Dwarf Nettle

Urtica urens

Weed management guide for Australian vegetable production

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Identification

Dwarf nettle (*Urtica urens*) is an annual herbaceous plant, native to Mediterranean Europe, that grows between 10 and 75 cm in height.

Leaves are up to 6 cm in length but often 1-3 cm, oval to elliptical in shape, deeply toothed or serrated on the edges, green to dark green, and covered with scattered stinging hairs. Clusters of small, greenish-white flowers form where the leaves join the stems.

Dwarf nettle is also known in Australia as small nettle, lesser nettle, or stinging nettle. Vegetable farmers are likely to be very familiar with it where it is found on their farm, and to be well aware of how to identify it. However depending on its stage of growth, it may be possible to mis-identify it as tall nettle (*Urtica dioica*), native scrub nettle (*Urtica incisa*) or potentially deadnettle (*Lamium amplexicaule*), particularly where the plants are recently germinated.

Figure 1 includes a series of photos of dwarf nettle at different life stages in order to facilitate correct identification on-farm, from a young seedling through to a mature flowering plant.

Figure 1 Life stages, from germination to flowering

Dwarf nettle may be mis-identified as native scrub nettle (*Urtica incisa*), a common species native to Australia.

Compared to dwarf nettle, native scrub nettle reaches up to 1m in height, has longer lance-shaped leaves (up to 12 cm) that are paler beneath, fewer stinging hairs, and spike-like clusters of flowers that can be longer than the leaf stalks.

Figure 2 native scrub nettle flowers and leaves (South Australian Seed Conservation Centre).

Characteristics

Key characteristics

Table 1 Key characteristics of dwarf nettle

Time of germination	Year round (moderate climates); spring/summer (cool climates)
Time of flowering and seed set	Late spring through to early autumn
Reproduction	By seed only
Seed productivity	Up to 1,500 seeds/plant
Seed viability	Up to several decades depending on conditions
Optimum germination soil depth	Within 25 mm of the soil surface
Soil type/s	Favours soils high in organic matter
Competitive advantages	Germinates under wide range of soil temperatures; early emergence; rapid growth; long-term seed viability; high seed production; competes well with crops

Seasonality

Dwarf nettle is classified as a summer annual in cooler climates, and a winter annual in warmer climates. Most dwarf nettle seedlings emerge in the spring, though emergence can continue until late summer in cooler climates, and throughout the year in warmer climates. Plants are killed by the onset of frost, with younger plants being more susceptible. Germination can continue in temperatures ranging from 4°C to 26°C. Flowering and seed set usually occurs from later spring through to autumn. Occasionally plants may flower and set seed when only 8 to 10 cm in height.

Seed production

Dwarf nettle seed vary in colour from yellow to tan or brown, are 1.6 to 2 mm long and 1 to 1.5 mm wide, oval-shaped with a pointed tip. Up to 1,500 seeds per plant can be produced, and previous research on vegetable farms in the UK has estimated approximately 90 million seeds per hectare were present across a number of field sites. Early germinating plants can flower several times in one season, and seed from early germinating plants may themselves produce plants within the same growing season. In ideal conditions, plants can produce seed as little as five weeks after germination.

Seed germination and viability

Seed dormancy capacity contributes to the success of dwarf nettle. Seed can reportedly remain viable in the soil for up to several decades, though the number of viable seeds found is greatly reduced in regularly tilled soils compared to undisturbed soils. Research suggests that at a range of temperatures, seed viability of dwarf nettle remains high, with germination rates of over 90% obtained in ideal temperature ranges (approximately 20°C to 25°C). Germination is enhanced by soil disturbance (such as tillage) and the rate of germination is greatest in the top 25 mm of soil. The germination rate is also greater in darkness than in light, which suggests that the seed does better if buried than on the soil surface.

Soil preference

Dwarf nettle shows a preference for moist soils that are rich in organic matter. Stinging nettle responds well to nitrogen, and its presence is often an indicator of high rates of nitrogen in the soil.

