VKM Report 2020: 04

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Scientific Opinion of the Panel on Plant Health of the Norwegian Scientific Committee for Food and Environment

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Preparation of the opinion.

The Norwegian Scientific Committee for Food and Environment (Vitenskapskomiteen for mat og miljø, VKM) appointed a project group to draft the opinion. The project group consisted of two VKM members and a project manager from the VKM secretariat. Two referees commented on and reviewed the draft opinion. The Committee, by the Panel on Plant health assessed and approved the final opinion.

Authors of the opinion

The authors have contributed to the opinion in a way that fulfils the authorship principles of VKM (VKM, 2019). The principles reflect the collaborative nature of the work, and the authors have contributed as members of the project group and/or the VKM Panel on Plant health.

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Acknowledgment

VKM would like to thank the referees Dr. Maria Björkman (The Swedish Environmental Protection Agency) and Dr. Lawrence Kirkendall (University of Bergen and member of the VKM Panel on Alien Organisms and Trade in Endangered Species (CITES)) for reviewing and commenting on the manuscript. VKM emphasises that the referees are not responsible for the content of the final opinion. In accordance with VKM's routines for approval of a risk assessment (VKM, 2018), VKM received their comments before evaluation and approval by the Panel on Plant Health, and before the opinion was finalised for publication.

Competence of VKM experts

Persons working for VKM, either as appointed members of the Committee or as external experts, do this by virtue of their scientific expertise, not as representatives for their employers or third party interests. The Civil Services Act instructions on legal competence apply for all work prepared by VKM.

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Summary

ANDERcontrol with the predatory mite Amblyseius andersoni as the active organism is sought to be used as a biological control agent in Norway. ANDERcontrol is intended for use against different mites (such as the two-spotted, fruit-tree, and red spider mite, russet mite,cyclamen mite) and in horticultural crops such as fruits, berries, vegetables, and ornamental.

VKM's conclusions are as follows

<u>Prevalence, especially if the organism is found naturally in Norway:</u>

Amblyseius andersoni has not been observed in Norway. It has been observed, in low numbers, in southern Sweden and has the capability to enter diapause under unfavourable conditions which suggests the potential for establishing under Norwegian conditions. It is however, the view of VKM that it likely lacks the ability to survive and establish in areas with cold winters and chilly summers, as found in most parts of Norway under current climatic conditions.

<u>The potential of the organism for establishment and spread under Norwegian conditions specified for use in greenhouses and open field:</u>

The thermal preference of A. andersoni restricts its establishment, and the species has not been observed in Norway. The species is capable of entering diapause, but the lack of records, despite targeted surveys, makes it the opinion of VKM that it is unlikely that A. andersoni will be able to establish in outdoor areas in Norway. However, the lack of information on temperature tolerance of the species constitute an uncertainty factor. The risk of spread from greenhouses is low because no wind or vector are likely to carry the mites from the greenhouse to suitable outdoor habitats, and mite populations in greenhouses do not enter the more cold-tolerant diapause.

All conclusions are uncertain due to lack of relevant information regarding the species' climate tolerance.

<u>Any ambiguities regarding the taxonomy, which hampers risk assessment:</u>

There are no taxonomic challenges related to the assessment of A. andersoni.

<u>Assessment of the product and the organism with regard to possible health risk:</u>

VKM is unaware of reports where harm to humans by A. andersoni itself, or associated pathogenic organisms have been observed. Mites may however produce allergic reactions in sensitive individuals handling plant material with high numbers of individuals. There is reason to believe that this holds true also for A. andersoni.

Key words: VKM, risk assessment, Norwegian Scientific Committee for Food and

Environment, Norwegian Food Safety Authority, biological control, predatory mite

Sammendrag på norsk

ANDERcontrol, med rovmidden Amblyseius andersoni som aktiv organisme har blitt søkt godkjent som plantevernmiddel i Norge. ANDERcontrol ønskes brukt til å bekjempe ulike typer midd, hovedsakelig fra familien Tetranychidae (spesielt Panonychus ulmi) og bjørkegallemidd. Arten kan også bekjempe i mindre grad trips og mellus. A.andersoni kan brukes i flere typeravlinger, som for eksempel frukt, prydplanter, grønnsaker, vindruer, jordbær, blåbær og sitrusvekster.

