Netherlands Food and Consumer
Product Safety Authority
*Ministry of Agriculture,*
*Nature and Food Quality*

# Quick scan for Monema flavescens

National Plant Protection Organization, the Netherlands

## Quick scan number: QS2024ENT001

## Quick scan date: 29 August 2024

| No. | Question | Quick scan answer for Monema flavescens |
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| 1. | What is the scientific name (if possible up to species level + author, also include (sub)family and order) and English/common name of the organism?<br>*Add picture of organism/damage if available and publication allowed*. | *Monema flavescens* Walker, 1855 Oriental moth<br>Family: Limacodidae |
| 2. | What prompted this quick scan?<br>*Organism detected in produce for import, export, in cultivation, nature, mentioned in publications, e.g. EPPO alert list, etc.* | The interception of cocoons of *M. flavescens* on plants for planting of *Crataegus* (bonsai trees) originating in Japan.<br><br>In 2004, a Pest Risk Analysis (PRA) for *M. flavescens* (syn. *Cnidocampa flavescens*) was made for the Netherlands (Lammers & Stigter, 2004). It was concluded that the organism should not be listed as a quarantine pest because of "*lack of information on significant damage levels and the fact that defoliation is only expected from September onwards* [in the Netherlands]". The PRA was, however, made 20 years ago and new information about the organism may have been published since then. In addition, the PRA-area was limited to the Netherlands and did not include the entire European Union (EU). For the present Quick scan, literature was especially searched for new information on damage caused by *M. flavescens* since the publication of the PRA in 2004. |

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| 3. | Wat is the risk assessment area? | The risk assessment area is the territory of the European Union (EU 27) |
| 4. | What is the current area of distribution? | Bhutan, Korea, Japan, Taiwan, China, Eastern Siberia, Nepal and the United States (University of Massachusetts Amherst) (Peng et al., 2017).<br><br>*Monema flavescens* has been introduced in the US probably in the beginning of the 20th century (Lammers & Stigter, 2004). |
| 5. | What are the host plants? | Polyphagous on deciduous trees and shrubs, like *Acer, Quercus, Juglans, Popular, Salix, Castanea, Malus, Prunus, Vaccinium* and *Citrus* (Lammers & Stigter, 2004; Yang et al., 2016; Choi et al., 2018). |
| 6. | Does the organism cause any kind of plant damage in the current area of distribution and/or does the consignment demonstrate damage suspected to have been caused by this organism?<br>*Yes/no + plant species on which damage has been reported + short description of symptoms.*<br>*Please indicate also when the organism is otherwise harmful (e.g. predator, human/veterinary pathogen vector, etc.).* | Eastern Asia<br>Yang et al. (2016) describes *M. flavescens* as "*a serious defoliator of many trees across China, with the exception of Guizhou Province and the Tibet Autonomous Region"* referring to four Chinese papers published from 2008 – 2013 (Ju et al., 2008; Li et al., 2010; Han et al., 2013; Li et al., 2013). Yang et al. (2019) referring to the same four papers state: "*currently, M. flavescens is increasing in abundance in China and overwintering cocoons are easily found in orchards and parks*". The abstract or full paper of each of these four references was retrieved and translated (Machine translated by Google):<br>- (Ju et al., 2008) studied the eclosion of overwintering adults but not of economic impacts caused by *M. flavescens* (Abstract).<br>- (Li et al., 2010) studied the spatial distribution pattern of *M. flavescens* in a walnut nursery in Shaanxi Province. In the introduction, the authors state that damage caused by *M. flavescens* has increased (Full paper).<br>- (Li et al., 2013) monitored *M. flavescens* in a jujube orchard in Ningxia province during two consecutive years which formed the basis of an integrated control program against the pest. The reason for this research was the serious damage *M. flavescens* had caused in recent years (Abstract).<br>- (Han et al., 2013) assessed the potential area of distribution of *M. flavescens* in Xinjiang (Xinjiang Uygur Autonomous Region). They describe *M. flavescens* as one of the most important invasive pests in Xinjiang that was introduced by the movement of infested plants. In Xinjiang, the moth has one generation per year. First larvae appear in early June. The larvae can eat the entire leaf only leaving the veins which affects photosynthesis, tree growth and yield. Control is difficult because the damage period coincides with the maturity of apricots, pears, and other fruit and there is a lack of natural enemies. They also state referring to other papers that the pest attacks various fruit crops and the direct economic losses has reached 2415 x $10^4$ RMB (about 3.1 million euro) in Xinjiang. No damage of urban trees have been found (Full paper). |

