

# Instituto Hórus de Desenvolvimento e Conservação Ambiental

## Análise de risco para plantas invasoras

*Moringa oleifera*

acácia-branca

RESULTADO		Avaliação válida (>70% das perguntas respondidas)		Recomendação
Pontuação: 20		RISCO MODERADO		Avaliação posterior
Seção	Grupo	Questão		
<b>Histórico biogeográfico</b>				
A	Cultivo / Domesticação	1.01	O táxon apresenta fortes indícios de domesticação?	sim
		1.02	Há registros de que o táxon esteja se propagando espontaneamente nos locais onde está domesticado?	sim
		1.03	Táxons da espécie estão registrados como plantas daninhas ou pragas?	sim
	Clima	2.01	O táxon ocorre naturalmente ou há registro de que esteja estabelecido em alguma região de clima Equatorial (Tipo Af de Koeppen-Geiger)?	sim
		2.02	O táxon ocorre naturalmente ou há registro de que esteja estabelecido em alguma região de clima Tropical (Zona Equatorial, Nordeste Oriental ou Brasil Central) (Grupo A de Koeppen-Geiger: Af, Aw, Am, As)?	sim
		2.03	O táxon ocorre naturalmente ou há registro de que esteja estabelecido em alguma região de clima Temperado ou Subtropical (Grupo C de Koeppen-Geiger: Cf, Cw, Cs)?	sim
	Registros de ocorrência e invasão	3.01	O táxon apresenta histórico de introduções repetidas fora da sua área de distribuição natural?	sim
		3.02	Há registro de que o táxon esteja estabelecido fora da sua área de ocorrência natural historicamente conhecida?	sim
		3.03	Há registro de impactos causados pelo táxon em jardins, benfeitorias ou áreas degradadas?	não
		3.04	Há registro de impactos causados pelo táxon em áreas com atividade agrícola, pecuária, silvicultural ou horticultural?	não
		3.05	Há registro de que a espécie seja invasora de ambientes naturais em algum lugar do mundo?	sim
3.06		Outras espécies do mesmo gênero são consideradas invasoras em outras regiões ou estão estabelecidas no Brasil?	não	
<b>Características indesejadas</b>				
B	Atributos indesejados	4.01	O táxon apresenta espinhos, acúleos ou outra saliência capaz de causar ferimentos ou impedir a passagem de pessoas ou animais?	não
		4.02	Há evidências de que o táxon produza alterações químicas no solo? (tais como alelopatia, mudança de pH, fixação de nitrogênio, entre outros)	não
		4.03	É um táxon parasita?	não
		4.04	É um táxon impalatável para animais de pasto nativos ou introduzidos?	não
		4.05	É um táxon tóxico para seres humanos ou para animais nativos ou domesticados economicamente importantes?	não
		4.06	Há registro de que o táxon seja hospedeiro ou vetor de pragas ou patógenos conhecidos que afetem espécies nativas ou de valor?	sim
		4.07	O táxon causa alergias em seres humanos?	não
	Hábito e potencial competição por recursos em ambientes naturais	5.01	Há evidências de que o táxon produz alterações físicas em interações ecológicas? (tais como aumento do risco de ocorrência de incêndios, altera processos erosivos naturais, afeta o sistema hidrológico do solo)	não
		5.02	É um táxon tolerante à sombra em alguma fase do ciclo de vida?	não
		5.03	O táxon tolera solos arenosos, ácidos ou de baixa fertilidade?	sim
		5.04	O táxon é uma liana ou tem outra forma de crescimento capaz de suprimir outras plantas?	não
		5.05	O táxon forma touceiras densas? (principalmente lenhosas perenes)	não
		5.06	O táxon é uma árvore, arbusto lenhoso perene, erva, gramínea ou geófito? (caso o táxon não pertença a nenhum destes grupos, o campo resposta deve permanecer em branco) responder: "árvore" ou "arbusto" ou "herbácea" ou "gramínea" ou "geófito" ou "não".	árvore
<b>Características biológicas e ecológicas</b>				
C	Mecanismos reprodutivos	6.01	Há evidências de fatores bióticos na área de distribuição natural do táxon que implicam em fracasso reprodutivo?	não
		6.02	O táxon produz sementes viáveis?	sim

