The development of sustainable medic/clover pastures in the Western Cape

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1 Survey conducted on a commercial farm

1.1 Methods

A survey was conducted on four paddocks on the farm Silvermyn, in Malmesbury, during 2014. The paddocks were chosen on two separate parts of the farm. Two of the paddocks has typical Malmesbury shale soils (D14 and D12) and two has sandy soils of granite parentage (S27 and S23). All the paddocks were submitted to a one year legume pasture (medic/clover = P) and one year wheat (W) system. One paddock on each soil type was in a pasture phase in 2012 and a wheat phase in 2013 (PW = D14 and S27). The other two paddocks (WP = D12 and S23) was in a wheat phase in 2012 and a pasture phase in 2013 (D14 and S27).

Ten plots of 100 m^2 were pegged out along a fence on each paddock in order to enable the relocation of them after a wheat phase, when the pegs had to be removed. Soil core samples of 0.066 m^2 were taken at a depth of 50 mm in each 100 m^2 plot during March on both the PW and WP paddocks and all the loose seed and pods removed by hand, the seeds removed from the pods and counted, after washing and drying the samples. On the PW paddocks a 0.391 m^2 sample was taken on top of the soil before the soil core samples were collected. In the case of the top soil samples the seeds and pods were also counted after drying and weighing. Seedlings were counted in 0.391 m^2 squares after seedling establishment in Junie 2014.

1.2 Results

The results are presented in Tables 1.1 to 1.6.

According to Table 1.1 the number of pods at 50 mm depth were very similar on both the WP and PW treatments. The PW treatment, however, had no pods at the 0 mm depths, while both treatments had a very large number of pods at the 50 mm sampling depth. From Table 1.2 it is clear that the total number of pods (50 mm plus 0 mm depths) were much higher on the WP than the PW treatment. This is agrees with previous surveys which showed the decline of pod numbers after each wheat (W) season, while there was a buildup of pods during the pasture (P) season. There was also a much greater number of barrel medic pods on the WP than the PW treatments, but the paddocks varied.

On the PW treatments 100% of the pods were at the 50 mm depth, while the WP treatments had between 6 and 26 % of the pods at 50mm. On the PW treatment 0% was on top of the soil, while between 74 and 94% were at this depth on the WP treatment (Table 1.3).

According to Tables 1.4 and 1.5 the seed numbers largely reflected the pod data. On the PW treatment all seed were at the 50 mm depths, while on the WP treatment the number of seeds were about three times as high at 50 mm as on the 0 mm depth. The total number of seeds on the PW treatment was about 69% of that on the PW treatments. In the PW treatment 100% of the seed were at 50mm depth. On the WP treatment 74% were at 50mm depth and 26% at 0 mm depth.

The number of seedlings that regenerated is shown in Table 1.6. In the WP no seedlings were available to count. On the PW treatment the number of seedlings varied between 44 and 667 m^{-2}, this represented between 5 and 75.7 % of the total seed numbers available.

1.3 Conclusions

The two treatments effected the number of pods, seeds and the depth at which the seeds were found. The PW treatment had only seeds at the 50 mm depth and lowered the number of pods and seeds in comparison to the WP treatments. The WP treatment had both seeds at the 0 and 50 mm depths, of which the majority was at the 50mm depth.

Table 1.1. The average number of medic pods surveyed at two depths on top of the soil (Top) and in the soil at 0 to 50mm depth (50mm) on four paddocks submitted two crop rotations (pasture 2012/wheat 2013 = PW and wheat 2012/pasture 2013 =WP) during 2014

Paddock	Crop rotation 2012 & 2013	Number of pods m^{-2}									
		Position	Barrel	Polymorpha Spiny	Polymorpha Smooth	Total	Position	Barrel	Polymorpha Spiny	Polymorpha Smooth	Total
D14	PW	50 mm	9	192	277	478	Top	0	0	0	0
S27	PW	50 mm	2	389	572	963	Top	0	0	0	0
D12	WP	50 mm	12	189	307	509	Top	32	888	519	1439
S23	WP	50 mm	2	201	235	438	Top	5616	1735	0	7351

Table 1.2. The average total number of medic pods surveyed at two depths on top of the soil (Top) and in the soil at 0 to 50mm depth (50mm) on four paddocks submitted two crop rotations (pasture 2012/wheat 2013 = PW and wheat 2012/pasture 2013 =WP) during 2014

