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# ***Trichoderma*: a multipurpose, plant-beneficial microorganism for eco-sustainable agriculture**

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**Supplementary Table 1** | Examples of *Trichoderma* antagonistic mechanisms used in interactions with fungal, oomycete, bacterial, nematode and insect targets.

<i>Trichoderma</i> spp.	Target organism	Antagonistic mechanism <sup>Reference</sup>
	<u>Fungi</u>	
<i>T. arundinaceum</i>	<i>Botrytis cinerea</i>	Interference by SM crosstalk <sup>97</sup>
<i>T. atroviride</i>	<i>Verticillium dahliae</i>	Protease <sup>74</sup>
<i>T. harzianum</i>	<i>Rhizoctonia solani</i>	Chitinases <sup>76</sup>
<i>T. harzianum</i>	<i>B. cinerea</i>	$\alpha$ -1,3-glucanase <sup>79</sup>
<i>T. harzianum</i>	<i>Gibberella fujikuroi</i>	$\beta$ -1,6-glucanase <sup>77</sup>
<i>T. harzianum</i>	<i>R. solani</i>	$\beta$ -1,3-glucanases + chitinases <sup>82</sup>
<i>T. harzianum</i>	<i>Fusarium oxysporum</i>	VOC SM (6-PP) <sup>83</sup>
<i>T. harzianum</i>	<i>B. cinerea</i>	Interference by proteases <sup>96</sup>
<i>T. koningii</i>	<i>Colletotrichum lagenarium</i>	SM (trichokonins) <sup>66</sup>
<i>T. virens</i>	<i>B. cinerea</i>	SM (gliotoxin) + chitinase <sup>87</sup>
	<u>Oomycetes</u>	
<i>T. atroviride</i>	<i>Phytophthora</i> spp.	SM mix <sup>85</sup>
<i>T. harzianum</i>	<i>Pythium ultimum</i>	$\beta$ -1,3-glucanase + cellulase <sup>81</sup>
<i>T. harzianum</i>	<i>P. ultimum</i>	ROS <sup>16</sup>
<i>T. longibrachiatum</i>	<i>P. ultimum</i>	Cellulase <sup>78</sup>
<i>T. virens</i>	<i>P. ultimum</i>	$\beta$ -1,6-glucanase <sup>80</sup>
<i>T. virens</i>	<i>P. ultimum</i>	SM (gliovirin) <sup>84</sup>
	<u>Bacteria</u>	

<i>T. hamatum</i>	<i>Xanthomonas campestris</i>	VOC SM mix <sup>73</sup>
<i>T. koningii</i>	<i>Clavibacter michiganensis</i>	SM (trichokonins) <sup>66</sup>

#### Nematodes

<i>T. hamatum</i>	<i>Meloidogyne incognita</i>	VOC SM mix <sup>73</sup>
<i>T. harzianum</i>	<i>M. incognita</i>	Protease <sup>91</sup>
<i>T. harzianum</i>	<i>Meloidogyne javanica</i>	Chitinase <sup>92</sup>

#### Insects

<i>T. asperellum</i>	<i>Anopheles</i> spp.	SM mix <sup>95</sup>
<i>T. atroviride</i>	<i>Spodoptera frugiperda</i> by <i>Campoletis sonorensis</i>	VOC parasitoid attraction <sup>98</sup>
<i>T. viride</i>	<i>Bombyx mori</i>	Chitinase <sup>93</sup>

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SM: secondary metabolites, VOC: volatile organic compounds, 6-PP: 6-pentyl-2H-pyran-2-one, ROS: reactive oxygen species,

**Supplementary Table 2.** Registered Plant Protection Products (microbial fungicides or mBCA), containing *Trichoderma* spp. as the active ingredient (a.i) found in commercial products of representative countries worldwide. The general characteristics for the specified *Trichoderma* a.i., the registered *Trichoderma* species/strain (in **bold**), are provided in an all-inclusive consolidated list. However, the described features may not necessarily correspond to the individual manufacturer's claims or the diverse single products that contain the same registered *Trichoderma* species/strain a.i. found in the bioformulation distribute on the market.