		6.03	Há evidências de que o táxon seja capaz de realizar hibridação interespecífica?	não
		6.04	Há no país alguma espécie nativa congênera?	não
		6.05	O táxon é capaz de realizar autopolinização ou apomixia?	sim
		6.06	O táxon necessita de polinizadores especializados?	não
		6.07	O táxon se reproduz por fragmentos vegetativos diferentes dos apomíticos ou geofíticos?	sim
		6.08	Qual a duração do período juvenil? [a] até 1 ano; [b] 1-4 anos; [c] mais de 4 anos	b
	Mecanismos de dispersão de propágulos	7.01	Produce propágulos com probabilidade de dispersão involuntária por pessoas, máquinas etc.?	não
		7.02	Produce propágulos dispersados intencionalmente ou cultivados por pessoas?	sim
		7.03	Produce propágulos com probabilidade de dispersão como contaminantes de produtos?	não
		7.04	Produce propágulos adaptados para dispersão pelo vento (anemocoria)?	sim
		7.05	Produce propágulos adaptados para dispersão por água (hidrocoria)?	sim
		7.06	Produce propágulos dispersados por pássaros (ornitocoria) ou morcegos (quiroptercoria)?	não
		7.07	Produce propágulos dispersados por animais (externamente)?	não
		7.08	Produce propágulos dispersados por animais que se alimentam dos frutos e as sementes sobrevivem à passagem pelo sistema digestivo?	não
	Atributos de persistência	8.01	O táxon é um produtor de sementes prolífero?	sim
8.02		Há evidências de que as sementes do táxon permanecem viáveis no solo por mais de 1 ano?	não	
8.03		É possível e fácil encontrar uma forma de controle eficaz com custos razoáveis?		
8.04		Algum predador natural efetivo do táxon está presente no país?	não	

## Histórico bibliográfico

1.01	<b>1.01a</b> Popoola, 2013: "The plant has been well domesticated and adapted to the different ecological regions in Nigeria" p.690; <b>1.01b</b> Navie Sheldon and Steve Csurhes, 2010. "Moringa oleifera has been grown since ancient times and is now widely cultivated and naturalised throughout the tropical and subtropical world " p.4; <b>1.01c</b> Fahey, 2005 "Moringa oleifera is the most widely cultivated species of a monogeneric family, the Moringaceae, that is native to the sub-Himalayan tracts of India, Pakistan, Bangladesh and Afghanistan"
1.02	<b>1.02a</b> Navie Sheldon and Steve Csurhes, 2010: "For example, M. oleifera naturalised in northern Transvaal and parts of Natal after being cultivated for some time" p.15; <b>1.02b</b> Lioligier & Martorell 2000: " Spontaneous after cultivation, mostly in southern districts, Porto Rico", p. 65. <b>1.02c</b>
1.03	<b>1.03a</b> James Cook University weed list (JCU 2007); <b>1.03b</b> Navie Sheldon and Steve Csurhes, 2010: "Currently, it is considered a minor weed in northern Australia, but its status may change over time" p.14 ; <b>1.03c</b> Randall, 2002 apud Navie Sheldon and Steve Csurhes, 2010: "it is described as both an environmental weed and casual alien species" p; 14.
2.01	<b>2.01a</b> Navie Sheldon and Steve Csurhes, 2010: "Moringa oleifera grows best in the tropical regions of the world that have semi-arid or monsoonal climates" p.14; <b>2.01b</b> Parrotta, 1993: "Resedá ins highly tolerant and is cultivated in semiarid and arid regions of India, Pakistan, Afghanistan, Saudi Arabia and east Africa, receiving na annual rainfall as low as 300mm, although such sites are probably irrigated or are characterized by a high water table", p.1; <b>2.01c</b> Papillo, 2007 apud Navie Sheldon and Steve Csurhes, 2010 "it is very drought tolerant and can even survive in relatively arid areas"
2.02	<b>2.02a</b> Navie Sheldon and Steve Csurhes, 2010 "Moringa oleifera grows best in the tropical regions of the world that have semi-arid or monsoonal climates", p.14; <b>2.02b</b> Duke, 1983: "widely cultivated and naturalized in tropical Africa, tropical America, Sri Lanka, India, Mexico, Malabar, Malaysia and the Philippine Islands"; <b>2.02b</b> Kumar et al, 2017: "Moringa naturally found in tropical and sub-tropical forest of India or grow by farmers on bund of agricultural land", p.229;
2.03	<b>2.03a</b> Kumar et al, 2017: "Moringa naturally found in tropical and sub-tropical forest of India or grow by farmers on bund of agricultural land", p.229; <b>2.03b</b> Duke, 1983: "Ranging from Subtropical Dry to Moist through Tropical Very Dry to Moist Forest Life Zones";
3.01	<b>3.01a</b> Popoola, 2013: "The age of the introduction of the plant ranges from 3 years in Okitipupa area of Ondo state to 58 years in Okaka area of Oyo state. In Oyo State, the age of the accessions ranges from 6 years in Aroje, Saki West Local Government (introduced from the USA) to 58 years in Okaka, Itesiwaju Local Government (introduced from Kano by a Hausa settler, Late Baba Manman). For Edo State (Ehanlen Ewu) the age of the accession was above 55 years, and the plant was introduced from the Northern part of Nigeria by Late Okogbo Esichei, who had worked there as a civil servant. The age and history of accessions collected from the Northern part were mostly unknown as respondents were not specific and not sure of their history or ages because the plant had been with them all along", p.689; <b>3.01b</b>