VKM konkluderer følgende

<u>Utbredelse, spesielt hvis organismen forekommer naturlig i Norge:</u>

Amblyseius andersoni har aldri blitt observert i Norge. Små forekomster har blitt registrert i sør-Sverige, og siden arten kan gå i diapause under suboptimale forhold er det grunn til å tro at den kan etablere seg under Norge forhold. VKM ser det likevel som lite sannsynlig at arten kan overleve og etablere seg i områder med kalde vintre og kjølige somre, noe som kjennetegner de klimatiske forholdene i store deler av Norge i dag.

<u>Organismens potensiale for å etablere og spre seg under norske forhold spesifisert for bruk i drivhus og på friland:</u>

Temperatur begrenser hvilke områder A. andersoni kan etablere seg i. Selv om arten kan gå i dvale, er den ikke registrert i Norge, på tross av målrettede søk. Derfor anser VKM det som usannsynlig at A. andersoni vil klare å etablere seg utendørs i Norge. Konklusjonen er usikker på grunn av mangel på informasjon om artens temperaturtoleranse. Risikoen for spredning fra drivhus anses som lav, fordi hverken vind eller andre vektorer vurderes som effektive spredningsveier til egnede områder utendørs. Individer som brukes innendørs går ikke i dvale og er derfor mindre kuldetolerante.

Alle konklusjoner er usikre grunnet mangel på informasjon om artens klimatoleranse.

<u>Tvetydigheter relatert til taksonomi som påvirker risikovurderingen:</u>

Det er ingen taksonomiske utfordringer relatert til vurderingen av A. andersoni.

<u>Vurdering av produktet og organismen opp mot mulig helserisiko:</u>

VKM har ikke funnet rapporter som beskriver skade på mennesker fra A. andersoni eller potensielle følgeorganismer. Midd kan utløse allergiske reaksjoner hos sensitive personer som håndterer plantemateriale med mye midd, og det er grunn til å tro at det også gjelder for A. andersoni.

Nøkkelord: VKM, risikovurdering, Vitenskapskomiteen for mat og miljø, Mattilsynet, biologisk kontroll, rovmidd

Terms of reference as provided by the Norwegian Food Safety Authority/ Norwegian Environment Agency

ANDERcontrol is a new product containing the new macroorganism Amblyseius andersoni. The intended use is for biological control of mites in horticultural crops such as fruits, vegetables, ornamentals, vine, strawberries, blueberries and citruses.

In this regard, The Norwegian Food Safety Authority would like an assessment of the following:

- Prevalence, especially if the organism is found naturally in Norway.
- The potential of the organism for establishment and spread under Norwegian conditions specified for use in greenhouses and open field.
- Any ambiguities regarding the taxonomy, which hampers risk assessment.
- An assessment of the product and the organism with regard to possible health risk.

Assessment

1 Introduction

1.1 Purpose and scope

This document presents a scientific opinion prepared by the Panel of Plant Health, in response to a request from the Norwegian Food Safety Authority. The opinion is an assessment of the biological control product ANDERcontrol and the predatory mite Amblyseius andersoni. The assessment area for this opinion is Norway.

1.2 Product and trade name

The predatory mite Amblyseius andersoni is used as a biological control agent in ANDERcontrol.

The Product ANDERcontrol contains A. andersoni individuals in all life stages (e.g. adult females and first nymphs) and are mixed in an inert substrate e.g. vermiculite or sterilised bran flakes. The product also contains a feeding mite as a food source.
A. andersoni is reportedly suited for use in crops grown in greenhouse conditions (optimum: 25-27 °C, with medium to high humidity), but it is also used in orchards in Central and Southern Europe and is active between 6 and 40 °C. At lower temperatures, it will hibernate or be inactive.

1.2.1 Associated organism

The ANDERcontrol product contains the cheese mite, Tyrolichus casei, which serves as a food source, and carrier material. Tyrolichus casei is probably globally distributed and are a common mite on cheeses (Hughes, 1976). Tyrolichus has been widely used as a food source for Phytoseii predatory mites in other biological control products. Tyrolichus casei is present in Norway.

1.2.2 Original location of Amblyseius andersoni

The original A. andersoni specimens used to establish the culture for ANDERcontrol were sampled during the period 2008-2009 from peach and apple in Lleida (Spain), which represents a minor part of the species' distribution.

