

<b>Taxon:</b> Matricaria chamomilla L.	<b>Family:</b> Asteraceae
<b>Common Name(s):</b> blue chamomile chamomile common chamomile German chamomile scented chamomile scented mayweed true chamomile	<b>Synonym(s):</b> Chamomilla recutita (L.) Rauschert Matricaria courrantiana DC. Matricaria recutita L.

<b>Assessor:</b> Chuck Chimera	<b>Status:</b> Assessor Approved	<b>End Date:</b> 18 Jan 2023
<b>WRA Score:</b> 10.0	<b>Designation:</b> H(HPWRA)	<b>Rating:</b> High Risk

**Keywords:** Annual Herb, Crop Weed, Herbal Uses, Self-Fertile, Animal Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	Low
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	n
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	y
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	y
405	Toxic to animals		

Qsn #	Question	Answer Option	Answer
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans		
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle		
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	1
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	y
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	y
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)		
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m <sup>2</sup> )	y=1, n=-1	y
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	y
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

**Supporting Data:**

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Lim, T.K. (2014). Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	"Matricaria chamomilla is native to southern and eastern Europe and northern and western Asia. It has been introduced elsewhere and has naturalized in North America and Australia."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2023). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2023). Personal Communication	NA

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	Low
	Source(s)	Notes
	Lim, T.K. (2014). Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	"Matricaria chamomilla is native to southern and eastern Europe and northern and western Asia. It has been introduced elsewhere and has naturalized in North America and Australia."

Qsn #	Question	Answer
	<p>USDA, Agricultural Research Service, National Plant Germplasm System. (2023). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a>. [Accessed 16 Jan 2023]</p>	<p>"Native  Africa  NORTHERN AFRICA: Algeria, Morocco  Asia-Temperate  WESTERN ASIA: Afghanistan, Cyprus, Iran, Iraq (n.), Israel, Lebanon, Syria, Turkey  CAUCASUS: Russian Federation-Ciscaucasia [Ciscaucasia], Azerbaijan, Georgia, Russian Federation [Dagestan]  SIBERIA: Russian Federation-Western Siberia [Western Siberia], Russian Federation-Eastern Siberia [Eastern Siberia]  MIDDLE ASIA: Kazakhstan, Kyrgyzstan, Uzbekistan  MONGOLIA: Mongolia  CHINA: China [Anhui Sheng, Hebei Sheng, Jiangsu Sheng, Liaoning Sheng, Shandong Sheng, Shaanxi Sheng, Sichuan Sheng, Xinjiang Uygur Zizhiqu]  Asia-Tropical  INDIAN SUBCONTINENT: India [Himachal Pradesh, Jammu and Kashmir, Punjab, Uttar Pradesh]  Europe  NORTHERN EUROPE: Denmark, Finland, United Kingdom, Norway, Sweden  MIDDLE EUROPE: Austria, Belgium, Switzerland, Czech Republic, Germany, Hungary, Netherlands, Poland, Slovakia  EASTERN EUROPE: Russian Federation-European part [European part], Belarus, Ukraine (incl. Krym)  SOUTHEASTERN EUROPE: Albania, Bulgaria, Bosnia and Herzegovina, Greece (incl. Crete), Croatia, Italy (incl. Sardinia, Sicily), Montenegro, Romania, Serbia, Slovenia  SOUTHWESTERN EUROPE: Spain, France (incl. Corsica), Portugal"</p>
	<p>Das, M. (2015). Chamomile. Medicinal, Biochemical, and Agricultural Aspects. CRC Press, Boca Raton, FL</p>	<p>"The herbaceous annual chamomile plant is adapted to the temperate climate. It is found growing in the wild in the areas where it originated. These areas extend from the south and east European countries to the Near East countries."</p>

202	Quality of climate match data	High
	Source(s)	Notes
	<p>USDA, Agricultural Research Service, National Plant Germplasm System. (2023). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a>. [Accessed 16 Jan 2023]</p>	

203	Broad climate suitability (environmental versatility)	n
	Source(s)	Notes

Qsn #	Question	Answer
	Lim, T.K. (2014). Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	"German chamomile is a cool climate species, growing in areas with temperatures of 7–26 °C and mean annual rainfall of 400–1,400 mm per season. It is frost tolerant down to –12 °C. It grows best in full sun and requires long summer days and high heat units for optimum essential oil yield (Alberts 2009 ). Optimum oil yields were found in temperature range of 20–26 °C, but increasing temperature had a negative impact on individual flower-head weight and days from buds to full-opened flowers (Betray and Vömel 1992 )."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2023). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a> . [Accessed 16 Jan 2023]	"Naturalized Africa MACARONESIA: Spain [Canarias], Portugal [Azores] NORTHERN AFRICA: Algeria, Egypt Australasia AUSTRALIA: Australia [South Australia] Europe MIDDLE EUROPE: Poland EASTERN EUROPE: Estonia, Lithuania Northern America SUBARCTIC AMERICA: Greenland EASTERN CANADA: Canada [Québec, Nova Scotia, Ontario, Newfoundland and Labrador] WESTERN CANADA: Canada [Saskatchewan, Alberta, Manitoba, British Columbia] NORTHEASTERN U.S.A.: United States [Connecticut, Indiana, Maine, Massachusetts, Michigan, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont] NORTH-CENTRAL U.S.A.: United States [Illinois, Iowa, Kansas, Minnesota, Missouri, North Dakota, Wisconsin] NORTHWESTERN U.S.A.: United States [Oregon, Washington] SOUTHEASTERN U.S.A.: United States [Alabama, Arkansas, Kentucky, Maryland, Mississippi, Tennessee, Virginia, District of Columbia] SOUTH-CENTRAL U.S.A.: United States [Texas] SOUTHWESTERN U.S.A.: United States [Arizona, California, Utah] NORTHERN MEXICO: Mexico [Chihuahua, Coahuila de Zaragoza, San Luis Potosí, Sinaloa, Zacatecas] SOUTHERN MEXICO: Mexico [Chiapas, Hidalgo, Jalisco, México, Michoacán de Ocampo, Veracruz de Ignacio de la Llave] Southern America CARIBBEAN: Dominican Republic CENTRAL AMERICA: Guatemala WESTERN SOUTH AMERICA: Peru SOUTHERN SOUTH AMERICA: Argentina, Chile, Paraguay [Caazapá], Uruguay"
	Imada, C. (2019). Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). Bishop Museum Technical Report 69. Bishop Museum, Honolulu, HI	No evidence. <i>Matricaria discoidea</i> reported to be naturalized on Oahu (questionably) and Maui

