and fruits (Nath et al, 1987).

Synchytrium species cause galls on lamina and petioles (Srivastava, 1985).

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Other pathogens, while not specifically linked with ivy gourd, are common to cucurbits in general (Nath et al, 1987):

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IX. Rating elements of risk model

(See Appendix B on page 16 for explanation of codes)

Estimate probability of pest spreading beyond colonized area. **HIGH - VC**

Intentional multiple introductions by humans are likely since ivy gourd may be used as food, medicine and ornament. Informal taste trials indicate tindora has a broad appeal which may allow entry into more traditional specialty markets (Lamberts, 1992). *Hortus Third* lists *Coccinia grandis* as an ornamental in North America and seeds are available through at least one California seed company (Facciola, 1990).

Rapid spread of *C. grandis* after introduction has been demonstrated in Guam and Hawaii, attributable to vigorous growth, easy reproduction from stem fragments and in Hawaii, prolific seed production. Spread is also attributed to birds that feed on the mature fruits (Whitson et al, 1991). In Guam, ivy gourd spread from 6 to 7 acres in 1990 to about 70 to 100 acres in 1995, spreading vegetatively. No fruits are produced in Guam because all of the plants are male (Thomas, 1995). In Jamaica, tindora was introduced roughly fouteen years ago, and is cultivated on about 100 acres for local consumption and export to ethnic markets in the United States. Plants have escaped from the growing fields onto nearby roadsides (Tengan, 1994).

Although Linney (1986) observed that ivy gourd seems to be restricted to hot, dryish, coastal lowlands in most of its range, notes on herbarium specimens show a wide range of habitats. For

CONTENTS: Page

I. Taxonomy, synonymy, common names

Cucurbitaceae
Coccinia grandis (L.) J. Voigt

The genus name *Coccinia* is derived from the Latin *coccineus*, scarlet, alluding to fruit color (Everett,1981) (Telford, 1990). The genus is taxonomically unsettled, but probably contains about 30 species, all natives of the Old World (Correll and Johnston, 1979).

Frequently used common names are ivy gourd and scarlet-fruited gourd (Telford, 1990). The name "tindora" is used in Jamaica and Florida (Tengan, 1994) (Lamberts, 1992) and in Hawaii, *C. grandis* is sometimes called lowland banana poka (Outdoor Circle, 1994). Other common names are kunduri (Rehm and Espig, 1991), or in Hindi, kundru; in Malayalam, kovakka; in Tamil, kovaikkai (Ramachandran and Subramaniam, 1983); in Java, Boloo teke (Tanaka, 1976); in Senegal, "gourd of the toad" (Burkill, 1985).

Synonyms are:

C. cordifolia auct. non (L.)Cogn. (of authors). The type specimen of this name is actually *Mukia*, all later references are probably *C. grandis* (Wiersema, 1994).

C. indica Wight & Arn. nom. illeg. (Ramachandran and Subramaniam, 1983) (Wiersema, 1994).

Ivy gourd was originally described by Linne in 1767 as *Bryonia grandis* L., with no type specimen or type locality indicated (Linney, 1986).

II. Description

Ivy gourd is a rapidly growing, climbing or trailing dioecious vine. Ivy gourd overgrows vegetation, walls, fences, and utility poles (HDOA, 1994), producing abundant fruit (Uchida et al, 1990). Described by various authors as perennial, semi-perennial or annual, the species is variable depending on habitat (Ramachandran and Subramaniam, 1983) (Everett, 1981) (Lamberts, 1992).

Stems are slender, long running and climbing, sometimes up to several meters long (Telford, 1990). Stems are much branched and angular (Chakravarty, 1959), furrowed and glabrous, with simple tendrils (Bailey, 1949). Linney (1986) describes stems as succulent, the older ones reaching 5 cm in diameter, with occasional adventitious roots where the stems run along the ground. Stems become white-dotted when older, eventually woody (Jeffrey, 1967).