<i>Trichoderma</i> species – Nomenclature (ref.); Registered a.i. <i>Trichoderma</i> species/strain	Date of approval	Country	Product Formulation	Other microbial components	Commercial product	Manufacturer/distributor	General characteristics noted for the <i>Trichoderma</i> a.i., crop, application, pathogens controlled; Notes
<b><i>Trichoderma afroharzianum</i> ex-novo (Chaverri et al. 2015; Cai and Druzhinina 2021)</b>							
ex- <i>T. harzianum</i> 8119	12/02/2020	BR	WG	<i>Bacillus amyloliquefaciens</i> ; <i>T. asperellum</i> 8120	BF20.001	Ballagro Agro Tecnologia Ltda.	
<b>ex-<i>T. harzianum</i> 8119</b>	09/07/2020	BR	WG	<i>B. amyloliquefaciens</i> ; <i>T. asperellum</i> 8120	Pardella	Ballagro Agro Tecnologia Ltda.	Bean; foliar; <i>Rhizoctonia solani</i> , <i>Sclerotinia sclerotiorum</i> , <i>Colletotrichum lindemuthianum</i>
ex- <i>T. harzianum</i> 8119	09/02/2021	BR	WG	<i>B. amyloliquefaciens</i> ; <i>T. asperellum</i> 8120	Tanus	Biota Innovations Industria e Comercio de Bioprodutos Ltda	
ex- <i>T. harzianum</i> 8119	12/02/2020	BR	WG	<i>B. amyloliquefaciens</i> ; <i>T. asperellum</i> 8120	Tricozak	Cooperativa Mista de Desenvolvimento do Agronegócio/COMDEAGRO	
<b>ex-<i>T. harzianum</i> BK-Th001</b>	17/04/2019	BR	WP		Natucontrol	Mezfer	Root fungal pathogens <i>Fusarium</i> , <i>Phytophthora</i> etc.
ex- <i>T. harzianum</i> CCT 6550	12/02/2019	BR	GL		Trychonyd FR 25	TZ Biotec Ltda.	
<b>ex-<i>T. harzianum</i> CCT 7589</b>	09/10/2019	BR	SC		Biagro Geb	Simbiose Indústria e Comércio de Fertilizantes e Insumos Microbiológicos Ltda.	Phytopathogenic fungi
ex- <i>T. harzianum</i> CCT 7589	09/04/2019	BR	SC		Bio Zenon	Simbiose Indústria e Comércio de Fertilizantes e Insumos Microbiológicos Ltda.	
ex- <i>T. harzianum</i> CCT 7589	03/07/2017	BR	SC		Stimucontrol	Simbiose Indústria e Comércio de Fertilizantes e Insumos Microbiológicos Ltda.	
ex- <i>T. harzianum</i> CCT 7589	13/07/2020	BR	OD		Stimucontrol Evolution	Simbiose Indústria e Comércio de Fertilizantes e Insumos Microbiológicos Ltda.	
ex- <i>T. harzianum</i> CPQBA 040-11DRM 09	21/03/2019	BR	WP	<i>B. amyloliquefaciens</i> CPQBA 040-11DRM 01; <i>B. amyloliquefaciens</i> CPQBA 040-11RRM 04	Native	Agrivalle Brazil Industria e Comercio de Produtos Agrícolas S.A.	
ex- <i>T. harzianum</i> CPQBA 040-11DRM 09	08/10/2020	BR	WP	<i>B. amyloliquefaciens</i> CPQBA 040-11DRM 01; <i>B. amyloliquefaciens</i> CPQBA 040-11RRM 04	Shocker-A	Agrivalle Brazil Industria e Comercio de Produtos Agrícolas S.A.	
ex- <i>T. harzianum</i> CPQBA 040-11DRM 09	03/12/2020	BR	WP	<i>B. amyloliquefaciens</i> CPQBA 040-11DRM 01 and CPQBA 040-11DRM 04	Torpeno - Shocker-B	Massen Produtos Biologicos S.A.	

