PEST RISK ANALYSIS

Horidiplosis ficifolii Harris

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INITIATION

STAGE 1: INITIATION		
The aim of the initiation stage is to identify the pest(s) and pathways, which are of phytosanitary concern and should be considered for risk analysis in relation to the identified PRA area.		
Question	**Yes / No / Score**	**Notes**
1. Give the reason for performing the PRA	Go to 2	*Horidiplosis ficifolii* has been found during inspections of *Ficus* plants at different glasshouse production sites in the Netherlands in 2005. The plants had been imported from China and *Horidiplosis ficifolii* caused considerable damage on these plants.
2. Specify the pest or pests of concern and follow the scheme for each individual pest in turn. For intentionally introduced plants specify the intended habitats.	Go to 3	*Horidiplosis ficifolii* Harris
If no pest of concern has been identified, the PRA may stop at this point.		
3. Clearly define the PRA area.	*Go to 4*	The Netherlands
Earlier analysis		
4. Does a relevant earlier PRA exist ? *if yes go to 5* *if no go to 7*	**No**	
5. Is the earlier PRA still entirely valid, or only partly valid (out of date, applied in different circumstances, for a similar but distinct pest, for another area with similar conditions)? *if entirely valid, End* *if partly valid proceed with the PRA, but compare as much as possible with the earlier PRA, go to 6*		

if not valid go to 6		
Stage 2: Pest Risk Assessment		
Section A: Pest categorization		
Identify the pest (or potential pest)		
6. Is the organism clearly a single taxonomic entity and can it be adequately distinguished from other entities of the same rank? *if yes indicate the correct scientific name and taxonomic position go to 8* *if no go to72*	**Yes**	Taxonomic Tree Class: Insecta Order: Diptera Family: Cecidomyiidae Genus: *Horidiplosis* Species: *Horidiplosis ficifolii* Harris Bron: Harris and Goffau, 2003
7. Even if the causal agent of particular symptoms has not yet been fully identified, has it been shown to produce consistent symptoms and to be transmissible? *if yes go to 8* *if no go to 17*		
Confirm pest status (actual or potential)		
8. Is the organism in its area of current distribution a known pest (or vector of a pest) of plants or plant products? *if yes, the organism is considered to be a pest, go to 10* *if no, go to 9*	**Yes**	*H. ficifollii* was reported for the first time in China on *Ficus* sp. in 2003 according to Mr. Zhou Weichuan (Technical Service Centre of Exit & Entry Inspection and Quarantine Administration of Fujian Province; personal communication to Mr. G.A. Rikken, 2006).

9. Does the organism have intrinsic attributes that indicate that it could cause significant harm to plants? *if yes or uncertain, the organism may become a pest of plants in the PRA area, go to 10* *if no, go to 17*		
Presence or absence in the PRA area and regulatory status		
10. Does the pest occur in the PRA area ? *if yes go to 11* *if no go to 12*	**Yes**	In 2005, *Horidiplosis ficifolii* has been found by inspectors of the Dutch Plant Protection Service in several glasshouse productions sites on *Ficus* plants imported from China. Plants from *Ficus microcarpa*, *F. retusa*, *F. nitida* and *F. panda* were infested. It is uncertain if these names were the correct botanical names. *Ficus* is a complex genus with several confusing trade names for *Ficus* species.
11. Is the pest widely distributed in the PRA area? *if not widely distributed, go to 12* *if widely distributed, go to 17*	**No**	
Potential for establishment and spread in the PRA area		
12. Does at least one host-plant species (for pests directly affecting plants) or one suitable habitat (for non parasitic plants) occur in the PRA area (outdoors, in protected cultivation or both)? *if yes go to 13* *if no go to 17*	**Yes**	According to Harris and Goffau (2003), *Horidiplosis ficifolii* can infest *Ficus benjamina* plants that are grown in the Netherlands in glasshouses.
13. If a vector is the only means by which the pest can spread, is a vector present in the PRA area? (if a vector is not needed or is not the only means by	**Not applicable**	

which the pest can spread go to 14)		
14. Does the known area of current distribution of the pest include ecoclimatic conditions comparable with those of the PRA area or sufficiently similar for the pest to survive and thrive (consider also protected conditions)? *if yes go to 15* *if no go to 17*	**Yes**	*Horidiplosis ficifolii* has proven to be able to develop in glasshouse productions sites of *Ficus* plants in the Netherlands (W. den Hartog, Dutch Plant Protection Service, personal communication to D.J. van der Gaag, 2006).
Potential for economic consequences in PRA area		
15. With specific reference to the plant(s) or habitats which occur(s) in the PRA area, and the damage or loss caused by the pest in its area of current distribution, could the pest by itself, or acting as a vector, cause significant damage or loss to plants or other negative economic impacts (on the environment, on society, on export markets) through the effect on plant health in the PRA area? *if yes or uncertain go to 16* *if no go to 17*	**Yes**	*Horidiplosis ficifolii* causes dark brown patches on leaves of *Ficus benjamina* plants. In these patches the larvae develop (Harris and Goffau, 2003). Infested leaves have to be removed by hand before plants can be sold.
Conclusion of pest categorization		
16. **This pest could present a risk to the PRA area** (Summarize the main elements leading to the conclusion that the pest presents a risk to the PRA area)	**Go to Section B**	.
17. **The pest does not qualify as a quarantine pest for the PRA area** and the assessment for this		

pest can stop (summarize the main reason for stopping the analysis).		