The species has a very wide natural distribution, being reported from Europe, North America, and the western parts of Asia (see references below).

The species is found in both natural systems and agroecosystems, especially in orchards and vineyards in Europe (e.g. Czech Republic (Kabíček, 2010), France (Genini et al., 1991), Germany (Jäckel et al., 2002), Greece (Papaioannou-Souliotis et al., 2000), Hungary (Marko et al., 2012), Italy (Lorenzon et al., 2018), the Netherlands (Pijnakker et al., 2007), Poland (Kaźmierczak and Lewandowski, 2006), Serbia (Petrovic et al., 2010), Spain (Garcia-Martinez et al., 2019), Switzerland, Slovakia (Praslicka et al., 2009), Slovenia, Turkey (Ozsisli and Cobanoglu, 2011), and Ukraine (Grabovska et al., 2017), Asia (e.g. Israel, Syria (Korhayli et al., 2018)), and the United States (e.g. California ((Howell and Daugovish, 2016), Oregon (Pratt and Croft, 1998), Pennsylvania (Jubb et al., 1985), and Washington (James, 2002; James et al., 2002).

1.3 Properties for use as a plant protection product

A. andersoni is a generalist predator (Nguyen et al., 2015) feeding on all sorts of mites (e.g. (Lorenzon et al., 2012)) and other small arthropods, including whiteflies. It can also feed, and sustains itself, on plant food including pollen and phytopathogens. The omnivorous lifestyle enables it to survive on host plants during periods of prey scarcity, which is considered an advantage for biocontrol agents. The extensive use of A. andersoni for biocontrol in Central and Southern Europe, and North America, has spurred a flurry of primary research papers (cited throughout this report), and some reviews (e.g. (McMurtry and Croft, 1997; Pertot et al., 2017)), dealing with its ecology, and distribution. As natural populations of A. andersoni occurs across Europe from the Mediterranean in the South to Scania (Southern Sweden) (at least) in the North, its use is normally classified as augmentation or inoculation biological control (for definitions of classifications, see Eilenberg et al. (2001)).

1.3.1 Sensitivity to pesticides

Several studies show that most synthetic pesticides have limited effects on A. andersoni (e.g. James (2002); James (2003)). In some areas A. andersoni populations have even evolved tolerance to several pesticides and fungicides (e.g. Duso et al. (1992); Printzioui et al. (2000)).

Biopesticides like bicarbonates, and mineral oils, and microbial biocontrol agents like Ampelomyces quisqualis, Bacillus subtilis and Trichoderma harzianum have no or small effects on A. andersoni (Pertot et al., 2008).

Some studies report negative effects of synthetic fungicides on A. andersoni populations (e.g. Ioriatti et al. (1992)), but this may be an indirect effect (i.e. not direct toxicity), as the targeted phytopathogens (e.g. powdery mildew) are important alternative food sources for A. andersoni.

A. andersoni is reportedly not negatively affected by insecticidal crystal proteins produced by Bt crops (Guo et al., 2016).

1.3.2 Target pests

Amblyseius andersoni is an omnivorous phytoseid. It feeds on small arthropods including (but not limited to) mites from families Tetranychidae (especially Panonychus ulmi and Tetranychus urticae) and Eriophyidae, as well as thrips (Thripidae), and whiteflies (Aleyrodidae). It also feeds on pollen and some phytopathogenic fungi.

1.3.3 Life cycle of target pests

Panonychus ulmi: the European red mite, Panonychus ulmi (Koch), is one of the most important plants pest in fruticulture. It hibernates in the egg stage on the bark, usually in angels of the branches between first and second years growth. These winter eggs hatch from bud set to after flowering. The European red mite mainly lives on the lower side of the leaves and damages the plant by punctuating the leaf cells with its sting/suction mouth. In Norway, the European read mite go through 2-3 generations a year (Plantevernleksikonet.no).