Methods of spread

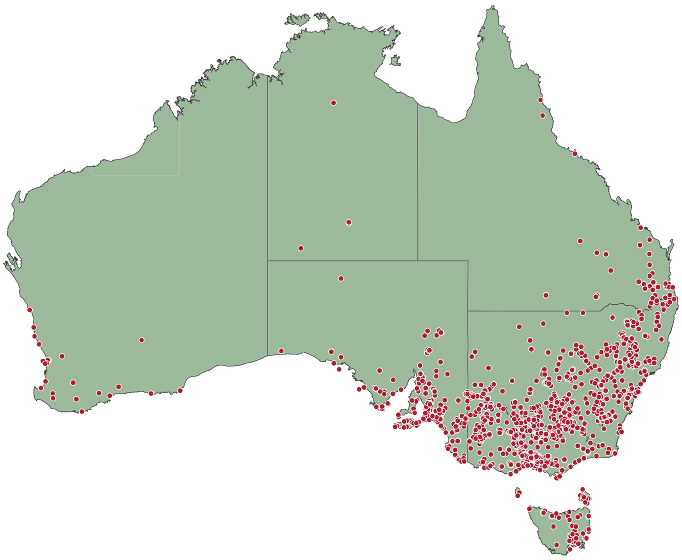
Dwarf nettle may spread across and within farms in a number of ways, including:

- via contaminated grains or vegetable seeds;
- machinery and agricultural practices; and
- passing intact through the digestive tract of livestock.

Once dwarf nettle has spread to vegetable fields, populations can increase rapidly.

Distribution

Dwarf nettle is a common weed of disturbed sites such as fence lines, earth banks and roadsides, in addition to being problematic in vegetables and other horticultural crops. It is widespread in all Australian states, particularly in the south-east, and is noted as a significant weed of vegetable production.



Map 1 Australian distribution of dwarf nettle (source: Atlas of Living Australia)

Figure 3 Regular soil disturbance and addition of organic materials, and heavy seeding of the weed, means that dwarf nettle can quickly become dominant within vegetable crops.

Impacts

Intensive vegetable cropping favours the establishment and growth of dwarf nettle, given that it requires as little as five weeks between emergence and production of viable seed, depending on conditions, and is stimulated by soil disturbance. Once established in vegetable fields, a large seed bank can be established and populations can increase rapidly. Around the world, it is considered a major weed of a number of vegetable crops, including beets, cabbage, carrots, onions, peas, and potatoes. Researchers in Egypt found that tuber yield was reduced by about 40% in an unweeded potato field where dwarf nettle was one of the dominant weed species.

Harvesting interference and hand removal

One of the key impacts of dwarf nettle is its capacity to sting when coming into contact with bare skin, via the hairs located on the leaves and stems. When touched, the tip of each hair can break off and become a miniature hypodermic needle, penetrating the skin and injecting irritating chemicals. Gloves are required for hand weeding, and the weed is consequently an irritating presence that interferes with crop harvesting operations, particularly when conducted by hand, but also where machine harvesting is utilised.

Crop competition and contamination

Some impacts of this weed in row crops include:

- crop nutrition deficiency;
- competition for light and water; and
- crop contamination.

Early emergence and rapid growth rate gives dwarf nettle a competitive advantage over crop plants. Contamination can result in significant removal costs during processing, or lower prices at sale. Contamination has been particularly noted as a problem for machine-harvested cut-leaf vegetables such as spinach and baby leaf lettuce.

A host of pests and diseases

Dwarf nettle hosts a range of vegetable crop pests and diseases in Australia and elsewhere around the world. These include *Pratylenchus* nematodes, viruses (including cucumber mosaic virus), *Verticillium* wilt, and aphids.

Management

Management methods

Table 2 Dwarf nettle management methods

Activity	Suitability	Notes
Tillage	✔✔	No later than 2 weeks after emergence. May include stale seedbed. Inversion ploughing not recommended due to long seed viability period.
Cover crops	✔✔	Feasibility of cover crops dependent on cash crop produced and viability of non-crop period in annual rotation. Thick canopy effective in reducing dwarf nettle germination and seed set. Good establishment is critical.
Planting density	✔✔	Plant crop at highest practical density without impacting on crop yield, to increase competition.
Farm hygiene	✔	Best suited to farms with no current dwarf nettle infestation, or an infestation restricted to one part of the farm.
Physical control	✔	As follow-up to early-stage herbicide and tillage. Hand weeding is expensive and not suitable for wide-scale use. Stinging plants require gloves and protective clothing. Suited to lighter infestations or occasional larger plants.
Herbicides	✔✔✔	No later than 3 weeks after emergence. Potential resistance to simazine based on Victorian vegetable crop example.
Biological control	**N/A**	Not currently available in Australia.
Integrated weed management	✔✔✔	Precise combination of techniques will vary from farm to farm. Early control with herbicides or tillage is critical, while the plants are vulnerable and before further weed seed production.

