

Alternatives to Chemical Weed Control

What are organic herbicides?

Organic herbicides are plant based and include:

- Vinegar
- Plant essential oils and their extracts
- Pine oil fractions
- Weed Zap ® clove, cinnamon & cottonseed oil, oleic & lauric acid, lactose & water

How do organic herbicides work?

- Dissolve the outer layer of leaves and seeds (lipids)
- Cause plants to desiccate (requires warm dry weather)
- Work very fast in temperatures above 30°

Plants do not develop resistance to organic herbicides

- Conventional herbicides target chemical pathways within plants, stopping physiological processes
- Plants can dispose of, isolate or avoid chemicals and substitute other pathways to manufacture plant products
- Organic herbicides target fundamental plant structures – resistance requires overcoming millions of years of evolution

How are organic herbicides used?

Organic herbicides can be applied by

- Spraying
- Painting
- Soil drench (to control seed)

Organic herbicides do not affect woody plant parts including stems and plant roots

How are organic herbicides used?

Organic herbicides have no withholding period (stock can be returned to pasture once plants are dry) and have a short period of activity in the soil

In normal use organic herbicides are exceptionally safe for operators

Reasons why many farmers and others are reluctant to use non-chemical methods of weed control in place of herbicides.

1. More complex to manage - time constraints
2. Can be less effective than herbicides
3. Control levels more variable
4. More expensive than traditional herbicides
5. Control levels less predictable
6. No compensation following control failure
7. May not reduce the need for herbicides
8. Little visible evidence of success
9. More risky, to consultant as well as farmer
10. Less return for supplier of herbicides
11. May have adverse environmental effects
12. Harder manual effort
13. Off-target damage and potential litigation

Advantages of organic herbicides:

1. Organic herbicides are very safe to use for the operator and in public areas
2. They work very quickly in ideal weather conditions
3. They do not harm plant stems or roots
4. They can be used to provide a selective action, & may be applied by spraying, painting or drenching
5. They can have cumulative benefits to soil seed banks if used at correct timing

The cheapest weed control option is obviously prevention. There are many practices that we can adopt to ensure we do not introduce weeds onto our property.

There are six principles of weed management:

1. Awareness – be aware of potential and existing weed problems.
2. Detection – look for any new weed infestations before they become too large or widespread.
3. Planning – Prioritise the treatment of weeds, what weeds threaten the profitability of your grazing enterprise the most eg. lippia, creeping lantana.
4. Prevention – far better than a cure, a \$100/hour for a contractor to clean down seed laden machinery is much cheaper than any 20 litre drum of chemical. Another example is feeding hay and grain only in designated areas

to reduce risk of new weed introduction.

5. Intervene – Do it early this keeps a potentially large problem manageable.

6. Control and monitor – any weed needs to be monitored after control to ensure success.

The rising cost of chemicals coupled with uncertainty about safety prompt many to think about any alternative weed control that is available. Depending on the situation though, for any type of weed control it is usually a combination of controls that will be the most efficient way to deal with the problem. A good case in point is Gorse control where large infestations are removed mechanically or by fire and the resultant regrowth is treated by chemicals and any new seedlings can be removed by manual methods over time. Much of the alternative weed control technology has been developed for cropping situations and may not be applicable to woody weed treatment. Mechanical control is the most obvious means of non-chemical weed control but is not covered here.

Some of the alternatives to chemical weed control that have been developed are:

- Flame weeding
- Steam weeding
- Oil based herbicides
- Vinegar
- UV treatment
- Soil fertility management
- Animal/species management

Flame weeding uses LP gas as a direct flame or an infrared burner to contact plants and produce heat that will vaporize water in the plant cells. This allows moisture loss from the plants and inhibits photosynthesis. To test if the flame weeding has been successful, squeeze a treated leaf between your thumb and finger and if a visible thumbprint remains it indicates that weed has been subjected to sufficient heat and should be dead within three days. Flame weeders are commonly used in horticulture on tractor-mounted units. Handheld wands are also available for individual plants. The main disadvantage of flame weeding is the danger of fire and cost of gas.