ex-T. <i>harzianum</i> IBL19/17	04/06/2021	BR	WP		Trichodermaiz WP	Biocontrol Sistema de Controle Biológico Ltda	
ex-T. <i>harzianum</i> IBLF006	20/05/2013	BR	WP		Ecotrich WP	Ballagro Agro Tecnologia Ltda.	<i>Rhizoctonia solani</i> , <i>Fusarium</i> , <i>Pythium</i>
ex-T. <i>harzianum</i> IBLF006	09/06/2015	BR	SC		Predatox	Ballagro Agro Tecnologia Ltda.	
ex-T. <i>harzianum</i> IBLF006	15/03/2019	BR	WP		Rizoderma- BF30.001	Ballagro Agro Tecnologia Ltda	
ex-T. <i>harzianum</i> IBLF006	07/08/2018	BR	WP		Tritter	Ballagro Agro Tecnologia Ltda	
ex-T. <i>harzianum</i> ITEM 908	01/05/2009	EU (HU)			Trichover	Agrifutur s.r.l	
ex-T. <i>harzianum</i> Rifai Esalq -1306	14/03/2021	BR	SC		Trichodermil SC 1306	Koppert Biological System	Beans, soya, peppers; <i>Rhizoctonia solani</i> , <i>Fusarium</i> spp., <i>Sclerotinia</i> spp., <i>Pythium</i> spp., <i>Botrytis cinerea</i> , <i>Phytophthora infestans</i>
ex-T. <i>harzianum</i> Rifai Esalq -1306	20/07/2018	BR	SC		Trichodermil Super SC 1306	Koppert Biological System	
ex-T. <i>harzianum</i> Rifai ESALQ-1306	20/07/2018	BR	SC		Daytona	Koppert Biological System	
ex-T. <i>harzianum</i> SIMBI T5 (CCT 7589)	14/07/2021	BR	WP		GreenControl	Simbiose Indústria e Comércio de Fertilizantes e Insumos Microbiológicos Ltda.	
ex-T. <i>harzianum</i> Rifai T-22	21/05/1993	US	WP		PlantShield HC Biological Fungicide; T-22 HC Biological Fungicide; RootShield Home and Garden Biological Fungicide; Root Guardian; RootShield Seed Treatment; RootShield Seed Treatment Biological Fungicide; RootShield AG; RootShield AG Biological Fungicide	Bioworks	Vegetables, soft fruit, herbs, bulbs, ornamentals, perennials, turf and arboriculture. Root diseases <i>Rhizoctonia</i> spp., <i>Fusarium</i> sp., <i>Pythium</i> sp., <i>Collectotrichum</i> spp., <i>Fulvia fulva</i> , <i>Monilia laxa</i> ,
ex- T. <i>harzianum</i> Rifai T-22	01/05/2009	EU (CZ, EL, FI, LV, NL, SE)	WP		Trianium P	Koppert Biological System	<i>Plasmopara viticola</i> , <i>Pseudoperonospora cubensis</i> , <i>Rhizopus stolonifer</i> , <i>Sclerotinia sclerotiorum</i>
ex- T. <i>harzianum</i> Rifai T-22	06/04/2021	BR	WG		Trianium DS	Koppert Biological System	
ex- T. <i>harzianum</i> Rifai T-22	27/11/2017	BR	WG		Trianium WG	Koppert Biological System	Vegetables, soft fruit, herbs, bulbs, ornamentals, perennials, turf and arboriculture; ISR to various phytopathogens.
ex-T. <i>harzianum</i> Rifai T-22	23/01/2011	US	WP/WG	<i>T. vires</i> G-41	BW 240 G; RootShield Plus Granules, RootShield Plus Granules Biological Fungicide; TurfShield PLUS G; TurfShield PLUS G Biological Fungicide; TurfShield PLUS Granules Biological Fungicide	Bioworks	Berries, small fruits, bulb vegetable, cereals, citrus, cucurbit; soil inoculant or planting mix; plant root pathogens <i>Pythium</i> , <i>Phytophthora</i> , <i>Rhizoctonia</i> , <i>Fusarium</i> , <i>Cylindrocladium</i> , <i>Thielaviopsis</i> .
ex-T. <i>harzianum</i> Rifai T-22	10/10/2018	BR	WG		WALKER	Koppert Biological System	
ex-T. <i>harzianum</i> Th2RI99	26/10/2021	BR	SC		Rizoderma TSI	Rizobacter	
ex-T. <i>harzianum</i>	27/02/2017	CN					Reg. No. PD20140319F170013

ex-T. <i>harzianum</i>	13/02/2019	CN					Reg. No. PD20140319
ex-T. <i>harzianum</i>	21/04/2020	CN					Reg. No. PD20150694
ex-T. <i>harzianum</i>	11/06/2021	CN					Reg. No. PD20210970
ex-T. <i>harzianum</i> LTR-2	30/12/2021	CN				Kunming Pesticide Co., Ltd.	Reg. No. PD20212932
<b>ex-Trichoderma harzianum</b>	30/06/2021	IN	0.5 % WS Fermented biomass			Pest Control (India) Pvt, Ltd.	Cardamom - capsule rot ( <i>Phytophthora meadii</i> )
ex-T. <i>harzianum</i>		AR			Advance Bio	Fitoquimica S.A	Registration No.40405
ex-T. <i>harzianum</i>		AR			Tricomil	Fitoquimica S.A	Registration No.40655
ex-T. <i>harzianum</i>		AR	SC		Trichodermil SC	Xomezana S.A	Registration No.40655. From Brazil
ex-T. <i>harzianum</i>		AR			Hulkgreen	Agro Advance Technology S.A	Registration No.39751
ex-T. <i>harzianum</i>		AR			Rizoderma Soja	Rizobacter Argentina S.A	Registration No.38908
ex-T. <i>harzianum</i>		AR			Rizoderma Trigo	Rizobacter Argentina S.A	Registration No.38875
ex-T. <i>harzianum</i>		AR			Rizoderma	Rizobacter Argentina S.A	Registration No.38004
ex-T. <i>harzianum</i>		AR			TropBio Derma	Tropfen S.A	Registration No.40723
<b>ex-Trichoderma harzianum IHR Th-2 (Strain Accession No. ITCC-6888)</b>	30.06.2021	IN	1.0% WP			TStanes and Company Limited, Sumitomo Chemical India Ltd, International Biotech, Tropical Agrosystems (India) Pvt, Ltd.	Tomato - <i>Fusarium oxysporum</i> f. sp. <i>lycopersici</i> , Okra – F.o. f.sp. <i>vasinfectum</i> , Root-knot nematodes ( <i>Meloidogyne incognita</i> )
<b>ex-Trichoderma harzianum</b>	2021	CO	WP	<i>Trichoderma koningii</i> <i>Trichoderma viride</i>	Fitotripen WP	Natural Control S.A.S.	Dahlia, avocado, thyme, rosemary, vanilla, tarragon, oregano, coffee, passion fruit, tomato, golden berry, naranjilla, tamarillo, sweet chili pepper, cherry peppers, eggplant; <i>Rhizoctonia solani</i> ; <i>Phytophthora</i> spp.
<b>ex-Trichoderma harzianum</b>	2021	CO	WP		Tricho D. WP	Biotech-Orius S.A.S.	Rice, Dahlia, coffee; <i>Rhizoctonia solani</i> , <i>Sclerotinia sclerotiorum</i> , <i>Ceratocystis fimbriata</i>
<b>ex-Trichoderma harzianum</b>	2021	CO	WP		Bioregulax WP	Biotech-Orius S.A.S.	Rice; <i>Rhizoctonia solani</i>
<b>ex-Trichoderma harzianum</b>	2021	CO	WP		Biofungo WP	Biotech-Orius S.A.S.	Rice, Dahlia; <i>Rhizoctonia solani</i> , <i>Sclerotinia sclerotiorum</i>
<b>ex-Trichoderma harzianum</b>	2021	CO	WP		Trichox WP	Semillas Valle S.A.	Carnations, rice; <i>Fusarium</i> sp., <i>Rhizoctonia solani</i>