Tillage ✔✔

Dwarf nettle germination is enhanced by tillage, and is greastest in the top 2.5 cm of soil. Nonetheless, repeated tillage reduces the dwarf nettle seed bank over time. Shallow tillage can also be particularly helpful in controlling recently emerged dwarf nettle seedlings, including within recently established crop beds ('intra-row tillage').

Soil disturbance by tillage before crop planting at a depth of 2.5 to 5 cm can therefore be highly effective, by stimulating germination and then controlling recently germinated weeds when they are still small and fragile, before the crop is planted. This is commonly known as a stale seed bed and it provides the crop with a head-start.

Stale seed beds are highly recommended for management of the dwarf nettle seed bank, with one study suggesting that only 4% of seed remained viable in the soil after 6 years of regular cultivation, compared with 39% of seed in undisturbed soil. However, using a stale seed bed will require sufficient time between crops, and it depends on having suitable soil moisture conditions.

A stale seed bed may also be effective *within* the crop row in the first 4-6 weeks after crop planting. Feasibility of this option depends on crop type and availability of suitable intra-row tillage equipment.

The capacity of dwarf nettle seed to remain dormant in the soil for many years suggests that inversion ploughing or deeper ripping may create problems, either by bringing long-dormant dwarf nettle seeds to the surface, or burying large numbers of viable seed to become a future problem in the paddock.

Figure 4 A shallow 'tickle' till within the crop row and between the plants early in their life cycle may help to manage recently germinated dwarf nettle and other important broadleaf weeds, allowing the crop to form a canopy before the weed problem becomes significant within the rows. Relevance of this technique will depend on crop/s grown, and availability of intra-row tillage equipment. In this crop in South Australia, a Weed Fix cultivator is used to manage weeds such as dwarf nettle within the crop beds.

Cover crops

Cover crops grown in the period between vegetable cash crops offer growers an opportunity to reduce the impact of dwarf nettle on their farm. They can be expected to reduce dwarf nettle germination, flowering and seed set through competition for resources (soil nutrients, water and light), and potentially as a result of their biofumigant effects.

Research in the United States suggests that early-season cover crop canopy establishment, and cover crop plant density, are significant factors in the capacity of different cover crop types to suppress dwarf nettle emergence, growth and seed production. They found that a 50/50 mix of white mustard (*Sinapis alba*) and Indian mustard (*Brassica juncea*) was significantly more effective at suppressing dwarf nettle than oats (*Avena sativa*) or mixed cover crops of oats and a legume.

The superiority of the mustard cover crops may also be due to a biofumigant effect, however the role of biofumigation in management of significant weeds such as dwarf nettle in Australian conditions requires further research.

Selection of cover crop variety will need to take several factors into account, such as cost of and ability to grow the cover crop, its expected soil health benefits, relevance for breaking the disease cycle within the cash crop, and overall contribution to cash crop productivity. As the United States example shows, good establishment is critical for achieving effective weed management using the cover crop.

*Figure 5 Rapidly establishing and high biomass brassica cover crops have been shown to be particularly effective in suppressing dwarf nettle germination and growth due to their high biomass and dense canopy. Here, tillage radish (*Raphanus sativus*) was effective for managing a variety of broadleaf weed species on a farm near Hobart, Tasmania.*

Planting density

Agronomic practices, such as increased plant density, that contribute towards the rapid development of a thick crop canopy cover will result in fewer and shorter dwarf nettle plants, fewer flowers, reduced seed production, and less return of dwarf nettle seed to the soil. This principle is similar to selecting a competitive cover crop variety, as discussed above. Competitive crop variety selection may result in more rapid establishment of crop canopy, and is likely to have similar effectiveness in suppressing dwarf nettle germination, growth and seeding.

Where it is appropriate to the crop, higher plant density and variety selection (including shading of wheel tracks where this is possible) may contribute to reduced dwarf nettle impact in the longer term.

Figure 6 On this farm near Richmond, New South Wales, appropriate planting density was combined with planting along an east-west axis in an effort to achieve greater shading of the wheel tracks. This can be used along with other techniques (such as tillage, pre-plant/pre-emergent herbicide application and selective hand weeding) to suppress dwarf nettle and other weeds effectively within the crop beds.

