

Organisation Européenne et Méditerranéenne pour la Protection des Plantes
European and Mediterranean Plant Protection Organization

Normes OEPP EPPO Standards

Safe use of biological control
Sécurité de la lutte biologique

PM 6/3(2)



Organisation Européenne et Méditerranéenne pour la Protection des Plantes
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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.

Reference

IPPC (1995) *Code of Conduct for the Import and Release of Exotic Biological Control Agents*. ISPM no. 3. IPPC Secretariat, FAO, Rome (IT).

Outline of requirements

NPPOs of the EPPO region generally promote the use of biological control in plant protection as, like other aspects of integrated pest management, it reduces risks for 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.

Approbation

Les Normes OEPP sont approuvées par le Conseil de l'OEPP. La date d'approbation figure dans chaque norme. Selon les termes de l'Article II de la CIPV, il s'agit de Normes régionales pour les membres de l'OEPP.

Révision

Les Normes OEPP sont sujettes à des révisions et des amendements périodiques. La prochaine date de révision de cette série de Normes OEPP est décidée par le Groupe de travail pour l'étude de la réglementation phytosanitaire.

Enregistrement des amendements

Des amendements seront préparés si nécessaire, numérotés et datés. Les dates de révision figurent (si nécessaire) dans chaque norme individuelle.

Distribution

Les Normes OEPP sont distribuées par le Secrétariat de l'OEPP à tous les Etats membres de l'OEPP. Des copies sont disponibles, sous certaines conditions, auprès du Secrétariat de l'OEPP pour toute personne intéressée.

Champ d'application

Les Normes OEPP sur la sécurité de la lutte biologique sont destinés aux ONPV ou aux organismes équivalents, en leur qualité d'autorités responsables de la surveillance et, le cas échéant, de la réglementation de l'importation et de l'utilisation des agents de lutte biologique.

Référence

CIPV (1995) *Code de Conduite pour l'Importation et le Lâcher des Agents Exotiques de Lutte Biologique*. NIMP no. 3. Secrétariat de la CIPV, FAO, Rome (IT).

Vue d'ensemble

Les ONPV de la région OEPP soutiennent en général l'utilisation de la lutte biologique en protection des végétaux, dans la mesure où, comme d'autres éléments de la lutte intégrée, elle réduit les risques pour la santé humaine et pour l'environnement. L'utilisation des auxiliaires peut toutefois comporter certains risques, en particulier pour l'environnement dans le cas des agents exotiques introduits à partir d'autres continents, et pour l'applicateur lorsque les agents prennent la forme de produits phytosanitaires formulés. Ce dernier cas est en général couvert par les Normes OEPP de la série PP, concernant les produits phytosanitaires. L'objectif des Normes OEPP sur la sécurité de la lutte biologique est de fournir aux ONPV des directives pour l'évaluation et la réduction des risques occasionnés par diverses étapes de l'introduction et de l'utilisation des agents de lutte biologique et, le cas échéant, de les comparer avec les avantages en termes d'efficacité. Les Normes OEPP préconisent que le cadre administratif pour l'introduction et l'utilisation des auxiliaires reste léger, afin d'éviter autant que possible dans la pratique tout conflit avec la politique générale de promotion de la lutte biologique.

Existing EPPO standards in this series

Two EPPO guidelines on the safe use of biological control have already been approved and published. Each standard is numbered in the style PM 6/1(1), meaning an EPPO Standard on Phytosanitary Measures (PM), in series 6 (Safe use of biological control), in this case standard no. 1, first version. The existing standards are:

PM 6/1(1) First import of exotic biological control agents for research under contained conditions. *Bulletin OEPP/EPPO Bulletin 29*, 269–272.

PM 6/2(1) Import and release of exotic biological control agents. *Bulletin OEPP/EPPO Bulletin 31*, 29–36.

Normes OEPP déjà existantes dans cette série

Deux Normes OEPP sur la sécurité de la lutte biologique ont déjà été approuvées et publiées. Chaque norme est individuellement numérotée: par exemple, la norme PM 6/1(1) est une Norme OEPP sur les mesures phytosanitaires (PM), appartenant à la série 6 (Sécurité de la lutte biologique); il s'agit dans ce cas de la Norme 1, première version. Les normes existantes sont:

PM 6/1(1) Première importation d'agents exotiques de lutte biologique aux fins de recherche en confinement. *Bulletin OEPP/EPPO Bulletin 29*, 269–272.

PM 6/2(1) Importation et lâcher d'agents exotiques de lutte biologique. *Bulletin OEPP/EPPO Bulletin 31*, 29–36.

Safe use of biological control
Sécurité de la lutte biologique

List of biological control agents widely used in the EPPO region
Liste d'agents de lutte biologique largement utilisés dans la région OEPP

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 2001-09. Revisions of the list are not subject to approval by EPPO Council, but are decided by the Panel on Safe Use of Biological Control. Last revision in 2002-03.

Champ d'application spécifique

Cette norme donne une liste d'agents de lutte biologique largement utilisés dans la région OEPP, afin de faciliter les décisions concernant l'importation et le lâcher d'agents de lutte biologiques dans les pays de l'OEPP.

