Department of
Primary Industries and Regional Development

GOVERNMENT OF WESTERN AUSTRALIA

Environmental weed risk assessment

Finger grass (*Digitaria milanjiana*)

Species: *Digitaria milanjiana*

(Synonyms: *Digitaria setivalva*; *Digitaria swynnertonii*, *Digitaria mombasana*)

Family: Poaceae

Common name: Finger grass, tall finger grass, digit grass

Cultivars: Includes Arnhem, Jarra, Strickland

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Species summary:

Finger grass is a subtropical to tropical perennial grass native to a wide range in Africa from South Africa to Ethiopia (Cook et al. 2020). It is now cultivated in Africa, Asia (Malaysia; Thailand; Vietnam), Australia (Northern Territory, Queensland), the Caribbean and in the Pacific (Fiji). Finger grass is a highly variable grass species (Hacker 1984). The growth habit varies depending on the variety, as there are stoloniferous, rhizomatous and tufted types. For example, with the commercial cultivars available in Australia; ‘Arnhem’ is a tussock habit with no stolons, while both ‘Jarra’ and ‘Strickland’ are stoloniferous.

Finger grass is suitable as a long-term pasture, for cut and carry, hay production and as groundcover for erosion control. It is adapted to a range of well-drained soils from sands to clay loams but is not normally grown on cracking clays or soils with a strong alkaline pH. It has good drought tolerance but is less tolerant of waterlogging, although there is variation between varieties. Finger grass is not shade tolerant. The rainfall requirements vary widely, and it occurs naturally in areas with annual rainfall from 400 to 1,700mm (Hacker and Wong 1992; Cameron 2009; Cook et al. 2020).

Finger grass has been grown commercially to a very limited extent in Western Australia, however it is more widely grown in the Northern Territory (NT). It has been evaluated under irrigation in the west Kimberley, but it is less productive over the cool season than some other species. It was assessed as a low weed risk in the Northern Territory (Cameron 2009).

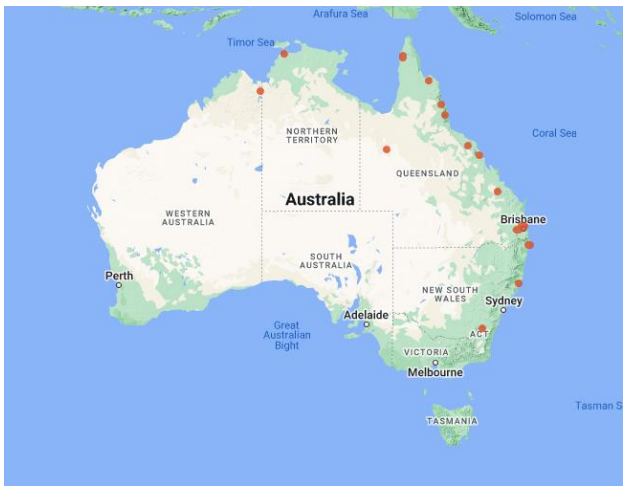


Figure 1. Distribution of finger grass (*Digitaria milanjiana*) in Australia (Source: 'The Australasian Virtual Herbarium')

Section 1: Invasiveness

1. Does the species have a documented environmental weed history?

a) Is an environmental weed in Australia

b) Is an environmental weed overseas

c) Species not known to be an environmental weed but there are environmental weed species in the genus

d) Genus has no known environmental weeds

Digitaria milanjiana is not listed as an environmental weed. It is not listed in Weeds of Australia (398 weed species) https://weeds.org.au/weeds-profiles/, or on the Weeds of Australia website Fact sheet Index (lucidcentral.org). Not listed on the NSW Weedwise website https://weeds.dpi.nsw.gov.au/ On the Global compendium of weeds finger grass is listed as an agricultural weed, casual alien, naturalised, weed (Randall 2017). Finger grass is not listed in 'Weeds of Australian rangelands' (Martin et al. 2006).

