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SCIENTIFIC OPINION

Scientific Opinion on a technical file submitted by the Japanese Authorities to support a derogation request from the EU import requirements for bonsai and topiary trees that are host plants of *Anoplophora chinensis.*[1]

EFSA Panel on Plant Health (PLH)[2, 3]

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ABSTRACT

Following a request from the European Commission, the EFSA Panel on Plant Health was asked to deliver a scientific opinion on a technical file submitted by the Japanese Authorities to support a derogation request from the EU import requirements for bonsai and topiary trees that are host plants of *Anoplophora chinensis* (Forster) (Coleoptera: Cerambycidae). Three options were proposed as alternatives to the existing requirements of the European Union: a) to reduce the required period to grow plants in field cages from two years to one season prior to export (from April to October); b) to allow grafting of scions with no risk of infestation by *A. chinensis* during the two years of field-cage cultivation and c) to remove the net from the field cage during the winter period (from November to March) when adult *A. chinensis* do not visit the area or lay eggs. The Panel evaluated the technical file and concluded that as the life cycle duration of the pest can be more than one season and larvae cannot be reliably detected within the plant, a reduction of the required growing period under complete physical protection increases the risk of entry into the EU compared with the current EU requirements. The Panel considered scions collected from a branch of a stock tree 50 cm or higher above the ground, with a diameter not exceeding 5 mm and a length of 5 cm, are unlikely to increase the risk of entry. The Panel also considered that, due to uncertainty on the occurrence of beetle flight and potential for oviposition between November and March, opening cages during this period may lead to an increased risk of entry into the EU compared to current measures.

KEY WORDS

Anoplophora chinensis, Anoplophora malasiaca, bonsai, citrus longhorn beetle, EU, Japan

1 On request from the European Commission, Question No EFSA-Q-2010-00945, adopted on 30 September 2010.

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SUMMARY

Following a request from the European Commission, the EFSA Panel on Plant Health was asked to deliver a scientific opinion on a technical file submitted by the Japanese authorities to support a derogation request from the EU import requirements for bonsai and topiary trees that are host plants of the citrus longhorn beetle, *Anoplophora chinensis* (Forster) (Coleoptera: Cerambycidae). In particular, EFSA was requested to determine whether the alternative measures included in the Japanese derogation request provide a comparable level of protection of the EU against the introduction of *A. chinensis* than those stipulated in Commission Decision 2008/840/EC[4].

The Panel examined the technical file submitted to the European Commission by the Japanese Authorities and reached the following conclusions on the three alternative risk management options proposed:

<u>Option 1</u>: A reduction of the required period to grow plants in field cages (*i.e.* with complete physical protection against the introduction of *A. chinensis*) from two years (as stipulated in the current EU requirements), to one season prior to export (from April to October) presents an increased risk of entry of *A. chinensis* into the EU, due to the two-year life cycle duration of the pest and the potential presence of larvae within the plant which cannot be reliably detected by visual inspection;

<u>Option 2</u> (for plants of *Acer* spp. grafted on seedlings of *Acer palmatum*): Grafting of scions collected from a branch of a stock tree 50 cm or higher above the ground, with a diameter not exceeding 0.5 cm and length not exceeding 5 cm during the two years of field cage cultivation is unlikely to increase the risk of entry of *A. chinensis* into the EU. Although oviposition can occur on host plants at a height above 50 cm, a scion with a diameter not exceeding 0.5 cm is unlikely to provide conditions for survival of eggs of *A. chinensis*;

<u>Option 3</u>: Removal of the net from the field cage during the winter period (from November to March) may result in an increased risk of entry of *A. chinensis* compared to the current measures, as there is uncertainty on the occurrence of adult flight and oviposition during this period. Further evidence is required to confirm that no adults are likely to be flying between November and March.

[4] Amended by Council Decision 2010/380/EU

TABLE OF CONTENTS

BACKGROUND AS PROVIDED BY THE EUROPEAN COMMISSION

The current European Union plant health regime is established by Council Directive 2000/29/EC on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community (OJ L 169, 10.7.2000, p.1).

