

Family: *Lythraceae*

Taxon: *Lawsonia inermis*

Synonym: *Lawsonia alba* Lam.

Common Name: Henna
Mignonette tree
Alcana
henné

Questionnaire :	current 20090513	Assessor:	Chuck Chimera	Designation:	EVALUATE
Status:	Assessor Approved	Data Entry Person:	Chuck Chimera	WRA Score	5
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)		Low
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)		
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)		n
401	Produces spines, thorns or burrs		y=1, n=0		y
402	Allelopathic		y=1, n=0		n
403	Parasitic		y=1, n=0		n
404	Unpalatable to grazing animals		y=1, n=-1		n
405	Toxic to animals		y=1, n=0		n
406	Host for recognized pests and pathogens		y=1, n=0		n
407	Causes allergies or is otherwise toxic to humans		y=1, n=0		y
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		
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	
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	>3
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
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	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
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	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	

Designation: EVALUATE

WRA Score 5

Supporting Data:

101	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Is the species highly domesticated?? No] "Many cultivars already exist locally, having being selected for their leaves or flowers. Research is also needed on ways to improve drying and processing of the leaves."
102	2012. WRA Specialist. Personal Communication.	NA
103	2012. WRA Specialist. Personal Communication.	NA
201	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Species suited to tropical or subtropical climate(s) 2-High] "It originates from the Persian Gulf region (and possibly northeast Africa) to northwest India and is now cultivated widely throughout the tropics and subtropics."
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 0-Low] "...cultivated in Africa and Asia for so long that its native range is unknown."
203	2002. Ved, D.K./Oommen, S./Singh, A.. Propagation and Agrotechnology Status of Commercially Important Medicinal Plant Species Of The Project Area Of Andhra Pradesh Community Forest Management Project. FRLHT, Bangalore	[Broad climate suitability (environmental versatility)? Yes] "This plant is hardy by nature and can tolerate a wide range of climatic conditions. However, hot and dry climate with a temperature range of 20-30°C is considered to be ideal. It can even grow with low rainfall ranging from 200-450m."
203	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Broad climate suitability (environmental versatility)? Yes] "It is adapted to a wide range of environmental conditions, but requires high temperatures for good growth." ... " - Altitude range: 0 - 1500 m - Mean annual rainfall: 500 - 1000 mm - Rainfall regime: summer; winter; bimodal - Dry season duration: 3 - 6 months - Mean annual temperature: 17 - 25°C - Mean maximum temperature of hottest month: 28 - 36°C - Mean minimum temperature of coldest month: 6 - 13°C - Absolute minimum temperature: > 0°C"
204	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Native or naturalized in regions with tropical or subtropical climates? Yes] "It originates from the Persian Gulf region (and possibly northeast Africa) to northwest India and is now cultivated widely throughout the tropics and subtropics."
205	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Does the species have a history of repeated introductions outside its natural range? Yes] "It originates from the Persian Gulf region (and possibly northeast Africa) to northwest India and is now cultivated widely throughout the tropics and subtropics."
205	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Does the species have a history of repeated introductions outside its natural range? Yes] "Native: Algeria, Cyprus, Egypt, Eritrea, Ethiopia, Indonesia, Iran, Iraq, Jordan, Kenya, Kuwait, Lebanon, Libyan Arab Jamahiriya, Malaysia, Morocco, Oman, Philippines, Qatar, Saudi Arabia, Syrian Arab Republic, Tanzania, Tunisia, Turkey, Western Sahara, Yemen." ... "Exotic: Australia, Benin, Burkina Faso, Cameroon, Central African Republic, Chad, China, Congo, Cote d'Ivoire, Democratic Republic of Congo, Gabon, Gambia, Ghana, Guinea, India, Liberia, Mali, Mauritania, Niger, Nigeria, Pakistan, Senegal, Sierra Leone, Spain, Sudan, Togo, Zanzibar"
301	1994. Liogier, H.A.. Descriptive Flora of Puerto Rico and Adjacent Islands. Spermatophyta, Volume III. Cyrillaceae to Myrtaceae. La Editorial, UPR, San Juan, Puerto Rico	[Naturalized beyond native range? Yes] "Widely planted for ornament, and spontaneous after cultivation, PR; native probably of eastern Africa and Asia, now grown for ornament and naturalized in most tropical regions."
301	2001. Hanelt, P. (ed.). Mansfeld's encyclopedia of agricultural and horticultural crops: (except ornamentals). Angiospermae - monocotyledones: orchidaceae - pandanaceae, Volume 5. Springer-Verlag, Berlin, Heidelberg, New York	[Naturalized beyond native range? Yes] "Widely cultivated in Near East, Middle Asia, SE Asia, S China, Japan, Philippines, N and SE Africa, tropical America. In these regions also often escaped from cultivation and naturalized."
301	2007. Guezou, A./Poza, P./Buddenhagen, C.. Preventing Establishment: An Inventory of Introduced Plants in Puerto Villamil, Isabela Island, Galapagos. PLoS ONE. 2(10): e1042. doi:10.1371/journal.pone.0001042.	[Naturalized beyond native range? Yes] "Lawsonia inermis was determined to be fully naturalized in Puerto Villamil."
301	2008. Connor, R.A.. Anguilla Invasive Species strategy (2008) draft. Department of Environment, Anguilla, WI	[Naturalized beyond native range? Presumably Yes] "The following list provides an overview of the known invasive species that are found throughout Anguilla" [Includes Lawsonia inermis]