3.02	<b>3.02a</b> Parrotta, 1993: "It has been introduced and become naturalized in others parts of India, Pakistan, Afghanistan, Bangladesh, Sri Lanka, Southeast Asia, west Asia, the Arabian peninsula, east and west Africa, southern Florida, throughout the West Indies, and from Mexico to Peru, Paraguay and Brazil", p.1; <b>3.02b</b> Popoola, 2013: "Moringa oleifera is widely naturalized in other tropical regions including Zimbabwe, Madagascar, South Africa, Burkina Faso, Cameroun, Sierra Leone, Sudan, Zaire, Togo, Ugandan, Senegal and in Asian continent supporting its wide distribution beyond the tropical areas", p.690; <b>3.02c</b> :Navie Sheldon and Steve Csurhes, 2010: "M. oleifera has naturalised in at least 70 countries across the tropical and subtropical regions of the world", p.14.
3.03	<b>3.04a</b> Navie Sheldon and Steve Csurhes, 2010: "Despite being listed as a weed in many countries, there is very little information on its impact. This species spreads relatively slowly and is generally described as a 'potentially invasive' or 'moderately invasive' species, and nowhere is it regarded as being highly invasive or very aggressive", p.15; <b>3.03b</b> Groves, 2003: "Naturalised and may be a minor problem but not considered important enough to warrant control at any location", p. 69;
3.04	<b>3.04a</b> Groves, 2003: "Present in a State or Territory but not given a rating as an agricultural weed, either because it was not considered a problem or because it was not known to occur in agricultural areas at present", p.158; <b>3.04b</b> Maroyi, 2003: "Of the documented edible weeds, 52.4% are indigenous while 47.6% are exotic to Zimbabwe. With the exception of Cucumis metuliferus and Moringa oleifera which are semi-cultivated, the rest are categorized as agricultural weeds", p. 6
3.05	<b>3.05a</b> Navie Sheldon and Steve Csurhes, 2010:"Bignelli et al. (1998), in an extensive and widely researched overview of invasive woody plants in the tropics, ranked M. oleifera as a 'moderately invasive' species. According to their system of classification, a 'moderately invasive' species is one that is spreading but still occurs at low densities and is not considered to be an immediate problem. Moringa oleifera appears on several invasive species lists at an international level. For example, it is listed in the Global compendium of weeds (Randall 2002), where it is described as both an environmental weed and casual alien species, and in the Global invasive species list that was derived from it (Rice 2003). It also appears on the list of plant species that are thought to threaten Pacific islands' ecosystems (PIER 2007), p. 14-15. <b>3.05b</b> Miles 2015: Report to Kayangel State: 2015 Survey of Invasive Plant Species( <a href="http://www.hear.org/pier/reports/kayangel_2015_survey_report.htm#summaryandconclusions">http://www.hear.org/pier/reports/kayangel_2015_survey_report.htm#summaryandconclusions</a> ) <b>3.05c</b> Binggeli et al 2015: OF INVASIVE WOODY PLANTS IN TROPICAL AND SUB-TROPICAL REGIONS, p.34.
3.06	<b>3.06</b> sem evidências: <a href="http://www.hear.org/pier/wra/pacific/moringa_oleifera_htmlwra.htm">http://www.hear.org/pier/wra/pacific/moringa_oleifera_htmlwra.htm</a>
4.01	<b>4.01</b> sem evidências: <a href="http://www.hear.org/pier/wra/pacific/moringa_oleifera_htmlwra.htm">http://www.hear.org/pier/wra/pacific/moringa_oleifera_htmlwra.htm</a>
4.02	<b>4.02</b> sem evidências: <a href="http://www.hear.org/pier/wra/pacific/moringa_oleifera_htmlwra.htm">http://www.hear.org/pier/wra/pacific/moringa_oleifera_htmlwra.htm</a>
4.03	sem evidências
4.04	<b>4.04a</b> Navie Sheldon and Steve Csurhes, 2010: It is also highly prized as a fodder tree in developing countries, where its leaves are fed to cattle, sheep, camels, goats, pigs, poultry and donkeys (RBG Kew 1999; HDRA 2002). The branches are often lopped for fodder, and animals are also known to browse the bark and young shoots of this species (Qaiser 1973; HDRA 2002), p.16.
4.05	<b>4.05a</b> Navie Sheldon and Steve Csurhes, 2010: It is grown in many parts of the world as a 'vegetable tree', with the roots, leaves, flowers and fruit all being used for food (Lu & Olson 2001). The leaves are probably the most widely used part, being compared to spinach in appearance and nutritional quality (Papillo 2007) p.16.
4.06	<b>4.06a</b> Navie Sheldon and Steve Csurhes, 2010: One record from the Torres Strait notes that this species is a host for the spiralling whitefly ( <i>Aleurodicus dispersus</i> ) (EPA 2007), a relatively new and potentially serious pest of bananas and horticultural crops in northern Australia (Botha et al. 2000). Spiralling whitefly is currently regarded as an emerging pest in northern Queensland and the Northern Territory (Chin et al. 2007; Lambkin 2007), and as a potential pest in Western Australia (Botha et al. 2000, p.19. <b>4.06b</b> Lambkin, 1999, p.374.
4.07	<b>4.07</b> sem evidências: <a href="http://www.hear.org/pier/wra/pacific/moringa_oleifera_htmlwra.htm">http://www.hear.org/pier/wra/pacific/moringa_oleifera_htmlwra.htm</a>
5.01	<b>5.01a</b> Navie Sheldon and Steve Csurhes, 2010: Moringa oleifera has also been employed for erosion control in areas where strong winds and long, dry spells occur simultaneously (ICRAF 2001), p.17.
5.02	<b>5.02</b> sem evidências: <a href="http://www.hear.org/pier/wra/pacific/moringa_oleifera_htmlwra.htm">http://www.hear.org/pier/wra/pacific/moringa_oleifera_htmlwra.htm</a>

