

Mites in soybean production

Željko Milovac, Kristina Petrović, Svetlana Balešević Tubić,
Jürgen Recknagel and Marjana Vasiljević



Pests are generally not a problem in European soybean crops. Spider mites account for a large proportion of what pest damage there is. The risk of damage is high during dry and hot conditions in summer. Several mite species can damage soybean plants, but two are more harmful than others: the spider mite (*Tetranychus atlanticus*) and the two-spotted spider mite (*Tetranychus urticae*). There are no acaricides available for use in soybean in the European Union (EU) and chemical control is not an option in the EU or for crops grown to EU standards elsewhere.

Outcome

Spider mite populations can reach damaging levels very quickly. Infestation can reduce the soybean yield by 40–60%. The protection of the crop from stresses, such as herbicide damage, reduces the risk of damaging infestation. Where chemical control is permitted, detection of outbreaks in the early stage helps to implement effective control measures. Monitoring should start in late June and continue throughout July and August. Early treatment decreases damage and spot treatment of localised patches of infection near field boundaries may be sufficient.



The two-spotted spider mite, *Tetranychus urticae*.
Photograph: USDA ARS, Electron and Confocal Microscope Unit

Applicability

Theme: Crop protection

For: All soybean growers

Where: Where soybean is planted

Timing: June - August

Equipment: Spraying if permitted

Follow up: Monitoring of fields

Impact: Yield

Biology of the spider mite and the two-spotted spider mite

Mature spider mite females are 0.5 mm long and egg shaped. Summer generation females are yellow green, while winter generation females are more red. Males are smaller and yellow, with a sharp-pointed abdomen. Eggs are oval and approximately 0.14 mm in diameter. Freshly laid eggs are glassy-white. The eggs become more yellow later. The first immature stage (larvae) is around 0.5 mm long and yellow, with three pairs of legs. The following nymphal stages and adults have four pairs of legs.

The two-spotted spider mite is a cosmopolitan species and can feed on a range of host plant species. Adults are the size of salt grains and are greenish-yellow to brown, with two black spots. Morphological traits, biology, damage and control are similar to *Tetranychus atlanticus*.

Biology

Mites have 10 to 14 generations per year. Overwintering females lay their eggs on wild plants in spring. Mites migrate from wild plants on field margins to crops and create colonies very fast. These are usually covered with a fine silky web which protects them from predators and adverse weather conditions. Colonies consist of individuals of all growing stages.





Mites attack. Photograph: IFVCNS

This makes chemical control more difficult. Populations rapidly increase during June. Mites reach their highest abundance in July and August. Daytime temperatures over 30°C greatly increase the risk of damage. Natural enemies and diseases of the mites that counter the build-up of infestations, spread in cooler humid conditions.

Crop monitoring and detection

A 10x magnifying lens is very helpful for the visual detection. The easiest way to detect an infestation is to tap a leaf over a sheet of white paper on which the mites are visible as dark, moving dots. Webs on the leaf surface indicate an infestation. The mites migrate into the soybean crop particularly if the vegetation in field margins is mown or otherwise disturbed. Neighbouring alfalfa fields pose a particular risk, as alfalfa is a preferred host plant of mites. The mites use the wind and their nets for transport, flying like a balloon ('ballooning'). If possible, vegetation adjacent to the soybean field should not be mown during dry periods because this can stimulate migration into the crop.

Mites pierce leaves to suck sap causing yellow dots which expand and merge over time. Infested leaves become yellow or bronze. Some leaf drop follows. Webbing may also be present under the

leaves. Mites usually populate the upper young leaves but in some cases of heavier infestation, whole plants can be covered with web. Damaged plants are smaller, their transpiration increases and photosynthesis is less effective. They also mature earlier, producing fewer pods and lower yields. Symptoms of infestation can easily be confused with water stress, improper herbicide application, or leaf diseases. The first symptoms occur at field edges, and later the whole field can be infested.

Control

Spider mites are controlled by various natural enemies. These are mainly predatory mites (e.g., species of the Phytoseiidae), lesser mite destroyer/spider mite destroyer (*Stethorus punctillum*), the common green lacewing (*Chrysoperla carnae*), brown lacewings (Hemerobiidae) and predatory bugs (*Orius spp.*). These beneficial insects should be supported to avoid mass reproduction of spider mites. In addition, all cultivation measures that reduce drought stress will help. These include attention at sowing to establish a crop that competes against weeds avoiding severe herbicide use that stresses the crop. Rain is the farmer's best friend in case of spider mites because the spider mite population usually collapses when rain

follows a warm dry period. The mites are then attacked by the fungal antagonist *Neozygites floridana*. The fungus requires 12–24 hours of weather conditions with less than 29°C in combination with 90% humidity to spread throughout the whole population. Infected mites can be recognized by their waxy and dull structure. They die after 1–3 days.

