



**Cultivated/naturalized:**

Throughout the tropics and subtropics.

## Uses/applications

### Forage

Grazing in mixture with grasses and cut-and-carry forage for ruminants and monogastrics. The leaves, soft branches and even the plant's yellow flowers are eaten.

### Environment

Green manure, hedgerows for erosion control and bee forage.

### Other

Tithonia is used as an ornamental, for live fencing and boundary demarcation, and for intercropping. The stems can be used as firewood and the leaves to make medicine for treatment of various ailments.

## Ecology

### Soil requirements

Requires well-drained, moderately fertile soils. Is reported to tolerate acid, low-fertility soils and to have a high capacity of phosphorus uptake.

### Moisture

Prefers mean annual rainfall in the range of 1,000–2,000 mm, but tolerates 700–>2,500 mm. Considered as moderately drought-resistant.

### Temperature

Can be found at elevations up to 2,300 m asl; best growth where annual daytime temperatures are within the range 15–31 °C, but can tolerate 12–38 °C.

### Light

Prefers full sunlight; no particular shade tolerance reported.

### Reproductive development

Flowers and produces seeds throughout the year. Mature plants can produce up to 900,000 seeds per square meter annually, with up to 93% viability. Seed can be disseminated by water flow, strong wind and adhering to animals. Field observations indicate that *T. diversifolia* is able to reproduce also clonally, especially during the rainy season, when adventitious roots and young shoots rapidly emerge from nodes on lower or prostrate branches. Clonal growth contributes to horizontal expansion of patches and can lead to the creation of dense stands.

### Defoliation

Recommended plant height for use of tithonia for forage (grazing or cutting) is 1.00–1.50 m; suggested cutting height is 10–15 cm. First grazing at 1.50–1.80 m height, when plants have developed a strong root systems that will allow vigorous regrowth. Grazing must be rotational with an occupation time of no longer than 2 days and a rainfall-dependent rest period of 60–90 days. Rapid regrowth. Post-flowering cuts result in higher yields than pre-flowering cuts. In lignified plants, 1–2 standardization cuts/year at 20 cm height are suggested to stimulate leafy regrowth.

### Fire

Tolerance of fire has been reported.

## Agronomy

Guidelines for establishment and management of sown forages.

### Establishment

Tithonia is usually propagated from stem cuttings of 20–40 cm length, inserted vertically into the soil, 10–20 cm deep (similar to planting of cassava). Direct sowing of seeds and transplanting to other areas of spontaneous seedlings emerged under the canopy are also options, the main benefit being that under optimum conditions the roots may grow deeper in the soil and improve plant growth. Suggested planting distances are in the range of 0.75–2.0 m × 0.75–2.0 m or, in cooler regions with less radiation, wider.

### Fertilizer

There is no information on the effect of fertilizers on tithonia but the species can be expected to respond to application of production-limiting nutrients.

## Compatibility (with other species)

Tithonia is reported to be suitable for association with a number of pasture grasses and shrub legumes.

## Companion species

Grasses: *Cynodon nlemfuensis*, *Megathyrsus maximus*, *Urochloa* spp., *Cenchrus clandestinus*

Legumes: *Gliricidia sepium*

## Pests and diseases

No major pests and diseases are known for *T. diversifolia*.

## Ability to spread

*T. diversifolia* can spread via both seed and young branches (clonal proliferation).

## Weed potential

In some countries considered an invasive weed. In Australia it is rated as a serious environmental weed.

## Feeding value

### Nutritive value

For a non-legume, high nutritive value, which however decreases considerably with increasing plant age and development. CP 14–28%; 84% moisture content, low fibre concentrations; digestibility 63–65%; high DM degradability *in sacco* (90% after 48 h); P 0.29–0.38%, Ca 2.0–2.5%.

### Palatability/acceptability

Moderate palatability to cattle and small ruminants .

### Toxicity

There are reports on low concentrations of secondary metabolites (alkaloids, polyphenols, saponins, terpenes and others) which may be responsible for the moderate palatability of *T. diversifolia* to livestock and for affected growth (occasionally observed) of neighboring vegetation (phytotoxicity, allelopathy). One study showed that carcass traits and sensory characteristics of broilers were adversely affected when dried leaf material comprised >4% of the ration.

### Feedipedia link

<https://www.feedipedia.org/node/15645>

## Production potential

### Dry matter

Green matter production reported is in the range of 30–70 t/ha/cut is reported as well as annual biomass yields of 60 t/ha at cutting intervals of 4 months.

### Animal production

Livestock production has been improved by feeding tithonia; e.g. daily LWG of young bulls 643 g/animal when chopped grass was supplemented with tithonia vs. 509 g without. There are also reports on slightly increased milk production when tithonia was fed.

## Genetics/breeding

$2n = 34$ .

## Seed production

Based on available information (up to 900,000 seeds/m<sup>2</sup>) seed production potential is high.

## Herbicide effects

The following chemicals can be used in NSW Australia (<https://weeds.dpi.nsw.gov.au/Weeds/JapaneseSunflower> )

- Metsulfuron-methyl 300 g/kg + Aminopyralid 375 g/kg (Stinger™) at 20 g in 100 L of water; hand gun application; withholding period: 3–56 days.
- Metsulfuron-methyl 600 g/kg (Brush-off®) at 10 g in 100 L of water applied to actively growing plants after full leaf expansion but before seed set. Add surfactant. Withholding period: Nil (recommended not to graze for 7 days before treatment and for 7 days after treatment to allow adequate chemical uptake in target weeds).
- Picloram 100 g/L + Triclopyr 300 g/L + Aminopyralid 8 g/L (Grazon Extra®) at 350 mL in 100 L of water applied as foliar spray pre-

flowering Withholding period: Where product is used to control woody weeds in pastures there is a restriction of 12 weeks for use of treated pastures for making hay and silage; using hay or other plant material for compost, mulch or mushroom substrate; or using animal waste from animals grazing on treated pastures for compost, mulching, or spreading on pasture/crops.

- Picloram 44.7 g/kg + Aminopyralid 4.47 g/L (Vigilant II®) undiluted as cut stump/stem injection application. Apply a 3–5 mm layer of gel for stems less than 20 mm and 5 mm layer on stems above 20 mm. Withholding period: Nil.
- Triclopyr 300 g/L + Picloram 100 g/L (Grazon® DS) at 350 mL in 100 L of water applied as a foliar spray pre-flowering. Withholding period: Nil.

## Strengths

- High DM production potential .
- Adaptation to a wide range of climate and soils.
- Fast growth and regrowth.
- High nutritive value for a non-legume.

## Limitations

- High weed potential.
- Unclear allelopathic potential.
- Unclear importance of antinutritional factors.
- Low drought tolerance.

## Internet links

<https://www.cabi.org/isc/datasheet/54020>

[http://apps.worldagroforestry.org/treedb/AFTPDFS/Tithonia\\_diversifolia.PDF](http://apps.worldagroforestry.org/treedb/AFTPDFS/Tithonia_diversifolia.PDF)

[https://www.prota4u.org/database/protav8.asp?g=psk&p=Tithonia+diversifolia+\(Hemsl.\)+A.Gray](https://www.prota4u.org/database/protav8.asp?g=psk&p=Tithonia+diversifolia+(Hemsl.)+A.Gray)

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## Cultivars

None released.

## Promising accessions

None reported.

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