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Biodiversity Guide in viticulture



[Ecological infrastructure: ground cover between vines]

Picture: Cristina Carlos | Advind

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»»» Introduction

A balanced vineyard environment with a diverse agro-ecosystem must be created and preserved to enhance vine production in the long term. Whilst grape varieties are a core part of vine biodiversity, many other species of plants and animals related to the viticulture landscape contribute to the natural control of pests, at the same time enriching the soil and humus of the vineyard. This small pocket guide is intended to describe the main species that can be easily detected by the farmer, focusing mostly on beneficials – organisms that benefit the growing process – in contrast to the detrimental action of pests. Benefits include pest control, pollination and the maintaining of soil health. Some nematodes, fungi and bacteria are beneficials but are not visible enough, so they are not featured here. The guide also provides some insight on how to promote biodiversity, in particular the presence of beneficials, by using ecological infrastructure.

》》》 Beneficial fauna

ARTHROPODS [insects/spiders/mites]

→ **Insects** (*Insecta*)

Insects are one of the most diverse and successful groups of organisms on the planet. Although they include numerous pests, many others play a dominant and vital role in the functioning of ecosystems, contributing to key ecological functions. For example, by behaving like predators, parasites or parasitoids, many insects limit the development of populations of crop enemies. By fragmenting and pre-digesting excrement, dead plant and/or animal material, some insect species stimulate and accelerate organic matter decomposition, improving soil fertility. Many species are pollinators, assuming great importance in agricultural production and plant diversity.

Ladybirds (*Coccinellidae*)

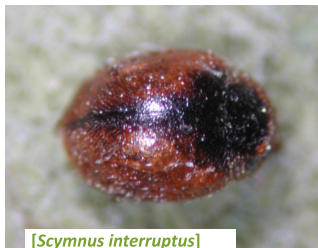


● ● ● Ladybirds are mostly predators, both in the larval and adult stages; many feed preferentially on certain groups of insects or mites. In particular, there are species that feed on aphids (detrimental insects that suck out plant fluids) and species that feed on mites. The most well known is the seven-spot ladybird, *Coccinella septempunctata*, which has red-colored wings punctuated with three black dots each and with one more dot on the junction of the two wings, making a total of seven dots. It is an typical species of biological control, often sold for that purpose. On the other hand, *Stethorus punctillum* is a smaller ladybird and a spider mite predator; adults are tiny and oval shaped, dark brown to black in colour. Larvae are slow moving, gray with conspicuous legs. They move from plant to plant on leaves.



[*Coccinella septempunctata*]

Picture: Cristina Carlos | Advind



[*Scymnus interruptus*]

Picture: Cristina Carlos | Advind



[*Adalia bipunctata*]

Picture: Cristina Carlos | Advind



[Larvae of *C. septempunctata*]

Picture: Cristina Carlos | Advind



[*Stethorus punctillum*]

Picture: Gilles San Martin



[larvae of *Scymnus* sp. feeding on aphids]

Picture: Cristina Carlos | Advind

Green lacewings (*Chrysopidae*)



● ● ● Green lacewings are delicate insects. They are characterized by a wide costal field in their wing venation. The bodies of the adults are usually bright green to greenish-brown, and the wings are usually translucent with a slight iridescence.

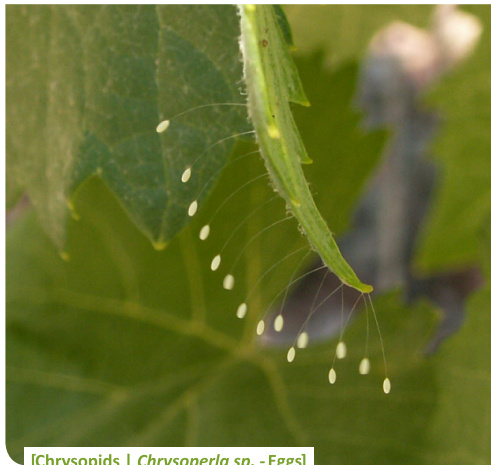
Green lacewings have a wide food range. Their larvae feed on eggs and immature stages of mites and insects; adults can eat insects, sugary substances like pollen, nectar and honeydew excreted by other insects, or have a mixed diet. Eggs are placed on plants, usually where aphids are present nearby in numbers. Each egg is hung on a slender stalk about 1 cm long, usually on the underside of a leaf.

