



**WEST MIDLANDS GROUP**  
our knowledge hub

## Herbicide options for annual legume pastures

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Grain & Graze 3 project

**Purpose:** To demonstrate the available herbicide options for a range of annual legume pasture varieties

**Location:** "Kayanaba" (WMG main trial site), Dandaragan

**Soil Type:** Course non-wetting red sand

**Soil Test Results:** n/a

**Rotation:** 2014: RR Canola, 2013: Wheat, 2012: Oats

**Growing Season Rainfall (April- October 2015):** n/a

### BACKGROUND SUMMARY

A small but growing number of farmers in the West Midlands region are using Serradella (and other aerial seeded annual legume pastures) in the pasture phase of their rotation. Controlling weeds in Serradella pastures requires the use of different herbicides and other management strategies (e.g. weed wiping) when compared to traditional subclover based pastures.

### TRIAL DESIGN

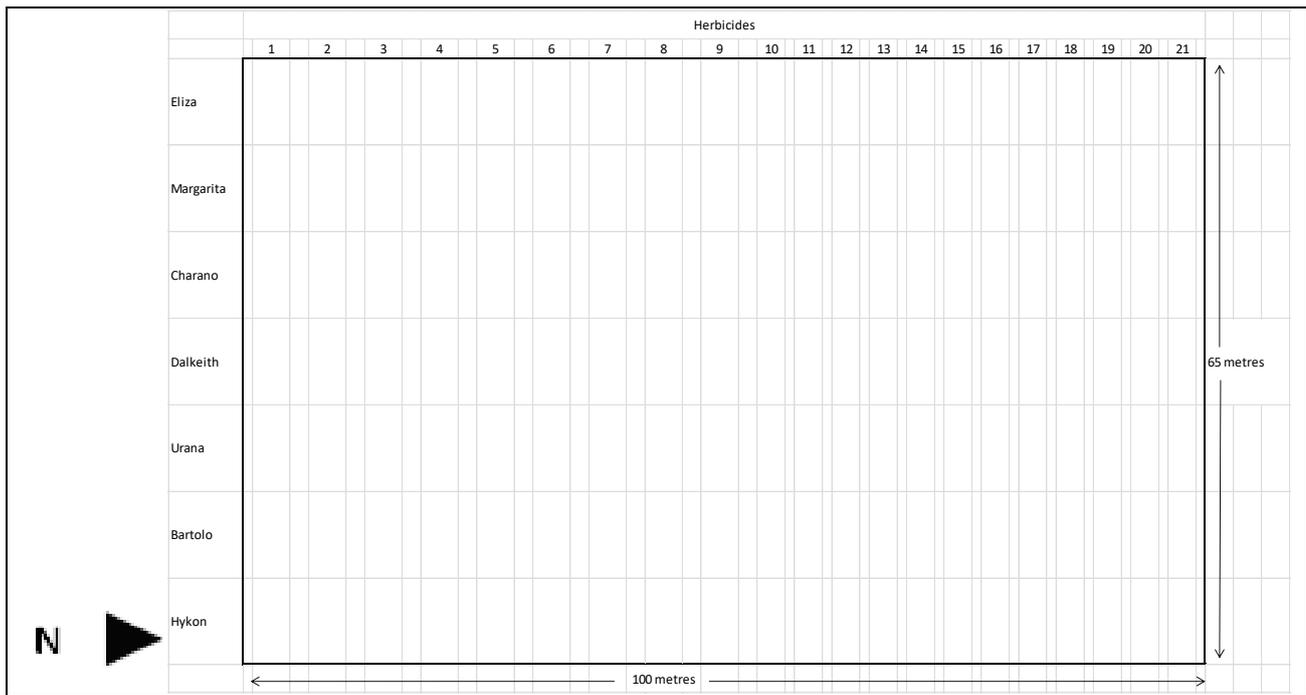
**Machinery used:** DAFWA Cone Seeder with knife points and press wheels on 9" row spacing

**Pastures & seeding rate:** Eliza French Seradella (10kg/ha pod), Margarita French Serradella (5kg/ha seed), Santorini Yellow Serradella (5kg/ha seed), Dalkeith Subclover (10kg/ha), Urana Subclover (10kg/ha), Bartolo Bladder Clover (10kg/ha), Hykon Rose Clover (5kg/ha)

