

◆ **EPPO Standards** ◆

SAFE USE OF BIOLOGICAL CONTROL

LIST OF BIOLOGICAL CONTROL AGENTS WIDELY USED IN THE EPPO REGION

PM 6/3 English

2021 VERSION



European and Mediterranean Plant Protection Organization
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APPROVAL

EPPO Standards are approved by EPPO Council. The date of approval appears in each individual standard. In the terms of Article II of the IPPC, EPPO Standards are Regional Standards for the members of EPPO.

REVIEW

EPPO Standards are subject to periodic review and amendment. The next review date for this set of EPPO Standards is decided by the EPPO Working Party on Phytosanitary Regulations.

AMENDMENT RECORD

Amendments will be issued as necessary, numbered and dated. The dates of amendment appear in each individual standard (as appropriate).

DISTRIBUTION

EPPO Standards are distributed by the EPPO Secretariat to all EPPO member governments. Copies are available to any interested person under particular conditions upon request to the EPPO Secretariat.

SCOPE

The EPPO Standards on the safe use of biological control are intended to be used by NPPOs or equivalent authorities, in their capacity as bodies responsible for overseeing and, if appropriate, regulating the introduction and use of biological control agents.

OUTLINE OF REQUIREMENTS

NPPOs of the EPPO region generally promote the use of biological control in plant protection because, like other aspects of integrated pest management, it reduces risks to human health and the environment. Use of biological control agents may, nevertheless, present some risks, in particular for the environment if exotic agents are introduced from other continents, and for the user if agents are formulated as plant protection products. In general, the latter case can be covered by EPPO Standards of series PP, concerning plant protection products. The aim of the EPPO Standards on the safe use of biological control is to provide the NPPOs with guidelines for assessing and reducing the risks associated with various aspects of the introduction and use of biological control agents and, as appropriate, for comparing them with the benefits in terms of efficacy. The EPPO Standards seek to make the administrative framework for the introduction and use of biological control agents as light as practically possible, in order to sustain a general policy of promotion of biological control.

Safe use of biological control

LIST OF BIOLOGICAL CONTROL AGENTS WIDELY USED IN THE EPPO REGION

Specific scope

This standard gives a list of biological agents widely used in the EPPO region, to facilitate decisions on the import and release of biological control agents within EPPO countries.

Specific approval and amendment

First approved in September 2001. Revisions of the list are not subject to approval by EPPO Council, but are decided by the Panel on Safe Use of Biological Control.

Introduction

EPPO Standards PM 6/1 and PM 6/2 provide guidelines to national authorities in the EPPO region on the introduction and release of non-indigenous biological control agents, so as to identify and avoid hazards for agricultural and natural ecosystems. These standards are intended to be used in relation to future introductions but not retrospectively for past introductions. There is extensive previous knowledge and experience of the use of introduced biological control agents in a number of countries in the EPPO region, sufficient to indicate their safe use in plant protection. The addition of a species to the list is made on the basis of current knowledge. The list is subject to regular review and may change based on new information whereby a listed species may no longer fulfil the criteria to remain on the list and is removed.

List of biological control agents

This list accordingly specifies indigenous, introduced and established biological control agents¹ which are recognized by the EPPO Panel on Safe Use of Biological Control to have been widely used in several EPPO countries. Other EPPO countries may therefore presume with some confidence that in the absence of any reported negative effects on non-target organisms, these agents can be introduced and used safely. They may, according to their judgement, dispense with, or simplify, the notification procedures proposed in EPPO Standards PM 6/1 and PM 6/2.

The agents are listed on the basis of an expert judgement of available information which are categorized as follows:

1. biological control agent which is (or has been) commercially available, and is either indigenous and widespread in the EPPO region, or established and widespread in the EPPO region, or has been used for at least 5 years in at least five EPPO countries (exceptionally less, if crops are grown in few countries).
2. successful classical biological control agent

Microorganisms used for biological control are not considered (since these are covered by EU Regulation 1107/2009 or equivalent regulations in most EPPO countries). The absence of a given organism from the list does not mean that it is considered unsafe, but only that it has not yet been studied, that there are uncertainties that justify further study, or else that its use is too recent for it to be included. The list (drawn up in English) is updated annually. It is divided into three parts: commercially used biological control agents (Appendix I), successfully introduced classical biological control agents (Appendix II) and agents formerly listed on Appendix 1 and/or 2 but removed (Appendix 3).

¹ In relation to ISPM No. 3, this means biological control agents which either originate in the EPPO region (i.e. indigenous), or have been released into an ecosystem in the EPPO region where they did not exist previously (i.e. introduced) or are perpetuating themselves in the EPPO region after introduction for the foreseeable future (i.e. established).

APPENDIX I - Commercially used biological control agents

Further details are given for each agent on its name, common synonyms, taxonomic classification, the pests against which it is mostly targeted, its origin, the date of first use as a commercial agent. Countries where it is or has been used in the EPPO region are listed, on the basis of information provided by the industry and by some EPPO countries. This information was not available from all EPPO countries and may therefore be incomplete. Each agent has been used commercially at some time in the countries listed, but in some cases may no longer be commercially available or used there. Information is also given, when available, on natural distribution of the agent in the EPPO region, whether it is used in the field or under protected conditions. Additional remarks are appended when needed.

INSECTA

Coleoptera

Adalia bipunctata
Aleochara bilineata
Atheta coriaria
Chilocorus baileyi
Chilocorus bipustulatus
Chilocorus circumdatus
Chilocorus nigrata
Coccinella septempunctata
Cryptolaemus montrouzieri
Delphastus catalinae
Propylea quatuordecimpunctata
Rhyzobius lophanthae
Rodolia cardinalis
Scymnus rubromaculatus
Stethorus punctillum

Diptera

Aphidoletes aphidimyza
Episyrphus balteatus
Eupeodes corollae
Feltiella acarisuga
Sphaerophoria rueppellii

Hemiptera/Heteroptera

Anthocoris nemoralis
Anthocoris nemorum
Macrolophus pygmaeus
Orius albidipennis
Orius laevigatus
Orius majusculus
Picromerus bidens
Podisus maculiventris

Hymenoptera

Acerophagus maculipennis
Anagrus atomus
Anagrus fusciventris
Anagrus vladimiri
Anastatus bifasciatus
Aphelinus abdominalis
Aphidius colemani
Aphidius ervi
Aphidius matricariae
Aphytis diaspidis
Aphytis holoxanthus
Aphytis lingnanensis
Aphytis melinus
Aprostocetus hagenowii

Bracon hebetor
Coccophagus lycimnia
Coccophagus rusti
Coccophagus scutellaris
Compariella bifasciata
Cotesia marginiventris
Dacnusa sibirica
Diglyphus isaea
Encarsia citrina
Encarsia formosa
Encyrtus aurantii
Encyrtus infelix
Ephedrus cerasicola
Eretmocerus eremicus
Eretmocerus mundus
Gyranusoidea litura
Leptomastidea abnormis
Leptomastix dactylopii
Leptomastix epona
Metaphycus flavus
Metaphycus helvolus
Metaphycus lounsburyi
Metaphycus swirskii
Microterys nietneri
Opius pallipes
Praon volucre
Scutellista caerulea
Tetracnemoidea peregrina
Tetracnemoidea brevicornis
Thripobius javae
Trichogramma brassicae
Trichogramma cacoeciae
Trichogramma cordubensis
Trichogramma dendrolimi
Trichogramma evanescens
Trichogramma pintoi
Trichopria drosophilae

Neuroptera

Chrysoperla carnea

Thysanoptera

Franklinothrips megalops
Franklinothrips vespiformis
Karnyothrips melaleucus

ARACHNIDA

Acarina

Amblydromalus limonicus
Amblyseius andersoni

Amblyseius barkeri
Amblyseius degenerans
Amblyseius swirskii
Cheyletus eruditus
Euseius gallicus
Hypoaspis aculeifer
Macrocheles robustulus
Metaseiulus occidentalis
Neoseiulus californicus
Neoseiulus cucumeris
Phytoseiulus persimilis
Stratiolaelaps scimitus
Transeius montdorensis

Typhlodromus pyri

NEMATODA

Heterorhabditis bacteriophora
Heterorhabditis downesi
Heterorhabditis megidis
Phasmarhabditis hermaphrodita
Steinernema carpocapsae
Steinernema feltiae
Steinernema glaseri
Steinernema kraussei

Insecta, Coleoptera

Adalia bipunctata

Family	Coccinellidae
Main target pests	Aphididae
Original distribution	Palearctic (?)
Distribution in EPPO	Widespread
Date of first use	?
EPPO countries where used	Belgium, Denmark, Germany, Italy, Netherlands, Portugal, Switzerland
Use	Indoors

Aleochara bilineata

Family	Staphylinidae
Main target pests	<i>Delia antiqua</i> , <i>Delia radicum</i> (= <i>Delia brassicae</i>)
Original distribution	Northern and Middle Europe, Canada and USA
Distribution in EPPO	Widespread
Date of first use	1997 (in Netherlands)
EPPO countries where used	Netherlands, some other European countries
Use	Outdoors

Atheta coriaria

Synonyms	<i>Atheta brachelytra</i> , <i>Dalotia coriaria</i> , <i>Homalota coriaria</i>
Family	Staphylinidae
Original distribution	Europe, Northern Asia, North America, Oceania, widespread in EPPO region
Main target pests	Thripidae (thrips), Sciaridae (fungus gnats), Ephydriidae (shore flies)
Date of first use	2002 (Biobest)
EPPO countries where used	Belgium, France, Germany, Netherlands, Poland, Spain, Switzerland, United Kingdom
Use	Indoors

Chilocorus baileyi

Family	Coccinellidae
Main target pests	Diaspididae
Original distribution	Australia
Distribution in EPPO	Not established
Date of first use	1985
EPPO countries where used	Belgium, France, Netherlands
Use	Indoors