Tetranychus urticae: The red spider mite (The two-spotted spider mite) has an egg stage, a larval stage with three pairs of legs and a nymph stage with four pairs of legs prior to the adult stage. It hibernates as an adult female, often in large clusters just below ground level, on withered leaves, in bark cracks and in the vegetation on the ground or in the green house. The time from egg to adult (in Norway) is 3-4 week during the summer. However, in dry and hot years, the developmental time is somewhat shorter. The number of yearly generations depends on the temperature. The adult mites are generally alive for one month during the summer and the females lay about 100 eggs each. For normal years, you can expect 5-6 generations that time-wise overlap each other. The total developmental time for females at 12 °C is 42 days, at 21 °C 14 days and at 27 °C 7 days. The life span of the active females varies with temperature. At 27 °C, 10 % of the females can live up to 25 days. If the temperature is lowered 15 degree Celsius, the life span is doubled. During their lifetime, the females lay maximally 200 eggs per individual. The oviposition is optimal at 2830 °C (Plantevernleksikonet.no).

1.4 Status in Norway

Amblyseius andersoni has not been recorded in Norway. The Norwegian Institute of Bioeconomy Research (NIBIO) has conducted a targeted, though limited, search in several areas in Southern Norway where the species most likely would occur (pers. comm. Nina Trandem, 2020). All specimens collected have been identified to species by international experts and A. andersoni has not been found. However, it was approved for greenhouse and field use in Sweden 2013 (Kemikalieinspektionen 2013; regnr: 5128) and is listed on the European and Mediterranean Plant Protection Organisation (EPPO) list of commercially used biological control agents (EPPO 2019; PM6/003(4)).

Three other Amblyseius species (A. cucumeris, A. montdorensis, and A. swirskii) have previously been assessed and approved in Norway for use in greenhouse crops.

Product names:	
Species names:	Amblyseius cucumeris (Oudemans), A. montdorensis (Schicha), and A. swirskii Athias-Henriot: predatory mites in the family Phytoseiidae (Acari: Parasitiformes).
Target pests:	Whiteflies, thrips, and mites.
Area for use:	Greenhouse crops.

2 Data collection and literature search

Literature searches were performed in Medline, ISI Web of Science, Scopus. These databases were chosen to ensure comprehensive study retrieval. The literature search was performed by senior librarians at the Norwegian Public Institute of Public Health on 29.11.2019.

The main searches resulted in a total of 190 records after duplicates were removed, both automatically and during primary screening of Endnote bibliography. In the primary screening, titles and abstracts of all publications retrieved were independently screened against the inclusion criteria.

2.1 Inclusion and exclusion criteria:

- Inclusion criteria: ○ Publication type – primary research studies, review papers, systematic reviews, editorials and meeting abstracts addressing livestock/aquaculture, veterinary medicine or basic research with indirect applicability.
- Exclusion criteria: ○ Publications addressing other species or A. andersoni under environmental conditions not relevant for Norway. ○ Not relevant for answering the questions stated in the terms of references

Publications that did not meet the inclusion criteria were excluded from further analysis. In situations where it was unclear whether the publication was of relevance to the study, it was retained for further screening. Full text articles that passed the primary screening were retrieved and compared against the inclusion criteria and assessed for relevance and quality.

The screenings as well as quality assessment of papers were performed independently by one member of the project group. Potential disagreements were solved in the project group.

Articles that did not appear to meet the inclusion criteria were excluded from further analysis. In situations where it was unclear whether the publication was of relevance to the study, it was retained for further screening. Full text articles that passed the primary screening were retrieved and compared against the inclusion criteria and assessed for relevance and quality.

In order to strengthen the data basis of the opinion, additional manual searches for papers and relevant grey literature were also performed. Manual searches included snow-balling, i.e. articles that were referred to in papers found in the main literature, searches via Google, Google Scholar, and PubMed via EndNote. The manual searches resulted in 8 relevant papers and documents included in the opinion (Figure 1.)

