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Inspection Agency

Agence canadienne
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**Pest Risk Management Document for
Dioscorea polystachya (Chinese yam) in Canada**



Photo by: Chris Evans, River to River CWMA, Bugwood.org
<http://www.invasive.org/browse/detail.cfm?imgnum=2120017>

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EXECUTIVE SUMMARY

This Risk Management Document (RMD) is part of a three-step pest risk analysis process examining the risk associated with importation, cultivation and trade of *Dioscorea polystachya* (Chinese yam) in Canada. The RMD includes a summary of the findings of a pest risk assessment and identifies and evaluates potential mitigation measures which may be applied to reduce the identified pest risk to acceptable levels. It examines policy alternatives, identifies a recommended risk management approach and seeks input from a range of potentially affected stakeholders.

Dioscorea polystachya is a fast-growing vine that has the ability to rapidly invade undisturbed habitats, such as riparian forests, where it can cover and out-compete native vegetation. Control is difficult and expensive. In the 25 or so years that *Dioscorea polystachya* has been present in the U.S., it has spread across many of the eastern states. In that short period of time, it has been identified as a species of concern by various state invasive plant councils. Historically, invasive plants have often followed a pattern of at first impacting only small portions of their range, then later becoming serious invaders as their population density increases. The CFIA is concerned that this may be the case with *Dioscorea polystachya* and that these early reports of invasiveness may be signs that the plant could become a much more significant threat in the future, both in the U.S. and in Canada. A Canadian Weed Risk Assessment carried out by the Canadian Food Inspection Agency (CFIA) determined that the plant could survive in portions of Canada (southern and coastal British Columbia, southern Ontario, southern Quebec and parts of the Maritime Provinces) and could threaten Canada's economy and environment.

Dioscorea polystachya is planted as an ornamental and its tubers are used as a food and for medicinal purposes, particularly in eastern Asia, where it originates. Intentional importation of plants or plant parts for these purposes is the most likely pathway of introduction into Canada. To date, plants in the genus *Dioscorea* have only rarely been imported (as plants, seeds, tubers) into Canada, which may or may not include plants of *Dioscorea polystachya*. The Canadian Food Inspection Agency (CFIA) recommends that *Dioscorea polystachya* be regulated as a quarantine pest under the *Plant Protection Act* and as a Class 1 noxious weed under the *Weed Seeds Order* of the *Seeds Act* in order to prevent its entry and establishment in Canada. This would involve adding the species to the List of Pests Regulated by Canada and prohibiting importation of all plants and plant parts that could be used for propagation. Importation of tubers intended for consumption would be prohibited, though tubers processed or dried in such a way as to make them non-viable would still be permitted entry.

Stakeholder views on the recommended risk management option are herein being solicited.

Preface

As described by the International Plant Protection Convention (IPPC), Pest Risk Analysis (PRA) includes three stages: initiation, pest risk assessment and pest risk management. Initiating the PRA process involves identifying pests and pathways of concern and defining the PRA area. Pest risk assessment provides the scientific basis for the overall management of risk. Pest risk management is the process of identifying and evaluating potential mitigation measures which may be applied to reduce the identified pest risk to acceptable levels and selecting appropriate measures. Pest risk communication is an additional component of PRA that is common to all stages of the PRA process.

This Risk Management Document (RMD) includes a summary of the findings of a pest risk assessment and records the pest risk management process for the identified issue. It is consistent with the principles, terminology and guidelines provided in the IPPC standards for pest risk analysis which may be found at <https://www.ippc.int/>

1.0 PURPOSE

The purpose of this document is to examine, with affected stakeholders, the options for mitigating the risks associated with the introduction of *Dioscorea polystachya* Turcz. (Chinese yam) into Canada.

2.0 SCOPE

This Risk Management Document (RMD) examines the risks associated with the introduction of *Dioscorea polystachya* into Canada and outlines potential risk management options. It focuses on the phytosanitary risks associated with the plant itself. Risk analysis of pests that may be associated with the plant is not within the scope of this document.

Additional points for consideration:

1. Prior to use as human food, new plants and/or derived products that fit the definition of a novel food require approval under the authority of the *Food and Drugs Act* from Health Canada.
2. Prior to use as livestock feed, new plants and/or derived products must be assessed and approved by the Animal Feed Division, CFIA under the authority of the *Feeds Act* and *Feeds Regulations*. A positive list of approved ingredients can be found in Schedules IV and V of the *Feeds Regulations, 1983*.
3. Release (e.g. cultivation) of new plants into the Canadian environment may require prior approval under the authority of the *Seeds Act* and the *Seeds Regulations* from the Field Crops Division, CFIA.
4. The importation and sale of seed in Canada must meet the requirements of the *Seeds Act*, *Seeds Regulations* and *Weed Seeds Order*.

5. In addition to the mitigation measures suggested in this document, imported commodities likely to contain *Dioscorea polystachya* must meet the phytosanitary requirement for other regulated organisms, as stated in CFIA's Plant Protection Policies and Directives (<http://www.inspection.gc.ca/english/plaveg/protect/dir/directe.shtml>).

