Note: The Federal Noxious Weed regulation for these species was revised effective 10 Dec 2010 to reflect the change of the genus Homeria to the genus Moraea.

Homeria Vent.

(Cape tulip)

Weed Risk Assessment

April, 2000
Version 5

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Introduction

This pest risk assessment (PRA) was prepared by the Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture (USDA) to examine the plant pest risk associated with the importation into the United States of the genus *Homeria* Vent. This is a qualitative pest risk assessment, that is, estimates of risk are expressed in qualitative terms such as high, medium and low as opposed to numerical terms such as probabilities or frequencies.

International plant protection organizations (*e.g.*, North American Plant Protection Organization (NAPPO), International Plant Protection Convention (IPPC) of the United Nations Food and Agriculture Organization (FAO)) provide guidance for conducting pest risk analyses. The methods APHIS uses to initiate, conduct, and report this plant pest risk assessment are consistent with guidelines provided by NAPPO, IPPC and FAO. Our use of biological and phytosanitary terms (*e.g.*, introduction, quarantine pest) conforms with the *NAPPO Compendium of Phytosanitary Terms* (NAPPO 1995) and the *Definitions and Abbreviations* (Introduction Section) in *International Standards for Phytosanitary Measures, Section 1—Import Regulations: Guidelines for Pest Risk Analysis* (FAO 1995).

Pest risk assessment is one component of an overall pest risk analysis. The *Guidelines for Pest Risk Analysis* provided by FAO (1995) describe three stages in pest risk analysis. This document satisfies the requirements of FAO Stages 1 (initiation) and 2 (risk assessment). Stage 3 (risk management) is discussed briefly in the summary/discussion section at the end.

The Food and Agriculture Organization (FAO, 1995) defines "pest risk assessment" as "Determination of whether a pest is a quarantine pest and evaluation of its introduction potential." "Quarantine pest" is defined as "A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled" (FAO, 1995; NAPPO, 1995). Thus, pest risk assessments should consider both the likelihood and consequences of introduction of quarantine pests. Both issues are addressed in this qualitative assessment.

Stage 1: Initiating Pest Risk Analysis Process

Step 1. Document the Initiating Event(s) for the PRA

Until December 1998, Australian oats rarely entered the US because they were commonly contaminated by wheat seeds, which were prohibited under the wheat diseases quarantine. Based on a risk assessment of the flag smut disease of wheat, APHIS decided in December 1998 to no longer prohibit the entry of non-propagative materials contaminated with wheat seeds from flag smut countries. The change in enterability of contaminant wheat seed renewed an interest in importing oats from Australia. Prospective importers submitted seed analysis reports from Australian oats to see if other contaminants, particularly noxious weeds, might be

a problem. One seed analysis report included *Homeria* sp. as a prohibited weed in Australia. Species of *Homeria* are not known to occur in the United States (USDA, USGS, 1999) outside of cultivation. By consulting several world weed references, we established that at least some species of *Homeria* are classified as weeds. We are conducting this risk assessment to determine if species of *Homeria* should be listed as Federal noxious weeds.

Step 2. Identify and Cite Previous Risk Assessments.

This is the first risk assessment for this genus.

Step 3. Establish Identity of Weed

TAXONOMY: (after Cronquist)

Division:	Spermatophyta (Seed plants)
Subdivision:	Angiospermae (Flowering plants)
Class:	Monocotyledoneae (Monocots)
Subclass:	Liliidae
Order:	Liliales
Family:	Iridaceae
Scientific name:	*Homeria* Vent, 31- 40 species of perennial herbs
Common names:	Cape tulips**,** tulp
Etymology:	from the Greek *homero*, "I meet together", alluding to the filaments (stalks of the stamen) being united into a tube surrounding the style (Everett,1981)**.**

Five species of *Homeria* are economically important (Wiersema and Leon, 1999):

Scientific name	common name
H. collina (Thunb.) Vent.	Cape-tulip
H. flaccida Sweet	one-leaf Cape-tulip
H. miniata (Andrews) Sweet	two-leaf Cape-tulip
H. ochroleuca Salisb.	red Cape-tulip, red tulp
H. pallida Baker	yellow Cape-tulip, Transvaal yellow tulp

Native distribution: South Africa.