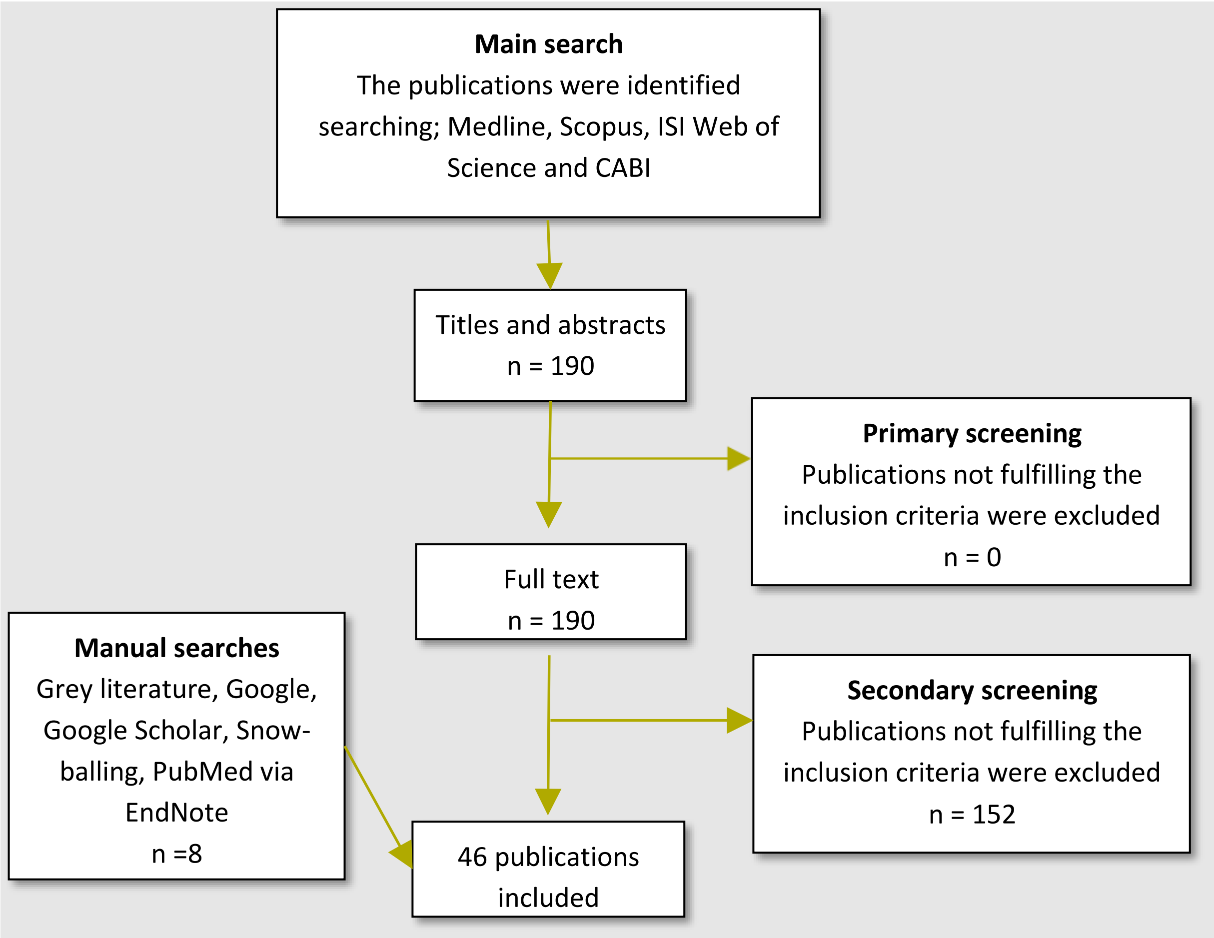

Figure 1. Flowchart for the literature search on A. andersoni

3 Hazard identification and characterisation / Positive health effect/reduced adverse effect identification and characterisation

3.1 Occurrence and distribution in Norway

A recent, yet unpublished, report (Trandem and Westrum et al., 2020) concludes that A. Andersoni has not yet been detected in Norway. The lack of reports does not necessarily suggest that the organism is not present in Norway. Considering the mild climate in the South-Western parts of Norway, and the observations of A. andersoni in Southern Sweden, we do not consider its presence in Norway unlikely though this statement comes with high uncertainty.

3.2 Potential for establishment and dispersal

3.2.1 Climatic limitations

A. andersoni is reported from areas with similar winter climate as Norway, for example Pennsylvania (Jubb et al., 1985), Poland, and Ukraine (Grabovska et al., 2017). Thus, climate conditions alone are not likely to prevent its establishment in Norway. In Scandinavia, however, it has not been reported north of Skåne in Sweden, where it was found in low numbers in 2 out of 24 investigated sites (Steeghs et al., 1993), suggesting that its competitive ability and population growth may be limited by climate in northern parts of its natural range. A previous inventory (Tuovinen and Rokx, 1991) of phytoseiid mites in Finnish apple orchards (which would be a suitable habitat according to many mid- and south European inventories) did not find a single specimen of A. andersoni.

