501
CHICORY
Chicory performs an important role in our farm systems. Its high quality summer feed simultaneously supports good animal production and lessens grazing pressure on ryegrass pastures during dry conditions, improving pasture persistence.

501 Chicory from Agriseeds has two important advantages.

More feed, faster – thanks to high DM yield and rapid establishment. 501 Chicory establishes and grows rapidly so can provide an extra grazing over some other cultivars.

High utilisation – upright growth makes 501 Chicory easier to graze.
‘‘We were supposed to be on a 25 day round, but given the drought conditions we were on the 501 between 12 to 18 days, amazing.’’

Aaron Cox, Dairy Farmer, Te Puke.
WHY 501 CHICORY?

Expect more

We’ve brought 501 Chicory to the market because of its superior performance in three critical areas.

First - fast establishment and outstanding DM yield. In replicated yield trials and on-farm demonstration trials across a wide range of different soil types and managements 501 Chicory has stood out right from the start, establishing rapidly, particularly in challenging dry conditions.

Second – a low crown. 501 was bred to protect the plant from treading damage; so reduce susceptibility to infection from root rot (Sclerotinia), and persist better in wet soil conditions.

Third – an erect growth habit. 501 is easier to graze, so you get very high utilisation.

501 great for pasture renewal

501 Chicory is very useful for reducing pests, weeds and diseases in a pasture renewal programme.

It does not host many pasture pests, including black beetle or Argentine stem weevil, so it reduces these pests for the following pasture. 501, like other chicory cultivars, contains two defensive chemicals, lactucin and lauctucopicrin, which make it less susceptible to butterfly and moth damage compared with alternatives like turnips.

Renewing poor performing paddocks through a chicory break crop also provides an opportunity for multiple-herbicide applications to reduce the burden of problem weeds in paddocks.

Key to pasture after chicory

501 Chicory can look great in autumn, but it is more important to sow your new grass early than to get an extra grazing from 501 and compromise establishment of the new pasture.

To establish pasture, chicory should be grazed, with regrowth sprayed out with glyphosate at full label rates and either cultivated or direct-drilled.

Paddocks which are sprayed-drilled will often have surviving chicory plants in the subsequent pasture providing a healthy, diverse sward for stock.
“501 was easy to establish, and persisted well though a very dry summer”

John Assen, Dairy Farmer, Taupiri, Waikato.
Two taproots

The combination of 501 Chicory and Tuscan red clover has extra advantages.

Both 501 and Tuscan red clover have the drought-busting asset of a long taproot. They can retrieve moisture from deeper within the soil, and recover important nutrients which might otherwise have been lost.

Tuscan red clover has the added advantages of nitrogen fixation, adding N to the pasture and soil.

Different look

The combination of 501 Chicory and Tuscan red clover can be deceiving in yield, because the red clover plants aren’t as upright or ‘showy’ as 501. However the dry matter percent of red clover is much higher, and there is always much more yield from the red clover than expected – which becomes apparent if you take a DM yield cut.

Seed mix

<table>
<thead>
<tr>
<th>Seed mix</th>
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<tbody>
<tr>
<td>6 kg 501 Chicory</td>
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<tr>
<td>3 kg Tuscan red clover</td>
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<tr>
<td>9 kg/ha total mix</td>
</tr>
</tbody>
</table>

North Island persistence trial (0-9; 0=least persistent, 9=most persistent)

<table>
<thead>
<tr>
<th>Entry</th>
<th>Persistence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuscan red clover</td>
<td>8.2 a</td>
</tr>
<tr>
<td>Punter chicory</td>
<td>7.6 a</td>
</tr>
<tr>
<td>501 + Tuscan</td>
<td>7.3 ab</td>
</tr>
<tr>
<td>501 Chicory</td>
<td>7.2 ab</td>
</tr>
<tr>
<td>Chico chicory</td>
<td>5.8 b</td>
</tr>
<tr>
<td>Choice chicory</td>
<td>5 bc</td>
</tr>
<tr>
<td>Puna II chicory</td>
<td>4.1 c</td>
</tr>
<tr>
<td>Trial Mean</td>
<td>6.4</td>
</tr>
<tr>
<td>Significance</td>
<td>***</td>
</tr>
</tbody>
</table>

* Te Awamutu 2011-12 trial, plant density score taken post-summer in March 2012.

Tuscan red clover shows excellent persistence under grazing.
501 - IN DAIRY SYSTEMS

In a summer dry dairy farm system, 501 Chicory can save thousands of dollars on ‘take-aways’ - expensive purchased supplementary feeds which can only be eaten once.