Current distribution: Most species occur only in the winter rainfall area of the Cape Province of South Africa with the exception of *H. pallida*, which extends beyond the Cape Province into Botswana, Namibia, Lesotho, the Orange Free State, Natal, and Transvaal (Arnold and De Wet, 1993).

H. flaccida and *H. miniata* are widespread and weedy in the southern Australian states of New South Wales, Victoria, South Australia and Western Australia. *H. flaccida* also occurs in Tasmania (Parsons & Cuthbertson, 1992) and has become naturalized repeatedly in New

Zealand, but is subject to eradication (Panetta and Mitchell, 1991). *H. ochroleuca* Salisb. occurs sporadically in New South Wales,Victoria, South Australia, Western Australia (Auld and Medd, 1992). An English web site reports *Homeria collina* from the Scilly Isles but not from mainland Cornwall (http://www.ex.ac.uk/~cnfrench/ics/cbru/checklist/fpclscil.htm).

Cape tulip corms are produced in the Netherlands, and have been sold in the United States.

Description:

Mature Plants are erect, corm-bearing perennial herbs. The corms have tunics with coarse black or brown fibers. Each corm produces a single stem, which is usually erect or slightly inclined. The branching pattern is an important characteristic of species (Goldblatt, 1981). Aerial parts die back annually (Pope, 1993).

Leaves are solitary or few, narrowly sword-shaped**.** Basal leaves are long and slender; those above are shorter and clasp the stems with their bases (Everett, 1981).

Inflorescences are enclosed in paired, opposed sheathing bracts called spathes. The outer spathe is usually 1/2 to 2/3 as long as the inner spathe**.** Each inflorescence produces several flowers over a 2-several week period (Goldblatt, 1981).

Flowers are yellow, copper, orange, salmon pink or lilac, soon perishing, produced in succession, in terminal clusters. The perianth tube is absent. Perianth segments number 6, and curve to form a cup around the stamen-style branch apparatus, later spreading or becoming recurved. The filaments of the three stamen are united in a tube around the style, which has three bilobed branches, each with two small crests.

Fruits are leathery 3-valved loculicidal capsule**s,** often included in spathes until maturity (Pope, 1993).

Seeds are brown**,** angled, and numerous in the capsule. The angles have membranous transparent ridges, too poorly developed to be called wings. Apart from size, seeds of different species are indistinguishable morphologically (Goldblatt, 1981).

Habitat: Cape tulips occur in a variety of habitats from desert to Mediterranean shrubland to grassland (Goldblatt, 1980). Cape tulips are found in pastures, plains, hillsides (Reed, 1977), woodlands, granite rocks, and limestone heaths (Hussey et al, 1997).

Stage 2: Assessing Pest Risk

Step 4. Verify Quarantine Pest Status: Geographic and Regulatory Criteria

Geographic: Species of the genus *Homeria* are not known to occur in the United States outside of cultivation (USDA, USGS, 1999; Kartesz, J. T., 1994). According to the APHIS, International Services Monthly and Annual Reports from Bulb Preclearance Program, the

United States has imported *Homeria* spp. from Holland since 1994. Between July 1994 and March 1999, American companies imported over 1.8 million Cape tulip plants. *Homeria marlothii* and *H. ochroleuca* have appeared in a North Carolina nursery's catalogue (Isaacson, 1993). When contacted, the nurseryman indicated that *Homeria* plants are occasionally grown as potted greenhouse plants, but he has never seen the plants growing outdoors in North Carolina (Cross, 1999).