Chilocorus bipustulatus

Family	Coccinellidae
Main target pests	Diaspididae, Coccidae (<i>Saissetia oleae</i>)
Original distribution	South Palaearctic
Distribution in EPPO	Widespread (South and Central)
Date of first use	1959
EPPO countries where used	Belgium, France, Greece, Israel, Italy, Netherlands, Turkey
Use	Outdoors/Indoors

Chilocorus circumdatus

Family	Coccinellidae
Main target pests	Diaspididae
Original distribution	S. E. Asia
Distribution in EPPO	Not established
Date of first use	1985
EPPO countries where used	Belgium, France, Netherlands
Use	Indoors

Chilocorus nigrata

Family	Coccinellidae
Main target pests	Diaspididae, Asterolecaniidae
Original distribution	S. Asia
Distribution in EPPO	Not established
Date of first use	1985
EPPO countries where used	Belgium, Denmark, France, Germany, Netherlands, UK
Use	Indoors

Coccinella septempunctata

Family	Coccinellidae
Main target pests	Aphididae
Original distribution	Palaearctic
Distribution in EPPO	Widespread
Date of first use	1980
EPPO countries where used	France, Germany, Portugal
Use	Outdoors

Cryptolaemus montrouzieri

Family	Coccinellidae
Main target pests	<i>Planococcus citri</i>
Original distribution	Australia
Distribution in EPPO	Mediterranean area
Date of first use	1985
EPPO countries where used	Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Ireland, Italy, Jersey, Netherlands, Norway, Poland, Portugal, Russia, Slovakia, Spain, Sweden, Switzerland, Tunisia, UK
Use	Indoors/outdoors

Delphastus catalinae

Synonym	<i>Delphastus pusillae</i>
Family	Coccinellidae
Main target pests	Aleyrodidae (<i>Trialeurodes vaporariorum</i> , <i>Bemisia tabaci</i>)
Original distribution	Nearctic/Neotropic
Distribution in EPPO	Not established
Date of first use	1993
EPPO countries where used	Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Jordan, Netherlands, Poland, Russia, Spain, Tunisia, UK (restricted under license)
Use	Indoors

Propylea quatuordecimpunctata

Synonyms	Propylaea 14-punctata, Calvia
Family	Coccinellidae
Main target pests	great variety of aphids belonging to the superfamily of Aphidoidea
Original distribution	Native to the Palearctic region and widely distributed in Europe, established in the Nearctic region.
Distribution in EPPO	Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Luxembourg, Macedonia, Malta, Moldova, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, the Netherlands, Turkey, Ukraine.
Date of first use	2018
EPPO countries where used	Belgium, Italy, Luxembourg, the Netherlands, Spain, UK and Benelux
Use	Indoors/outdoors

Rhyzobius lophanthae

Synonym	<i>Lindorus lophanthae</i>
Family	Coccinellidae
Main target pests	Diaspididae (<i>Pseudolacaspis pentagona</i>), <i>Quadraspidiotus perniciosus</i> , <i>Chrysomphalus dictyospermi</i> , <i>Parlatoria blanchardi</i>
Original distribution	Australia
Distribution in EPPO	Mediterranean, Russia
Date of first use	1980
EPPO countries where used	Belgium, Denmark, Germany, Greece, Israel, Italy, Netherlands, Portugal, Switzerland, Turkey
Use	Indoors

Rodolia cardinalis

Family	Coccinellidae
Main target pests	<i>Icerya purchasi</i>
Original distribution	Australia
Distribution in EPPO	Mediterranean, CIS
Date of first use	?1980s
EPPO countries where used	Belgium, Netherlands
Use	Indoors/outdoors

Scymnus rubromaculatus

Family	Coccinellidae
Main target pests	Aphididae
Original distribution	Central Europe
Distribution in EPPO	Finland, Estonia, Lithuania
Date of first use	1990
EPPO countries where used	Belgium, France, Netherlands, Portugal
Use	Indoors

Stethorus punctillum

Family	Coccinellidae
Main target pests	<i>Panonychus ulmi</i>
Original distribution	Palaeartic
Distribution in EPPO	Widespread
Date of first use	1995
EPPO countries where used	Belgium, France, Germany, Netherlands, Portugal, Spain, Sweden
Use	Indoors

Insecta, Diptera***Aphidoletes aphidimyza***

Family	Cecidomyiidae
Main target pests	Aphididae (<i>Aphis gossypii</i> , <i>Myzus persicae</i> , <i>Macrosiphum</i> sp., <i>Aulacorthum</i> sp.)
Original distribution	Central Europe, Palaeartic
Distribution in EPPO	Widespread
Date of first use	1985
EPPO countries where used	Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Hungary, Ireland, Italy, Jersey, Jordan, Lithuania, Malta, Morocco, Netherlands, Norway, Poland, Portugal, Spain, Slovakia, Sweden, Switzerland, Tunisia, UK
Use	Indoors/outdoors

Episyrphus balteatus

Family	Syrphidae
Main target pests	Aphididae
Original distribution	Europe
Distribution in EPPO	Widespread
Date of first use	1995
EPPO countries where used	Belgium, Denmark, Germany, Italy, Netherlands, Portugal
Use	Indoors/outdoors

Eupeodes corollae

Synonyms	<i>Metasyrphus corollae</i> , <i>Syrphus corollae</i>
Family	Syrphidae
Main target pests	Aphididae
Original distribution	Palaeartic and southern Afrotropical regions
Distribution in EPPO	Widespread
Date of first use	2020
EPPO countries where used	Belgium, Latvia, the Netherlands, Spain, UK
Use	Indoors/outdoors

Feltiella acarisuga

Synonyms	<i>Feltiella tetranychii</i> , <i>Therodiplosis persicae</i>
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Family	Cecidomyiidae
Main target pests	<i>Tetranychus urticae</i> , <i>T. cinnabarinus</i>
Original distribution	W. Europe/Mediterranean
Distribution in EPPO	Widespread
Date of first use	1995
EPPO countries where used	Belgium, Czechia, Denmark, Finland, France, Germany, Guernsey, Ireland, Italy, Lithuania, Netherlands, Norway, Poland, Spain, Sweden, Switzerland, UK
Use	Indoors

Sphaerophoria rueppellii

Synonyms	<i>Sphaerophoria flavicauda</i> , <i>Sphaerophoria nitidicollis</i>
Family	Syrphidae
Main target pests	Mainly Aphididae but also whiteflies, thrips and spider mites
Original distribution	Widely distributed in Palaearctic and Afrotropical regions
Distribution in EPPO	Mediterranean region
Date of first use	2012
EPPO countries where used	Spain
Use	Indoors/outdoors

Insecta, Hemiptera/Heteroptera

Anthocoris nemoralis

Family	Anthocoridae
Main target pests	Psyllidae (orchards)
Original distribution	Palaearctic
Distribution in EPPO	Widespread
Date of first use	?
EPPO countries where used	Belgium, Denmark, Germany, Netherlands
Use	Outdoors

Anthocoris nemorum

Family	Anthocoridae
Main target pests	<i>Cacopsylla pyri</i> , thrips
Original distribution	Palaearctic
Distribution in EPPO	Widespread
Date of first use	1992
EPPO countries where used	Belgium, Denmark, France, Italy, Jersey, Netherlands, UK
Use	Outdoors

Macrolophus pygmaeus

Family	Miridae
Main target pests	Aleyrodidae
Original distribution	Palaearctic
Distribution in EPPO	Widespread
Date of first use	1990
EPPO countries where used	Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Hungary, Ireland, Italy, Jordan, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, Tunisia, Turkey, UK (restricted under license)
Use	Indoors

Additional remark *Macrolophus pygmaeus* was previously included on the positive list under the name *Macrolophus melanotoma* (synonym: *Macrolophus caliginosus*), this error was found and corrected in 2009;

Macrolophus pygmaeus has been reported as damaging on cherry tomato

and on *Gerbera*. It is therefore not recommended for use on these crops. Caution is advised when using *M. pygmaeus* on any new crop, particularly ornamentals with a low threshold for cosmetic damage.

Orius albidipennis

Family	Anthocoridae
Main target pests	Thrips
Original distribution	Mediterranean, palaeartic
Distribution in EPPO	Mediterranean
Date of first use	1991
EPPO countries where used	Belgium, France, Israel, Italy, Netherlands, Spain
Use	Indoors

Orius laevigatus

Family	Anthocoridae
Main target pests	Thripidae (<i>Frankliniella occidentalis</i> , <i>Thrips tabaci</i>)
Original distribution	Palaeartic (except north)
Distribution in EPPO	Widespread (except north)
Date of first use	1991
EPPO countries where used	Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Hungary, Ireland, Italy, Jersey, Jordan, Lithuania, Malta, Morocco, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Switzerland, Tunisia, UK
Use	Indoors

Orius majusculus

Family	Anthocoridae
Main target pests	Thripidae (<i>Frankliniella occidentalis</i> , <i>Thrips tabaci</i>)
Original distribution	Palaeartic
Distribution in EPPO	Widespread
Date of first use	1991
EPPO countries where used	Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Italy, Jersey, Lithuania, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, UK
Use	Indoors

Picromerus bidens

Family	Pentatomidae
Main target pests	Lepidoptera
Original distribution	Palaeartic (also established in Nearctic)
Distribution in EPPO	Widespread
Date of first use	1990
EPPO countries where used	CIS countries, Germany, Poland, Russia
Use	Outdoors/indoors

Podisus maculiventris

Family	Pentatomidae
Main target pests	Lepidoptera, <i>Leptinotarsa decemlineata</i>
Original distribution	North and South America
Distribution in EPPO	Not established
Date of first use	1996
EPPO countries where used	Belgium, Bulgaria, Denmark, Finland, France, Greece, Italy, Netherlands, Russia, Spain
Use	Indoors/outdoors

