

Importation of *Brachiaria* hybrid seeds, Mulatto II for planting in Jamaica

A Pathway-Initiated Plant Weed Risk Analysis



**Pest Risk Analysis Unit
Plant Quarantine/Produce Inspection
Ministry Of Agriculture and Fisheries**

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**WEED RISK ASSESSMENT FOR
BRACHIARIA HYBRID SEEDS, MULATO II
FOR PLANTING IN JAMAICA**

Executive Summary

The Pest Risk Analysis Unit of Jamaica's Ministry of Agriculture and Fisheries prepared this weed risk assessment to examine the weed potential of Mulato II *Brachiaria* hybrid seeds, if planted in Jamaica. This is a qualitative risk assessment and the estimates of risk are expressed in qualitative terms (high, medium, low) rather than in numerical terms, such as probabilities or frequencies. The details of the methodology and rating criteria used to analyze the weed potential are in the **Assessment Tables 1 and 2**.

The Weed Risk Potential was estimated to be **High (9)**. The Weed Risk Potential is the summation of the scores of the weed assessment. The values for Weed Risk Potential were based on the biology of the plant and its expected behaviour, dispersal and growth rate, in the Jamaican climate.

Although the Weed Risk Potential was estimated to be high the major reason was due to the hybrid being a grass (Poaceae). There is no direct history linking the Mulato II *Brachiaria* hybrid to any weedy behaviour. Hence, the recommendations for the importation of these seeds are to be considered with the conclusive results of the Bodles Agricultural Research Centre (BARC). The BARC will be able to give results of the *Brachiaria* Mulato II hybrid behaviour specific to Jamaica's environment (soil and climate). Other recommendations for this hybrid seeds involve carefully attention that the seeds to be imported are only from the Mulato II hybrid and come from a reputable distributor.

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1. Introduction

This Weed Risk Analysis was prepared in Jamaica by the Pest Risk Analysis Unit of the Plant Quarantine/Produce Inspection Division of the Ministry of Agriculture and Fisheries. The style and scope of this assessment was adapted from the Australia/New Zealand weed risk assessment system.

This document provides the pest risk analysis (PRA) potential of Mulato II *Brachiaria* hybrid seeds imported into Jamaica for the specific purpose of planting. The scope does not include contaminating pests that may be unintentionally introduced through the seeds for planting pathway (e.g., weed seeds in seed consignments).

Seeds to be permitted entry as a result of this screening process may also require analysis of their potential to serve as a pathway for other quarantine pests. This standard should be used in conjunction with ISPM No. 2 *Guidelines for pest risk analysis*, ISPM No. 11 and *Pest risk analysis for quarantine pests including analysis of environmental risks*.

1.1 Initiating event/Proposed action:

This analysis was initiated by Seprod Ltd proposal to import Mulato II *Brachiaria* hybrid seeds from Mexico through Tropical seeds, USA to Jamaica for the purpose of planting. This Weed Risk Analysis was warranted in order to examine the potential weed risks associated with the importation of Mulato II *Brachiaria* hybrid seeds into Jamaica and would play a major role in the decision making process as to whether this plant will be allowed into the country.

1.2 Identification of the plant:

According to Seprod Ltd, it is the Mulato II hybrid of *Brachiaria* seeds that is to be imported. This artificial hybrid is a result of crosses among *Brachiaria ruziziensis*, *Brachiaria decumbens* and *Brachiaria brizantha*. This hybrid is a perennial with a semi-erect growth habit, spreading by rooting from lower culm nodes. Its leaf blade is linear-triangular in shape, broad, dark green, both abaxial and adaxial surfaces densely covered with long hairs (shorter than Mulato hybrid – *B. brizantha* x *B. ruziziensis*). The leaf sheath is densely pubescent and the ligule

membranociliate and short. The Mulato II stigmas are white/cream and its inflorescence is a panicle 12 cm long, with 4–8 racemes about 6 cm long, and spikelets arranged in two rows on each raceme .