Qsn #	Question	Answer
205	Does the species have a history of repeated introductions outside its natural range?	y
	<b>Source(s)</b>	<b>Notes</b>
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). <i>World Weeds: Natural Histories and Distribution</i> . John Wiley and Sons, Inc., New York, NY	"M. chamomilla (Figure 55-1) is found in eastern Australia, New Zealand, and the several countries of South America in the south temperate zone and behaves as a weed in most agricultural areas of the north temperate zone. It is not a weed of consequence in Southeast Asia or the Pacific Islands. It is found in pastures at 1650 m in Switzerland."
	Lim, T.K. (2014). <i>Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers</i> . Springer, Dordrecht	" <i>Matricaria chamomilla</i> is native to southern and eastern Europe and northern and western Asia. It has been introduced elsewhere and has naturalized in North America and Australia."

301	Naturalized beyond native range	y
	<b>Source(s)</b>	<b>Notes</b>
	Lim, T.K. (2014). <i>Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers</i> . Springer, Dordrecht	" <i>Matricaria chamomilla</i> is native to southern and eastern Europe and northern and western Asia. It has been introduced elsewhere and has naturalized in North America and Australia."

Qsn #	Question	Answer
	<p>USDA, Agricultural Research Service, National Plant Germplasm System. (2023). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a>. [Accessed 16 Jan 2023]</p>	<p>"Naturalized  Africa  MACARONESIA: Spain [Canarias], Portugal [Azores]  NORTHERN AFRICA: Algeria, Egypt  Australasia  AUSTRALIA: Australia [South Australia]  Europe  MIDDLE EUROPE: Poland  EASTERN EUROPE: Estonia, Lithuania  Northern America  SUBARCTIC AMERICA: Greenland  EASTERN CANADA: Canada [Québec, Nova Scotia, Ontario, Newfoundland and Labrador]  WESTERN CANADA: Canada [Saskatchewan, Alberta, Manitoba, British Columbia]  NORTHEASTERN U.S.A.: United States [Connecticut, Indiana, Maine, Massachusetts, Michigan, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont]  NORTH-CENTRAL U.S.A.: United States [Illinois, Iowa, Kansas, Minnesota, Missouri, North Dakota, Wisconsin]  NORTHWESTERN U.S.A.: United States [Oregon, Washington]  SOUTHEASTERN U.S.A.: United States [Alabama, Arkansas, Kentucky, Maryland, Mississippi, Tennessee, Virginia, District of Columbia]  SOUTH-CENTRAL U.S.A.: United States [Texas]  SOUTHWESTERN U.S.A.: United States [Arizona, California, Utah]  NORTHERN MEXICO: Mexico [Chihuahua, Coahuila de Zaragoza, San Luis Potosí, Sinaloa, Zacatecas]  SOUTHERN MEXICO: Mexico [Chiapas, Hidalgo, Jalisco, México, Michoacán de Ocampo, Veracruz de Ignacio de la Llave]  Southern America  CARIBBEAN: Dominican Republic  CENTRAL AMERICA: Guatemala  WESTERN SOUTH AMERICA: Peru  SOUTHERN SOUTH AMERICA: Argentina, Chile, Paraguay [Caazapá], Uruguay"</p>
	<p>Imada, C. (2019). Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). Bishop Museum Technical Report 69. Bishop Museum, Honolulu, HI</p>	<p>No evidence. <i>Matricaria discoidea</i> reported to be naturalized on Oahu (questionably) and Maui</p>

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	<p>Holm, L.G., Doll, J., Holm, E., Pancho, J.V. &amp; Herberger, J.P. (1997). <i>World Weeds: Natural Histories and Distribution</i>. John Wiley and Sons, Inc., New York, NY</p>	<p>[An agricultural weed that can establish in disturbed sites] "M. chamomilla (Figure 55-1) is found in eastern Australia, New Zealand, and the several countries of South America in the south temperate zone and behaves as a weed in most agricultural areas of the north temperate zone." ... "It is found along cattle paths and in waste places."</p>