3.0 DEFINITIONS

Definitions for terms used in this document can be found in the Plant Health Glossary of Terms at www.inspection.gc.ca/english/plaveg/protect/dir/glosterme.shtml or the IPPC Glossary of Phytosanitary Terms at www.ippc.int.

4.0 BACKGROUND

- The CFIA has initiated a “Least Wanted Invasive Plants” project in order to expand on its efforts to prevent the introduction and spread of invasive plants in Canada. The goal of this project is to identify Canada’s “least wanted” plants and regulate them as quarantine pests under the *Plant Protection Act*. *Dioscorea polystachya* is being considered for regulation as part of the Least Wanted Invasive Plants project.
- This project builds on past efforts to prevent the introduction of invasive plants and weeds into Canada under the *Plant Protection Act* and the *Weed Seeds Order* under the *Seeds Act*.
- Invasive plants are plant taxa that spread when introduced outside of their natural past or present distribution and cause serious and often irreversible damage to Canada’s ecosystems, economy and society.
- A quarantine pest is a pest of potential economic importance, not yet present in Canada or present but not widely distributed and under official control.
- The CFIA is carrying out this project as part of its commitment to limit the introduction and spread of invasive plants under *An Invasive Alien Species Strategy for Canada* (Government of Canada 2004). The Strategy aims to reduce the risk of invasive species to the environment, economy, and society, and to protect environmental values such as biodiversity and sustainability.

5.0 PEST RISK ASSESSMENT SUMMARY

The information in Section 5 is taken from the Pest Risk Assessment (PRA# 2009-20 dipo-Revised) conducted by Ken Allison of the Plant and Biotechnology Risk Assessment Unit, CFIA, in 2009.

5.1 Identity of Organism

NAME: *Dioscorea polystachya* Turcz. (Family Dioscoreaceae) (USDA-ARS 2009)

SYNONYMS: *Dioscorea batatas* Decne., *Dioscorea cayenensis* Lam. var. *pseudobatatas* Hauman, *Dioscorea decaisneana* Carrière, *Dioscorea doryphora* Hance, *Dioscorea opposita* auct., *Dioscorea oppositifolia* auct., *Dioscorea potaninii* Prain & Burkill, *Dioscorea rosthornii* Diels, *Dioscorea swinhoei* Rolfe, *Dioscorea trinervia* Roxb. ex Prain & Burkill (Global Invasive Species Database 2009; USDA-ARS 2009)

ENGLISH COMMON NAMES: Chinese yam, Chinese-potato, cinnamon-vine (USDA-ARS 2009)

FRENCH COMMON NAME: igname de Chine (CAB International 2007; USDA-ARS 2009)

DESCRIPTION: The plants are vines growing from spindle-shaped tubers which are on long stalks and are deeply buried. The twining stems are up to 5 m in length. Small bulbils (less than 2 cm in diameter) are produced in the leaf axils. The lower leaves are alternate, becoming opposite higher up the stem and are 3–9 cm long × 3–11 cm wide. The petioles are as long as the blade. The blade is 7(–9)-veined, glabrous and 3-lobed. Inflorescences are borne in the leaf axils. The flowers are small, yellowish and have a cinnamon fragrance. Staminate and pistillate flowers are on separate plants. The fruit is an ovate capsule. The seeds are winged. Only one pistillate specimen has been documented from North America and it is assumed that the plants propagate vegetatively by means of the bulbils (FNA Editorial Committee 1993+; Gleason and Cronquist 1963).

Dioscorea polystachya is native to eastern Asia, where it is cultivated for its edible tubers. In North America, it is planted as a garden ornamental and has become naturalized throughout much of the eastern United States (FNA Editorial Committee 1993+).

5.2 Organism Status

Dioscorea polystachya has been imported for sale in Canada on a very limited scale. The UBC Botanical Garden offered it for sale (as *Dioscorea batatas*) in their catalogue in 2006 (http://www.ubcbotanicalgarden.org/community/2006_pps_vines.pdf). There are no records of plants outside of cultivation (CFIA 2008a; Scoggan 1979). Based on this information, for the PRA area, this species is considered to be possibly present only in cultivation.

5.3 Current Regulatory Status

Dioscorea polystachya is not regulated in Canada. It is not regulated as a federal noxious weed in the U.S., nor is it regulated in any of the states (USDA-NRCS 2009).

It is currently listed in the Southeast Exotic Pest Plant Council's Invasive Exotic Pest Plant List for Tennessee as a Rank 1-Severe Threat species, indicating that it is an exotic species that possesses characteristics of an invasive species and could spread easily into native plant communities and displace native vegetation (Tu 2002).

5.4 Probability of Entry

Dioscorea polystachya is native to eastern Asia, where it is cultivated for its edible tubers. In North America, it is planted as a garden ornamental and has become naturalized throughout much of the eastern United States (FNA Editorial Committee 1993+).