**Seeding date:** 7 May 2015 (dry) following a knockdown

**Fertiliser at seeding:** 50kg/ha Big Phos Mn + 40kg/ha Muriate of Potash

### TRIAL LAYOUT



**Treatments:**

| Plot | Post-sowing Pre-emergent        | Post-emergent  | Cost (\$/ha) |
|------|---------------------------------|--|--------------|
| 1    | Spinnaker (Imazethapyr) 100g/ha |  | 13           |
| 2    | Kerb (Propyzamide) 1L/ha        |  | 22           |
| 3    | Spinnaker 100g/ha + Kerb 1L/ha  |  | 35           |
| 4    | Spinnaker (Imazethapyr) 100g/ha | Weed Wiper (Glyphosate)  | 18           |
| 5    | Kerb (Propyzamide) 1L/ha        | Weed Wiper (Glyphosate)  | 27           |
| 6    | Spinnaker 100g/ha + Kerb 1L/ha  | Weed Wiper (Glyphosate)  | 40           |
| 7    | Spinnaker (Imazethapyr) 100g/ha | Raptor (Imazamox) 40g/ha   | 45           |
| 8    | Kerb (Propyzamide) 1L/ha        | Raptor (Imazamox) 40g/ha   | 64           |
| 9    | Spinnaker 100g/ha + Kerb 1L/ha  | Raptor (Imazamox) 40g/ha   | 77           |
| 10   |                                 | Spinnaker (Imazethapyr) 75g/ha   | 10           |
| 11   |                                 | Raptor (Imazamox) 40g/ha   | 32           |
| 12   |                                 | Broadstrike (Flumetsulam) 25g/ha   | 13           |
| 13   |                                 | Bromoxynil (Bromoxynil) 1.25L/ha   | 15           |
| 14   |                                 | EcoPar (Pyraflufen-Ethyl) 400ml/ha +<br>Agritone 750 (MCPA Amine) 330ml/ha | 16           |
| 15   |                                 | Spinnaker (Imazethapyr) 75g/ha   | 10           |
| 16   |                                 | Raptor (Imazamox) 40g/ha   | 32           |
| 17   |                                 | Broadstrike (Flumetsulam) 25g/ha   | 13           |
| 18   |                                 | Bromoxynil (Bromoxynil) 1.25L/ha   | 15           |
| 19   |                                 | EcoPar (Pyraflufen-Ethyl) 400ml/ha +<br>Agritone 750 (MCPA Amine) 330ml/ha | 16           |
| 20   |                                 | Weed Wiper (Glyphosate)  | 5            |

|    |                         |   |
|----|-------------------------|---|
| 21 | Weed Wiper (Glyphosate) | 5 |
|----|-------------------------|---|

### **Spray Dates:**

Post-Sowing Pre-Emergent: 7 May 2015

Post-Emergent: 9 July 2015

Weed Wiper: 27 August 2015

### **RESULTS**

Weed density (mostly wild radish) was variable across the site, so instead of accurately measuring weed numbers and their subsequent control, the following observations were made:

- 1) The density and early growth of the annual legume pastures, despite the moderate-high sowing rates, was less than ideal due to the non-wetting nature of the soil and the dry conditions experienced throughout May and June.
- 2) Margurita French Serradella was the most productive variety at the site, with Charano Yellow Serradella the next most productive. This was not unexpected given the sandy soil type. Eliza French Serradella was patchy but this was due to poor seed quality.
- 3) Spinnaker applied at 100g/ha post-sowing pre-emergent gave excellent weed control throughout the growing season. However, it also severely retarded the growth of the annual pasture legumes. The Serradella's were least affected but early vigour, in particular, was still retarded. It is fair to say that this rate of Spinnaker was too high for this soil type and this type of season. A more moderate rate of 50 to 75g/ha might have been more appropriate.
- 4) Propyzamide had little or no impact on weed density and growth, but this was as expected given there was a predominance of broad leafed weeds and little or no annual ryegrass.
- 5) Raptor and Spinnaker applied as post-emergent sprays were effective at reducing wild radish density and growth, although the timing of the post-emergent spray should have been 1-2 weeks earlier to achieve a better result. Raptor (Imazamox) is set to become significantly cheaper in future years as the product becomes "off-patent".
- 6) EcoPar + MCPA applied as a post-emergent spray was effective at reducing radish density and growth, but it caused unacceptable levels of damage to the Serradella's. It was a good option on sub clovers.
- 7) Broadstrike and Bromoxynil as post-emergent sprays were relatively ineffective at reducing wild radish density and growth.
- 8) The weed wiper was effective at reducing radish density and growth (particularly later in the season), although it is probably best used in conjunction with either grazing or an early spray. It could also be used more than once in the season.

