Government of India
Ministry of Agriculture & Farmers Welfare
Department of Agriculture& 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)

(Based on certificate issued)

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(Updated upto 30.11.2024)

BIO-PESTICIDES

1. Major uses of Bio-Fungicides

Name ofCrop	Common name of the Disease	Dose/ha		Dilution in water (liter/ha)	Waitingperiod (Days)
		a.i. (g)	Formulation (g/ml)/%		
***Ampelomyces quisqualis* 2.0% WP**					
Okra (Bhindi)	Powdery mildew (*Erysiphe cichoracearum*)	-	2.5 kg	500	-
Cucumber	Powdery mildew	5.0 kg		500	-
Grapes	Powdery mildew	8.0 kg		1000	-
Neem oil based EC containing, Azadirachtin 0.030% (300 ppm)					
Okra	Powdery mildew	-	2-2.50	500	03
***Pseudomonas fluorescens* 1.75% WP (T Stanes Pf-1 Strain Accession No. MTCC 5671)**					
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.	Dilution in water (lit/ha) As per requirement for uniform coating of seeds 500 lit per ha
		-	2.5 kg per ha (05 g/litre water) (Foliar spray)	Spray Pseudomonas fluorescens 1.75% WP uniformly on the crop.	500 lit per ha
Tomato	Early blight		05 g/kg seed (Seed treatment)	Mix required quantity of the seeds with the required quantity of *Pseudomonas fluorescens* 1.75% WP. Ensure uniform coating, shadedry and sow the seeds.	As per requirement for uniform coating of seeds
			3 kg per ha	Spray *Pseudomonas fluorescens* 1.75%	500 lit perha

			(06 g/litre water) (Foliar spray)	WPuniformly on the crop.	
***Bacillus subtilis* 1.50% L.F (T Stanes Bs-1 Strain MTCC 25072)**					
Banana	Sigatoka (*Mycosphaere lla musicola*)	-	5 Liter/ ha (Foli ar spray)	750 Liter/ha	-
Tomato	Early blight (caused by Alternaria solani)	10 ml/ kg seed	Seed treatment	-	
		3.0 lit./ha	Foliar spray	500	
***Pseudomonas fluorescens 2.0% AS* (Strain No. IPL/PS-01, Accession No. MTCC 5727)**					
Paddy	Bacterial leaf blight(*Xanthomonas oryzae* pv.oryzae)	-	10 ml/liter of water	**Treatment:** Mix 10 ml of *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.	NIL
			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 incident at interval of 10-12 days using a hand	NIL

				operated Knapsack sprayer or power sprayer fitted with a hollow cone nozzle.	
***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.	NIL
Bacillus subtilis 1.50% AS (MTCC Accession no. 5786)					
Grapes	Powdery mildew (Erysiphe necator)		2 ml/litre water	Bacillus subtilis 1.50% AS is applied as foliar spray and soil spray @ 2 ml/litre of water. The product has to be used with activator provided. Shake the bottle well. Mix the contents of Bacillus subtilis 1.50% AS activator bottles with Bacillus subtilis 1.50% AS in a clean vessel.	

				For 1 Ltr packing add 10 g activator (2 bottles of 5 g each). Mix thoroughly and spray. The product can be applied at 15 days interval. Thorough coverage is essential for optimum result.	
***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 ofseeds with the requiredquantity of *Pseudomonas fluorescens* 0.5% WP formulation and ensure uniform coating. Shade dry and sow the seeds	
		-	1 kg/ha	**Soil Treatment:** 01 kgof *Pseudomonas fluorescens* 0.5% WP spread uniformly over 1 hectare of land (foliar spray @ 2%).	
Rice	Leaf and neck blast (*Pyriculari a oryzae*)	-	10gm/kg seed	**Seed Treatment:** Mix required quantity of theseeds with the requiredquantity of *Pseudomonas fluorescens* 0.5% WP.	Nil
		-	1 kg/ha	**Soil Treatment:** Broadcast1 kg *Pseudomonas fluorescens* 0.5% WP by mixing with 2.5 kg organic manure in one ha area.	-
		-	1 kg/ha	**Foliar spray:** Spray0.5% WP @ 1 kg/ha	-
Chilli seedlings		-	10	**Seed Treatment:**	Nil