302	2007. Randall, R.P.. Global Compendium of Weeds - Index [Online Database]. http://www.hear.org/gcw/	[Garden/amenity/disturbance weed? Possibly] "cultivation escape, naturalised, weed" [Listed as naturalized or as a weed, but impacts unspecified]
302	2008. Connor, R.A.. Anguilla Invasive Species strategy (2008) draft. Department of Environment, Anguilla, WI	[Garden/amenity/disturbance weed? Possibly] "The following list provides an overview of the known invasive species that are found throughout Anguilla" [Includes <i>Lawsonia inermis</i> but negative impacts, if any, unspecified]
303	2007. Randall, R.P.. Global Compendium of Weeds - Index [Online Database]. http://www.hear.org/gcw/	[Agricultural/forestry/horticultural weed? No] No evidence
304	2007. Randall, R.P.. Global Compendium of Weeds - Index [Online Database]. http://www.hear.org/gcw/	[Environmental weed? No] No evidence
305	2005. Jansen, P.C.M./Cardon, D.. Plant Resources of Tropical Africa. Volume 3. Dyes and Tannins. PROTA, Wageningen, Netherlands	[Congeneric weed? No] " <i>Lawsonia</i> comprises only 1 species."
401	2007. Kubitzki, K./Bayer, C./Stevens, P.F.. The families and genera of vascular plants: Volume IX. Flowering Plants. Eudicots. Springer-Verlag, Berlin, Heidelberg, New York	[Produces spines, thorns or burrs? Yes] "Small glabrous shrubs, branches stiffly divaricate, often terminating in a rigid spine."
401	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Produces spines, thorns or burrs? Yes] " <i>Lawsonia inermis</i> is a much branched glabrous shrub or small tree 2-6 m in height, which may be spiny. Bark greyish brown, unarmed when young, older plants with spine tipped branchlets. Young branches quadrangular, green but turn red with age."
402	2003. Fujii, Y./Parvez, S. S./Parvez, M.M./Ohmae, Y./Iida, O.. Screening of 239 medicinal plant species for allelopathic activity using the sandwich method. <i>Weed Biology and Management</i> . 3: 233-241.	[Allelopathic? No] "Table 1. Screening of leaf litter of 239 medicinal plant species under different families using the sandwich method" [<i>Lawsonia inermis</i> not shown to have a stronger inhibitory activity greater than the mean]
403	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Parasitic? No] " <i>Lawsonia inermis</i> is a much branched glabrous shrub or small tree 2-6 m in height, which may be spiny."
404	1978. Leuthold, W.. Ecological Separation among Browsing Ungulates in Tsavo East National Park, Kenya. <i>Oecologia</i> . 35(2): 241-252.	[Unpalatable to grazing animals? No] "Table 2a. Overlap in the diets of gerenuk, lesser kudu and giraffe, on the basis of percentages of individual plant species in their diets" [<i>Lawsonia inermis</i> consumed by browsing ungulates]
404	1984. Lusigi, W.J./Nkurunziza, E.R./Masheti, S.. Forage Preferences of Livestock in the Arid Lands of Northern Kenya. <i>Journal of Range Management</i> . 37(6): 542-548.	[Unpalatable to grazing animals? No] "Table 1. Food preference of various livestock species in the Integrated Project on Arid Lands (I.P.A.L.) Study Area in the wet and dry seasons. (VD - Very desirable; D - Desirable; I - Intermediate; U - Undesirable)" [Desirable to camels and goats]
404	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Unpalatable to grazing animals? No] "Fodder: Leaves of <i>L. inermis</i> are browsed by livestock." ... "Young plants must be protected from browsing animals and can be watered to increase growth rate."
405	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Toxic to animals? No evidence] "Fodder: Leaves of <i>L. inermis</i> are browsed by livestock."
406	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Host for recognized pests and pathogens? No] "Very few pests and diseases attack <i>L. inermis</i> . A black root rot caused by <i>Corticium koleroga</i> and a bacterial leaf spot caused by <i>Xanthomonas lawsoniae</i> have been reported from India."
407	2000. Gamaniel, K.S.. Toxicity from Medicinal Plants and their Products. <i>Nigerian Journal of Natural Products and Medicine</i> . 4: 1-8.	[Causes allergies or is otherwise toxic to humans? Yes] "The pollens of <i>Lawsonia inermis</i> L. (Lythraceae) have been reported to cause asthma, rhinitis and other nasobronchial allergies."