### **DISCUSSION**

- 1) Total seasonal biomass production from all of the annual pasture legumes was relatively poor as a result of the poor start. It begs the question, should Serradella,

given its useful tolerance to the Imidazolinone group of herbicides, be sown with a fast growing Imidazolinone tolerant cereal such as Scope CL barley to improve early season feed production? If the season is good, the cereal could be grazed early and then sprayed out with a grass selective herbicide to stop it out-competing the Serradella later on. If the season is poor, the cereal could be left to provide valuable winter and spring feed.

- 2) Residues of Imidazolinone group herbicides can affect the performance of the following year's crops and pastures, so be aware and plan ahead.

## ACKNOWLEDGEMENTS

Thanks to the Roberts family for hosting the trial, the DAFWA trials team from Geraldton for sowing the trial and spraying the PSPE herbicides, Steve Pettenon from Agsense for spraying the PE herbicides, and Chris Wilkins and the WMG for undertaking site maintenance.



## Serradella in sub-tropical pastures 2013 vs 2015

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Funded by: DAFWA, MLA Feedbase project and GRDC's EverCrop III project

|                           |   |
|---------------------------|---|
| <b>Purpose:</b>           | To determine how serradella performs when introduced to a sub-tropical pasture stand.   |
| <b>Location:</b>          | Peter Negus property. West side of Dandaragan Rd (~ 2km North of Rows Rd)   |
| <b>Soil Type:</b>         | Deep sand.  |
| <b>Soil Test Results:</b> | (0-10cm): OC - 1.06%, P - 26 mg/kg, K - 19 mg/kg, S - 5.9 mg/kg,<br>N - 5.33 mg/kg, conductivity - 0.04 dS/m<br>pH(CaCl <sub>2</sub> ) - 5.4 (0-10cm)<br>4.5 (10-40 cm)<br>4.8 (40-80 cm)<br>5.0 (80-120cm) |

**Rotation:** Volunteer pasture pre 2012; perennial pastures sown August 2012, serradella sown into perennials in 2013 and barley sown in 2014. 2015 was regenerating serradella in perennial pasture.

**Growing Season Rainfall (2013 - 2015):**

|      | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec | Total |
|------|------|------|------|------|------|------|------|------|------|------|------|-----|-------|
| 2013 | 23.8 | 1.4  | 73.6 | 9.4  | 116  | 15.6 | 89.6 | 168  | 135  | 25   | 1.6  | 0   | 659   |
| 2014 | 13.8 | 0    | 6.8  | 34.6 | 106  | 65.6 | 101  | 50.6 | 81.6 | 37.8 | 18   | 0.2 | 516   |
| 2015 | 1.6  | 39.6 | 34.4 | 26.8 | 61.6 | 49.2 | 98.8 | 90   | 27.2 | 16.4 | 10.4 | 4.8 | 461   |

**BACKGROUND SUMMARY**

Perennials are nitrogen hungry and respond well to N inputs. Typically though, the deep sands that are suited to perennials have poor nutrition and leach nitrogen readily through the soil. Legumes are an important tool that can address shortfalls in N during periods of perennial growth. Serradella has shown to be suited to this role as both a source of much needed nitrogen and a valuable winter feed source during times of perennial inactivity. Although there is a yield penalty when sowing serradella into perennials; this trial aims to examine this and serradella performance over two contrasting seasons (2013 and 2015).

**TRIAL DESIGN**

**Plot size:** 15 x 7 m (30 Total)

**Machinery use:** DAFWA cone seeder (1.5 m wide), 220 mm row spacing, tynes with trailing press wheels, offset to perennials rows (DGPS with +/- 2cm accuracy and auto steer)