Leaves are simple, 3 to 10 cm long and 4 to 10 cm broad, bright green and studded, sometimes rough, with numerous small round discs or papillae above, paler beneath, palmately 5-nerved from a deeply cordate base, often with 3-8 circular glands between the nerves near the petiole. Leaf shape and lobation are variable. Leaves are described by various authors as broadly triangular-ovate (Everett, 1981), cordate (Small, 1933), ovate to orbicular, palmately 3-7 lobed, the lobes broad, obtuse or acute, shallow to deep (Bailey, 1949) (Bisht and Nayar, 1958) (Telford, 1990) (Whitson et al 1991). Leaf margins are minutely denticulate (Chakravarty, 1959). Petioles are 1 to 4 cm long, slender and cylindrical with unbranched tendrils (Small, 1933) (Bisht and Nayar, 1958) (Telford, 1990), or 2-branched tendrils (HDOA, 1994).

Flowers are bell-shaped and white with 5 sharp corolla lobes (Everett, 1981), about 2-3 cm long (Linney, 1986). The sepals are subulate or linear-subulate, 3-4 mm long, and reflexed (Small, 1933). Staminate flowers are solitary or rarely in axillary clusters of 2-3, with pedicels of about 15-50 mm long. Pistillate flowers are solitary on pedicels of 1-3 cm long (Telford, 1990).

Fruits are green with faint white longitudinal stripes when immature, resembling miniature cucumbers (Lamberts, 1992). When ripe, the fruits are scarlet with red, juicy flesh (Uchida et al, 1990) (Telford, 1990) (Chakravarty, 1959). Variously described as ovoid, ellipsoid, ellipsoid-oblong or cylindrical, the glabrous fruits are between 2.5 and 6 cm long, 1.5 to 3.5 cm in diameter, and are borne on stalks 1-4 cm long (Telford, 1990) (Ramachandran and Subramaniam, 1983).

Seeds are white to tan, often slightly curved, 6-8 mm long, 2.5-4 mm wide, 1-1.5 mm thick, with thickened 2-grooved margins. Slightly papillose and compressed (Chakravarty, 1946), the seeds are numerous in the fruit (Telford, 1990).

Roots are perennial, the fresh tap root is tuberous, long tapering, more or less tortuous, with a few fibrous rootlets attached (Bisht and Nayar, 1958). Linney (1986) reports the roots are succulent, not tuberous.

III. Distribution

Ivy gourd is native to Africa, Asia, Fiji and Northern (tropical) Australia (Jeffrey, 1967). It has become naturalized in Hawaii (Telford, 1990), introduced in Guam and the Caribbean (McConnell and Muniappan, 1991), the Philippines, Cuba, St. Croix, Barbados (Linney, 1986). Ivy gourd is cultivated in Amboina (Merrill, 1917), Jamaica (Tengan, 1994) and Florida (Rollins, 1994).

Chakravarthy (1961) included Central America in its range, as did

Small (1933), who also included the West Indies, Mexico, and South America.

IV. Uses

Young leaves and long slender tops of the stems are cooked and eaten as potherbs, in soup, or as a side dish with rice. Young and tender green fruits are eaten raw in salads, boiled, fried or added to curries. The ripe scarlet fruit is fleshy and can be eaten raw or occasionally candied (Facciola, 1990) (Tanaka, 1976) (Rehm and Espig, 1991). According to Nath, et al (1987), the greens and fruit are good sources of carbohydrates and Vitamins A and C. In India, Paroda and Mal (1989) recommended cultivation of *Coccinia grandis* as a food plant for emergency situations where life support is needed in extreme environmental situations, such as on a desert.