Insecta, Hymenoptera

Acerophagus maculipennis

Synonym	<i>Pseudaphycus maculipennis</i> ²
Family	Encyrtidae
Main target pests	Pseudococcidae
Original distribution	Palearctic
Distribution in EPPO	Widespread (south)
Date of first use	1980
EPPO countries where used	Belgium, France, Germany, Netherlands, Spain
Use	Indoors

Anagrus atomus

Family	Mymaridae
Main target pests	Cicadellidae
Original distribution	Palearctic
Distribution in EPPO	?
Date of first use	1994
EPPO countries where used	Belgium, France, Germany, Guernsey, Jersey, Netherlands, Spain, UK
Use	Indoors

Anagrus fusciventris

Family	Encyrtidae
Main target pests	Pseudococcidae
Original distribution	Australia
Distribution in EPPO	Not present
Date of first use	1990
EPPO countries where used	Belgium, Denmark, France, Germany, Netherlands, Spain
Use	Indoors

Anagrus vladimiri

Synonym	<i>Anagrus pseudococci</i> ³
Family	Encyrtidae
Main target pests	Pseudococcidae
Original distribution	Mediterranean
Distribution in EPPO	Mediterranean
Date of first use	1995
EPPO countries where used	France, Czechia, Greece, Italy, Netherlands, Portugal, Spain
Use	Indoors/outdoors

Anastatus bifasciatus

Family	Eupelmidae
Main target pests	Heteroptera (<i>Halyomorpha halys</i>)
Original distribution	Europe
Distribution in EPPO	Widespread
Date of first use	2019
EPPO countries where used	Italy
Use	Outdoors

² The genus *Pseudaphycus* was synonymized with the genus *Acerophagus*: Trjapitzin VA (2008) A Review of Encyrtid Wasps (Hymenoptera, Chalcidoidea, Encyrtidae) of Macaronesia. *Entomological Review*, Vol. 88, No. 2, pp. 218–232.

³ Andreason SA, Triapitsyn SV & Perring TM (2019) Untangling the *Anagrus pseudococci* species complex (Hymenoptera: Encyrtidae), parasitoids of worldwide importance for biological control of mealybugs (Hemiptera: Pseudococcidae): Genetic data corroborates separation of two new, previously misidentified species. *Biological Control* **129**: 65-82.

Aphelinus abdominalis

Family	Aphelinidae
Main target pests	Aphididae (<i>Macrosiphum euphorbiae</i> , <i>Aulacorthum solani</i>)
Original distribution	Europe
Distribution in EPPO	Widespread
Date of first use	1992
EPPO countries where used	Austria, Belgium, Bulgaria, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Ireland, Italy, Jersey, Jordan, Netherlands, Poland, Spain, Sweden, Switzerland, Tunisia, UK
Use	Indoors

Aphidius colemani

Family	Braconidae
Main target pests	Aphididae (<i>Aphis gossypii</i> , <i>Myzus persicae</i> , <i>M. nicotianae</i>)
Original distribution	North Africa, Middle East, India
Distribution in EPPO	Mediterranean area
Date of first use	1992
EPPO countries where used	Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Hungary, Ireland, Italy, Jersey, Jordan, Lithuania, Malta, Morocco, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, Tunisia, Turkey, UK
Use	Indoors

Aphidius ervi

Family	Braconidae
Main target pests	<i>Aulacorthum solani</i> , <i>Macrosiphum euphorbiae</i>
Original distribution	Palearctic
Distribution in EPPO	Widespread
Date of first use	1995
EPPO countries where used	Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Hungary, Ireland, Italy, Jersey, Lithuania, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, UK
Use	Indoors/outdoors

Aphidius matricariae

Family	Braconidae
Main target pests	<i>Myzus persicae</i>
Original distribution	Holarctic
Distribution in EPPO	Widespread in temperate regions
Date of first use	1990
EPPO countries where used	Austria, Belgium, Germany, Guernsey, Jersey, Netherlands, Poland, Portugal, Slovakia, UK
Use	Indoors

Aphytis diaspidis

Family	Aphelinidae
Main target pests	Diaspididae, <i>Quadraspidiotus perniciosus</i> , <i>Pseudaulacaspis pentagona</i>
Original distribution	California
Distribution in EPPO	Mediterranean
Date of first use	?
EPPO countries where used	Netherlands
Use	Indoors

Aphytis holoxanthus

Family	Aphelinidae
Main target pests	Diaspididae

Original distribution	Asia
Distribution in EPPO	Mediterranean
Date of first use	1996
EPPO countries where used	Belgium, Czechia, France, Netherlands, Spain
Use	Indoors

Aphytis lingnanensis

Family	Aphelinidae
Main target pests	<i>Aonidiella aurantii</i> , <i>Chrysomphalus dictyospermi</i>
Original distribution	Probably eastern Asia (widely established elsewhere)
Distribution in EPPO	Mediterranean
Date of first use	?
EPPO countries where used	Greece, Italy, Spain
Use	Indoors/outdoors

Aphytis melinus

Family	Aphelinidae
Main target pests	<i>Aonidiella aurantii</i>
Original distribution	India/Pakistan
Distribution in EPPO	Mediterranean
Date of first use	1985
EPPO countries where used	Belgium, Czechia, Denmark, France, Greece, Italy, Portugal, Spain
Use	Outdoors/indoors

Aprostocetus hagenowii

Synonyms	<i>Tetrastichus hagenowii</i> , <i>Tetrastichodes hagenowii</i>
Family	Eulophidae
Main target pests	Blattidae (<i>Periplaneta</i> spp.)
Original distribution	?
Distribution in EPPO	Romania
Date of first use	1993
EPPO countries where used	Belgium, France, Germany, Netherlands, Spain
Use	Indoors

Bracon hebetor

Synonyms	<i>Habrobracon hebetor</i>
Family	Braconidae
Main target pests	Lepidoptera (on stored products)
Original distribution	India, New England
Distribution in EPPO	Mediterranean area (mostly Eastern)
Date of first use	1980
EPPO countries where used	Many (including Germany, Portugal)
Use	Indoors

Coccophagus lycimnia

Family	Aphelinidae
Main target pests	Coccidae
Original distribution	Cosmopolitan
Distribution in EPPO	Mediterranean
Date of first use	1988
EPPO countries where used	Belgium, Denmark, France, Germany, Netherlands, Portugal, Spain, Sweden
Use	Indoors

Coccophagus rusti

Family	Aphelinidae
Main target pests	Coccidae
Original distribution	Cosmopolitan
Distribution in EPPO	Mediterranean
Date of first use	1988
EPPO countries where used	Belgium, France, Netherlands, Spain
Use	Indoors

Coccophagus scutellaris

Family	Aphelinidae
Main target pests	Coccidae
Original distribution	Cosmopolitan
Distribution in EPPO	Widespread
Date of first use	1986
EPPO countries where used	Belgium, France, Netherlands, Portugal, Spain
Use	Indoors

Comperiella bifasciata

Family	Encyrtidae
Main target pests	Diaspididae (<i>Chrysomphalus aonidum</i> , <i>Aonidiella aurantii</i>)
Original distribution	?California/South China
Distribution in EPPO	Mediterranean
Date of first use	1985
EPPO countries where used	Belgium, Greece, Netherlands
Use	Indoors/outdoors

Cotesia marginiventris

Synonyms	<i>Apanteles marginiventris</i>
Family	Braconidae
Main target pests	Lepidoptera (Noctuidae)
Original distribution	Americas
Distribution in EPPO	?
Date of first use	1993
EPPO countries where used	Belgium, France, Netherlands, Spain
Use	Indoors

Dacnusa sibirica

Family	Braconidae
Main target pests	Agromyzidae (<i>Liriomyza</i> spp.)
Original distribution	Palaearctic, Europe
Distribution in EPPO	Widespread, temperate regions
Date of first use	1981
EPPO countries where used	Austria, Belgium, Bulgaria, Czechia, Denmark, Finland, France, Germany, Guernsey, Italy, Jersey, Jordan, Malta, Morocco, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, UK
Use	Indoors/outdoors (celery, lettuce)

Diglyphus isaea

Family	Eulophidae
Main target pests	Agromyzidae (<i>Liriomyza</i> spp.)
Original distribution	Palaearctic
Distribution in EPPO	Widespread
Date of first use	1984
EPPO countries where used	Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Hungary,

	Italy, Jordan, Malta, Morocco, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, Tunisia, Turkey, UK
Use	Indoors/outdoors
<i>Encarsia citrina</i>	
Family	Aphelinidae
Main target pests	Diaspididae
Original distribution	Cosmopolitan
Distribution in EPPO	Mediterranean
Date of first use	1984
EPPO countries where used	Belgium, France, Germany, Netherlands, Spain
Use	Indoors
<i>Encarsia formosa</i>	
Family	Aphelinidae
Main target pests	Aleyrodidae (<i>Trialeurodes vaporariorum</i> , <i>Bemisia tabaci</i>)
Original distribution	Southern nearctic
Distribution in EPPO	Widespread
Date of first use	1930
EPPO countries where used	Austria, Belgium, Bulgaria, Czechia, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Jordan, Lithuania, Malta, Morocco, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, Tunisia, Turkey, UK
Use	Indoors
<i>Encyrtus aurantii</i>	
Synonyms	<i>Encyrtus lecaniorum</i>
Family	Encyrtidae
Main target pests	Coccidae
Original distribution	Palaeartic
Distribution in EPPO	Widespread (south)
Date of first use	1980
EPPO countries where used	Belgium, France, Germany, Netherlands, Spain
Use	Indoors
<i>Encyrtus infelix</i>	
Synonyms	<i>Eucomys tananarivensis</i>
Family	Encyrtidae
Main target pests	Coccidae
Original distribution	Afrotropical region
Distribution in EPPO	Israel
Date of first use	1992
EPPO countries where used	Belgium, Denmark, France, Netherlands, Spain
Use	Indoors
<i>Ephedrus cerasicola</i>	
Family	Braconidae
Main target pests	<i>Aphis frangulae</i> , <i>A. gossypii</i> , <i>Aulacorthum circumflexum</i> , <i>Aulacorthum solani</i> , <i>Brachycaudus helichrysi</i> , <i>Capitophorus inulae</i> , <i>Cavariella aegopodii</i> , <i>Chaetosiphon fragaefolii</i> , <i>Cryptomyzus galeopsidis</i> , <i>Dysaphis apiifolia</i> , <i>Dysaphis sp.</i> , <i>Hyadaphis foeniculi</i> , <i>Hyperomyzus lactucae</i> , <i>Hyperomyzus sp.</i> , <i>Myzus ascalonicus</i> , <i>M. cerasi</i> , <i>M. ligustri</i> , <i>M. nicotinae</i> , <i>M. ornatus</i> , <i>M. persicae</i> , <i>Nasonovia ribisnigri</i> , <i>Nasonovia sp.</i> , <i>Ovatus crataegarius</i> , <i>Phorodon humili</i> , <i>Rhodobium porosum</i>
Original distribution	Naturally throughout Europe
Distribution in EPPO	Widespread
Date of first use	1999