Taxonomic classification:	Domain: Eukaryota Kingdom: Viridiplantae Phylum: Spermatophyta Subphylum: Angiospermae Class: Monocotyledonae Family: Poaceae Subfamily: Panicoideae
Scientific name	<i>Brachiaria ruziziensis</i> x <i>B. decumbens</i> x <i>B. brizantha</i> artificial hybrids
Common name(s):	Brachi hybrid/Brachiaria hybrid/Mulato II <i>Brachiaria</i> hybrid

Reference: Tropical Forages, 2005

1.3 Identification of the intended habitat:

The plant is requested to be planted in Jamaica to establish a 125 acre pasture in St. Thomas. St. Thomas is known for its area of disturbed broadleaf forest and an estimate of about 2000 mm of rainfall (per year). (Forest areas of Jamaica, 2002 and Meteorological Service Jamaica, 2009)

1.4 Identification of PRA area:

The PRA area will encompass the entire island of Jamaica since the majority of the island has the similar environmental characteristics (rainfall, temperature and soil quality). Moreover, the seeds are intended for planting and expected to spread naturally.

1.5 Information:

In Jamaica, the species *Brachiaria humidicola* and *Brachiaria decumbens* (Signal grass) have been used for the past 50 years as forage for ruminants (Forage research, 2009). Any pest associations and behaviour of these grasses (*Brachiaria* spp.) have not been detrimental to the Jamaican environment.

1.5.1 Current assessment:

At the Bodles Agricultural Research Centre (BARC) new strains of forage are being researched and tested to estimate the yield potential, nutritional value, agronomics and persistence of the plants before farmer distribution. Currently Mulato II *Brachiaria* hybrid and Crop residue are being evaluated. These forages subjected to a 3-year evaluation program done at the BARC. As for the Mulato II *Brachiaria* hybrid, seed production trials in the field have already been done (Forage research, 2009). However, there are still no conclusive results for the hybrid.

1.5.2 Other assessment:

Literatures about the Mulato II *Brachiaria* hybrid identify the hybrid as relatively good quality feed which would survive well during the dry season. There are no evidence identifying the hybrid as a weed but due to its nature (grass) it is expected to become weedy given the opportunity.

1.6 Conclusion of initiation:

The seeds of Mulato II *Brachiaria* hybrid (*Brachiaria ruziziensis* x *B. decumbens* x *B. brizantha*) are proposed for importation into St. Thomas of the island of Jamaica for planting. The weed assessment follows in **2**.

The potential of the plant to become a weed after it enters Jamaica was examined using **Table 1**. The reasons and references pertaining to the results in **Table 1** are found in **Table 2**.

2. Assessment

MULATO II BRACHIARIA HYBRID SEEDS**WEED RISK ASSESSMENT****Table 1: Weed Risk Assessment of *Mulato II Brachiaria hybrid seeds***

	<i>Mulato II Brachiaria hybrid seeds</i>		Answer	Score
History/Biogeography				
1. <i>Domestication/ Cultivation</i>				
1.01	Is the species highly domesticated?	y=-3, n=0	n	0
1.02	Has the species become naturalized where grown?	y=-1, n=-1	-	-
1.03	Does the species have weedy races?	y=-1, n=-1	-	-
Biology/Ecology				
2. <i>Climate and Distribution</i>				
2.01	Species suited to tropical or subtropical climate(s) (0-low; 1-intermediate; 2-high) –	See Append	..	2
2.02	Quality of climate match data (0-low; 1-intermediate; 2-high) see appendix		-	2
2.03	Broad climate suitability (environmental versatility)	y=1, n=0	y	1
2.04	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y	1
2.05	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	n	0
3. <i>Weed else ware</i>				
3.01	Naturalized beyond native range y = 1*multiplier (see Append), n= question 2.05		n	0
3.02	Garden/amenity/disturbance weed y = 1*multiplier (see Append)	n=0	n	0
3.03	Agricultural/forestry/horticultural weed y = 2*multiplier (see Append)	n=0	n	0
3.04	Environmental weed y = 2*multiplier (see Append)	n=0	n	0
3.05	Congeneric weed y = 1*multiplier (see Append)	n=0	y	0
4. <i>Undesirable Trait</i>				
4.01	Produces spines, thorns or burrs	y=1, n=0	n	0
4.02	Allelopathic	y=1, n=0	n	0
4.03	Parasitic	y=1, n=0	n	0
4.04	Unpalatable to grazing animals	y=1, n=-1	n	-1
4.05	Toxic to animals	y=1, n=0	n	0
4.06	Host for recognized pests and pathogens	y=1, n=0	n	0
4.07	Causes allergies or is otherwise toxic to humans	y=1, n=0	n	0
4.08	Creates a fire hazard in natural ecosystems	y=1, n=0	n	0
4.09	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y	1