In several countries, Green lacewings are reared for sale as biological control agents of insect and mite pests in agriculture and gardens.



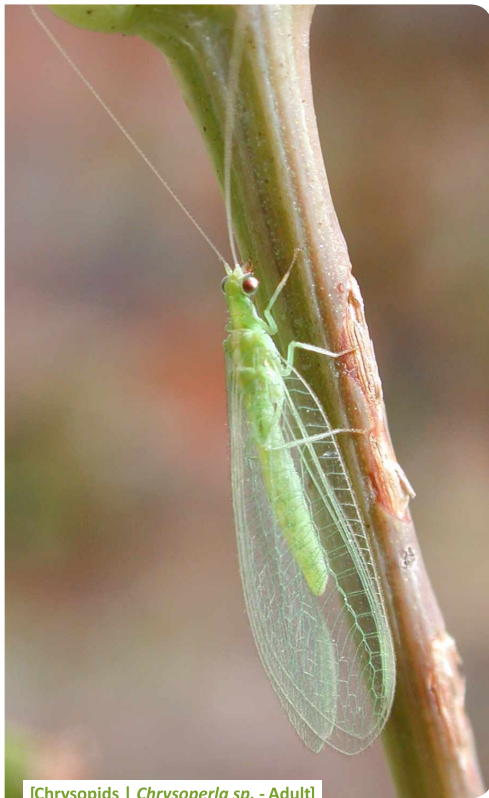
[Chrysopids | *Chrysoperla sp.* - Larva]

Picture: Cristina Carlos | Advíd



[Chrysopids | *Chrysoperla sp.* - Eggs]

Picture: Cristina Carlos | Advíd



[Chrysopids | *Chrysoperla sp.* - Adult]

Picture: Cristina Carlos | Advíd

Parasitic wasps



● ● ● Some insects among the Hymenoptera – a large group that includes wasps, bees and ants – are parasitoids. Adults lay their eggs inside the larvae of other insects and when they hatch, the larvae devour them from inside, exerting a very effective control. These wasps attack mainly caterpillars present in the vineyard.

Adults of the Encyrtidae and Eulophidae families eat sugary substances such as pollen, nectar or molasses. *Elachertus affinis* is the main European grapevine moth parasitoid in Douro vines (Portugal) and they are also present in Valencia (Spain), while *Anagyrus pseudococci* is an important mealybug parasitoid.

Among the family Ichneumonidae, *Campoplex capitator* is an important grapevine moth parasitoid.



[Eulophid | *Elachertus affinis* - Larva]

Picture: Cristina Carlos | Advíd



[Ichneumonid | *Campoplex capitator* - Adult]

Picture: Cristina Carlos | Advíd



[Eulophid | *Elachertus affinis* - Adult]

Picture: Cristina Carlos | Advíd



[Encyrtid | *Anagyrus prox. pseudococi* - Adult]

Picture: Fátima Gonçalves

Flies (*Diptera*)



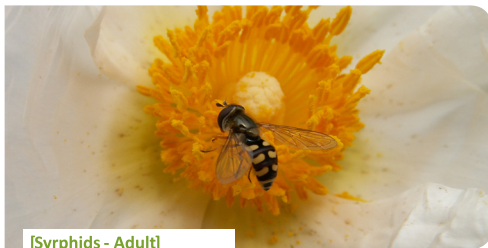
● ● ● Insects of this group use only a single pair of wings to fly, the hindwings being reduced to club-like balancing organs known as halteres. Diptera is one of the largest groups in insects, containing around 1 million species. It aggregates several insects, and larval stages often play an important role in pest control. For example, larvae of tachinids are parasitoids that develop preferentially at the expense of lepidopteran larvae; the larvae of Cecidomyiidae are predators of eggs and soft-bodied insects, such as mealybugs.

Hoverflies (Syrphids): In the larval state they are predators, feeding on aphids and other soft-bodied insects; the adults feed on pollen and nectar of flowers, especially on plants from the Asteraceae family (aster, daisy, sunflower, etc.) on which they are frequently observed.