The Directive lays down, amongst others, the technical phytosanitary provisions to be met by plants and plant products and the control checks to be carried out at the place of origin on plants and plant products destined for the EU or to be moved within the EU, the list of harmful organisms whose introduction into or spread within the EU is prohibited and the control measures to be carried out at the outer border of the EU on arrival of plants and plant products.

Anoplophora chinensis (Forster), the citrus longhorn beetle, is a serious pest of woody plant species such as *Acer* spp., *Aesculus hippocastanum, Alnus* spp., *Betula* spp., *Carpinus* spp., *Citrus* spp., *Corylus* spp., *Cotoneaster* spp., *Fagus* spp., *Lagerstroemia* spp., *Malus* spp., *Platanus* spp., *Populus* spp., *Prunus* spp., *Pyrus* spp., *Salix* spp., and *Ulmus* spp. It is widespread in Asia, where it causes extensive damage, particularly in orchards.

In Section I, Part A, of Annex I to Council Directive 2000/29/EC, *Anoplophora malasiaca* (Forster) and *Anoplophora chinensis* (Thomson) are listed. Recent studies[5] have found that those two denominations cover in fact one single species of harmful organism. It is therefore appropriate to use the single revised scientific denomination *Anoplophora chinensis* (Forster) to designate what is listed in that Annex as *Anoplophora malasiaca* (Forster) and *Anoplophora chinensis* (Thomson).

A Pest Risk Analysis (PRA) released by the Netherlands in 2008 concluded that there is a high probability of establishment of *Anoplophora chinensis* in the EU and a high potential of economic damage to several host plants. Consequently, upon the report of outbreaks of this organism in the territory of Italy and the Netherlands as well as of interceptions on many consignments of *Acer* spp. plants for planting originating in third countries, the Commission adopted on 7 November 2008 provisional emergency measures to prevent the introduction into and the spread within the EU of *Anoplophora chinensis* (Commission Decision 2008/840/EC). These measures lay down the specific requirements that *Anoplophora chinensis* host plants originating from third countries need to fulfil to be imported into the EU. In spite of these measures consignments with *Acer* spp. originating in China have been intercepted due to the presence of *Anoplophora chinensis.* Consequently stricter import requirements, addressed mainly to China, have been voted at the May meeting of the Standing Committee on Plant Health and they will be soon adopted by the Commission.
On 16 October 2009 the Japanese authorities submitted a request for derogation from the present EU import requirements for bonsai and topiary trees that are *Anoplophora chinensis* host plants. The request includes three pest management strategies (a preferred one and two alternative ones). Since most of the scientific publications submitted to support this request were in Japanese, the Japanese authorities were asked to provide English translations. These were received on 10 February 2010. The Japanese request was discussed during the February meeting of the Standing Committee on Plant Health and it was decided to seek a scientific opinion from EFSA before considering further steps in this matter.

TERMS OF REFERENCE AS PROVIDED BY THE EUROPEAN COMMISSION

EFSA is requested, pursuant to Article 29(1) and Article 22(5) of Regulation (EC) No 178/2002, to provide a scientific opinion on a technical file submitted by the Japanese authorities to support a

[5] Lingafelter SW and Hoebeke ER, 2002. Revision of the Genus *Anoplophora* (Coleoptera: Cerambycidae). Washington, DC: Entomol. Soc. Wash. 236 pp.

derogation request from the EU import requirements for bonsai and topiary trees that are host plants of *Anoplophora chinensis.*

In particular, EFSA is requested to determine whether the alternative measures included in the Japanese derogation request provide a comparable level of protection of the EU against the introduction of *Anoplophora chinensis* than those stipulated in Commission Decision 2008/840/EC[6].

[6] Amended by Commission Decision 2010/380/EU of 7 July 2010

ASSESSMENT

1. Introduction

This document presents the opinion of the EFSA Panel on Plant Health on a technical file submitted by the Japanese Authorities to support a derogation request from the EU import requirements for bonsai and topiary trees that are host plants of the citrus longhorn beetle, *Anoplophora chinensis* (Forster) (Coleoptera: Cerambycidae).