Approbation et amendement spécifiques

Approbation initiale en 2001-09. Les révisions de la liste ne sont pas soumises à l'approbation du Conseil de l'OEPP, mais sont décidées par le Groupe d'experts sur la sécurité de la lutte biologique. Dernière révision en 2002-03.

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 exotic 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 the absence of significant risks, or the availability of reliable risk management measures, for many individual organisms.

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 these agents can be introduced and

¹In 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 (without necessarily establishing) (i.e. introduced) or are perpetuating themselves in the EPPO region after introduction for the foreseeable future (i.e. established).

Introduction

Les Normes OEPP PM 6/1 et PM 6/2 fournissent des directives aux autorités nationales de la région OEPP sur l'introduction et le lâcher d'agents exotiques de lutte biologique, afin d'identifier et d'éviter les risques pour les écosystèmes agricoles et naturels. Ces normes sont destinées à être utilisées en relation avec des introductions futures, et non pas rétrospectivement pour d'anciennes introductions. L'expérience et les connaissances accumulées sur l'utilisation des agents de lutte biologique introduits dans un certain nombre de pays de la région OEPP suffisent pour indiquer l'absence de risques significatifs, ou l'existence de mesures appropriées pour la gestion du risque, pour de nombreux agents.

Liste d'agents de lutte biologique

Cette liste spécifie donc les agents de lutte biologique indigènes, introduits et établis¹ qui sont reconnus par le Groupe d'experts OEPP sur la sécurité de la lutte biologique comme ayant été largement utilisés dans plusieurs pays OEPP. D'autres pays OEPP peuvent donc présumer, avec une certaine confiance, que ces agents peuvent être

¹Par rapport à la NIMP no. 3, cela signifie les agents de lutte biologique originaires de la région OEPP (c'est-à-dire indigènes), ou les agents de lutte biologique lâchés dans un écosystème de la région OEPP où ils n'étaient pas présents (sans nécessairement s'établir) (c'est-à-dire introduits) ou les agents de lutte biologique persistants dans un avenir prévisible après leur introduction dans la région OEPP (c'est-à-dire établis).

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. These are related to certain broad criteria, which are flexibly applied:

- (1) successful classical biological control agent, or
- (2) 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).

Microorganisms used for biological control are not considered (since these are covered by EU Directive 91/414 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 two parts: commercially used biological control agents (Appendix I) and successfully introduced classical biological control agents (Appendix II).

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.

Table 1 List of commercially used biological control agents

INSECTA	
Coleoptera	<i>Encyrtus lecaniorum</i>
<i>Adalia bipunctata</i>	<i>Eretmocerus eremicus</i>
<i>Chilocorus baileyi</i>	<i>Eretmocerus mundus</i>
<i>Chilocorus bipustulatus</i>	<i>Gyranoidea litura</i>
<i>Chilocorus circumdatus</i>	<i>Hungariella peregrina</i>
<i>Chilocorus nigrita</i>	<i>Hungariella pretiosa</i>
<i>Coccinella septempunctata</i>	<i>Leptomastidea abnormis</i>
<i>Cryptolaemus montrouzieri</i>	<i>Leptomastix dactylopii</i>
<i>Delphastus catalinae</i>	<i>Leptomastix epona</i>
<i>Rhyzobius lophanthae</i>	<i>Lysiphlebus testaceipes</i>
<i>Rodolia cardinalis</i>	<i>Metaphycus flavus</i>
<i>Scymnus rubromaculatus</i>	<i>Metaphycus helvolicus</i>
<i>Stethorus punctillum</i>	<i>Metaphycus lounsburyi</i>
	<i>Metaphycus swirskii</i>
Diptera	<i>Microterys flavus</i>
<i>Aphidoletes aphidimyza</i>	<i>Opius pallipes</i>
<i>Episyrphus balteatus</i>	<i>Praon volucre</i>
	<i>Pseudaphycus maculipennis</i>

introduits et utilisés en sécurité. Ils peuvent, d'après leur jugement, se passer de, ou simplifier, les procédures de notification proposées dans les Normes OEPP PM 6/1 et PM 6/2.

Les agents sont ajoutés à la liste sur la base d'un jugement d'experts sur les informations disponibles. Des critères larges sont appliqués, de manière flexible:

- (1) agent de lutte biologique classique utilisé avec succès ou
- (2) agent de lutte biologique qui est (ou a été) commercialisé et qui soit est indigène et largement réparti dans la région OEPP, soit est établi et largement réparti dans la région OEPP, soit a été utilisé pendant au moins 5 ans et dans au moins cinq pays OEPP (exceptionnellement moins, par ex. cultures cultivées dans quelques pays seulement).

Les microorganismes utilisés pour la lutte biologique ne sont pas pris en compte (car ils sont couverts par la Directive de l'UE 91/414 ou des réglementations équivalentes dans la plupart des pays OEPP). L'absence d'un organisme donné sur la liste ne signifie pas qu'il n'est pas sûr, mais qu'il n'a pas encore été étudié, ou que des incertitudes nécessitent qu'il soit encore étudié, ou que son utilisation est trop récente pour pouvoir l'ajouter à la liste. La liste (établie en langue anglaise) est mise à jour chaque année. Elle est divisée en deux parties: agents de lutte biologique commercialisés (annexe I) et agents de lutte biologique introduit avec succès (annexe II).