[Syrphids - Pupa and larva]

Picture: Cristina Carlos | Advíd



[Syrphids - Adult]

Picture: Cristina Carlos | Advíd



[Syrphids - Adult]

Picture: Fátima Gonçalves



[Syrphids | *Sphaerophoria scripta* - Female]

Picture: Fátima Gonçalves



[Syrphids | *Episyrphus balteatus* - Female]

Picture: Fátima Gonçalves



[Syrphids | *Eupeodes corollae* - Female]

Picture: Fátima Gonçalves

True bugs

(Miridae, Anthocoridae, Nabidae)



● ● ● Miridae is a large and diverse insect family frequently referred to as capsid bugs or mirid bugs. They are small and usually oval-shaped or elongated. Common names are leaf bugs and grass bugs. The most widely known mirids are notorious agricultural pests but some species, however, are predators, hence their special interest for the vineyard. The Anthocoridae are a family of bugs, commonly called minute pirate bugs or flower bugs. Their head is extended forward and the antennae are longer than the head and visible from above. They are often predacious as nymphs and adults, and mostly feed on other small arthropods. The insect family Nabidae contains the so-called damsel bugs. Many of these insects catch and hold prey with their forelegs, similarly to the praying mantis. They are generalist predators, catching almost any insect smaller than themselves, and cannibalizing each other when no other food is available.



[Mirids | *Lygocoris sp.*]

Picture: Cristina Carlos | Advíd



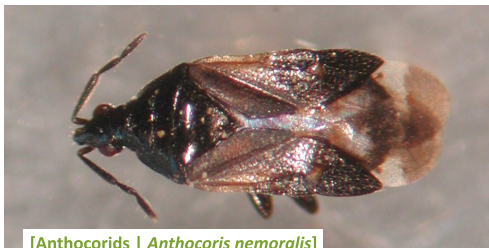
[Mirids | *Deraeocoris ruber*]

Picture: Cristina Carlos | Advíd



[Mirids | *Malacocoris chlorizans*]

Picture: Cristina Carlos | Advíd



[Anthocorids | *Anthocoris nemoralis*]

Picture: Cristina Carlos | Advíd



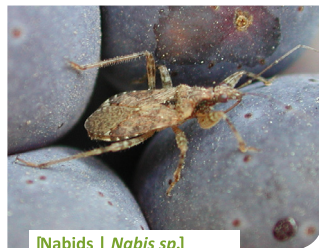
[Anthocorids
Anthocoris nemoralis - nymph]

Picture: Cristina Carlos | Advíd



[Nabids | *Himacerus sp.*]

Picture: Fátima Gonçalves



[Nabids | *Nabis sp.*]

Picture: Cristina Carlos | Advíd

Dragonflies and damselflies (*Odonata*)



● ● ● Dragonflies and damselflies are distinct odonates. Damselflies are smaller, more delicate and fragile, and much more dependent on water. When they land, they normally keep their four wings closed and together on the abdomen. Dragonflies are larger, can be seen far from the water and some are even migratory. When they are landed, their wings remain open.

Odonates are predators in both the adult and nymph states; nymphs feed on insects and small aquatic crustaceans, while adults feed on various terrestrial insects. They are normally found close to running water bodies and function as ecological indicators (dragonflies in particular are quite intolerant to pollution).

A steady decline of the Odonata insect order has been observed over the years and almost a fifth (19%) of the dragonfly species occurring in the Mediterranean region are currently threatened.



[Violet dropwing
Trithemis annulata]
Picture: Paulo Barros



[Golden-ringed dragonfly
Cordulegaster boltonii]
Picture: Paulo Barros



[Ruddy darter
Sympetrum sanguineum]
Picture: Paulo Barros



[Migrant hawk | *Aeshna mixta*]
Picture: Paulo Barros



[Beautiful demoiselle | *Calopteryx virgo*]
Picture: Paulo Barros

→ Arachnids (Arachnida)



Arachnids include mites, spiders and several other organisms, such as opiliones (also called harvestmen), scorpions and pseudoscorpions, and solifugids (also called false spiders).