Regulatory: Because *Homeria* spp. are not known to occur outside of cultivation (USDA, NCRS, PLANTS database, 1999), there are no control programs for *Homeria* in the United States.

Step 5. Assess Economic Importance: Consequences of Introduction.

The risk assessment evaluates whether or not the weed is of potential economic importance by considering the consequences and likelihood of introduction. In qualitative pest risk assessments, we use five Risk Elements (RE) to estimate risk. RE'S #1-4 focus on the consequences of introduction and RE #5 considers the likelihood of introduction.

RE #1: Habitat Suitability

A weed may behave in its area of introduction as it does in its native area if climatic conditions are similar. For this element, we base estimates on the availability of a suitable climate. To rate this RE, we use the U.S. "plant hardiness zones" as described by the U.S. Department of Agriculture (USDA, 1990).

Assign rating as follows:

Rating	Numerical Score	Explanation: Suitable climate and host plants would permit the weed to establish:
High✓	3✓	In most of the United States (In four or more plant hardiness zones)✓
Medium	2	In approximately one third to two thirds of the US (two or three plant hardiness zones).
Low	1	In approximately one third or less of the United States (at most a single plant hardiness zone).
Negligible	0	no potential to survive and become established

Level of certainty - High

Rationale: The Summer Bulb Guide of the U.S. Netherlands Flower Bulb Information Center (NFBIC), denotes cape tulips as suitable for USDA hardiness zones as follows: zones 4-8 in containers;
zone 9, hardy with mulch; zones 10-11, hardy.

However, based on the use of the computer prediction system CLIMEX, matching known locations of infestations in Southern Africa and Australia to locations with similar climate in

the United States, the predicted range is wider. Based on climate matching model, cape tulips could survive outside of containers in zones 5-11. Although cape tulip persists under a wide variety of climatic conditions and soils, it is particularly aggressive in areas of high rainfall (Murrie and Garrick, 1974).

RE #2: Dispersal/ Spread Potential

A newly introduced weed may disperse. We consider the following factors:

- reproductive patterns in the weed (e.g., reproductive output)
- dispersal capability of the weed
- facilitation of dispersal by natural factors (*e.g.,* wind, water, presence of vectors)
- facilitation of dispersal by human factors (*e.g.,* ornament, spice, food, medicine)

Assign rating as follows:

Rating	Numerical score	Explanation:▫
High✓	3✓	Weed has potential for rapid natural spread throughout its potential range in the PRA area (*e.g.*, high reproductive potential ***AND*** highly mobile propagules) ✓
Medium	2	Weed has potential for natural spread throughout a physiolographic region of the PRA within a year (*e.g.*, it has either high reproductive potential ***OR*** highly mobile propagules).
Low	1	Weed has potential for natural spread locally in the PRA area within a year (some reproductive potential and/or some mobility of propagules).
Negligible	0	Weed has no potential for natural spread in the PRA area

Level of certainty = High

Rationale: Cape tulips produce abundant seeds and corms, which may be spread by wind, water, machinery, animals, and humans.

Alternate method for RE #2
List characteristics that may influence a plant's ability to reproduce and disperse and assign a point for each: (Each check mark denotes that the characteristic applies, and represents one point.)

1. Prolific seed production ✓
2. Dormant, long-lived seeds
3. Reproduction by rhizomes, stolons, tubers, corms ✓, turions, vegetative fragmentation, offsets and cleistogenes
4. Dispersal by wind ✓, water ✓, machinery ✓, animals ✓, humans ✓

5. Rapid growth to reproductive maturity
6. High germination rate in a wide range of conditions
7. Allelopathy
8. Stress tolerance (partial ✓) (ability to tolerate a wide range of conditions, includes herbicide resistance)

(Rate H(3)/M(2)/L(1) based on the number of characteristics: High =5 or more, medium = 3 or 4, low =1-2.) *Homeria* earns 8 points, which translates to a high dispersal potential rating.