Table 1. Summary of Pathways

Type of pathway	Specific pathways
Natural dispersal	<p>Natural spread is by seeds and aerial bulbils, but sexual reproduction by means of seeds has not been detected in North America. The aerial bulbils can be spread by rodents who feed on them.</p> <p>This pathway allows only local movement and is not likely to be a conduit for entry into Canada.</p>
Intentional introduction	<p>Plants have been intentionally introduced into the U.S. as an ornamental or medicinal plant. In eastern Asia it has been widely planted as a starchy food tuber crop.</p> <p>This is the most likely pathway for entry into Canada.</p>
Unintentional introduction	<p>As with any weed, introduction is possible via soil imported with nursery stock from infested areas of the U.S. The risk from this pathway is likely to be minor, however.</p> <p>As reproduction does not appear to occur through seed in North America, contaminated seed imported from the U.S. is not a potential pathway. Seed imported from other countries where sexual reproduction does occur could be contaminated, however. The risk from this pathway is likely to be minor, though, as the plant is not known to be a weed of crops and so would probably not be harvested along with seeds for planting.</p>

5.5 Probability of Establishment

Dioscorea polystachya is native to China (Anhui, Fujian, eastern Gansu, northern Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, southern Shaanxi, Shandong, Sichuan, northern Yunnan and Zhejiang), Japan (Hokkaido, Honshu, Kyushu, Shikoku), Korea and Taiwan (USDA-ARS 2009). The species is widely cultivated for food in temperate eastern Asia (Bailey and Bailey 1976).

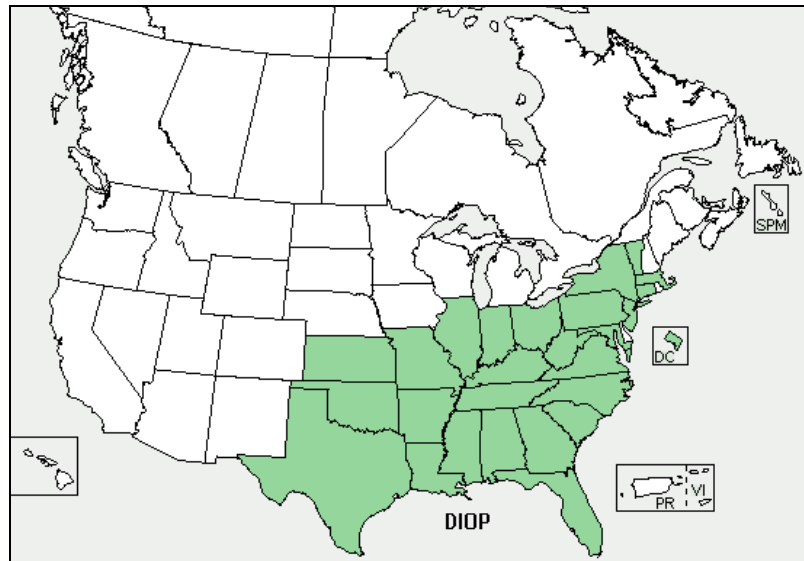


Figure 1. Range of *Dioscorea polystachya* in North America (USDA-NRCS 2009)

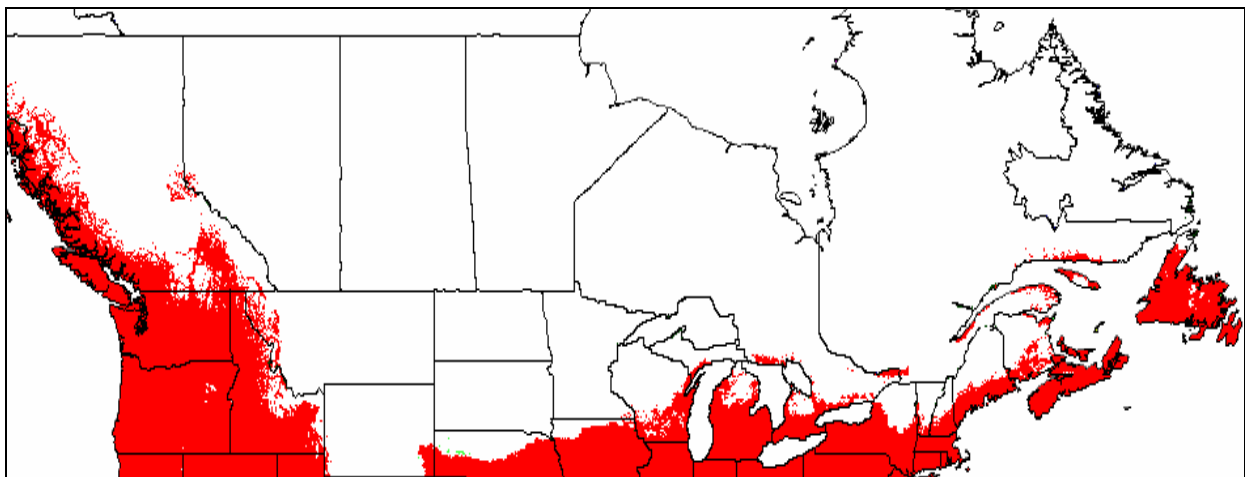


Figure 2. Potential range of *Dioscorea polystachya* in Canada (NAPPFAST zones 5-9)

The species is introduced and cultivated as an ornamental, food and medicinal plant and is naturalized in temperate regions, including the U.S. (Figure 1, USDA-ARS 2009). It is described as root hardy to USDA Plant Hardiness Zone 5 (Bailey and Bailey 1976) (Figure 2).