**Replicates:** Range from 2 to 12 (6 Treatments)

**Crop type and varieties used:** Margurita French Serradella, YS\_72.1A Yellow Serradella

### Seeding, treatments and harvest:

| Date   | Action               |                                 |   |
|--------|----------------------|---------------------------------|---|
| 2013   | 27 Feb               | Summer Sowing                   | Margurita 20 and 40kg/ha pod, 77.1A 30kg/ha pod,                  |
|        | 24 May               | Winter Sowing                   | Margurita 10kg/ha   |
|        |                      | Fertilizer                      | 160 kg/ha Super Potash  |
|        |                      | Knockdown                       | Sprayseed (1L/ha) prior to winter sowing treatments only          |
|        | 2 July               | Grass selective                 | Select (500mL/ha)   |
| 11 Nov | Harvested Serradella |                                 |   |
| 2014   | 21 May               | Barley seeded                   | Barley was seeded into perennial grass, and harvested in November |
| 2015   | April                | Serradella germination          | False break   |
|        | 6 May                | Grass selective                 | Propizamide sprayed (1L/ha)                                       |
|        | June                 | 2 <sup>nd</sup> Serradella germ | Definitive break  |
|        | 18 Nov               | Harvested Serradella            |   |

| TRIAL LAYOUT  |
|---|
| Treatments  |
| Margarita over Perennial rows 44 cm apart                 |
| Margarita over Perennial rows 88 cm apart                 |
| Margarita over traditional annual based pasture (Control) |
| YS_72.1a over Perennial rows 44 cm apart                  |
| YS_72.1a over Perennial rows 88 cm apart                  |
| YS_72.1a over traditional annual based pasture (Control)  |

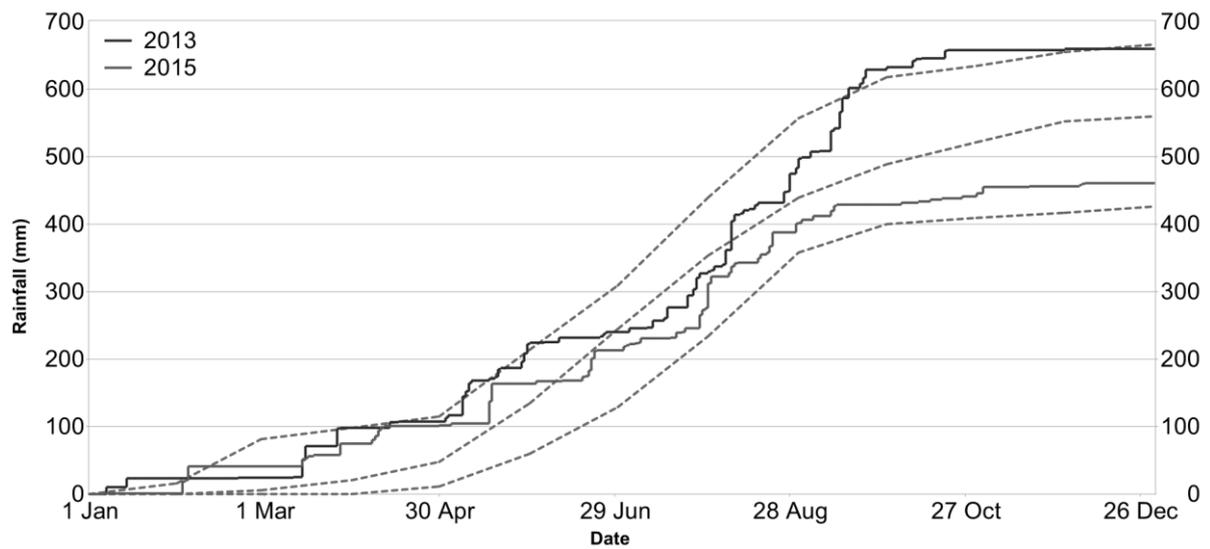
### RESULTS

The annual rainfall conditions in 2013 were a decile 9 and contrasted by 2015 with a decile 2, (Figure 1). The total rainfall for 2013 was 659mm, with 558mm of that falling in the annual growing season. Almost 200mm less (461mm) fell in 2015, 370mm of that in the growing season.

#### Serradella Germination

In 2013, serradella was summer sown in February before 74mm of rain fell in March. Fortunately, this didn't result in a false break as YS\_72.1a and Margurita seed pod require several months in the environment to 'soften' before being able to germinate. This was followed up by a favorable seasonal finish, with 228mm falling from August to October. The serradella yielded a large seed bank to be set up for a rotational crop or permanent pasture.