1. Yes. Most Cape tulips produce abundant seed (Goldblatt, 1981). *H. flaccida* and *H. collina* produce seeds prolifically.

2. No evidence. *H. flaccida* seeds are not long-lived in the soil. Most germinate in the autumn following formation, and most that do not germinate die (Parsons & Cuthbertson, 1992).

3. All Cape tulips produce corms. *H. miniata* does not produce viable seeds, but makes up for this by producing cormils in each leaf axil and around the developing corm at the base of the plant. Cormils of *H. flaccida* live longer than the seeds, and may remain dormant for at least 8 years. Up to 200,000 cormils per square meter may build up in an established patch. Up to 60% of the corms may remain dormant through a growing season (Parsons & Cuthbertson, 1992).

4. Gardeners cultivate Cape tulips for their attractive flowers (Murrie and Garrick, 1974). Cape tulips are dispersed by animals, both internally and externally, wind, and water (Carr et al, 1992). Corms and seeds contaminate produce and machinery and adhere to wool and the feet of animals. Seeds remain viable after passing through stock. Dried plants with intact seed capsules break off and are wind-blown or carried off in running water. Movement of gravel from infested sites for road making spreads corms and seeds, as does hay or silage cut from infested paddocks (Parsons & Cuthbertson, 1992). During flooding, creeks and gullies transport cormils into lower lying areas (Murrie and Garrick, 1974).

5. No evidence. Seedling plants do not flower in their first year (Parsons & Cuthbertson, 1992).

6. No evidence. Soil temperature and moisture determine the proportion of corms that germinate in any season (Parsons & Cuthbertson, 1992).

7. No evidence.

8. Complex heterozygosity in *H. pallida* allows one race to be successful in arid, even harsh habitats (Goldblatt, 1980). Some plants of *H. flaccida* produce contractile roots that drag corms deeper into the soil. Up to 60% of the corms may remain dormant through a growing season (Parsons & Cuthbertson, 1992).

RE #3: Economic Impact Rating

Introduced weeds can cause a variety of economic impacts. We divide these impacts into three primary categories (other types of impacts may occur):

1. Reduced crop yield (*e.g.*, by parasitism, competition, or by harboring other pests) or other negative affects to useful plants, plant products, or livestock. For non parasitic weeds, risk is correlated with the number of crops, plant products, other useful plants, or kinds of livestock affected.
2. Lower commodity value (e.g., by increasing costs of production, lowering the market price, or a combination); or if not an agricultural weed, by increasing costs of control.
3. Loss of markets (foreign or domestic) due to presence of a new quarantine pest.

Assign ratings as follows:

Rating	Numerical score	Explanation
High✓	3✓	Weed causes all three of the above impacts, or causes any one impact over a wide range (over 5 types) of economic plants, plant products, or animals.✓
Medium	2	Weed causes any two of the above impacts, or causes any one impact to a wide range (over 5 types) of economic plants, plant products, or animals.
Low	1	Weed causes any one of the above impacts to one or two types of economic plants, plant products, or animals.
Negligible	0	Weed causes none of the above impacts.

Level of certainty - High

Rationale: Cape tulips can reduce crop and livestock yields and lower commodity values. *Homeria* and *Moraea* (a related genus) cause economic loss due to stock poisoning. In South Africa, poisoning from these two genera results in losses estimated between $2.5-3 million per year in direct deaths or debilitation (Goldblatt, 1981). All classes of livestock are susceptible, but cattle, sheep, goats and donkeys are most likely to suffer poisoning under natural conditions. Since *Homeria* grows on cultivated land, it may be cut with forage and then cause poisoning in stall-fed animals. Desiccation has little effect on its toxicity (Naude & Potgieter, 1971; Naude, 1974).