Paddock	Crop rotation 2012 & 2013	Number of pods m^{-2}				
		Position	Barrel	Polymorpha Spiny	Polymorpha Smooth	Total
D14	PW	Total	9	192	277	478
S27	PW	Total	2	389	572	963
D12	WP	Total	44	1077	827	1948
S23	WP	Total	5617	1937	235	7789

Table 1.3. The average % of medic pods surveyed at two depths on top of the soil (Top) and in the soil at 0 to 50mm depth (50mm) on four paddocks submitted two crop rotations (pasture 2012/wheat 2013 = PW and wheat 2012/pasture 2013 =WP) during 2014

Paddock	Crop rotation 2012 & 2013	% of pods									
		Position	Barrel	Polymorpha Spiny	Polymorpha Smooth	Total	Position	Barrel	Polymorpha Spiny	Polymorpha Smooth	Total
D14	PW	50 mm	100	100	100	100	Top	0	0	0	0
S27	PW	50 mm	100	100	100	100	Top	0	0	0	0
D12	WP	50 mm	28	18	37	26	Top	72	82	63	74
S23	WP	50 mm	0	10	100	6	Top	100	90	0	94

Table 1.4. The average number of medic seeds surveyed at two depths on top of the soil (Top) and in the soil at 0 to 50mm depth (50mm) on four paddocks submitted two crop rotations (pasture 2012/wheat 2013 = PW and wheat 2012/pasture 2013 =WP) during 2014

Paddock	Crop rotation 2012 & 2013	Number seeds m^{-2}					
		Position	Medic seeds	Position	Medic seeds	Position	Medic
D14	PW	50 mm	306	Top	0	Total	306
S27	PW	50 mm	441	Top	0	Total	441
D12	WP	50 mm	412	Top	184	Total	595
S23	WP	50 mm	392	Top	93	Total	485

Table 1.5. The average % of medic seeds surveyed at two depths on top of the soil (Top) paddocks and in the soil at 0 to 50mm depth (50mm) on four submitted two crop rotations (pasture 2012/wheat 2013 = PW and wheat 2012/pasture 2013 =WP) during 2014

Paddock	Crop rotation 2012 & 2013	% of Seeds			
		Position	Medic seeds	Position	Medic seeds
D14	PW	50 mm	100	Top	0
S27	PW	50 mm	100	Top	0
D12	WP	50 mm	69	Top	31
S23	WP	50 mm	81	Top	19

Table 1.6. The average number of medic seedlings and % of seed establishing on four paddocks submitted two crop rotations (pasture 2012/wheat 2013 = PW and wheat 2012/pasture 2013 =WP) during 2014

Paddock	Crop rotation 2012 & 2013	Seedlings m-2	% Establishing
D14	PW	44	5.0
S27	PW	667	75.7
D12	WP	0	0
S23	WP	0	0

2 Evaluation of new annual legume cultivars on two farms in the Swartland and Overberg respectively

2.1 Methods

Two trials were conducted. One trial on the farm Silvermyn, between Malmesbury and Moorreesburg and one on the experiment farm of Overberg Agri, Roodebloem, near Caledon. The species and cultivars, which were evaluated are shown in Tables 2.1 and 2.2.

Table 2.1. Medic, clover, serradella and biserulla cultivars planted at Silvermyn, Malmesbury, during 2014

No	Common name	Botanical name	Cultivar
1	Balansa Clover	*Trifolium michelianum* Savi	Bolta
2			Frontier
3			Taipan
4			Cobra
5			Viper
6	Bladder Clover	*Trifolium spumosum*	Bartolo
7	Crimson Clover	*Trifolium incarnatum*	Blaza
8	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	Woogenellup
9	Barrel Medic	*Medicago truncatula*	Jester
10			Parabinga
11			Paraggio
12	Polymorpha Medic	*Medicago polymorpha*	Cavalier
13			Scimitar
14			Persistor
15	Sand Medic	*Medicago littoralis*	Angel
16	Biserrula	*Biserrula pelecinus*	Biserrula
17	Pink Seradella	*Ornithopus sativus*	Margarita
18			Emena
19	Yellow Seradella	*Ornithopus compressus*	Charano

The trials were sown in May 2014. Plot sizes were similar (5m x 15m) at both sites and the seed was sown broadcast by hand and either covered by rolling (Silvermyn) or using a shallow tined harrow. Two replicates were used and cultivars were allocated randomly within each replicate. Before sowing the soil of the trial sites were analised and well cultivated to produce a fine seedbed.

Seeding rate were adapted according to seed size and seed viability. A base seeding rate of 25 kg ha^{-1} for Paraggio barrel medic was used. The seeding rates of all other species and cultivars were adapted to this baseline seeding rate. Larger seeded and less viable cultivars were thus sown more densely.