Farm hygiene

Implementing appropriate farm hygiene practices helps limit the spread of dwarf nettle seeds across and between properties, and onto crop beds from other parts of a property where the weed is present. Common practices include permanent or set vehicle tracks, equipment wash-down, and restricting movement onto the property.

While dwarf nettle may be well managed within the crop beds, the authors have regularly observed this weed in wheel tracks, headlands, nearby non-crop areas and post-harvest crop residues, with plants going to seed and replenishing the seed bank both around and within the fields. Effectively managing off-bed dwarf nettle plants may therefore reduce the burden of this weed within crop beds in the longer term.

Farm hygiene may be less relevant for managing dwarf nettle where it has already spread across the whole farm. Other difficulties associated with this approach include the time required to wash equipment down thoroughly, and the potential for uncontrolled spread in flood prone areas.

Figure 7 Establishing a fixed equipment wash-down bay can help restrict the spread of dwarf nettle on the farm, particularly where it is not present at all or only present on part of the farm.

Physical control

Physical control options include digging or hoeing plants out, or potentially pulling larger plants out by hand, however thick gloves need to be worn to reduce the likelihood of being stung by dwarf nettle. Nevertheless, hand weeding can be a key component of achieving commercially acceptable levels of dwarf nettle control, particularly where higher planting densities or larger crop plant sizes make tillage within the crop impossible.

Hand weeding may also be necessary to remove dwarf nettle plants growing close to crop plants, in crop plant holes in a plastic mulch system, or more generally within the crop bed where selective herbicide options are not available, and where other attempts to manage the weed have been less successful.

Farmers are generally hesitant to implement wide-scale hand weeding due to its high cost. However, selective and timely hand weeding can be a very effective follow-up to tillage and herbicide control in particular, especially when implemented earlier in the crop life cycle. Removing a few remaining dwarf nettle plants by hand and taking any flowering or seeding plants away from the paddock may have significant benefits in reducing the weed seed bank in future crop seasons. It may also help prevent herbicide resistance from developing.

Figure 8 Removing recently germinated weeds such as dwarf nettle before they have a chance to establish is an effective follow-up to pre-plant tillage and herbicide control, and will have longer-term benefits in reducing the weed seed bank. Tools that require relatively little effort, such as the stirrup hoe pictured here, can make this task easier depending on soil type and moisture level, and weed plant size.

Herbicides

In addition to knock-down options such as glyphosate or diquat, dwarf nettle is susceptible to a range of herbicides in groups C, D, G and K. However, control effectiveness can vary depending on the stage of plant development.

A range of selective and non-selective herbicides are registered to control dwarf nettle, across a variety of vegetable crops. Farmers should consult with their advisor or agronomist for specific product availability in their district, whether herbicide options are registered for the crop/s they grow, and the suitability of these products for their production system.

Table 3 Herbicides registered for management of dwarf nettle in Australian vegetable production

Herbicide active ingredient*	Trading name/s	Group	Vegetable crop/s in which use is registered	Timing/crop growth stage
Chloridazon	Pyramin	C	Red beet, silver beet, baby leaf spinach	Post-sowing pre-emergence
Chlorthal-Dimethyl	Dacthal 900 WG	D	Brassicas, beans, peas, garlic, onions, carrots, lettuce, potatoes, turnips	At time of seedling or transplanting
Dimethenamid-P	Frontier-P	K	Green beans, navy beans, sweet corn, corn, green peas, pumpkins and kabocha	At or immediately after sowing; pre-emergence
Linuron	Linuron DF and Flowable	C	Carrots, parsnips, onions, potatoes	Pre- or post-emergent depending on crop
Methabenzthiazuron	Tribunil	C	Onions	Post-emergent (one or more true leaves in onion crop)
Metolachlor	Metolachlor 720EC; Meto-lachlor 960	K	Broccoli, Brussels sprouts, cabbage, cauliflower	Immediately after transplanting
Metham	Metham Sodium; Tamafume (fumigants)	N/A	All crops	
Metribuzin	Various	C	Peas, potatoes, tomatoes	Pre-emergence (potatoes), inter-row (tomatoes)
Oxyfluorfen	Baron 400 WG; Goal; Striker	G	Brassicas	Pre-transplant (7 days prior)
Pendimethalin	Rifle 440; Romper; Stomp 330EC; Stomp 440; Stomp Xtra	D	Carrots, peas, beans, onions, transplanted broccoli, cabbage, cauliflower, processing tomatoes	Pre-emergence
Phenmedipham	Betanal Flow 160 SE	C	Beetroot, silver beet	Post-emergence selective
Prometryn	Gesagard; Prometryn 900DF	C	Carrots, celery, potatoes	Pre-emergence, or early post-emergentcein carrots
Propachlor	Ramrod	K	Onions, transplanted brassicas, beetroot	Pre-emergence, pre-transplant or at-transplant, depending on crop
Propyzamide	Various	D	Lettuce	Pre-emergence or immediately after transplanting
S-Metolachlor	Dual Gold	K	Brassicas	Immediately after transplanting
Simazine	Gesatop; Simagranz	C	Asparagus	Pre-emergence