	Damping off (*Pythium aphanidermatum*)		g/kg seed	Mix required quantity of theseeds with the requiredquantity of *Pseudomonas fluorescens* 0.5% WP and ensure uniform coating, shade dry and sow	
Tomato	Wilt (*Fusarium oxysporum* F.sp.)	-	10 g/kg of seeds	**Seed Treatment:** Mix required quantity of theseeds with the requiredquantity of *Pseudomonas fluorescens*0.5% WP and ensure uniform coating, shade dry andsow	Nil
			2.5 kg/ha	**Soil Treatment:** 2.5 kg of *Pseudomonas fluorescens* 0.5% WP Spread uniformly overa hectare of land	Nil
Cotton	Bacterial Leaf blight	-	10 g/kg of seeds	Seed treatment- Mix required quantity of theseeds with the requiredquantity of *Pseudomonas fluorescens* WP and ensure uniform coatingwith 0.2% Foliar spray,shade dry and sow	Nil
***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% WPwith min. volume of water and coat the seeduniformly, shades dry the seeds just before showing.	Nil
		-	2.5 kg	**Soil Treatment:** Mix	Nil

			/ha	2.5 kg of *Pseudomonas fluorescens* 1.5% WP with 50 kg FYM or and broadcast uniformly over hectareof land 30days after planting.	
***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 andbroadcast uniformly over a hectare of land.	Nil
		-	10gm/lit resof water	**Seedling Root Dip Treatment:** Mix 10 gmof *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	Bacterial Wilt (*Ralstonia solanacearum*)	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	Bacterial Wilt (Ralstonia solanacearum)	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	Bacterial soft rot (Erwinia carotovora)	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 f.sp. vasinfectum*)	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% LF (MTCC no. 5671, Strain designation Pf-1)**			
Paddy	Leaf/neck blast	4.5mlperkg seed	**Seed Treatment:** Mix the required quantity of seeds withthe required of *Pseudomonas fluorescens* 1.5% Liquid formulation ensure uniform coating, shade dry and sow.
		6.0 litre per ha	**Foliar spray:** Spray *Pseudomonas fluorescens* 1.5% Liquidformulation uniformly on the crop.
***Trichoderma harzianum* 0.50% WS**			
Cardamom	Capsule rot (*Phytophthora meadii*)	-	100 gm/plant	**Soil Treatment:** Apply100 gm product/ plant along with Neem cake (0.5 kg/plant) and 5 kgFYM/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 *Trichoderma harzianum* 1.0% WP @ 5kg/ha enriched FYM*@ 5tons/ha to the soil beforesowing.	
Okra	Wilt (*Fusarium oxysporum*)	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 beforesowing.			
***Trichoderma harzianum 1.0% WP* (Strain no. Th3 Accession no. 5593)**					
Chickpea	Root rot (*Rhizoctonia solani*)	6 gm/kg of seeds (seed treatment) and soil drenching with *Trichoderma harzianum* after 50 days of sowing.			
***Trichoderma harzianum* 2.0% WP (NBRI-1055)**					
Maize	Root rot (*Fusarium moniliforme*), Fusarium wilt	-	20 gm/kg of seed	**Seed Treatment:** Makea thin paste of requiredquantity of *Trichoderma harzianum* 2.0% WP with minimum volume of water and coat the seeds uniformly, shade dry the seeds just before sowing.	-
***Trichoderma reesei 3.0% WP* (CSR-T-3 Strain Accession No. NAIMCC-SF-0030) -9(3b)**					
Banana	Panama wilt	18 kg/ha.	250 ml/plant	600 Liters	7 days
***Trichoderma viride* 1.0% WP**					
Pigeon pea	Wilt, Root rot	-	8 g/kg of 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* 0.5% WP**					
Tomato	Wilt (*Fusarium oxysporum*)	-	10 g/kg seed	**Seed Treatment-** Mix the required quantity ofseeds with the required quantity of *Trichoderma viride* 0.50% WP and ensure uniform coating, Shadedry and sow.	-

***Trichoderma viride 1.50% WP* (T Stanes Tv-1 Strain Accession No. MTCC 5170)**					
Groundnut	Seedling wilt	-	4 gram/kg seeds	**Seed Treatment:** Mix required quantity of seeds with the required quantity of *Trichoderma viride*1.50% WP and ensure uniform coating, shade dry andsow. **Soil Application:** Mix 2.5 kg *Trichoderma viride*1.50% with 100 kg of properly decomposed farmyard manure and spread uniformly over a hectare of land.	
Wheat	Loose smut	-	4 gram/kg seeds	**Seed Treatment:** Mix required quantity of seeds with the required quantity of *Trichoderma viride1.50% WP and ensure uniform coating, shade dry and sow.*	
Chilli	Root wilt		5.0 gm/ kgseed 5.0 gm/lit water	**Seed Treatment:** Mix required quantity of seeds with the required quantity of *Trichoderma viride*1.50% WP and ensure uniform coating, shade dry andsow. **Seedling dip treatment:** Dip roots of the seedlings for 20 minutes at the time	