EPPO countries where used	Belgium, Denmark, Finland, France, Germany, Netherlands, UK
Use	Indoors
<i>Eretmocerus eremicus</i>	
Family	Aphelinidae
Main target pests	<i>Bemisia tabaci</i>
Original distribution	Southern nearctic
Distribution in EPPO	Mediterranean
Date of first use	1994
EPPO countries where used	Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Hungary, Italy, Lithuania, Malta, Morocco, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Switzerland, Tunisia, Turkey
Use	Indoors
<i>Eretmocerus mundus</i>	
Family	Aphelinidae
Main target pests	<i>Bemisia tabaci</i>
Original distribution	South Europe
Distribution in EPPO	Mediterranean
Date of first use	1996
EPPO countries where used	Denmark, Germany, Italy, Netherlands, Portugal, Spain
Use	Indoors
<i>Gyranusoidea litura</i>	
Family	Encyrtidae
Main target pests	<i>Pseudococcus longispinus</i>
Original distribution	Africa
Distribution in EPPO	France, Spain
Date of first use	1990
EPPO countries where used	Belgium, France, Netherlands
Use	Indoors
<i>Leptomastidea abnormis</i>	
Synonym	<i>Leptomastix abnormis</i>
Family	Encyrtidae
Main target pests	Pseudococcidae
Original distribution	Palearctic
Distribution in EPPO	Widespread
Date of first use	1984
EPPO countries where used	Austria, Belgium, Denmark, Germany, Guernsey, Israel, Italy, Jersey, Netherlands, Spain, Switzerland, Turkey, UK
Use	Indoors
<i>Leptomastix dactylopii</i>	
Family	Encyrtidae
Main target pests	<i>Planococcus citri</i>
Original distribution	Neotropic
Distribution in EPPO	Mediterranean area
Date of first use	1992
EPPO countries where used	Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Ireland, Italy, Jersey, Netherlands, Norway, Poland, Portugal, Spain, UK
Use	Indoors/outdoors
<i>Leptomastix epona</i>	
Family	Encyrtidae
Main target pests	Pseudococcidae, especially <i>Pseudococcus viburni</i>

Original distribution	Palaeartic
Distribution in EPPO	Widespread (south)
Date of first use	1992
EPPO countries where used	Belgium, Denmark, France, Germany, Guernsey, Jersey, Netherlands, Spain, UK
Use	Indoors
<i>Metaphycus flavus</i>	
Family	Encyrtidae
Main target pests	Coccidae, <i>Saissetia oleae</i> , <i>Coccus hesperidum</i>
Original distribution	Nearctic
Established in EPPO	Yes
Distribution in EPPO	Mediterranean
Date of first use	1999
EPPO countries where used	Germany, Netherlands, Switzerland
Use	Indoors
<i>Metaphycus helvolus</i>	
Family	Encyrtidae
Main target pests	Coccidae (<i>Saissetia oleae</i> <i>Coccus hesperidum</i>)
Original distribution	South Africa (also established in Nearctic)
Distribution in EPPO	Greece, Italy
Date of first use	1992
EPPO countries where used	Austria, Belgium, Denmark, France, Germany, Greece, Israel, Italy, Netherlands, Spain, Sweden, Switzerland
Use	Indoors/outdoors
<i>Metaphycus lounsburyi</i>	
Synonyms	<i>M. bartletti</i> , <i>M. anneckeii</i> and <i>M. hagenowii</i> , also established in some Mediterranean countries, have been misidentified as <i>M. lounsburyi</i>
Family	Encyrtidae
Main target pests	Coccidae (<i>Saissetia oleae</i>)
Original distribution	California, Australia, Hawaii, South Africa
Distribution in EPPO	Mediterranean
Date of first use	1997
EPPO countries where used	Denmark, France, Italy, Netherlands
Use	Indoors/outdoors
<i>Metaphycus swirskii</i>	
Family	Encyrtidae
Main target pests	Coccidae
Original distribution	East Africa?
Distribution in EPPO	France, Greece (Crete), Israel, Italy (probably more widely in Mediterranean region)
Date of first use	1992
EPPO countries where used	Belgium, France, Netherlands, Spain
Use	Indoors
<i>Microterys nietneri</i>	
Synonyms	<i>Microterys flavus</i>
Family	Encyrtidae
Main target pests	Coccidae (<i>Saissetia oleae</i>)
Original distribution	California, Pakistan
Distribution in EPPO	Italy
Date of first use	1987
EPPO countries where used	Belgium, Denmark, France, Germany, Greece, Israel, Netherlands, Spain,

	former-Yugoslavia
Use	Indoors/outdoors
<i>Opius pallipes</i>	
Family	Braconidae
Main target pests	<i>Liriomyza bryoniae</i>
Original distribution	Palearctic (?)
Distribution in EPPO	Widespread
Date of first use	1980
EPPO countries where used	Belgium, Czechia, Denmark, France, Germany, Greece, Guernsey, Jersey, Lithuania, Netherlands, Poland, Spain, UK
Use	Indoors
<i>Praon volucre</i>	
Synonym	<i>Aphidius volucre</i>
Family	Braconidae
Main target pests	Aphididae
Original distribution	Palearctic
Distribution in EPPO	Widespread
Date of first use	?
EPPO countries where used	Belgium, Guernsey, Jersey, Netherlands, UK
Use	Indoors
<i>Scutellista caerulea</i>	
Synonym	<i>Scutellista cyanea</i>
Family	Pteromalidae
Main target pests	Coccidae (<i>Saissetia oleae</i> , <i>S. coffeae</i> , <i>Ceroplastes rusci</i>)
Original distribution	Africa
Distribution in EPPO	Mediterranean, CIS
Date of first use	1990
EPPO countries where used	Belgium, Denmark, France, Netherlands, Switzerland
Use	Indoors
<i>Tetracnemoidea peregrina</i>	
Synonyms	<i>Hungariella peregrina</i>
Family	Encyrtidae
Main target pests	Pseudococcidae
Original distribution	North America
Distribution in EPPO	Israel
Date of first use	1992
EPPO countries where used	Belgium, France, Israel, Netherlands, Spain
Use	Indoors/outdoors
<i>Tetracnemoidea brevicornis</i>	
Synonyms	<i>Hungariella pretiosa</i>
Family	Encyrtidae
Main target pests	Pseudococcidae
Original distribution	?
Distribution in EPPO	Italy
Date of first use	1992
EPPO countries where used	Belgium, France, Netherlands, Spain
Use	Indoors
<i>Thripobius javae</i>	
Synonyms	<i>Thripobius semiluteus</i>
Family	Eulophidae

Main target pests	Thysanoptera (<i>Heliothrips</i> spp.)
Original distribution	Tropical and subtropical areas of Africa, Asia and Australia
Distribution in EPPO	Israel
Date of first use	1995
EPPO countries where used	Belgium, Denmark, France, Germany, Netherlands
Use	Indoors
<i>Trichogramma brassicae</i>	
Synonyms	<i>Trichogramma maidis</i>
Family	Trichogrammatidae
Main target pests	Lepidoptera (<i>Ostrinia nubilalis</i>)
Original distribution	Europe
Distribution in EPPO	Widespread
Date of first use	1980
EPPO countries where used	Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Italy, Jersey, Jordan, Netherlands, Slovakia, Spain, Switzerland, UK
Use	Outdoors/Indoors
<i>Trichogramma cacoeciae</i>	
Family	Trichogrammatidae
Main target pests	Lepidoptera
Original distribution	Europe
Distribution in EPPO	Widespread
Date of first use	1980
EPPO countries where used	Denmark, France, Germany, Hungary
Use	Outdoors
<i>Trichogramma cordubensis</i>	
Year of addition to the EPPO Positive List	2020
Family	Trichogrammatidae
Main target pests	Lepidoptera (e.g. <i>Cydalima perspectalis</i> , <i>Lobesia botrana</i> & <i>Eupoecilia ambiguella</i>)
Original distribution	Mediterranean (Algeria, Egypt, France, Iran, Morocco, Portugal, Spain)
Distribution in EPPO	Widespread
Date of first use	1980
EPPO countries where used	France
Use	Outdoors
<i>Trichogramma dendrolimi</i>	
Family	Trichogrammatidae
Main target pests	Lepidoptera
Original distribution	Europe
Distribution in EPPO	Widespread
Date of first use	1985
EPPO countries where used	Germany, Slovakia
Use	Outdoors
<i>Trichogramma evanescens</i>	
Family	Trichogrammatidae
Main target pests	Lepidoptera (including on stored products)
Original distribution	Europe
Distribution in EPPO	Widespread
Date of first use	1993
EPPO countries where used	Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Italy, Jersey, Jordan, Netherlands, Portugal, Slovakia, Spain, Tunisia, UK