Section B. Assessment of the probability of introduction and spread and of potential economic consequences		
1. Probability of introduction *Introduction, as defined by the FAO Glossary of Phytosanitary Terms, is the entry of pest resulting in its establishment.*		
Probability of entry		
1.1 Consider all relevant pathways and list them. *Relevant pathways are those with which the pest has a possibility of being associated (in a suitable life stage), on which it has the possibility of survival, and from which it has the possibility of transfer to a suitable host* Go to 1.2		Plants of *Ficus* spp. Ficus plants imported under the name: • *F. microcarpa* • *F. retusa* • *F. nitida* • *F. panda* were observed to be infested with *H. ficifolii* (*F. panda* was only slightly affected). According to Harris and Goffau (2003), *H. ficifolii* can also attack *F. benjamina*. It is unknown if other *Ficus* spp. can be infested by *H. ficifolii.* As long as no information is available on the exact host range of *H. ficifolii,* all *Ficus* species are considered host plants and relevant pathways. **Uncertainty:** it is unknown which *Ficus* species are host plants of *H. ficifolii*
1.2 Estimate the number of relevant pathways, of different commodities, from different origins, to different end uses. Go to 1.3	few	The genus *Ficus* consists of about 60 species. If all these species are present in China (the known current area of distribution of *H. ficifolii*), 60 potential pathways can be identified, In this PRA, these pathways are clustered in one major pathway: plants of *Ficus* spp. imported from China (see also 1.1). **Notes** *H. ficifolii* has also been reported on plants imported into the Netherlands from Taiwan (Harris and Goffau, 2003). *H. ficifolii* may, therefore, also occur in Taiwan but the plants may

		also have originated from China and imported via Taiwan. Plants imported from China usually stay 8 – 20 weeks in a glasshouse in the Netherlands before they are sold. Young plants of the most regular grown *Ficus benjamina* in the Netherlands is derived from companies in Europe, either from tissue culture laboratories or plant nurseries. Many companies (rough estimate: 60%) grow their own propagation material (information obtained from Dutch *Ficus* growers). About 10 companies in the Netherlands import ficus plants from China. One or a few of these companies sell plant from China to other glasshouse production sites in the Netherlands and it is estimated that about 15 glasshouse production sites in the Netherlands grow ficus plants imported from China.
1.3. Select from the relevant pathways, using expert judgement, those which appear most important. If these pathways involve different origins and end uses, it is sufficient to consider only the realistic worst-case pathways. The following group of questions on pathways is then considered for each relevant pathway in turn, as appropriate, starting with the most important. Go to 1.4		Plants of *Ficus* spp. imported from China
Probability of the pest being associated with the individual pathway at origin.		
1.4 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like the prevalence of the pest at origin, the life stages of the pest, the period of the year? Go to 1.5	likely	No information was available of the prevalence of the pest at origin. However, imported *Ficus* plants from China into the Netherlands, are sometimes heavily infested with *Horidiplosis ficifolii*. Dutch inspectors from the Crop Protection Service estimated that about 40% of all shipments from China had some degree of infestation in the period December 2005 – February 2006. This estimation is based on the percentage of consignments with symptomatic plants and may overestimate the percentage of consignments with living specimen of *H. ficifolii*. Plants may have leaf lesions caused by *H. ficifolii* but these may not harbour living larvae due to insecticide sprays performed in China just before export (e.g. to

		eradicate quarantine organisms like *Thrips palmi*).
1.5 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like cultivation practices, treatment of consignments? Go to 1.6	likely	It is believed that the prevalence is probably high considering the high percentage of shipments infested with *Horidiplosis ficifolii* (see the answer on question 1.4).
1.6 How large is movement along the pathway? Go to 1.7	moderate	In 2005, about 540 lots with Ficus plants were imported from China and inspected by the Dutch Plant Protection service. The total number of plants was 1 – 1,5 million (Source: inspection database from the Dutch Plant Protection Service).
1.7 How frequent is the movement along the pathway? Go to 1.8	very often	*Ficus* plants from China are imported throughout the year.
Probability of survival during transport or storage		
1.8 How likely is the pest to survive during transport / storage? Go to 1.9	very likely	During import inspections, large numbers of living specimen (larvae) are found in leaves of *Ficus* plants. Larvae are present in galls in the leaves which may protect them from unfavourable environmental conditions during transport.
1.9 How likely is the pest to multiply / increase in prevalence during transport / storage? Go to 1.10	unlikely	At around 20 C, the lifecycle of this species is approximately 1 month (personal observation E. Dijkstra, Dutch Plant Protection Service). If the temperature during transport is low due to a cooling system, the species is unlikely to reproduce during transport.
Probability of the pest surviving existing pest management procedures		
1.10 How likely is the pest to survive or remain undetected during existing phytosanitary procedures? Go to 1.11	Moderately likely	The egg stage, first larval stages and pupae are difficult to detect and may therefore remain undetected. Later immature stages will produce relatively large galls with discolouring leaves, both of which are more easy to detect
Probability of transfer to a suitable host or habitat		