From the Australasian Virtual Herbarium (AVH) records *D. milanjiana* is sparingly naturalised in Queensland (Mareeba, roadsides in Lakefield National Park, Collinsville (weedy gully) and Lennox Head). There is a record from NT at an old fodder trial site. Overall, it has some potential to become naturalised on creeks and lakes in the Kimberley.

Western Australia:

- Not listed in 'Western weeds. A guide to the weeds of Western Australia' (Hussey et al. 2007).
- Not listed in 'The naturalized vascular plants of Western Australia 1: Checklist, environmental weeds, and distribution in IBRA regions' (Keighery and Longman 2004)
- Not listed in naturalised taxa recorded from conservation lands in Western Australia (Keighery 1991).

Within the genus *Digitaria* there are species listed as environmental weeds, for example, *Digitiaria insularis* (Randall 2017).

2. What is the ability of the species to successfully establish and compete with other plants, especially amongst intact native vegetation?

a) High - species can establish and displace intact native vegetation

b) Moderate - species can establish amongst intact native vegetation, but may not displace the native vegetation

c) Low - species can only establish where there is little or no competition or in areas where the native vegetation is in poor condition or has been disturbed

d) Very low - species can only successfully establish in vegetation which has been highly disturbed (e.g. roadsides, degraded or cleared areas)

e) Don't know

Finger grass has a good ability to spread as it produces new plants from both stolons and seed. However, it generally does not spread out of sown paddocks as some disturbance, such as a rough cultivation is the minimum requirement to ensure establishment (Cameron 2009). Similarly, Cook et al. (2020) states that, "creeping types spread from seed if conditions are favourable or gradually from stolons. Soil disturbance or open space is necessary for spread by seed".

"D. milanjiana occurs naturally in a wide range of habitats which ae mostly subject to some degree of disturbance" (Hacker and Wong 1992).

3. Grazing tolerance and palatability

a) Very high - Unpalatable (or toxic), rarely grazed

b) High - Will persist under heavy continuous grazing due to plant structure (like rhizomatous grasses) or has limited palatability

c) Moderate - Tolerant of grazing as, usually, only young growth (annuals) or young re-growth (perennials) is grazed, for example after fire or early in wet season; or plants are occasionally browsed

d) Low - Readily grazed during the wet season with some preferential grazing, during the dry season some plants are grazed while others are left ungrazed

e) Very low - Comparatively good feed quality and preferentially grazed at all growth stages; or has low tolerance to grazing and plants are easily killed. Plant numbers decline over successive years if overgrazed.

f) Don't know

Mostly an extremely palatable species (Cook et al. 2020). The young regrowth is both of high quality and highly palatable, but finger grass is not tolerant of heavy continuous grazing, although there is some variation between varieties (Cameron 2009).

"It should not be grazed in the season of establishment before it has had the time to develop a strong root system. In the semi-arid tropics, it should be only lightly grazed in its first dry season" (Cameron 2009).

4. What is the species' ability to persist as a long-term sward or stand without management?

a) Plant numbers increase substantially with successive reproductive cycles to form a near monoculture over a significant area

b) Plant numbers remain at a steady level, persisting as a significant component of a mixed sward/stand

c) Plant numbers decline slowly over successive years so that it becomes a minor component of the vegetation

d) Plant numbers decline rapidly over successive years so that only occasional plants can be found

e) Don't know

Without management, finger grass is likely to be preferentially grazed as new regrowth is highly palatable and it does not tolerate heavy continuous grazing (Cameron 2009; Cook et al. 2020). The stoloniferous forms are high quality grasses, while the tufted form ('Arnhem') has moderate feed quality. For the stoloniferous forms, *in vitro* digestibility of tops can be as high as 76% but is more commonly 68–70% during the growing season and drops to 45–55% during the dry season (Cameron 2009).