Weed Risk Analysis

4.1	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y	1
4.11	Climbing or smothering growth habit	y=1, n=0	n	0
4.12	Forms dense thickets	y=1, n=0	y	1
5. Plant type				
5.01	Aquatic	y=5, n=0	n	0
5.02	Grass	y=1, n=0	y	1
5.03	Nitrogen fixing woody plant	y=1, n=0	n	0
5.04	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n	0
6. Reproduction				
6.01	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n	0
6.02	Produces viable seed.	y=1, n=-1	y	1
6.03	Hybridizes naturally	y=1, n=-1	n	-1
6.04	Self-compatible or apomictic	y=1, n=-1	n	-1
6.05	Requires specialist pollinators	y=-1, n=0	n	0
6.06	Reproduction by vegetative fragmentation	y=1, n=-1	y	1
6.07	Minimum generative time (years) 1 year = 1, 2 or 3 years = 0, 4+ years = -1	See left	1 yr	1
7. Dispersal Mechanism				
7.01	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n	-1
7.02	Propagules dispersed intentionally by people	y=1, n=-1	n	-1
7.03	Propagules likely to disperse as a produce contaminant	y=1, n=-1	-	-
7.04	Propagules adapted to wind dispersal	y=1, n=-1	y	1
7.05	Propagules water dispersed	y=1, n=-1	-	-
7.06	Propagules bird dispersed	y=1, n=-1	-	-
7.07	Propagules dispersed by other animals (externally)	y=1, n=-1	-	-
7.08	Propagules survive passage through the gut	y=1, n=-1	-	-
8. Persistence attributes				
8.01	Prolific seed production (>1000/m ²)	y=1, n=-1	y	1
8.02	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	y	1
8.03	Well controlled by herbicides	y=-1, n=1	-	-
8.04	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y	1
8.05	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	n	1
	Total score:			9

Table 2: Supporting data for Weed Risk Assessment of *Mulato II Brachiaria hybrid seeds*

	Source ¹	Notes
1.01	Argel, P.J, et al, 2005	In 2000, CIAT granted Papalotla S. A. (Mexican company) exclusive rights to seed multiplication and commercialization of this hybrid. From 2000 to present the hybrid will have passed through at least 20 generations.
1.02	None	There have been no reports of Mulato II spread in areas other than the intended growing pasture. 1.01 is no , not applicable
1.03	Argel, P.J, et al, 2005	This hybrid is known to bear “true” seeds. Hence, the next generation of the hybrid has the same characteristics as the mother hybrid plant. 1.01 is no , not applicable
2.01	Argel, P.J, et al, 2005	Mulato II grows well from sea level up to 1800 m above sea level in humid tropics with high precipitation and in sub humid conditions with 5-6 dry months and annual precipitation over 700 mm. This is extremely similar to the island of Jamaica habitat which has several rivers, hills and is completely enclosed by the sea. No computer analysis done
2.02	None	No computer analysis done
2.03	Argel, P.J, et al, 2005	Mulato II grows well from sea level up to 1800 m above sea level in humid tropics with high precipitation and in sub humid conditions with 5-6 dry months and annual precipitation over 700 mm. Mulato II is also known to grow in subtropical environments such as in Canelones state (Uruguay) where periodic frost occurs.
2.04	Tropical forages, 2005 Forages of Florida, 2007	Mulato II grows well with in dry months but require the minimum of 700 mm of annual precipitation.