407	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Causes allergies or is otherwise toxic to humans? No evidence, but possibly if used medicinally at incorrect dosage] "Medicine: Roots are regarded as a potent medicine for gonorrhoea and to enhance fertility in women; a decoction of them is considered to be diuretic or for treating blenorrhoea and pectoral for bronchitis. A reported constituent of the leaves is an oxynaphthoquinone called lawsone, which has antibiotic properties. Flower oil contains alpha- and betaionone, the latter being the main component. Leaf and flower infusions are applied externally for ulcers and rheumatism or are taken orally for tetanus, epilepsy and stomach pains; leaves are used in treatment of leprosy, jaundice and scurvy. Astringent roots are ground and rubbed on the heads of children to treat boils and eye diseases. In Malaysia, fresh bruised leaves are used as poultices to relieve a burning sensation of the feet; to treat beriberi, skin diseases, boils, circumcision wounds and distension of the stomach; a decoction can also be gargled to treat gum boils, or prescribed to relieve abdominal pains after childbirth. It is an emmenagogue and an abortifacient. In Indonesia, a paste of the leaves is applied for diseases of the fingernails and for herpes infection; tea made from the leaves is said to be taken to prevent obesity, and an ointment made from very young fruits treats itches. In the Philippines, flowers are reported to be soporific."
408	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Creates a fire hazard in natural ecosystems? Possibly] "L. inermis is widely distributed throughout the Sahel and into Central Africa; it also occurs in the Middle East. It grows mainly along watercourses and in semi-arid regions and is adapted to a wide range of conditions. It can withstand low air humidity and drought." [No evidence, although probably would burn if conditions were dry]
409	2012. Dave's Gardern. PlantFiles: Henna, Mignonette Tree, Egyptian Privet - Lawsonia inermis. http://davesgarden.com/guides/pf/go/62228/	[Is a shade tolerant plant at some stage of its life cycle? Possibly No] "Sun Exposure: Full Sun"
409	2012. Desert Tropicals. Henna, Mignonette Tree - Lawsonia inermis. Faucon, P., http://www.desert-tropicals.com/Plants/Lythraceae/Lawsonia_inermis.html	[Is a shade tolerant plant at some stage of its life cycle? Possibly No] "Sun Exposure: Full sun"
410	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Tolerates a wide range of soil conditions ? Yes] "Soil descriptors - Soil texture: light; medium; heavy - Soil drainage: free; impeded - Soil reaction: neutral; alkaline - Special soil tolerances: shallow; saline; infertile"
410	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Tolerates a wide range of soil conditions? Yes] "Soil type: Prefers sandy soils but can tolerate clays and poor, stony, sand soils; optimum soil pH is 4.3-8."
411	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Climbing or smothering growth habit? No] "L. inermis is a small, multi-stemmed shrub or small tree 2-6 m tall, commonly known as henna."
412	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Forms dense thickets? No evidence]
412	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Forms dense thickets? No evidence]
501	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Aquatic? No] "L. inermis is widely distributed throughout the Sahel and into Central Africa; it also occurs in the Middle East. It grows mainly along watercourses and in semi-arid regions and is adapted to a wide range of conditions. It can withstand low air humidity and drought. Henna requires high temperatures for germination, growth and development."
502	2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Grass? No] Lythraceae
503	2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Nitrogen fixing woody plant? No] Lythraceae