Ivy gourd is used medicinally by the people of India, who especially value the plant as a treatment for diabetes (Bisht and Nayar, 1958). Additionally, the leaves are applied externally to treat skin eruptions, and the plant may be eaten to treat gonorrhoea (Chakravarty, 1946). Citing medicinal uses such as treatment of dyspnea, cough, emaciation, fever, convulsions, syphilis, slow pulse, anemia, ringworm, psoriasis, itching, blood disorders, and ear pain, Ramachandran and Subramaniam (1983) suggest the plant should be investigated phytochemically and pharmacologically. In Tanganyika, women suffering delayed childbirth may drink the liquid from a boiling of the leaves, and in Nigeria, the fruit has been used as an eye medicine. (Burkill, 1985).

Older stems may be used for fire fuel and raft-making in Burma (Isherwood, 1994). In Senegal and Jebel Marra, stock graze the plants (Burkill, 1985).

V. Physiology

Prefering a warm humid climate, *Coccinia grandis* occupies the tropics and subtropics (Rehm and Espig, 1991). The plants prefer sheltered, sunny locations with fertile, loose soil enriched with compost or other decayed organic matter (Everett, 1981). Although ivy gourd requires generous amounts of water, it requires good drainage since it is very susceptible to water-logging (Nath et al, 1987). Ivy gourd is most often observed in areas where soil remains relatively moist due to rain runoff, such as roadside ditches, vacant lots, and at edges of tall vegetation (Uchida et al, 1990). Waters (1990) observed the plant growing in a wide range of soils; sand, sandy clay, clay-humus, humus, gravel with rock dust, and cinders.

The roots are succulent and may be sufficient for storing water during dry weather (Linney, 1986). On O'ahu, even water stressed

plants produce leaves and fruit. The perennial stems are capable of producing leaves, stems, and fruits rapidly during short periods of occasional rain (Uchida et al, 1990). New shoots can grow from roots left in the ground (Steiner and Ellett, 1994) (Tengan, 1994).

Ivy gourd plants are easily and usually propagated by stem cuttings (Linney, 1986) (Moseley, 1990). Plants also can be raised from seeds. In regions of long, warm growing seasons, seeds may be sown outside in spring; elsewhere seeds are started indoors and grown at a night temperature of 60 °F and day temperature of 65-70 °F until outdoor weather is warm and settled (Everett, 1981).

In Australia, *C. grandis* completes its development in one season, its seeds remaining latent during the hot season (Specht and Mountford, 1958).)

Singh (1990) reported that *C. grandis* is a faculative apomict (it can produce seeds sexually or asexually). Waters (1990) observed that *Coccinia grandis* almost always germinates in the shade of other plants and that seeds do not require ingestion or mechanical damage to germinate.

According to Rollins (1994), in Florida seeds produce mostly male plants. When a farmer finds a prolific female plant, he often propagates it by cuttings. "Tindora" is planted in February and harvested from May to October in Florida, where the average yield is 9520 kg/hectare, or 8,000-9,000 lbs. per acre (Moseley, 1990) (Lamberts, 1992).

VI. History of domestic introduction

Correll and Johnston (1979) reported that ivy gourd was introduced in extreme south Texas, and a herbarium specimen was collected from Port Isabel in 1927. However, botanists in Texas are currently unable to confirm surviving populations (Rodriquez, 1994).

In Florida, herbarium specimens were collected from the Indian River area in 1918, and from several locations in Dade County in the 1970s and 1980s. Rollins (1994) believes it is widely cultivated throughout South Florida, especially by Indian, and Thai farmers who use the green fruits in salads and stir fry. Lamberts (1992) includes ivy gourd as one of the fruits introduced by Asian immigrants and now produced in Dade County for specialty markets. In 1992, about three hectares were under cultivation in Florida.

Dr. Prasad of the University of the West Indies in Jamaica believes *Coccinia grandis* is grown commercially in the Los

Angeles, California area (Tengan, 1995), but Los Angeles and Orange County agricultural agents have been unable to confirm this. Dr. Prasad also said he knows of plans to start a new farm for Asian vegetables in Texas where "tindora" will be grown.