The lethal humidity (LH_{50}) of A. andersoni at 20 °C is c. 62% (Croft et al., 1993), and survival rate increase with increasing humidity, for eggs suggesting that climate conditions, at least in the South-Western parts of Norway, may be suitable for establishment of the species.

The available experimental data on effects of climate factors on survival and life history traits is limited, but one laboratory study (Genini et al., 1991) showed that the development rate is substantially reduced already at 14 °C, and the ANDERcontrol application states that it is inactive below 6 °C. Therefore, it is a limited potential of establishment of the species in colder parts of Norway.

3.2.2 Other factors affecting survival

The survival and growth of A. andersoni is correlated to food availability (Garcia-Martinez et al., 2019). However, the availability of food is not likely to constrain the survival of A. andersoni in Norwegian orchards or wild habitats as it is omnivorous, feeding on a range of prey (Lorenzon et al., 2012; Nguyen et al., 2015), as well as fungal phytopathogens (Pozzebon and Duso, 2008; Pozzebon et al., 2009; Pozzebon et al., 2015b) and pollen (Lorenzon et al., 2015).

A. andersoni can suffer from intraguild predation from other mites, partly reducing its ability to build up populations in orchards and wild habitats (Lorenzon et al., 2018). Mites, in general, are also consumed by many larger-sized predators like ladybirds and spiders.

3.2.3 Reproduction

A. andersoni reproduces sexually, and females require multiple matings to maximize their reproductive potential (Amano & Chant. 1978). It has a short generation time and females are able to produce 20-30 eggs per day at 20 °C (Lorenzon et al. 2012, 2015), partly depending on their food source. The number of progeny produced can exceed 500 per individual male (Amano and Chant, 1978). The application states that the life time fitness of females is only about 35 eggs, but this statement seems to contradict Lorenzon et al. (2012); (2015) as mentioned above.

3.2.4 Means of dispersal

Mites have no wings and long distance dispersal is dependent on wind or vectors (e.g. humans). There are no data suggesting that long distance dispersal by wind is common, and generally we expect A. andersoni to have limited capability to disperse from e.g. greenhouses to wild habitats.

3.3 Taxonomic challenges

Amblyseius andersoni Chant (synonym: Typhlodromus andersoni) is a predatory mite in the family Phytoseiidae (Acari: Parasitiformes). A. andersoni and A. potentillae were previously regarded as separate species. However, hybridization studies by Messing and Croft (1991) showed that their offspring are viable and fertile. Backcrosses of F1 hybrids likewise showed no evidence of genetic isolation. Messing and Croft (1991) thus suggested that they should be considered as one single species, and that A. potentillae should be recognized as a junior synonym of A. andersoni (Chant and Yoshida-Shaul, 1990).

The original A. andersoni specimens used to establish the culture for ANDERcontrol were sampled during the period 2008-2009 from peach and apple in Lleida (Spain), which represents a minor part of the species' distribution.

A. andersoni is similar to A. swirskii, but can be morphologically identified with high certainty
(Schmidt-Jeffris and Beers, 2013). Molecular identification is also possible (see below)

VKM assessment of the taxonomy

In addition to morphological identification (Schmidt-Jeffris and Beers, 2013), Agribio has identified five specimens A. andersoni using DNA mitochondrial fragments of the 12s rRNA gene. The molecular analysis was done by Prof. Marie-Stéphane Tixier at Montpellier SupAgro, France.

The sequence of 12s rRNA (specimen 101) is:
ACTATGTTACGACTTATCTCCTATCAAAGAGAGTGACGGGCAATATGTACACATACTAACGTAAAATT
CAAATTAACATAATATATTAATTTTACTTTTAAATTCTTATTTATTAAAAATTACAAAATTAAACTTTG
CAAAATATAAATATATAAAACTTATTTCATTCTTTTTTATATGCCGCACCTTGCCCTAAAAACCAGCC
CTTAAGGTTTAATATTATAGATTAAAAAATAATAAAATAGAGGTATACGAGCTGAATTTTTCTAAAAA
AAGTAAGATTTTGGGGTTAAATCCTTTACAGAATAAGTTTCTCTAAAAAATTTAAGTAGCCGCCAATT
TATTTTAGTTTCATGAATAACACTTACTACTAAATTTTAAAAATTCTCTAATAGGGTATCTAATCCTA
GTTTA

It is the opinion of VKM that no taxonomic problems exist for the identification of A. andersoni.