Feltiella acarisuga

Hemiptera/Heteroptera

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

Hymenoptera

Anagrus atomus
Anagrus fusciventris
Anagrus pseudococci
Aphelinus abdominalis
Aphidius colemani
Aphidius ervi
Aphidius matricariae
Aphytis diaspidis
Aphytis holoxanthus
Aphytis lingnanensis
Aphytis melinus
Aprostocetus hagenowii
Bracon hebetor
Cales noacki
Coccophagus lycimnia
Coccophagus rusti
Coccophagus scutellaris
Compariella bifasciata
Cotesia marginiventris
Dacnusa sibirica
Diglyphus isaea
Encarsia citrina
Encarsia formosa
Encyrtus infelix

Scutellista cyanea

Thripobius semiluteus
Trichogramma brassicae
Trichogramma cacoeciae
Trichogramma dendrolimi
Trichogramma evanescens

Neuroptera

Chrysoperla carnea

Thysanoptera

Franklinothrips megalops
Franklinothrips vespiformis
Karnyothrips melaleucis

ARACHNIDA

Acarina

Amblyseius barkeri
Amblyseius degenerans
Cheyletus eruditus
Hypoaspis aculeifer
Metaseiulus occidentalis
Neoseiulus californicus
Neoseiulus cucumeris
Phytoseiulus persimilis
Stratiolaelaps miles
Typhlodromus pyri

NEMATODA

Heterorhabditis bacteriophora
Heterorhabditis megidis
Phasmarhabditis hermaphrodita
Steinernema carpocapsae
Steinernema feltiae

INSECTA**Coleoptera***Adalia bipunctata*

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

Chilocorus bipustulatus

Family: Coccinellidae
 Main target pests: Diaspididae, Coccidae (*Saissetia oleae*)
 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, Germany,
 Netherlands
 Use: Indoors

Chilocorus nigrita

Family: Coccinellidae
 Main target pests: Diaspididae, Asterolecaniidae
 Original distribution: S. Asia, E. Africa
 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 pest: *Planococcus citri*
 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, Ireland, Italy, Netherlands,
 Norway, Poland, Portugal, Russia, Slovakia, Spain, Sweden,
 Switzerland, Tunisia, UK
 Use: Indoors/outdoors

Delphastus catalinae

Synonym: *Delphastus pusillae*
 Family: Coccinellidae
 Main target pests: Aleyrodidae (*Trialeurodes vaporariorum*, *Bemisia tabaci*)
 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

Rhyzobius lophanthae

Synonym: *Lindorus lophanthae*
 Family: Coccinellidae
 Main target pests: Diaspididae (*Pseudolacaspis pentagona*),
Quadraspidiotus perniciosus, *Chrysomphalus dictyospermi*,
Parlatoria blanchardi
 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 pest: *Icerya purchasi*
 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 pest: *Panonychus ulmi*
 Original distribution: Palaearctic
 Distribution in EPPO: Widespread

Date of first use: 1995
 EPP0 countries where used: Belgium, France, Germany, Netherlands, Portugal, Spain, Sweden
 Use: Indoors

Diptera

Aphidoletes aphidimyza
 Family: Cecidomyiidae
 Main target pests: Aphididae (*Aphis gossypii*, *Myzus persicae*, *Macrosiphum* sp., *Aulacorthum* sp.)
 Original distribution: Central Europe, Palaearctic
 Distribution in EPP0: Widespread
 Date of first use: 1985
 EPP0 countries where used: Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, 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 EPP0: Widespread
 Date of first use: 1995
 EPP0 countries where used: Belgium, Denmark, Germany, Italy, Netherlands, Portugal
 Use: Indoors/outdoors

Feltiella acarisuga
 Synonyms: *Therodiplosis persicae*
 Family: Cecidomyiidae
 Main target pests: *Tetranychus urticae*, *T. cinnabarinus*
 Original distribution: W. Europe/Mediterranean
 Distribution in EPP0: Widespread
 Date of first use: 1995
 EPP0 countries where used: Belgium, Czechia, Denmark, Finland, France, Germany, Ireland, Italy, Lithuania, Netherlands, Norway, Poland, Spain, Sweden, Switzerland, UK
 Use: Indoors

Hemiptera/Heteroptera

Anthocoris nemoralis
 Family: Anthocoridae
 Main target pests: Psyllidae (orchards)
 Original distribution: Palaearctic
 Established in EPP0: Yes
 Distribution in EPP0: Palaearctic
 Date of first use: ?
 EPP0 countries where used: Belgium, Denmark, Netherlands
 Use: Outdoors

Anthocoris nemorum
 Family: Anthocoridae
 Main target pests: *Cacopsylla pyri*, thrips
 Original distribution: Palaearctic
 Distribution in EPP0: Widespread
 Date of first use: 1992

EPP0 countries where used: Belgium, Denmark, France, Germany, Italy, Netherlands, UK
 Use: Outdoors

Macrolophus melanotoma

Synonyms: *Macrolophus caliginosus*
 Family: Miridae
 Main target pests: Aleyrodidae
 Original distribution: Mediterranean
 Distribution in EPP0: Croatia, Turkey, France, Greece, Hungary, Italy, Malta, Macedonia, Portugal, Spain (including Islas Canarias), Switzerland, Algeria, Morocco, Tunisia, Cyprus, Israel (also Libya, Yemen, Iraq)
 Date of first use: 1990
 EPP0 countries where used: Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Jordan, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, Tunisia, Turkey, UK (restricted under licence)
 Use: Indoors