Steam weeding has been used in many horticultural applications. Steam has the advantage of being more effective at killing plants than flame weeding. Generally though steam weeders require significant energy inputs to heat the water and they can require significant amounts of water. They are generally very time consuming as the steaming wand needs to be held over the target area for several seconds before moving on. In an inter-row cropping/viticulture situation this appears to prove cost prohibitive for most.



Vinegar (Acetic acid) has been found to be useful herbicide for broadleaf weeds and grasses. Generally the acetic acid content in vinegar is about 5% but a level of 10% is needed to treat most weeds. One proprietary brand also has 4% salt with the acetic acid. Trials have shown that 10-20 concentrations of vinegar are effective on broadleaf weed but less successful on grasses. While vinegar may seem to be innocuous, at a concentration of 10% acetic acid it will cause skin irritation, have fumes and can cause eye irritation/damage.

Oil based Herbicides are based primarily on pine oil. These sprays remove the outer wax layer of the plant causing it to dehydrate. These sprays also reduce the viability of any weed seeds in the soil that are contacted by the spray. Some of these sprays are registered for use in organic farms. Application times and methods differ from other common herbicides so this must be taken into considerations when using the product.

Pine oil is obtained by the steam distillation of needles, twigs and cones from a variety of species of pine, particularly *Pinus sylvestris*



UV treatment using Ultra violet light is being used in Europe as a weed control method and may have applications here as the science and practicalities of the method are further developed.

- The leaves of the weed absorb much of the ultra violet light so the weed overheats in a second or two.
- The energy consumption is only 1/4 of the equivalent energy used in gas burners for weed control.
- The uv light does not start fires, as gas burners for weed control.
- If used on railway tracks, a powerful locomotive (5MW supplied to the UV-lamps) can remove weed at a speed above 100 kilometres per hour, if one side on way out and the other side on way back.
- An ordinary very powerful tractor (100HP on PTO) can remove 10,000 m² weed in one hour.
- A special built powerful 1000HP high ground speed vehicle can remove 100,000 m² weed in one hour using light weight aircraft technology for large organic farms and contract weed control companies.
- Selective removal of vegetation is possible. e.g. is straight vertical growing corn only dried by vertical radiated uv-light in the upper top, but weed's having horizontal leaves are dried all through.



Soil management can affect the number and type of weeds that we have. There are a number of publications that indicate the soil conditions that can favour particular types of plants. Some weeds such as African Lovegrass have the ability to grow over a huge range of soil types but other weeds can have specific soil requirements such as low Calcium or phosphorus. A soil test and a change in soil fertility based on the soil test may be the easiest option to control some weeds.

Animal management or variation in grazing species can be a useful management tool. Cattle, sheep and goats have been used with success in controlling some weeds but are they more difficult to manage than the weed. This would need to be seriously investigated before adopting this type of weed management.



The disadvantage of this method is you cannot control what they eat and in many scenarios in SA regarding blackberry and gorse are in amongst native vegetation

Grooming and slashing can be a very useful means of getting woody weeds back to a manageable level for greater access, reduction of fire fuel loads, promote new fresh growth for possible spraying and can result in some mortality in some species. It also reduces the area required for spraying. This method is only really suited to large thickets of weeds, not scattered areas in bushland

Broom (Genista spp) that is brush cut with a tri-angular steel blade has been reported to effectively kill over 70% of shrubs and it is thought to be as a result of the 'splaying' action that the triangular blade creates, making a rough cut open to rotting and dehydration (A Stafford Pers Com).



Before we try to control any weed it is important to ask;

1. Is the weed a threat to productivity, health or the environment
2. Is the weed costing more to control than it is worth
3. Is the weed a symptom of dry seasons or overstocking
4. Is the weed Declared and required to be controlled by law
5. Will you be there in the following season to do follow-up
6. What weeds might come after treating the target species and is this easily controlled

More information from:

- www.richgro.com.au vinegar/salt herbicide
- www.acaengineering.com.au steam weeders
- www.certifiedorganics.info Pine oil based herbicide
- www.gameco.com.au flame weeders

Acknowledgement

This article has been adapted from Queensland Primary Industries and Fisheries - BeefTalk magazine
http://www.wmssa.org.au/documents/Organicherbicides_Tim_Marshall_Notes_from_WMSSA_workshop_on_alternative_control_options_2002