¹ Refer to reference at the end of document for full reference details.

2.05	Tropical forages, 2005 Forages of Florida, 2007	Mulato II grows well in tropical and warm subtropical climates.
3.01	Tropical forages, 2005 Forages of Florida, 2007	Mulato II grows well in tropical and warm subtropical climates.
3.02	Argel, P.J, et al, 2005 US Forest Service, Pacific Island Ecosystems at Risk (PIER), 2008.	<i>Brachiaria brizantha</i> is one of the parent plants of the Brachiaria Mulato II hybrid. <i>B. brizantha</i> is listed in the Global Compendium of Weeds. <i>Brachiaria</i> Mulato II hybrid seeds show no evidence of reverting to the parent species'.
3.03	Same as above	Same as above
3.04	Same as above	Same as above
3.05	Same as above	<i>Brachiaria brizantha</i> is one of the parent plants of the Brachiaria Mulato II hybrid. <i>B. brizantha</i> is listed in the Global Compendium of Weeds. <i>B. brizantha</i> and other members of this genus are known weeds and/or expected to show weedy nature due to their high adaptability.
4.01	Same as above	<i>Brachiaria</i> Mulato II hybrid has hairs on both sides of the leaf but not at any level to cause irritation or discomfort to animals or humans.
4.02	Same as above	No evidence to support this characteristic.
4.03	Same as above	No evidence to support this characteristic
4.04	Argel, P.J, et al, 2005	The hybrid is known to be highly palatable to grazing animals.
4.05	Same as above	No evidence to support this characteristic
4.06	Forage Research, 2009. Argel, P.J, et al, 2005	This hybrid has been investigated in greenhouse and field tests to show antibiotic resistance to some spittlebug species (i.e. <i>Aeneolamina reducta</i> , <i>A. varia</i> , <i>Zulia carbonaria</i> , <i>Z. pubescens</i> , <i>Prosapia simulans</i> and <i>Mahanarva trifissa</i>). Furthermore Mulato II has been observed to be moderately susceptible to damage by <i>Rhizoctonia solani</i> . There are currently 2 members of the

		Brachiaria genus in Jamaica, any pest that may still plague the Mulato hybrid will have already been in Jamaica.
4.07	Argel, P.J, et al, 2005	No evidence to support this characteristic
4.08	Argel, P.J, et al, 2005	No evidence to support this characteristic
4.09	Tropical forages, 2005	The hybrid is likely to be similar to <i>Brachiaria brizantha</i> which has intermediate shade tolerance when compared to other tropical grasses.
4.1	Tropical forages, 2005	Mulato II prefers well-drained soils of medium to high fertility with pH 4.5–8.0 but can grow in less infertile acid soils with high Aluminium. This hybrid also responds strongly to Nitrogen added on deficient soils.
4.11	None	Mulato II absorbs nutrients and spread quickly. Hence, any other plants within close proximity to the growing grass may not be able to compete at the rate the Mulato II grows.
4.12	Argel, P.J, et al, 2005	Mulato II is a densely growing grass, which spreads through cracks and any patches in between planted grass.
5.01	Argel, P.J, et al, 2005. Forages of Florida, 2007 Tropical forages, 2005	No evidence
5.02	Same as above	Belongs to the family Poaceae
5.03	Tropical forages	Will combine with aggressive creeping legumes i.e. (<i>Arachis pintoi</i>)
5.04	Tropical forages	Has the ability to spread by rooting from lower culm nodes.
6.01	Argel, P.J, et al, 2005. Forages of Florida, 2007 Tropical forages, 2005	No evidence
6.02	Same as above	The seeds are viable to produce true descendants of the plant hybrid. Although fresh seeds will have to go