Table 2.2. Medic, clover and biserulla cultivars olanted at Roodebloem, Caledon during 1914

No	Common name	Botanical name	Cultivar
1	Balansa Clover	*Trifolium michelianum* Savi	Bolta
2			Frontier
3			Taipan
4			Cobra
5			Viper
6	Bladder Clover	*Trifolium spumosum*	Bartolo
7	Crimson Clover	*Trifolium incarnatum*	Blaza
8	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	Losa
9	Subterranean Clover	*Trifolium subterraneum var. Brachycalycinum*	Mintaro
10	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	Woogenellup
11			Coolamon
12			Urana
13	Barrel Medic	*Medicago truncatula*	Jester
14			Parabinga
15			Paraggio
16			Cheetah
17			Lynx
18	Button Medic	Medicago orbicularis	Bindara
19	Polymorpha Medic	*Medicago polymorpha*	Cavalier
20			Persistor
21			Santiago
22			Scimitar
23	Sand Medic	*Medicago littoralis*	Angel
24	Biserrula	*Biserrula pelecinus*	Casbah

Seedling counts were taken one month after establishment and was determined by counting seedlings in grids. During September and October dry matter yield were determined at Silvermyn and Roodebloem respectively. Cut material was fractionated to determine the amount of dry matter produced by each cultivar and the other volunteer grass and broad leaved weeds and legumes.

2.1 Results

The data for Roobebloem is shown in Tables 2.3 to 2.7 and for Silvermyn in Tables 2.8 to 2.12.

2.1.1 Roodebloem

According to Table 2.3 the number of seedlings varied between 542 (Frontier) and 1255 m^{-2} (Mintaro) between the cultivars, at Roodebloem. The subterranean clovers, Mintaro, Coolamon, Losa and Urana and the burr medics, Persistor, Santiago and

Table 2.3 . Number of legume seedlings m^{-2} of 24 annual legumes at Roodebloem, Caledon during 2014

Cultivar	Common name	Species & genus	Number of Seedlings m^{-2}	Data with same letter do not differ (P<0.05)
Casbah	Biserulla	*Biserulla pelisinus*	636	d
Angel	Sand Medic	*Medicago littoralis*	924	bc
Bindara	Button Medic	*Medicago orbicularis*	561	d
Cavalier	Burr medic	*Medicago plymorpha*	979	b
Persistor	Burr medic	*Medicago plymorpha*	**1252**	ab
Santiago	Burr medic	*Medicago plymorpha*	**1067**	ab
Scimitar	Burr medic	*Medicago plymorpha*	**1030**	ab
Cheetah	Barrel medic	*Medicago truncatula*	**1055**	ab
Jester	Barrel medic	*Medicago truncatula*	912	bc
Lynx	Barrel medic	*Medicago truncatula*	679	cd
Parabinga	Barrel medic	*Medicago truncatula*	**1015**	ab
Paraggio	Barrel medic	*Medicago truncatula*	979	b
Blaza	Crimson Clover	*Trifolium incarnatum*	**1070**	ab
Bolta	Balansa Clover	*Trifolium michelianum* Savi	979	b
Cobra	Balansa Clover	*Trifolium michelianum* Savi	679	cd
Frontier	Balansa Clover	*Trifolium michelianum* Savi	542	d
Taipan	Balansa Clover	*Trifolium michelianum* Savi	979	b
Viper	Balansa Clover	*Trifolium michelianum* Savi	679	cd
Bartolo	Bladder Clover	*Trifolium spumosum*	594	d
Mintaro	Subterranean Clover	*Trifolium subterraneum var. Brachycalycinum*	**1255**	ab
Coolamon	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	**1121**	ab
Losa	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	**1139**	ab
Urana	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	**1106**	ab
Woogenellup	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	988	b

Scimitar and the barrel medics Cheetah and Parabinga generated the greatest number of seedlings. Bindara button medic and Frontier balansa clover had the lowest number of seedlings establishing.

At Roodebloem (Table 2.4) the percentage viable seeds that established varied between 41.4% (Casbah) and 96.3% (Persistor). The cultivars with the highest % establishment were the burr medics Persistor, Scimitar, Santiago and Cavalier, the barrel medics Cheetah and Parabinga, Blaza, crimson clover, Viper and Bolta, balansa clover, Mintaro, Losa, Coolamon and Urana, subterranean clover.