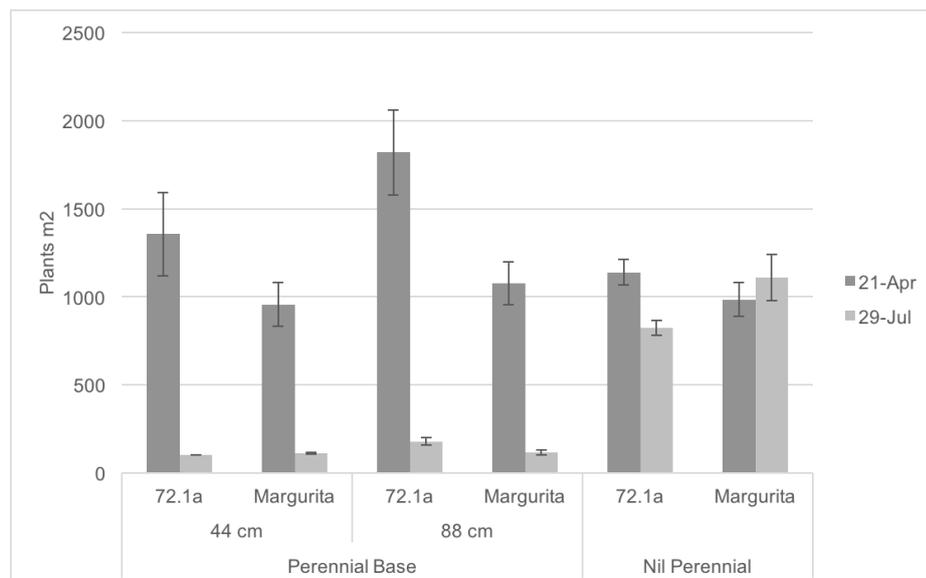
**Figure 1: Shows the rainfall deciles at the Lake Nammen weather station in 2013 and 2015. The weather station is situated 11km west of the trial site**



Barley was sown into the trial in 2014 and there was still a large seed bank left in 2015. A false break of 27mm in April 2015 resulted in the serradella pod from the 2013 seed set to germinate. Panic grass was still highly active and able to compete with the germinating annuals, consequently the serradella seedlings died in the perennial plots. There was some germination in the control (nil perennial) plots, these survived and managed to gain a 'head start' on the later germinating serradella, (Figure 2).

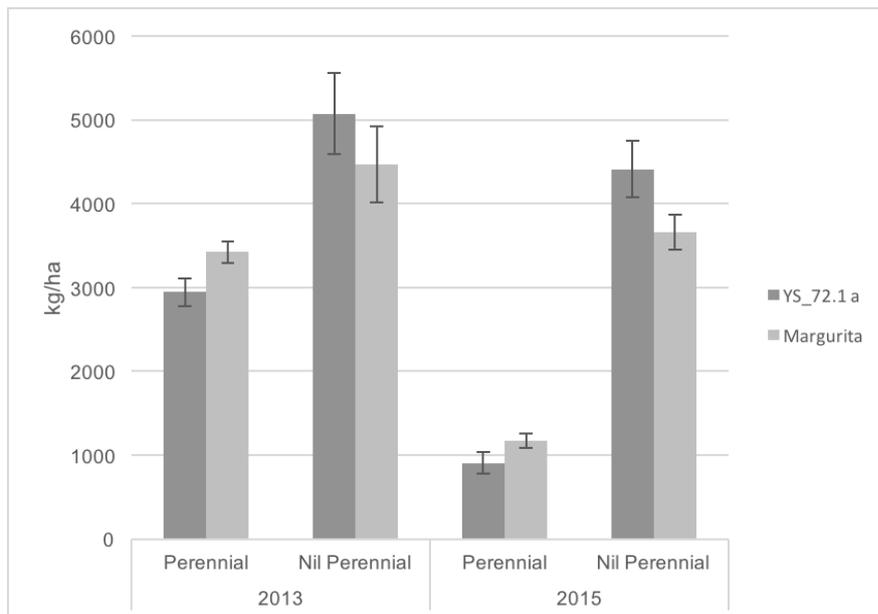
Fortunately, serradella seed set was very good in 2013 and this allowed for an effective reserve to be available for the more decisive winter break in May.