The most troublesome populations of ivy gourd occur in Hawaii, where the earliest collection was made by Nagata in 1968 in the Punchbowl area of O'ahu (Uchida et al, 1990). Linney (1986) was first to report on *C. grandis* in Hawaii, mentioning that seeds from naturalized populations in Fiji were sent to the Harold L. Lyon Arboretum on O'ahu in 1969. The seedlings were later destroyed as undesirable. Linney began observing the vines enshrouding koa haole plants in the early 1980s (Uchida et al, 1990). By 1990, the vine was spreading, but mostly restricted to O'ahu and the Big Island. Now ivy gourd is "naturalized and rapidly spreading in disturbed sites, 0-100 m, in Honolulu from Manoa Valley to Punchbowl and in Kailua, on O'ahu, and at Kailua-Kona, Hawaii" (Wagner, 1990). Ivy gourd has expanded its range on the island of O'ahu and can now be found in most lowland areas, in forests, waysides, as well as backyard gardens of Asian immigrants. It has moved inland and is found as high as 300 m on O'ahu and above Kailua-Kona, Hawaii (Isherwood, 1995). A few plants have been discovered and destroyed in Hilo, Hawaii, Kahului, Maui and Kalaheo, Kauai (HDOA, 1994). At one Maui site, two hundred seedlings were found at the site where one plant had been previously eradicated. The seedlings were also destroyed (Medeiros et al, 1993).

VII. Control

Chemical and mechanical control are difficult, requiring constant vigilance. Young vines can be hand-pulled, but the root system of mature vines serves as a carbohydrate reservoir, enabling regeneration even after repeated herbicide application (HDOA, 1994). Since ivy gourd grows in a canopy over other plants, herbicide application may damage non-target plants. Foliar uptake of herbicides may be impeded by the waxy surfaces of ivy gourd leaves. The recommended control for homeowners is severing the vine from the tuber, followed by treatment of the cut end of the tuber with a systemic herbicide (HDOA, 1994).

According to Rollins (1994), small populations of ivy gourd are easy to eradicate in Florida by severing the top of the vine and pulling up the roots. However, the area must be watched for new shoots from roots that may be left in the ground.

Biological control may be possible. The Hawaii Department of Agriculture (HDOA) believes a complex of pathogens and insects can be established to reduce the range and aggressiveness of ivy gourd in Hawaii (HDOA, 1994). Three promising insect species, collected in Kenya and East Africa, are currently undergoing host range testing in the HDOA quarantine insectary. The first is the

moth *Mellitia oedipus* Oberthur (Lepidoptera: Sesiidae) whose larvae are stem borers which feed within the vines and perennial tubers of ivy gourd. The second and third promising agents are species of the weevil *Baris* (Coleoptera: Curculionidae). Both species inhibit ivy gourd plant growth, one by egg laying and gall formation on terminal shoots; the other by adult feeding and larval tunneling within leaves, causing defoliation.

The most promising pathogen is the rust organism *Puccinia cucumeris*, visually rated as very destructive to ivy gourd. Two samples were received by HDOA; one was an insufficient quantity for testing, and inoculations of the other were unsuccessful. HDOA places high priority on obtaining additional cultures of this pathogen. Contracted by HDOA, the International Institute of Biological Control collected several fungal pathogens in India in November, 1994. These pathogens will be tested after preliminary identifications and culturing are completed (HDOA, 1994).

VIII. Pest associations

Besides the above mentioned potential biological control agents, other insects and diseases are associated with ivy gourd.

Insect associations:

The pumpkin caterpillar, *Diaphania indica* (Saunders) (Lepidoptera: Pyralidae) causes severe crop damage in India. Its larvae feed on flowers, leaves, and fruits (Peter and David, 1991).

Coccinia is a host for the fruit flies *Bactrocera cucurbitae*, *B. vertebratus*, and *Daucus ciliatus* (Lightfield and Chawket, 1993).