		through dormancy for several months before producing viable seedlings.
6.03		No evidence
6.04		No evidence
6.05	Argel, P.J, et al, 2005. Forages of Florida, 2007 Tropical forages, 2005	The plant is perennial
6.06	Same as above	The hybrid has the ability to spread by rooting from lower culm nodes, has well as rooted cuttings.
6.07	Same as above	The plant is perennial
7.01	From permit information	The plant will be grown has pasture for grazing animals.
7.02	From permit information	This plant is just a grazing grass, not very attractive or useful for horticultural purposes.
7.03	Argel, P.J, et al, 2005. Forages of Florida, 2007 Tropical forages, 2005	No evidence
7.04	Same as above	The plant is a grass and hence its seed are adapted for wind dispersal.
7.05	Same as above	No evidence
7.06	Same as above	No evidence
7.07	Same as above	No evidence
7.08	From permit information Argel, P.J, et al, 2005. Forages of Florida, 2007 Tropical forages, 2005	Possibly since the plant is for grazing. The seed either goes through months of dormancy or is scared with sulphuric acid to break dormancy.
8.01	Argel, P.J, et al, 2005. Forages of Florida, 2007	Even though the plant produces several seeds (it is a grass) the seeds are not viable for growth until after

	Tropical forages, 2005	several months of dormancy.
8.02	Same as above	The seeds are not viable for growth until after several months of dormancy.
8.03		No evidence
8.04	Argel, P.J, et al, 2005. Forages of Florida, 2007 Tropical forages, 2005	The hybrid can withstand intensive grazing, months of drought, has intermediate shade tolerance and prefers medium to very fertile soil but can survive less fertile soils with high acidity. It is also expected to survive occasional fire but not necessary benefit for the fire.
8.05	CPC, 2006	This hybrid is said to have resistance to spittlebug, a major pest of the <i>Brachiaria</i> genus, as well as <i>Rhizoctonia</i> leaf blight. (CPC, 2006) In Jamaica, <i>Erwinia chrysanthemi</i> and <i>Tetraneura nigriabdominalis</i> are pests of members of the <i>Brachiaria</i> genus and Poaceae family respectively.

3. Results

3.1 Outcome

Using the Weed Risk Assessment scoring sheet (Appendix), the total score for the assessment will give one of three outcomes (accept/evaluate/reject). The scores and the outcome for the weed risk assessment (Table 3) are appropriate as long as for each section the minimum number of questions have been answered (Table 4).

Table 3: Score of weed risk assessment versus the appropriate outcome

Score	Risk level	Outcome
< 1	Low	Accept
1 – 6	Medium	Evaluate
> 6	High	Reject

Table 4: Minimum number of questions for each section of weed risk assessment

Section	Part(s)	Minimum number of questions
A	1.01 – 3.05	2
B	4.01 – 4.12	2
C	5.01 – 8.05	6
Total		10

The total score for the *Brachiaria* Mulato II hybrid weed risk assessment is **9**. This is a **High** result which correlates to an outcome of **Reject**.

However, the scores leading to this high score are results of the hybrid being a member of Poaceae. In the weed assessment sections: 5.02, 6.06, 6.07, 7.04 and 8.01 are automatic **yes** for members of the Poaceae family. Furthermore, there is no information that the Mulato II *Brachiaria* hybrid has displayed any weedy behaviour.

Hence, the recommendations for the importation of these seeds are to be considered with the conclusive results of the Bodles Agricultural Research Centre (BARC). If the BARC can conclude that the benefits of this hybrid outweigh the possible economic costs, then the

importation of the *Brachiaria* Mulato II hybrid seeds are allowed considering two other evaluations. As follows:

1. A Pest Risk Analysis of possible pests that may travel with the seed shipments.
2. The seeds must come from a reputable distributor and is carefully labelled identifying the specific hybrid (only *Brachiaria* Mulato II) and the official origin of the seed shipment.