303	Agricultural/forestry/horticultural weed	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). <i>World Weeds: Natural Histories and Distribution</i> . John Wiley and Sons, Inc., New York, NY	" <i>M. chamomilla</i> is a very versatile weed and appears in 24 crops in more than 50 countries. It is a serious weed of cereals in England, the Netherlands, Poland and Spain; of peas in the Netherlands; of potatoes and other vegetables in England; of rape and sugar beets in Spain; of sugar beets and vegetables in Germany; and of wheat and several winter season crops in Uruguay. It is a principal weed of barley in Germany; of beans in France, Germany, and India; of fodder beets, table beets, and sugar beets in Belgium; of cereals in Belgium, Hungary, and Finland; of winter and spring cereals in Sweden; of flax in France; peas, potatoes, and other vegetables in Belgium; of peas in Greece; of rape in France; of sugar beets in Belgium, France, and Italy; of wheat in Italy; and of winter wheat in Belgium and Germany. It is also ranked as a principal weed of unspecified crops in Afghanistan, Austria, and Tunisia. It is a common weed of barley in France and Canada; of cereals in Bulgaria, Germany, South Africa, Switzerland, and Tunisia; of maize in France; of flax in the Netherlands; of legumes in Tunisia; of oats in Canada; of pastures in Poland and New Zealand; of peas, potatoes, and sunflowers in France; of potatoes and rye in Germany; and of wheat in Canada, France, Spain, and the United States. <i>M. chamomilla</i> is also reported to be a ubiquitous weed, with crops unspecified, in Albania, Argentina, Brazil, Bulgaria, Chile, Colombia, Costa Rica, Czechoslovakia, Cyprus, Denmark, Egypt, Hawaii, India, Iran, Iraq, Israel, Japan, Jordan, Norway, New Zealand, Peru, Portugal, the former Soviet Union, Turkey, Venezuela, and the former Yugoslavia. This weed is an important competitor in several crops of central and southern Europe and is troublesome regionally elsewhere on the continent. In Poland, in 1984, the mayweeds <i>M. chamomilla</i> and <i>Anthemis cotula</i> were found to infest 60 to 70% of the cereal-growing areas and yield losses amounted to 10 to 35% (Rola and Rola 1984). On a severity scale of 1 to 5, <i>M. chamomilla</i> ranks 3 in importance in cereals in Tunisia. Raatikainen and Mukula (1985) found that 8% of the biomass of the aerial parts of plants in 540 winter cereal fields in Finland was made up of weeds, with <i>M. chamomilla</i> ranking third in weight among the winter annuals. In more than 170 areas surveyed in northern Italy, Ferrari et al. (1984) found that regardless of the recent use of shorter rotations, less fertilizer and more limited soil tillage, <i>M. chamomilla</i> was one of seven annual weeds that had become dominant again."

304	Environmental weed	n
	Source(s)	Notes
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). <i>World Weeds: Natural Histories and Distribution</i> . John Wiley and Sons, Inc., New York, NY	" <i>M. chamomilla</i> is a very versatile weed and appears in 24 crops in more than 50 countries."
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	"Weed of: Canola, Cereals, Grapevines, Orchards & Plantations, Pastures, Pome Fruits, Vegetables" [No evidence]

305	Congeneric weed	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	" <i>Matricaria discoidea</i> ... Weed of: Canola, Cereals" ... " <i>Matricaria inodora</i> ... Weed of: Cereals, Grapevines, Orchards & Plantations, Pastures" ... " <i>Matricaria maritima</i> ... Weed of: Cereals, Vegetables" ... " <i>Matricaria matricarioides</i> ... Weed of: Bulbs, Carrots, Cereals, Cucurbits/Melons, Cutflowers, Nursery Production, Orchards & Plantations, Pastures, Pome Fruits, Vegetables" ... " <i>Matricaria perforata</i> ... Weed of: Cereals, Orchards & Plantations, Pastures, Pome Fruits" ... " <i>Matricaria recutita</i> ... Weed of: Canola, Cereals, Orchards & Plantations, Pastures"
	Peschken, D. P., Thomas, A. G., Bowes, G. G., & Douglas, D. W. (1990). Scentless chamomile ( <i>Matricaria perforata</i> )—a new target weed for biological control. In Proceedings VII International Symposium on Biological Control of Weeds (pp. 411-416)	[ <i>Matricaria perforata</i> ] "Scentless chamomile is primarily a weed of cultivated land, but it is also found in hay fields and pastures (Alberta Agriculture 1982). It forms semi-permanent stands as previously mentioned. From there the light seeds are spread by wind and water and by harvesting machinery to the well drained areas of the fields."

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). World Weeds: Natural Histories and Distribution. John Wiley and Sons, Inc., New York, NY	" <i>M. chamomilla</i> (Figure 55-2) is an annual herb, erect, branched, up to 1 m tall, with a strong odor when the plant is bruised; leaves alternate, soft, 2 to 3 pinnatipartite (pinnately-parted) with slender segments; flower head large, solitary on 2 to 8 cm long grooved peduncles; receptacle glabrous, hollow, conical about 5 to 7 mm high and 2.5 mm wide; ray flowers 1 seriate, white, 7 to 10 mm long and 2 to 3 mm wide, deflexed nocturnally and after pollination; disk flowers numerous, yellow, 2 mm long; flowerheads give off characteristic chamomille odor when crushed; fruit is an achene with pappus small or absent, elongated, curved, oval in cross section, tapers to basal end, apex has collar with central beak, ventral side with 5 long ribs, dorsal with fine longitudinal grooves, surface dull, color yellow-brown to brown with lighter ribs; small seed is 1.1 mm long by 0.4 mm wide, weight is 0.07 gm per 1000 seeds."