Use	Indoors/outdoors
<i>Trichogramma pintoi</i>	
Synonyms	<i>Trichogramma euproctidis</i>
Family	Trichogrammatidae
Original distribution	Palearctic, Near East, Nearctic, Neotropical region; Oriental region, widespread in EPPO region
Main target pests	Mainly Lepidoptera species: <i>Ostrinia nubilalis</i> , <i>Helicoverpa armigera</i> , <i>Cydia nigricana</i> , <i>Cydia pomonella</i> , <i>Cydia funebrana</i> , <i>Plutella xylostella</i> , <i>Mamestra brassicae</i> , <i>Lacanobia oleracea</i>
Date of first use	2002 (Hungary)
EPPO countries where used	Belarus, Czech Republic, Hungary, Moldova, Poland, Russia, Slovakia, Ukraine, Uzbekistan
Use	Outdoors/Indoors

<i>Trichopria drosophilae</i>	
Family	Diapriidae
Original distribution	Worldwide, mainly in tropical/Mediterranean/warmer temperate climatic areas. Indigenous in the EPPO region
Distribution in EPPO	France, Germany, Greece, Israel, Italy, Morocco, the Netherlands, Spain.
Main target pests	Pupal parasitoid of <i>Drosophila suzukii</i> , relatively specific parasitoid compared to other parasitoids of Diptera.
Date of first use	2015 (Italy)
EPPO countries where used	Italy (by 2015), Spain (2017) and Switzerland (2017)
Use	Outdoors/Indoors

Insecta, Neuroptera

<i>Chrysoperla carnea</i>	
Synonyms	<i>Chrysopa carnea</i>
Family	Chrysopidae
Main target pests	Aphididae etc.
Original distribution	Cosmopolitan
Distribution in EPPO	Widespread
Date of first use	1987
EPPO countries where used	Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, Switzerland, UK
Use	Indoors/outdoors

Insecta, Thysanoptera

<i>Franklinothrips megalops</i>	
Synonym	<i>Franklinothrips myrmicaeformis</i>
Family	Aeolothripidae
Main target pests	Thysanoptera
Original distribution	Africa, Israel, India
Distribution in EPPO	Israel, Tunisia
Date of first use	1992
EPPO countries where used	Belgium, France, Netherlands, Spain
Use	Indoors

<i>Franklinothrips vespiformis</i>	
Family	Aeolothripidae
Main target pests	Thysanoptera
Original distribution	Asia

Distribution in EPPO	Israel, Portugal
Date of first use	1990
EPPO countries where used	Belgium, Denmark, France, Germany, Israel, Netherlands, Portugal, Sweden, Switzerland
Use	Indoors

Karnyothrips melaleucus

Family	Phlaeothripidae
Main target pests	Coccidae, Diaspididae (<i>Howardia biclavis</i>)
Original distribution	Pantropical
Distribution in EPPO	Portugal (Madeira)
Date of first use	1994
EPPO countries where used	Belgium, Denmark, France, Netherlands, Spain
Use	Indoors

Arachnida, Acarina

Amblydromalus limonicus

Synonyms	<i>Amblyseius limonicus</i> , <i>Typhlodromus (Amblyseius) limonicus</i> , <i>Amblyseius (Typhlodromalus) limonicus</i> , <i>Typhlodromus limonicus</i> , <i>Amblyseius (Amblyseius) limonicus</i> , <i>Typhlodromalus limonicus</i> , <i>Typhlodromalus lailae</i>
Family	Phytoseiidae
Main target pests	Thrips and whiteflies (mainly <i>Bemisia tabaci</i>)
Original distribution	North, Central and South America, Hawaii, New Zealand and Australia
Distribution in EPPO	Established in north-east Spain
Date of first use	2010
EPPO countries where used	Austria, Belgium, Denmark, England, Finland, France, Germany, Ireland, the Netherlands, Poland, Russia, Sweden and Ukraine
Use	Indoors / Outdoors

Amblyseius andersoni

Synonyms	<i>Typhlodromus andersoni</i>
Family	Phytoseiidae
Main target pests	<i>Tetranychus urticae</i> , <i>T. cinnabarinus</i> , <i>Panonychus ulmi</i> , <i>Aculops lycopersicae</i> , <i>Polyphagotarsonemus latus</i> , <i>Phytonemus pallidus</i>
Original distribution	Palearctic and Nearctic
Distribution in EPPO	Widespread
Date of first use	2006 (by Syngenta)
EPPO countries where used	France, Guernsey, Italy, Netherlands, Poland, Spain, UK
Use	Indoors / Outdoors

Amblyseius barkeri

Synonyms	<i>Amblyseius mckenziei</i> , <i>Neoseiulus barkeri</i>
Family	Phytoseiidae
Main target pests	Thysanoptera (<i>Thrips tabaci</i> , <i>Frankliniella occidentalis</i>), Tarsonemidae
Original distribution	Europe
Distribution in EPPO	Widespread
Date of first use	1981
EPPO countries where used	Austria, Belgium, Denmark, France, Germany, Italy, Netherlands, Slovakia, Switzerland
Use	Indoors

Amblyseius degenerans

Synonym	<i>Iphiseius degenerans</i>
Family	Phytoseiidae
Main target pests	Thysanoptera

Original distribution	Africa/Mediterranean
Distribution in EPPO	Mediterranean
Date of first use	1993
EPPO countries where used	Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Jersey, Netherlands, Norway, Poland, Spain, Switzerland, Tunisia, Turkey, UK
Use	Indoors

Amblyseius swirskii

Synonym	<i>Typhlodromips swirskii</i>
Family	Phytoseiidae
Original distribution	East of Mediterranean region, naturally occurs in Israel, Italy, Cyprus, Greece and Egypt, found there in various crops like apples, apricot, citrus, vegetables and cotton
Main target pests	<i>Bemisia tabaci</i> , <i>Trialeurodes vaporariorum</i> , <i>Frankliniella occidentalis</i>
Date of first use	2005 (Austria, Belgium, Finland, France, Germany, Greece, Hungary, Italy, Morocco, Netherlands, Poland and Turkey)
EPPO countries where used	Austria, Belarus, Belgium, Denmark, Finland, France, Germany, Greece, Guernsey, Hungary, Italy, Jersey, Morocco, the Netherlands, Norway, Poland, Spain, Turkey, UK
Use	Indoors/outdoors

Cheyletus eruditus

Family	Cheyletidae
Main target pests	Storage mites, spider (foliage) mites
Original distribution	Indigenous
Distribution in EPPO	Belgium, Netherlands
Date of first use	1985
EPPO countries where used	Belgium, Czechia, France, Germany, Netherlands
Use	Indoors
Additional remarks	Cases of allergic reactions to farmers have been reported

Euseius gallicus

Family	Phytoseiidae
Main target pests	Whitefly (Aleyrodidae) and thrips (Thysanoptera)
Original distribution	Europe, Maritime and Mediterranean zones
Distribution in EPPO	Belgium, France, the Netherlands, Tunisia and Turkey
Date of first use	The Netherlands, 2010
EPPO countries where used	Belgium, France, Germany, the Netherlands, Poland and Ukraine
Use	Indoors

Hypoaspis aculeifer

Synonyms	<i>Geolaelaps aculeifer</i>
Family	Laelapidae
Main target pests	Sciaridae, <i>Rhizoglyphus echinopus</i>
Original distribution	Europe
Distribution in EPPO	Widespread
Date of first use	1995
EPPO countries where used	Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Spain, Switzerland, UK
Use	Indoors

Macrocheles robustulus

Synonyms	<i>Holostaspis subbadius</i> , <i>Macrocheles coprophila</i>
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Family	Macrochelidae
Main target pests	Soil dwelling pests like thrips (pupae) and sciarids (larvae)
Original distribution	Cosmopolitan
Distribution in EPPO	Austria, Bulgaria, Czech Republic, Georgia, Germany, Greece, Hungary, Italy, Poland, Russia, Slovakia, Sweden and the UK
Date of first use	2010
EPPO countries where used	Austria, Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Poland, Russia, Spain, Sweden, the UK and Ukraine
Use	Indoors

Metaseiulus occidentalis

Synonyms	<i>Galendromus occidentalis</i> , <i>Typhlodromus occidentalis</i>
Family	Phytoseiidae
Main target pests	Tetranychidae
Original distribution	Nearctic
Distribution in EPPO	?
Date of first use	1991
EPPO countries where used	Denmark, France, Greece, Guernsey, Jersey, Netherlands, Poland, Spain, UK
Use	Indoors/outdoors

***Neoseiulus californicus* (non-diapausing strain only*)**

Synonyms	<i>Amblyseius californicus</i> , <i>Typhlodromus californicus</i> , <i>Amblyseius mungeri</i> , <i>Typhlodromus mungeri</i> , <i>Amblyseius chilensis</i> , <i>Typhlodromus marinus</i>
Family	Phytoseiidae
Main target pests	Tetranychidae
Original distribution	Southern N. America/California, Mediterranean
Distribution in EPPO	?
Date of first use	1985
EPPO countries where used	Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Ireland, Italy, Jersey, Malta, Netherlands, Poland, Portugal, Spain, Switzerland, Tunisia, UK (restricted under license)
Use	Indoors/outdoors

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Neoseiulus cucumeris

Synonym	<i>Amblyseius cucumeris</i>
Family	Phytoseiidae
Main target pests	Thysanoptera (<i>T. tabaci</i> , <i>F. occidentalis</i>)
Original distribution	Cosmopolitan
Distribution in EPPO	Widespread (not present in Sweden, Finland, Norway)
Date of first use	1985
EPPO countries where used	Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Hungary, Ireland, Italy, Jersey, Jordan, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, Tunisia, Turkey, UK