In its native range, *Dioscorea polystachya* grows in forests, scrub, herbaceous plant communities, on mountain slopes, along rivers and roadsides (Wu and Raven 2000).

Dioscorea polystachya has not become established outside cultivation in Canada (CFIA 2008; Scoggan 1979).

Dioscorea polystachya has a wide range of environmental adaptability and few pests and predators in North America. It has a high degree of asexual reproductive vigour, and is difficult to manage once firmly established (Tu 2002).

5.6 Probability of Spread

Dioscorea polystachya is found in thickets, ravines, stream banks, creek bottoms, limesinks, granite outcrops, alluvial woods, roadsides, drainage canals, waste places and fence rows in its introduced range in the southeastern U.S. (FNA Editorial Committee 1993+).

Initial infestations are generally associated with human disturbances, such as old home sites and along roadways. From these areas, the species can easily spread into nearby riparian areas and undisturbed habitats. In 1970, the species had not yet been documented as escaping from cultivation in the U.S., but by 1986 it had become naturalized (Tu 2002).

As *Dioscorea polystachya* can grow in both disturbed and natural sites, habitats will not be a limiting factor for spread in Canada.

5.7 Potential Economic Consequences

Both the tuber and bulbils are edible, although the bulbils are not generally used as food. The edible tuber, which can measure up to 1 m long and weigh up to 2 kg or more, is flavourful and nutritious. The tubers are sometimes used in herbal medicine. The species is frequently planted for its ornamental value (Tu 2002).

In forested areas, branches can be broken off of trees by the weight of the vines (ISSG 2009).

Manual and mechanical methods of plant removal can effectively control small isolated patches of *Dioscorea polystachya*. However, these methods are extremely time and labour-intensive, as the large, deeply-buried tuber makes removal very difficult. Herbicide application appears to be the most effective means for controlling large infestations. Repeated treatments are usually necessary to completely kill large underground tubers (ISSG 2009), which increases the cost.

5.8 Potential Environmental and Social Consequence

Dioscorea polystachya is a fast-growing vine that has the ability to rapidly invade undisturbed habitats, such as riparian forests. It spreads prolifically by asexual reproduction via bulbils. In the U.S., it reduces native species richness and abundance by outcompeting and eliminating native plant species. It thickly blankets adjacent vegetation, and excludes light from understory vegetation. It can break branches of large trees and shrubs. It is able to completely cover the ground so that the growth of native herbaceous ground cover is prevented (ISSG 2009).

5.9 Uncertainty

Although it is listed on one nursery website there is no definite information to confirm that *Dioscorea polystachya* is being grown in gardens in Canada or if it is present. An online search found no other nurseries or seed suppliers that offer the species for sale in Canada.

5.10 Conclusion

Based on the outcome of this pest risk assessment, *Dioscorea polystachya* is likely to become weedy or invasive in parts of Canada, including southern and coastal British Columbia, southern Ontario, southern Quebec and parts of the Maritime Provinces. This plant should be considered for regulation under Canada's *Plant Protection Act*. Regulation under the *Seeds Act* may also be warranted, although seed is not currently considered to be a likely pathway for this species. It is recommended that the pest risk analysis process continue for this plant with the completion of a Risk Management Document.

5.11 Technical Issues for Consideration

The very large number of species in *Dioscorea* complicates identification. There is one native species of this genus in southern Ontario, *Dioscorea villosa* L. This species is distinguishable from *Dioscorea polystachya*, with care and training.

6.0 RISK MANAGEMENT CONSIDERATIONS

6.1 Introduction

In cases where different risk mitigation approaches are possible, the RMD provides a means of communicating and recording information. In this section, potential risk mitigation measures are provided for each pathway type outlined in Section 5.4, Table 1. The effectiveness and feasibility of those mitigation measures are discussed including impacts on the CFIA, practicality of implementation, impacts on Canadian stakeholders, impacts on trading relationships, and short-term and long-term sustainability.

This RMD documents the rationale in determining the regulatory status of the plant. It outlines the possible phytosanitary requirements for traded commodities. The commodities may be the plant under consideration for regulation itself (intentional introduction) or a product contaminated with the plant (unintentional introduction).

6.2 International Responsibilities, Government of Canada Priorities and CFIA Objectives

The CFIA plays an important role in protecting Canada's plant resource base from pests and diseases. The objectives of the Plant Protection Program within the CFIA are: (1) to prevent the

introduction and spread within Canada of plant pests of quarantine significance, including invasive plants; (2) to detect and control or eradicate designated plant pests in Canada; and (3) to certify plants and plant products for domestic and export trade.