High DM in the dry

501 has demonstrated excellent summer DM yield in replicated trials and in demonstration areas across a wide variety of soil types and farms.

In four trials run under dairy grazing in the North Island 501 Chicory has yielding very well, producing up to 12% more than Choice.

This means more milk for longer.

Fast establishment

With quick establishment 501 is ready to graze early, allowing for a shorter grazing round and potentially an extra grazing before autumn renewal.

This additional feed is particularly valuable in dry summers, as have been experienced in many areas in recent years.

Improves pasture persistence

Chicory can also be used as a tool to protect pastures (especially new grass paddocks) from overgrazing through summer dry conditions.

Once cows have grazed to target pasture residuals they can be shifted onto their chicory break, and fed additional silage if required.

This avoids overgrazing pastures in summer, which depletes grass reserves (stored in the basal stem above the ground); leads to opening up of pastures and poor recovery when rains come.

North Island DM yield combined over four trials 2010 to 2013

(Relative to trial mean = 100%)*

<table>
<thead>
<tr>
<th>Entry</th>
<th>Establishment</th>
<th>Summer</th>
<th>Autumn</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>501 Chicory</td>
<td>109 a</td>
<td>109 a</td>
<td>106 a</td>
<td>110 a</td>
</tr>
<tr>
<td>Punter</td>
<td>109 a</td>
<td>110 a</td>
<td>104 ab</td>
<td>110 a</td>
</tr>
<tr>
<td>501 + Tuscan</td>
<td>101 ab</td>
<td>109 a</td>
<td>105 a</td>
<td>109 a</td>
</tr>
<tr>
<td>Punta II</td>
<td>104 ab</td>
<td>105 a</td>
<td>106 a</td>
<td>105 ab</td>
</tr>
<tr>
<td>Chico</td>
<td>104 ab</td>
<td>104 a</td>
<td>100 ab</td>
<td>103 ab</td>
</tr>
<tr>
<td>Choice</td>
<td>97 ab</td>
<td>100 a</td>
<td>97 b</td>
<td>98 b</td>
</tr>
<tr>
<td>Tuscan</td>
<td>93 b</td>
<td>66 b</td>
<td>97 b</td>
<td>70 c</td>
</tr>
<tr>
<td>Trial mean (kgDM/ha)</td>
<td>697</td>
<td>2085</td>
<td>803</td>
<td>3582</td>
</tr>
<tr>
<td>LSD (5%)</td>
<td>113</td>
<td>243</td>
<td>71</td>
<td>371</td>
</tr>
</tbody>
</table>

* Results combined over four trials at Te Awamutu 2010-11, Cambridge 2011-12, Te Awamutu 2011-12, Ashurst 2012-13.
Selecting paddocks

Chicory suits a wide range of soil types, but performs best on free-draining soils with a pH between 5.6-6.2

Paddocks close to the dairy shed which are in need of renewal are ideal - this reduces walking time, and energy spent by cows over the summer. Chicory crops also work well on effluent paddocks, helping reduce nitrate leaching by recovering nutrients from deep within the soil profile which are not accessible by shallower grass roots.

Do not sow chicory in a paddock which has been in a brassica in the past two years. Brassicas can host the Sclerotinia fungus which can severely affect chicory persistence.

Cows can be fed up to a third of their diet in 501 Chicory over summer and autumn.

Sowing 5-6 ha/100 cows will provide about 30-35% of cows’ daily diet once established.

Seed bed preparation

Selected paddocks should be sprayed out with non-residual herbicide, and preferably cultivated.

The seedbed needs to be firm before sowing, which may require the paddock to be rolled several times. A firm seed bed (where your heel sinks in no more than 5 mm) improves depth control of the seed drill, and speed and uniformity of germination.

Roller drills are ideal for sowing chicory seed evenly, reducing competition between plants while lessening weed ingress.

Below: Lack of consolidation in a dry summer can lead to variable germination and poor establishment.
“The girls ran to it (501) like kids to a lolly shop”

Barry & Donna McCleod,
Dairy Farmers,
Edgecumbe.
Sowing

Sow once soil temperatures are consistently above 12°C and rising in spring, placing seed no deeper than 1 cm. If direct-drilling chicory, take extra care to ensure seed is buried at the right depth, and always apply slug bait.

The paddock should be rolled again after sowing for good soil to seed contact.

Sowing rate

8 kg/ha 501 Chicory

Grazing

Chicory should only have its first grazing once it has reached the 7-leaf stage (usually around 8 weeks after sowing). By this point the plant has a well-developed taproot which will aid growth and survival through summer and autumn.