At Roodebloem (Table 2.5) Casbah (336 kg ha^{-1}) yielded the least dry matter and Santiago (6304 kg ha^{-1}) the highest. The burr medics Cavalier, Persistor, Santiago and Scimitar, the barrel medics, Cheetah, Jester, Parabinga and Paraggio, crimson clover, Blaza, and the balansa clovers Cobra and Taipan and the subterranean clovers Mintaro and Coolamon were highest yielding.

Table 2.4. Percentage of viable seeds establishing on 24 annual legumes at Roodebloem, Caledon during 2014

Cultivar	Common name	Species & genus	% of Viable seeds Establishing	Data with same letter do not differ (P<0.05)
Casbah	Biserulla	*Biserulla pelisinus*	44.1	h
Angel	Sand Medic	*Medicago littoralis*	**76.0**	abcdefg
Bindara	Button Medic	Medicago orbicularis	68.0	efg
Persistor	Burr medic	*Medicago plymorpha*	**96.3**	a
Scimitar	Burr medic	*Medicago plymorpha*	**89.7**	abcd
Santiago	Burr medic	*Medicago plymorpha*	**84.9**	abcde
Cavalier	Burr medic	*Medicago plymorpha*	**80.4**	abcdef
Cheetah	Barrel medic	*Medicago truncatula*	**94.4**	ab
Parabinga	Barrel medic	*Medicago truncatula*	**80.7**	abcdef
Paraggio	Barrel medic	*Medicago truncatula*	72.7	cdefg
Jester	Barrel medic	*Medicago truncatula*	69.5	defg
Lynx	Barrel medic	*Medicago truncatula*	62.2	fgh
Blaza	Crimson Clover	*Trifolium incarnatum*	**89.0**	abcde
Viper	Balansa Clover	*Trifolium michelianum* Savi	**78.8**	abcdef
Bolta	Balansa Clover	*Trifolium michelianum* Savi	**76.5**	abcdefg
Taipan	Balansa Clover	*Trifolium michelianum* Savi	73.1	bcdefg
Cobra	Balansa Clover	*Trifolium michelianum* Savi	57.4	gh
Frontier	Balansa Clover	*Trifolium michelianum* Savi	41.4	h
Bartolo	Bladder Clover	*Trifolium spumosum*	71.9	cdefg
Mintaro	Subterranean Clover	*Trifolium subterraneum var. Brachycalycinum*	**92.5**	abc
Losa	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	**94.7**	a
Coolamon	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	**93.0**	abc
Urana	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	**89.8**	abcd
Woogenellup	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	72.1	cdefg

The total dry matter yield (Table 2.6) (cultivar plus weeds and volunteer species) were also determined at Roodebloem. Casbah (2069 kg ha^{-1}) had the lowest and Cavalier (6720 kg ha^{-1}) the highest. The burr medics Cavalier, Santiago, Scimitar and Persistor, the barrel medics, Paraggio, Parabinga, Cheetah and Jester, Blaza, crimson clover and Cobra and Viper balansa clover had the highest total dry matter yield.

At Roodebloem the contribution of a particular cultivar to the total dry matter yield (Table 2.7) varied between 17% (Casbah) and 99% (Cavalier). The burr medics Cavalier, Santiago, Scimitar and Persistor, the barrel medics Paraggio, Jester, Cheetah and Lynx, Blaza crimson clover, the balansa clovers Taipan, Frontier, Viper and Cobra and the subterranean clovers Mintaro, Urana, Coolamon and Woogenellup contributed the most dry matter to the total available dry matter.

Table 2.5. Dry mass (DM) yield of 24 annual legumes at Roodebloem, Caledon during 2014

Cultivar	Common name	Species & genus	DM kg ha^{-1}	Data with same letter do not differ (P<0.05)
Casbah	Biserulla	*Biserulla pelisinus*	336	i
Angel	Sand Medic	*Medicago littoralis*	2240	ghi
Bindara	Button Medic	*Medicago orbicularis*	1241	hi
Cavalier	Burr medic	*Medicago plymorpha*	**5662**	abc
Persistor	Burr medic	*Medicago plymorpha*	**5362**	abcd
Santiago	Burr medic	*Medicago plymorpha*	**6304**	a
Scimitar	Burr medic	*Medicago plymorpha*	**6254**	a
Cheetah	Barrel medic	*Medicago truncatula*	**4578**	abcdef
Jester	Barrel medic	*Medicago truncatula*	**4878**	abcde
Lynx	Barrel medic	*Medicago truncatula*	3198	efg
Parabinga	Barrel medic	*Medicago truncatula*	**4583**	abcdef
Paraggio	Barrel medic	*Medicago truncatula*	**5340**	abcd
Blaza	Crimson Clover	*Trifolium incarnatum*	**6085**	ab
Bolta	Balansa Clover	*Trifolium michelianum* Savi	2746	fgh
Cobra	Balansa Clover	*Trifolium michelianum* Savi	**5734**	abc
Frontier	Balansa Clover	*Trifolium michelianum* Savi	3586	defg
Taipan	Balansa Clover	*Trifolium michelianum* Savi	**5054**	abcde
Viper	Balansa Clover	*Trifolium michelianum* Savi	3879	cdefg
Bartolo	Bladder Clover	*Trifolium spumosum*	2567	gh
Mintaro	Subterranean Clover	*Trifolium subterraneum var. Brachycalycinum*	**4963**	abcde
Coolamon	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	**4566**	abcdef
Losa	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	2722	fgh
Urana	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	3918	cdefg
Woogenellup	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	4162	abcdef

