilt (*Fusarium oxysporum*)	Treat the seed with *Pseudomonas fluorescens*1.0% WP @ 20 gm/kg of seeds & treat the nursery beds with the			

		*Pseudomonas fluorescens*1.0% WP @ 50gm/sq.m and apply Pseudomonas fluorescens1.0% WP @ 5 kg/ha enriched FYM* @ 5 tons/ha to the soil before transplanting.			
Brinjal	Wilt (*Fusarium solani*)	Treat the seed with *Pseudomonas fluorescens* 1.0% WP @ 20 gm/kg of seeds & treat the nursery beds with the *Pseudomonas fluorescens* 1.0% WP @ 50 gm/sq.m and apply Pseudomonas fluorescens 1.0% WP @ 5 kg/ha enriched FYM* @ 5 tons/ha to the soil before transplanting.			
Carrot	Root rot (*Athelia rolfsii*)	Treat the seed with *Pseudomonas fluorescens*1.0% WP @ 20gm/kg of seeds and apply *Pseudomonas fluorescens*1.0% WP @ 5 kg/ha enriched FYM* @ 5tons/ha to the soil before sowing.			
Okra	Wilt (*Fusarium oxysporum*)	Treat the seed with *Pseudomonas fluorescens* 1.0% WP @ 20 gm/kg of seeds and apply *Pseudomonas fluorescens* 1.0% WP @ 5 kg/ha enriched FYM* @ 5 tons/ha to the soil before sowing.			
***Pseudomonas fluorescens* 1.5% AS (Strain Accession No. MTCC - 2539)**					
Groundnut	Late leaf spot	-	10 ml/kg seed	**Seed Treatment:** Mix the required quantity of seeds with the required of *Pseudomonas fluorescens* 1.5% AS and ensure uniform coating. Shade dry and sow the seeds.	Nil
		-	01 litre/ha	**Soil Treatment:** 1 Litre of *Pseudomonas fluorescens* 1.5% AS spread	Nil

				uniformly over 1 hectare of land (foliar spray @ 0.2%)	
***Trichoderma harzianum* 0.50% WS**					
Cardamom	Capsule rot (*Phytophthora meadii*)	-	100 gm/plant	**Soil Treatment:** Apply 100 gm product/ plant along with Neem cake (0.5 kg/plant) and 5 kg FYM/plant	-
***Trichoderma harzianum* 1.0% WP(Strain No. IIHR-TH-2 Accessions No. ITCC6888**					
Tomato	Wilt (Fusarium Oxysporum)	Treat the seed with *Trichoderma harzianum* 1.0% WP @ 20 gm/kg of seeds & treat the nursery beds with the *Trichoderma harzianum* 1.0% WP @ 50 gm/sq.m and apply *Trichoderma harzianum* 1.0% WP @ 5 kg/ha enriched FYM*@5tons/ha to the soil before transplanting.			
Brinjal	Wilt (*Fusarium solani*)	Treat the seed with *Trichoderma harzianum* 1.0% WP @ 20 gm/kg of seeds & treat the nursery beds with the *Trichoderma harzianum*1.0% WP @ 50gm/sq.m and apply *Trichoderma harzianum* 1.0% WP @ 5kg/ha enriched FYM*@5tons/ha to the soil before transplanting.			
Carrot	Root rot (*Sclerotium rolfsii)*	Treat the seed with *Trichoderma harzianum* 1.0% WP @ 20gm/kg of seeds and apply *Trichodermaharzianum* 1.0% WP @ 5kg/ha enriched FYM*@ 5tons/ha to the soil before sowing.			
Okra	Wilt (*Fusariumoxysporum*)	Treat the seed with *Trichoderma harzianum* 1.0% WP @ 20gm/kg of seeds and apply *Trichoderma harzianum*1.0% WP @ 5kg/ha enriched FYM*@ 5tons/ha to the soil before sowing.			
***Trichoderma harzianum* 2.0% WP (NBRI-1055)**					
Maize	Root rot (*Fusarium moniliforme*),	-	20 gm/kg seed	**Seed Treatment:** Make a thin	-