504	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "Lawsonia inermis is a much-branched glabrous shrub or small tree 2-6 m in height, which may be spiny. Bark greyish brown, unarmed when young, older plants with spine-tipped branchlets."
601	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Evidence of substantial reproductive failure in native habitat? No] "It originates from the Persian Gulf region (and possibly northeast Africa) to northwest India and is now cultivated widely throughout the tropics and subtropics." [No evidence, although area of origin uncertain]
602	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Produces viable seed? Yes] "It is easily grown as a short-lived perennial crop from seed and transplanted, or propagated by cuttings."
602	2007. Lal, G./Roy, P.K./Singh, Y.V.. Effect of Different Treatments on Germination Behaviour of Henna (<i>Lawsonia inermis</i> L.) Seeds. SAARC Journal of Agriculture. 5(2): 67-74.	[Produces viable seed? Yes] "Propagation of henna is done mainly by seeds for commercial cultivation and by cuttings for hedge plantation. Henna seeds are straw to dark brown, small (1-2 mm long), hard and wedge-shaped. They are borne in small globular capsules exhibiting sometimes polymorphism in size. The seeds have a xeromorphic structure. Germination rate is affected by the length of storage and depth of sowing."
603	2005. Jansen, P.C.M./Cardon, D.. Plant Resources of Tropical Africa. Volume 3. Dyes and Tannins. PROTA, Wageningen, Netherlands	[Hybridizes naturally? Unknown] "Lawsonia comprises only 1 species."
604	2007. Kubitzki, K./Bayer, C./Stevens, P.F.. The families and genera of vascular plants: Volume IX. Flowering Plants. Eudicots. Springer-Verlag, Berlin, Heidelberg, New York	[Self-compatible or apomictic? Possibly] "The typical reproductive system is one of homomorphic flowers that are self-compatible but rely on pollinators for outcrossing." [Family description]
605	2007. Kubitzki, K./Bayer, C./Stevens, P.F.. The families and genera of vascular plants: Volume IX. Flowering Plants. Eudicots. Springer-Verlag, Berlin, Heidelberg, New York	[Requires specialist pollinators? No evidence] "Flowers of most genera are odorless, entomophilous and promiscuously visited by a variety of small to large bees, butterflies, day-flying moths, and hummingbirds. Lawsonia is fragrant."
605	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Requires specialist pollinators? No] "Flowers small, white, numerous; in large pyramidal terminal cymes, fragrant, 1 cm across, 4 petals crumpled in the bud. Calyx with 2-mm tube and 3-mm spread lobes; petals orbicular to obovate, white or red; stamens 8, inserted in pairs on the rim of the calyx tube; ovary 4 celled, style up to 5 mm long, erect."
605	2010. Tiwari, P./Tiwari, J.K./Ballabha, R.. Studies on Sources of Bee-forage for Rock Bee (<i>Apis dorsata</i> F.) from Garhwal Himalaya, India: A Melissopalynological Approach. Nature and Science. 8(6): 5-15.	[Requires specialist pollinators? No. Bee-pollinated] "Abstract: Rock bee, <i>Apis dorsata</i> F. is the best honey gatherer and important pollinator among the Indian honey bees. While other bees stop their work during night, rock bees are the only bees that work during full moon night to collect nectar and pollen. Seeing the role of rock bees in meeting the honey demand in the country; it was aimed to study the forage of this group of bees on the basis of Melissopalynological analysis. The study was conducted in Garhwal Himalaya, India. Pollen analysis of 21 samples of rock bee honey was made to work out the rock bee flora on the basis of pollen morphology, composition and percentage of pollen present in honey. Methodology suggested by International Commission for Bee Botany (Louveaux et al., 1978) was followed. The pollen analysis revealed the members of family Asteraceae, Brassicaceae, Betulaceae, Myrtaceae, Rosaceae and Rubiaceae as pre-dominant and Acanthaceae, Balsaminaceae, Lamiaceae, Onagraceae, Ericaceae, Polygonaceae and Hippocastanaceae as secondary source of pollen. The species of <i>Echinops</i> , <i>Scurulla</i> , <i>Dipsacus</i> , <i>Sedum</i> , <i>Citrus</i> , <i>Juglans</i> , <i>Bombax</i> , <i>Geranium</i> and <i>Plectranthus</i> have emerged as important minor pollen types. [Nature and Science 2010;8(6):5-15]. (ISSN: 1545- 0740)."
606	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Reproduction by vegetative fragmentation? No] "- Vegetative propagation by cuttings - Stand establishment using direct sowing; planting stock" [No evidence]
607	1993. Bekele-Tesemma, A.. Useful Trees and Shrubs for Ethiopia. Regional Soil Conservation Unit, Swedish International Development Authority, Nairobi, Kenya	[Minimum generative time (years)? Probably >4] "Slow growing."
607	2011. Jan, H.U./Shinwari, Z.K./Khan, A.A.. Staining Effect of Ddy Extracted from Dry Leaves of <i>Lawsonia inermis</i> Linn (Henna) on Angiospermic Stem Tissue. Pakistan Journal of Botany. 43(1): 383-389.	[Minimum generative time (years)? 5] "The plant grows at temperatures higher than 11oC and needs around 5 years to mature as well as achieves a height of 8 to 10 feet."
701	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Propagules likely to be dispersed unintentionally ? Unlikely] "Fruits small, brown, globose capsules 4-8 mm in diameter, many-seeded, opening irregularly, split into 4 sections, with a persistent style. Seeds 3 mm across, angular, with thick seed coat." [Not grown in heavily trafficked areas, and fruits/seeds lack means of external attachment.]