<i>ex-Trichoderma harzianum</i>	2021	CO	WP		Antagon WP	Bioecologicos S.A.S.	Rice, beans, carnations; <i>Rhizoctonia solani</i> , <i>Sclerotinia sclerotiorum</i> , <i>Fusarium oxysporum</i> , <i>Fusarium roseum</i>
<i>ex-Trichoderma harzianum</i>	2021	CO	WP		Trichodermus	Biologicos y Ecologicos de Colombia Ltd.A	Rice; <i>Rhizoctonia solani</i>
<i>ex-Trichoderma harzianum</i>	2021	CO	WP		Trichollanos WP	Laboratorio Biologico La Avispita	Rice, soya; <i>Rhizoctonia solani</i>
<i>ex-Trichoderma harzianum</i>	2021	CO	WP		Protector WP	Bio-Crop S.A.S.	<i>Fusarium oxysporum</i>
<i>ex-Trichoderma harzianum</i>	2021	CO	WP		Trichofus WP	Sanitex S.A.S	Carnations; <i>Rhizoctonia solani</i> , <i>Sclerotinia sclerotiorum</i> , <i>Fusarium</i> spp.
<i>ex-Trichoderma harzianum</i>	2021	CO	WP		Agroint-T	Agroinsumos Biologicos	Rice; <i>Rhizoctonia solani</i>
<i>ex-Trichoderma harzianum</i>	2021	CO	WP		Tribiol WG	Bioproteccion S.A.S	Tomato seeds; <i>Rhizoctonia solani</i>
<i>ex-Trichoderma harzianum</i>	2021	CO	WP		Fungigrasp WP	Core Biotechnology S.A.S	Tomato; <i>Fusarium</i> spp.
<i>ex-Trichoderma harzianum</i>	2021	CO	WP		Natucontrol Mezfer	Mezfer Andina S.A.S	Wheat; sheath blast
<i>ex-Trichoderma harzianum</i>	2021	CO	GL	<i>Trichoderma koningii</i>	Trichogel GL	Soluciones Microbianas del Tropico S.A.S	Coffee; <i>Rhizoctonia solani</i>
<i>ex-Trichoderma harzianum</i>	2021	CO	SL		Trichoplanta	Agrobiologicos Planta S.A.S	Carnations
<i>ex-Trichoderma harzianum</i>	2021	CO	WP		Biotricho WP	Biocultivares S.A.S	Rice; <i>Rhizoctonia solani</i>
<i>ex-Trichoderma harzianum</i>	2021	CO	EW		Fitobac Fitobac	Organizacion Pajonales S.A.S	Tomato
<i>ex-Trichoderma harzianum</i>	2021	CO	WP		Aegis-P	Bionexus S.A.S	n/a
<i>ex-Trichoderma harzianum</i>	2021	CO	SC		Trichosym Bio	Agroadviser S.A.S	n/a
<i>ex-Trichoderma harzianum</i>	2021	CO	WP	<i>Trichoderma koningii</i>	Trichotropico WP	Soluciones Microbianas del Tropico S.A.S	Coffee; <i>Rhizoctonia solani</i>
<i>ex-Trichoderma harzianum</i>	2021	CO	WP	<i>Saccharomyces cerevisiae</i>	Trombo WP	Bio-Crop LtdA	Carnations
<i>ex-Trichoderma harzianum</i> DSM 14944	2021	CO	SC		Foliguard SC	Live Systems Technology S.A. "LST S.A"	Roses, tomato; <i>Botrytis cinerea</i> , damping off; <i>Alternaria solani</i>
<i>ex-Trichoderma harzianum</i> (LCB-TH01)	2021	CO	SL		BIO-T	P.L.A. Biologicos	Rice
<i>ex-Trichoderma harzianum</i> CEPA BTH003	2021	CO	SC		Blinder SC Mycos	Mycros Internacional S.A.S	Strawberries, roses, thyme, rice; <i>Botrytis cinerea</i> , <i>Rhizoctonia solani</i>
<i>ex-Trichoderma harzianum</i> DSM 14944	2021	CO	WP		Agroguard ®	Live Systems Technology S.A. "LST S.A"	Roses; <i>Botrytis cinerea</i>

