Keywords: High Risk, Annual, Edible, Naturalized, Invasive, Non-toxic, Self-compatible, Sun

Family: ***Amaranthaceae***

Taxon: ***Amaranthus tricolor***

Synonym:
Amaranthus gangeticus L.
Amaranthus gangeticus var. melancholicus (L
Amaranthus mangostanus L.
Amaranthus melancholicus L.
Amaranthus polygamus L.
Amaranthus tricolor subsp. mangostanus (L.)
Amaranthus tricolor subsp. tristis (L.) Thell.

Common Name:
Chinese amaranth
Chinese spinach
Joseph's coat
summer-pointsettia
tampala

Questionaire : current 20090513 **Assessor:** Patti Clifford **Designation:** H(HPWRA)
Status: Assessor Approved **Data Entry Person:** Patti Clifford **WRA Score 14**

101	**Is the species highly domesticated?**	**y=-3, n=0**	**n**
102	**Has the species become naturalized where grown?**	**y=1, n=-1**	
103	**Does the species have weedy races?**	**y=1, n=-1**	
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)**	**High**
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**	**y**
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)**	**y**
303	**Agricultural/forestry/horticultural weed**	**n=0, y = 2*multiplier (see Appendix 2)**	**n**
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**	**y=1, n=0**	
403	**Parasitic**	**y=1, n=0**	**n**
404	**Unpalatable to grazing animals**	**y=1, n=-1**	
405	**Toxic to animals**	**y=1, n=0**	**n**
406	**Host for recognized pests and pathogens**	**y=1, n=0**	
407	**Causes allergies or is otherwise toxic to humans**	**y=1, n=0**	**n**
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**	**y=1, n=0**	**n**
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**	**y=1, n=-1**	
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**	
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**	**n**
704	**Propagules adapted to wind dispersal**	**y=1, n=-1**	**n**
705	**Propagules water dispersed**	**y=1, n=-1**	
706	**Propagules bird dispersed**	**y=1, n=-1**	
707	**Propagules dispersed by other animals (externally)**	**y=1, n=-1**	**y**
708	**Propagules survive passage through the gut**	**y=1, n=-1**	**y**
801	**Prolific seed production (>1000/m2)**	**y=1, n=-1**	
802	**Evidence that a persistent propagule bank is formed (>1 yr)**	**y=1, n=-1**	
803	**Well controlled by herbicides**	**y=-1, n=1**	
804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**y=1, n=-1**	
805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	**y=-1, n=1**	

Designation: H(HPWRA) **WRA Score** **14**

Supporting Data:

101	2004. Grubben, G.J.H. (ed.). Vegetables. Volume 2 of Plant resources of tropical Africa. PROTA, Wageningen, Netherlands	[Is the species highly domesticated? No] Its domestication took place in prehistoric times and the wild ancestor is not known.
101	2012. WRA Specialist. Personal Communication.	[Is the species highly domesticated? No] No evidence of domestication that reduces invasive traits.
102	2012. WRA Specialist. Personal Communication.	[Has the species become naturalized where grown? NA]
103	2012. WRA Specialist. Personal Communication.	[Does the species have weedy races? NA]
201	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"? 2 - High] Native region: Asia from Pakistan to China, Japan, and Indonesia.
202	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Quality of climate match data? 2 - High] Native region: Asia from Pakistan to China, Japan, and Indonesia.
203	2012. Missouri Botanical Garden. Amaranthus tricolor (vegetable group). http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/plant-finder/plant-details/kc/a688/amaranthus-tricolor-vegetable-group.aspx	[Broad climate suitability (environmental versatility)? Yes] USDA zones: 2 - 11.
204	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Native or naturalized in regions with tropical or subtropical climates? Yes] Native region: Asia from Pakistan to China, Japan, and Indonesia.
205	2004. Grubben, G.J.H. (ed.). Vegetables. Volume 2 of Plant resources of tropical Africa. PROTA, Wageningen, Netherlands	[Does the species have a history of repeated introductions outside its natural range? Yes] Amaranthus tricolor has been introduced to several African countries, (Benin, Nigeria, Kenya and Tanzania).
205	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Does the species have a history of repeated introductions outside its natural range? Yes] Widely cultivated and escaped into Africa, the Caribbean and islands of the Pacific.
301	1970. Stone, B.C.. The flora of Guam. Micronesica. 6: 1-659.	[Naturalized beyond native range? Yes] Cultivated as a potherb and naturalized in Guam.
301	2003. Wu, Z.Y./Raven,P.H./Hong, D.Y. (eds.). Flora of China. Vol. 5 (Ulmaceae through Basellaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Naturalized beyond native range? Yes] Widely cultivated and naturalized in China.
302	2004. Grubben, G.J.H. (ed.). Vegetables. Volume 2 of Plant resources of tropical Africa. PROTA, Wageningen, Netherlands	[Garden/amenity/disturbance weed?] Weedy plants of Amaranthus tricolor can be found occasionally. They are recently escaped from cultivation, since Amaranthus tricolor is far from competitive with true weeds.
302	2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	[Garden/amenity/disturbance weed? Yes] The GCW lists Amaranthus tricolor as an environmental weed. The research is unavailable, so scored for this question according to protocol.
303	2012. WRA Specialist. Personal Communication.	[Agricultural/forestry/horticultural weed? No] No evidence on production impacts or control.
304	2012. WRA Specialist. Personal Communication.	[Environmental weed? No] No evidence of impacts or control. The Global Compendium of Weeds lists Amaranthus tricolor as and environmental weed. (scored in 3.02)
305	2004. Costea, M./Weaver, S.E./Tardif, F.J.. The biology of Canadian weeds. 130. Amaranthus retroflexus L., A. powellii S. Watson and A. hybridus L. (update). Canadian Journal of Plant Science. 84: 631-668.	[Congeneric weed? Yes] Amaranthus retroflexus is a weed of 60 crops in 70 countries, while A. hybridus is a weed of 27 crops in 27 countries. The detrimental effects include reductions in crop yield and quality, toxicity to livestock, production of secondary chemicals with allelopathic effects on crops, serving as alternative hosts for crop pathogens and insect pests, and production of pollen that causes allergic reactions in humans.
401	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Produces spines, thorns or burrs? No] Annual herb to 4' tall. Leaves long-petiolate; blades broadly ovate to diamond shaped.