There are no synthetic acaricides approved for the control of mites in soybean in the European Union. Outside the EU, there are only a few acaricides available for chemical control based on chlorpyrifos, dimethoate (both organophosphates), bifenthrin (a pyrethroid) or abamectin (avermectins). Some of these pesticides are available for use in European countries outside the EU. These are often not able to effectively control an infestation.

Management options

- Cultural and biological control is the cornerstone of managing these pests. Good crop establishment (sowing date, crop densities etc.) can reduce the damage of this pest.
- It is important to prevent weeds since a wide range of weed species host mites in the crop. These plants can host several generations and provide the starting point of infestations.
- Irrigation has beneficial effects on soybean. It also helps control mites.
- The crop is particularly sensitive to infestation at flowering (R1 and BBCH stages 60 to 69). This period is critical for yield formation. Where chemical control is an option, a decision to treat should focus on protecting the crop at this time. Although infestation in later growth phases results in increased pod shattering, the negative effects on the yield are not as high.
- Regular and systematic field observations is an important part of crop protection planning.
- The economic threshold for implementing a curative treatment is when 50% of plants with symptoms are observed on field borders, or when there are on average more than 5 specimens on one leaf.
- For chemical control, acaricides registered for this purpose are legal in some European countries outside the EU. In cases of severe attacks, spraying may be repeated after 7 to 10 days. The use of larger quantities of water than is used for other spraying purposes combined with higher sprayer pressure enhances the effect because the colonies inhabit the back of the leaves. Treatments during the hottest daytime periods should be avoided.
- The same acaricide should not be used twice in the same season because spider mites are able to quickly develop resistance.
- When chemical control is used the lowest effective amount of the respective pesticide, using equipment that is properly calibrated, should be used.
- Following the above-mentioned suggestions will greatly assist in managing spider mites populations. Other activities that will assist include encouraging predators and beneficial insects and monitoring mite populations.



Tetranychus urticae, 200x magnification. Photograph: State Horticultural College and Research Institute Heidelberg (LVG)

Sources

Information shared in this practice note results from the trials and studies carried out by the Institute of Field and Vegetable Crops Novi Sad, Serbia, LTZ Augustenberg, Germany and Sojacentrum Taifun-Tofu GmbH, Freiburg, Germany.

Bachteler, K., 2015. Spider mites on soybeans, Taifun Soy Info n°7: www.sojafoerderring.de/wp-content/uploads/2020/11/10_Red-spider-mite.pdf

Buyung, H. et al., 2016. Northern Plains Integrated Pest Management Guide; consulted November 25th, 2020. [https://wiki.bugwood.org/NPIP:Tetranychus_urticae_\(soybean\)](https://wiki.bugwood.org/NPIP:Tetranychus_urticae_(soybean))

Đorđević, V., Malidža, G., Vidić, M., Milovac, Ž. and Šeremešić, S., 2015. Priručnik za gajenje

soje[Manual for Soybean Growing], Danube Soja, Novi Sad

Knodel, J., 2019. Insect Mangement in Soybeans in Kandel, H. Soybean Production Field Guide for North-Dakota; consulted 25 November, 2020; www.ag.ndsu.edu/publications/crops/soybean-production-field-guide-for-north-dakota

Meier, U., 1997. Growth stages of mono- and dicotyledonous plants = Entwicklungsstadien mono- und dikotyler Pflanzen = Estadios de las plantas mono- y dicotiledóneas = Stades phénologiques des mono- et dicotylédones cultivées. Berlin [u.a.]. Blackwell.

Sekulic, R. and Keresi, T., 2011. Pests of soybean, in Miladinović, J., Hristić, M. and Vidić, M. (Eds), Soybean. Institute of Field and Vegetable Crops, Novi Sad, pp. 446–497.

About this practice note and Legumes Translated

Authors: Željko Milovac, Kristina Petrović, Svetlana Balešević Tubić, Jürgen Recknagel and Marjana Vasiljević

Publisher: Institute of Field and Vegetable Crops, Novi Sad, Serbia (IFVCNS)

Production: Donau Soja

Permalink: www.zenodo.org/record/5060691

Copyright: © The Authors, 2021. Reproduction and dissemination is permitted for non-commercial purposes provided the authors and source are fully acknowledged.

This practice note was prepared within the Legumes Translated project funded by the European Union through Horizon 2020, Project Grant Number 817634.

Citation: Milovac, Z., Petrović, K., Balešević Tubić, S., Recknagel, J. and Vasiljević, M., 2021. Mites in soybean production. Legumes Translated Practice Note 21. Institute of Field and Vegetable Crops Novi Sad (IFVCNS). www.legumestranslated.eu

The content is solely the responsibility of the authors. No warranties, expressed or implied, are made with respect to the information provided. Information relating to the use of plant protection products (pesticides) must be checked against the product label or other sources of product registration information.



This project is funded
by the European Union