2.1.2 Silvermyn

At Silvermyn (Table 2.8) the number of seedlings establishing varied between 576 (Margurita) and 1382 (Blaza) seedlings m^{-2}. The burr medics Scimitar, Cavalier and

Persistor, the barrel medics Jester and Paraggio, crimson clover, Blaza, balansa clovers, Cobra and Frontier and Woogenellup subterranean clover had the highest number of seedlings.

At Silvermyn the percentage viable seeds establishing (Table 2.9) varied between 40 (Margurita) and 100% (Scimitar). The cultivars with the highest percentage viable seeds establishing were Scimitar and Cavalier burr medic, Jester barrel medic, Blaza crimson clover, and Viper and Cobra balansa clover.

Table 2.6. Total mass on plots (cultivar plus other species) kg ha^{-1} of 24 annual legumes at Roodebloem, Caledon, during 2014

Cultivar	Common name	Species & genus	Total DM kg ha^{-1}	Data with same letter do not differ (P<0.05)
Casbah	Biserulla	*Biserulla pelisinus*	2069	g
Angel	Sand Medic	*Medicago littoralis*	2842	fg
Bindara	Button Medic	*Medicago orbicularis*	4124	cdef
Cavalier	Burr medic	*Medicago plymorpha*	**6720**	a
Santiago	Burr medic	*Medicago plymorpha*	**6421**	ab
Scimitar	Burr medic	*Medicago plymorpha*	**6383**	ab
Persistor	Burr medic	*Medicago plymorpha*	**5576**	abcd
Paraggio	Barrel medic	*Medicago truncatula*	**5728**	abc
Parabinga	Barrel medic	*Medicago truncatula*	**5294**	abcde
Jester	Barrel medic	*Medicago truncatula*	**5228**	abcde
Cheetah	Barrel medic	*Medicago truncatula*	**5140**	abcde
Lynx	Barrel medic	*Medicago truncatula*	4115	cdef
Blaza	Crimson Clover	*Trifolium incarnatum*	**5058**	abcde
Cobra	Balansa Clover	*Trifolium michelianum* Savi	**6526**	ab
Taipan	Balansa Clover	*Trifolium michelianum* Savi	**5621**	abcd
Viper	Balansa Clover	*Trifolium michelianum* Savi	4471	cdef
Frontier	Balansa Clover	*Trifolium michelianum* Savi	4089	cdef
Bolta	Balansa Clover	*Trifolium michelianum* Savi	3910	def
Bartolo	Bladder Clover	*Trifolium spumosum*	3527	efg
Mintaro	Subterranean Clover	*Trifolium subterraneum var. Brachycalycinum*	**5554**	abcd
Coolamon	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	**5027**	abcde
Woogenellup	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	4749	bcde
Urana	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	4319	cdef
Losa	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	3602	efg

At Silvermyn the dry matter yield of the cultivars (Table 2.10) varied between 166 (Charano) and and 2873 kg ha^{-1} (Scimitor). The burr medics Scimitor and Persistor yielded the highest dry matter.

The total dry matter yield (Table 2.11) (cultivar plus weeds and volunteer species) were also determined at Sivermyn. Blaza (1446 kg ha^{-1}) had the lowest and Scimitor (3501 kg ha^{-1}) the highest. The burr medics Cavalier, the barrel medic, Jester, Cobra balansa clover and Blaza, crimson clover had the highest total dry matter yield.

At Silvermyn (Table 2.12) Charano (9%) contributed least to the total dry matter and Persistor (92.4%) the most. The cultivars which contributed most to the total dry matter yield were the burr medics Cavalier and Scimitar, the barrel medics Jester, Parabinga and Paraggio and the balansa clovers, Bolta, Cobra, Frontier and Taipan.