402	2012. WRA Specialist. Personal Communication.	[Allelopathic? Unknown]
403	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Parasitic? No] Not parasitic.
404	2004. Grubben, G.J.H. (ed.). Vegetables. Volume 2 of Plant resources of tropical Africa. PROTA, Wageningen, Netherlands	[Unpalatable to grazing animals?] "The rather high content of hydrocyanic acid and oxalic acid makes it less suitable for fresh consumption by humans and is a limiting factor for the use as fodder for animals."
404	2012. WRA Specialist. Personal Communication.	[Unpalatable to grazing animals? Unknown] [possibly]
405	2008. Wagstaff, D.J.. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	[Toxic to animals? No] No evidence.
405	2012. National Center for Biotechnology Information. PubMed. http://www.ncbi.nlm.nih.gov/sites/entrez	[Toxic to animals? No] No evidence.
406	2004. Grubben, G.J.H. (ed.). Vegetables. Volume 2 of Plant resources of tropical Africa. PROTA, Wageningen, Netherlands	[Host for recognized pests and pathogens?] "The main disease of Amaranthus tricolor is stemrot caused by the fungus Choanephora cucurbitarum. Damping-off caused by Pythium and Rhizoctonia may be serious in seedlings....White rust (Albugo bliti) is sometimes serious, leaf and stem blight caused by Phomopsis amaranthophila can be serious. No virus diseases have been reported."
406	2012. WRA Specialist. Personal Communication.	[Host for recognized pests and pathogens? Unknown]
407	2004. Grubben, G.J.H. (ed.). Vegetables. Volume 2 of Plant resources of tropical Africa. PROTA, Wageningen, Netherlands	[Causes allergies or is otherwise toxic to humans? No] The leaves and stems are used as vegetable. Widely eaten in Asian countries.
407	2008. Wagstaff, D.J.. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	[Causes allergies or is otherwise toxic to humans? No] No evidence.
407	2012. National Center for Biotechnology Information. PubMed. http://www.ncbi.nlm.nih.gov/sites/entrez	[Causes allergies or is otherwise toxic to humans? No] No evidence.
408	2004. Grubben, G.J.H. (ed.). Vegetables. Volume 2 of Plant resources of tropical Africa. PROTA, Wageningen, Netherlands	[Creates a fire hazard in natural ecosystems? No] No evidence.
409	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Is a shade tolerant plant at some stage of its life cycle?] In Hawaii, cultivars with a large reddish blotch in the center of a green leaf are popular (yin choi, hin choi) and require full sun.
409	2012. ECHO Asia Impact Center. Seed Catalog.	[Is a shade tolerant plant at some stage of its life cycle? No] Amaranthus tricolor prefers sunny locations.
410	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)? Yes] In Hawaii, cultivars with a large reddish blotch in the center of a green leaf are popular (yin choi, hin choi) grow on any soil.
410	2011. Agriinfo.in. Cultivation of amaranths (Amaranthus tricolor). http://www.agriinfo.in/default.aspx?page=topic&superid=2&topicid=952	[Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)? Yes] It can be grown on all types of soil, but loam soil is most suitable for its cultivation. Fine seed bed necessary for this crop and this can be done by repeated ploughing.
410	2012. Missouri Botanical Garden. Amaranthus tricolor (vegetable group). http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/plant-finder/plant-details/kc/a688/amaranthus-tricolor-vegetable-group.aspx	[Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)?] Fertile well-drained soil.
411	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Climbing or smothering growth habit? No] Annual herb to 4 ft. tall.
412	2012. WRA Specialist. Personal Communication.	[Forms dense thickets? No] No evidence of thicket formation.