Canada is a contracting party to the International Plant Protection Convention (IPPC). Canada is a member of the World Trade Organization (WTO), and the IPPC is formally identified in the WTO Sanitary and Phytosanitary (SPS) Agreement as the international standard setting organization for phytosanitary measures. The IPPC is an international treaty to secure action to prevent the spread and introduction of pests of plants and plant products (including plants as pests), and to promote appropriate measures for their control. As the administrator of the *Plant Protection Act*, the CFIA is Canada's official National Plant Protection Organization responsible for implementing the standards of the IPPC in Canada.

The *Plant Protection Act* provides authority to prevent the importation, exportation and spread of pests injurious to plants, and provides for control and eradication methods and for the issuance of certificates.

In 1996, as a party to the United Nations Convention on Biological Diversity (CBD), Canada developed its own Canadian Biodiversity Strategy, which recognized the need to conserve biological diversity and promote the sustainable use of biological resources through increased understanding, legislation, incentives and other means. As party to these international and national instruments, Canada has a strong commitment to addressing the deleterious impacts of invasive plants.

6.3 History of invasiveness

In the 25 or so years that *Dioscorea polystachya* has been present in the U.S., it has spread across many of the eastern states. In that short period of time, it has been identified as a species of concern by various state invasive plant councils:

- Alabama: Scattered and localized infestations in urban environments, managed forests, rights-of-way and aquatic/wetland environments; extensive and dense infestations in natural areas and parks in Alabama or severe invasion in an adjacent state (AIPC 2007).
- Georgia: Moderate problem in natural areas (GEPPC 2006).
- Kentucky: Exotic, invasive, spreads easily into native plant communities and displaces native vegetation; includes species which are or could become widespread in Kentucky (KY-EPPC 2008).
- South Carolina: Limited infestations, posing a potential threat to natural areas and exhibiting invasive characteristics (SC-EPPC 2008).
- Tennessee: Exotic, invasive, spreads easily into native plant communities and displace native vegetation) (TN-EPPC 2001).

As described in Crooks and Soulé (1999), some invasive plant populations have historically shown a “lag” period after first establishing, during which the population remains relatively small and has a low impact. Following the lag, the population then explodes, its range and

impacts rapidly increasing. In brief, “past performance of an exotic is a poor predictor of potential population growth, range expansion and ecological impact” (Crooks and Soulé 1999).

The CFIA is concerned that this may be the case with *Dioscorea polystachya* and that the early reports of invasiveness described above may be signs that the plant could become a much more significant threat in the future, both in the U.S. and in Canada.

6.4 Potential Mitigation Measures for Natural Means of Dispersal

Though populations are present in U.S. states that adjoin the U.S.-Canada border (see Figure 1), *Dioscorea polystachya* has only been recorded, within those states, in counties that are not immediately adjacent to the U.S.-Canada border (USDA-NRCS 2009). Natural dispersal is therefore not expected to be an important factor in the spread of *Dioscorea polystachya* to Canada. If populations continue to spread in the U.S., however, dispersal of floating bulbils via waterways may become a concern. This means of spread would be extremely difficult to control.

6.5 Potential Mitigation Measures for Intentional Introduction Pathways

6.5.1 Plants for Planting Excluding Seed

6.5.1.1 Previous imports

Based on the information available in the CFIA’s Import Permit System, Import Retrieval System, and information compiled at the CFIA’s Import Service Centres, *Dioscorea polystachya* may have been recently imported into Canada. Three Permits to Import were issued by the CFIA over the last five years for cuttings of plants from the genus *Dioscorea*, but the precise species were not indicated. No plants from the genus *Dioscorea* are listed as available in Canadian nurseries (CNLA 2009).

6.5.1.2 Potential risk mitigation measures

Non-regulatory measures

- a. Encourage voluntary cessation of the sale of *Dioscorea polystachya*. Voluntary cessation is not effective by itself, but could support other measures.
- b. Increase public awareness of the risk posed by *Dioscorea polystachya*, publish a factsheet online, and distribute awareness material to garden centers, botanical gardens, gardeners associations, horticulture industry groups, etc. Not considered effective by itself, but could support other measures.

Regulatory measures

- c. Allow sale of *Dioscorea polystachya* with special conditions such as not to be grown close to natural areas and mandatory control of adventives. Allowing sale with special conditions is not considered effective because once grown in private gardens, CFIA does not have adequate resources to monitor.

- d. Regulate *Dioscorea polystachya* under the *Plant Protection Act* as a quarantine pest:
- Refuse to issue Permits to Import for *Dioscorea polystachya* plants¹.
 - Will require that importers of material from regions other than the continental U.S. specify the scientific name when applying for a Permit to Import plant and propagative material;
 - Will require that the scientific name of all *Dioscorea* species be provided on the Phytosanitary Certificate for plants exported to Canada from the continental U.S.