1.11 In the case of a commodity pathway, how widely is the commodity to be distributed throughout the PRA area? Go to 1.12	moderately widely	*Ficus* plants from China are imported to glasshouse production sites located in the western part of the Netherlands (Source: inspection database from the Dutch Plant Protection Service).
1.12 In the case of a commodity pathway, do consignments arrive at a suitable time of year for pest establishment? If yes, go to 1.13 If no, go to 1.3 (and start with other pathway, if relevant)	yes	Imported plants arrive throughout the year. These plants are placed in glasshouses in which the climatic conditions are favourable for development of *H. ficifolii* throughout the year.
1.13 How likely is the pest to be able to transfer from the pathway to a suitable host or habitat? Go to 1.14	Very likely	*H. ficifolii* is present on *Ficus* plants which are imported into the Netherlands. These imported plants are usually grown in a greenhouse for several months before they are sold to end users *H. ficifolii* may infest other *Ficus* plants which are present in the same greenhouse. It is uncertain which *Ficus* spp. are host plants. The pest has been found on *Ficus* plants which had been imported as *F. microcarpa*, *F. retusa*, *F. nitida* and *F. panda* of which *F. panda* seemed to be least susceptible. According to Harris and Goffau (2003), it can also attack *F. benjamina*. *Ficus benjamina* is the most commonly grown *Ficus sp.* in the Netherlands. In some greenhouses *F. benjamina* is grown in the same compartment as *Ficus* plants imported from China.
1.14 In the case of a commodity pathway, how likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) to aid transfer to a suitable host or habitat? Go to 1.15	Very likely	See 1.13

Consideration of further pathways In principle, all the relevant pathways selected at point 1.3 may in turn be considered. However, the replies given for the pathway(s) so far considered may indicate that it is not necessary to consider any more.		
1.15 Do other pathways need to be considered? If yes, go back to 1.3 If no, go to conclusion on the probability of entry	No	
Conclusion on the probability of entry		
Describe the overall probability of entry and identify the risks presented by different pathways Go to 1.16		The probability of entry with imported *Ficus* plants is very high. A large proportion of imported *Ficus* plants from China is infested (about 40% of imported lots is estimated to contain plants with some degree of infestation). The imported plants are placed and grown in commercial glasshouses before they are sold to end-users (via traders).
Probability of establishment		
Availability of suitable hosts or suitable habitats, alternate hosts and vectors in the PRA area		
1.16 Specify the host plant species (for pests directly affecting plants) or suitable habitats (for non parasitic plants) present in the PRA area. Go to 1.17		*Ficus* plants imported from China and which have been observed to be infested with *Horidiplosis ficifolii* had the (trade) names: - *Ficus microcarpa* - *Ficus nitida* - *Ficus retusa* - *Ficus panda* It is, however, uncertain if these names correspond with the scientific (botanical) names of the plant species. According to Harris and Goffau (2003), *H. ficifolii* can probably infest *Ficus benjamina* which is the most commonly grown *Ficus* in the Netherlands (Anonymous, 2005). It is unknown if *H. ficifollii* can infest other *Ficus* species like *F. elastica*, *F. pumila* and *F. binnedijkii* which are also grown in Dutch greenhouses.

1.17 How widespread are the host plants or suitable habitats in the PRA area? (specify) Go to 1.18	moderately widely	*Ficus* plants are grown on about 74 ha at about 80 glasshouse productions sites (Anonymous, 2005). These glasshouse productions sites are localized throughout the Netherlands. **Note** The companies that import and grow *Ficus* plants from China (about 15) are located in the western part of the Netherlands.
1.18 If an alternate host is needed to complete the life cycle, how widespread are alternate host plants in the PRA area? (not relevant for plants) Go to 1.19	Not applicable	
1.19 If the pest requires another species for critical stages in its life cycle such as transmission, (e.g. vectors), growth (e.g. root symbionts), reproduction (e.g. pollinators) or spread (e.g. seed dispersers) how likely is the pest to become associated with such species? Go to 1.20	Not applicable	
Suitability of the environment		
1.20 How similar are the climatic conditions that would affect pest establishment, in the PRA area and in the area of current distribution? Go to 1.21	moderately similar (in greenhouses)	The *Ficus* plants are imported from tropical areas in the southern part of China (information obtained from Dutch growers). The conditions in Dutch greenhouses will probably be moderately similar to these conditions and have been proven to be suitable for the establishment of *H. ficifolii*. The outdoor conditions in the PRA area are not similar to those in the area of the current distribution
1.21 How similar are other abiotic factors that would affect pest establishment, in the PRA area and in the area of current	unknown	The soil conditions may affect the development of *H. ficifolli* since the pupae are formed and develop in or on the soil/substrate. Pot plants are usually grown in peaty substrates and the pots are placed on concrete floors or metal benches.