The technical file submitted to the European Commission by the Japanese Authorities outlines three proposals as alternatives to the existing protective measures which require plants have been grown in a site with complete physical protection against the introduction of *A. chinensis* stipulated in Commission Decision 2008/840/EC. The Decision has been subsequently amended as 2010/380/EU but the requirement for physical protection remains unchanged.

The three Japanese proposals are presented in the opinion as options 1, 2 and 3.

1.1. Evaluation methodology

The Panel examined the technical file which comprised:

a) A PowerPoint presentation outlining the derogation request in sixteen slides;

b) Letter of 16th October 2009 from the Japanese Authorities, including a table with references (list of scientific papers), photographs and 13 scientific papers (4 in English and 9 in Japanese);

c) Letter of 10th February 2010 from the Japanese Authorities, including English translations of the 9 references originally provided in Japanese.

The Panel consulted additional experts and reviewed the scientific literature relevant to the request. The evaluation is based on the literature and the English translations provided by the Japanese Authorities and the Panel accepts no responsibility for the accuracy of the translations provided.

1.2. Scope of the opinion

The technical file submitted by the Japanese Authorities includes a description of the three proposals; the reasons for the proposal; and the conditions related to each proposal.

The scope of the opinion is restricted to an evaluation of the proposals described, which relate to the requirements for plants to be grown under physical protection. It does not include examination of the reasons and conditions related to growers' and exporters' requests nor does it include a detailed evaluation of inspection methodology.

2. Evaluation

2.1. Option 1: To reduce the required period to grow plants in field cages

2.1.1. Description of the proposal

The Japanese Authorities propose to reduce the period to grow plants in field cages from two years (as in the current requirements by the European Union), to one season prior to export (from April to October).

2.1.2. Analysis of pest life cycle

The literature provided in the Japanese technical file illustrates the variation in timing and duration of each stage of the life cycle of *A. chinensis* that can be observed in different locations and in different years in Japan. In support of their proposal, the Japanese Authorities included a diagram (Gantt chart) showing the duration of the different life stages of *A. chinensis*, the timing of official inspections, and the signs and symptoms to be taken into account during visual inspections. The Panel compared the life stage duration periods reported in this Gantt chart with data reported in the literature.

Adults

According to the Gantt chart provided, adults are present from mid-May to the end of September. These dates are consistent with the majority of the data found in the literature reviewed. Adults generally emerge during the period from late May until July (Ogihara and Ikeuchi, 1999; Hashimoto et al., 1989), with an emergence peak in the first half of June (Hashimoto et al., 1989; Kawamura, 1980; Komazaki and Sakagami, 1989). The earliest date of emergence reported in the literature provided is May 22 (Kawamura, 1980) and the possibility of emergence as late as mid August is noted in Komazaki and Sakagami (1989). Adult females were found to live up to 109 days in laboratory studies conducted under conditions of natural temperature and daylength (Adachi, 1988), and the occurrence of adults outdoors in October is reported in Kawamura (1980).

Eggs

According to the Gantt chart provided, eggs are present from June to mid-July for the one-year cycle, and from mid-July to the end of August for the two-year cycle. These dates are consistent with the majority of the data found in the literature. Oviposition (egg-laying) occurs from 10 to 15 days after emergence of the adults (Akutsu, 1990; Kawamura, 1980; Ito et al., 1980), peaking 30 days after eclosion (Ogihara and Ikeuchi, 1999). The earliest date of oviposition observed by Kawamura (1980) was on June 10 and the latest date of oviposition on September 11. Eggs usually require up to 10 days of development in order to hatch (Adachi, 1994). Depending on temperature, this period may last from 8 to 21 days at 29 °C and 15 °C, respectively (Kawamura, 1985).

Larvae and pupae

The insect overwinters as a larva and enters a non-feeding period in late autumn or early winter. Individuals with a one-year life cycle may resume feeding the following spring before pupation, while individuals with a two-year life cycle resume feeding and overwinter to pupate the following year. In the case of one-year development, 7 to 9 larval instars are observed, while up to 15 instars may develop in a two-year life cycle. Pupation usually occurs in May, regardless of the cycle type. The pupal stage lasts from 18 to 24 days (Adachi, 1994). Late emergence in July and potentially August discussed by Komazaki and Sakagami (1989) is not consistent with the Gantt chart provided in the technical file, where the pupal stage is considered to be completed in late June.