Subsequent grazings should occur once the sward has recovered to 25-30 cm in height (red band gumboot height). This will ensure taproot reserves are replenished to allow strong regrowth. 501 Chicory should be grazed to residuals of 5 cm.

If possible, chicory should not be grazed in wet conditions. This reduces the risk of Sclerotinia infection which infects plant crowns which have been chipped or damaged by treading.

Feed allowance

To feed milking cows a third of their diet in chicory, cows should be allocated about 25-30 m²/cow/day (or 0.25-0.3 ha/100 cows/day) when the sward is 25-30 cm pre-graze height (~3000 kg/DM).

At this allowance cows should reach target post-grazing residuals of 5 cm or 1500 kg/DM in 3 hours. If paddocks require more than 3 breaks, back-fencing should be used to protect regrowth.

Growing 5-6 ha of chicory/100 cows provides an approximate 20-25 day grazing rotation (where chicory is a third of the diet). This is generally long enough to allow 501 stands to recover before the next grazing. However, this rotation length may need to be adjusted to suit the system or growing conditions while still grazing at no less than 25 cm.

Most often chicory is grazed prior to afternoon milking. Chicory improves the appetite of cows on hot summer days, increasing their intake compared with a pasture-only diet. It therefore makes good sense to have cows on chicory during the warmest part of the day. This also allows dew to burn off so that cows are not grazing a wet crop.

Note that 501 Chicory should be a maximum of one third of the cows diet, as it contains sesquiterpene lactones which can cause a slight milk taint at higher levels.
501- FOR SHEEP & BEEF FINISHING

Faster LWG

Livestock love chicory and red clover, which simply means they eat more and grow faster. The very high digestibility of this combination is significantly better than pasture in summer, and allows the rumen to process the feed quickly making space for stock to eat more.

501 and Tuscan are high in crude protein and metabolisable energy (ME), perfect for finishing stock. Chicory can also take up essential trace elements which help keep stock healthy.

Canterbury sheep grazing trial 2012-13

( Relative to trial mean = 100%)*

<table>
<thead>
<tr>
<th>Entry</th>
<th>Establishment</th>
<th>Summer</th>
<th>Autumn</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Punter</td>
<td>112 ab</td>
<td>109 a</td>
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</tr>
<tr>
<td>501</td>
<td>115 ab</td>
<td>106 ab</td>
<td>105 a</td>
<td>107 ab</td>
</tr>
<tr>
<td>Puna II</td>
<td>118 a</td>
<td>106 ab</td>
<td>103 ab</td>
<td>107 ac</td>
</tr>
<tr>
<td>Choice</td>
<td>101 b</td>
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<td>Chico</td>
<td>109 ab</td>
<td>102 b</td>
<td>93 bc</td>
<td>101 c</td>
</tr>
</tbody>
</table>

Trial mean (kgDM/ha) 1431 4213 2406 8050
LSD (5%) 266 330 345 647

*Trial run at Agriseeds Research Farm, Courtenay, Canterbury

Feed quality and lamb growth

Lambs need high ME feed (above 11 MJ ME/kg DM) to grow quickly. In dry summers this is difficult to attain from grass-based pastures. Chicory and red clover maintain their summer quality, and typically offer an ME of 12 MJ ME/kg DM finishing lambs much faster.

Source: A guide to improved lamb growth, 2000
“It established well during difficult conditions (the drought was well underway at this stage) and continued to grow throughout the summer & autumn producing high quality feed”

Garry Brady, Sheep, Beef and Deer Farmer, Te Pohui, Hawkes Bay.
Paddock selection

For best results from 501 Chicory select a flat or gently rolling, well-fenced paddock on free draining or light soils with easy access.

Do not sow chicory in a paddock which has been in a brassica in the past two years. Brassicas can host the Sclerotinia fungus which can severely affect chicory persistence.

Seed bed preparation

The selected paddock should be sprayed out with a non-residual herbicide. A double spray is advised if the paddock is to remain in chicory for more than one summer. Weed ingress can be a major problem in second year crops, so it is essential to get a good weed kill before sowing.

The seedbed for chicory needs to be firm before sowing, which may require the paddock to be rolled several times. A firm seed bed (where you heel sinks in no more than 5 mm) improves sowing depth of drills, and also speed and uniformity of germination.

Roller drills are ideal for spreading chicory seed evenly at sowing, reducing competition between plants, giving better ground coverage, and less weed ingress.