5. Is the plant likely to spread or rapidly colonise a site?

a) High risk – plants with a history of spreading rapidly with many plants successfully establishing under favourable conditions >200m from the sown area within 5 years for herbaceous perennials or 10 years for woody perennials

b) Medium risk – some plants will spread outside the planted area and successfully establish under favourable conditions >100m from the sown area within 5 years for herbaceous perennials or 10 years for woody perennials

c) Low – No or minimal spread of sown species. Outside the planted area a few plants will spread and successfully establish within 100m of the planted area under favourable conditions within 5 years for herbaceous perennials or 10 years for woody perennials

d) No spread of sown species more than 10m outside the planted area within 5 years for herbaceous perennials or 10 years for woody perennials

e) Don't know

Creeping types spread from seed if conditions are favourable or gradually from stolons. Soil disturbance (rough seedbed) or open space is necessary for spread by seed (Cameron 2009; Cook et al. 2020). Stoloniferous spread is likely to be a maximum of several metres per year, so less than 100m within a five-year period.

6. Will the species establish and reproduce in low-nutrient Australian soils without the addition of fertiliser or inoculant?

a) Establishment, growth and seed production uninhibited in low-nutrient soils

b) Establishment, growth and seed production reduced in low-nutrient soils

c) Establishment, growth and seed production severely diminished in low-nutrient soils

d) Establishment, growth and reproduction not likely in low-nutrient soils without soil additives

e) Don't know

Finger grass prefers fertile soils. Cook et al. (2020) states that on less fertile soils, seed should be sown with 10–20kg/ha P, with annual maintenance applications of 5–10kg/ha P. Potassium may also be required on some soils where soil analysis or plant symptoms indicate deficiency. Finger grass is very responsive to N fertiliser application and needs at least 100kg N per ha per year to be productive on less fertile soils.

7.1 How likely is long-distance dispersal (>100m) by flying animals (birds, bats)?

a) Common

b) Occasional

c) Unlikely

d) Don't know

No information found that described dispersal by birds or bats.

7.2 How likely is long-distance dispersal (>100m) by stock, native and/or feral animals?

a) Common

b) Occasional

c) Unlikely

d) Don't know

The very small seed (2-2.5 million seeds/kg) has no structures to adhere to fur or hair. However, in suitable conditions the seed might be carried in mud on hooves or the feet of grazing animals.

There is no information available on germination of seed passed through the rumen.

7.3 How likely is long-distance dispersal (>100m) by water?

a) Common

b) Occasional

c) Unlikely

d) Don't know

Finger grass is mostly intolerant of poor drainage, so is not normally grown adjacent to streams and waterways (Cameron 2009). However, some types are tolerant of short-term flooding (Cook et al. 2020). Seed and vegetative propagules could be carried by waterways or dispersed by flood water. The small seed could be readily washed with organic matter across slopes and along drainage lines.

7.4 How likely is long-distance dispersal (>100 m) by wind?

a) Common

b) Occasional

c) Unlikely

d) Don't know

Finger grass has very small seed (2-2.5 million seeds/kg; Cook et al. 2020) and seed is readily shed from the seed head as it matures. The species is wind dispersed, but only short distances.

8.1 How likely is long-distance dispersal (>100m) accidentally by people and vehicles?

a) Common

b) Occasional

c) Unlikely

d) Don't know

Both seed and plant fragments can be spread in soil by vehicles, machinery and also on footwear when soil conditions are wet. Farm machinery, slashers and other equipment involved in road work and maintaining road verges may pick up and spread propagules from pastures and disturbed roadsides colonised by finger grass.

8.2 How likely is long-distance dispersal (>100 m) as fodder or accidentally in contaminated produce?

a) Common

b) Occasional

c) Unlikely

d) Don't know

Finger grass is suitable for hay production (Cook et al. 2020), so seed could potentially be spread in fodder.

9.1 What is the species minimum generation time?

a) ≤1 year

b) 2-3 years

c) >3 years or never

d) Don't know

Under favourable conditions, finger grass can most likely establish and set seed within 12 months, albeit there is a degree of post-harvest seed dormancy which varies with the 'type' (Hacker 1984; Hacker and Wong 1992).