distribution? Go to 1.22		Monitoring of infested plants in a commercial greenhouse during about three months indicated that *H. ficifolli* can complete its complete life cycle under glasshouse conditions. During this period adult midges and new leaf lesions on young leaves were observed by inspectors of the Dutch Plant Protection Service.
1.22 (Answer this question only if protected cultivation is important in the PRA area.) How often has the pest been recorded on crops in protected cultivation elsewhere? Go to 1.23	sometimes	The pest has been recorded in Denmark on plants imported from China via the Netherlands in 2001 (Harris & De Goffau, 2003). In 2001, Ficus plants imported from the Netherlands into the UK showed galls on leaves similar to those caused by *H. ficifolli*. However, the larvae present in the galls died and no definite diagnosis could be made (Harris and Goffau, 2003). Plants were probably infested with *H. ficifolli* and these plants and/or the source of infestation most likely originated from China.
1.23 How likely is establishment to be prevented by competition from existing species in the PRA area? Go to 1.24	unlikely	No other *Horidiplosis* species occur in the PRA. No information is available from literature but it seems unlikely that species present in the PRA area would compete with *H. ficifolli* in greenhouses.
1.24 How likely is establishment to be prevented by natural enemies already present in the PRA area? Go to 1.25	very unlikely	It is unknown whether endemic natural enemies will attack *H. ficifolii*, but prevention as such seems very unlikely.
Cultural practices and control measures		
1.25 To what extent is the managed environment in the PRA area favourable for establishment? Go to 1.26	favourable	*Ficus* plants in the Netherlands are grown under protected conditions. *Horidiplosis ficifolii* can develop in Dutch greenhouses. In one greenhouse with heavily infested plants it was difficult to control the pest. (outdoor conditions are not favourable in the PRA area)
1.26 How likely are existing control or husbandry measures to prevent establishment of the pest? Go to 1.27	unlikely	After arrival at a Dutch glasshouse production site, imported *Ficus* plants are sometimes treated with insecticides with active ingredients like: imidacloprid, pyriproxifen, abamectin and/or spinosad to control mites, thrips, aphids and others insects (very rough estimate: about 25% of shipments are treated after arrival). This treatment has appeared insufficient to eradicate *H.ficifolii* in several occasions

		(information from inspectors of the Dutch Plant Protection Service). In those cases plants were repeatedly sprayed with insecticides, which finally eradicated the pest (as far as known).
1.27 How likely is it that the pest could be eradicated from the PRA area? Go to 1.28	likely	*Horidiplosis ficifolii* can probably not survive outdoors in the Netherlands. The insect may, however, survive in heated glasshouses. Eradication in glasshouses is possible by frequent application of insecticides (information from Dutch growers and observations from inspectors of the Dutch Plant Protection Service). Pupae and eggs are not vulnerable to insecticides that are currently available in the Netherlands but the adult midges and larvae can be controlled. LVM application of pyrethroid insecticides, like deltamethrin and esfenvalerate, are probably effective against the adult midges and are also registered for pot plants in the Netherlands. Larvae may be killed by systemic insecticides such as the neonicotinoids imidacloprid and thiometoxam or the carbamates methomyl and carbofuran. Insecticides which exhibits translaminar movement like abamectine may also be effective. In a commercial greenhouse with severely infested plants, *H. ficifollii* was probably eradicated by using deltamethrin (against the adult midges) and imidacloprid, thiamethoxam and methomex (against the larvae). It was, however, unclear which insecticides were most effective against the larvae (no data of experiments on the efficacy of pesticides against *H. ficifolii* are known). Thus, *H ficifolii* can be eradicated from individual glasshouse productions sites. However, the pest is present in about 40% of consignments with *Ficus* plant from China (very rough estimate based on observations of inspectors of the Dutch Plant Protection Service; the percentage of consignments with living larvae of *H. ficifolli* may be less than 40% since the percentage is based on the observations of symptomatic plants). *H. ficifolii* is more or less continuously imported, which currently makes complete eradication from the PRA-area not possible.
Other characteristics of the pest affecting the probability of establishment		
1.28 How likely is the reproductive strategy of the pest and the duration of its life cycle	Not likely	The available data and observations suggest that the species does not have a particular reproductive trait that facilitates the species to establish itself.

to aid establishment? Go to 1.29		
1.29 How likely are relatively small populations or populations of low genetic diversity to become established? Go to 1.30	moderately likely	There are no indications that suggest that low numbers of *H. ficifolii* could not establish.
1.30 How adaptable is the pest? Go to 1.31	Unknown	Unknown
1.31 How often has the pest been introduced into new areas outside its original area of distribution? (specify the instances , if possible) Go to 1.32	occasionally (as far as known)	Besides introduction into the Netherlands, it has been reported from Denmark, the UK (no definite diagnosis) and the Netherlands (Harris and De Goffau, 2003). No other pest records are known. However, it is likely that *H. ficifolii* has been introduced into other countries that import *Ficus* plants from China considering the high percentage of infested *Ficus* consignments.
1.32 Even if permanent establishment of the pest is unlikely, how likely are transient populations to occur in the PRA area through natural migration or entry through man's activities (including intentional release into the environment) ? (Transience = presence of a pest that is not expected to lead to establishment) Go to 1.33	Not relevant	Permanent establishment of *H. ficifolii* is likely to occur when no control measures would be taken against the pest. **Note** The present situation is that growers use pesticides against *H. ficifolii* if the pest is present in imported plants and, as far was we know, *H. ficifolii* has been eradicated by application of these pesticides each time after it had been introduced into a glasshouses production site.
Probability of spread		
1.33 How likely is the pest to spread rapidly in the PRA area by natural means? Go to 1.34	unlikely	*H. ficifolii* is a small insect, and probably a weak flier. Little is known about the biology and behaviour of this species but own observations and information available of other gall midge species indicate that *H. ficifolii* is a weak flier and usually does not fly more than several metres. If *H. ficifolii* is outside, it is unlikely to spread rapidly by natural means even