Table 2.7. Percentage of total mass on plots (cultivar plus other species) comprised of sown cultivar at Roodebloem, Caledon for 24 annual legumes during 2014

Cultivar	Common name	Species & genus	% of Total DM	Data with same letter do not differ (P<0.05)
Casbah	Biserulla	*Biserulla pelisinus*	17	g
Angel	Sand Medic	*Medicago littoralis*	79	bcdef
Bindara	Button Medic	*Medicago orbicularis*	28	g
Cavalier	Burr medic	*Medicago plymorpha*	**99**	a
Santiago	Burr medic	*Medicago plymorpha*	**98**	ab
Scimitar	Burr medic	*Medicago plymorpha*	**98**	ab
Persistor	Burr medic	*Medicago plymorpha*	**95**	abc
Paraggio	Barrel medic	*Medicago truncatula*	**92**	abcd
Jester	Barrel medic	*Medicago truncatula*	**91**	abcd
Parabinga	Barrel medic	*Medicago truncatula*	**86**	abcdef
Cheetah	Barrel medic	*Medicago truncatula*	**86**	abcdef
Lynx	Barrel medic	*Medicago truncatula*	75	def
Blaza	Crimson Clover	*Trifolium incarnatum*	**94**	abcd
Taipan	Balansa Clover	*Trifolium michelianum* Savi	**90**	abcd
Frontier	Balansa Clover	*Trifolium michelianum* Savi	**86**	abcdef
Viper	Balansa Clover	*Trifolium michelianum* Savi	**85**	abcdef
Cobra	Balansa Clover	*Trifolium michelianum* Savi	**82**	abcdef
Bolta	Balansa Clover	*Trifolium michelianum* Savi	67	f
Bartolo	Bladder Clover	*Trifolium spumosum*	69	ef
Mintaro	Subterranean Clover	*Trifolium subterraneum var. Brachycalycinum*	**90**	abcd
Urana	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	**91**	abcd
Coolamon	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	**90**	abcd
Woogenellup	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	**88**	abcdef
Losa	Subterranean Clover	*Trifolium subterraneum var. Subterraneum*	76	cdef

2.1.3 Relationship between dry matter yield and the number of seedling establishing.

According to Figures 2.1 and 2.2 there was a linear relationship between the number of seedlings establishing and the dry matter yield of a particular cultivar. Although the functions do not explain all the variables contributing to yield. Figure 2.1, derived at Roodebloem, explains 31% of the yield while Figure 2.2, derived at Silvermyn, explains 51%.

Table 2.8 . Number of legume seedlings establishing on 19 annual legumes at Silvermyn, Malmesbury, during 2014

Cultivar	Common name	Species & genus	Number of Seedlings m^{-2}	Data with same letter do not differ (P<0.05)
Casbah	Biserulla	*Biserulla pelisinus*	706	efg
Angel	Sand medic	*Medicago littorales*	631	fg
Scimitar	Burr medic	*Medicago plymorpha*	**1367**	a
Cavalier	Burr medic	*Medicago plymorpha*	**1276**	ab
Persistor	Burr medic	*Medicago plymorpha*	**1173**	abc
Jester	Barrel medic	*Medicago truncatula*	**1279**	a
Paraggio	Barrel medic	*Medicago truncatula*	**1109**	abc
Parabinga	Barrel medic	*Medicago truncatula*	670	fg
Charano	Yellow serradella	*Ornithopus compressus*	824	def
Emena	Pienk serradella	*Ornithopus sativus*	618	fg
Margurita	Pienk serradella	*Ornithopus sativus*	576	g
Blaza	Crimson clover	*Trifolium incarnatum*	**1382**	a
Cobra	Balansa clover	*Trifolium michelianum Savi*	**1194**	abc
Frontier	Balansa clover	*Trifolium michelianum Savi*	**1191**	abc
Bolta	Balansa clover	*Trifolium michelianum Savi*	1012	bcd
Viper	Balansa clover	*Trifolium michelianum Savi*	943	cde
Taipan	Balansa clover	*Trifolium michelianum Savi*	651	fg
Bartolo	Bladder clover	*Trifolium spumosum*	664	fg
Woogenellup	Subterranean clover	*Trifolium subterraneum*	**1240**	ab

Table 2.9. Percentage of viable of legume seeds establishing on 19 annual legumes at Silvermyn, Malmesbury, during 2014