5.03	<b>5.03a</b> Ramachandran, 1980: "M. oleifera grows well in almost all types of soils except stiff clays, but sandy loams are the best", p.280. <b>5.03b</b> Navie Sheldon and Steve Csurhes, 2010: "This tree grows in a wide variety of soil types, but it prefers well-drained, sandy or loamy soils", p.14.
5.04	<b>5.04</b> sem evidências: <a href="http://www.hear.org/pier/wra/pacific/moringa_oleifera_htmlwra.htm">http://www.hear.org/pier/wra/pacific/moringa_oleifera_htmlwra.htm</a>
5.05	<b>5.05</b> sem evidências: <a href="http://www.hear.org/pier/wra/pacific/moringa_oleifera_htmlwra.htm">http://www.hear.org/pier/wra/pacific/moringa_oleifera_htmlwra.htm</a>
5.06	<b>5.06</b> Navie Sheldon and Steve Csurhes, 2010: "Moringa oleifera is a small to medium-sized deciduous tree that develops a swollen underground rootstock" p.5.
6.01	<b>6.01a</b> não há evidências, apenas que em condições marginais, a espécie pode crescer menos e mais lentamente. Segundo Navie Sheldon and Steve Csurhes, 2010: "However, plants growing in marginal conditions grow much slower and can have a stunted and shrubby habit, sometimes only reaching 3 m in height", p.9.
6.02	<b>6.02a</b> Navie Sheldon and Steve Csurhes, 2010: "it readily produces viable seed in all parts of the world where it has been introduced (including Australia)", p.10
6.03	<b>6.03a</b> sem evidências de hibridização natural. No entanto, a hibridização é sugerida por Vaknin & Mishal 2017: "Therefore, future breeding efforts concentrated on creating M. oleifera x M. peregrina interspecies hybrids may also produce genotypes with elevated fruit production as in M. oleifera, and larger seeds, containing more oil and less susceptible to local diseases, as in M. peregrina", p.435;
6.04	
6.05	<b>6.05a</b> Navie Sheldon and Steve Csurhes, 2010: "During one study on the mating system of M. oleifera, it was found that 74% of seed were produced as a result of cross-pollination and the remaining 26% of seed were produced by self-fertilisation (Muluvi et al. 2004)", p.10;
6.06	<b>6.06a</b> Navie Sheldon and Steve Csurhes, 2010: "M. oleifera does not seem to require any specific pollinators, as it readily produces viable seed in all parts of the world where it has been introduced (including Australia)", p.10;
6.07	<b>6.07a</b> Navie Sheldon and Steve Csurhes, 2010: "This species also quickly sends out new growth from the trunk after being cut or damaged, or from the ground when frosted (ICRAF 2001)"
6.08	<b>6.08a</b> Navie Sheldon and Steve Csurhes, 2010: "In cultivation, trees raised from seed start flowering after 2 years of growth, while trees grown from large cuttings can begin to produce fruit 6-12 months after planting (Bosch 2004)", p.9.
7.01	<b>7.01</b> Sem evidências, provavelmente porque os propágulos não possuem nenhum meio de fixação.
7.02	<b>7.02a</b> Navie Sheldon and Steve Csurhes, 2010: "Larger scale spread of M. oleifera is usually as a result of its deliberate introduction for cultivation", p.10; <b>7.02b</b> Silva et al., 2017: "Moringa oleifera (Moringaceae) is a plant native from India and broadly cultivated along the tropics."
7.03	<b>7.03.</b> Sem evidências: <a href="http://www.hear.org/pier/wra/pacific/moringa_oleifera_htmlwra.htm">http://www.hear.org/pier/wra/pacific/moringa_oleifera_htmlwra.htm</a>
7.04	<b>7.04a</b> <a href="http://www.efloras.org/florataxon.aspx?flora_id=2&amp;taxon_id=200009759">http://www.efloras.org/florataxon.aspx?flora_id=2&amp;taxon_id=200009759</a> : "Seeds subglobose, 3-angled, 8-15 mm in diam. excluding wings; wings 0.5-1 cm wide, rarely absent"; <b>7.04b</b> Navie Sheldon and Steve Csurhes, 2010: "While the seeds are relatively large, they are strongly winged. This may allow them to be spread short distances from the parent tree by wind", p.10.
7.05	<b>7.05</b> Navie Sheldon and Steve Csurhes, 2010: While the seeds are relatively large, they are strongly winged. This may allow them to be spread short distances from the parent tree by wind. It may also aid their dispersal downstream in water during floods (the mature pods may also float in water), as populations are sometimes found growing along waterways. Many naturalised populations occur around old dump sites.
7.06	<b>7.06a</b> Navie Sheldon and Steve Csurhes, 2010: "Like many other tree species that do not have very effective dispersal mechanisms (e.g. bird or animal-dispersed fruit), M. oleifera seems to spread at a relatively slow rate", p.20;