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| | | Zhang et al. (2024) state that populations of *Cnidocampa flavescens* (syn. *M. flavescens*) increased in walnut in Dongchangfu District in China leading to leaf damage that seriously affected yield (only the Abstract of the paper was retreived).<br><br>Park et al. (2021) mention *M. flavescens* as 'a major pest of urban trees' and 'an occasional pest of fruit trees' referring to several older papers including the PRA from Lammers & Stigter (2004) and three papers published after 2014 (Furukawa et al., 2016; Lim et al., 2016; Yang et al., 2016). No quantitative information was found in these three papers on the amount of damage.<br><br>In areas where *M. flavescens* produces two broods per year, larval damage mainly occurs in June and July (Furukawa et al., 2016; Park et al., 2021).<br><br>In China and the Republic of Korea, the pest is mainly controlled by chemical sprays (Yang et al., 2019; Park et al., 2021). Non-chemical methods including detection of cocoons using small unmanned aircraft systems, the use of entomopathogenic nematodes and plant extracts have been studied in the Republic of Korea (Choi et al., 2018; Yoon et al., 2018; Park et al., 2021). In China (Shanxi) research on pheromones has been conducted to find alternative control methods (mating disruption) (Yang et al., 2016).<br><br><u>US</u><br>No recent records of economic damage were found for the US where it seems a rather rare insect. The University of Massachusetts Amherst (2024) writes for example that the species "*is a very obscure insect that is rarely seen in a limited portion of eastern Massachusetts*". On MassMoths (2024) the following text indicate that the species is of no economic importance in the US: "*Introduced to Boston sometime before 1902 on fruit trees and apparently still occurred in the Boston area in the 1940s. It was next reported around the turn of the century on one of the Boston Harbor Islands and again found very recently. One must assume that the species has occurred at a low level continuously in the Boston area since it was first introduced".* In the past (1920s), heavy infestations were, however, observed in the Boston area but the growth of trees was little affected because defoliation does usually not occur before late September (Dowden, 1946). Introduction of the parasitoid tachinid fly *Chaetexorista javana* from Japan in 1929-1930 probably paid a role in decreasing damage levels caused by *M. flavescens* (Lammers & Stigter, 2004). Attempts to introduce *Chrysis shanghaiensis*, a parasitoid wasp, in Boston in 1917-1918 were unsuccessful as the wasp did not establish itself (Parker, 1936).<br><br><u>Allergic reactions by humans</u><br>Some hairs on the body of the larvae contain a venom which is an allergen to humans causing skin irritation and inflammation (Zhan et al., 2015; Yang et al., 2016). The |

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| | | allergic reaction can be compared with the reaction after touching a stinging nettle plant (*Urtica dioica*) (Lammers & Stigter, 2004).<br><br><u>Conclusions (impact on plant health)</u><br>In the US, *M. flavescens* seems to be a rare species which may (partly) be due to the introduction of a parasitoid in the past. However, the species has been indicated as a pest of urban trees and fruit trees in China and the Republic of Korea. In China, impact by *M. flavescens* appears to increase. Quantitave information on damage is, however, limited. |
| 7. | Assess the probability of establishment in the Netherlands (NL) (i.e. the suitability of the environment for establishment).<br>a. In greenhouses<br>b. Outdoors<br>c. Otherwise (e.g. storage facilities, human environment) | The organism can likely establish outdoors in the Netherlands (Lammers & Stigter, 2004). |
| 8. | Assess the probability of establishment in the EU (i.e. the suitability of the environment for establishment). | The organism is present in areas with cold winters and warm summers (Lammers & Stigter, 2004) and the organism can likely establish in a large part of the EU. A detailed assessment of the potential area of establishment is not part of this Quick scan. |
| 9. | What are the possible pathways that can contribute to spread of the organism after introduction? How rapid is the organism expected to spread (by natural dispersal and human activity)? | Natural spread appears to be slow. In the USA, the organism was found for the first time in 1906 in an area of 3 square miles; in 1916 and 1942 the infested area was about 12 and 300 square miles, respectively (Lammers & Stigter, 2004). This increase may, however, be caused by a combination of natural and human assisted spread. Human assisted spread may especially occur by movement/trade of infested plants for planting. |
| 10. | Provide an assessment of the type and amount of direct and indirect damage (e.g. lower quality, lower production, export restrictions, threat to biodiversity, etc.) likely to occur if the organism would become established in NL and the EU, respectively? | The pest can cause defoliation of various tree species that may result in decreased tree growth and, in case of fruit orchards, decreased fruit yield. There is, however, a high uncertainty about the level of impact that can be expected when *M. flavescens* were to become established in the EU. In China and the Republic of Korea, *M. flavescens* has been mentioned as a 'serious defoliator' or 'major pest' but quantitative data on leaf damage, growth reduction or yield losses during outbreaks have not been found. In the US the species is rare (see No. 6).<br><br>Damage levels may vary with climate. In the US (Boston area), defoliation has been reported to occur mainly at the end of the growing season with little effect on tree growth while in the Republic of Korea most damage appear to occur in June and July according to (Park et al., 2021) (see also No. 6). In NL summers are cooler than in Boston and introduction of *M. flavescens* in NL may lead to cosmetic damage only. Defoliation of trees in urban areas can, however, negatively impact the living |