	Fusarium wilt			paste of required quantity of *Trichoderma harzianum* 2.0% WP with minimum volume of water and coat the seeds uniformly, shade dry the seeds just before sowing.	
***Trichoderma viride* 1.0% WP**					
Pigeon pea	Wilt, Root rot	-	8 gm /kg seed	Seed Treatment	Nil
		-	5.0 kg/ha	Soil Treatment	Nil
Pulses (Cowpea, Mung bean, Urdbean)	Root rot	-	4 g/kg of seed	Seed Treatment	Nil
Chilli	Damping off	-	4 g/kg of seed	Seed Treatment	Nil
Trichoderma viride 1.0% WP (TNAU Strain Accession No. ITCC 6914)					
Cowpea	Root Rot	-	5 gm/kg seed	**Seed Treatment:** Make a fresh slurry of required quantity of *Trichoderma viride* 1.0% WP with minimum volume of water and coat the seeds uniformly, shade dry the seeds just	Nil

				before sowing.	
		-	2.5 kg/ha	**Soil Treatment:** Mix 2.5 kg of *Trichoderma viride* 1.0% WP with 62.5 kg FYM and broadcast uniformly over a hectare of land and irrigate the field immediately	Nil
Chili seedlings	Damping off (*Pythium aphanidermatum*)	-	4 g/kg seed	**Seed Treatment:** Mix required quantity of the seeds with the required quantity of *Trichoderma viride* 1.0% WP and ensure uniform coating shade dry and sow	Nil
Urd bean	Root rot (*Macrophomina phaseolina*)	-	4 g/kg seed	**Seed Treatment:** Mix required quantity of the seeds with the required quantity of *Trichoderma viride* 1.0% WP and ensure uniform coating shade dry and sow	Nil
Pigeon pea	Root rot (*Macrophomina phaseolina*)	-	4 g/kg seed	**Seed Treatment:**	Nil

				Mix required quantity of the seeds with the required quantity of *Trichoderma viride* 1.0% WP and ensure uniform coating shade dry and sow	
***Trichoderma viride* 1.0% WP (Strain T-14 in house isolate of M/s Indore Biotech Inputs & Research (P) Ltd., Indore)**					
Chickpea	Wilt (*Fusarium oxysporum*)	-	5 gm/kg seed	**Seed Treatment:** Make slurry of required quantity of Trichoderma viride 1.0% WP with minimum volume of water & coat the seeds uniformly, shade dry the seeds just before sowing	-
	Root Rot (*Rhizoctonia solani* & *Sclerotiumrolfsii*)	-	5.0 kg/ha	**Soil Treatment:** Mix 5.0 kg of *Trichoderma viride* 1.0% WP in 100 kg FYM and broadcast over a hectare land mix well with soil and irrigate the field immediately.	-
Paddy	Sheath blight (*Rhizoctonia solani*)	-	5-10 gm/litre of water	**Foliar spray:** Mix 2.5 kg of Trichoderma	-

				viride 1.0% WP in 500 litres of water. Spray three times at 15 days interval uniformly over one hectare land 30 days after planting	
***Trichoderma viride* 1.5% WP (Strain No. IIHR-TV-5, Accession No. ITCC 6889)**					
Tomato	Wilt (*Fusarium oxysporum*)	Treat the seed with T*richoderma viride* 1.5% WP @ 20 gm/kg of seeds & treat the nursery beds with the *Trichoderma viride* 1.5% WP @ 50 gm/sq.m and apply Trichoderma viride 1.5% WP @ 5 kg/ha enriched FYM* @ 5 tons/ha to the soil before transplanting.			
Brinjal	Wilt (*Fusarium solani*)	Treat the seed with *Trichoderma viride* 1.5% WP @ 20 gm/kg of seeds & treat the nursery beds with the *Trichoderma viride* 1.5% WP @ 50 gm/sq.m and apply *Trichoderma viride* 1.5% WP @ 5 kg/ha enriched FYM*@5tons/ha to the soil before transplanting.			
Carrot	Root rot (*Sclerotium rolfsii*)	Treat the seed with *Trichoderma viride* 1.5% WP @ 20 gm/kg of seeds and apply *Trichoderma viride* 1.5% WP @ 5 kg/ha enriched FYM* @ 5 tons/ha to the soil before sowing.			
Okra	Wilt (*Fusarium oxysporum*)	Treat the seed with *Trichoderma viride* 1.5% WP @ 20 gm/kg of seeds and apply *Trichoderma viride* 1.5% WP @ 5 kg/ha enriched FYM* @ 5 tons/ha to the soil before sowing.			
Trichoderma viride 1.0% WP(IPL/VT/101)					
Cauliflower	Stalk rot (*Sclerotinia sclerotiorum*)	-	4 gm/kg seed	**Seed Treatment:** Make a thin paste of required quantity of *Trichoderma viride* 1.0% WP with minimum volume of water	-