Life-cycle duration

According to Adachi (1994), the percentage of individuals in a population undergoing a two-year life cycle depends on a number of factors, such as oviposition time, temperature and food quality. The author observed a relationship between oviposition time and proportion of two-year cycle progeny. In the experiments undertaken, 66.7% of eggs deposited on July 25 underwent a two-year cycle, compared to 12.5% of eggs deposited on June 15. The influence of the timing of oviposition on life cycle duration was further reported by Kawamura (1985) where the ratio of the one-year type to the two-year type was found to be 1:1.

2.1.3. Effectiveness of first inspection

The first inspection proposed by the Japanese Authorities is during the period from May 1 to July 30 for signs and symptoms observed as adult individuals of *A. chinensis* and exit holes.

Emerging adult beetles leave the tree through circular exit holes which typically measure from 10 to 15 mm (Aono and Murakoshi, 1980; Haack et al., 2010). They can be located up to 6.5 m from ground level (Van der Gaag et al., 2010), but are most frequently found from 0 to 20 cm above ground (Mitomi et al., 1990). The Panel considers the presence of exit holes as the most reliable symptom for detection of infestation during visual inspection.

The effectiveness of this first inspection depends on the date of inspection; early inspection (e.g., in May) may miss late adult emergences (e.g., in June and July). The Panel thus considers that the first scheduled inspection may not detect exit holes of late emerging adults. Furthermore, insects with a two-year life cycle in the first year of their development, present as larvae in the trunk/stem of host plants, cannot be reliably detected by this first inspection.

2.1.4. Effectiveness of second inspection

The second inspection proposed by the Japanese Authorities is in September. The signs and symptoms are noted as exit holes and chewed tree debris and frass (faeces). This second inspection will allow inspectors to detect late adult emergence which may have been missed during the first inspection.

Some trees infested with insect larvae with a two-year cycle could be detected during this second inspection through the presence of frass and debris. However, the amount of extruded frass varies depending on the host plant species, larval instar and environmental conditions (Akutsu, 1990; Kawamura, 1985). Furthermore, frass could become dislodged and detached from the plant.

Observations made by Aono and Murakoshi (1980) on 121 pear trees infested with *A. chinensis* showed that frass is not always found on infested trees. Experience from outbreaks in the Netherlands and Italy show that the presence of frass is not a reliable symptom as some plants were found to be infested with larvae in the absence of symptoms (Van der Gaag et al., 2010). The Panel considers that insects with a two-year life cycle in the first year of their development, present as larvae in the trunk/stem of host plants, cannot be reliably detected by this second inspection.

2.1.5. Conclusion on Option 1

The Japanese literature confirms that the pest may have an extended life cycle of two years. The percentage of individuals in the population with one or two-year life cycles varies depending on timing of oviposition and other factors.

From an analysis of the submitted references, adult emergence may range from mid-May to mid-August depending on location and year. The first visual inspection (from May to July) may miss some exit holes but the during the second inspection in September exit holes of adults emerging later in the season can be detected. However, individuals with a two-year cycle cannot be reliably detected by visual inspection and emergence may occur the following year, after export.

In the Japanese proposal, it is suggested that insects with a two-year cycle can be detected by larval frass. However, although this can frequently be observed in infested trees, it may not always be present. Signs of larval feeding vary depending on the host species, larval instar and environmental conditions. Frass in the form of very fine particles located usually at ground level and external to the plant may not always be present and can become dislodged. Thus, reliance on visual inspection for signs of larval feeding is not considered by the Panel to be effective to confirm the absence of larvae with an extended two-year life cycle.

The Panel concludes that reducing the required period of growing plants under physical protection would increase the risk of entry of *A. chinensis* compared with the current EU requirements.

2.2. Option 2: To permit scion grafting during the required period to grow the plants in field cages

2.2.1. Description of the proposal

The Japanese Authorities propose to permit grafting of scions considered to present no risk of infestation by *Anoplophora chinensis* during the 2 years of field-cage cultivation. The proposal refers to "*Acer* spp. scions on *Acer palmatum* seedlings etc." and to permit "grafting of scions collected from a branch of a stock tree 50 cm or higher above the ground; diameter approximately 5 mm; length approximately 5 cm during the two years of field cage cultivation".