The toxic principle is a glycoside which causes loss of appetite, weakness, depression, blindness, dysentery, scouring, stiffness or paralysis of hind legs, and death (Parsons & Cuthbertson, 1992). Deaths may be reduced by predosing cattle with a prophylactic drench containing *Homeria* before allowing them to graze infested pastures (Strydom and Joubert, 1983).

Since they are avoided by animals, Cape tulips multiply to an unusual extent in the absence of competition in grazed areas (Goldblatt, 1981). *Homeria* patches can be dense, replacing

desirable pasture plants and reducing carrying capacity (Parsons & Cuthbertson, 1992). Murrie and Garrick (1974) report that two-leaf cape tulip can reduce carrying capacity by 50 per cent.

H. collina and *H. miniata* occur in dryland crops in Australia. Weeds in crop production lower yields, interfere with harvesting, and compete for moisture and nutrients (Wilding, et al, 1998). *H. flaccida* and *H. miniata* are important weeds of pastures and winter crops in all southern Australian states (Auld and Medd, 1992).

H. miniata, H. flaccida and *H. pallida* are the only *Homeria* species normally found as weeds in South Africa, in overgrazed pastures, vineyards, and plowed fields. *H. miniata* is also found in disturbed roadsides and abandoned fields (Goldblatt, 1981).

RE #4: Environmental Impact

Consider whether or not the weed, if introduced, could:

1. Cause impacts on ecosystem processes (alteration of hydrology, sedimentation rates, a fire regime, nutrient regimes, changes in productivity, growth, yield, vigor, etc.)
2. Cause impacts on natural community composition (*e.g.,* reduces biodiversity, affects native populations, affect endangered or threatened species, impact keystone species, impact native fauna, pollinators, or microorganisms, etc.)
3. Cause impacts on community structure✓ (*e.g.,* changes the density of a layer, covers the canopy, eliminates or creates a layer,impacts wildlife habitats, etc.)
4. Have impacts on human health such as allergies or changes in air or water quality.✓
5. Have sociological impacts on recreation patterns and aesthetic or property values.
6. Introduction of the weed would stimulate control programs including toxic chemical pesticides or introduction of a nonindigenous biological control agent.✓

Assign ratings as follows:

Rating	Numerical Score	Explanation
High	3	Three or more of the above. (Potential to cause major damage to the environment with significant losses to plant ecosystems and subsequent physical environmental degradation.)
Medium ✓	2 ✓	Two of the above (Potential to cause moderate impact on the environment with obvious change in the ecological balance, affecting several attributes of the ecosystem, as well as moderate recreation or aesthetic impacts.)✓
Low	1	One of the above. (Limited potential impact on environment.)
Negligible	0	None of the above. (No potential to degrade the environment or otherwise affect ecosystems.)

Level of Certainty - Medium. Impacts on human health would be negligible, since people in the United States would be unlikely to mistake Cape tulips for edible tulp. However, deaths have been reported in Africa, and adding this potential impact would result in a high rating.

Rationale:

1. No evidence. In Australia, two-leaf Cape tulip is essentially a pasture problem (Murrie and Garrick, 1974).

2. No evidence.

3. *Homeria flaccida* in Victoria invades dry coastal vegetation, heathlands, heathy woodlands, lowland grasslands, grassy woodlands, dry sclerophyll forests, and freshwater wetlands (Carr et al, 1992).

4. Cape tulips are toxic to humans. Deaths have been recorded in Africa when people have mistaken the bulbs for edible tulp (*Moraea fugax* or *M. edulis*) (Goldblatt, 1981; Naude & Potgieter, 1971).

5. Cape tulips are used as ornamentals; they are not likely to change property values, or reduce aesthetics.

6. Control programs would be initiated if Cape tulips escape from cultivation into pastures or natural areas. Chemical control (2,4-D, Glyphosate, 2,2-DPA, amitrole T) can reduce original density to low levels, but the weed is difficult to eliminate completely.