<i>ex-Trichoderma harzianum</i> T-39	2021	CO	WP		Trichodex 25	Proficol S.A.	Tomato, cucumber, grapes, citrus fruits, broad beans; <i>Botrytis cinerea</i>
<i>Trichoderma asperelloides</i> (Cai and Druzhinina 2021)							
<i>T. asperelloides</i> JM41R	06/05/2015	US	WP		Trichoplus biofungicide	BASF Corporation	Root diseases <i>Fusarium</i> , <i>Sclerotinia</i> , <i>Sclerotium rolfsii</i> , <i>Macrophomina</i> , <i>Rhizoctonia</i> , <i>Pythium</i> , <i>Cercospora</i> , <i>Phoma</i> , <i>Rosellinia</i> , <i>Phytophthora</i>
<i>Trichoderma asperellum</i> (Cai and Druzhinina 2021)							
<i>T. asperellum</i>	30/01/2013	BR	EC		Trichodermax EC	Novozymes BioAg Produtos	<i>Rhizoctonia</i> , <i>Sclerotinia</i> , <i>Fusarium</i> , <i>Botrytis</i> , <i>Monilinia</i> , <i>Verticillium</i> , <i>Pythium</i>
<i>T. asperellum</i> BV-10	08/02/2021	BR	EC		Bio-Hulk	Vittia Fertilizantes e Biológicos S.A.	
<i>T. asperellum</i> BV-10	27/07/2020	BR	EC		Tricho-Guard	Vittia Fertilizantes e Biológicos S.A.	
<i>T. asperellum</i> BV-10	28/07/2020	BR	EC		Tricho-Turbo	Vittia Fertilizantes e Biológicos S.A.	
<i>T. asperellum</i> CBMAI 1622	08/02/2021	BR	WP		Congregga/GNC006-2	Genica Inovação Biotecnologica S.A.	
<i>T. asperellum</i> CCT 2165	18/11/2021	BR	SL		Powerfung	Agrobiológica Sustentabilidade S.A.	
<i>T. asperellum</i> CCT 2165	10/05/2021	BR	SL		Trippel	Agrobiológica Sustentabilidade S.A.	
<i>T. asperellum</i> ICC012	01/05/2009	EU (CY, EL, ES, NL)	WP	<i>T. gamsii</i> ICC080	Remedier WP	Isagro s.p.a.	
<i>T. asperellum</i> ICC012	05/02/2010	US	WP	<i>T. gamsii</i> ICC080	Bioten Wp,Bio-tam 2.0; Remedier WP; Tenet T&O; Tenet WP	Isagro s.p.a.	
<i>T. asperellum</i> T25	01/05/2009	EU (EL, ES, FR)	WP	<i>T. atroviride</i> T11	TUSAL WG	Newbiotechnic S.A.	Horticulture crops; root pathogens - <i>Rhizoctonia solani</i> , <i>Sclerotinia sclerotiorum</i> , <i>Fusarium</i> sp., <i>Pythium</i> sp., <i>Phytophthora</i> sp.
<i>T. asperellum</i> T34	01/06/2013	EU (BE, CZ, DE, ES, FR, HU, IE, IT, NL, PL, PT, RO, SI, UK)	WP	<i>Trichoderma</i> , <i>Gliocladium</i> spp.	T34 Biocontrol	Biocontrol Technologies S.L.	In greenhouse - propagation, Seeding; carnations <i>Fusarium oxysporum</i>
<i>T. asperellum</i> T34	20/10/2011	US	WP		Asperello T34 Biocontrol; T34 Biocontrol	Biocontrol Technologies S.L.	