6.5.1.3 Trade Implications

As described in Section 6.5.1.1, *Dioscorea* plants have only rarely been imported into Canada. Prohibiting the species should therefore not significantly impact Canadian importers and vendors. In addition, other ornamental species could potentially be substituted. If the intent is cultivation for consumption or for medicinal purposes, roots (processed or dried) could be imported rather than grown in Canada (see Section 6.5.3 for more information).

6.5.1.4 Cost-effectiveness and Feasibility

It may be useful for CFIA inspectors to check imported *Dioscorea* plants to ensure that *Dioscorea polystachya* is not being imported under an incorrect name or synonym. This is particularly the case with *D. polystachya* because it has been widely sold in the U.S. as *D. oppositifolia*. This would require training inspectors and providing them with identification material. As described in Section 6.5.1.1, however, *Dioscorea* plants are only rarely imported; the impact on CFIA resources should therefore be minimal.

6.5.2 Seed

6.5.2.1 Previous imports

There is no record in the information available in the CFIA's Import Permit System, Import Retrieval System, and data compiled at the CFIA's Import Service Centres that *Dioscorea polystachya* seed has ever been imported to Canada. Seed of other *Dioscorea* species is known to have been imported at least three times in recent years.

6.5.2.2 Potential risk mitigation measures

- a. Regulate *Dioscorea polystachya* as a prohibited noxious weed (Class 1) under the *Weed Seeds Order* of the *Seeds Act*².
- This species meets the definitions for Class 1³ species under the *Weed Seeds Order*.

¹ Plants intended to be grown in confinement for research purposes may be imported under a Section 43 Import Permit. The measures required on the permit should be respected. Importing facilities are subject to CFIA inspection.

² The *Seeds Act* provides authority for the testing, inspection, quality and sale of seeds in Canada.

- All imported and domestic seed lots must be free of prohibited noxious weed seeds. Imported seed lots require a certificate of analysis stating that the seed lot is free of all prohibited noxious weeds in order to be imported..
- b. Regulate as a quarantine pest under the *Plant Protection Act*. Add this species to the *List of Pests Regulated by Canada* (CFIA 2009):
- This would prevent the importation, movement, and cultivation of this species in Canada. Currently, seed of many new crop species, such as field crops, can be imported without a Permit to Import or a Phytosanitary Certificate from throughout the world⁴.
 - It would enable inspectors to take appropriate action for the purposes of eradicating the pest or preventing its spread⁵.
 - Seed of horticultural plants is not within the scope of CFIA's draft directive D-08-04 on plants for planting (CFIA 2008b). Therefore phytosanitary requirements will be specified under a new regulatory directive or D-08-04 will be revised.
- c. Sufficient information about the use of *Dioscorea polystachya* as a potential crop does not exist. If the proponent, located in Canada, needs to collect more information about the plant (e.g. to generate data for a determination of environmental safety), then confined research field trials under Part V of the *Seeds Regulations* could be authorized by the Plant Biosafety Office.

6.5.2.3 Trade Implications

As described in Section 6.5.2.1, *Dioscorea polystachya* seed has only rarely been imported to Canada. Prohibiting the species should therefore not significantly impact Canadian importers and vendors. In addition, other ornamental species could potentially be substituted. If the intent is cultivation for consumption or for medicinal purposes, roots (processed or dried) could be imported rather than grown in Canada (see Section 6.5.3 for more information).

6.5.2.4 Cost-effectiveness and Feasibility

The CFIA Seed Program is already in place to prevent the entry of prohibited noxious weeds. As well, as described in Section 5.4, *Dioscorea polystachya* is not known to be a weed of crops. Negligible effort would therefore be required to identify the seeds or take

³ A **prohibited noxious Class 1 species** is not yet present in Canada, or is under official control as it has not yet reached its full ecological range. Official control is used to prevent further spread of the species and with the goal of eradicating the species. The species must be a weed whose presence in seed could affect the value and/or intended use of the seed; and/or could have potential impact on the economy, human and/or animal health. This determination would be based on a Pest Risk Assessment type process. The species must have identifiable seeds that can be visually distinguished from those of other species, or in rare instances, from entire genera.

⁴ *Ibid* note 1.

⁵ This could include: quarantine of commodities suspected of being infested with the pest; request for appropriate treatment to remove the pest; prohibit or restrict items coming from an infested area; or request that items suspected of being infested with the pest are disposed of by the party in possession of the items.

action on non-compliant shipments because it would be unlikely to find *Dioscorea polystachya* seeds as a contaminant in sampled seed or grain lots.

It may be useful for the CFIA to occasionally sample imported *Dioscorea* seeds to ensure that *Dioscorea polystachya* seeds are not imported under an incorrect name or synonym. As described in Section 6.5.2.1, however, *Dioscorea* seeds are only rarely imported; the impact on CFIA resources should therefore be minimal.