702	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Propagules dispersed intentionally by people? Yes] "L. inermis is mostly grown on a small scale in gardens (often as a hedge) but is grown commercially in India, Pakistan, Egypt, Libya and Sudan. In African plantations, it is often irrigated and fertilized."
702	2007. Kubitzki, K./Bayer, C./ Stevens, P.F.. The families and genera of vascular plants: Volume IX. Flowering Plants. Eudicots. Springer-Verlag, Berlin, Heidelberg, New York	[Propagules dispersed intentionally by people? Yes] "Lawsonia inermis is the source of the cosmetic dye henna, and is grown also for its fragrant flowers."
702	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Propagules dispersed intentionally by people? Yes] "Erosion control: Trees are employed in soil conservation. Shade/shelter: L. inermis can be grown as a live fence. Ornamental: An attractive small tree that can be successfully grown in gardens."
703	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Propagules likely to disperse as a produce contaminant? No] "Fruits small, brown, globose capsules 4-8 mm in diameter, many-seeded, opening irregularly, split into 4 sections, with a persistent style. Seeds 3 mm across, angular, with thick seed coat." ... "Trees should be spaced at 15 cm within a row, with distance between the rows varying according to the production area; a dense spacing that gives up to 200 000 plants/ha can be employed. Under intensive commercial production, as in North Africa, the crop is irrigated during the dry season and heavily fertilized. In India, it is grown on a larger scale but less intensively, often without irrigation, and rarely fertilized." [Cultivation as a crop suggests that seeds could contaminate other crops, although no such evidence was found]
704	2007. Kubitzki, K./Bayer, C./ Stevens, P.F.. The families and genera of vascular plants: Volume IX. Flowering Plants. Eudicots. Springer-Verlag, Berlin, Heidelberg, New York	[Propagules adapted to wind dispersal? No] "Berrylike fruits with a tough, indehiscent pericarp apparently evolved independently in Adenaria, Capuronia, Lawsonia, and Punica." ... "seeds not winged"
705	1993. Bekele-Tesemma, A.. Useful Trees and Shrubs for Ethiopia. Regional Soil Conservation Unit, Swedish International Development Authority, Nairobi, Kenya	[Propagules water dispersed? Potentially] "Grows mainly along river courses and in semi-arid parts."
705	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Propagules water dispersed? Possibly moved by water] "It grows mainly along watercourses and in semi-arid regions and is adapted to a wide range of conditions."
706	1993. Bekele-Tesemma, A.. Useful Trees and Shrubs for Ethiopia. Regional Soil Conservation Unit, Swedish International Development Authority, Nairobi, Kenya	{Propagules bird dispersed? Yes} "The fruit and flowers attract birds, and antelope browse the leafy branches."
706	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Propagules bird dispersed? Yes] "Birds feed on the fruits of L. inermis and probably disperse the seeds."
707	2007. Kubitzki, K./Bayer, C./ Stevens, P.F.. The families and genera of vascular plants: Volume IX. Flowering Plants. Eudicots. Springer-Verlag, Berlin, Heidelberg, New York	[Propagules dispersed by other animals (externally)? No] "Capsule globose, indurate, indehiscent. Seeds many, obpyramidal, the broad apex filled with dense, small-celled aerenchyma, 2 mm." [Indehiscent capsule with no means of external attachment. Possible that small seeds could stick to fur, mud, or feathers, but only if seeds dehisce]
708	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Propagules survive passage through the gut? Yes] "Birds feed on the fruits of L. inermis and probably disperse the seeds."
801	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Prolific seed production (>1000/m2)? Possibly] "On average, there are about 700 000 seeds/kg." [Numbers are from cultivation. Unknown in natural settings]
802	2005. Jansen, P.C.M./Cardon, D.. Plant Resources of Tropical Africa. Volume 3. Dyes and Tannins. PROTA, Wageningen, Netherlands	[Evidence that a persistent propagule bank is formed (>1 yr)? Possibly] "Because of its hard seedcoat, henna seeds have to be pre-germinated before sowing."