Ivy gourd is a host for the melon fly, *Dacus cucurbitae* Coquillett in Hawaii. Maggots cause damage to young fruits (Uchida et al, 1990).

Because of its superior nutritional value in terms of free aminoacids and fatty acids, ivy gourd is a preferred host of the pentatomid bug *Coridius obscurus* (Fab.) and indirectly, its egg parasitoid *Anastatus ramakrishnae* (Mani) (Hym., Eupelmidae) (Senrayan and Annadurai, 1991).

Diacrista obliqua Walker (Artiidae, Lepidoptera), a polyphagous caterpillar causes serious losses on "kundru" in India (Gargav and Katiyar, 1971).

Pathogen associations:

Ivy gourd is susceptible to powdery mildew caused by species of *Erysiphe* (Josekutty, et al, 1993), which attacks leaves, stems

and fruits (Nath et al, 1987).

Synchytrium species cause galls on lamina and petioles (Srivastava, 1985).

Anthracnose (*Colletotrichum* sp.) attacks leaves, stems, fruits (Nath et al, 1987). *Colletotrichum gloeosporioides* was determined to be a weak pathogen of ivy gourd when tested by HDOA as a potential biological control agent (HDOA, 1994).

Other pathogens, while not specifically linked with ivy gourd, are common to cucurbits in general (Nath et al, 1987):

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Mosaic (*Cucumis virus*-I) virus infection causes stunted growth and leaf mottling.

IX. Rating elements of risk model

(See Appendix B on page 16 for explanation of codes)

Estimate probability of pest spreading beyond colonized area. **HIGH - VC**

Intentional multiple introductions by humans are likely since ivy gourd may be used as food, medicine and ornament. Informal taste trials indicate tindora has a broad appeal which may allow entry into more traditional specialty markets (Lamberts, 1992). *Hortus Third* lists *Coccinia grandis* as an ornamental in North America and seeds are available through at least one California seed company (Facciola, 1990).

Rapid spread of *C. grandis* after introduction has been demonstrated in Guam and Hawaii, attributable to vigorous growth, easy reproduction from stem fragments and in Hawaii, prolific seed production. Spread is also attributed to birds that feed on the mature fruits (Whitson et al, 1991). In Guam, ivy gourd spread from 6 to 7 acres in 1990 to about 70 to 100 acres in 1995, spreading vegetatively. No fruits are produced in Guam because all of the plants are male (Thomas, 1995). In Jamaica, tindora was introduced roughly fouteen years ago, and is cultivated on about 100 acres for local consumption and export to ethnic markets in the United States. Plants have escaped from the growing fields onto nearby roadsides (Tengan, 1994).

Although Linney (1986) observed that ivy gourd seems to be restricted to hot, dryish, coastal lowlands in most of its range, notes on herbarium specimens show a wide range of habitats. For

example, the following notes appear on various specimens: "beach area, on a roof of a hut, on partially vegetated saline flats, dry, level sandy land, in scrub jungle and hedge rows, clay loam on basalt, disturbed site, in moonsoon forest, edge of field, grassland, stony brown to gray soil with pH 7.6 to 8.2".

The risk of introducing ivy gourd through importation of green fruit is very small, since fruits are harvested while immature and tender, before seeds mature (Nath et al, 1987)(Tengan, 1994).

Very susceptible to frost damage (Martin, 1995), ivy gourd would not likely thrive north of plant hardiness zone 8 in the continental United States.

Estimate economic impact. **LOW-RC**

The estimated value of the tindora crop in Dade County, Florida in 1988-1989 was $59,500, representing a harvest from about seven acres. A grower can harvest about 8,000 to 9,000 lbs. of tindora from 1 acre. Most of the crop is shipped to specialty markets in New York and Chicago (Moseley, 1990).