6.5.3 Plant parts for consumption or for medicinal use

6.5.3.1 Background

Importers are required to specify the intended end-use (e.g., consumption, planting) of imported products when requesting a Permit to Import, and a Permit to Import issued for plant parts imported for consumption specifies that the plant parts cannot be used for propagation. However, once the plant parts are distributed, the CFIA has no control over how they are used. *Dioscorea polystachya* tubers imported for consumption could therefore conceivably be planted for cultivation as an ornamental, or to grow tubers for consumption or medicinal use.

6.5.3.2 Previous imports

Based on the information available in the CFIA's Import Permit System, Import Retrieval System, and information compiled at the CFIA's Import Service Centres, *Dioscorea polystachya* tubers for consumption or medicinal use may have been recently imported into Canada. Only one Permit to Import was issued by the CFIA over the last five years for tubers for consumption from the genus *Dioscorea*, but the precise species was not specified. No shipments of *Dioscorea polystachya* tubers are known to have been imported, though approximately a dozen shipments of tubers of other *Dioscorea* species have been imported in recent years.

6.5.3.3 Potential risk mitigation measures

Non-regulatory measures

- a. Encourage voluntary cessation of the sale of *Dioscorea polystachya*. This would not be effective by itself, but could support other measures.

Regulatory measures

- b. Regulate *Dioscorea polystachya* under the *Plant Protection Act* as a quarantine pest and, as a supporting measure, prohibit importation of tubers for consumption.
 - Refuse to issue Permits to Import for viable plant parts of *Dioscorea polystachya* intended for consumption or medicinal use.
 - Allow importation of plant parts of *Dioscorea polystachya* intended for consumption or medicinal use if they are processed in such a way as to render them non-viable.

- Will require that importers of material from the non-continental U.S. specify the scientific name when applying for a Permit to Import for plant parts for consumption.

6.5.3.4 Trade Implications

As described in Section 6.4.3.2, *Dioscorea polystachya* plant parts for consumption or medicinal use have only rarely been imported to Canada. Prohibiting the species should therefore not significantly impact Canadian importers and vendors.

6.5.3.5 Cost-effectiveness and Feasibility

It may be useful for CFIA inspectors to occasionally check imported *Dioscorea* tubers to ensure that *Dioscorea polystachya* is not being imported under an incorrect name or synonym. This would require training inspectors and providing them with identification material. As described in Section 6.5.3.2, however, *Dioscorea* tubers are only rarely imported; the impact on CFIA resources should therefore be minimal.

6.6 Potential Mitigation Measures for Non-intentional Introduction Pathways

Note that, as described in Section 5.4, unintentional introduction pathways (through contaminated soil, seed, grain, etc.) are considered only minor pathways, posing a minimal risk to Canada. These pathways will therefore not be detailed here.

7.0 PEST RISK MANAGEMENT OPTIONS

7.1 Introduction

Table 2 summarizes the risk management options considered for *Dioscorea polystachya*.

Table 2. Advantages and disadvantages of the pest risk management options

Options	Advantages	Disadvantages
<p>1 Place <i>Dioscorea polystachya</i> on the <i>List of Pests Regulated by Canada</i></p> <p>AND</p> <p>Regulate <i>Dioscorea polystachya</i> as a prohibited noxious weed under the</p>	<ul style="list-style-type: none"> • Control over the main pathways of introduction. • Plant parts for consumption or medicinal use could still be imported if dried or processed so as to prevent propagation. • Authority to respond to 	<p>Note: All costs and impacts listed below are expected to be minimal given that <i>Dioscorea polystachya</i> material has rarely, if ever, been imported to Canada in the past.</p> <ul style="list-style-type: none"> • Potential costs to the owner of the non-compliant good in the exporting country. • Potential costs and impacts to trading partners and trading

Options	Advantages	Disadvantages
<p><i>Weed Seed Order of the Seeds Act.</i></p> <p>Prohibit importation of <i>Dioscorea polystachya</i> plants and plant parts BOTH for propagation and for consumption or medicinal use.</p> <p>Implement Official Control measures if <i>Dioscorea polystachya</i> is found in Canada.</p>	<p>incursions by applying official control measures.</p>	<p>relationships.</p> <ul style="list-style-type: none"> ▪ Resources needed by the CFIA for marketplace monitoring, surveillance, inspector training, communication material, sampling. ▪ Resources needed by the CFIA to enforce the regulation if non-compliance found. ▪ If <i>Dioscorea polystachya</i> is found in Canada, resources needed by the CFIA to administer and enforce Official Control (eradication or containment measures). ▪ Potential costs to businesses and citizens affected by the trade impacts of regulation and official measures to control any infestations, as specified in the Regulations of the <i>Plant Protection Act</i>.
<p>2 Place <i>Dioscorea polystachya</i> on the <i>List of Pests Regulated by Canada</i></p> <p>AND</p> <p>Regulate <i>Dioscorea polystachya</i> as a prohibited noxious weed under the <i>Weed Seed Order of the Seeds Act</i>.</p> <p>Prohibit importation of <i>Dioscorea polystachya</i> plants and plant parts for propagation but NOT for consumption or</p>	<ul style="list-style-type: none"> ▪ Control over the main pathways of introduction. ▪ Would still allow importation of fresh plant parts for consumption or medicinal use. ▪ Authority to respond to incursions by applying official control measures. 	<ul style="list-style-type: none"> ▪ Possibility that plant parts imported for consumption could be planted: inconsistent enforcement of quarantine pest status. <p>Note: All costs and impacts listed below are expected to be minimal given that <i>Dioscorea polystachya</i> material has only rarely been imported to Canada in the past.</p> <ul style="list-style-type: none"> ▪ Potential costs to the owner of the non-compliant good in the exporting country. ▪ Potential costs and impacts to trading partners and trading relationships. ▪ Resources needed by the CFIA for marketplace monitoring, surveillance, inspector training,