3.4 Health hazards

3.4.1 Human health

Some mites, including Amblyseius cucumeris which is approved for use in Norway, can sometimes cause allergic reactions in sensitive human individuals, especially after long-term exposal to these organisms (de Jong et al., 2004). However, to the best of our knowledge there are no published studies reporting adverse effects of A. andersoni to humans.

ANDERcontrol also contains the cheese mite Tyrolichus casei, that serves as a food source and carrier material for A. andersoni. T. casei is native to, and very common in, Norway. Like most other mites, it produces allergens that can affect sensitive humans (Sánchez-Borges and Fernandez-Caldas, 2015).

There is no evidence showing that these two mites are more allergenic than other mite species.

3.4.2 Animal health

A. andersoni is omnivorous (Nguyen et al., 2015) (Nguyen et al. 2015) and is known to feed on all sorts of mites and other small arthropods (e.g. Lorenzon et al. (2012)). From a plant protection perspective, it has been noted that A. andersoni is involved in intra-guild predation – both as a predator consuming other predatory mites, and as a prey of other predatory mites (Lorenzon et al., 2018). There are no reports of A. andersoni causing harm to other animal populations.

3.4.3 Potential for plant damage

A. andersoni is omnivorous and can feed on several plant tissues incl. pollen of different plant species (Lorenzon et al., 2015). There are no reports of direct plant damage caused by A. andersoni.

Several studies show that A. andersoni feeds on fungal pathogens, such as grape powdery mildew (Pozzebon and Duso, 2008; Pozzebon et al., 2009; Pozzebon et al., 2015a; Pozzebon et al., 2015b). One may expect fungivores to vector their fungi, but we are not aware of any study showing evidence for such indirect effects of A. andersoni on pathogen infection for any plant. Positive relations between A. andersoni population densities and disease prevalence have been reported (Pozzebon et al., 2010), but it is likely that such patterns reflect positive effects of the fungi on A. andersoni rather than vice versa.

4 Uncertainties

4.1 Summary of uncertainties

The main uncertainties with regards to Amblyseius andersoni are related to its northern distribution, its potential presence in Norway, and its temperature tolerance. Although the species has never been reported in Norway, we cannot exclude that low numbers are naturally occurring. The exact lower temperature thresholds for survival (of hibernating individuals in the winter, and active individuals in the summer), development, and reproduction are not known.

5 Conclusions (with answers to the terms of reference)

All conclusions are with uncertainty due to lack of relevant information regarding climatic suitability.

5.1 Prevalence, especially if the organism is found naturally in Norway.

The predatory mite Amblyseius andersoni has not been observed in Norway. A personal comment (Nina Trandem, NIBIO) concludes that A. Andersoni has not yet been detected in Norway. It has been observed, in low numbers, in Southern Sweden and has the capability to enter diapause under unfavourable conditions which suggests the potential for establishing under Norwegian conditions. It is however the view of VKM that it lacks the ability to survive and establish in areas with cold winters and chilly summers, as found in most parts of Norway under current climatic conditions.

5.2 The potential of the organism for establishment and spread under Norwegian conditions specified for use in greenhouses and open field.

The thermal preference of Amblyseius andersoni restricts its establishment, and the species has not been observed in Norway. The species is capable of entering diapause, but the lack of records, despite targeted surveys, makes it the opinion of VKM that it is unlikely that A. andersoni will be able to establish in outdoor areas in Norway. However, the lack of information on temperature tolerance of the species constitute an uncertainty factor.The risk of spread from greenhouses is low because no wind or vector are likely to carry the mites from the greenhouse to suitable outdoor habitats, and mite populations in greenhouses do not enter the more cold-tolerant diapause.

5.3 Any ambiguities regarding the taxonomy, which hampers risk assessment.

There are no taxonomic challenges related to the assessment of Amblyseius andersoni.

5.4 Assessment of the product and the organism with regard to possible health risk.

VKM is unaware of reports where harm to humans by Amblyseius andersoni itself, or associated pathogenic organisms have been observed. Mites may however produce allergic reactions in sensitive individuals handling plant material with a high number of individuals.

6 Data gaps

Some of the uncertainties mentioned in chapter 4 depends on lack of data. The gaps concern the northern distribution of Amblyseius andersoni in Europe, and its climatic requirements.

7 References

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