		when glasshouse production sites with *Ficus* plants are close to each other (e.g. less than 1 km). Moreover, the outdoor conditions in the PRA area will be unfavourable most time of the year and host plants are rare outdoors.
1.34 How likely is the pest to spread rapidly in the PRA area by human assistance? Go to 1.35	unlikely	Trade from glasshouse production sites that import *Ficus* plants to other *Ficus* production sites is limited. It is estimated that in total about 15 production sites in the Netherlands grow ficus plant originating from China. Glasshouse production sites that produce young planting material for *Ficus* growers do not import plants from China (information obtained from Dutch growers). Moreover, many *Ficus* growers in the Netherlands (rough estimate: 60%) produce their own propagation material. The probability that the pest will spread attached to shoes or clothes of people visiting different *Ficus* production sites is estimated to be low. The probability that *H. ficifollii* may enter a *Ficus* production site from plants sold to end-users is considered to be very low.
1.35 How likely is it that the spread of the pest could be contained within the PRA area? *Go to Conclusion on the probability of introduction and spread*	likely	The adult stage of *Horidiplosis ficifolii* can fly and move through the air by itself. However, it is believed that the species will only fly over very short distances (several meters) and usually stay within the crop considering the observations in Dutch glasshouses by employees of the Dutch Plant Protection Service and the behaviour of related species. Moreover, the outdoor climatic conditions in the Netherlands are not favourable for *H. ficifollii*. Natural spread is, therefore, unlikely to occur. *H. ficifollii* will probably only be able to survive and establish in heated glasshouses. Spread to other areas may occur by trade of infested plants to other countries. In 2001, this pest was found by the Plant Protection Service in Denmark on plants from China imported via the Netherlands (Harris and Goffau, 2003). The pest could be contained if trade of infested plants would not be allowed.

Conclusion on the probability of introduction (= entry + establishment) and spread

Describe the overall probability of introduction and spread. The probability of	very high	Introduction A high percentage of consignments with *Ficus* plants from China is currently infested with

introduction and spread may be expressed by comparison with PRAs on other pests. *Go to 1.36*	low	*H. ficifolii* (rough estimate: 40% during the period December 2005 – February 2006). These plants are placed in greenhouses of which the climate is favourable for development of the pest and the probability of introduction is very high when no control measures are taken against the pest. **Note** The current situation is that *H. ficifolii* is (probably) eradicated after a few sprays with insecticides each time it has entered a glasshouse production site. One occasion is known in which it was very difficult to control the pest, probably because of a high initial infestation level and improper measures taken after import of the infested plants. However, also in this case, the pest was eradicated after an intensive chemical control strategy. <u>Spread</u> The probability that *H. ficifolii* will spread from one glasshouse production site to another on its own or by human assistance is considered to be (very) low: the outdoor conditions are unfavourable and the pest is a weak flier. The probability that the pest will spread attached to shoes or clothes of people that visit different *Ficus* production sites is estimated to be low.
<u>Conclusion regarding endangered areas</u>		
1.36 Based on the answers to questions 1.16 to 1.35 identify the part of the PRA where presence of host plants or suitable habitats and ecological factors favour the establishment and spread of the pest to define the endangered area. Go to 2 Assessment of potential economic consequences		Glasshouse production sites that import and grow Ficus plants from China are the most endangered areas. Glasshouse production sites that grow *Ficus* plants but do not import Ficus plants from China do not belong do the endangered areas based on our current knowledge.