Options	Advantages	Disadvantages
<p>medicinal use.</p> <p>Implement Official Control measures if <i>Dioscorea polystachya</i> is found in Canada.</p>		<p>communication material, sampling.</p> <ul style="list-style-type: none"> ▪ Resources needed by the CFIA to enforce the regulation if non-compliance found. ▪ If <i>Dioscorea polystachya</i> is found in Canada, resources needed by the CFIA to administer and enforce Official Control (eradication or containment measures). ▪ Potential costs to businesses and citizens affected by the trade impacts of regulation and official measures to control any infestations, as specified in the Regulations of the <i>Plant Protection Act</i>.
<p>3 <i>Status Quo</i> –</p> <p>Do not place <i>Dioscorea polystachya</i> on the <i>List of Pests Regulated by Canada</i></p> <p>AND</p> <p>Do not regulate <i>Dioscorea polystachya</i> as a prohibited noxious weed under the <i>Weed Seed Order of the Seeds Act</i>.</p>	<ul style="list-style-type: none"> ▪ No additional costs for the CFIA. ▪ No additional requirements for exporters to Canada. 	<ul style="list-style-type: none"> ▪ No authority to refuse the entry of plants of <i>Dioscorea polystachya</i> for planting. ▪ No authority to require mitigation measures for commodities contaminated with <i>Dioscorea polystachya</i>. ▪ No authority to apply official control measures to introduced or established populations. ▪ No protection of our natural ecosystems.

7.2 Preferred Option

The CFIA recommends Option 1.

- As a signatory party under the International Plant Protection Convention (IPPC), the Government of Canada has a right to prevent the entry into Canada of invasive plants that can cause serious damage or threaten biodiversity, and to officially control them if they are present. As a signatory party to the Convention on

Biodiversity, the Government of Canada shall, as far as possible and as appropriate, prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or native species.

- *Dioscorea polystachya* presents a serious risk to the Canadian environment and economy.
- Effective mitigation measures currently do not exist to prevent the entry of *Dioscorea polystachya* into Canada.
- The proposed risk management option is cost-effective and the advantages clearly outweigh the disadvantages.

Under this option, importation of *Dioscorea polystachya* plants or seeds for propagation or plant parts such as tubers for consumption or medicinal use would be prohibited unless they are rendered non-viable by processing or drying.

8.0 RISK MANAGEMENT DECISION

8.1 Decision

The CFIA will make a decision after consulting with stakeholders and reviewing their comments. The CFIA will engage its federal, provincial and territorial partners, affected Canadian stakeholders, the scientific community and the general public in the consultation process.

8.2 Next Steps

The implementation of the regulation of *Dioscorea polystachya* will require the following steps:

- World Trade Organization (WTO) notification;
- Canada Border Services Agency (CBSA) notification;
- amendments to existing import directives;
- changes to the *List of Pests Regulated by Canada*; and
- amendments to the Automated Import Reference System (AIRS).

8.3 Re-evaluation of the Risk Management Decision

The CFIA will review the risk management decision at least every five years to ensure that the action being taken is still appropriate. Potential triggers for a review of the risk management decision are: (1) new information becomes available about the invasiveness of the species, (2) new incursions in Canada occur, (3) the species' world distribution changes, and (4) Canadian international trade patterns change. The extent of the review and potential amendments will be determined by the nature of the new information. In some instances, additional consultation with stakeholders will be required. Amendments are recorded in Appendix 1.

9.0 COMMUNICATION PLAN

If the CFIA, after consultation, decides to add *Dioscorea polystachya* to the *List of Pests Regulated by Canada*, it will implement the following actions:

- post the Risk Management Decision document on the CFIA website;
- amend and post all relevant directives on the CFIA website;
- send a notification to the World Trade Organization 60 days before implementation of the regulation;
- amend the Automated Import Reference System to inform importers and the Canadian Border Services Agency of the prohibition of entry for *Dioscorea polystachya*; and
- prepare and disseminate education and awareness materials.

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11.0 ENDORSEMENT

Approved by:

Chief Plant Health Officer

Date

APPENDIX 1: AMENDMENT RECORD

Amendment Number / Document Version	Amended by:	Date Amended:	Purpose of Amendment
1			
2			
3			