Additional remarks: *Macrolophus melanotoma* 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. melanotoma* on any new crop, particularly ornamentals with a low threshold for cosmetic damage

Orius albidipennis

Family: Anthocoridae
 Main target pests: Thrips
 Original distribution: Mediterranean, palaearctic
 Distribution in EPP0: Mediterranean
 Date of first use: 1991
 EPP0 countries where used: Belgium, France, Israel, Italy, Netherlands, Spain
 Use: Indoors

Orius laevigatus

Family: Anthocoridae
 Main target pests: Thripidae (*Frankliniella occidentalis*, *Thrips tabaci*)
 Original distribution: Palaearctic (except north)
 Distribution in EPP0: Widespread
 Date of first use: 1991
 EPP0 countries where used: Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Jordan, Lithuania, Malta, Morocco, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Switzerland, Tunisia, UK
 Use: Indoors

Orius majusculus

Family: Anthocoridae
 Main target pests: Thripidae (*Frankliniella occidentalis*, *Thrips tabaci*)
 Original distribution: Palaearctic
 Distribution in EPP0: Widespread
 Date of first use: 1991
 EPP0 countries where used: Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Italy, Lithuania, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, UK
 Use: Indoors

Picromerus bidens

Family: Pentatomidae
 Main target pests: Lepidoptera
 Original distribution: Palaearctic (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, *Leptinotarsa decemlineata*
 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, Germany, Greece, Italy, Netherlands, Russia, Spain
 Use: Indoors/outdoors

Hymenoptera*Anagrus atomus*

Family: Mymaridae
 Main target pests: Cicadellidae
 Original distribution: Palaearctic
 Distribution in EPPO: ?
 Date of first use: 1994
 EPPO countries where used: Belgium, France, Germany, 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 pseudococci

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

Aphelinus abdominalis

Family: Aphelinidae
 Main target pests: Aphididae (*Macrosiphum euphorbiae*, *Aulacorthum solani*)
 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, Ireland, Italy,

Jordan, Netherlands, Poland, Spain, Sweden, Switzerland, Tunisia, UK
 Use: Indoors

Aphidius colemani

Family: Braconidae
 Main target pests: Aphididae (*Aphis gossypii*, *Myzus persicae*, *M. nicotianae*)
 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, Hungary, Ireland, Italy, Jordan, Lithuania, Malta, Morocco, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, Tunisia, Turkey, UK
 Use: Indoors

Aphidius ervi

Family: Braconidae
 Main target pest: *Macrosiphum euphorbiae*
 Original distribution: Palaearctic
 Distribution in EPPO: Widespread
 Date of first use: 1995
 EPPO countries where used: Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, UK
 Use: Indoors/outdoors

Aphidius matricariae

Family: Braconidae
 Main target pest: *Myzus persicae*
 Original distribution: Holarctic
 Distribution in EPPO: Widespread in temperate regions
 Date of first use: 1990
 EPPO countries where used: Austria, Belgium, Netherlands, Poland, Portugal, Slovakia, UK
 Use: Indoors

Aphytis diaspidis

Family: Aphelinidae
 Main target pests: Diaspididae, *Quadraspidiotus perniciosus*, *Pseudaulacaspis pentagona*
 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, Germany, Netherlands, Spain
 Use: Indoors

Aphytis lingnanensis

Family: Aphelinidae
 Main target pests: *Aonidiella aurantii*, *Chrysomphalus dictyospermi*

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 pest: *Aonidiella aurantii*
 Original distribution: India/Pakistan
 Distribution in EPPO: Mediterranean
 Date of first use: 1985
 EPPO countries where used: Belgium, Czechia, Denmark, France, Germany, Greece, Portugal, Spain
 Use: Outdoors/indoors

Aprostocetus hagenowii

Synonyms: *Tetrastichus hagenowii*, *Tetrastichodes hagenowii*
 Family: Eulophidae
 Main target pests: Blattidae (*Periplaneta* 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: *Habrobracon hebetor*
 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

Cales noacki

Family: Aphelinidae
 Main target pest: *Aleurothrixus floccosus*
 Original distribution: Chile
 Distribution in EPPO: Mediterranean
 Date of first use: 1970
 EPPO countries where used: France, Greece, Israel, Italy, Malta, Morocco, Portugal, Spain, Tunisia
 Use: Outdoors

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, Germany, Netherlands, Portugal, Spain
 Use: Indoors

Comperiella bifasciata

Family: Encyrtidae
 Main target pests: Diaspididae (*Chrysomphalus aonidum*, *Aonidiella aurantii*)
 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: *Apanteles marginiventris*
 Family: Braconidae
 Main target pests: Lepidoptera (Noctuidae)
 Original distribution: Americas
 Distribution in EPPO: ?
 Date of first use: 1993
 EPPO countries where used: Belgium, France, Germany, Netherlands, Spain
 Use: Indoors

Dacnusa sibirica

Family: Braconidae
 Main target pests: Agromyzidae (*Liriomyza* 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, Italy, 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 (*Liriomyza* 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