The proposal is not clearly described and the scope of the proposal is unclear. The location and conditions of production of the stock trees, and the grafting procedure are not described. The Panel bases its evaluation on scions of *Acer* spp. not exceeding 0.5 cm in diameter and 5 cm in length.

2.2.2. Height of oviposition

The reviewed literature indicates that oviposition sites of *A. chinensis* are primarily located in the lower part of the host plant, close to the ground, root collar region or on the exposed roots (Ito et al., 1980; Mitomi et al., 1990; Lingafelter and Hoebeke, 2002; Haack et al., 2010). On rare occasions, the oviposition sites can be found at high locations on main or sub-branches (Ogihara and Ikeuchi, 1999). Oviposition and larval feeding damage has been further reported in the upper parts of host plants in Japan (Adachi, 1990b). Field observations and further studies undertaken in Italy confirm oviposition occurring on host plants at a height of 50 cm or more above ground level (Maspero personal communication[7], 2010; Van der Gaag et al., 2010).

2.2.3. Diameter of scions

The Japanese Authorities propose to use scions of approximately 0.5 cm in diameter and 5 cm in length collected outside the cages and consequently to be grafted on the root stocks that are grown in a pest-free production site.

The eggs of *Anoplophora* species are approximately 0.5 to 0.7 cm long (CABI, 2010; Haack et al., 2010). Stems with a small diameter may not be suitable for oviposition due to the relatively large size of the egg. The smallest size of stem where larvae have been detected had a diameter of around 1 cm, although the stem might have been smaller at the time of oviposition (Van der Gaag et al., 2008). The bark of a scion of 0.5 cm in diameter is very thin and as the females lay eggs within the bark tissues, the conditions for egg survival and further embryo development are unlikely to be met, as the cambium layer can be damaged when the egg slit is prepared by the adult, and proliferation of plant tissues often leads to egg extrusion (Hérard personal communication[7], 2010).

2.2.4. Conclusion on Option 2

Most of the evidence describes oviposition sites of *A. chinensis* up to 50 cm above ground level. However, in Japan and Europe, there are reports of oviposition slits and emergence holes in the higher regions of the trunk above 50 cm.

[7] available from EFSA on request

The egg size of *Anoplophora* species is approximately 0.5 to 0.7 cm in length and 0.17 cm in width. The bark of a scion of 0.5 cm in diameter is very thin and as the females lay eggs within the bark tissues, the conditions for the egg survival and further embryo development are unlikely to be met.

The use of scions collected higher than 50 cm above the ground level with diameter size not exceeding 0.5 cm and inspected to confirm no visible signs of infestation, is unlikely to increase the risk of entry of *A. chinensis* into the EU, compared to the existing requirements.

2.3. Option 3: To permit removal of insect control measures (*i.e.* net) during the winter

2.3.1. Description of the proposal

The Japanese Authorities propose removal of the net from the field cage during the winter period (from November to March) when adult *A. chinensis* do not visit the area or lay eggs.

In order to assess the probability of insects entering the field cages after removal of the net, two factors are taken into account: dispersal distance and period of adult flight.

2.3.2. Dispersal distance

Adachi (1990a) assessed the total distance travelled by *A. chinensis* adults in a Japanese citrus orchard. Most adults moved less than 50 m with maximum recorded dispersal distance of 160 m. However, a high number of adult immigrants from outside the study site was also noted (twice the number of adults emerging from the study site) and this is not taken into account in determining the potential dispersal distance of adult beetles. The author refers to unpublished data from a mark-recapture study with maximum recorded dispersal distance of 2 km. At high population densities, emigration over greater distances is also more likely to occur.

2.3.3. Period of adult flight

According to the Gantt chart provided, adults occur from mid-May to the end of September. Under natural conditions, the period of adult emergence of *A. chinensis* in Japan peaks in mid June, with variations noted from mid May to mid July (Akutsu, 1990; Hashimoto et al., 1989; Ito et al.1980). Komazaki and Sakagami (1989) suggest adult emergence may occur up to mid-August.