Mites

● ● ● Mites are the group with the highest specific diversity. Although the most known species are those that cause damage (yellow spider mite or eriophids), there are several groups that are highly important as biological control agents, behaving either as predators of other mites (phytoseiids), small insects (in the case of anystids), or as parasites of some pests (in the case of erittraeids), and others that can play an important role in the recycling of soil organic matter.



[Circular web spider | *Mangora acalypha*]
Picture: Cristina Carlos | Advind



[Circular web spider | *Agalenatea redii*]
Picture: Fátima Gonçalves

Spiders



● ● ● Spiders are, just after the mites, the group with the highest specific diversity. If we exclude mites, in vineyards they often represent more than 95% of predators, capturing various pests. For example, the circular-web spiders (araneids) are predators, feeding on a great variety of flying insects that they capture in webs; most construct orbicular webs, which consist of successive concentric circles, with lines arranged radially from the centre to the edge, toward the anchor points.

In the ground cover, canopy spiders, spring spiders and wolf spiders hunt and thus decimate pests in their spread.



[Anystid mite feeding on a grape moth]
Picture: Cristina Carlos | Advíd



[Phytoseiid acari]
Picture: Cristina Carlos | Advíd



[Jumping spider | *Evarcha sp.*]
Picture: Fátima Gonçalves



[Jumping spider | *Salticus sp.*]
Picture: Fátima Gonçalves



[Female of a licosid (group of tarantulas) carrying the egg sac.]
Picture: Cristina Carlos | Advíd

Other arachnids



● ● ● **Opiliones** resemble spiders, but their body is round, not divided in the same way as spiders and have very long legs. They feed on small insects, although some species may also consume decaying material and fungi.

Scorpions are predators that consume insects and arachnids; they have twilight and nocturnal habits, staying hidden during the day in sheltered places, frequently below stones.

Pseudoscorpions are generalist predators of small invertebrates; they usually prefer humid environments, spending most of their time inside cracks in bark, in organic waste, under rocks, or in soil insect shelters.

Solifugids are generalist predators, which feed on other arthropods in the soil; they have nocturnal habits, staying sheltered under stones or in cavities during the day; they inhabit hot and dry regions.



[Opiliones „Harvestmen“]
Picture: Cristina Carlos | Advíd



[Solifugid | *Gluvia dorsalis*]
Picture: Fátima Gonçalves



[Yellow Scorpion | *Buthus ibericus*]
Picture: Fátima Gonçalves



[Pseudoscorpion]
Picture: Fátima Gonçalves

REPTILES



Snakes and lizards

● ● ● Snakes and lizards belong to the same group of reptiles, both having the body and tail elongated and covered by scales, which allows them to avoid drying out, making them independent of the aquatic environment and able to conquer a large numbers of biotopes.

Saurians (lizards, skinks, geckos) are carnivores whose diet includes large numbers of prey, such as snakes, vipers, micro-mammals and invertebrates, such as flies, crickets, snails, spiders, caterpillars, etc. Therefore, they are considered as beneficial for agriculture in terms of controlling undesirable fauna and pests.



[Gecko | *Tarentola mauritanica*]

Picture: Joaquim Gonçalves



[Ladder snake | *Rhinechis scalaris*]

Picture: Aurora Monzón



[Montpellier snake | *Malpolom monspessulanus*]

Picture: Aurora Monzón

BIRDS



Birds are a relevant group in the vineyard in terms of natural limitation of pests and important for their conservation interest and ecotourism.

Passerine bird *(Passeriformes)*

● ● ● Most passerines are predators of invertebrates; both insectivorous and granivorous birds (birds feeding on seeds, berries and fruits, but young birds will be feed on arthropods during rearing) consume a great variety of these organisms, such as insect larvae and adults, arachnids, annelids and small mollusks. Hence, many of them contribute to the natural control of pest insects in agricultural land.

Agricultural areas, hardwood and coniferous forests, and ruderal and/or peri-urban habitats contribute to the occurrence of a significant number of passerines, mainly composed of resident species. Vineyards surrounded by very complex landscapes have shown a greater richness in bird species.