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| | | environment of people even if tree health is not seriously affected. In warmer parts of the EU, leaf damage may already occur earlier during the growing season which might lead to reduced tree growth and yield reduction in fruit orchards (high uncertainty).<br><br>In absence of natural enemies (which may be the case in the EU), the impact of *M. flavescens* may be higher than in areas where natural enemies are present like in Japan and the US (Lammers & Stigter, 2004).<br><br>The potential impact for the export of plants and wood was not assessed. |
| 11. | Has the organism been detected on/in a product other than plants for planting (e.g. cut flowers, fruit, vegetables)?<br>*If "no", go to question 12* | No |
| 12. | If the organism has been found on/in a product other than plants for planting (e.g. cut flowers, fruit, vegetables), what is the probability of introduction (entry + establishment)?<br>*Only to be answered in case of an interception or a find.* | |
| 13. | Additional remarks | • EFSA Panel on Plant Health et al. (2024) published a Pest categorisation of *M. flavescens* about the same time as this Quick scan was completed. They concluded that "*All criteria assessed by EFSA for consideration as a potential quarantine pest are met*". They also concluded that "*there is uncertainty regarding the magnitude of potential impact in EU depending on the influence of natural enemies*".<br>• *Monema flavescens* is a quarantine pest in Australia (Commonwealth of Australia, 2003)<br>• From several of the cocoons intercepted, the parasitoid *Chrysis* cf *shanghaiensis* emerged in the quarantine laboratory of the NPPO in the Netherlands. |
| 14. | Summary and conclusions | • This Quick scan was prompted by the interception of the slug moth *Monema flavescens* on plants for planting by the Netherlands.<br>• The species is absent from the EU but can likely establish in large parts of the EU.<br>• Larvae of *M. flavescens* feed on leaves of various broadleaf tree species including fruit tree species and can defoliate trees.<br>• In 2004, a Pest Risk Analysis (PRA) of *M. flavescens* (syn. *Cnidocampa flavescens*) was made for the Netherlands. At that time, it was concluded that the organism should not be listed as a quarantine pest because of "*lack of information on significant damage levels and the fact that defoliation is only expected from September onwards* [in the Netherlands]".<br>• In the United States where *M. flavescens* has been introduced more than a century ago, it still seems an unimportant pest or has even become a rare species which may (partly) be due to the introduction of a parasitoid in 1929-1930. |

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| | | • Several papers have been published since 2004 in which *M. flavescens* is considered a serious pest of various deciduous trees in urban areas in China and South Korea and in fruit crops in China. It seems more an occasional pest in fruit crops in South Korea. Damage by *M. flavescens* has been reported to increase in China. Limited quantitative information has been found but in one paper fruit losses of 3.1 million euro have been mentioned for the Xinjiang autonomous region in China.<br>• If *M. flavescens* were to become established in the EU, it will probably cause leaf damage to urban trees and fruit trees but the level of damage is highly uncertain. More damage may occur in warmer regions where leaf damage is expected to occur earlier in the season than in cooler regions. |
| 15. | References | Choi S, Jeong M & Lee D, 2018. Insecticidal activity of plant extracts against lepidopteran insect pests (Latoia hilarata, Monema flavescens and Euproctis similis) in blueberry. Korean J. Pestic. Sci, 22 (4), 255-260 [in Korean].<br>Commonwealth of Australia, 2003. Import of Asian ('Shandong') pear (Pyrus pyrifolia (Burm.) Nakai and P. ussuriensis var. viridis T. Lee) fruit from Shandong Province in the People's Republic of China. Agriculture, Fisheries and Forestry, Australia. 66 pp.<br>Dowden PB, 1946. Parasitization of the Oriental moth (Cnidocampa flavescens (Walk.)) by Chaetexorista javana B. and B. Annals of the Entomological Society of America, 39 (2), 225-241.<br>EFSA Panel on Plant Health, Bragard C, Baptista P, Chatzivassiliou E, Di Serio F, Gonthier P, Jaques Miret JA, Justesen AF, Magnusson CS, Milonas P, Navas-Cortes JA, Parnell S, Potting R, Reignault PL, Stefani E, Thulke H-H, Van der Werf W, Vicent Civera A, Yuen J, Zappalà L, Grégoire J-C, Malumphy C, Gobbi A, Golic D, Kertesz V, Sfyra O & MacLeod A, 2024. Pest categorisation of Monema flavescens. EFSA Journal, 22 (7), e8831. Beschikbaar online: https://doi.org/https://doi.org/10.2903/j.efsa.2024.8831<br>Furukawa M, Nakanishi K & Nishida T, 2016. Relationships between environmental factors and cocoon color morphs of a slug moth, Monema flavescens in the field. Japanese Journal of Environmental Entomology and Zoology, 27 (4), 133-139.<br>Han X, Zhu GF, Yu H.L. & Wang D, 2013. Analysis of potential geographic distribution of Monema flavescens (Walker) (Lepidoptera: Limacodidae) in Xinjiang. Biological Disaster Science, 36 (2), 181-184.<br>Ju R, Li Y, Wang F, Du Y & Zhu F, 2008. Effect of temperature and relative humidity on eclosion of overwintering adults of Cnidocampa flavescens. Chinese Bulletin of Entomology, 45 (1), 70-74.<br>Lammers JW & Stigter H, 2004. Report of a Pest Risk Analysis Cnidocampa flavescens. Plant Protection Service, the Netherlands. Beschikbaar online: https://english.nvwa.nl/topics/pest-risk-analysis/documents/plant/plant-health/pest-risk-analysis/documents/pest-risk-analysis-cnidocampa-flavescens |