** Details correct at time of writing; please consult the relevant herbicide label/s, contact your reseller for current registration details, or contact the Australian Pesticides and Veterinary Medicines Authority. This table does not include minor use permits, or non-selective options such as glyphosate or diquat. If using crop rotations, the APVMA Public Chemical Registration Information System database may be searched for 'nettle' to identify a range of herbicides suited to a range of cropping situations.*

Herbicide resistance

Vegetable growers should remain aware of the potential for herbicide resistance to develop in dwarf nettle and other key weeds, particularly if their crop rotation involves heavy reliance on a limited range of registered herbicides. Integrated weed management is of particular importance in reducing the risk of herbicide resistance developing.

A biotype of dwarf nettle that is resistant to Group C triazine (atrazine and simazine) herbicides was identified in Victoria in 2002, in a celery crop where the field had a history of 26 years of prometryn use. Greenhouse trials were conducted to confirm the resistance through comparison to known susceptible biotypes. The resistant biotype was found to have a 100-fold resistance to atrazine and simazine. At the time of writing, this was the only confirmed case worldwide of herbicide resistance in dwarf nettle.

Figure 9 Pre-plant or pre-emergent herbicides are often one of the key techniques for management of dwarf nettle in broadleaf vegetable crops, such as this lettuce crop near Gatton, Qld.

Biological control

Observations of damage to dwarf nettle plants in Argentina suggest that the fungus *Septoria urticae* is a potential biological control agent. Dwarf nettle is also susceptible to arabis mosaic nepovirus and hop mosaic carlavirus, while in Germany the highest infestations of *Pratylenchus* nematodes in 31 weed species were observed in dwarf nettle roots.

In general terms however, biological control agents will only suppress growth and/or flowering of weeds, and will not achieve sufficient control alone.

Biological control is no silver bullet for success and therefore needs to be integrated with other methods to achieve effective weed control. In Australia biological control has largely only been introduced for some perennial non-grass weeds in aquatic, pasture, and rangeland habitats. The short-term cropping season common in vegetable production makes it difficult for biological control agents to become established at effective levels. Therefore, vegetable farmers are unlikely to have the benefit of their use in the near future.

Bringing the control methods together

The three dimensions to success, most likely to provide effective control of major weeds such as dwarf nettle, include 'Deliberation', 'Diversity', and 'Dedication'.

In applying this '3D' approach, a variety of options is available as described on the next page. This is commonly known as 'integrated weed management', and is likely to bring you the greatest chance of success in restricting the impact of dwarf nettle on your farm.

Figure 10 Dedicated application of a well planned integrated weed management strategy can result in little weed impact by the time of harvest, such as in this Brussels sprouts crop in South Australia.

Integrated management of dwarf nettle

Integrating all available and feasible weed control techniques in a timely and diligent way has been shown to be very effective in bringing heavy infestations of broadleaf weed species such as dwarf nettle under control on Australian vegetable farms.

This section has been adapted from the chapter 'Vegetable Weed Management Systems', written by Craig Henderson, and published in the book *Australian Weed Management Systems* (edited by Brian Sindel, University of New England).

Some practices may be implemented for reasons other than weed management, but still have weed management benefits.