Encarsia citrina

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

Encarsia formosa

Family: Aphelinidae
 Main target pests: Aleyrodidae (*Trialeurodes vaporariorum*, *Bemisia tabaci*)
 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

Encyrtus infelix

Synonyms: *Eucomys tananarivensis*
 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, Germany, Netherlands, Spain
 Use: Indoors

Encyrtus lecaniorum

Family: Encyrtidae
 Main target pests: Coccidae
 Original distribution: Palaearctic
 Distribution in EPPO: Widespread (south)
 Date of first use: 1980
 EPPO countries where used: Belgium, France, Germany, Netherlands, Spain
 Use: Indoors

Eretmocerus eremicus

Synonyms: *Eretmocerus californicus*
 Family: Aphelinidae
 Main target pest: *Bemisia tabaci*
 Original distribution: Southern nearctic
 Distribution in EPPO: Mediterranean
 Date of first use: 1994
 EPPO countries where used: Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Lithuania, Malta, Morocco, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Switzerland, Tunisia, Turkey
 Use: Indoors

Eretmocerus mundus

Family: Aphelinidae
 Main target pest: *Bemisia tabaci*

Original distribution: South Europe
 Distribution in EPPO: Mediterranean
 Date of first use: 1996
 EPPO countries where used: Germany, Italy, Netherlands, Portugal, Spain
 Use: Indoors

Gyranusoidea litura

Family: Encyrtidae
 Main target pest: *Pseudococcus longispinus*
 Original distribution: Africa
 Distribution in EPPO: France, Spain
 Date of first use: 1990
 EPPO countries where used: Belgium, France, Germany, Netherlands
 Use: Indoors

Hungariella peregrina

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

Hungariella pretiosa

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

Leptomastidea abnormis

Synonym: *Leptomastix abnormis*
 Family: Encyrtidae
 Main target pests: Pseudococcidae
 Original distribution: Palaearctic
 Distribution in EPPO: Widespread
 Date of first use: 1984
 EPPO countries where used: Austria, Belgium, Denmark, Germany, Israel, Italy, Netherlands, Spain, Switzerland, Turkey, UK
 Use: Indoors

Leptomastix dactylopii

Family: Encyrtidae
 Main target pest: *Planococcus citri*
 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, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Spain, UK
 Use: Indoors/outdoors

Leptomastix epona

Family: Encyrtidae
 Main target pests: Pseudococcidae, especially *Pseudococcus affinis*

Original distribution: Palearctic
 Distribution in EPPO: Widespread (south)
 Date of first use: 1992
 EPPO countries where used: Belgium, France, Germany, Netherlands, Spain, UK
 Use: Indoors

Lysiphlebus testaceipes

Family: Braconidae
 Main target pests: Aphididae (*Aphis gossypii*)
 Original distribution: Nearctic, USA
 Distribution in EPPO: Mediterranean countries (and possibly others)
 Date of first use: 1990
 EPPO countries where used: Denmark, Italy, Spain
 Use: Indoors

Metaphycus flavus

Family: Encyrtidae
 Main target pests: Coccidae, *Saissetia oleae*, *Coccus hesperidum*
 Original distribution: Nearctic
 Distribution in EPPO: Mediterranean
 Date of first use: 1999
 EPPO countries where used: Germany, Netherlands, Switzerland
 Use: Indoors

Metaphycus helvolus

Family: Encyrtidae
 Main target pests: Coccidae (*Saissetia oleae*, *Coccus hesperidum*)
 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

Metaphycus lounsburyi

Synonyms: *M. bartletti*, *M. annecki* and *M. hagenowii*, also established in some Mediterranean countries, have been misidentified as *M. lounsburyi*
 Family: Encyrtidae
 Main target pests: Coccidae (*Saissetia oleae*)
 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

Metaphycus swirskii

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, Germany, Netherlands, Spain
 Use: Indoors

Microterys flavus

Family: Encyrtidae

Main target pests: Coccidae (*Saissetia oleae*)
 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

Opius pallipes

Family: Braconidae
 Main target pest: *Liriomyza bryoniae*
 Original distribution: Palearctic (?)
 Distribution in EPPO: Widespread
 Date of first use: 1980
 EPPO countries where used: Belgium, Czechia, Denmark, France, Germany, Greece, Lithuania, Netherlands, Poland, Spain, UK
 Use: Indoors

Praon volucre

Synonym: *Aphydius volucre*
 Family: Braconidae
 Main target pests: Aphididae
 Original distribution: Palearctic
 Distribution in EPPO: Widespread
 Date of first use: ?
 EPPO countries where used: Belgium, Germany, Netherlands, UK
 Use: Indoors

Pseudaphycus maculipennis

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

Scutellista cyanea

Synonym: *Scutellista caerulea*
 Family: Pteromalidae
 Main target pests: Coccidae (*Saissetia oleae*, *S. coffea*, *Ceroplastes rusci*)
 Original distribution: Africa
 Distribution in EPPO: Mediterranean, CIS
 Date of first use: 1990
 EPPO countries where used: Belgium, Denmark, France, Netherlands, Switzerland
 Use: Indoors

Thripobius semiluteus

Family: Eulophidae
 Main target pests: Thysanoptera (*Heliothrips* 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