402	Allelopathic	
	Source(s)	Notes

Qsn #	Question	Answer
	Elbouzidi, A., Bencheikh, N., Seddoqi, S., Bouhrim, M., Bouramdane, Y., & Addi, M. (2021). Investigation of the Allelopathic Effect of <i>Matricaria chamomilla</i> L. Parts' Aqueous Extracts on Germination and Seedling Growth of Two Moroccan Varieties of Durum Wheat. <i>International Journal of Agronomy</i> , 2021: 6 pp	[Leaf and root extracts demonstrate allelopathic effects] "The phenomenon of allelopathy has been known for more than 2000 years. &is phenomenon consists of the chemical interference of plant species (or other organisms), by enhancing, or inhibiting, the germination, seedling growth, or development of other plant species (or other organisms). This paper aimed to investigate the allelopathic potential of the aqueous extract of different parts of <i>Matricaria chamomilla</i> L. on germination parameters (radicle, coleoptile length, and dry weight) of two Moroccan varieties of durum wheat. Chamomile extracts from leaves, roots, or flowers at concentrations of 50 and 100 g·L <sup>-1</sup> were prepared and applied to wheat durum seeds. The control group was given distilled water. In both studied varieties of durum wheat, only flowers' aqueous extracts showed a significant positive allelopathic effect by increasing the studied parameters, while leaves and roots from chamomile showed an inhibiting potential on germination and seedling growth in varieties riyad and kanakis."

403	Parasitic	n
	Source(s)	Notes
	Lim, T.K. (2014). <i>Edible Medicinal And Non-Medicinal Plants</i> . Volume 7, Flowers. Springer, Dordrecht	"Chamomile is an erect, aromatic, herbaceous annual, 15–80 cm high with a much branched, light green stem." [Asteraceae. No evidence]

404	Unpalatable to grazing animals	y
	Source(s)	Notes
	Wisconsin Horticulture. (2023). Chamomile, <i>Matricaria chamomilla</i> . <a href="https://hort.extension.wisc.edu/articles/chamomile-matricaria-chamomilla/">https://hort.extension.wisc.edu/articles/chamomile-matricaria-chamomilla/</a> . [Accessed 17 Jan 2023]	" It is not preferred by deer."
	Dutta, I. C. (2012). <i>Matricaria chamomilla</i> L a viable option for improving livelihoods. <i>The Sanjivini</i> , 1(1): 2-4	"camomile is non-palatable to wild animals"

Qsn #	Question	Answer
	<p>Gross, E. M., Drouet-Hoguet, N., Subedi, N., &amp; Gross, J. (2017). The potential of medicinal and aromatic plants (MAPs) to reduce crop damages by Asian Elephants (<i>Elephas maximus</i>). <i>Crop Protection</i>, 100, 29-37</p>	<p>[Trampled, but not browsed, by elephants] "In all 13 Asian range countries of the wild Asian elephant (<i>Elephas maximus</i> L.), farmers suffer from crop damages caused by this endangered and highly protected species. As elephants are lured by highly nutritional crop types into agricultural lands, measures to deter or repel them from the high attraction will always be costly and labour intensive. The cultivation of crops, which are less attractive to elephants, yet economically viable for local farmers could lead to a new direction of land-use and income generation in human-elephant conflict areas. In this study, seven medicinal and aromatic plants (MAPs) containing higher amounts of specific plant secondary compounds were explored for their attractiveness to wild Asian elephants against a control of rice (<i>Oryza sativa</i> L.) and maize (<i>Zea mays</i> L.). The results show that chamomile (<i>Matricaria chamomilla</i> L.), coriander (<i>Coriandrum sativum</i> L.), mint (<i>Mentha arvensis</i> L.), basil (<i>Ocimum basilicum</i> L.), turmeric (<i>Curcuma longa</i> L.), lemon grass (<i>Cymbopogon flexuosus</i> (Nees ex Steud.) W. Watson) and citronella (<i>Cymbopogon winterianus</i> Jowitt.) were less attractive and were not consumed by elephants compared to rice. Damages to the MAPs occurred only through trampling, with mint being most prone to being trampled. Other wildlife species, however, were observed to feed on lemon grass. Long-term learning effects and the eventual palatability of crops with less efficient antifeedants need to be further explored. This study, however, gives first evidence that MAPs bear a high potential for a secure income generation in and close to Asian elephant habitats. Furthermore, the strategic plantation of crops unattractive and attractive to elephants could lead to new land-use strategies and improve functionality of elephant corridors."</p>

Qsn #	Question	Answer
405	<b>Toxic to animals</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Wisconsin Horticulture. (2023). Chamomile, <i>Matricaria chamomilla</i> . <a href="https://hort.extension.wisc.edu/articles/chamomile-matricaria-chamomilla/">https://hort.extension.wisc.edu/articles/chamomile-matricaria-chamomilla/</a> . [Accessed 17 Jan 2023]	"These plants are often confused with plants of the genus <i>Anthemis</i> , some of which are poisonous and have either a revolting smell or are nearly odorless."
	NC State Extension. (2023). <i>Matricaria chamomilla</i> . <a href="https://plants.ces.ncsu.edu/plants/matricaria-chamomilla/">https://plants.ces.ncsu.edu/plants/matricaria-chamomilla/</a> . [Accessed 17 Jan 2023]	[No evidence for animals. Potential dermatitis for people] "Poison Severity: Low Poison Symptoms: Can cause contact dermatitis or oral swelling in those sensitive to it. Poison Toxic Principle: Desacetylmaticarin Causes Contact Dermatitis: No Poison Part: Flowers Leaves"
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). <i>World Weeds: Natural Histories and Distribution</i> . John Wiley and Sons, Inc., New York, NY	[Not reported to be toxic but may alter milk taste if ingested by dairy cows. Low palatability may make this uncommon] "If ingested, <i>M. chamomilla</i> , <i>Anthemis cotula</i> , and other mayweeds taint the milk of cows, being most troublesome in early winter and spring."