2. Assessment of potential economic consequences

Pest effects

2.1 How important is the effect of the pest on crop yield and/or quality to cultivated plants or on control costs caused by the pest within its area of current distribution? Go to 2.2	minimal	According to Mr Zhou Weichuan (Technical Service Centre of Exit & Entry Inspection and Quarantine Administration of Fujian Province), *H. ficifolii* was firstly reported in China in 2003. It damages *Ficus benjamina* which is mainly distributed in the provinces Hainan, Yunnan, Guangdong and Fujian province. According to Mr. Zhou Weichuan, *H. ficifolii* does not cause serious damage in China (Ficus plant expert from Fujian Province, personal communication to Bert Rikken, Plant Protection Service, March 2006). More information about *H. ficifolii* in its area of current distribution could not be obtained.
2.2 How great a negative effect is the pest likely to have on crop yield and/or quality in the PRA area? Go to 2.3	moderate to high	Plants that are affected by *H. ficifolii* cannot be sold. Affected leaves can be removed by hand but this will only be economically feasible for the more expensive plants and not for the more regular grown *Ficus benjamina* pot plants. Plant losses may be up to 100% without any control measures. The fact that *H. ficifolli* does not appear to fly over distances more than a couple of metres, might result in lower damage levels, especially at a low level of infestation. Damage is expected on *Ficus* importing production sites only (approx. 1,5 million plants annually). **Note** Damage will probably be minor when insecticides are applied to control the pest.
2.3 How great an increase in production costs (including control costs) is likely to be caused by the pest in the PRA area? Go to 2.4	minor	Frequent spraying of insecticides may be needed to control *H. ficfolii*. At one Dutch glasshouse production site, it appeared to be very difficult to control *H. ficfolii* in a severely infested crop. The pest was finally controlled after the crop had been sprayed with pesticides 1-2 times a week during 2 months. It should, however, be noted that little information was available on the efficacy of insecticides against *H. ficifollii*. Therefore, a more effective

		control program may have been possible when more information would have been available on the efficacy of insecticides against *H. ficifolii*. At one production site, a few plants were infested only and *H. ficfolii* was (likely) eradicated after 10 applications of chemical pesticides during 33 days. Fewer applications would probably have been sufficient in that case. At one site with heavily infested plants, the grower had controlled (or even eradicated) the pest after 4 treatments with pesticides (observation of the infested plants after the treatments by an employee of the Dutch Plant Protection Service; information on the pesticide treatments obtained from the grower). It is believed that 2 to 4 pesticide applications may be sufficient to control or even eradicate the pest in a lightly infested crop. *Ficus* plants are usually not sprayed very frequently and plant protection costs may increase. Currently, *Ficus* plants are treated with insecticides 12 –14 times per year (personal communication J. Wubben, Applied Plant Research, Aalsmeer, the Netherlands to D.J. v.d. Gaag). On average, import of plants infested with *H. ficifolii* may lead to 2 – 3 insecticide applications extra per year on an area of 10 –15 ha (rough estimate of the total area of Ficus plants imported from China). This would be an increase of about 15 – 25 % of insecticide use. Costs for pesticides constitutes about 0,5% of the total costs on pot plant production sites (Source: Bedrijven-Informatienet LEI, www.lei.wur.nl) and total costs for crop protection including labour and depreciation of spraying equipment are a few percent of the total production costs. Therefore, the relative increase in production costs will be minor.
2.4 How great a reduction is the pest likely to cause on consumer demand in the PRA area? Go to 2.5	minimal	Prices may increase slightly due to higher production costs or a lower supply. However, it is expected that this will hardly or probably not affect consumer demand.
2.5 How important is environmental damage caused by the pest within its area	minimal	Given the information from Mr. Zhou Weichuan (2.1), it is estimated that the environmental damage caused by the pest is minimal.

of current distribution? Go to 2.6		
2.6 How important is the environmental damage likely to be in the PRA area? Go to 2.7	minimal	In the Netherlands, host plants of *H. ficifolii* are very rare outdoors. Moreover, the outdoor climate is probably not suitable for establishment of the pest.
2.7 How important is social damage caused by the pest within its area of current distribution? Go to 2.8	minimal	Given the information from Mr. Zhou Weichuan (2.1), it is estimated that the social damage caused by the pest is minimal.
2.8 How important is the social damage likely to be in the PRA area? Go to 2.9	minimal	No social damage is expected.
The evaluation of the following questions may not be necessary if any of the responses to questions 2.2, 2.3, 2.4, 2.6, or 2.8 is "major or massive" or "likely or very likely". You may go directly to point 2.16 unless a detailed study of impacts is required.		
2.9 How easily can the pest be controlled in the PRA area? Go to 2.10	with some difficulty (uncertainty)	In the Netherlands, the commercial production of *Ficus* takes place in glasshouses only. Therefore, *H. ficifolli* does not need to be managed in the open field, also because *H. ficifolii* is not expected to survive outdoors. The climate will be favourable for *H. ficifolii* in glasshouses in the PRA area. The larvae of *H. ficifolii* develop in galls on young leaves and they are hidden between the upper and lower side of the leaves and are only vulnerable to systemic and possibly also translaminair insecticides. According to Dutch growers, the pest can be controlled/eradicated with a few pesticide applications after it had been introduced with imported plants. In one known occasion, it was very difficult to control the pest in the Netherlands. The possible reason for that was that the plants had been severely infested because no good control measurements had been taken after import of the plants. Eventually, frequent spraying of insecticides (1-2 times a week) controlled the pest in that case (see also question 1.27 and 2.3).