Use Indoors/outdoors

Phytoseiulus persimilis

Synonyms *Phytoseiulus riegei*, *Phytoseiulus tardi*
Family Phytoseiidae
Main target pests Tetranychidae (*Tetranychus urticae*)
Original distribution Mediterranean
Distribution in EPPO Southern Europe
Date of first use 1968
EPPO countries where used Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Hungary, Ireland, Italy, Jersey, Jordan, Lithuania, Malta, Morocco, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, Tunisia, Turkey, UK

Use Indoors/outdoors

Stratiolaelaps scimitus

Synonyms *Hypoaspis scimitus*
Taxonomic remark The species has been previously used under the erroneous name *Stratiolaelaps miles* (= *Hypoaspis miles* = *Geolaelaps miles*)*
Family Laelapidae
Main target pests Sciaridae, *Rhizoglyphus echinopus*
Original distribution Palaearctic
Distribution in EPPO Widespread
Date of first use 1994
EPPO countries where used Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Jersey, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, UK

Use Indoors

*** References:**

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Transeius montdorensis

Synonym *Amblyseius montdorensis*, *Typhlodromips montdorensis*
Family Phytoseiidae
Original distribution Pacific Islands and western areas of the Australian mainland
Main target pests Aleyrodidae (*Trialeurodes* spp. and *Bemisia* spp.), thrips (*Franklinella occidentalis* and *Thrips tabaci*) and Eriophyidae (*Aculops lycopersici*), although to be used principally against *Frankliniella occidentalis*
Date of first use 2004
EPPO countries where used Belgium, Denmark, Finland, France, Germany, Greece, the Netherlands, Poland, Romania, Spain and UK

Use Indoors/outdoors

Typhlodromus pyri

Family Phytoseiidae
Main target pests *Panonychus ulmi*, *Tetranychus urticae*, *Eriophyes vitis*, *Epitrimerus vitis*
Original distribution Europe/Nearctic

Distribution in EPPO	Widespread
Date of first use	1985
EPPO countries where used	Austria, Belgium, Czechia, Denmark, France, Germany, Hungary, Portugal, Slovakia
Use	Outdoors

Nematoda

Heterorhabditis bacteriophora

Synonyms	<i>Heterorhabditis heliothidis</i>
Family	Heterorhabditidae
Main target pests	Vine weevils (<i>Otiorhynchus</i> spp.)
Original distribution	South and central Europe/N. America
Distribution in EPPO	South and central Europe
Date of first use	1984
EPPO countries where used	Austria, Belgium, France, Germany, Italy, Netherlands, Slovenia, Switzerland
Use	Outdoors/?indoors

Heterorhabditis downesi

Synonyms	Irish type of <i>Heterorhabditis</i>
Family	Heterorhabditidae
Main target pests	Vine weevils (<i>Otiorhynchus</i> spp.), <i>Phyllopertha horticola</i> , <i>Hoplia philanthus</i> , <i>Melolontha melolontha</i> , <i>Hylobius abietis</i>
Original distribution	Europe
Distribution in EPPO	Denmark, Germany, Hungary, Ireland, Italy, UK
Date of first use	2001
EPPO countries where used	Ireland, UK
Use	Outdoors/ ?indoors

Heterorhabditis megidis

Family	Heterorhabditidae
Main target pests	Vine weevils (<i>Otiorhynchus</i> spp.)
Original distribution	Europe
Distribution in EPPO	Widespread
Date of first use	1984
EPPO countries where used	Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Ireland, Italy, Jersey, Netherlands, Norway, Poland, Slovakia, Spain, Sweden, Switzerland, Tunisia, UK
Use	Indoors/outdoors

Phasmarhabditis hermaphrodita

Family	Phasmarhabditidae
Main target pests	Slugs
Original distribution	Central Europe
Distribution in EPPO	Widespread (except in Northern countries)
Date of first use	1984
EPPO countries where used	Belgium, Denmark, France, Germany, Guernsey, Italy, Jersey, Netherlands, UK
Use	Indoors/outdoors

Steinernema carpocapsae

Synonyms	<i>Neoplectana carpocapsae</i> , <i>N. feltiae</i>
Family	Steinernematidae
Main target pests	Vine weevils (<i>Otiorhynchus</i> spp.), Sciaridae, soil-borne insects

Original distribution	Europe (Holarctic)
Distribution in EPPO	Widespread
Date of first use	1984
EPPO countries where used	Belgium, Denmark, France, Germany, Guernsey, Italy, Jersey, Netherlands, Portugal, Slovenia, Sweden, UK
Use	Indoors/outdoors

Steinernema feltiae

Synonyms	<i>Neoaplectana feltiae</i> , <i>N. bibionis</i> , <i>Steinernema bibionis</i> , <i>N. leucaniae</i>
Family	Steinernematidae
Main target pests	Melolonthidae, Sciaridae etc.
Original distribution	Europe (Holarctic)
Distribution in EPPO	Widespread
Date of first use	1984
EPPO countries where used	Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Ireland, Italy, Jersey, Netherlands, Norway, Poland, Slovakia, Slovenia, Spain, Sweden, Switzerland, UK
Use	Indoors/outdoors

Steinernema glaseri

Synonyms	<i>Neoaplectana glaseri</i>
Family	Steinernematidae
Main target pests	Soil insects, especially Coleoptera including Chrysomelidae, Curculionidae, Elateridae, Scarabaeidae, some Lepidoptera, Orthoptera etc.
Original distribution	Argentina, Brazil, China, Czech Republic, Palestine, Portugal, Republic of Korea, Slovak Republic, Spain, Switzerland, the USA
Distribution in EPPO	Czech Republic, Portugal, Slovak Republic, Spain, Switzerland
Date of first use	2004
EPPO countries where used	Netherlands, Belgium
Use	Indoors/outdoors

Steinernema kraussei

Family	Steinernematidae
Main target pests	<i>Otiorhynchus sulcatus</i>
Original distribution	Throughout Europe and North America
Distribution in EPPO	Widespread
Date of first use	2001 (in Ireland)
EPPO countries where used	Ireland, Norway, most of other European countries
Use	Indoors/outdoors

Appendix II: Successfully established classical biological control agents

Further details are given for each agent on its name, common synonyms, taxonomic classification, the pest(s) against which it has been released, date of first use, whether the agent was introduced as single or multiple introductions, and the origin of the collected material. Countries where the agent has been introduced for classical biological control in the EPPO region are listed. The presence of an agent on the list means that it has been successfully established in at least one of the countries mentioned. The results of the introductions in target pest control in different countries are given, when available, as follows: [C] complete, [S] substantial, [P] partial, [E] established but not contributing to control or status unknown, [F] failed to become established; [N] no information on the outcome; [T] established but believed to have died out. Asterisks (*) indicate cases where more than one organism contributed to the result. Information on countries and results of introductions are given on the basis of information provided by the BIOCAT database of CABI (data from 1997 and 2000) and by some EPPO countries. Countries are, as far as possible, listed in the chronological order of introduction of the agent for classical biological control. The list of countries indicates to a certain degree the area in which each organism is present and established in the EPPO region, to the extent that each successful introduction can be presumed to have involved establishment. However, organisms may already be indigenous in some parts of the EPPO region, or have spread from countries where they were introduced, or indeed have disappeared from countries where they were once established, so the true distribution is uncertain in many cases. In some cases, a general statement can be made about present distribution in the EPPO region and this has been added in italics at the end of the list of countries.

INSECTA

Coleoptera

Adalia bipunctata

Cryptolaemus montrouzieri

Rhizophagus grandis

Rhyzobius forestieri

Rodolia cardinalis

Scymnus impexus

Scymnus reunioni

Serangium parcesetosum

Diptera

Cryptochetum iceryae

Hymenoptera

Ageniaspis citricola

Allotropa burrelli

Allotropa convexifrons

Amitus spiniferus

Anagyrus agragensis

Anagyrus fusciventris

Anaphes nitens

Aphelinus mali

Aphytis holoxanthus

Aphytis lepidosaphes

Aphytis lingnanensis

Aphytis melinus

Aphytis proclia

Clausenia purpurea

Comperiella bifasciata

Encarsia berleseii

Encarsia herndoni

Encarsia lahorensis

Encarsia perniciosi

Eretmocerus debachi

Metaphycus anneckeii

Metaphycus flavus

Metaphycus helvolus

Metaphycus lounsburyi

Metaphycus swirskii

Neodryinus typhlocybae

Neodusmetia sangwani

Ooencyrtus kuvanae

Pseudaphycus malinus

Psyllaepagus pilosus

Psytalia concolor

Pteroptrix orientalis

Pteroptrix smithi

Insecta, Coleoptera

Adalia bipunctata

Family	Coccinellidae
Target pest	<i>Toxoptera aurantii</i>
Date of first use	?
EPPO countries where introduced	Portugal (Azores) [S*] (<i>Widespread in the EPPO region</i>)
Multiple/single introductions	Single
Origin of collected material	Portugal

Cryptolaemus montrouzieri

Family	Coccinellidae
Target pest	Pseudococcidae
Date of first use	1929
EPPO countries where introduced	Portugal [S] (<i>Mediterranean distribution</i>)
Multiple/single introductions	Single
Origin of collected material	Australia
Target pest	<i>Planococcus citri</i>
Date of first use	1908-
EPPO countries where introduced	Italy [E; Sardegna P; Sicilia E], Israel [P], Portugal, Greece [F], Cyprus [T], France [P], Spain [P], former USSR (Georgia) [F?] (<i>Mediterranean distribution</i>)
Multiple/single introductions	Single, multiple
Origin of collected material	Australia

Rhizophagus grandis

Family	Rhizophagidae
Target pest	<i>Dendroctonus micans</i>
Date of first use	1963-
EPPO countries where introduced	former USSR (Georgia) [S], UK [E], France [E] (<i>Probably widespread in Central & Eastern Europe</i>)
Multiple/single introductions	Single, multiple
Origin of collected material	Belgium