406	Host for recognized pests and pathogens	
	<b>Source(s)</b>	<b>Notes</b>
	Das, M. (2015). Chamomile. <i>Medicinal, Biochemical, and Agricultural Aspects</i> . CRC Press, Boca Raton, FL	"Chamomile is susceptible to southern root-knot nematode ( <i>Meloidogyne incognita</i> [Kofoid and White] Chitwood, race 3), which decreases the dry weight of the plant (Walker 1995). Insect pests reported are <i>Aphis fabae</i> , <i>Nysius minor</i> , and <i>Antographa chryson</i> . These can be controlled with 20% EC (280) or 0.05% malathion (Ram et al. 1997). No cases of insects are reported from Argentina. The losses caused by the pests and diseases in the field conditions in India remain to be estimated."

Qsn #	Question	Answer
407	Causes allergies or is otherwise toxic to humans	
	Source(s)	Notes
	NC State Extension. (2023). <i>Matricaria chamomilla</i> . <a href="https://plants.ces.ncsu.edu/plants/matricaria-chamomilla/">https://plants.ces.ncsu.edu/plants/matricaria-chamomilla/</a> . [Accessed 17 Jan 2023]	[Potential dermatitis for susceptible people] "Poison Severity: Low Poison Symptoms: Can cause contact dermatitis or oral swelling in those sensitive to it. Poison Toxic Principle: Desacetylmaticarin Causes Contact Dermatitis: No Poison Part: Flowers Leaves"

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). <i>World Weeds: Natural Histories and Distribution</i> . John Wiley and Sons, Inc., New York, NY	[A temperate, agricultural weed with no evidence of increased fire risk] "M. chamomilla (Figure 55 -1) is found in eastern Australia, New Zealand, and the several countries of South America in the south temperate zone and behaves as a weed in most agricultural areas of the north temperate zone. It is not a weed of consequence in Southeast Asia or the Pacific Islands. It is found in pastures at 1650 m in Switzerland."
	Das, M. (2015). <i>Chamomile. Medicinal, Biochemical, and Agricultural Aspects</i> . CRC Press, Boca Raton, FL	[A well-studied plant with no evidence of increased fire risk] "The herbaceous annual chamomile plant is adapted to the temperate climate. It is found growing in the wild in the areas where it originated. These areas extend from the south and east European countries to the Near East countries. The plant is an annual in many countries but biannual in many other countries."

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	Notes
	Wisconsin Horticulture. (2023). Chamomile, <i>Matricaria chamomilla</i> . <a href="https://hort.extension.wisc.edu/articles/chamomile-matricaria-chamomilla/">https://hort.extension.wisc.edu/articles/chamomile-matricaria-chamomilla/</a> . [Accessed 17 Jan 2023]	"Grow chamomile in full sun and in well-drained soil."
	NC State Extension. (2023). <i>Matricaria chamomilla</i> . <a href="https://plants.ces.ncsu.edu/plants/matricaria-chamomilla/">https://plants.ces.ncsu.edu/plants/matricaria-chamomilla/</a> . [Accessed 17 Jan 2023]	"Light: Full sun (6 or more hours of direct sunlight a day) Partial Shade (Direct sunlight only part of the day, 2-6 hours)"
	The National Gardening Association. (2023). German Chamomile ( <i>Matricaria chamomilla</i> ). <a href="https://garden.org/plants/view/86786/German-Chamomile-Matricaria-chamomilla/">https://garden.org/plants/view/86786/German-Chamomile-Matricaria-chamomilla/</a> . [Accessed 17 Jan 2023]	"Sun Requirements: Full Sun Full Sun to Partial Shade"

Qsn #	Question	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Lim, T.K. (2014). Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	"Chamomile is not fastidious of soil types but thrives best on a well-drained, sandy or sandy-loam soils and tolerates pH from 4.8 to 8.5. It will also grow on clayey lime soils as it has a great tolerance to soil alkalinity."
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). World Weeds: Natural Histories and Distribution. John Wiley and Sons, Inc., New York, NY	"From reports across the world, it is obvious that this weed can succeed on many soil types. Hanf (1983) reports the weed to be abundant on arable land of all kinds in Europe, particularly in cereals. It is found along cattle paths and in waste places. It is present mainly on fertile clay or sandy loams that are lime free. The plants will tolerate some salinity. In the former Yugoslavia, Tucakov (1957) found this weed grew best on loamy soils at an optimum pH of 8 and with a tolerance at pH 9 if a Cl was not in excess."

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Lim, T.K. (2014). Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	"Chamomile is an erect, aromatic, herbaceous annual, 15–80 cm high with a much branched, light green stem."

412	Forms dense thickets	n
	Source(s)	Notes
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). World Weeds: Natural Histories and Distribution. John Wiley and Sons, Inc., New York, NY	"M. chamomilla is a very versatile weed and appears in 24 crops in more than 50 countries. It is a serious weed of cereals in England, the Netherlands, Poland and Spain" [No description of dense stands or infestations]
	Lym, R. G. & Travnicek, A. J. (2010). Identification and Control of Invasive and Troublesome Weeds in North Dakota. NDSU Extension Service, North Dakota State University and North Dakota Department of Agriculture, Fargo, North Dakota	"Plants grow 6 to 18 inches tall and commonly are found in wet sites, road ditches, old gardens and weedy (waste) areas." [No evidence]

501	Aquatic	n
	Source(s)	Notes
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). World Weeds: Natural Histories and Distribution. John Wiley and Sons, Inc., New York, NY	[Terrestrial] "From reports across the world, it is obvious that this weed can succeed on many soil types. Hanf (1983) reports the weed to be abundant on arable land of all kinds in Europe, particularly in cereals. It is found along cattle paths and in waste places. It is present mainly on fertile clay or sandy loams that are lime free."