		Note When pesticides are applied at an early stage of infestation (low level of infestation), plant losses will probably be low especially because the pest does not appear to fly over distances more than a couple of metres and, therefore, it will not spread very quickly in a glasshouse. Economic losses would become much higher when *H. ficifolii* would become less sensitive or develop resistance against insecticides. No information is available on resistance development of *H. ficifolii* against insecticides. Frequent use of insecticides belonging to the same chemical group, e.g. the neonicotinoids, will increase the chance of resistance development. Presently, it is unknown which kind of insecticides are sufficiently effective. In a commercial greenhouse with severely infested plants, *H. ficifollii* was probably eradicated by using deltamethrin (against the adult midges) and imidacloprid, thiamethoxam and methomyl (against the larvae). It was, however, unclear which insecticides were most effective against the larvae (no data of experiments on the efficacy of pesticides against *H. ficifolii* are known; see also the answer on question 1.27). If, for example the neonicotinoids, imidacloprid, thiamethoxam would be most effective and would be used at high frequencies in the future, resistance development may occur. **Uncertainty** No experimental data are available on the efficacy of insecticides against *H. ficifolii*. Information was obtained from growers and by observations of inspectors of the Dutch Plant Protection Service inspecting *Ficus* plants infested with *H. ficifolii.* It remains uncertain how easily *H. ficifolii* can be controlled in the Netherlands and if maximum pesticide dosages and minimum time intervals between two pesticide applications as indicated on the pesticide label are sufficient for control especially when plants are severely infested.
2.10 How probable is it that natural enemies, already present in the PRA area, will suppress populations of the pest if introduced?	Unlikely (probably)	No data are available on natural enemies of *H. ficifolii*, but in populations of other gall midge species, large proportions of gall midge populations can be parasitized by parasitoids (Briggs and Latto, 2001). E.g. it was found that 51-78% of the gall midge Rabdophaga strobiloides e.g. was parasitized by *Torymus cecidomyiae* (Hymenoptera: Torymidae) and *Gastrancistrus*

Go to 2.11		sp. (Hymenoptera: Pteromalidae) (Van Hezewijk & Roland, 2003). **Uncertainty** No information is available on natural enemies of *H. ficifolli*. It is believed that *H. ficifolii* will not be suppressed to a large extent by natural enemies in the PRA also because the crop is regularly sprayed with insecticides which may kill natural enemies.
2.11 How likely are control measures to disrupt existing biological or integrated systems for control of other pests or to have negative effects on the environment? Go to 2.12	unlikely	Currently, the use of biological control agents in the cultivation of *Ficus* plants is not very common in the Netherlands. An increased use of pesticides will therefore not disrupt existing biological or integrated control systems. The development of integrated control systems in the cultivation of *Ficus* plants will, however, become much more difficult. Introduction of *H. ficifolii* will lead to an increased use of pesticides and, because of this, to an increased pollution of the environment with pesticides. The effect of pesticide use on the environment is probably minor as long as they are used properly, i.e. according to the directions on the pesticide label. However, imidacloprid is frequently found in surface water in glasshouse production areas above ecological risk levels (Maximum Permissible Concentration; Anonymous, 2006) and the introduction of *H. ficifolii* may add to this problem to some extent. Pesticide use may increase substantially with about 15 - 25% on about 10 -15 ha due to import of *H.ficifolii* (see also the answer on question 2.3). The effect will, however, be minimal considering the total use of pesticides on the total glasshouse area in the Netherlands of about 10.600 ha.
2.12 How likely is the presence of the pest in the PRA area to affect export markets? Go to 2.13	moderately likely	No detailed export figures are known. Probably about 80 – 90 % of the *Ficus* plants grown in the Netherlands are exported and about 95% of the export is to countries within the EU (J. Lanning, HBAG, personal communication to D.J. van der Gaag, March 2006). Normally, infested plants will not be sold. However, plants carrying living larvae or pupae (in the pots) may be exported, as well as plants with young instar larvae that are difficult to detect. In 2001, larvae of *H. ficifolii* had been found in plants at a glasshouse production site in the UK and the plants had originated from the Netherlands (Harris and De Goffau, 2003). If *H.*

		ficifolii would be regularly found in export lots, it may negatively affect Dutch export markets.
2.13 How important would other costs resulting from introduction be? Go to 2.14	minor	Research may be needed to determine the most optimal control strategies.
2.14 How likely is it that genetic traits can be carried to other species, modifying their genetic nature and making them more serious plant pests? Go to 2.15	very unlikely	No *Horidiplosis* species occur in Europe
2.15 How likely is the pest to act as a vector or host for other pests? Go to 2.16	unlikely	Unknown, but unlikely. No data are known that describe gall midges as vectors of any kind of pathogens.
Conclusion of Assessment of potential economic consequences		
2.16 Referring back to the conclusion on endangered area (1.36), identify the parts of the PRA area where the pest can establish and which are economically most at risk. Go to Degree of Uncertainty		Glasshouse production sites that grow *Ficus* plant from China are at risk (about 15 productions sites in the Netherlands). If no appropriate (chemical) management action is taken, the economic impact is expected to be moderate or even high. Plants that are affected by *H. ficifolii* cannot be sold and losses may be up to 100% without any control measures. However, currently growers seem to be able to manage the pest. According to information obtained from growers, the pest can be controlled/eradicated with a few pesticide applications after it has been introduced with imported plants. In one occasion in the Netherlands, it was very difficult to control the pest possibly because no appropriate control measures had been taken after import resulting in a severely infested crop in which it was very hard to control the pest. If the grower takes appropriate control measures, damage levels will probably be minimal.
Degree of uncertainty		

