Factsheet

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Mid row crops for vineyards

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Take home messages

- Crop residues of legume shoots and roots still provide nitrogen during breakdown.
- Inoculate legume seed at sowing with the recommended strain of rhizobia to maximise N fixation.
- Sowing time, sowing rate, seed quality, germination rate and sowing depth are crucial factors impacting final outcome.
- Discuss appropriate and suitable crop species and varietal selection with your local agronomist, consultant and/or seed supply company.
- Vineyard operators should always practice crop rotation to limit pest and disease pressure.

Introduction

Various winter crops such as brassicas, legumes and pulses are usual suspects in vegetable and broadacre cropping however rarely seen in vineyard production systems. Demonstration trials to investigate their effectiveness to establish without applied irrigation and their ability to capture free nitrogen and generate biomass as a food source to drive healthy biologically active soils in NSW/ACT vineyards was undertaken on vineyard sites in the Hunter Valley and Orange.

Figure 1: Cultivation of mid rows in the Hunter Valley

Figure 2: Permanent mid-rows in Orange Chardonnay

Variety	Sowing rate (kg/Ha)	Costs of seed ($/Ha)
Faba – Warda	180	$210.00
Field Peas – Morgan	100	$233.00
Fescue – Hummer	10–20	$360.00
Lupins – Luxor	80–100	$205.00
Crimson clover – Soweasy	8–10	$69.00
Forage Brassica – Winfred Rape	3–5	$123.00

Table 1: Seed varieties, sowing rates and costs per hectare

Month	Avg. Air Temp (OC)		Avg. Soil Temp (OC) 10cm		Rainfall mm	
	Hunter	Orange	Hunter	Orange	Hunter	Orange
May	15.1	11	17.1	12.8	**20.6**	**122.8**
June	12.1	7.6	13.5	9.5	**55.2**	**266.8**
July	11.8	7.2	12.3	8.7	**41.2**	**172.6**
August	11.5	7.8	13.1	9.3	**36.2**	**90**
September	15	9.7	15.9	11.4	**66.2**	**185.6**
October	**16.9**	**11.9**	**16.7**	**13**	**59.6**	**71.2**

Table 2: Onsite weather station data showing average air temperature, average soil temperature and rainfall totals for trial period May 2016 to October 2016

Variety	Fresh Wt (T/Ha)		Dry Matter Yield (T/Ha)		N2 fixed (kg/Ha)	
	Hunter	Orange	Hunter	Orange	Hunter	Orange
Faba Beans	53	65	6.36	10.4	**100**	**170**
Field Peas	42	86	7.56	13.7	**120**	**200**
Crimson Clover		51		8.1		**120**
Forage Brassica	36		5.04			

Table 3: Fresh weight, dry matter yield and fixed nitrogen data of the three best performing crops at each site
Note: N fixation assumptions provided via http://www.soilquality.org.au/factsheets/legumes-and-nitrogen-fixation-south-australia

In the Hunter Valley there is a tendency to cultivate alternate mid row areas within vineyard blocks each vintage while the adjacent undisturbed row allows tractor access (Figure 1), this is a long held practice aimed at eliminating competition from weeds and breaking up heavier soils to allow water to infiltrate more readily in wetter years. However this practice does have drawbacks such as loss of carbon to the atmosphere, disturbance and loss of soil flora and fauna which may result in collapsed soil structure and possible sodicity issues. Whereas in Orange permanent mid row swards (Figure 2) are typical with either selected grass species and/or mixed naturally grasses and weed species, this situation is utilised to allow grasses to uptake excess rainfall and allow for tractor use at all times, benefits of this practice are retention of soil carbon, biology and maintenance of soil structure.

Methods

Six winter crop species (Table 1), were dry sown in late May of 2016 accompanied with a starter fertiliser CROPLIFT ®15 and applied as a band at recommended rate into the top 5cm range along with the inoculated seed at placement into fully cultivated soil at the Hunter Valley site and direct drilled into existing soil at the Orange site. Average soil temperature at both sites remained above that of air temperature for the entire trial period and significant rainfall followed planting across both regions over the winter with record rainfall occurring in the Orange region during the trial period (Table 2).