In Hawaii, the plant's fruit is likely to become a major host reservoir for the melon fly, *Daucus cucurbitae*, which could hamper eradication efforts (Uchida et al, 1990). Not reported to occur in the continental United States, the melon fly is a serious economic pest of melons, squashes, cucumbers, peppers, beans and tomatoes (Back and Pemberton, 1917).

Coccinia indica and *Coccinia grandis* (synonyms of *C. grandis*) are listed in Geographical Atlas of World Weeds (Holm et al, 1979) as weeds of unknown importance in India and Thailand. In Asia, ivy gourd is managed by cultivation and harvesting. Similarly, in Florida it is not yet considered a economically important weed.

Estimate environmental impact. **Medium-MC**

In Hawaii, ivy gourd quickly smothers other plants and the ground under a solid blanket of sun-blocking vines (Linney, 1986). It attacks shrubs, trees, and overhead wires (Outdoor Circle, 1994). Hundreds of acres of Hawaii's lowland forests have been covered by ivy gourd, posing a threat to Hawaii's endangered species. Ivy gourd could trigger the decline of native biota and transform the landscape in hot, dry areas (Medeiros et al, 1993).

On the mainland United States, though specimens were collected as early as 1918, ivy gourd has not been reported as an invasive, environmental weed.

In Hawaii, repeated herbicide application is necessary to control ivy gourd, and non-target plants may be injured or killed because

of their close association with ivy gourd.

Estimate impact from social and/or political influence. **MEDIUM-RC**

"Tindora" production is a source of income for growers in Florida and possibly California. Asian communities grow the plant for medicinal and culinary use. Ivy gourd flowers and fruits are attractive, and horticulturists and gardeners import seeds and nursery stock for ornamental use. These groups would oppose restrictions on importation and interstate movement of the species. Rollins (1995) believes listing ivy gourd would be the act of an "overzealous Agency going overboard".

On the other hand, if *Coccinia grandis* escapes from cultivation and becomes a nuisance, APHIS will be criticized by environmental groups and weed scientists for not listing it as a Federal noxious weed.

Ivy gourd may have a negative aesthetic effect, transforming the landscape into a sculptured mass of vines in Hawaii (Outdoor Circle, 1994) (Medeiros et al, 1993).

Wayne I. Kobayashi, Chief, Chemical/Mechanical Control Section and Myron Isherwood, Agricultural Pest Control Manager, both of the State of Hawaii Department of Agriculture, strongly recommend APHIS list this species as a noxious weed, based on Hawaii's experience (Personal communication, 1995).

Richard D. Gaskalla, Director of the Division of Plant Industry, Florida Department of Agriculutre & Consumer Services, also thinks APHIS should list ivy gourd. "Florida is already suffering the consequences of waiting for species to prove their invaseness... Since ivy gourd is a problem in Hawaii, it is likely that this plant species will escape from cultivation and become a problem in South Florida (Coile, 1995)."

X. Pest Risk Potential Rating. Medium

This rating is derived from the high rating for spread potential, combined with the low rating for economic and the medium ratings for environmental and social impact.

XI. Summary and discussion

Until its introduction into Hawaii and Guam, ivy gourd was mostly considered a food crop with medicinal and ornamental uses. Ivy gourd is clearly a serious noxious weed in Hawaii, which should be protected from further introduction. Ivy gourd was declared a noxious weed in Hawaii in 1992 (HDOA, 19944). The Outdoor

Circle, a grassroots organization of over 3300 people in Hawaii, has mounted a campaign to eradicate ivy gourd and educate the public about the "malevolent vine". The Hawaii Department of Agriculture has begun studies to find and test biological control agents for ivy gourd but future funding is not guaranteed.

Coccinia grandis meets the current definition of Federal Noxious Weed; "any living stage of any parasitic or other plant ... which is of foreign origin, is new to or not widely prevalent in the United States, and can directly or indirectly injure crops, other useful plants, livestock, or poultry or other interests of agriculture, including irrigation, or navigation or the fish or wildlife resources of the United States, territories, or districts of the United States". APHIS policy has been to consider "not widely prevalent in the United States" as three or fewer states. Ivy gourd is capable of injuring "other useful plants" and "wildlife resources of the United States." Ivy gourd is an environmental pest more than an agricultural pest.