<b><i>T. asperellum</i> TV1</b>	01/05/2009	EU (EL, ES)	WG	<i>T. atroviride</i> T11	Virisan	Agribiotec srl., Isagro S.p.A., Newbiotechnic S.A.	Tomato; <i>Rhizoctonia</i> , <i>Fusarium</i> sp., <i>Pythium</i> , <i>Phytophthora</i>
<b><i>T. asperellum</i> URM 5911</b>	31/08/2021	BR	WG		Quality	Lallemand Soluções Agrobiológicas Ltda	Soya, beans and cotton; soil pathogens
<i>T. asperellum</i> URM 5911	30/08/2016	BR	WP		Organic WP	Lallemand Soluções Agrobiológicas Ltda	
<i>T. asperellum</i> URM 8120	12/02/2020	BR	WG	<i>B. amyloliquefaciens</i> ; <i>T. harzianum</i> 8119	BF20.001	Ballagro Agro Tecnologia Ltda.	
<b><i>T. asperellum</i> URM 8120</b>	09/07/2020	BR	WG	<i>B. amyloliquefaciens</i> ; <i>T. harzianum</i> URM 8119	Pardella	Ballagro Agro Tecnologia Ltda.	Bean; foliar; <i>Rhizoctonia solani</i> , <i>Sclerotinia sclerotiorum</i> , <i>Colletotrichum lindemuthianum</i>
<i>T. asperellum</i> URM 8120	09/02/2021	BR	WG	<i>B. amyloliquefaciens</i> ; <i>T. harzianum</i> 8119	Tanus	Biota Innovations Industria e Comercio de Bioprodutos Ltda	
<i>T. asperellum</i> URM 8120	12/02/2020	BR	WG	<i>B. amyloliquefaciens</i> ; <i>T. harzianum</i> 8119	Tricozak	Cooperativa Mista de Desenvolvimento do Agronegócio/COMDEAGRO	
<b><i>Trichoderma atroviride</i> (Cai and Druzhinina 2021)</b>							
<b><i>T. atroviride</i> ag1, ag2, ag3, ag5, ag11, ag14</b>	12/02/2003	AU	WP		Vinevax Biological Wound Dressing Fungicide; Vinevax Biological Fungicide Bio-Implants; Vinevax Bio-Injection Biological Fungicide	Agrimm Technologies Ltd	Orchard, ornamental trees and Grapevines; <i>Eutypa dieback</i> , <i>Armillaria</i> , <i>Botryosphaeria</i> , <i>Chondrostereum</i> , <i>Phaeoconiella</i> ; kiwifruit vines against <i>Armillaria</i>
<i>T. atroviride</i> ag1, ag2, ag3, ag5, ag11, ag14	14/11/1991	NZ	WP		Vinevax Bio-injection	Agrimm Technologies Ltd	
<i>T. atroviride</i> ag1, ag2, ag3, ag5, ag11, ag15	23/05/1991	NZ	WP		Vinevax Wound Dressing	Agrimm Technologies Ltd	Stem pathogens after pruning
<i>T. atroviride</i> ag1, ag2, ag3, ag5, ag11, ag15	11/08/1987	NZ	WP		Vinevax Bio-dowel	Agrimm Technologies Ltd	
<b><i>T. atroviride</i> I-1237</b>	01/06/2013	EU (CY, ES, FR, IT, PT)	WP		ESQUIRE WP	Agrauxine	Vineyards; fungal infections - <i>Pythium</i> , <i>Phytophthora</i> , <i>Botrytis</i> , <i>Rhizoctonia</i>
<b><i>T. atroviride</i> IMI 206040</b>	01/05/2009	EU (SE)	WP		Binab TF WP, Binab T Vector	Binab Bio innovation	Pruning wound infection <i>Chondrostereum purpureum</i> ; fungal decay of wood products and tree wounds; wilt, take-all, root rot - <i>Botrytis</i> , <i>Verticillium</i> , <i>Pythium</i> , <i>Fusarium</i> , <i>Phytophthora</i> , <i>Rhizoctonia</i> ; fairy rings and soil-borne fungal pathogens - <i>Didymella</i> , <i>Chondrostereum</i> , <i>Heterobasidion</i>

<b><i>T. atroviride</i> lu132</b>	29/11/2004	NZ	WP		Sentinel/TENET	Agrimm Technologies Ltd	Grapes, tomato stem rot, soil-borne, stem colonising and foliar pathogens - <i>Pythium</i> , <i>Phytophthora</i> , <i>Botrytis</i> , <i>Rhizoctonia</i>
<i>T. atroviride</i> lu297	09/12/2016	NZ	WP	<i>T. atroviride</i> lu668; <i>T. virens</i> lu753	Kiwivax	Agrimm Technologies Ltd	
<i>T. atroviride</i> lu668	09/12/2016	NZ	WP	<i>T. atroviride</i> lu297; <i>T. virens</i> lu753	Kiwivax	Agrimm Technologies Ltd	
<i>T. atroviride</i> SC1	06/07/2016	EU (BE, CY, CZ, DE, EL, ES, FR, HR, HU, IT, LU, NL, PL, PT, RO, SI)	WG		BI-PA NV	Vintec	
<i>T. atroviride</i> SC1	05/08/2020	US	WP		Vintec	BI-PA NV	
<b><i>T. atroviride</i> T11</b>	01/05/2009	EU (EL, ES, FR)	WP	<i>T. asperellum</i> T25	TUSAL WG	Newbiotechnic S.A.	Horticulture crops; root pathogens - <i>Rhizoctonia solani</i> , <i>Sclerotinia sclerotiorum</i> , <i>Fusarium</i> sp., <i>Pythium</i> sp., <i>Phytophthora</i> sp.
<b><i>Trichoderma gamsii</i> (Cai and Druzhinina 2021)</b>							
<b><i>T. gamsii</i> ICC 080</b>	05/02/2010	US	WP	<i>T. asperellum</i> ICC012	Bioten Wp,Bio-tam 2.0; Remedier WP; Tenet T&O; Tenet WP	Isagro s.p.a.	Flowers, ornamentals in vase ( <i>Chrysanthemums</i> , <i>cyclamens</i> , poinsettia, primula etc.); Horticulture (tomato, peppers, lettuce, radicchio, indivia, rucola), artichoke, celery, beans, zucchini, eggplant, cucumber, melon, fennel, basil and aromatic herbs; <i>Rhizoctonia solani</i> , <i>Sclerotinia sclerotiorum</i> , <i>Verticillium dahliae</i> , <i>Thielaviopsis basicola</i> , <i>Phytophthora capsici</i> .
<b><i>T. gamsii</i> ICC 080</b>	01/05/2009	EU (CY, DE, EL, ES, FR, IT, NL, PT)	WP	<i>T. asperellum</i> ICC012	Remedier WP	Isagro s.p.a.	Tomato; <i>Rhizoctonia</i> spp., <i>Fusarium</i> sp., <i>Pythium</i> sp.
<b><i>Trichoderma hamatum</i> (Cai and Druzhinina 2021)</b>							
<i>T. hamatum</i> 382	14/07/2010	US	WP		Incept	Syngenta crop protection	
<b><i>Trichoderma koningiopsis</i> (Cai and Druzhinina 2021)</b>							
<i>T. koningiopsis</i>	25/08/2021	BR	WG		Lalnix Resist	Lallemand Soluções Agrobiológicas Ltda	