Cultivar	Common name	Species & genus	% of Viable Seedlings	Data with same letter do not differ (P<0.05)
Casbah	Biserulla	*Biserulla pelisinus*	41.1	ij
Angel	Sand medic	*Medicago littorales*	43.5	hij
Scimitar	Burr medic	*Medicago plymorpha*	**100.0**	a
Persistor	Burr medic	*Medicago plymorpha*	75.8	bcdef
Cavalier	Burr medic	*Medicago plymorpha*	**88.1**	abc
Paraggio	Barrel medic	*Medicago truncatula*	69.2	cdef
Parabinga	Barrel medic	*Medicago truncatula*	44.8	ghij
Jester	Barrel medic	*Medicago truncatula*	**81.9**	abcde
Charano	Yellow serradella	*Ornithopus compressus*	64.1	efgh
Margurita	Pienk serradella	*Ornithopus sativus*	40.0	j
Emena	Pienk serradella	*Ornithopus sativus*	52.9	fghi
Blaza	Crimson clover	*Trifolium incarnatum*	**96.6**	a
Viper	Balansa clover	*Trifolium michelianum Savi*	**92.0**	ab
Taipan	Balansa clover	*Trifolium michelianum Savi*	40.8	ij
Frontier	Balansa clover	*Trifolium michelianum Savi*	76.3	bcdef
Cobra	Balansa clover	*Trifolium michelianum Savi*	**84.9**	abcd
Bolta	Balansa clover	*Trifolium michelianum Savi*	66.5	defg
Bartolo	Bladder clover	*Trifolium spumosum*	67.5	def
Woogenellup	Subterranean clover	*Trifolium subterraneum*	76.0	bcdef

Table 2.10 . Total annual dry matter yield (kg ha^{-1}) of 19 annual legumes at Silvermyn, Malmesbury, during 2014

Cultivar	Common name	Species & genus	DM yield kg ha^{-1}	Data with same letter do not differ (P<0.05)
Casbah	Biserulla	*Biserulla pelisinus*	617	de
Angel	Sand medic	*Medicago littorales*	641	de
Scimitar	Burr medic	*Medicago plymorpha*	**2873**	a
Persistor	Burr medic	*Medicago plymorpha*	**2179**	ab
Cavalier	Burr medic	*Medicago plymorpha*	2017	bc
Parabinga	Barrel medic	*Medicago truncatula*	1871	bc
Jester	Barrel medic	*Medicago truncatula*	1668	bc
Paraggio	Barrel medic	*Medicago truncatula*	1436	c
Charano	Yellow serradella	*Ornithopus compressus*	166	e
Emena	Pienk serradella	*Ornithopus sativus*	368	e
Margurita	Pienk serradella	*Ornithopus sativus*	344	e
Blaza	Crimson clover	*Trifolium incarnatum*	1682	bc
Cobra	Balansa clover	*Trifolium michelianum Savi*	1701	bc
Bolta	Balansa clover	*Trifolium michelianum Savi*	1547	bc
Taipan	Balansa clover	*Trifolium michelianum Savi*	1460	c
Frontier	Balansa clover	*Trifolium michelianum Savi*	1427	c
Viper	Balansa clover	*Trifolium michelianum Savi*	1321	cd
Bartolo	Bladder clover	*Trifolium spumosum*	412	e
Woogenellup	Subterranean clover	*Trifolium subterraneum*	1411	c

Table 2.11. Total DM contributed by cultivar and other species on 19 annual legumes at Silvermyn, Malmesbury, during 2014

Cultivar	Common name	Species & genus	Total DM kg ha^{-1}	Data with same letter do not differ (P<0.05)
Casbah	Biserulla	*Biserulla pelisinus*	2160	bcde
Angel	Sand medic	*Medicago littorales*	1859	cde
Cavalier	Burr medic	*Medicago plymorpha*	**2691**	abc
Persistor	Burr medic	*Medicago plymorpha*	2356	bcde
Scimitar	Burr medic	*Medicago plymorpha*	**3501**	a
Jester	Barrel medic	*Medicago truncatula*	2374	bcd
Parabinga	Barrel medic	*Medicago truncatula*	2205	bcde
Paraggio	Barrel medic	*Medicago truncatula*	1993	bcde
Charano	Yellow serradella	*Ornithopus compressus*	1849	cde
Emena	Pienk serradella	*Ornithopus sativus*	1624	de
Margurita	Pienk serradella	*Ornithopus sativus*	1674	de
Blaza	Crimson clover	*Trifolium incarnatum*	1446	e
Bolta	Balansa clover	*Trifolium michelianum Savi*	2316	bcde
Cobra	Balansa clover	*Trifolium michelianum Savi*	**2809**	ab
Frontier	Balansa clover	*Trifolium michelianum Savi*	1968	bcde
Taipan	Balansa clover	*Trifolium michelianum Savi*	1923	bcde
Viper	Balansa clover	*Trifolium michelianum Savi*	2090	bcde
Bartolo	Bladder clover	*Trifolium spumosum*	1699	de
Woogenellup	Subterranean clover	*Trifolium subterraneum*	1902	bcde