502	Grass	n
	Source(s)	Notes

Qsn #	Question	Answer
	USDA, Agricultural Research Service, National Plant Germplasm System. (2023). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a> . [Accessed 16 Jan 2023]	"Family: Asteraceae (alt. Compositae) Subfamily: Asteroideae Tribe: Anthemideae Subtribe: Matricariinae"
503	<b>Nitrogen fixing woody plant</b>	n
	<b>Source(s)</b>	<b>Notes</b>
	USDA, Agricultural Research Service, National Plant Germplasm System. (2023). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a> . [Accessed 16 Jan 2023]	"Family: Asteraceae (alt. Compositae) Subfamily: Asteroideae Tribe: Anthemideae Subtribe: Matricariinae"
504	<b>Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)</b>	n
	<b>Source(s)</b>	<b>Notes</b>
	Das, M. (2015). Chamomile. Medicinal, Biochemical, and Agricultural Aspects. CRC Press, Boca Raton, FL	"Annual herb with fibrous roots, sweetly scented when fresh."
601	<b>Evidence of substantial reproductive failure in native habitat</b>	n
	<b>Source(s)</b>	<b>Notes</b>
	Lim, T.K. (2014). Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	[No evidence] "Matricaria chamomilla is native to southern and eastern Europe and northern and western Asia. It has been introduced elsewhere and has naturalized in North America and Australia."
602	<b>Produces viable seed</b>	y
	<b>Source(s)</b>	<b>Notes</b>
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). World Weeds: Natural Histories and Distribution. John Wiley and Sons, Inc., New York, NY	"Reproduction of <i>M. chamomilla</i> is by seed, with flushes of germination in spring and fall. Seedlings that emerge in late autumn behave as winter annuals and overwinter in rosette form. A plant in favorable surroundings can produce 5000 seeds."
603	<b>Hybridizes naturally</b>	
	<b>Source(s)</b>	<b>Notes</b>
	McKenzie, R. J. (2001). Intergeneric hybridisation in New Zealand Gnaphalieae (Compositae). PhD Dissertation. University of Canterbury, Christchurch	[Unknown. No evidence. Hybrids documented in genus] "Intergeneric hybridisation in the Anthemis group (tribe Anthemideae) has also been investigated experimentally. Natural intergeneric hybrids between Anthemis, Matricaria and Tripleurospermum Sch.Bip. are recorded in Europe (Rothmaler, 1963; Kay, 1971a; Kay, 1971b; Mitsuoka and Ehrendorfer, 1972; Stace, 1975)."

Qsn #	Question	Answer
604	Self-compatible or apomictic	y
	Source(s)	Notes
	Yadav, N. et al. (2022). Investigation on pollination approaches, reproductive biology and essential oil variation during floral development in German chamomile ( <i>Matricaria chamomilla</i> L.). <i>Scientific Reports</i> , 12(1), 1-13	"Breeding systems. German chamomile could be believed cross-pollinated plant due to high insect movements during flowering <sup>42</sup> . However, the proportion of cross-pollination may vary over different varieties and ploidy levels. In the present study, analysis of variance for seed setting showed a highly significant ( $p \leq 0.01$ ) difference among all the three controlled pollination experiments (open pollination, selfed and crossed) (Fig. 6f). The results showed the highest (91%) viable seed setting in open pollination conditions (Fig. 6f). Few disc florets (3–9%) at the central tip of the capitulum were not developed into seeds, possibly due to tip sterility or improper development of florets. However, the seed set was also successfully achieved in selfed conditions (73%) and manually hand-pollinated experiments (78%), where all the disc florets were removed for controlled pollination. As the ray florets are the fertile pistillate florets, and stamens are present only in disc florets, disc florets removal was practiced for controlled pollination. The experiments showed that the practice of removal of disc florets could be successfully used as an alternate to emasculation in German chamomile (Fig. 6a–e). Moreover, comparable seed settings in selfed conditions indicated the possibility of often-cross pollination behavior in this plant."

605	Requires specialist pollinators	n
	Source(s)	Notes



Qsn #	Question	Answer
	<p>Das, M. (2015). Chamomile. Medicinal, Biochemical, and Agricultural Aspects. CRC Press, Boca Raton, FL</p>	<p>"Chamomile plants exhibit high variability. This variability is related to the entomophilous mode of pollination. The inflorescence of the plant is characteristically structured to favor pollination by insects. The receptacle bearing the flowers is erect and provides easy accessibility to the insects. In the receptacle, the whorl of flowers matures centripetally. In each flower, the stigma emerges out of the syngenesious anthers 24 hours before the anthers dehisce and insect pollination occurs with pollen from a different flower. In a study by Kuberappa et al. (2007), it was found that the flowers opened from 06.30 am to 07.00 am and anther dehiscence was initiated at 07.00 am. The dehiscence of the anthers and release of pollen grains take place inside the tube of the already pollinated flower (Claphman et al. 1962). The pollen adheres to the stigma of the flower and is made available to the visiting insect during or after the emergence of the style. The honeybees have been found by Kuberappa et al. (2007) to collect nectar from the base of the corolla tube. Kuberappa et al. (2012), in South India, found mainly three species of honeybees namely <i>Apis cerana</i>, <i>Apis floreae</i>, and <i>Trigona iridipennis</i> foraging. They found that <i>Apis floreae</i> visited a plant 7.31 times in 5 minutes. This species was followed by <i>Apis cerana</i> (3.36 visits per plant in 5 minutes), <i>Trigona iridipennis</i> (2.65 visits per plant in 5 minutes), and other species of pollinators (2.36 visits per plant in 5 minutes). As a result of insect pollination, inbreeding is not common in chamomile. All these factors ensure outbreeding in the population, thus creating tremendous variability. In addition to creating variability, Kuberappa et al. (2012) found that the modes of pollination indeed increased the productivity of chamomile. They found that open pollination gave more yield of flowers and oil compared with the plants grown in plots caged with <i>Apis cerana</i>, <i>Apis floreae</i>, and <i>Trigona iridipennis</i>."</p>