			3.0 kg/ha	oftransplanting. **Soil Application:** Mix 3.0 kg *Trichoderma viride* 1.50% with 100 kg of properly decomposed farmyard manure and spread uniformly over a hectare of land at the time of crop transplanting and at the time of flowering.	
***Trichoderma viride 1.0% WP* (TNAU Strain Accession No. ITCC 6914)**					
Cowpea	Root Rot	-	5 gm/kg seed	**Seed Treatment:** Make 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 before sowing.	Nil
			2.5 kg/ha	**Soil Treatment:** Mix 2.5 kg of *Trichodermaviride* 1.0% WP with 62.5 kg FYM and broadcast uniformly over a hectare of landand irrigate the field immediately	Nil
Chili seedlings	Damping off (*Pythium aphanider matum*)	-	4 g/kg seed	**Seed Treatment:** Mixrequired quantity of the seeds with the required quantity of *Trichoderma viride* 1.0% WP and ensure uniform coating shadedry and sow	Nil
Urd bean	Root rot (*Macrophomina*	-	4 g/kg seed	**Seed Treatment:** Mixrequired	Nil

	phaseolina)			quantity of the seeds with the required quantity of *Trichoderma viride* 1.0% WP and ensure uniform coating shadedry and sow	
Pigeon pea	Root rot (*Macrophomina phaseolina*)	-	4 g/kg seed	**Seed Treatment:** Mixrequired quantity of the seeds with the required quantity of *Trichoderma viride* 1.0% WP and ensure uniform coating shadedry and sow	Nil
***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 Trichoderm a viride 1.0% WP with minimum volume of water & coat the seeds uniformly, shade dry the seeds just before sowing	
Paddy	Sheath blight (*Rhizoctoni asolani*)	-	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% LF* (Strain No. TV-1, Accession No. MTCC 5170)**					
Tomato	Root wilt (*Fusarium oxysporum* f.sp. *lycopersici*)	-	5ml/ kg seed + 5 ml/ lit wat er + 3000 ml/ha	Seed treatment + Seedling dip treatment + Soil treatment	**Dilutionin water-** 500 liter/ha
***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)**					
Cauliflowerr	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 *Trichodermaviride* 1.0% WP with 62.5 kg FYM and broadcast uniformly over a hectare of landand 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 ofrequired quantity of *Trichoderma viride* 1.0% WP with minimum volume ofwater 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* liter of water and dip the Brinjal seedlingroot for 15	

				minutes	
		-	2.5 kg/ha	**Soil Treatment:** Mix 2.5 kg of *Trichodermaviride* 1.0% WP with 62.5 kg FYM and broadcast uniformly over a hectare of landand 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 *Trichodermaviride* 1.0% WP with 62.5 kg FYM and broadcast uniformly over a hectare of landand irrigate the field immediately	
Trichoderma viride 1.0% WP					
Tomato	Seedling wilt (*Fusarium oxysporum*), Dampingoff (*Pythium aphanidermatum, Rhizoctonia solani*)	-	9 g/kg seed	**Seed Treatment:** Mix 9 kg of the product perkg seed.	-
		-	2.5 kg/ha	**Root zone application:** Mix thoroughly 2.5 kg of the product in 150 kgof compost or farmyard	-

				manure andapply this mixture in the field after sowing/ transplanting of crops	
Bengalgram	Seedling wilt (*Fusarium oxysporum*), Damping off (*Pythium aphanidermatum, Rhizoctonia solani*)	-	9 g/kg seed	**Seed Treatment:** Mix 9 kg of the product perkg 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*), Rootrot (*Sclerotium rolfsii*)	-	6 g/kg seed	**Seed Treatment:** Mix required quantity of theseeds with the required quantity of product in rice gruel, ensure uniform coating, shadedry and sow	
		-	1.25-2.5 kg/ha	**Soil Treatment:** Mixwith 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 theseeds with the required quantity of *Trichoderma viride* 1.0% WP and	-

				ensure uniform coating, shadedry and sow	
Urd bean	Root rot (*Macrophomina phaseolina*)	-	4 gm/kg seed	**Seed Treatment:** Mix required quantity of theseeds with the required quantity of Trichoderma viride 1.0% WP and ensure uniform coating, shadedry for 24 hours and sow	-
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 theseeds with the required quantity of *Trichoderma viride* 5.0% SC. Ensure uniform coating, shadedry and sow	Nil
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 mlof *Trichoderma harzianum* 2.0% AS inone litre of water and dip the paddy seedlingroot 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 decomposed FYM and broadcast	Nil

				uniformly over a hectare of land prior to transplanting.	
Trichoderma viride 5.0% Liquid Formulation (Accession no. NAIMCC-F-03034)					
Rice	Brown spot (*Cochliobolus miyabeanus*)	-	500 liter/ha	Foliar spray	-
Pea	Powdery mildew	-	500 liter/ha	Foliar spray	-

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