Trichogramma brassicae

Family: Trichogrammatidae
 Main target pests: Lepidoptera (*Ostrinia nubilalis*)
 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, Jordan, Netherlands, Slovakia, Spain, Switzerland, UK
 Use: Outdoors/indoors

Trichogramma cacoeciae

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

Trichogramma dendrolimi

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

Trichogramma evanescens

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, Jordan, Netherlands, Portugal, Slovakia, Spain, Tunisia, UK
 Use: Indoors/outdoors

Neuroptera*Chrysoperla carnea*

Synonym: *Chrysopa carnea*
 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, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, Switzerland, UK
 Use: Indoors/outdoors

Thysanoptera*Franklinothrips megalops*

Synonym: *Franklinothrips myrmicaeformis*
 Family: Aeolothripidae
 Main target pests: Thrips

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

Franklinothrips vespiformis

Family: Aeolothripidae
 Main target pests: Thrips
 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 (*Howardia biclavis*)
 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***Amblyseius barkeri*

Synonyms: *Amblyseius mackenziei*, *Neoseiulus barkeri*
 Family: Phytoseiidae
 Main target pests: Thysanoptera (*Thrips tabaci*, *Frankliniella occidentalis*)
 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

Synonyms: *Iphiseius degenerans*
 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, Netherlands, Norway, Poland, Spain, Switzerland, Tunisia, Turkey, UK
 Use: Indoors

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, Czech Republic, France, Germany, Netherlands
 Use: Indoors
 Additional remarks: Cases of allergic reactions to farmers have been reported

Hypoaspis aculeifer

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

Metaseiulus occidentalis

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

Neoseiulus californicus

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

Neoseiulus cucumeris

Synonyms: *Amblyseius cucumeris*
 Family: Phytoseiidae
 Main target pests: Thysanoptera (*T. tabaci*, *F. occidentalis*)
 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, Hungary, Ireland, Italy, Jordan, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, Tunisia, Turkey, UK
 Use: Indoors/outdoors

Phytoseiulus persimilis

Synonyms: *Phytoseiulus riegeli*, *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, Hungary, Ireland, Italy, Jordan, Lithuania, Malta, Morocco, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, Tunisia, Turkey, UK

Use: Indoors/outdoors

Stratiolaelaps miles

Synonyms: *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, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, UK
 Use: Indoors

Typhlodromus pyri

Family: Phytoseiidae
 Main target pests: *Panonychus ulmi*, *Tetranychus urticae*, *Eriophyes vitis*, *Epitimerus 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: *Heterorhabditis heliothidis*
 Family: Heterorhabditidae
 Main target pests: Vine weevils (*Otiorynchus* 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, Switzerland
 Use: Outdoors/?indoors

Heterorhabditis megidis

Family: Heterorhabditidae
 Main target pests: Vine weevils (*Otiorynchus* 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, Ireland, Italy, 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, Italy, Netherlands, UK
Use: Indoors/outdoors

Steinernema carpocapsae

Synonyms: *Neoapectana carpocapsae*, *N. feltiae*

Family: Steinernematidae

Main target pests: Vine weevils (*Otiiorhynchus* 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, Italy, Netherlands, Portugal, Sweden, UK

Use: Indoors/outdoors

Steinernema feltiae

Synonyms: *Neoapectana feltiae*, *N. bibionis*, *Steinernema bibionis*, *N. leucaniae*

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, Ireland, Italy, Netherlands, Norway, Poland, Slovakia, Spain, Sweden, Switzerland, UK

Use: Indoors/outdoors

Appendix II Successfully introduced 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 used, 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 used successfully in at least one of the countries mentioned. The result of the introduction is 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 result of introduction 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.

Table 2 List of successfully introduced classical biological control agents

INSECTA	<i>Aphytis lingnanensis</i>
Coleoptera	<i>Aphytis melinus</i>
<i>Adalia bipunctata</i>	<i>Aphytis proclia</i>
<i>Cryptolaemus montrouzieri</i>	<i>Archenomus orientalis</i>
<i>Harmonia axyridis</i>	<i>Cales noacki</i>
<i>Rhizophagus grandis</i>	<i>Clausenia purpurea</i>
<i>Rhyzobius forestieri</i>	<i>Comperiella bifasciata</i>
<i>Rodolia cardinalis</i>	<i>Encarsia berleseii</i>
<i>Scymnus impexus</i>	<i>Encarsia elongata</i>
<i>Scymnus reunioni</i>	<i>Encarsia lahorensis</i>
<i>Serangium parcesetosum</i>	<i>Encarsia perniciosi</i>
Diptera	<i>Eretmocerus debachi</i>
<i>Cryptochetum iceryae</i>	<i>Lysiphlebus testaceipes</i>
Hymenoptera	<i>Metaphycus anneckii</i>
<i>Ageniaspis citricola</i>	<i>Metaphycus flavus</i>
<i>Allotropa burrelli</i>	<i>Metaphycus helvolus</i>
<i>Allotropa convexifrons</i>	<i>Metaphycus lounsburyi</i>
<i>Amitus spiniferus</i>	<i>Metaphycus swirskii</i>
<i>Anagyrus agrausis</i>	<i>Neodryinus typhlocybae</i>
<i>Anagyrus fusciventris</i>	<i>Neodusmetia sangwani</i>
<i>Anaphes nitens</i>	<i>Ooencyrtus kuvanae</i>
<i>Aphelinus mali</i>	<i>Pseudaphycus malinus</i>
<i>Aphytis holoxanthus</i>	<i>Psyllaephagus pilosus</i>
<i>Aphytis lepidosaphes</i>	<i>Psytalia concolor</i>
	<i>Pteroptrix smithi</i>

INSECTA

Coleoptera

Adalia bipunctata

Family: Coccinellidae

Main target pest: *Toxoptera aurantii*

Date of first use: ?