Figure 3: Faba beans in the Hunter Valley

Figure 4: Field peas reaching great heights in Orange

Outcomes

The timing of sowing in conjunction with good rainfall resulted in excellent crop establishment for all varieties except for Lupins and Fescue. Biomass cuts were undertaken by cutting complete plant structures at the soil surface using garden shear's with the area cut measured using a one by one metre quad. Data was collected from the three best performing crops at each site with the averaged fresh weight, dry matter yield and nitrogen fixation figures provided in Table 3. The crops measured at both sites fully covered the entire mid row areas to thet undervine area with tall crop heights achieved at both sites with Faba beans (Figure 3) reaching over 110cm at the Hunter Valley site and Field peas exceeding the height of the cordon wire at the Orange site (Figure 4).

Discussion

This demonstration trial was successful in achieving the aim of producing biomass and N fixation to promote biologically active soils across two separate wine growing regions of Greater NSW/ACT assisted greatly by record rainfalls across several months especially at the Orange site.

However, not all crops succeeded toward achieving the goal. The Lupin crops failed to establish across both regions and this was a fact of being sown later than the suggested recommendation of early April highlighting the importance of sowing times. The Fescue crop also resulted in sporadic and sparse establishment at both sites possible due to the shallow sowing depths, a sowing depth of 10–15cm is recommended.

Field peas was the most productive crop used in this demonstration generating the highest tonnage of dry matter yield and fixed nitrogen across both trial sites. Depending on the management strategies and philosophies the biomass can either be rolled over and left to lay on the soil surface to decay slowly overtime as an excellent source of readily digestible labile carbon which soil biology can feed on and return into the soil or can be cut and thrown under the vine row to be used as a temporary mulch. The use of inoculated legume seeds clearly showed the importance that Rhizobia play in capturing free atmospheric nitrogen in plant roots, (Figures 5 and 6). Faba beans also produced good amounts of biomass and fixed N with bees highly attracted to its flowers (Figure 7). Crimson clover started slow put raced away at the end of the season and was knee deep prior to collecting harvest data in Orange (Figures 8 and 9). Fresh weight moisture percentage of harvested crops ranged between 80–90% highlighting the amount of water captured within plant parts.

Figure 5: Nodules of fixed N on roots of Faba beans

Figure 6: Nodules of fixed N on roots of field peas

Figure 7: Bees foraging and pollinating Faba bean flowers

Figure 8: Crimson clover in the early September 2016

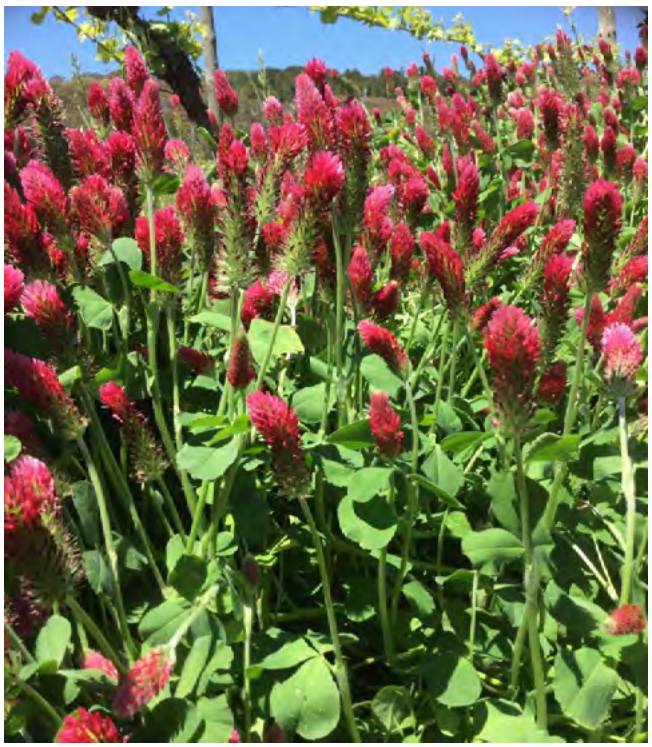

Figure 9: Crimson clover in full flower in October 2016

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More information

The factsheet http://research.wineaustralia.com/wp-content/uploads/2012/09/2012-03-FS-Cover-Crops-Nutrition1.pdf provides more information on the relationship between cover crops and vine nutrition.

The factsheet http://research.wineaustralia.com/wp-content/uploads/2012/09/2012-07-FS-Covercrops-Water-Use.pdf provides more information on the relationship between cover crops and water use.

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