Rhyzobius forestieri

Family	Coccinellidae
Target pest	<i>Saissetia oleae</i>
Date of first use	1980
EPPO countries where introduced	Italy [S], France [S], Greece [E], Cyprus [N], Israel [E]
Multiple/single introductions	Single
Origin of collected material	Australia

Rodolia cardinalis

Family	Coccinellidae
Target pest	<i>Icerya purchasi</i>
Date of first use	1897-
EPPO countries where introduced	Portugal [C], former USSR (Georgia) [C], Italy [S], former Yugoslavia [N], Israel [C*], France [C], Spain [C], Switzerland [F], Greece [S], Malta [C], Cyprus [S] (<i>Mediterranean distribution, CIS</i>)
Multiple/single introductions	Single, multiple
Origin of collected material	Australia

Scymnus impexus

Family	Coccinellidae
Target pests	<i>Adelges</i> spp.
Date of first use	1968

EPPO countries where introduced	Sweden [S], UK [N] (<i>native in Europe</i>)
Multiple/single introductions	Single
Origin of collected material	Germany
<i>Scymnus reunioni</i>	
Synonym	<i>Nephus reunioni</i>
Family	Coccinellidae
Target pest	<i>Planococcus citri</i>
Date of first use	1967
EPPO countries where introduced	Israel [N], Italy (Sardegna) [P], former USSR (Georgia) [F?]
Multiple/single introductions	Single
Origin of collected material	India
<i>Serangium parcesetosum</i>	
Family	Coccinellidae
Target pest	<i>Dialeurodes citri</i>
Date of first use	1973
EPPO countries where introduced	former USSR [Georgia, C*; Azerbaijan, C*; Uzbekistan, F], France (Corse) [E], Israel, Turkey [S?]
Multiple/single introductions	Single
Origin of collected material	India, former USSR

Insecta, Diptera

Cryptochetum iceryae

Family	Cryptochetidae
Target pest	<i>Icerya purchasi</i>
Date of first use	1987
EPPO countries where introduced	Israel [S]
Multiple/single introductions	Single
Origin of collected material	Australia

Insecta, Hymenoptera

Ageniaspis citricola

Family	Encyrtidae
Target pest	<i>Phyllocnistis citrella</i>
Date of first use	1994-
EPPO countries where introduced	Israel, Morocco, Algeria, Tunisia, France, Greece, Cyprus, Spain [C], Italy (Sicilia); established only on Canary Islands where provides complete control of the target pest
Multiple/single introductions	Single, multiple
Origin of collected material	Thailand, Florida (USA)

Allotropa burrelli

Family	Platygasteridae
Target pest	<i>Pseudococcus comstocki</i>
Date of first use	1945
EPPO countries where introduced	former USSR [P*]
Multiple/single introductions	Single
Origin of collected material	Japan

Allotropa convexifrons

Family	Platygasteridae
Target pest	<i>Pseudococcus comstocki</i>
Date of first use	1945
EPPO countries where introduced	former USSR [P*]
Multiple/single introductions	Single
Origin of collected material	Korea

Amitus spiniferus

Family	Platygasteridae
Target pest	<i>Aleurothrixus floccosus</i>
Date of first use	1971-
EPPO countries where introduced	France [C*], Italy [S*]
Multiple/single introductions	Single
Origin of collected material	Central America

Anagyrus agragensis

Family	Encyrtidae
Target pest	<i>Nipaecoccus viridis</i>
Date of first use	1984-
EPPO countries where introduced	Jordan [S?], Israel [S?]
Multiple/single introductions	Single
Origin of collected material	Guam

Anagyrus fusciventris

Family	Encyrtidae
Target pests	Pseudococcidae (<i>Pseudococcus longispinus</i>)
Date of first use	1972
EPPO countries where introduced	Israel [S]
Multiple/single introductions	Single
Origin of collected material	Australia

Anaphes nitens

Family	Mymaridae
Target pest	<i>Gonipterus scutellatus</i>
Date of first use	1978
EPPO countries where introduced	Italy [C], France [P], Spain [S]
Multiple/single introductions	Single
Origin of collected material	Australia

Aphelinus mali

Family	Aphelinidae
Target pest	<i>Eriosoma lanigerum</i>
Date of first use	1920-
EPPO countries where introduced	France [P], Hungary [S], Israel [P], Italy [S], Switzerland [S], former USSR (Azerbaijan) [C], Portugal [N], Belgium [C], Germany [P], UK [P], Slovenia, Malta, Netherlands [P], Spain [P], Poland [P], Sweden [P], Cyprus [C], Denmark [P] (<i>Widespread in the EPPO region</i>)
Multiple/single introductions	Single
Origin of collected material	USA

Aphytis holoxanthus

Family	Aphelinidae
Target pest	<i>Chrysomphalus aonidum</i>
Date of first use	1956

EPPO countries where introduced	Israel [C*] (<i>Mediterranean distribution</i>)
Multiple/single introductions	Single
Origin of collected material	Hong Kong
<i>Aphytis lepidosaphes</i>	
Family	Aphelinidae
Target pest	<i>Cornuaspis beckii</i>
Date of first use	1956-
EPPO countries where introduced	Israel [C], Cyprus [N], France [N], Greece [S], Spain [S], Italy (Sicilia) [P]
Multiple/single introductions	Single
Origin of collected material	China
<i>Aphytis lingnanensis</i>	
Family	Aphelinidae
Target pest	<i>Aonidiella aurantii</i>
Date of first use	1960-
EPPO countries where introduced	Cyprus [P], Israel [E], Italy (Sicilia), Morocco [E], Spain [P] (<i>Mediterranean distribution</i>)
Multiple/single introductions	Single
Origin of collected material	China
<i>Aphytis melinus</i>	
Family	Aphelinidae
Target pest	<i>Chrysomphalus dictyospermi</i>
Date of first use	1962-
EPPO countries where introduced	Greece [S; Kriti, C], Italy [C], Morocco [C], France (Corse) [P], Spain [P] (<i>commercially available for inundative releases since 2008</i>), former USSR (Georgia) [E?] (<i>Mediterranean distribution</i>)
Multiple/single introductions	?
Origin of collected material	India/Pakistan
Target pest	<i>Aonidiella aurantii</i>
Date of first use	1961-
EPPO countries where introduced	Cyprus [P], Israel [P], Italy (Sicilia) [P], Morocco [E] (<i>Mediterranean distribution</i>)
Multiple/single introductions	Single, multiple
Origin of collected material	India/Pakistan
Target pest	<i>Aspidiotus nerii</i>
Date of first use	?
EPPO countries where introduced	Greece (Kriti) [P] (<i>Mediterranean distribution</i>)
Multiple/single introductions	Single
Origin of collected material	India/Pakistan
<i>Aphytis proclia</i>	
Family	Aphelinidae
Target pest	<i>Pseudaulacaspis pentagona</i>
Date of first use	1924
EPPO countries where introduced	Italy [S] (<i>Widespread in the EPPO region</i>)
Multiple/single introductions	Single
Origin of collected material	East Asia
<i>Clausenia purpurea</i>	
Family	Encyrtidae
Target pest	<i>Pseudococcus citriculus</i>
Date of first use	1940

EPPO countries where introduced	Israel [C]
Multiple/single introductions	Single
Origin of collected material	Japan
<i>Comperiella bifasciata</i>	
Family	Encyrtidae
Target pest	<i>Aonidiella aurantii</i>
Date of first use	1924-
EPPO countries where introduced	Israel [P*], Italy, France [N], Spain [P] (<i>Mediterranean distribution</i>)
Multiple/single introductions	Single
Origin of collected material	South China
<i>Encarsia berleseii</i>	
Family	Aphelinidae
Target pest	<i>Pseudaulacaspis pentagona</i>
Date of first use	1906-
EPPO countries where introduced	Italy [C], Bulgaria [C], Switzerland [C], Spain [C], Austria [C], former USSR [C], France [P], Hungary, Slovenia
Multiple/single introductions	Single
Origin of collected material	Japan, East Asia
<i>Encarsia herndoni</i>	
Synonym	<i>Encarsia elongata</i>
Family	Aphelinidae
Target pest	<i>Lepidosaphes gloverii</i>
Date of first use	1979
EPPO countries where introduced	Spain [S]
Multiple/single introductions	Single
Origin of collected material	East Asia
<i>Encarsia lahorensis</i>	
Family	Aphelinidae
Target pest	<i>Dialeurodes citri</i>
Date of first use	1973-
EPPO countries where introduced	Italy [S; Sardegna, P; Sicilia, C], former USSR (Georgia) [C*], France [E], Turkey, Greece [S, E], Israel [C*]
Multiple/single introductions	Single, multiple
Origin of collected material	India, Pakistan
<i>Encarsia perniciosi</i>	
Family	Aphelinidae
Target pest	<i>Quadraspidiotus perniciosus</i>
Date of first use	1932-
EPPO countries where introduced	Italy [P], former USSR [E], Germany [P], France [P], Bulgaria [C], former Czechoslovakia [E, N], Switzerland [P], former Yugoslavia [N], Austria [E], Greece [E], Spain [P] (<i>Widespread in the EPPO region</i>)
Multiple/single introductions	Single, multiple
Origin of collected material	China, Korea
<i>Eretmocerus debachi</i>	
Family	Aphelinidae
Target pest	<i>Parabemisia myricae</i>
Date of first use	1982-
EPPO countries where introduced	Israel [C], Turkey [C], Italy [S] (<i>Mediterranean distribution?</i>)
Multiple/single introductions	Single