3.2 Phytosanitary considerations

The Plant Quarantine/Produce Inspection Division of the Ministry of Agriculture and Fisheries, Jamaica requires that the exporter National Plant Protection Organization sample and inspect the consignment according to official procedures for all visually detectable regulated pests and purity (only *Brachiaria* Mulato II hybrid) of the seed shipment. Consignments should also be inspected to ensure that the seeds are free of soil.

If regulated pests are intercepted / detected on the commodity, or associated packaging, the following actions will be undertaken as appropriate:

- Re-export (where possible) of the consignment at the importer's expense
- The destruction of the consignment at importer's expense.
- The suspension of trade, until the cause of the non-compliance is investigated, identified and rectified.

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Appendix

Figure 1: Weed Risk Assessment scoring sheet

	a	b	c	d	e	
Section	Question	Response¹	Score	N score	Y score	
A	C 1.01			0	-3	
	C 1.02			-1	1	
	C 1.03			-1	1	
	2.01		The response for these questions is 2 unless a climate analysis is done			
	2.02					
	C 2.03			0	1	
	C 2.04			0	1	
	2.05					
	C 3.01					
	E 3.02					
	A 3.03					
	E 3.04					
	C 3.05					
	B	C 4.01			0	1
		C 4.02			0	1
C 4.03				0	1	
A 4.04				-1	1	
C 4.05				0	1	
C 4.06				0	1	
C 4.07				0	1	
E 4.08				0	1	
E 4.09				0	1	
E 4.10				0	1	
E 4.11				0	1	
C 4.12				0	1	
C	E 5.01			0	5	
	C 5.02			0	1	
	E 5.03			0	1	
	C 5.04			0	1	
	C 6.01			0	1	
	C 6.02			-1	1	
	A 6.03			-1	1	
	C 6.04			-1	1	
	C 6.05			0	-1	
	A 6.06			-1	1	
	C 6.07					
	A 7.01			-1	1	
	C 7.02			-1	1	
	A 7.03			-1	1	
	C 7.04			-1	1	
E 7.05			-1	1		
E 7.06			-1	1		
C 7.07			-1	1		
C 7.08			-1	1		
C 8.01			-1	1		
C 8.02			-1	1		
A 8.03			1	-1		
A 8.04			-1	1		
C 8.05			1	-1		
Total score³						
Outcome⁴						
Agricultural score ⁶						
Environmental ⁶						

Only score 1.02 and 1.03 if you answered yes to 1.01

Lookup table for section 3.
Locate value of inputs and lookup output for each

	Yes to questions 3.01 - 3.05										default
Inputs	2.01	0	0	0	1	1	1	2	2	2	2
	2.02	0	1	2	0	1	2	0	1	2	2
Results	3.01	2	1	1	2	2	1	2	2	2	2
	3.02	2	1	1	2	2	1	2	2	2	2
	3.03	3	2	1	4	3	2	4	4	4	4
	3.04	3	2	1	4	3	2	4	4	4	4
	3.05	2	1	1	2	2	1	2	2	2	2

No to questions 3.01 - 3.05

Input	2.05	?	N	Y
Results	3.01	-1	0	-2
	3.02-3.05	0	0	0

Procedure for scoring assessment

- Record appropriate responses in column b.
- Look up score in columns d & e and record result in column c.
- Calculate total score.
- Lookup and record recommendation.
- Verify that minimum number of questions from each section are answered.
- Compute Agricultural (A&C) and Environmental (E&C) scores: if either score is less than 1, the outcome pertains to the other sector.

Lookup table for 6.07

years	1	2	4
score	1	0	-1

Score	Outcome
< 1	Accept
1-6	Evaluate
> 6	Reject

Section	Minimum # questions ⁵
A	2
B	2
C	6
Total	10