7.07	<b>7.07</b> Sem evidências
7.08	<b>7.08</b> Sem evidências
8.01	<b>8.01a</b> Navie Sheldon and Steve Csurhes, 2010:A single tree can produce 300–400 fruit per year within 3 years of planting, while a mature tree can produce up to 1000 fruit per year (HDRA 2002). As each fruit contains approximately 20 seeds, a mature tree can therefore produce about 20 000 seeds per year", p.10; <b>8.01b</b> Ramachandran, 1980: "Seeds are numerous, globular, about 1 cm diameter, 3-winged", p.277; <b>8.01c</b> <a href="https://hort.purdue.edu/newcrop/duke_energy/Moringa_oleifera.html#Uses">https://hort.purdue.edu/newcrop/duke_energy/Moringa_oleifera.html#Uses</a> : "pods pendulous, brown, triangular, splitting lengthwise into 3 parts when dry, 30–120 cm long, 1.8 cm wide, containing about 20 seeds embedded in the pith, pod tapering at both ends"
8.02	<b>8.02</b> Navie Sheldon and Steve Csurhes, 2010:"HDRA (2002) states that 'seeds can be planted as soon as they are mature but should only be kept for up to 3 months in natural conditions'. Hence, they probably do not have any significant innate dormancy and begin to lose their viability after a relatively short period of time. Germination rates for fresh seeds are around 80%, going down to about 50% after 12 months storage, with no seeds usually being viable after 2 years of storage", p.10;
8.03	<b>8.03</b> Navie Sheldon and Steve Csurhes, 2010: Sem evidências de que o controle da espécie tenha sido realizado ou requerido. "As this species is not yet regarded to be a problem of any significance, control has not been required and there is a lack of information in this area. "
8.04	<b>8.04</b> Não foram encontradas evidências.