Table 2.12. Percentage of total DM contributed by cultivar sown on 19 annual legumes at Silvermyn, Malmesbury, during 2014

Cultivar	Common name	Species & genus	% of Total DM	Data with same letter do not differ (P<0.05)
Casbah	Biserulla	*Biserulla pelisinus*	**72.8**	ab
Angel	Sand medic	*Medicago littorales*	42.8	cde
Cavalier	Burr medic	*Medicago plymorpha*	**74.7**	ab
Persistor	Burr medic	*Medicago plymorpha*	**92.4**	a
Scimitar	Burr medic	*Medicago plymorpha*	**84.9**	ab
Jester	Barrel medic	*Medicago truncatula*	**73.2**	ab
Parabinga	Barrel medic	*Medicago truncatula*	**84.1**	ab
Paraggio	Barrel medic	*Medicago truncatula*	**69.7**	ab
Charano	Yellow serradella	*Ornithopus compressus*	9.0	f
Emena	Pienk serradella	*Ornithopus sativus*	23.3	ef
Margurita	Pienk serradella	*Ornithopus sativus*	17.6	ef
Blaza	Crimson clover	*Trifolium incarnatum*	41.2	de
Bolta	Balansa clover	*Trifolium michelianum Savi*	**71.4**	ab
Cobra	Balansa clover	*Trifolium michelianum Savi*	**67.0**	abcd
Frontier	Balansa clover	*Trifolium michelianum Savi*	**69.1**	abc
Taipan	Balansa clover	*Trifolium michelianum Savi*	**75.2**	ab
Viper	Balansa clover	*Trifolium michelianum Savi*	65.0	bcd
Bartolo	Bladder clover	*Trifolium spumosum*	21.3	ef
Woogenellup	Subterranean clover	*Trifolium subterraneum*	76.0	bcdef

Figure 1. Relationship between the number of seedlings establishing and the dry matter yield for 24 annual legumes at Roodebloem, Caledon, during 2014

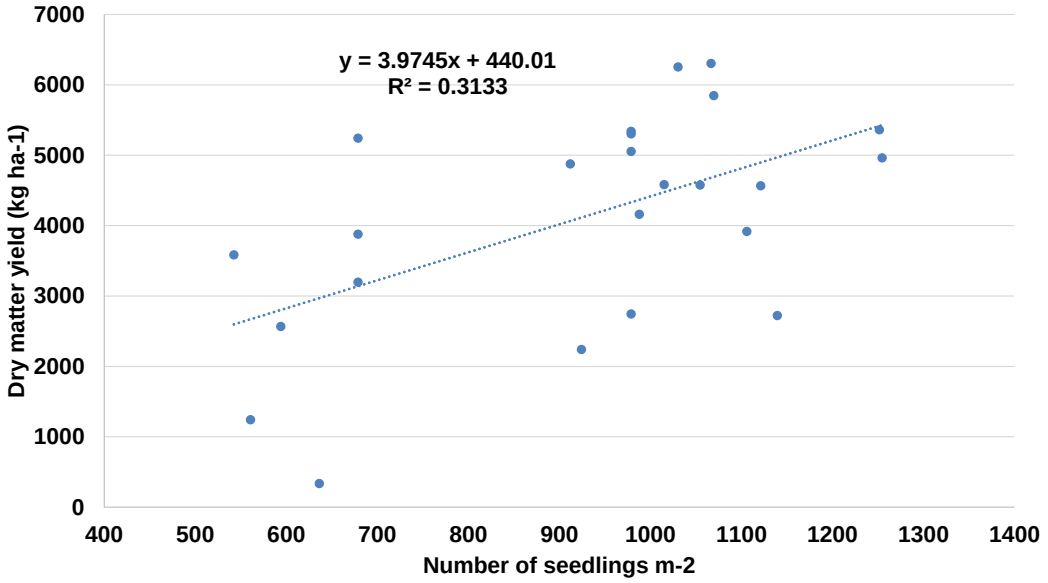

Figure 2. Relationship between the number of seedlings establishing and the dry matter yield of 19 annual pasture legumes at Silvermyn, Malmesbury, during 2014