Document the areas of uncertainty and the degree of uncertainty in the assessment, and indicate where expert judgment has been used. This is necessary for transparency and may also be useful for identifying and prioritizing research needs. Go to Conclusion of the Risk Assessment	Except from one paper describing *H. ficifolii* as a new species damaging *Ficus benjamina* plants (Harris and Goffau, 2003), no information on this species was available from literature nor from internet. Also, hardly any information could be obtained from entomologists, crop protection experts or growers of *Ficus* plants in China. Thus, almost all information about *H. ficifolii* is based on observations from inspectors of the Dutch Plant Protection Service, expert judgment and information from Dutch growers. Dutch inspectors have been working together with several growers on the control and eradication of the pest from which most information on the control was obtained. Entomologists of the Dutch Plant Protection Service maintained *H. ficifolii* on Ficus plants in a quarantine glasshouse compartment for several months (December 2005 – March 2006) from which some information could be derived about the development of *H. ficifolii*.

3. Conclusion of the Risk Assessement

Entry

The only pathway is the import of *Ficus* pot plants from China. The probability of entry of *Horidiplosis ficifolii* with *Ficus* plant imported from China is currently very high. About 40% (very rough estimate) of the consignments in the period December 2005 – February 2006 were infested with the pest or showed characteristic leaf lesions. Imported plants are grown in a greenhouse for several months before they are sold (via traders) to end-users.

ENTRY RISK: VERY HIGH

Establishment

The climate in glasshouses in which imported plants are grown is favourable for development of the pest. Without any additional control measures the pest will establish in Dutch greenhouses that import plants from China. The current situation is that the pest is controlled or even eradicated after it has entered a glasshouse production site by the application of pesticides. The pest can, however, re-enter the glasshouse production site with newly imported consignments.

About ten glasshouse production sites that import *Ficus* plant from China were visited during November 2005 – February 2006. *H. ficifollii* had probably been introduced with imported plants at most of these glasshouse production sites and subsequently eradicated using insecticides. Control and eradication of *H. ficifollii* was very difficult on, at least, one of the visited sites that had imported plants from China, probably because of a very high infestation level of the imported plants together with unsufficient control measures directly after import. However, *H. ficifollii* was controlled and probably eradicated at this site as well using pesticides.

ESTABLISHMENT RISK IN GLASSHOUSES: VERY HIGH (WITHOUT ADDITIONAL CONTROL MEASURES)

Spread

The probability that *H. ficifolii* will spread to greenhouses that do not grow ficus plants originating from China is believed to be low. *H. ficifolii* is probably a weak flier and the outdoor conditions will be unfavourable for this tropical species most time of the year. The probability of spread by human activities is also considered to be very low since no trade occurs from glasshouse production sites that import *Ficus* plants to other *Ficus* production sites.

SPREAD RISK: LOW

Endangered area

Glasshouse production sites that grow *Ficus* plants originating from China are the endangered area (about 10 – 15 ha). It is believed that the other *Ficus* production sites are not endangered.

GLASSHOUSE PRODUCTION SITES THAT GROW FICUS PLANTS FROM CHINA

Economic importance

Plants that are infested are unmarketable. Infested leaves can be removed by hand but this is economically not feasible for low yielding plants. If no appropriate action is taken, the economic impact could be high. Plant losses will probably be low as long as pesticides are applied at an early stage of infestation, which generally is the current situation in the Netherlands. At present, no indications are available for resistance development of *H. ficifolii* against insecticides but it can certainly not be excluded.

ECONOMIC IMPACT: MODERATELY HIGH (IF NO CONTROL MEASURES WOULD BE APPLIED)

CURRENT ECONOMIC IMPACT: LOW (BECAUSE PESTICIDES ARE APPLIED AGAINST *H. FICIFOLII*)

Uncertainty: based on information obtained from growers and observations of inspectors of the Dutch Plant Protection Service, it is believed that *H. ficifolii* can be controlled with the insecticides currently allowed to use in floricultural crops. However, it is uncertain if the maximum pesticide dosages and the minimum time interval between two applications as indicated on the pesticide label are sufficient for control of the pest. No efficacy trials are known in which pesticides have been tested against *H. ficifolii*.

Overall conclusion

H. ficifolii does not qualify as a quarantine organism. The probability that *H. ficifolii* will enter the PRA area is very high and establishment will probably occur if growers would not take any control measures against the pest but:

- Growers use pesticides against *H. ficifolii* which, as far as known, has eradicated the pest from individual glasshouse production sites after it had been introduced;
- The probability that the pest will spread from glasshouses that grow ficus plants from China to other glasshouses is low and the pest can probably not survive outdoors;
- The total economic losses will be minor after establishment if pesticides are used at an early stage;
- The use of insecticides may increase with an estimated 15 – 25 % on about 10 – 15 ha when the pest will not be regulated and the import frequency of the pest will remain at a similar level. Its contribution to the total use of pesticides in glasshouse horticulture (total area about 10,600 ha) will be minimal;

The pest may cause major losses if no effective insecticides would be available. No indications are available that the pest would develop resistance against the currently used insecticides nor that the use of these insecticides will be restricted or forbidden by law.

References

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