[Eurasian blue tit | *Cyanistes caeruleus*]

Picture: Carlos Rio

European robin (*Erithacus rubecula*)



● ● ● Also known simply as the robin or robin redbreast, this is a small insectivorous passerine bird, specifically a chat, with a distinctive red spot on its breast. It is mostly diurnal and is relatively unafraid of people and drawn to human activities involving soil digging, in order to look for earthworms and other food freshly turned up. Indeed, the robin is considered to be a gardener's friend. In autumn and winter, robins will supplement their usual diet of spiders, worms and insects, with berries and fruit. Robins may choose a wide variety of sites for building a nest, as long as it can offer some shelter, like a depression or hole. During the breeding season, male robins usually initiate their morning song an hour before sunrise, and usually terminate their daily singing around thirty minutes after sunset.



[European robin | *Erithacus rubecula*]

Picture: Carlos Rio

Stonechat

(Saxicola rubicola)



● ● ● The European stonechat, common stonechat or just stonechat (*Saxicola rubicola*) is a species of the Old World flycatcher family.

It is a small, easily identifiable insectivore, especially the males. It has a characteristic black pattern on the head, contrasting with the white collar and orange breast.

This bird is one of the easiest to observe due to its conspicuity, especially when it perches on the poles and fences of open areas to watch out for insects.

European stonechats are short-distance migrants or non-migratory, with part of the population moving to spend the winter further south in Europe or north Africa. Both sexes have a clicking call like stones knocking together; in fact, *saxicola* means “rock-dweller” in Latin.



[Stonechat | *Saxicola rubicola*]

Picture: Nuno Silva



[Stonechat | *Saxicola rubicola*]

Picture: Cristina Carlos | Advíd

Common chaffinch / finch (*Fringilla coelebs*)



● ● ● The common finch has distinct plumages for males and females, being in the latter quite less showy. The males sport a typical blue cap that extends from the nape to the back, chest and reddish cheeks, and wings with a contrasting black-and-white pattern. It is distributed throughout Europe, Central Asia and North Africa.

It frequents forest areas, such as pine forests, cork oaks and hardwoods, and builds its nest in the trees. Although adults only eat seeds, the young are fed almost exclusively with insects, hence their potential functional role as beneficials near the vineyard.

Chaffinches are partial migrants: While a part of the population in Western and Southern Europe overwinters, the rest, remains in Germany, for example, all year round.



[Common chaffinch | *Fringilla coelebs* - Male]
Picture: Nuno Silva



[Common chaffinch | *Fringilla coelebs* - Female]
Picture: Nuno Silva

Black redstart

(Phoenicurus ochruros)



● ● ● The black redstart is a common bird in urban gardens; in rural settings it can be found mostly on rocky slopes. It is a bird of 14 cm in length and 24 cm of wingspan, whose male features dark gray body plumage, a black head and a red-orange rust-colored tail; the female and juveniles have a grayish brown body and head.

It has a characteristic behaviour, wagging its tail when resting on roofs or walls and stirring continuously. Its vocalisation, similar to that of the European robin, is clear and chirping.

They feed essentially on insects and their larvae, which they collect from the ground, jumping on them from a perch, usually of little height; hence their potential role as beneficials. At the end of the summer and in the autumn they also eat berries and fruits.



[Black redstart | *Phoenicurus ochruros* - Female]

Picture: Nuno Silva

Wheatear (*Oenanthe* sp.)



● ● ● *Oenanthe* is a genus belonging to the so-called Old World flycatchers. The northern wheatear, or simply wheatear, is a small passerine bird; it is “the most widespread member of the wheatear genus *Oenanthe* in Europe and Asia. The northern wheatear is a migratory insectivorous species, breeding in open stony country and nesting in rock crevices and rabbit burrows. All birds spend most of the winter in Africa.

Oenanthe derives from the Greek ainos (“wine”) and anthos (“flower”). The name evokes these birds return to Greece in the spring just as the grapevines blossom. The black wheatear (*Oenanthe leucura*) is slightly larger than the other wheatear species and is characterized by black plumage, strongly contrasting with the white tail. Though its conservation status worldwide is of “Least concern”, in Europe it is “Vulnerable”.



[Gray wheatear | *Oenanthe oenanthe*]

Picture: Carlos Rio



[Black wheatear | *Oenanthe leucura*]

Picture: Nuno Silva

The genus *Carduelis* is a group of birds belonging to the finch family.