Economic Importance Summary: Consequences of Introduction. Cumulative Risk Element Score

Adding together the numerical estimates for the five risk elements, we produce an overall estimate of the Consequences of Introduction Risk Rating for the weed. The overall risk rating is used to assign a Consequences of Introduction Risk Score as follows:
Habitiat suitability + Agricultural Damage potential + Dispersal Potential + Economic Impact + Environmental Impact = Consequences of Introduction.
(RE1 + RE2 + RE3 + RE4) = TOTAL.
3 + 3 + 3 + 2 = 11

Risk: Consequences of Introduction (Sum RE #1-4)

Cumulative Risk Element Score	Risk Rating	Risk Score
0-2	Negligible	0
3-6	Low	1
7-10	Medium	2
11- 12✓	High✓	3✓

The Consequences of Introduction Risk Rating is an indicator of the potential of the weed to become established and spread, and its potential to cause economic and environmental impacts.

Step 6. Assess Likelihood of Introduction/Spread

RE #5: Entry Potential: Number of Potential Pathways and Likelihood of Survival in Each

The likelihood that an exotic weed will be introduced depends on the number of associated pathways and within each pathway, the weed's opportunity to survive and find a suitable habitat. For each pathway, we consider five sub-elements, *i.e.*, we consider the likelihood that the weed may:

1. Survive postharvest treatment (if no treatment, answer high, *i.e.*, $>10\%$).
2. Survive shipment.
3. Not be detected at the port of entry (if no inspection, answer high, *i.e.*, $>10\%$).
4. Imported or moved subsequently to an area with an environment suitable for survival.
5. Come into contact with suitable growing substrate or host material.

Likelihood Estimates for Risk Element #5.

Likelihood		Score
Low	= less than 0.1% = less than one in a thousand	1
Medium	= between 0.1% and 10% = between one in a thousand and one in ten	3
High	= greater than 10% = greater than one in ten	5

Three pathways by which the weed might enter the United States are most likely, infested grain, passenger baggage, and nursery stock shipments. The following table provides an estimate of the likelihood of introduction for each pathway:

Scoring for RE #5:

Pathway	Survive treatment	Survive shipment	Not be detected	Environment suitable for survival	Find growing substrate	path total
Passenger Baggage from Australia or South Africa	5	5	3	3	5	21
Grain	5	5	1	5	5	21
Ornamental plant shipment	5	5	1	5	5	21
Total across pathways						63

The cumulative pathway score is 63.

Rate the Likelihood of Introduction as shown in the Table below:

Risk: Likelihood of Introduction (Sum across pathways, RE #5)

Cumulative pathway Score	Risk Rating	Risk Score
5 - 14	Low	1
15 - 24	Medium	2
25 or more✓	High✓	3✓

Level of Certainty - High

Step 7. Conclusion/Pest Risk Potential (PRP): Determine if Weed Should be Listed

We produce an estimate of the pest risk potential by considering the Consequences of Introduction and the Likelihood of Introduction using the following table as a guide. The pest risk potential will be obtained from the combination of the scores for likelihood of introduction and consequences of introduction, and will be assigned as follows: negligible (0), low (1-3), medium (4-5), medium-high (6) and high (9):

Likelihood of Introduction (Rating and Score)	Consequences of Introduction (Rating and Score)	Overall Pest Risk Potential
Negligible (0)	Negligible (0)	Negligible (0)
Negligible (0)	Low (1)	Negligible (0)
Negligible (0)	Medium (2)	Negligible (0)
Negligible (0)	High (3)	Negligible (0)
Low (1)	Negligible (0)	Negligible (0)
Low (1)	Low (1)	Low (1)
Low (1)	Medium (2)	Low (2)
Low (1)	High (3)	Low (3)
Medium (2)	Negligible (0)	Negligible (0)
Medium (2)	Low (1)	Low (2)
Medium (2)	Medium (2)	Medium (4)
Medium (2)	High (3)	Medium-High (6)
High (3)	Negligible (0)	Negligible (0)
High (3)	Low (1)	Low (3)
High (3)	Medium (2)	Medium-High (6)
High (3)✓	High (3) ✓	High (9) ✓