606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	<p>Holm, L.G., Doll, J., Holm, E., Pancho, J.V. &amp; Herberger, J.P. (1997). World Weeds: Natural Histories and Distribution. John Wiley and Sons, Inc., New York, NY</p>	<p>"Reproduction of <i>M. chamomilla</i> is by seed, with flushes of germination in spring and fall." [Annual. No evidence]</p>

Qsn #	Question	Answer
607	Minimum generative time (years)	1
	Source(s)	Notes
	Lim, T.K. (2014). Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	"Chamomile is an erect, aromatic, herbaceous annual, 15–80 cm high with a much branched, light green stem."
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). World Weeds: Natural Histories and Distribution. John Wiley and Sons, Inc., New York, NY	"In stands of <i>M. chamomilla</i> , flowering proceeds from May to September in the north temperate zone, with some plants having two flowering periods per year. Roberts and Feast (1974) in England found that several mayweeds that may emerge from January to June, including <i>M. chamomilla</i> , required progressively shorter periods to first flowering as days become longer, reaching a minimum of 40 to 50 days. After midsummer the time from emergence to flowering became longer. Plants emerging in late summer-early fall remained in rosette form over the winter and flowered the next spring. In plants held at 8, 13, 15, and 17 hours of daylength in a glasshouse, flowering was hastened at the longer photoperiods."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	Source(s)	Notes
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). World Weeds: Natural Histories and Distribution. John Wiley and Sons, Inc., New York, NY	"Ridley (1930) reports that the seed surfaces have a mucilaginous exudation from hairs and glands when moist and this helps in seed dispersal."
	Mayer, F., Albrecht, H., & Pfadenhauer, J. (2002). Secondary dispersal of seeds in the soil seed bank by cultivation. Journal of Plant Diseases and Protection, 18: 551-560	[Dispersed on farm machinery] "In agricultural landscapes tillage implements act as dispersal vectors for weed seeds. The aim of the presented investigations was to estimate numbers of diaspores contained in the transported soil and transport distances. Tillage experiments with five different implements (plough, heavy cultivator, rotary harrow, rotary tiller, curry comb) and a tractor were carried out. Under moist conditions, and when using implements which carry much soil, numbers of transported seeds increased linearly with soil mass; species numbers increased to a maximum value. Under dry conditions insufficient soil was collected, especially by implements with little surface area, to come close to a maximum value. The species in the adhering soil had a lower average seed weight than the species of the above ground vegetation on the experimental plots. Examples which took seed bank data and farming operations into consideration showed that between two fields which are 1.7 km apart a transport of approximately 3,500 seeds could potentially occur during one season. Even species introduction into an arable field was assumed possible."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Lim, T.K. (2014). Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	" <i>Matricaria chamomilla</i> is native to southern and eastern Europe and northern and western Asia. It has been introduced elsewhere and has naturalized in North America and Australia."

703	Propagules likely to disperse as a produce contaminant	y
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Major Pathway/s: Contaminant, Crop, Herbal, Ornamental Dispersed by: Humans, Horse, Livestock, Escapee Weed of: Canola, Cereals, Grapevines, Orchards & Plantations, Pastures, Pome Fruits, Vegetables"
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). World Weeds: Natural Histories and Distribution. John Wiley and Sons, Inc., New York, NY	"Perhaps related to this was a report by Petzold (1959) on the dispersal of weed seeds by several types of machines and harvesting systems that were coming into use in cereal fields. On average, 60 to 80% of the weed seeds were found in the grain as it was harvested with combine machines. The blow chaff (resulting from the cleaning operation inside the combine) contained 10 to 25 percent of the weed seed (that was sometimes returned to the ground). <i>M. chamomilla</i> was among the four species found in greatest quantity in the chaff."

704	Propagules adapted to wind dispersal	n
	<b>Source(s)</b>	<b>Notes</b>
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Horse, Livestock, Escapee"
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). World Weeds: Natural Histories and Distribution. John Wiley and Sons, Inc., New York, NY	"Ridley (1930) reports that the seed surfaces have a mucilaginous exudation from hairs and glands when moist and this helps in seed dispersal."

705	Propagules water dispersed	n
	<b>Source(s)</b>	<b>Notes</b>
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Horse, Livestock, Escapee"
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). World Weeds: Natural Histories and Distribution. John Wiley and Sons, Inc., New York, NY	"Ridley (1930) reports that the seed surfaces have a mucilaginous exudation from hairs and glands when moist and this helps in seed dispersal."
	WRA Specialist. (2023). Personal Communication	Possibly, if grown in riparian areas, but no direct evidence or adaptations for water dispersal found

706	Propagules bird dispersed	n
	<b>Source(s)</b>	<b>Notes</b>
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Horse, Livestock, Escapee"
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). World Weeds: Natural Histories and Distribution. John Wiley and Sons, Inc., New York, NY	"Ridley (1930) reports that the seed surfaces have a mucilaginous exudation from hairs and glands when moist and this helps in seed dispersal." [Could potentially adhere to birds, but direct evidence not found]

707	Propagules dispersed by other animals (externally)	n
	<b>Source(s)</b>	<b>Notes</b>

Qsn #	Question	Answer
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). <i>World Weeds: Natural Histories and Distribution</i> . John Wiley and Sons, Inc., New York, NY	[Likely externally dispersed] "It is found along cattle paths and in waste places." ... "Ridley (1930) reports that the seed surfaces have a mucilaginous exudation from hairs and glands when moist and this helps in seed dispersal."