9.2 What is the species' average seed set in a favourable season?

a) Prolific seed production high (e.g. >1000 m^{-2}/year for woody species, >5000 m^{-2}/year for herbaceous species)

b) Moderate – low seed production

c) None (or seed is sterile)

d) Don't know

Seeds are extremely small with approximately 2 to 2.5 million seeds/kg (Cook et al 2020).

Commercial seed production: "In some environments, 3 harvests are possible in some years. The harvests will be in November/December, January/February and in April. In semi-arid tropical areas, the February seed crop is generally the largest at 100kg/ha. ….In north Queensland and subtropical southern Queensland, the January/February harvest can yield 200-250kg seed/ha" (Cameron 2009).

9.3 What is the species seed persistence in the soil seedbank?

a) >5 years

b) 2-5 years

c) <2 years

d) Don't know

The persistence of finger grass seed is likely to be in the range of 2 to 5 years. Finger grass has some post-harvest seed dormancy which varies with the 'type' and with the environment (Hacker et al. 1984). The ecotypes from low rainfall tropical regions had the longest dormancy and required extended periods of high temperature to break dormancy (Hacker 1984). With some low rainfall 'types' there was an induced or secondary dormancy (Hacker et al. 1984).

9.4 Can the species' reproduce vegetatively?

a) Yes – rapid vegetative reproduction

b) Yes – slow

c) No

d) Don't know

The stoloniferous types can spread vegetatively to form new plants spreading several metres per year.

Section 2: Impacts

1. Could the species reduce the biodiversity value of a natural ecosystem, either by reducing the amount of biodiversity present (diversity and abundance of native species), or degrading the visual appearance?

a) The species could significantly reduce biodiversity such that areas infested become low priorities for nature conservation and/or nature-based tourism

b) The species could have some effect on biodiversity and reduce its value for conservation and/or tourism

c) The species would have marginal effects on biodiversity but is visually obvious and could degrade the natural appearance of the landscape

d) The species would not affect biodiversity or the appearance of natural ecosystems

e) Don't know

D. milanjiana is not listed as an environmental weed (Randall 2017) and even where well adapted to the climate and soils is unlikely to invade native vegetation as it requires at a minimum a rough seedbed to establish (Cameron 2009). If present, the appearance is not dissimilar to other tufted and stoloniferous grasses in the WA rangelands.

2. Does the species have a history of, or potential to reduce the establishment of other plant species?

a) The species can significantly inhibit the establishment of other plants (e.g. regenerating native vegetation) by preventing germination and/or killing seedlings, and/or the species forms a monoculture over a large area

b) The species can inhibit the establishment of other plants and can become dominant.

c) The species can cause some minor displacement by inhibiting establishment, but will not become dominant.

d) The species does not inhibit the establishment of other plants.

e) Don't know

A dense sward of finger grass may inhibit the germination of annual weeds in an agricultural situation; however, it is unlikely to form a dense sward in native vegetation where the soils are of inherently low fertility. Cook et al. (2020) reports finger grass is not as competitive as many of the tropical grasses, but sward-forming types may suppress legume seedling recruitment.

In agronomic field trials in the west Kimberley under irrigation, the plots of Jarra grass were invaded by annual grass weeds and other perennial grasses over the cool season as the Jarra grass was comparatively slow growing (semi-dormant) and uncompetitive (G. Moore unpublished).

3. Could the species alter the structure of any native ecosystems at risk of invasion from this species by adding a new strata level?

a) Will add a new strata level, and could reach medium to high density

b) Will add a new strata level, but at low density

c) Will not add a new strata level

d) Don't know

The tropical and sub-tropical rangelands of northern Western Australia include large areas of grassland with shrub and tree strata with a native grass understory so that any incursion by finger grass (unlikely) would not usually add a new strata to the ecosystem.