Origin of collected material	Japan, North America
<i>Metaphycus anneckeii</i>	
Family	Encyrtidae
Target pest	Saissetia oleae
Date of first use	?
EPPO countries where introduced	Greece [C], Israel [E], France [E], Italy [F]
Multiple/single introductions	Single
Origin of collected material	South Africa
<i>Metaphycus flavus</i>	
Family	Encyrtidae
Target pest	Coccus hesperidum
Date of first use	1959
EPPO countries where introduced	Italy [P], former USSR (Ukraine) [C] (<i>Mediterranean distribution</i>)
Multiple/single introductions	Single
Origin of collected material	Morocco
<i>Metaphycus helvolus</i>	
Family	Encyrtidae
Target pest	Saissetia oleae
Date of first use	1960-
EPPO countries where introduced	Israel [E], France (Corse) [P*], Greece [C; Kriti, S], Italy [P], Spain [S], Cyprus [E], former USSR [F]
Multiple/single introductions	Single
Origin of collected material	South Africa
<i>Metaphycus lounsburyi</i>	
Family	Encyrtidae
Target pest(s)	Saissetia oleae
Date of first use	1973-
EPPO countries where introduced	France [P], Israel [C], Greece (Kriti) [P], Italy [E], Cyprus [S] (<i>Mediterranean distribution</i>)
Multiple/single introductions	Single
Origin of collected material	South Africa
<i>Metaphycus swirskii</i>	
Family	Encyrtidae
Target pest	Saissetia oleae
Date of first use	1973
EPPO countries where introduced	Israel [E], France [E], Greece (Kriti) [P], Italy [P]
Multiple/single introductions	Single
Origin of collected material	Kenya
<i>Neodryinus typhlocybae</i>	
Family	Dryinidae
Target pest	Metcalfa pruinosa
Date of first use	1989-
EPPO countries where introduced	Italy, France, Slovenia, Switzerland
Multiple/single introductions	Single
Origin of collected material	USA
<i>Neodusmetia sangwani</i>	
Family	Encyrtidae
Target pest	Antonina graminis
Date of first use	1971
EPPO countries where introduced	Israel [S]

Multiple/single introductions	Single
Origin of collected material	South India
<i>Ooencyrtus kuvanae</i>	
Family	Encyrtidae
Target pest	Lymantria dispar
Date of first use	1922
EPPO countries where introduced	former Czechoslovakia [E], Spain [P], Morocco [E], Algeria [E], Portugal [E], former USSR (Kazakhstan, Moldova, Russia, Ukraine, Uzbekistan) [P]
Multiple/single introductions	Single
Origin of collected material	Japan
<i>Pseudaphycus malinus</i>	
Family	Encyrtidae
Target pest	Pseudococcus comstocki
Date of first use	1945
EPPO countries where introduced	former USSR [C]
Multiple/single introductions	Single
Origin of collected material	Korea
<i>Psyllaephagus pilosus</i>	
Family	Encyrtidae
Target pest	Ctenarytaina eucalypti
Date of first use	1994
EPPO countries where introduced	Ireland [S], France [S]
Multiple/single introductions	Single
Origin of collected material	Australia
<i>Psytalia concolor</i>	
Synonym	Opius concolor
Family	Braconidae
Target pest	Bactrocera oleae
Date of first use	1914-
EPPO countries where introduced	Italy [S], Greece [P], France [P], Spain [P], Portugal, former Yugoslavia [N]
Multiple/single introductions	Single
Origin of collected material	Libya, Tunisia
<i>Pteroptrix orientalis</i>	
Synonym	Archenomus orientalis
Family	Aphelinidae
Target pest	Pseudaulacaspis pentagona
Date of first use	1909
EPPO countries where introduced	Italy [S]
Multiple/single introductions	Single
Origin of collected material	Japan
<i>Pteroptrix smithi</i>	
Family	Aphelinidae
Target pest	Chrysomphalus aonidum
Date of first use	1956
EPPO countries where introduced	Israel [C*]
Multiple/single introductions	Single
Origin of collected material	Hong Kong

Appendix III: List of biological control agents removed from Appendices I or II

Species which appear on this list were listed in Appendix I or II but have been removed. These species are not necessarily unsafe. Rather, they no longer fulfil all of the criteria to remain on the Positive List. The reasons for removal from Appendix I or II are provided. Evidence for removal relating to adverse effects in one or more countries in the EPPO region are referenced.

Formerly recommended as commercially used biological control agents

Insecta
Hymenoptera
- *Cales noacki*
- *Lysiphlebus testaceipes*

Formerly recommended as successfully introduced classical biological control agents

Insecta
Coleoptera
- *Harmonia axyridis*
Hymenoptera
- *Cales noacki*
- *Lysiphlebus testaceipes*

Insecta: Hymenoptera

Cales noacki

Family	Aphelinidae
Main target pest	<i>Aleurothrixus floccosus</i>
Date of first use	1970
EPPO countries where introduced	Spain [S], France [C], Italy [S], Morocco [C], Portugal [E], Tunisia [C], Malta, Greece (<i>Mediterranean distribution</i>)
Multiple/single introductions	Single, multiple
Origin of collected material	Chile
Date of removal from the list	2009-03-25/26, Joint EPPO/IOBC Meeting on Biological Control Agents, Engelberg (CH)
Summary of reasons	Commercial releases may lead to establishment in non-target habitats in certain areas. Outdoor releases have shown a wide host range that extends beyond the order Hemiptera and in some areas out competes indigenous natural enemies.

Lysiphlebus testaceipes

Family	Braconidae
Main target pest	Aphididae (<i>Aphis gossypii</i>)
Original distribution	Nearctic, USA
Distribution in EPPO	Mediterranean countries (and possibly others)
Date of first use	1990
EPPO countries where used	Denmark, Germany (DE), Italy, Spain
Use	Indoors
Date of removal from the list	2008-03-26/28, Joint EPPO/IOBC Meeting on Biological Control Agents Wageningen (NL)
Summary of reasons	The species has a wide host range and shown non-target effects. In some areas it has spread into non-target habitats, where it has attacked non-target host species and replaced native primary parasitoid species (see references). Lumbierres B., Starý P., Pons X., 2007. Seasonal parasitism of cereal aphids in a Mediterranean arable crop system. <i>Journal of Pest Science</i> , 80: 125-130. Pons X., Lumbierres B., Starý P., 2004. Expansión de <i>Lysiphlebus testaceipes</i> (Cresson) (Hym., Braconidae, Aphidiinae) en el Noreste de

la Península Ibérica. Boletín de Sanidad Vegetal. Plagas, 30: 547-552.

Starý P., Lumbierres B., Pons, X., 2004. Opportunistic changes in the host range of *Lysiphlebus testaceipes* (Cr.), an exotic aphid parasitoid expanding in the Iberian Peninsula. Journal of Pest Science, 77: 139-144.

Insecta: Coleoptera

Harmonia axyridis

Family	Coccinellidae
Main target pest	<i>Toxoptera aurantii</i>
Date of first use	1964
EPPO countries where introduced	Portugal (Azores) [S*], Greece, former USSR [N], Ukraine, Tunisia, Italy
Multiple/single introductions	Single
Origin of collected material	East Asia
Date of removal from the list	2009-03-25/26, Joint EPPO/IOBC Meeting on Biological Control Agents, Engelberg (CH)
Summary of reasons	The species has a wide host range across many taxonomic groups with a strong capacity for natural spread. The species has become established in large areas of the EPPO region and is known to attack non-target prey, including some beneficial species. Based on releases elsewhere, replacement of native coccinellid species in the EPPO region could be expected.

Insecta: Hymenoptera

Cales noacki

Family	Aphelinidae
Main target pest	<i>Aleurothrixus floccosus</i>
Date of first use	1970
EPPO countries where introduced	Spain [S], France [C], Italy [S], Morocco [C], Portugal [E], Tunisia [C], Malta, Greece (<i>Mediterranean distribution</i>)
Multiple/single introductions	Single, multiple
Origin of collected material	Chile
Date of removal from the list	2009-03-25/26, Joint EPPO/IOBC Meeting on Biological Control Agents, Engelberg (CH)
Summary of reasons	Commercial releases may lead to establishment in non-target habitats in certain areas. Outdoor releases have shown a wide host range that extends beyond the order Hemiptera and in some areas out competes indigenous natural enemies.

Lysiphlebus testaceipes

Family	Braconidae
Target pest	<i>Aphis citricola</i>
Date of first use	1973
EPPO countries where introduced	former Czechoslovakia, France (Corse) [P], Morocco [N] (<i>Mediterranean countries and possibly others</i>)
Multiple/single introductions	Single, multiple
Origin of collected material	USA
Target pest	<i>Toxoptera aurantii</i>
Date of first use	1973
EPPO countries where introduced	France [S, P], Spain [P], Italy [E], Morocco [N] (<i>Mediterranean</i>)

	<i>countries and possibly others)</i>
Multiple/single introductions	Single, multiple
Origin of collected material	USA
Date of removal from the list	2008-03-26/28, Joint EPPO/IOBC Meeting on Biological Control Agents Wageningen (NL)
Summary of reasons	<p>The species has a wide host range and shown non-target effects. In some areas it has spread into non-target habitats, where it has attacked non-target host species and replaced native primary parasitoid species (see references).</p> <p>Lumbierres B., Starý P., Pons X., 2007. Seasonal parasitism of cereal aphids in a Mediterranean arable crop system. <i>Journal of Pest Science</i>, 80: 125-130.</p> <p>Pons X., Lumbierres B., Starý P., 2004. Expansión de <i>Lysiphlebus testaceipes</i> (Cresson) (Hym., Braconidae, Aphidiinae) en el Noreste de la Península Ibérica. <i>Boletín de Sanidad Vegetal. Plagas</i>, 30: 547-552.</p> <p>Starý P., Lumbierres B., Pons, X., 2004. Opportunistic changes in the host range of <i>Lysiphlebus testaceipes</i> (Cr.), an exotic aphid parasitoid expanding in the Iberian Peninsula. <i>Journal of Pest Science</i>, 77: 139-144.</p>

Result of introduction when available: [C] complete, [S] substantial, [P] partial, [E] established but not contributing to control or status unknown, [F] failed to become established; [N] no information on the outcome; [T] established but believed to have died out. Asterisks (*) indicate cases where more than one organism contributed to the result.