Adults of *A. chinensis* have been observed, albeit in small numbers, outdoors in Japan during October, and individuals reared in petri dishes are noted as surviving as late as December (Kawamura, 1980). *A. chinensis* is reported as found from the southern part of Hokkaido to Okinawa Island in the Ryukyu Archipelago, in the south (CABI, 2010). Due to higher temperatures in southern Japan, adults are likely to be active later in the year than in northern Japan.

The Japanese technical file includes several laboratory studies on the development of *A. chinensis* and the results differ from those observed under natural conditions. Adults successfully emerged from the end of May to the beginning of January (Adachi, 1994). In a study where newly emerged adult of *A. chinensis* (aged 1 or 2 days) were captured and reared under controlled conditions, the average life span of the adult was calculated as 77.6 days, with a maximum recorded life span of 109 days (Adachi, 1988).

2.3.4. Temperature threshold

Adachi (1988, 1994) suggests that there is a positive correlation between mean daily temperature and number of deposited eggs, as well as some elements of the life cycle of *A. chinensis*, such as egg and larval development. The author estimated that the lower developmental temperature thresholds for eggs and larvae are 6.7 °C and 11.6 °C, respectively. However there is no information on minimum temperature thresholds for adult flight.

2.3.5. Conclusion on Option 3

From the reviewed literature, the latest documented survival of adult *A. chinensis* under natural conditions was in October, although adult beetles were observed until January in experiments conducted under controlled climatic conditions, derived from real climatic data. Survival is highly dependent on the climatic conditions and in particular on temperature. There is no information in the literature on the temperature thresholds for adult survival and flight. Given this, and the range of climatic conditions in Japan, it is uncertain whether beetles would be able to fly and infest new hosts during the period when the nets of the cages would be removed. Further evidence is required to confirm that no adults are likely to be flying between November and March.

The Panel considers that there is uncertainty on the occurrence of adult flight and oviposition in winter, and that opening cages from November to March might lead to an increased risk of infestation of bonsai and topiary trees compared to current measures.

CONCLUSIONS

The Panel examined the technical file submitted to the European Commission by the Japanese Authorities and reached the following conclusions on the three risk management options proposed:

Option 1: A reduction of the required period to grow plants in field cages (*i.e.* with complete physical protection against the introduction of *A. chinensis*) from two years (as stipulated in the current EU requirements), to one season prior to export (from April to October) presents an increased risk of entry of *A. chinensis* into the EU, due to the two-year life cycle duration of the pest and the potential presence of larvae within the plant which cannot be reliably detected by visual inspection;

Option 2 (for plants of *Acer* spp. grafted on seedlings of *Acer palmatum*): Grafting of scions collected from a branch of a stock tree 50 cm or higher above the ground, with a diameter not exceeding 0.5 cm and length not exceeding 5 cm during the two years of field cage cultivation is unlikely to increase the risk of entry of *A. chinensis* into the EU. Although oviposition can occur on host plants at a height above 50 cm, a scion with a diameter not exceeding 0.5 cm is unlikely to provide conditions for survival of eggs of *A. chinensis*;

Option 3: Removal of the net from the field cage during the winter period (from November to March) may result in an increased risk of entry of *A. chinensis* compared to the current measures, as there is uncertainty on the occurrence of adult flight and oviposition during this period. Further evidence is required to confirm that no adults are likely to be flying between November and March.

DOCUMENTATION PROVIDED TO EFSA

a) A PowerPoint presentation outlining the derogation request in sixteen slides;

b) Letter of 16th October 2009 from the Japanese Authorities, including a table with references (list of scientific papers), photographs and 13 scientific papers (4 in English and 9 in Japanese);

c) Letter of 10th February 2010 from the Japanese Authorities, including English translations of the 9 references originally provided in Japanese.

The references provided by the Japanese Authorities are listed below:

Adachi I, 1988. Reproductive biology of the white-spotted longicorn beetle, *Anoplophora malasiaca* (Thomson) (Coleoptera: Cerambycidae), in citrus trees. Applied Entomology and Zoology, 23(3), p256-264.

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