4. Could or does the species restrict the physical movement of people, animals, and/or water?

a) Species infestations could become impenetrable throughout the year, preventing the physical movement of people, animals and/or water

b) Species infestations could significantly slow the physical movement of people, animals and/or water throughout the year

c) Species infestations could slow the physical movement of people, animals and/or water at certain times of the year or provide a minor obstruction throughout the year.

d) Species infestations have no effect on physical movement

e) Don't know

With finger grass the foliage is generally less than 0.7–1.0m with seed heads 1.5 to 1.8m in height (Cameron 2009; Cook et al. 2020). It is not spiky and is unlikely to cause any greater obstruction than native tussock-forming grasses. Under favourable conditions finger grass can form dense swards over small areas, but these would have little effect on physical movement through an area for people, animals or water.

5. Does the species have, or show the potential to modify the existing behaviour and alter the fire regime?

a) High - major effect on frequency and/or fire intensity. May greatly increasing the dry season fuel load

b) Moderate effect on frequency or fire intensity

c) Minor or no effect

d) Don't know

The relationship between grass invasion and fire has received considerable attention in the literature. In comparison to other vegetation types, many tropical pasture grasses produce large fuel loads and burn hotter and often later in the season than native grasses, are relatively flammable and can regenerate quickly after fire (Low 1997). Finger grass as a tufted and/or stoloniferous grass does not produce the bulk of the large tufted or bunch grasses like Gamba grass (*Andropogon g*ayanus) which produces large amounts of biomass that dries out quickly and can readily burn. In general, finger grass produces considerably less biomass than the medium to large bunch (tufted) grasses. Finger grass is tolerant of fire and recovers after burning (Cameron 2009).

6.1 Is the species toxic to animals, have spines or burrs, or host other pests or diseases that could impact on native fauna and flora?

a) Yes – plant poisonous or other adverse factors present

b) No – plant is not poisonous, does not produce burrs or spines or harbour pests or diseases

No livestock disorders or toxicity has been recorded (Cameron 2009).

6.2 Could the species provide food and shelter for pest animals?

a) Yes – could provide more shelter or greater nutritional value than the native vegetation

b) No – could provide similar or less shelter or nutritional value than the native vegetation

c) Don't know

Finger grass would provide similar food and shelter to other perennial grasses in a rangeland context.

7.1 Does the species have, or show the potential to have, a major effect on nutrient levels in intact native vegetation?

a) Will significantly increase soil nutrient levels

b) Will significantly decrease soil nutrient levels

c) Will have minimal effect on soil nutrient levels

d) Don't know

Finger grass is likely to grow rapidly in the first year or two and utilise the available nutrients. The biomass production in subsequent years is likely to decline as the nutrient levels are rundown. Plant persistence may also be adversely affected in low nutrient soils.

7.2 Could the species reduce water quality or cause silting of waterways?

a) Could significantly reduce water quality or cause silting or alteration of flow of waterways

b) May have some effect on water quality or silting of waterways in some ecosystems

c) Minor or no effect on water quality

d) Don't know

This species has been used as a soil stabiliser and as a groundcover to reduce soil erosion, so is unlikely to cause silting of waterways.

7.3 Does the species have, or show the potential to have, a major effect on the soil water table below intact native vegetation?