EPPO countries where introduced: Portugal (Azores) [S*]
(*Widespread in the EPPO region*)

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] (*Mediterranean distribution*)

Multiple/single introductions: Single

Origin of collected material: Australia

Target pest: *Planococcus citri*

Date of first use: 1908-

EPPO countries where introduced: Italy [E; Sardegna P; Sicilia E], Israel [P], Portugal, Greece [F], Cyprus [T], Spain [T], former USSR (Georgia) [F?] (*Mediterranean distribution*)

Multiple/single introductions: Single, multiple

Origin of collected material: Australia

Harmonia axyridis

Family: Coccinellidae

Main target pest: *Toxoptera aurantii*

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

Rhizophagus grandis

Family: Rhizophagidae

Main target pest: *Dendroctonus micans*

Date of first use: 1963-

EPPO countries where introduced: former USSR (Georgia) [S], UK [E], France [E] (*Probably widespread in Central & Eastern Europe*)

Multiple/single introductions: Single, multiple

Origin of collected material: Belgium

Rhyzobius forestieri

Family: Coccinellidae

Main target pest: *Saissetia oleae*

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

Main target pest: *Icerya purchasi*

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 [S], Switzerland [F], Greece [S], Malta [C], Cyprus [S] (*Mediterranean distribution, CIS*)

Multiple/single introductions: Single, multiple

Origin of collected material: Australia

Scymnus impexus

Family: Coccinellidae

Main target pests: *Adelges* spp.

Date of first use: 1968

EPPO countries where introduced: Sweden [S], UK [N] (*native in Europe*)

Multiple/single introductions: Single

Origin of collected material: Germany

*Scymnus reunioni*Synonym: *Nephus reunioni*

Family: Coccinellidae

Main target pest: *Planococcus citri*

Date of first use: 1967

EPPO countries where introduced: Israel [N], Italy (Sardagna) [P], former USSR (Georgia) [F?]

Multiple/single introductions: Single

Origin of collected material: India

Serangium parcesetosum

Family: Coccinellidae

Main target pest: *Dialeurodes citri*

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

Diptera*Cryptochetum iceryae*

Family: Cryptochetidae

Main target pest: *Icerya purchasi*

Date of first use: 1987

EPPO countries where introduced: Israel [S]

Multiple/single introductions: Single

Origin of collected material: Australia

Hymenoptera*Ageniaspis citricola*

Family: Encyrtidae

Main target pest: *Phyllocnistis citrella*

Date of first use: 1994-

EPPO countries where introduced: Israel, Morocco, Algeria, Tunisia, France, Greece, Cyprus, Spain, Italy (Sicilia)

Multiple/single introductions: Single, multiple

Origin of collected material: Thailand, Florida (USA)

Allotropia burrelli

Family: Platygasteridae

Main target pest: *Pseudococcus comstocki*

Date of first use: 1945

EPPO countries where introduced: former USSR [P*]

Multiple/single introductions: Single

Origin of collected material: Japan

Allotropia convexifrons

Family: Platygasteridae

Main target pest: *Pseudococcus comstocki*

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

Main target pest: *Aleurothrixus floccosus*

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

Main target pest: *Nipaecoccus viridis*

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

Main target pests: Pseudococcidae (*Pseudococcus longispinus*)
 Date of first use: 1972
 EPPO countries where introduced: Israel [S]
 Multiple/single introductions: Single
 Origin of collected material: Australia

Anaphes nitens

Family: Mymaridae
 Main target pest: *Goniopteris scutellatus*
 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
 Main target pest: *Eriosoma lanigerum*
 Date of first use: 1920-
 EPPO countries where introduced: France [P], 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] (*Widespread in the EPPO region*)
 Multiple/single introductions: Single
 Origin of collected material: USA

Aphytis holoxanthus

Family: Aphelinidae
 Main target pest: *Chrysomphalus aonidum*
 Date of first use: 1956
 EPPO countries where introduced: Israel [C*] (*Mediterranean distribution*)
 Multiple/single introductions: Single
 Origin of collected material: Hong Kong

Aphytis lepidosaphes

Family: Aphelinidae
 Main target pest: *Cornuaspis beckii*
 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

Aphytis lingnanensis

Family: Aphelinidae
 Main target pest: *Aonidiella aurantii*
 Date of first use: 1960-
 EPPO countries where introduced: Cyprus [P], Israel [E], Italy (Sicilia), Morocco [E] (*Mediterranean distribution*)
 Multiple/single introductions: Single
 Origin of collected material: China

Aphytis melinus

Family: Aphelinidae
 Target pest: *Chrysomphalus dictyospermi*
 Date of first use: 1962-
 EPPO countries where introduced: Greece [S; Kriti, C], Italy [C], Morocco [C], France (Corse) [C], Spain [S], former USSR (Georgia) [E?] (*Mediterranean distribution*)