				and coat the seeds uniformly, shade dry the seeds just before sowing	
		-	2.50 kg/ha	**Soil Treatment:** Mix 2.5 kg of *Trichoderma viride* 1.0% WP with 62.5 kg FYM and broadcast uniformly over a hectare of land and irrigate the field immediately	-
Brinjal	Root Rot/ Wilt/ Damping off (*Rhizoctonia bataticola, Sclerotium rolfsii, Fusarium oxysporum, Rhizoctonia solani*)	-	5 gm/kg seeds	**Seed Treatment:** Make a thin paste of required quantity of *Trichoderma viride* 1.0% WP with minimum volume of water and coat the seeds uniformly, shade dry the seeds just before sowing	
		-	250 gm/50 litre of water/400 sq. m	**Nursery Treatment:** Mix 250 gm of *Trichoderma viride* 1.0% WP in 50 litres of water and drench the soil	-

				in 400 sq.m area	
		-	10 gm/litre of water	**Seedling Root dip Treatment:** Mix 10 gm of Trichoderma *viride 1.0% WP in one* litre of water and dip the Brinjal seedling root for 15 minutes	-
		-	2.5 kg/ha	**Soil Treatment:** Mix 2.5 kg of *Trichoderma viride* 1.0% WP with 62.5 kg FYM and broadcast uniformly over a hectare of land and irrigate the field immediately	
Cabbage	Root rot/Collar rot (*Rhizoctonia solani*)	-	10 gm/litre water	**Seedling Root dip Treatment:** Mix 10 gm of *Trichoderma viride* 1.0% WP in one litre of water and dip the Cabbage seedling root for 30 minutes	-
		-	2.5 kg/ha	**Soil Treatment:** Mix 2.5 kg of *Trichoderma viride* 1.0% WP with 62.5 kg FYM and broadcast	-

				uniformly over a hectare of land and irrigate the field immediately	
***Trichoderma viride* 1.0% WP**					
Tomato	Seedling wilt (*Fusarium oxysporum*), Damping off (*Pythium aphanidermatum, Rhizoctonia solani*)	-	9 g/kg seed	**Seed Treatment:** Mix 9 kg of the product per kg seed.	-
		-	2.5 kg/ha	**Root zone application:** Mix thoroughly 2.5 kg of the product in 150 kg of compost or farmyard manure and apply this mixture in the field after sowing/ transplanting of crops	-
Bengal gram	Seedling wilt (*Fusarium oxysporum*), Damping off (*Pythium aphanidermatum, Rhizoctonia solani*)	-	9 g/kg seed	**Seed Treatment:** Mix 9 kg of the product per kg seed.	-
		-	2.5 kg/ha	**Root zone application:** Mix thoroughly 2.5 kg of the product in 150 kg of compost or farmyard manure and apply this mixture in the field after	-

				sowing/ transplanting crops	
***Trichoderma viride* 1.0% WP**					
Sunflower	Seed rot (*Sclerotium rolfsii*), Root rot (*Sclerotium rolfsii*)	-	6 g/kg seed	**Seed Treatment:** Mix required quantity of the seeds with the required quantity of product in rice gruel, ensure uniform coating, shade dry and sow	-
		-	1.25-2.5 kg/ha	**Soil Treatment:** Mix with 30-60 kg of compost/ farmyard manure and spread uniformly over 1 hectare of land.	-
***Trichoderma viride* 1.0% WP (TNAU Strain Accession No. ITCC 6914)**					
Pigeon pea	Root rot (*Macrophomina phaseolina*)	-	4 gm/kg seed	**Seed Treatment:** Mix required quantity of the seeds with the required quantity of *Trichoderma viride* 1.0% WP and ensure uniform coating, shade dry and sow	-