Goldfinch (*Carduelis carduelis*)



● ● ● The goldfinch's preferred food is small seeds such as those from thistles (*carduus* in Latin) and teasels, but insects are also taken when feeding young. It can be observed in almost all places, from urban areas to forests and woods, except mountain highlands. It regularly visits bird feeders in winter.

Linnet (*Carduelis cannabina*)

● ● ● Males are easily recognizable by the characteristic red forehead and chest, which contrast with the gray head. It frequents very diverse habitats, including agricultural land. Their food is basically composed of seeds, but also consumes some insects.

Greenfinch (*Carduelis chloris*)

● ● ● It presents a showy coloration, but it is its singing, sonorous and trilled, that most attracts attention. The male has a thick beak and is distinguished by the general greenish tonality.



[Goldfinch | *Carduelis carduelis*]

Picture: Nuno Silva



[Linnet | *Carduelis cannabina*]

Picture: Nuno Silva



[Greenfinch | *Carduelis chloris*]

Picture: Carlos Rio

Tits (*Parus sp.*)



● ● ● Tits are widespread among all Europe in almost all habitats, from woods to open landscapes, rural and urban areas or gardens.

Great tit (*Parus major*)

● ● ● The great tit (*Parus major*) is a bird of the Paridae family, which also includes the well-known blue-tit. It is a fairly common species throughout Europe and Asia. From 13 to 14 cm in length, it is easily identified due to the yellow breast with a black band that connects the throat to the abdomen. The characteristic behavior it adopts as it feeds, fluttering among the branches of the trees, suspending itself upside down and emitting successive calls, makes its detection and identification easier.

The great tit's diet consists mainly of insects and spiders, but also fruits and seeds, especially in winter when insects are scarce. The great tit easily adapts to artificial feeders and nesting boxes.



[Great tit | *Parus major*]
Picture: Carlos Rio

OTHER KINDS OF BIRDS



Birds (in Latin Aves) are a complex group with many divisions, established according to their evolutive history. Predators of large animals, such as mammals, reptiles and amphibians, are popularly called “birds of prey”, and include eagles, falcons and owls, which in fact belong to very distinct biological groups. They can also eat smaller animals, such as annelids, grasshoppers, beetles and other arthropods. Being at the top of food chains, they help to regulate the whole ecosystem.

Little owl (*Athene noctua*)

● ● ● It inhabits much of the temperate and warmer parts of Europe, among other regions in the world. This owl is a member of the typical or true owl family, *Strigidae*, which contains most species of owl, the other group being the barn owls. It is a small, mainly nocturnal species and is found in a wide range of habitats. It feeds on insects, earthworms, other invertebrates and small vertebrates.



[Little owl | *Athene noctua*]

Picture: Márcio Nobrega | Sogevinus

MAMMALS



Bats

● ● ● There are approximately 1,200 species of bats (*Chiroptera*), representing a quarter of all mammalian fauna in the world, of a huge variety of shapes, sizes and dietary habits. Most bat species in Europe are protected under the Habitats Directive. Many are predators, feeding on large amounts of mosquitoes and other insects, a great benefit for agriculture in general.

Rodents and other small mammals

● ● ● Rodents intervene directly in the regeneration, growth and composition of plant species, contributing to the dispersion of spores and seeds; insectivore mammals (ex: the Hedgehog) in particular help protect against pests. Another mammal group, the *Soricomorpha* (moles, shrews) include the small *Crocidura russula*, the most common of the white-toothed shrews, a good example of beneficial mammals, being a very active insect predator.



[Lesser horseshoe bat
Rhinolophus hipposideros]
Picture: Cristina Carlos | Advíd



[Greater mouse-eared bat
Myotis myotis]
Picture: Ján Svetlík



[Greater white-toothed shrew
Crocidura russula]
Picture: Aurora Monzón



[Common bent-wing bat
Miniopterus schreibersii]
Picture: Paulo Barros



[Hedgehog] *Erinaceus europaeus*]
Picture: Carlos Rio



》》》 Beneficial plants

Plants are intrinsically part of the landscape and they constitute an extremely important portion of the so-called “ecological infrastructures”, the basis for shelter, nesting or food of many animals and other organisms. The presence of flower-producing plants increases the biological protection of pest conservation. There is a wide range of beneficial plants the farmer can sow, but they should preferably be indigenous or native and not water demanding, and herbaceous, shrub or arboreal.

