

Understanding Pasture Species Trial Results – What does it all mean?

The presentation of pasture species trial results can be varied, hard to understand and sometimes very misleading, so here is an explanation of the key issues.

Trials are undertaken to evaluate and quantify the relative performance of varieties across locations and seasons under a given set of environmental conditions.

Varieties are bred for different conditions and different farm management systems and will perform differently under different conditions. Conditions vary markedly throughout New Zealand, and even more so compared to northern hemisphere countries. Northern hemisphere varieties are bred for winter dormancy in order to survive under snow for long periods. They are also designed for 'cut and carry' systems with stock housed in doors. Grasses bred for these conditions won't necessarily suit southern hemisphere conditions, nor perform adequately here.

Varieties need to be trialled under local conditions; and across a range of sites, stock types and management conditions before we can confidently make claims about performance and quality. Not all products marketed here have been trialled under NZ or Australian conditions. Always ask for trial data before choosing a variety to assess its likely performance and suitability for your farming situation.

Industry Standards:

Protocols have been developed by the seed industry, and professional seed companies adhere to these. These protocols dictate how trials are measured for any given parameter, how the results are analysed and how data is presented.

Farmers often comment on the fact that each seed company presents results showing their varieties are the best performing and this leads to confusion and scepticism.

The reason for this variance is often determined by a number of factors. These include the particular environmental conditions and trial management at the site; whether the trial was run on a research station or on-farm; and whether the trials were sole species or mixed swards. All such options are valid under industry protocols.

Different cultivars can behave very differently under different management conditions. For example a short leaved, densely tillered cultivar may perform better than a long leaved, laxly tillered cultivar under a set stocked management system and the reverse may apply under a rotational grazing system.

Varieties bred for evaluation under a particular trialling system are likely to perform better under that system than an alternative evaluation system. Hence the variation in the various seed companies' trial results.

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Cropmark's philosophy is that varieties should be trialled on-farm under a range of environmental conditions, management systems and stock types. Therefore we conduct trials under varying farm management systems at sites throughout the country to assess the performance of varieties under different conditions.

In addition to trials run by the various individual companies, the New Zealand Plant Breeders Rights Association (NZPBRA) which is an industry body to which the major seed breeding companies in New Zealand belong, administers independent 'cultivar evaluation trials'.

Trial Set-up

In managing a trial it is important to reduce environmental variances, such as soil type and soil moisture, fertility, slope, and stock camps that can impact upon the trial's results. Trials should be sown on flat, uniform sites with uniform soil type. Trial plots should be located away from gateways and stock camps.

Within any trial site, there will be natural variances however. To minimise the effect of any environmental variation on results, trials are designed in what is called a randomised complete block. Under this system each variety is randomly assigned to a plot. This is replicated three or four times to ensure that one abnormal result (e.g., as a result of a urine patch) does not affect the overall trial result.

Measurements

DM yields

Dry matter yields can either be measured by cutting, drying and weighing samples taken within the trial, or by using pasture probes to assess yields. Yields are measured throughout the year to assess seasonal and annual yield performance of the varieties.

The duration of trials will depend on the species of grass used. For example, it is standard protocol to measure perennial ryegrasses for a minimum of three years, whereas Italian ryegrass trials will be measured for a one to two year period and Westerwold annuals for one year.

Dry matter yield data for each variety within the trial can either be presented as actual dry matter yield results, or as a percentage of the trial mean. In the latter case, actual mean results are also included as a reference.

Metabolisable Energy and digestibility:

To assess the metabolisable energy content and digestibility of varieties, a pre-determined number of random samples are taken from each variety plot and sent off to the laboratory for analysis.

The metabolisable energy and digestibility levels of grasses vary markedly throughout the year according to stage of growth (vegetative vs. flowering, young vs. mature). Each individual variety will have different ME and digestibility content curves over the year

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relative to other varieties. A snapshot measurement at any given date is not a reliable indicator of how the variety will perform throughout the year. Ideally measurements should be taken over at least a 12 month period, preferably more, (as well as across sites) and either presented as a graph or a pooled average result.

Disease:

Disease resistance of the varieties within a trial is assessed at each measurement of the trial, and generally scored 'by eye' and ranked on a 1–10 scale. For 'rust' infection assessment, in addition to eye appraisal, plot samples can also be sent to the laboratory for analysis of the level and severity of rust infection.

Persistence:

Persistence is measured by counting the number of plants of the desired variety at randomised locations within the trial after a pre-determined period, at the same time assessing the amount of undesired (weed/grass) species and bare soil. For perennial species, persistence is usually assessed after 3 years, whereas for Italian and annual ryegrasses persistence is assessed after 12–18 months.