Urd bean	Root rot (*Macrophomina phaseolina*)	-	4 gm/kg seed	**Seed Treatment:** Mix required quantity of the seeds with the required quantity of Trichoderma viride 1.0% WP and ensure uniform coating, shade dry for 24 hours and sow	-
***Pseudomonas fluorescens* 1.5% AS (Strain Accession No. MTCC - 2539)**					
Groundnut	Late leaf spot	-	10 ml/kg seed	**Seed Treatment:** Mix the required quantity of seeds with the required of *Pseudomonas fluorescens* 1.5% AS and ensure uniform coating. Shade dry and sow the seeds.	NIL
		-	1 Litre/ ha	**Soil Treatment:** 1 Litre of *Pseudomonas fluorescens* 1.5% AS spread uniformly over 1 hectare of land (foliar spray @ 0.2%)	NIL
***Bacillus subtilis* 1.50% LF (T Stanes BS-1 Strain MTCC 25072)**					

Banana	Sigatoka (*Mycosphaerella musicola*)	-	5 liter/ha (Foliar spray)	750 Liter/ha	-
***Trichoderma viride* 5.0% SC (Strain Accession No. ITCC 7111)**					
Chilli (Nursery)	Damping off (*Pythium aphanidermatum*)	-	2 ml/kg seed	**Seed Treatment:** Mix required quantity of the seeds with the required quantity of *Trichoderma viride* 5.0% SC. Ensure uniform coating, shade dry and sow	Nil
***Bacillus subtilis* 2.0% AS (Strain No. IPL/BS-09, Accession No. MTCC 5728)**					
Paddy	Bacterial leaf blight (*Xanthomonas oryzae* pv. oryzae)	-	10 ml/litre of water	**Seedling Root Dip Treatment:** Mix 10 ml of *Bacillus subtilis* 2.0% AS in one litre of water and dip the paddy seedling root for 30 minutes before transplanting followed by foliar application.	Nil
		-	1.87-2.50 litre/ha	**Foliar Spray:** Suspend 1.87 to 2.50 litre of *Bacillus subtilis* 2.0% AS in 500 litre of water and spray uniformly after	Nil

				40-45 days of transplantation over one hectare land 2-3 spray are required depending upon the disease incidence at interval of 10-12 days using a hand operated Knapsack sprayer or power sprayer fitted with a hollow cone nozzle.	
***Trichoderma harzianum* 2.0% AS (Strain No. IPL/VT/102, Accession No. ITCC 6893)**					
Paddy	Bakane (Foot rot) *(Fusarium moniliforme*)	-	30 ml/litre of water	**Seedling Root Dip Treatment:** Mix 30 ml of *Trichoderma harzianum* 2.0% AS in one litre of water and dip the paddy seedling root for 30 minutes before transplanting followed by Soil treatment.	Nil
		-	2.5 litre/ha	**Soil Treatment:** Mix 2.5 litre of *Trichoderma harzianum* 2.0% AS with 100 kg of properly	Nil

				decomposed FYM and broadcast uniformly over a hectare of land prior to transplanting.	
***Trichoderma viride* 1.0% AS (Strain TV-AAV-RJP, Accession no. MCC 1013)**					
Urd Bean (Black gram)	Root rot	-	4-6 ml/kg. Seed	**Seed Treatment:** Mix required quantity of the seeds with the required quantity of *Trichoderma viride* 1.0% AS and ensure uniform coating, shade dry and sow	-
***Trichoderma viride* 5.0% Liquid Formulation (Accession no. NAIMCC-F-03034)**					
Rice	Brown spot (*Cochliobolus miyabeanus*)	-	500 liter/ha	Foliar spray	-
Pea	Powdery mildew (*Microsphera alni*)	-	500 liter/ha	Foliar spray	-

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