Ivy gourd has already been established in the areas of the mainland United States most at risk. South Texas populations apparently died out. In Florida the plants are not behaving as weeds, possibly because they are well-managed as a cash crop. According to Martin (1995), the form of *Coccinia grandis* grown in Florida is non-seed producing. The seedy form of the fruit, which is found in Hawaii, is bitter and less suitable as a vegetable. The most likely means of future introduction is purposeful introduction of seeds or cuttings by people wanting to grow *Coccinia grandis* for food, medicine or ornament. Importation of green fruits is not a likely means of introduction because the fruits are harvested before the seeds mature.

Should APHIS list ivy gourd as a Federal noxious weed? APHIS could take either of two approaches. The first approach is to immediately begin the process for listing *Coccinia grandis* as a Federal noxious weed, based on demonstrated invasiveness in Hawaii and Guam, and the plant's potential to become another "kudzu" in the southern states. After the final rule is published, seeds and other propagatable material would be prohibited into all ports of entry unless authorized by a noxious weed permit. Current or planned small-scale production of tindora in Florida and other states would be shut down, or possibly allowed under permit. This aggressive approach is supported by State Officials in Hawaii and Florida.

The second approach is for PPQ and State officials in Florida (and in California and Texas if populations are found) to keep close watch over areas where ivy gourd is cultivated. APHIS would initiate the listing procedure only if signs of invasiveness are detected.

This second approach is supported by Elton's observation (1958)

that islands seem to be more vulnerable to invading species than are continents. The phenomenon of lower competitive ability among endemics of oceanic islands is also discussed by Carlquist (1974). Competitive ability appears to depend upon constant selective pressure, abundantly represented on continents where many aggressive groups are evolving simultaneously. Selective pressure is lower on islands, where there are fewer species to contest ecological opportunities. In Hawaii, almost any introduced continental plant species seems capable of replacing indigenous species of comparable ecological requirements (Carlquist, 1974). A plant that is invasive on Oceanic islands may not be as competitive on a continent.

XII. Recommendations

PPQ should continue to refer to Hawaii State Agricultural officials all propagatable material of ivy gourd found at Hawaiian ports of entry.

Prohibiting green fruits from Jamaica is unneccessary because fruits are not marketable unless they are picked before the seeds are mature. Importation of ripe (red) fruits should not be approved into Hawaii or Guam.

So far, although ivy gourd has been collected in the southern United States since 1918, we have no evidence that ivy gourd is invasive there. The majority opinion of the APHIS weed team[1] is that APHIS should take the second approach. PPQ and State Officials in states where ivy gourd or tindora is grown should monitor known populations. Local extension service agents and weed scientists at local universities can be enlisted in this effort. When and if *Coccinia grandis* shows signs of escaping from cultivation in the continental United States, APHIS should initiate the listing process.

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[1] APHIS "weed team" consists of M. Rogriguez (DEO), P. Lehtonen (BATS), R. Westbrooks (MD), A. Tasker (BBEP), D. Meyerdirk (BCO)