Trimming of trials

When trials are run on farm under grazing systems, preferential grazing by livestock can result in variance of residual dry matter between plots. To overcome such variances, the trial is mown after grazing to ensure all varieties start from an equal footing.

Livestock performance trials:

Livestock performance trials are run according to similar principles and protocol to that described above for yield trials. Plots are randomised and replicated but on a larger scale to assess the effect of each variety on livestock performance.

A number of factors combine to affect stock performance, including the dry matter production of a variety, its metabolisable energy, digestibility, palatability and the impact of its alkaloid composition. (Endophyte alkaloids can cause grass staggers, heat stress, etc and levels vary between varieties).

Consequently a wide range of measurements need to be taken within the trial including dry matter yields (pre-graze and residual yields), metabolisable energy and digestibility levels, alkaloid analyses, as well as stocking rate, livestock rectal temperatures and liveweight gains.

Livestock performance trials are by nature very time consuming and expensive.

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Terms:

blksig (block significance).

This indicates whether there are any significant differences between replicates (blocks) as a result of environmental variances within the trial. NS indicates there is no significant difference. If there are significant differences between the replicates, the resultant error in the trial is likely to be high and it is more difficult to make statistical comparisons between varieties.

Trtsig (treatment significance).

This indicates whether there are any significant differences between varieties in the trial as a result of the genetic ability of one variety over another.

* means some or small significant differences are present between replicates or varieties.

** means there is high levels of significant difference present

Coefficient of Variation (abbreviated to CV%):

A term used to help give some definition to the accuracy of the results collected from a particular trial, and expressed as a percentage. A low CV% (less than 10%) is indicative of an accurate trial. A CV above 15% indicates that a trial has a lot of unexplained variation, and that the results need to be treated with some caution.

Mean (average):

Means are usually provided for the average seasonal and yearly performance of the trial, as well as for individual varieties within the trial. If the trial mean is stated to be 100%, the yield of each variety can be ranked and compared with it in terms of a percentage difference.

Least Significant Difference (LSD):

LSD's are used in order to see if differences between varieties are realistic, and not just a product of variation within a trial. Usually the LSD figure is calculated at the 95% probability level by the analyst, and the difference in yield between two varieties must be greater than this to prove statistically that one yields more than the other.

In the example below, the LSD for Total Yields is 5%. This means that Matrix has significantly higher DM yield than Impact, but Impact does not have significantly higher yield than Meridian because the difference between the two is less than 5%.

The LSD's can either be presented as a line at the bottom of the table or as columns, in which instance, lower case lettering is used to show these differences in a more readable form, where common letters indicate no significant differences.

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Source info:

It is industry protocol when presenting trial data that the source information is fully outlined. Such information should include the trial operator, trial duration and location of the trial. The same principle applies for laboratory analyses.

Here is an example of the sort of table we might expect for yield presentation for a perennial ryegrass trial. The data below is actual data collected by Cropmark Seeds.

Pooled Dry Matter Yield Results – Perennial Ryegrasses

Variety	Winter	LSD	Spring	LSD	Summer	LSD	Autumn	LSD	Total	LSD
Matrix	121	a	109	a	116	a	117	a	115	a
Impact	110	bc	105	ab	109	b	110	b	108	b
Meridian	108	bc	106	ab	100	cd	99	ce	104	b
Dobson	103	cd	102	bc	105	bc	104	bc	104	b
Bronsyn	100	ef	103	bc	106	bc	104	bc	103	b
Samson	102	ce	105	ac	103	bd	102	cd	103	b
Vedette	102	ce	103	bc	104	bd	104	c	103	bc
Yatsyn	97	eg	106	ab	104	bc	103	cd	103	bc
Aries HD	96	fg	98	cd	98	d	97	de	97	c
Embassy	96	fg	91	e	86	e	94	ef	91	d
Supreme	87	h	93	de	89	e	89	fg	90	d
Nui	87	h	93	de	90	e	86	g	90	d
Quartet	91	gh	87	e	90	e	89	fg	89	d
Mean (kg)	3,489		5,213		4,416		2,987		16,107	
LSD %	6		6		6		6		5	
trtsig	***		***		***		***		***	
blksig	NS		NS		NS		NS		NS	
CV%	12		12		12		11		10	

Source: Pooled dry matter yield results over 7 three year trials (1999-2003) on farms at Wellsford, Te Awamutu, Hawera, Otane, Sheffield, Balclutha and Invercargill.