**Figure 2: The impact of a perennial base and perennial row spacing on 2015 serradella establishment; measured April 21 and July 29 (Bars = SE)**



## Biomass

**Figure 3: The impact of a perennial base and season on the biomass of Margurita and YS\_72.1a yellow serradella (Bars = SE)**



The ability for the serradella in the nil perennial plots to survive the false break allowed for a developmental 'head start' on serradella sown into perennials. This can be seen in the results in Figure 3 which show that:

- Serradella did far better in the perennial plots in 2013 compared to 2015
  - When sown into perennials, the 2013 YS\_72.1a produced 69% more biomass and Margurita 66% compared to 2015.
- Serradella performed similarly in the control (nil perennial) in 2013 when compared to 2015
  - There was little biomass difference between 2013 and 2015 when established in a typical pasture without perennials.
- Serradella grown in perennials had a small to moderate biomass penalty in 2013
  - In 2013 when sown into perennials, there was a 23% biomass penalty in Margurita and 42% in YS\_72.1a when compared to serradella in traditional pasture.
- Serradella grown in perennials had a large biomass penalty in 2015
  - In 2015 when sown into perennials, there was a 68% biomass penalty in Margurita and 80% in YS\_72.1a when compared to serradella in traditional pasture.

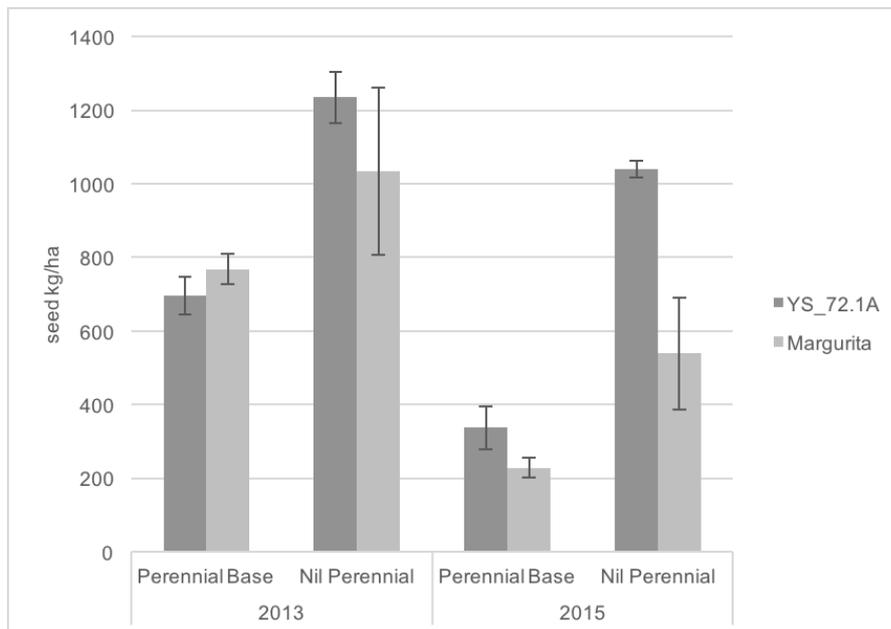
## Harvest

Figure 4 shows seed weight in kg/ha and includes seed that was grown and harvested in 2013 and 2015. In 2013, sowing serradella into a perennial grass reduced Margurita seed yield by approximately 25% and YS\_72.1a yield by 43%. However, perennial row spacing made little difference to seed yield (not shown).

Biomass has been a good predictor of seed yield, even with the harsh cut off of the 2015 season. The false break in 2015 initially depressed seedling numbers, but the serradella was

able to rebound from seed stores and produce a large bank of seed. In 2015, Margurita yield was reduced by 58% and YS\_72.1a 67% when sown into perennials.

**Figure 4: 2013 and 2015 serradella seed harvest. (Bars = SE). Serradella pod was harvested and seed yields were estimated using the seed to pod ratio of 36% for YS\_72.1a and 63% for Margurita**



#### **OBSERVATION/ DISCUSSION/ MEASUREMENTS**

Legumes are an important tool in a perennial sward to supply a nitrogen source and maintain production. Serradella can be successfully established and persist in an established perennial pasture; this includes persisting as part of a crop/pasture rotation in perennials.

In the more favorable year of 2013 serradella biomass and pod production was higher. There is a yield penalty for serradella when sown into perennials, the penalty though will vary depending on the seasonal conditions. Perennials are still actively growing in March and April before the cooler weather starts to suppress their growth and they become less competitive. An indecisive Autumn break can allow active perennials to deplete moisture reserves that would normally allow germinating serradella to survive. These results clearly demonstrate the advantage of a successful early germination and establishment, although an indecisive break and low rainfall year will exaggerate the yield penalty when serradella is sown into perennials. Additionally, the suppressive effect of a grass selective on perennial growth may reduce competition with annual pasture species and can be used as a tool to increase annual legume production.

#### **ACKNOWLEDGEMENTS/ THANKS**

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