Herbaceous species (ground covers)

● ● ● Example: Common nettle, *Urtica dioica*. Also called stinging nettle, this is a perennial flowering plant, native to Europe and many other regions and has the potential for encouraging beneficial insects; it can also be used to produce a natural insecticide.



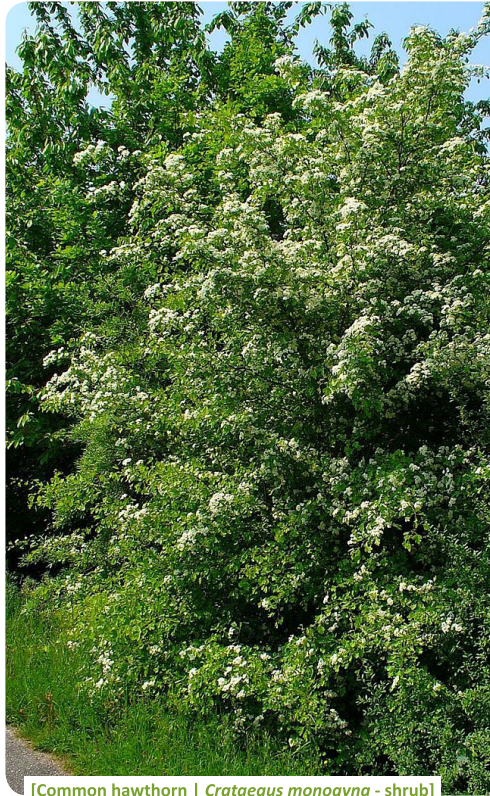
[Common nettle | *Urtica* sp.]
Picture: Cristina Carlos | Advivid

Shrubby species (Hedges)



● ● ● Example: **Common hawthorn** (*Crataegus monogina*)

This is a species native to Europe, northwest Africa and western Asia, common and spontaneous in several types of soil, preferring loose soils with some moisture. Usually lives at low altitudes, in full light; it fits well in warm climates but resists frost well. It is an important food source for larvae of many Lepidoptera. There are over 140 species of insects associated with the tree. Studies conducted in Douro, Portugal, showed that it is home for many helpful insects, including crisopids and syrphids.



[Common hawthorn | *Crataegus monogyna* - shrub]

Picture: H. Zell



[Common hawthorn | *Crataegus monogyna* - flower]

Picture: H. Zell



[Common hawthorn | *Crataegus monogyna* - berry]

Picture: H. Zell

Trees (*linear element*)



● ● ● The presence of trees is very important in hedgerows or vine surroundings, in the separation of plots or in riparian galleries; indigenous tree species or regional varieties of fruit trees can be conserved, whilst the practice of leaving dead trees with hollows and cavities is also a good practice to promote biodiversity.

Olive tree | *Olea europaea*

● ● ● The olive tree is an important element of the landscape and Mediterranean vegetation and agriculture of this region due to its food interest (olives and olive oil). It is a broad, rounded tree or shrub with a thick trunk, usually quite tortuous, with a gray bark, very cracked. It can support some bird species (little owl, hoopoe, etc.).



[Olive tree | *Olea europaea* L.]

Picture: David Brühlmeier



[Olive tree line within vineyards]

Picture: Cristina Carlos | Advivid

》》》 Pests and invasive species

● ● ● Some species can harm production, halt the development of biodiversity or even endanger the vineyard ecosystem: these are the pests and the invasive species. If left uncontrolled, they can spread and conquer the entire habitat of native species, with the consequent imbalance of the whole system. Relevant pests in vineyards are: **European grapevine moth** (*Lobesia botrana*); **green leafhopper** (*Empoasca vitis*); **vine mealybug** (*Planococcus ficus*); **red spider mite** (*Tetranychus urticae*); **grape bud mite** (*Eriophyes vitis*).