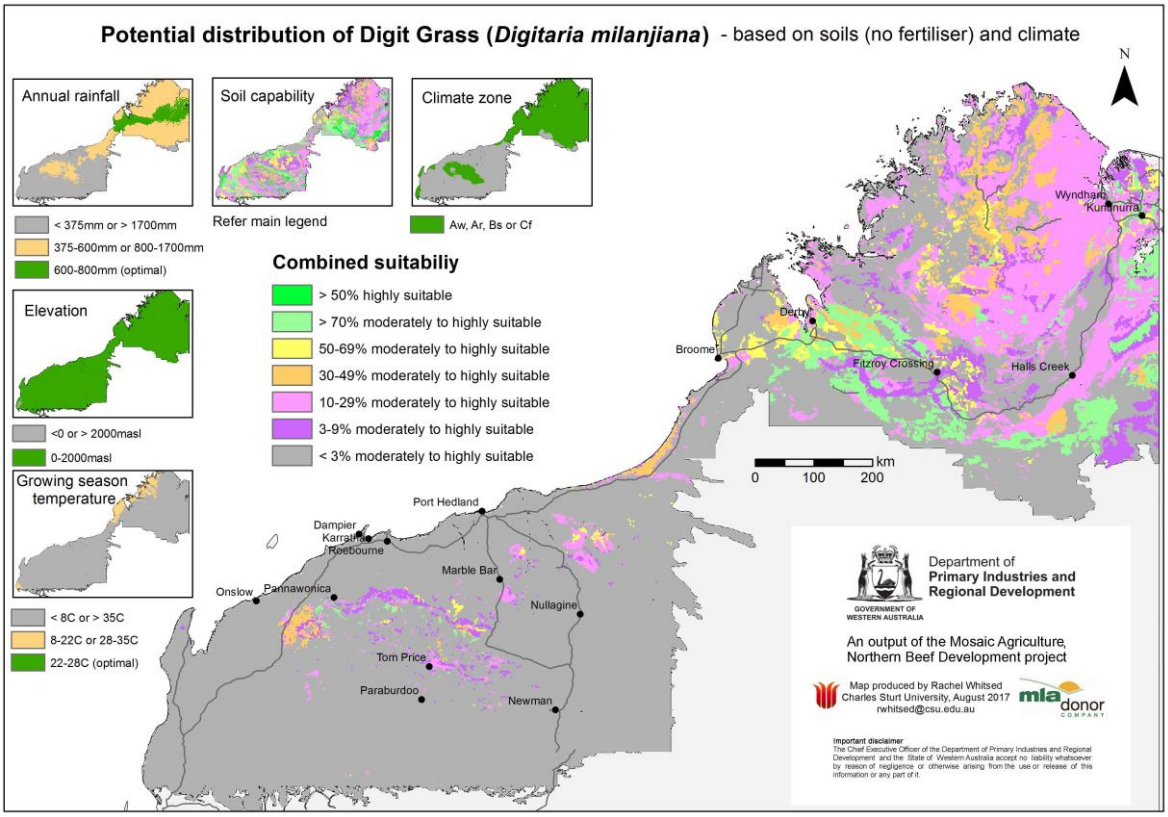
a) Will significantly lower the water table and/or reduce groundwater recharge to the water table.

b) Will have little or no impact on hydrology

c) Don't know

In a rangelands context most landscapes have a woody shrub and or tree strata which would have much deeper root systems than the perennial grasses, so finger grass would have minimal or no impact on hydrology.

Potential distribution



Region	Area of suitable soils and climate	Potential distribution score
Kimberley	6.35Mha	7.0
Pilbara (>375mm AAR)	0.39Mha	2.0
Pilbara (<375mm AAR)	0	0.5
Gascoyne – Goldfields	0	0.5

Overall weed risk assessment

The overall weed risk assessment (WRA) is calculated from Equation 1.

Equation1: Invasiveness (0-10) x Impacts (0-10) x Potential Distribution (0-10) = Weed risk score (0-1000)

Invasiveness score = 4.3; Impacts score = 2.0

Region	WRA calculation*	Overall score	WRA rating
Kimberley	4.3 x 2.0 x 7.0	**60.2**	**Medium**
Pilbara (>375mm AAR)	4.3 x 2.0 x 2.0	**17.2**	**Negligible-low**
Pilbara (<375mm AAR)	4.3 x 2.0 x 0.5	**4.3**	**Negligible-low**
Gascoyne – Goldfields	4.3 x 2.0 x 0.5	**4.3**	**Negligible-low**

***** Invasiveness (0-10) x Impacts (0-10) x Potential Distribution (0-10) = Weed risk score (0-1000)

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