<i>T. koningiopsis</i>	2021	CO	WG		Tricotec WG	Corporacion Colombia de Investigacion Agropecuria – Agrosavia	Tomato, lettuce, rice, strawberries, blackberry, raspberry, blueberries, grapes, ornamentals; <i>Fusarium oxysporum</i>
<i>T. koningiopsis</i>	2021	CO	WP		Tricotec WP	Corporacion Colombia de Investigacion Agropecuria – Agrosavia	Tomato; <i>Fusarium oxysporum</i>
<b><i>Trichoderma polysporum</i> (Cai and Druzhinina 2021)</b>							
<i>T. polysporum</i> ATCC 20475	24/07/1989	US	WP	<i>T. viride</i> ATCC 20476	Binab T Wettable Powder Biorational Fungicide	Binab Bio-Innovation EFTR AB	Soil and foliar diseases
<b><i>Trichoderma stromaticum</i> (Cheng et al. 2017)</b>							
<i>T. stromaticum</i> CEPLAC	31/07/2019	BR	WP		Tricovab	CEPLAC - Ministerio da Agricultura, Pecuária e Abastecimento	Cocoa; <i>Moniliophthora perniciosa</i>
<b><i>Trichoderma virens</i> (Cai and Druzhinina 2021)</b>							
<i>T. virens</i>	2021	CO	WP	<i>Bacillus subtilis</i>	Centeon Max	Bionexus S.A.S	NA
<i>T. virens</i> G-41	23/01/2012	US	WP/WG	<i>T. virens</i> G-41	BW 240 G; RootShield Plus Granules, RootShield Plus Granules Biological Fungicide, TurfShield PLUS G, TurfShield PLUS G Biological Fungicide, TurfShield PLUS Granules, TurfShield PLUS Granules Biological Fungicide	Bioworks	Horticultural and agricultural crops; media incorporation – nursery, greenhouse and vegetables; drench for nursery, greenhouse and vegetables. Root disease control <i>Fusarium</i> , <i>Pythium</i> , <i>Rhizoctonia</i> , <i>Thielaviopsis</i> , <i>Cylindrocladium</i> ; <i>Phytophthora</i> ; promotes healthier root system
<i>T. virens</i> lu753	07/12/2016	NZ	WP	<i>T. atroviride</i> lu668; <i>T. atroviride</i> lu297	Kiwivax	Agrimm Technologies Ltd	
<b><i>Trichoderma viride</i> (Jaklitsch et al. 2006)</b>							
<i>T. viride</i>	2021	CO	SP		Trifisol WP	Biocultivos S.A	Rice; <i>Rhizoctonia solani</i>
<i>T. viride</i>	2021	CO	SC		Trifisol SC	Biocultivos S.A	
<i>T. viride</i>	2021	CO	WP		Trifisol 1000 WP	Biocultivos S.A	
<i>T. viride</i>	2021	CO	SC		Trifisol 1000 SC	Biocultivos S.A	
<i>T. viride</i>	2021	CO	WP		Trifisol 100SC	Biocultivos S.A	
<i>T. viride</i>	2021	CO	SC		Trifisol 100 WP	Biocultivos S.A	
<i>T. viride</i>	2021	CO	WP		Bioregulax WP	Orius Biotecnologia LtdA	Champignon
<i>T. viride</i>	2021	CO	WP		Pro-Root	Q-Biol Calidad Biologica	Lettuce; <i>Sclerotinia sclerotium</i>