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). <i>World Weeds: Natural Histories and Distribution</i> . John Wiley and Sons, Inc., New York, NY	"In a study of weed seeds consumed by cattle, Hansen (1911) in Norway learned that a single cow in a weedy field may ingest one-half million <i>M. chamomilla</i> seeds in one day and pass one-fourth of these in feces, with 27 percent remaining viable. As with many species, such seeds remain dormant in the dung heaps until the material is sufficiently decomposed that the seeds can germinate."

801	Prolific seed production (>1000/m2)	y
	Source(s)	Notes
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). <i>World Weeds: Natural Histories and Distribution</i> . John Wiley and Sons, Inc., New York, NY	"A plant in favorable surroundings can produce 5000 seeds."

802	Evidence that a persistent propagule bank is formed (>1 yr)	y
	Source(s)	Notes
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. (1997). <i>World Weeds: Natural Histories and Distribution</i> . John Wiley and Sons, Inc., New York, NY	"In long-term experiments with seeds buried in soil, Salzmann (1954) obtained germination of 89, 81, 77, and 73% after 1, 2, 3, and 11 years, respectively."

803	Well controlled by herbicides	y
	Source(s)	Notes
	Lym, R. G. & Travnicek, A. J. (2010). <i>Identification and Control of Invasive and Troublesome Weeds in North Dakota</i> . NDSU Extension Service, North Dakota State University and North Dakota Department of Agriculture, Fargo, North Dakota	"Chemical. Today, chamomile species can be controlled easily with any sulfonylurea herbicide such as Ally, Cimarron or Escort (metsulfuron) and Telar (chlorsulfuron). Bromoxynil plus MCPA and Tordon (picloram) also provide good chamomile control."
	Das, M. (2015). <i>Chamomile. Medicinal, Biochemical, and Agricultural Aspects</i> . CRC Press, Boca Raton, FL	"Mackova and Helemikova (1992) in Slovakia studied the effect of the herbicide Hedonal DP (dichlorprop) on chamomile plants. The chamomile plants were found to be resistant at 1.5 L/ha. At a higher dose of 3 L/ha, it was found that 33% of chamomile plants died. Hedonal DP had no negative effect at 1.5 L/ha on either the content or composition of the essential oil or the fertility of the chamomile seeds." [May be resistant to some herbicides]

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes

Qsn #	Question	Answer
	Lym, R. G. & Travnicek, A. J. (2010). Identification and Control of Invasive and Troublesome Weeds in North Dakota. NDSU Extension Service, North Dakota State University and North Dakota Department of Agriculture, Fargo, North Dakota	"Mechanical. Hand-pulling can be an effective control method in small infestations of chamomile. Mowing early in the growing season or before plants flower will reduce populations but should be repeated often. Shallow tillage is recommended during hot, dry weather."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	Lym, R. G. & Travnicek, A. J. (2010). Identification and Control of Invasive and Troublesome Weeds in North Dakota. NDSU Extension Service, North Dakota State University and North Dakota Department of Agriculture, Fargo, North Dakota	[Unknown in the Hawaiian Islands] "Biological. Several biological control agents have been researched for scentless chamomile control. The seed-head weevil, <i>Omphalaplus hookeri</i> , feeds on developing seeds of the plant, thereby reducing seed production. The stem-boring weevil, <i>Microplontus edentulous</i> , feeds on the interior of the stem and produces hollow areas that reduce the vigor of the plant. <i>Rhopalomyia tripleurospermii</i> , the scentless chamomile gall midge, forms a gall on the plant, which acts as a nutrient sink that can interrupt and stunt the growth of the plant. Research still is being conducted on these biocontrol agents to predict effectiveness in reducing plant population."

**Summary of Risk Traits:**

## High Risk / Undesirable Traits

- Able to grow in temperate and subtropical climates.
- Widely cultivated and naturalized (but no evidence in the Hawaiian Islands to date).
- A common weed of other agricultural crops worldwide.
- Other *Matricaria* species are invasive weeds.
- May be allelopathic.
- Unpalatable to deer, and other browsing and grazing animals (although cows may consume it in infested pastures).
- May taint milk if consumed by dairy cows.
- May be mildly toxic or cause dermatitis to susceptible people.
- Tolerates many soil types.
- Reproduces by prolific seed production.
- Self-fertile.
- Quickly reaches reproductive maturity (< 1 year).
- Seeds dispersed by externally on farm equipment, and possible animals, as a crop contaminant, internally by cattle, and through intentional cultivation.
- One plant can produce up to 5000 seeds.
- Seeds may form a persistent seed bank (up to 11 years).

## Low Risk Traits

- A primarily temperate species that may not thrive in tropical climates, and may be a greater risk at cooler, higher elevations of tropical island ecosystems.
- Valued and cultivated as an herbal and medicinal plant.
- Unarmed (no spines, thorns, or burrs).
- Grows best in high light environments (dense shade may inhibit spread).
- Hand pulling can be effective in controlling smaller populations. Mowing may limit seed set in larger infestations.
- Herbicides may provide effective control.