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| | | Li J, Li X, Feng J, Li D & Hua L, 2010. Spatial distribution pattern and sampling technique of Cnidocanpa flavescens larva in walnut. Journal of Anhui Agricultural Sciences, 38 (36), 21074-21078.<br>Li ZW, Guo YH, Qiu FC, Li P, Wang DJ & Li SZ, 2013. Occurrence and comprehensive prevention and control technology of Monema flavescens in jujube orchard of Lingwu, Ningxia Hui Autonomous Region. China Fruits, 2, 58-60.<br>Lim J-R, Kim E-J, Moon H-C, Cho C-H, Han S-G, Kim H-J & Song Y-J, 2016. Patterns of insect pest occurrences and Dasineura oxycoccana Johnson in blueberry farms in Jeonbuk province. Korean journal of applied entomology, 55 (1), 45-51.<br>MassMoths, 2024. Monema flavescens [Webpagina]. Beschikbaar online: https://massmoths.org/moths/monema-flavescens/ [Geraadpleegd: 14-03-2024].<br>Park Y-L, Cho JR, Lee G-S & Seo BY, 2021. Detection of Monema flavescens (Lepidoptera: Limacodidae) cocoons using small unmanned aircraft system. Journal of Economic Entomology, 114 (5), 1927-1933.<br>Parker D, 1936. Chrysis shangaiensis Smith, a parasite of the oriental moth. . Journal of Agricultural Research, 52, 449 - 458.<br>Peng S, Zhang Y, Zhang X, Li Y, Huang Z, Zhang Y, Zhang X, Ding J, Geng X & Li J, 2017. Complete mitochondrial genome of Cnidocampa flavescens (Lepidoptera: Limacodidae). Mitochondrial DNA Part B, 2 (2), 534-535.<br>University of Massachusetts Amherst, 2024. Monema (Cnidocampa) flavescens [Webpagina]. Beschikbaar online: https://ag.umass.edu/landscape/publications-resources/insect-mite-guide/monema-cnidocampa-flavescens [Geraadpleegd: 14-03-2024].<br>Yang S, Liu H, Yang M & Zhang J, 2019. Daily rhythmicity in the sexual behaviour of Monema flavescens (Lepidoptera: Limacodidae). European Journal of Entomology, 116.<br>Yang S, Liu H, Zheng H, Yang M, Ren Y & Zhang J, 2016. Attraction of Monema flavescens males to synthetic blends of sex pheromones. Bulletin of Insectology, 69 (2), 193-198.<br>Yoon J, Kim H, Kim D, Yang C, Seo M, Jung Y & Lee D, 2018. Pathogenicity of entomopathogenic nematodes on Monema flavescens and Latoia consocia. Kor. J. Pestic. Sci, 22, 62-68 [in Korean].<br>Zhan X, Li C & Wu Q, 2015. Cardiac urticaria caused by eucleid allergen. Int J Clin Exp Med, 18, 21659–21663.<br>Zhang M, Zheng R, Gu M, Duan G, Yang Y & Sui G, 2024. The Occurrence Pattern and Control Techniques of Cnidocampa flavescens on Walnut Orchards. Northern Fruits, 4, 47-49. |
| **16.** | **Follow-up measures** | Official measures will be taken in case of an interception or finding of *Monema flavescens* (the organism will be considered 'Q-waardig' in the Netherlands). |