802	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Evidence that a persistent propagule bank is formed (>1 yr)? Possibly] "Seed storage behaviour is orthodox; long term storage is feasible. On average, there are about 700 000 seeds/kg."
803	2012. WRA Specialist. Personal Communication.	[Well controlled by herbicides? Unknown] No information on herbicide efficacy or chemical control of this species
804	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Tolerates, or benefits from, mutilation, cultivation, or fire? Yes] "- Tolerates drought; frost - Ability to coppice"
804	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Tolerates, or benefits from, mutilation, cultivation, or fire? Yes] "The first harvest is taken 12 months after field planting by cutting the plant about 10 15 cm above ground level. Subsequently, 2 harvests are taken a year under rainfed conditions and 3 harvests may be possible with irrigation. Under rainfed conditions, dried-leaf yield in the 1st year may be about 200 kg/ha, while over the 2nd, 3rd and 4th years, yields normally range from 1000 to 1500 kg/ha. With irrigation, heavy fertilizer treatment and 3 croppings a year, peak yields in excess of 2000 kg/ha can be obtained. Maximum yields occur during the 1st 4-8 years after planting, but plants are often left in the field for 12-25 (max. 40) years."
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:

- Adapted to a wide range of environmental conditions
- Naturalized in several locations
- Older plants with spine tipped branchlets
- Allergenic pollen
- Tolerates many soil conditions (and potentially able to exploit many different habitat types)
- Birds feed on the fruits and probably disperse the seeds
- Able to coppice resprout

Low Risk / Desirable Traits:

- Grown for the cosmetic dye henna
- Ornamental value
- Slow growth rate (Reaches maturity in 5 or more years)
- Palatable to cattle and other ungulates