CONCLUSION:

Five species of *Homeria* are economically important. The other species are little known. The outcome of this assessment is a high pest risk potential (a high consequences of introduction

and spread combined with a high likelihood of introduction). Cape tulips have the following weediness characteristics:

- they are poisonous to livestock and humans,
- they have prolific capacity to reproduce and persist,
- their dense clumpy growth crowds out desirable plants, and reduces the carrying capacity of pastures,
- they compete for soil nutrients and reduce crop yields.

Discussion/Risk Management

The Federal Noxious Weed Act defines "noxious weed" as "any living stage (including but not limited to, seeds and reproductive parts) of any parasitic or other plant of a kind, or subdivision of a kind, 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 and wildlife resources of the United States or the public health." *Homeria* spp. *that are not widely prevalent* meet this definition.

Between the beginning of 1997 and June 1999, 1,260,925 *Homeria* bulbs entered the United States (Bedat,1999). Although Cape tulips have been imported as ornamentals for several years, the number of species and extent to which they have escaped cultivation is unknown. Escape from cultivation is increasingly likely with continuing introductions.

Recommendation:
APHIS should propose listing *Homeria* spp. in the Federal Noxious Weed List. The proposed rule should request information from importers about the species imported and whether or not they have become naturalized. If some species are already widespread, they should be omitted from the listing. If certain species are determined to be of limited distribution in the United States, APHIS should regulate only if they are under official control as defined by the National Plant Board.[1] Because identification to species is not possible based on morphological characteristics of seeds or corms, APHIS should prohibit the entry of all *Homeria* propagules found as contaminants in imported commodities. On a case by case basis, APHIS may approve processing of a commodity to devitalize the *Homeria* seeds.

Control Options if established:

1[1] *Officially Controlled - The conduct, by an official public pest prevention agency, of eradication or intensive suppression activity including various treatments, quarantine and other measures with the goal of eliminating an isolated infestation or prevention of further spread within the endangered area. It does not include private general agricultural, urban forestry, or home garden pest control measures conducted by individuals against pests permanently established in an endangered area. National Plant Board, 1995.*
2

Mechanical control: Very small sites can be hand-cleared as long as all of the long-persistant corms are removed. Pigs were used successfully to grub out corms in one Tasmanian location, but this method failed at another location (Australia, Tasmanian Dept. of Agriculture, 1974).

Cultivation is effective only when applied during a short period when the old corm has shriveled and the new corm is only partially developed. Cultivation during this time below the depth of the deepest corm kills most plants, and must be followed 4 weeks later by further working to kill any survivors. The difficulties with this control are determining the correct stage of corm development, and the infested areas may be too wet to cultivate at the right time (Parsons & Cuthbertson, 1992).

Chemical control: Chemical control can reduce population density to low levels, but the plant is difficult to eliminate completely (Parsons & Cuthbertson, 1992).

2,4-D prevents flowering and seeding (Australia, Tasmanian Department of Agriculture, 1974).

Ester 2,4-D most commonly used in Australia, gives good results when applied just before flowering or just when plants begin to flower. When Homeria is growing next to crops susceptible to 2,4-D, spraying with 2,2-DPA or amitrole T is effective. Glyphosate has been effective. A mixture of amitrole, atrazine and 2,4-D leaves the ground bare but encourages corms to sprout in the following year instead of remaining dormant. (Parsons & Cuthbertson, 1992). Murrie and Garrick (1974) note that hormone-type sprays increase the plant's palatibility, so cape tulip infested pastures sprayed with 2,4-D should not be grazed for at least eight weeks after treatment.

Chlorsulfuron reduces corm production over a range of application times, and is effective when used before cropping, but it damages legumes. (Parsons & Cuthbertson, 1992).

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