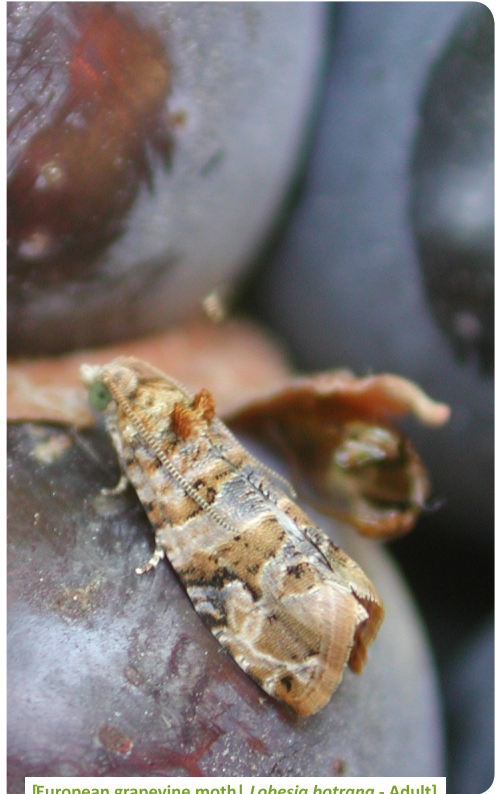
Examples of invasive animals: the leafhopper *Scaphoideus titanus*, vector of the disease flavescence dorée; spotted-wing drosophila, the spotted-wing drosophila fly (*Drosophila suzukii*). Examples of invasive plants: *Ailanthus altissima*, *Acacia mimosa*, *Phytolacca americana*.



[Green leafhopper | *Empoasca vitis* - nymph and adult]
Picture: Cristina Carlos | Advíd



[*Scaphoideus titanus*]
Picture: Cristina Carlos | Advíd



[European grapevine moth | *Lobesia botrana* - Adult]
Picture: Cristina Carlos | Advíd

》》》 Promoting biodiversity in the vineyard

To enhance biodiversity, there are some key structural elements that can be set up or improved by the farmer. Next to each beneficial animal group or species in this guide, there are one or more icons that correspond to the element(s) that improve their presence, directly or by attracting most of their prey:



1.) Hedgerows

Lines or groups of trees, shrubs, perennial forbs and grasses that grow naturally or are planted along roadways, fences, field edges or other non-cropped areas. They diversify the landscape and provide relevant habitats for plants and animals, promoting shadow and nesting places for several birds. Hedgerows help reduce soil erosion, reduce the drying effects of wind and work as barriers to avoid drifts of pesticides, preventing, as well, the spreading of invasive alien plants.



2.) Cover crops

Vegetation, either native or seeded between or in vine rows, which contributes to the rational and sustainable management of the crop, as it attracts beneficial organisms which prey on pest species. They improve soil fertilization, can be reused as mulching and contribute to preventing or reducing soil erosion.



3.) Herbaceous borders, headlands or slopes with natural vegetation

Very important elements of connection between major habitats (woodland, scrubland areas) and vineyards, promoting the dissemination of biodiversity into the cropped area.



4.) Dry stone walls / equivalent structures

It is important to build or restore stone walls, which will provide shelter to several species of birds, reptiles, insects and spiders. Besides stone walls, old mines, dovecotes, lofts and abandoned houses are very important infrastructures for bats and birds.



5.) Forests, copses, woodland, scrubland areas

While the proximity of these at the surroundings of vineyards will enhance the presence of several beneficials, they also are important for protecting threatened species. Riparian vegetation, i.e. trees and bushes near water streams, are of particular importance for biodiversity.

Note that these elements can be complemented with the setting of artificial structures, such as nesting places for bats and birds, “insect hotels”, etc.



[Ecological infrastructure: dry stone wall with fauna and flora]

Picture: Márcio Nobrega | Sogevinus

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»»» Further readings

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- (8) Heiko Bellmann: welches Insekt ist das? ISBN: 978-3-440-15050-4
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***THE PARTNERSHIP FOR BIODIVERSITY
PROTECTION IN VITICULTURE
IN EUROPE ...***

aims at adapting vine-growing practices to protect, enhance and promote the biodiversity in vineyards, through the development of analysis modules and trainings around Germany, Turkey, Portugal and Spain.

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