Multiple/single introductions: ?
 Origin of collected material: India/Pakistan

Target pest: *Aonidiella aurantii*

Date of first use: 1961-
 EPPO countries where introduced: Cyprus [P], Israel [P], Italy (Sicilia) [P], Morocco [E] (*Mediterranean distribution*)
 Multiple/single introductions: Single, multiple
 Origin of collected material: India/Pakistan

Target pest: *Aspidiotus nerii*

Date of first use: ?
 EPPO countries where introduced: Greece (Kriti) [P] (*Mediterranean distribution*)
 Multiple/single introductions: Single
 Origin of collected material: India/Pakistan

Aphytis proclia

Family: Aphelinidae
 Main target pest: *Pseudaulacaspis pentagona*
 Date of first use: 1924
 EPPO countries where introduced: Italy [S] (*Widespread in the EPPO region*)
 Multiple/single introductions: Single
 Origin of collected material: East Asia

Archenomus orientalis

Family: Aphelinidae
 Main target pest: *Pseudaulacaspis pentagona*
 Date of first use: 1909
 EPPO countries where introduced: Italy [S]
 Multiple/single introductions: Single
 Origin of collected material: Japan

Cales noacki

Family: Aphelinidae
 Main target pest: *Aleurothrixus floccosus*
 Date of first use: 1970-
 EPPO countries where introduced: Spain [S], France [C], Italy [S], Morocco [C], Portugal [E], Tunisia [C], Malta, Greece (*Mediterranean distribution*)
 Multiple/single introductions: Single, multiple
 Origin of collected material: Chile

Clausenia purpurea

Family: Encyrtidae
 Main target pest: *Pseudococcus citriculus*
 Date of first use: 1940
 EPPO countries where introduced: Israel [C]
 Multiple/single introductions: Single
 Origin of collected material: Japan

Comperiella bifasciata

Family: Encyrtidae
 Main target pest: *Aonidiella aurantii*
 Date of first use: 1924-
 EPPO countries where introduced: Israel [P*], Italy, France [N] (*Mediterranean distribution*)
 Multiple/single introductions: Single
 Origin of collected material: South China

Encarsia berlesei

Family: Aphelinidae

Main target pest: *Pseudaulacaspis pentagona*

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

Encarsia elongata

Family: Aphelinidae

Main target pest: *Lepidosaphes gloverii*

Date of first use: 1979

EPPO countries where introduced: Spain [S]

Multiple/single introductions: Single

Origin of collected material: East Asia

Encarsia lahorensis

Family: Aphelinidae

Main target pest: *Dialeurodes citri*

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

Encarsia perniciosi

Family: Aphelinidae

Main target pest: *Quadraspidiotus perniciosus*

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] (*Widespread in the EPPO region*)

Multiple/single introductions: Single, multiple

Origin of collected material: China, Korea

Eretmocerus debachi

Family: Aphelinidae

Main target pest: *Parabemisia myricae*

Date of first use: 1982-

EPPO countries where introduced: Israel [C], Turkey [C], Italy [S] (*Mediterranean distribution?*)

Multiple/single introductions: Single

Origin of collected material: Japan, North America

Lysiphlebus testaceipes

Family: Braconidae

Target pest: *Aphis citricola*

Date of first use: 1973-

EPPO countries where introduced: former Czechoslovakia, France (Corse) [P], Morocco [N] (*Mediterranean countries (and possibly others)*)

Multiple/single introductions: Single, multiple

Origin of collected material: USA

Target pest: *Toxoptera aurantii*

Date of first use: 1973-

EPPO countries where introduced: France [S, P], Spain [P], Italy [E], Morocco [N] (*Mediterranean countries (and possibly others)*)

Multiple/single introductions: Single, multiple

Origin of collected material: USA

Metaphycus anneckeii

Family: Encyrtidae

Main 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

Metaphycus flavus

Family: Encyrtidae

Main target pest: *Coccus hesperidum*

Date of first use: 1959

EPPO countries where introduced: Italy [P], former USSR (Ukraine) [C] (*Mediterranean distribution*)

Multiple/single introductions: Single

Origin of collected material: Morocco

Metaphycus helvolus

Family: Encyrtidae

Main 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

Metaphycus lounsburyi

Family: Encyrtidae

Main target pest: *Saissetia oleae*

Date of first use: 1973-

EPPO countries where introduced: France [P], Israel [C], Greece (Kriti) [P], Italy [E], Cyprus [S] (*Mediterranean distribution*)

Multiple/single introductions: Single

Origin of collected material: South Africa

Metaphycus swirskii

Family: Encyrtidae

Main 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

Neodryinus typhlocybae

Family: Dryinidae

Main 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

Neodusmetia sangwani

Family: Encyrtidae

Main 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

Ooencyrtus kuvanae

Family: Encyrtidae
 Main 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

Pseudaphycus malinus

Family: Encyrtidae
 Main 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

Psyllaephagus pilosus

Family: Encyrtidae

Main 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

Psytalia concolor

Synonym: *Opius concolor*

Family: Braconidae

Main target pest: *Bactrocera oleae*

Nature of control: Substantial, partial

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

Pteroptrix smithi

Family: Aphelinidae

Main 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