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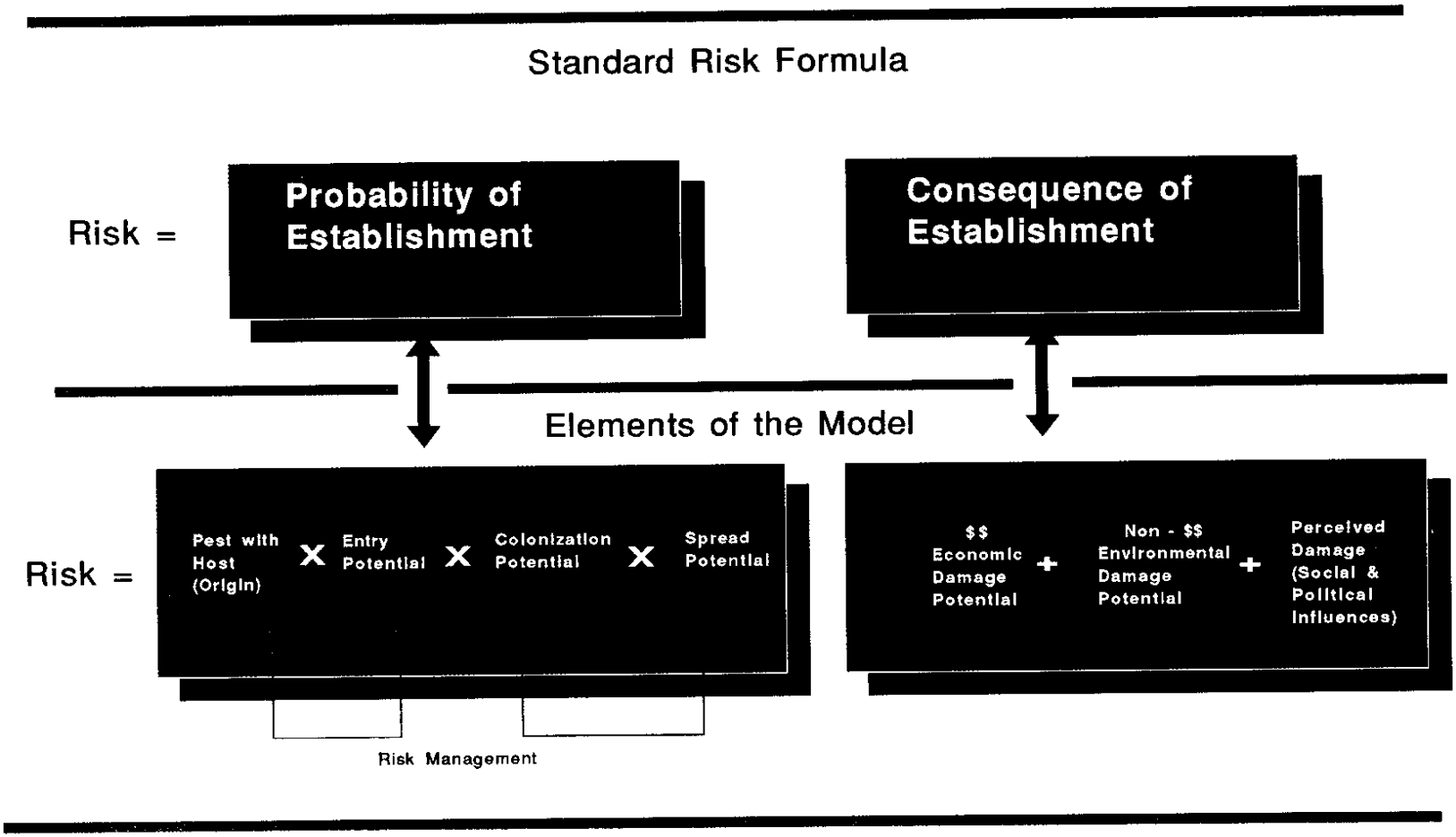
Pest Risk Assessment Model



- For model simplification the various elements are depicted as being independent of one another
- The order of the elements in the model does not necessarily reflect the order of calculation.

Appendix B

UNCERTAINTY CODES TO INDIVIDUAL ELEMENTS

Uncertainty Code	Symbol	Description
Very Certain	VC	As certain as I am going to get
Reasonably Certain	RC	Reasonably certain
Moderately Certain	MC	More certain than not
Reasonably Uncertain	RU	Reasonably uncertain
Very Uncertain	VU	A guess

U.S. Distribution of Ivy Gourd

Coccinia grandis