<b><i>T. viride</i> ATCC 20476</b>	24/07/1989	US	WP	<i>T. polysporum</i> ATCC 20475	Binab T Wettable Powder Biorational Fungicide	Binab Bio-Innovation EFTR AB	Fungal pathogens, fairy ring - <i>Botrytis, Verticillium, Pythium,</i> <i>Fusarium, Phytophthora, Rhizoctonia,</i> <i>Didymella, Chondrostereum,</i> <i>Heterobasidion</i>
<i>T. viride</i> (Tv-1, ITCC-6914)	2022	IN	WP			Yashwantrao Mohite Krishna Sahakari Sakhar Karkhana Ltd.	
<i>T. viride</i> (IIHR-Tv-5, ITCC-6889)	2022	IN	WP			Manshya Enviro Biotech Pvt. Ltd.	
<i>T. viride</i> TNAU, strain accession no. ITCC 6914	30/06/2021	IN	1 % WP			MSKan Biosys Pvt. Ltd., Mewar Pesticides and Fertilizers Pvt. Ltd, y R B Herbal Agro, Nirmal Seeds pvt Ltd.	Urd Bean (Black Gram); root rot disease
<i>T. viride</i> TNAU, strain accession no. ITCC 6914	30/06/2021	IN	1% WP			Om Agro Organics	Pigeon pea; root rot disease
<i>T. viride</i> IIHR TV-5, strain accession No. ITCC 6889	30/06/2021	IN	1.5% WP			Amit Biotech PVT. LTD	Urd Bean (Black gram); root rot ( <i>Macrophomina phaseolina</i> )
<i>T. viride</i> IIHR TV-5, strain accession No. ITCC 6889	30/06/2021	IN	1.5% WP			Curative Microbes PVT. LTD	Tomato, eggplant, okra - wilt disease; root rot of carrot; control root-knot nematodes (RKN; <i>Meloidogyne</i> <i>incognita</i> )
<i>T. viride</i> IIHR TV-5, strain accession No. ITCC 6889	30/06/2021	IN	1.5% WP			Agrimycil Bio Science PVT. LTD.	Tomato – Wilt ( <i>Fusarium oxysporum</i> <i>f.sp lycopersici</i> ), RKN; eggplant - Wilt <i>Fusarium solani</i> , RKN; Okra- Wilt <i>F.o.</i> <i>f.sp vasifectum</i> , RKN; Carrot - <i>Sclerotium rolfsi</i> , RKN
<i>T. viride</i> IIHR TV-5, strain accession No. ITCC 6889	30/06/2021	IN	1.5% WP			Tropical Agrosystems (India) PVT. LTD	Tomato and Okra; Root-knot nematodes and Wilt disease
<i>T. viride</i> TV-1 strain accession no. MTCC 5170	30/06/2021	IN	1.5% WP			TStanes and Company Limited	Groundnut- seedling wilt; wheat Loose smut
<i>T. viride</i> TV-1 strain accession no. MTCC 5170	30/06/2021	IN	Liquid Formulation			TStanes and Company Limited	Tomato - root wilt
<b><i>Trichoderma</i> species</b>							
<i>Trichoderma</i> sp.	20/06/2021	CN	n/a				Registration No. PD20160752
<i>Trichoderma</i> sp.	22/05/2020	CN	n/a			Mountain Milicic Star Pesticide Co., Ltd.	Reg. No. PD20200374
<i>Trichoderma</i> sp.	22/09/2019	CN	n/a			Shangdong Tenov Pesticides Co. Ltd.	11/11/2021 use changed to <i>Fusarium</i> in strawberry
<i>Trichoderma</i> sp.	06/08/2021	CN	n/a			Ruyang Ziqiang Biotechnology co. , LTD	Reg. No. PD20211132
<i>Trichoderma</i> sp.	09/05/2022	CN	n/a			Shandong Kanghui Plant Protection Co.,Ltd	Reg. No. PD20170879
<i>Trichoderma</i> sp.	19/09/2019	CN	n/a			Shandong Yueming Biological Technology Co.,Ltd	Reg. No. PD20142169

<i>Trichoderma</i> sp.	02/06/2019	CN	n/a			Shangdong Tenov Pesticides Co. Ltd.	Reg. No. PD20101573; 24/04/2022 added <i>Botrytis cinerea</i>
<i>Trichoderma</i> sp.	15/10/2021	CN	n/a			Qingdao Zhongda Agritech Co.,Ltd	Reg. No. PD20161313
<i>Trichoderma</i> spp.	2021	CO	SC	<i>T. harzianum, T. konigii, T. asperellum, T. viride, Bacillus, Polymyxa inertes</i>	Biohar Forte	Bioquirama S.A.S	
<i>Trichoderma</i> spp.	2021	CO	SC	<i>Bacillus, Polymyxa</i>	Biohar Forte	Bioquirama S.A.S	Avocado

Product formulations: EC, emulsifiable concentrate; EW, emulsion oil in water; GL, emulsifiable; OD, oil dispersion; SC, suspension concentrate (= flowable concentrate); SL, soluble concentrate; SP, water soluble powder; WP, wettable powder/gel; WG, water dispersible granules; WS, water slurry (seed treatment). (see [http://www.dropdata.org/IPARC\\_guide/Formulation\\_codes.pdf](http://www.dropdata.org/IPARC_guide/Formulation_codes.pdf)).

Abbreviations of Countries, see [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Country\\_codes](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Country_codes)

Note: This table is not considered to be complete list of all registered PPPs containing *Trichoderma* as an active substance, and any omissions or errors are regretted. Indications to commercial products by the authors does not in any manner imply an endorsement of the product or the manufacturer/distributor.

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