Depending on the farmer's circumstances and resources and the extent of the dwarf nettle infestation, whole-of-farm integrated weed management strategies may include the following:

- Shifting most cash crop production to the parts of the farm where the dwarf nettle infestation is lower.
- *Repeated cultivations* and *knock-down herbicides* may be used together to reduce the population of dwarf nettle and other weeds before each crop planting. These approaches may include implementing a stale seed bed, and controlling recently germinated plants either by light tillage or herbicide application. Encouraging seeds to germinate and then controlling the plants before seed set can reduce the weed seed bank in the longer term.
- Including a cash crop or cover crop during the traditional non-cash crop period in the rotation allows use of *selective herbicide options* that have been registered for dwarf nettle control. Fewer weeds may be expected to appear in the paddock when an out of season cover crop is grown. Including a fallow period in the crop rotation may also allow *non-selective herbicide* application to reduce the dwarf nettle seed bank.
- Where a weed infestation is particularly heavy, it may be necessary to produce cash crops only during the warmest months of the year, when crop seeding or transplanting through to harvest is likely to take less time than during the cool season. This short crop production period may be beneficial in minimising the renewal of the dwarf nettle soil seedbank, even though the species has a relatively rapid life cycle. Once the crop is harvested, the residue can be quickly ploughed in to prepare the land for the next cropping sequence, also helping to prevent seed set by escapee weed plants.
- Implementing and rigorously adhering to a *farm hygiene* program, for example: undertaking thorough vehicle washdown in between farm sites (especially infested and non-infested areas); laying concrete or gravel tracks along major farm laneways to reduce the amount of soil being spread by vehicles; and planting a competitive grass species (e.g. Kikuyu) along laneways and drainage lines, and mowing these areas to minimise the chance of undesirable weed establishment. Farm hygiene reduces the potential for dwarf nettle seeds outside the vegetable beds to act as sources for recolonisation, and is particularly relevant when parts of the farm are infested while others remain free of the weed.
- Use of a *drip irrigation system* can mean that the non-irrigated inter-rows remain dry (unless rain falls) throughout most of the growing period, with consequent reductions in dwarf nettle and other weed populations. Such an irrigation system may be integrated with a *plastic mulch* in some high-value vegetable crops such as cucurbits. This will result in little dwarf nettle emergence within the mulched crop beds, though farmers need to remain aware of the potential for weed seeds to germinate in the crop holes, as well as where the mulch has been punctured during laying or during crop management activities.
- *Close plant spacings*, *rapid crop growth* and *canopy closure*, combined with in-crop spraying of *selective herbicides* (where such options are available) can result in low survival of dwarf nettle in the vegetable crop. A similar approach may be pursued in cover crop rotations, and has been shown to suppress dwarf nettle effectively due to competition.
- *Hand weeding* also has a role to play in an integrated approach, although gloves and protective clothing will be required in the case of dwarf nettle. Farm staff should be encouraged where possible to physically remove and destroy older weeds (particularly those flowering) that they come across in the course of their work, especially at harvest time when large numbers of workers are likely to be systematically moving through each field.

Because annual broadleaf weeds such as dwarf nettle rely in part on rapid turnover of large numbers in the weed seed bank to maintain high populations, an integrated management system of this nature can be expected to result in a relatively sharp decline in weed numbers over time. Nonetheless, farmers need to remain aware of the potential for dwarf nettle seed to remain dormant for up to several decades depending on conditions, and therefore for germination flushes to occur at any stage given suitable circumstances.

However, integrated management of dwarf nettle is likely to be effective in reducing its impact at relatively little extra cost to the farmer, given that most of the operations described above would still have been implemented for other reasons and have other farm and crop benefits.

The key to integrated management of dwarf nettle is a planned strategy to link the key management components in a sensible sequence, and the persistence to ensure that each step is diligently carried out. In the longer term, integrated weed management may contribute to improved enterprise flexibility, where cash crops may eventually be grown at any stage of the viable production period without concern that this will result in a vast increase in weed numbers, or that the weed burden will impact too significantly on the cash crop.

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Disclaimer

Descriptions of herbicide use in this guide are not to be taken as recommendations. Herbicides must only be used in accordance with the recommendations provided on herbicide labels. Readers are reminded that off-label use of herbicides may be restricted or not permitted under relevant legislation. Landholders are therefore advised to determine current registrations and legal requirements for herbicides they may be considering, and to consult with their State or Territory government departments regarding the legal requirements they are obligated to adhere to relating to herbicide use and weed control.

Coleman, M., Kristiansen, P., Sindel, B., Fyfe, C. 2018. Dwarf Nettle (*Urtica urens*): Weed management guide for Australian vegetable production. School of Environmental and Rural Science, University of New England, Armidale.

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