501	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Aquatic? No] Terrestrial; herbaceous.
502	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Grass? No] Herb; Amaranthaceae.
503	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Nitrogen fixing woody plant? No] Herbaceous.
504	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] Herbaceous without underground storage units.
601	2012. WRA Specialist. Personal Communication.	[Evidence of substantial reproductive failure in native habitat? No] No evidence.
602	2004. Grubben, G.J.H. (ed.). Vegetables. Volume 2 of Plant resources of tropical Africa. PROTA, Wageningen, Netherlands	[Produces viable seed? Yes] Grow from seed.
602	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Produces viable seed? Yes] Self-sows readily and seedlings proliferate where ever plants are allowed to go to seed.
603	2012. WRA Specialist. Personal Communication.	[Hybridizes naturally? Unknown]
604	1981. Khoshoo, T.N.. Breeding systems in relation to evolution in some ornamentals. Proceedings of the Indian National Science Academy. B47: 279-301.	[Self-compatible or apomictic? Yes] Self-fertilizing.
604	2004. Grubben, G.J.H. (ed.). Vegetables. Volume 2 of Plant resources of tropical Africa. PROTA, Wageningen, Netherlands	[Self-compatible or apomictic? Yes] Pollination is effected by wind, but the abundant pollen production causes a high rate of self-pollination.
605	1981. Khoshoo, T.N.. Breeding systems in relation to evolution in some ornamentals. Proceedings of the Indian National Science Academy. B47: 279-301.	[Requires specialist pollinators? No] Wind-pollinated.
605	2004. Grubben, G.J.H. (ed.). Vegetables. Volume 2 of Plant resources of tropical Africa. PROTA, Wageningen, Netherlands	[Requires specialist pollinators? No] Pollination is effected by wind, but the abundant pollen production causes a high rate of self-pollination.
606	2012. WRA Specialist. Personal Communication.	[Reproduction by vegetative fragmentation? Unknown]
607	2012. ECHO Asia Impact Center. Seed Catalog.	[Minimum generative time (years)? 1] Fast-growing, short-lived annual.
701	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? Yes] The species self-sows readily and seedlings proliferate anywhere plants are allowed to go to seed.
702	2004. Grubben, G.J.H. (ed.). Vegetables. Volume 2 of Plant resources of tropical Africa. PROTA, Wageningen, Netherlands	[Propagules dispersed intentionally by people? Yes] In South and South-East Asia Amaranthus tricolor is one of the major leaf vegetables and the most important Amaranthus species.
702	2012. ECHO Asia Impact Center. Seed Catalog.	[Propagules dispersed intentionally by people? Yes] Amaranthus tricolor is grown for its protein rich leaves and plant tops.
703	2012. WRA Specialist. Personal Communication.	[Propagules likely to disperse as a produce contaminant? No] No evidence.
704	2000. Staples, G.W./Herbst, D.R/Imada, C.T.. Survey of invasive or potentially invasive cultivated plants in Hawai'i. Bishop Museum Occasional Papers. 65: 1-35.	[Propagules adapted to wind dispersal? No] Dispersed in stock manure and by ants.
705	2012. WRA Specialist. Personal Communication.	[Propagules water dispersed? Unknown]

706	2000. Staples, G.W./Herbst, D.R/Imada, C.T.. Survey of invasive or potentially invasive cultivated plants in Hawai'i. Bishop Museum Occasional Papers. 65: 1-35.	[Propagules bird dispersed? Unknown] Possibly.
707	2000. Staples, G.W./Herbst, D.R/Imada, C.T.. Survey of invasive or potentially invasive cultivated plants in Hawai'i. Bishop Museum Occasional Papers. 65: 1-35.	[Propagules dispersed by other animals (externally)? Yes] Seeds are spread in livestock manure and by ants.
708	2000. Staples, G.W./Herbst, D.R/Imada, C.T.. Survey of invasive or potentially invasive cultivated plants in Hawai'i. Bishop Museum Occasional Papers. 65: 1-35.	[Propagules survive passage through the gut? Yes] Seeds are spread in livestock manure and by ants.
801	2012. WRA Specialist. Personal Communication.	[Prolific seed production (>1000/m2)? Unknown]
802	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Evidence that a persistent propagule bank is formed (>1 yr)?] Self-sows readily.
802	2012. WRA Specialist. Personal Communication.	[Evidence that a persistent propagule bank is formed (>1 yr)? Unknown]
803	2012. WRA Specialist. Personal Communication.	[Well controlled by herbicides? Unknown]
804	2012. WRA Specialist. Personal Communication.	[Tolerates, or benefits from, mutilation, cultivation, or fire? Unknown]
805	2012. WRA Specialist. Personal Communication.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown]

Summary of Risk Traits

High Risk / Undesirable Traits

- Native to tropical regions
- Adapted to wide variety of climatic conditions
- Naturalized in Guam and China
- Invasive
- Congeneric weed
- Possibly unpalatable to animals
- Tolerates wide variety of soil types
- Self-fertilizing
- Annual
- Unintentional dispersal
- Human and ant dispersed

Low Risk / Desirable Traits

- Non-toxic
- Not shade-tolerant
- Limited dispersal mechanisms