Sowing

Sow once soil temperatures are consistently above 12°C and rising in spring, with seed sown no deeper than 1 cm. If direct-drilling, take extra care to ensure seed is buried at the right depth and always apply slug bait.

The paddock should be rolled again after sowing for good soil to seed contact.

501/Tuscan finishing mix

6 kg 501 Chicory
3 kg Tuscan red clover

9 kg/ha total mix

501 Chicory crop

8 kg 501 Chicory

Grazing management

Once established (7 leaf stage), chicory crops should be rotationally grazed on approximately a 20-25 day rotation.

Pre-grazing residuals should exceed 25 cm (~2800-3000 kg/DM/ha), aiming for a 5 cm (1000kg/DM/ha) post grazing residual. At 2800 kg DM/ha cover chicory plants have replenished taproot reserves to fuel vigorous regrowth after grazing. Back-fencing should be used to protect regrowth where stock are on the same paddock for more than three days.
501 FEED VALUE & ANIMAL HEALTH

Nutritional Value

The advantage of both chicory and red clover over ryegrass during summer dry conditions is highlighted by their much higher feed value and digestibility at a time when pasture growth and quality are reduced.

<table>
<thead>
<tr>
<th></th>
<th>Chicory</th>
<th>Red clover</th>
<th>Ryegrass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter %</td>
<td>8-19</td>
<td>12-20</td>
<td>15-30</td>
</tr>
<tr>
<td>ME MJ/kg DM</td>
<td>11.5-13.0</td>
<td>11</td>
<td>9.5-12.5</td>
</tr>
<tr>
<td>Crude protein %</td>
<td>16-27</td>
<td>25-30</td>
<td>12-28</td>
</tr>
<tr>
<td>NDF %DM</td>
<td>20-30</td>
<td>25-30</td>
<td>40-55</td>
</tr>
<tr>
<td>Typical lamb growth rate (g/day)</td>
<td>220+</td>
<td>220+</td>
<td>90+</td>
</tr>
</tbody>
</table>

Trace elements

Chicory generally has elevated levels of phosphorous, potassium, sulphur, calcium, sodium, magnesium, copper, boron and zinc compared with perennial ryegrass. These macro- and micronutrients are essential for healthy stock.

Facial eczema and bloat

Facial eczema and bloat are not a problem on chicory crops.

There is evidence to suggest problems with internal parasites are substantially reduced in stock grazing chicory compared to ryegrass-based pastures.

Adapted from DairyNZ Farm Facts and Figures (2011) and DairyNZ Farmfact I-72 (2013).

Left: 501 Chicory green in the drought, Te Awamutu, March 2013.
**501 ONE YEAR VS TWO YEAR CROP**

501 Chicory was bred to best suit use as a 6-8 month summer crop, with very fast establishment and high first summer yields.

In saying that, we have had farmers take good stands of 501 through into a second summer. However, we suggest this is not always the case and is a result of careful management.

Crops should only be considered for a second year if the chicory plant populations are above 40 plants/m² in the first autumn. If plant populations are below this DM yield in the second summer may not be worthwhile.

Chicory crops have a tendency to ‘bolt’ in their second spring, quickly going to seed and becoming unpalatable and difficult to manage (see photo below).

To help reduce this, chicory should be grazed before seed heads become tall (over 25 cm) and woody. Mechanical topping can be used if stalks become too long.

Hollow stalks which are cut, however, trap rain water and can consequently rot, killing the plant. Chicory should therefore be monitored and grazed to avoid seed head development.

Above: Second year reproductive Chicory which has become less palatable with lower feed value.
**AGRICOTE SEED TREATMENT**

*Get your crop off to the best start*

Both 501 and Tuscan are available with AGRICOTE seed treatment technology, reducing the risk of losing the crop at establishment.

AGRICOTE Chicory protects emerging seedlings, when they are most vulnerable, from springtails and dampening off diseases (Pythium and Fusarium).

AGRICOTE Clover protects emerging seedlings from nematode attack, as well as dampening off diseases (Pythium and Fusarium).

**Weed control**

Seek local advice regarding weed control.

Post establishment flumetsulam-based herbicides (e.g. Preside™ and Valdo™) can be used to control broadleaf weeds in Chicory. Weed grasses can be controlled using clethodim herbicides (e.g. Centurion™, Plus, Arrow™ and Sequence™). Do not use clethodims where grass is to be sown as part of the seed mix.

Weed control is particularly important where a chicory crop is being kept for a second summer.

**Slug Control**

Chicory can be affected by slugs, so care must be taken at establishment. Use slug bait where appropriate. Where direct-drilling is used slug bait is recommended.
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