

# RANGE SCIENCE REPORT

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## SEED PRODUCTION OF ANNUAL RANGE LEGUMES GROWN IN RANGE CONDITIONS 1/

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### Introduction

The successful perpetuation of annual legumes in California rangeland flora depends on the production of large amounts of seed. Unless the majority of the seed is hard (live seed which will not imbibe moisture because of an impermeable seed coat), sufficient amounts must be produced annually to insure a forage crop the following year. Also important are seed eating birds and other animals (Kay, 1986). Data on seed yield are difficult to come by because the ranges are normally grazed, not only for forage, but also as a necessary management practice to control species composition. Further complicating measurement of subclover seed production is the plant characteristic of burying all or a portion of the seed in the soil.

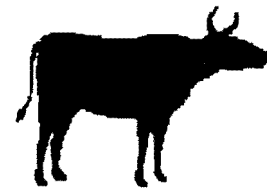
### Methods and materials

Seed yields were measured as part of legume establishment studies in the years 1968-1970. Trial locations include the UC Davis Farm (UCD), the George Durst Ranch in western Yolo Co. (Yolo), Black Butte in western Glenn Co. (Glenn), and Beal Air Force Base in Yuba Co. (Yuba).

Legume varieties and species were compared for seed and sometimes forage production in all studies. All treatments were replicated four times. Some studies also looked at the effect of weed control during the first year. Paraquat was sprayed shortly after germination of the resident flora, and pellet inoculated seed broadcast on the soil surface at the rate of 10 lb/acre. Single super-phosphate was also broadcast at 500 lb/acre.

1/ This research was cooperative with local ranchers and Farm Advisors.

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### Results and Discussion

Subclover seed yields varied greatly between varieties (Table 1). The earliest maturing varieties often, but not always, produced the most seed. The earliest maturing varieties generally buried a greater proportion of the seed, apparently because the soil was more likely to be moist enough to allow burial at the time of seed production.

The proportion of the seed buried varied from 9% to 98% depending on variety and location (Table 2). A larger proportion was buried at the Glenn County site, probably because the soil was the most friable.

Table 2. Percent of subclover seed found beneath the soil surface.

	Percent			
	UCD	Yolo	Glenn	Yuba
Talarook	6	-	-	-
Mt. Barker	9	19	24	82
Bacchus Marsh	8	11	34	-
Woogenellup	9	16	62	81
Clare	20	-	-	-
Yarloop	11	-	59	-
Dwalganup	16	45	67	-
Geraldton	20	-	98	-
Dinninup	12	18	66	-
Howard	11	-	-	-
Blackwood	9	-	-	-

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Table 1. Subclover seed yield and seed size, above and below ground.

	Pounds/acre				Grams/1,000 Seeds			
	UCD	Yolo	Glenn	Yuba	UCD	Yolo	Glenn	Yuba
Subclover-above ground								
Talarook	615	-	-	-	5.8	-	-	-
Mt. Barker	403	57	37	11	5.6	3.9	4.9	4.2
Bacchus Marsh	422	191	25	-	5.9	4.9	4.4	-
Woogenellup	278	171	21	20	6.3	4.7	4.0	5.0
Clare	192	-	-	-	6.8	-	-	-
Yarloop	470	-	87	-	5.7	-	4.8	-
Dwalganup	538	291	68	-	5.2	4.0	4.0	-
Geraldton	375	-	115	-	4.8	-	3.7	-
Dinninup	269	197	21	-	3.0	3.0	2.6	-
Howard	298	-	-	-	4.3	-	-	-
Blackwood	787	-	-	-	7.6	-	-	-
Subclover-below ground								
Talarook	38	-	-	-	6.4	-	-	-
Mt. Barker	38	13	12	50	5.8	4.2	5.5	4.6
Bacchus Marsh	38	24	13	-	5.7	4.8	6.8	-
Woogenellup	29	33	34	96	6.9	4.9	4.6	6.6
Clare	48	-	-	-	8.4	-	-	-
Yarloop	58	-	127	-	7.1	-	6.2	-
Dwalganup	106	238	575	-	7.1	5.3	5.5	-
Geraldton	96	-	806	-	6.1	-	4.6	-
Dinninup	38	44	41	-	5.2	3.8	3.7	-
Howard	38	-	-	-	5.6	-	-	-
Blackwood	77	-	-	-	7.5	-	-	-
Subclover-total								
Talarook	653	-	-	-				
Mt. Barker	441	70	49	61				
Bacchus Marsh	460	215	38	-				
Woogenellup	307	204	55	118				
Clare	240	-	-	-				
Yarloop	528	-	214	-				
Dwalganup	644	529	857	-				
Geraldton	471	-	921	-				
Dinninup	307	241	62	-				
Howard	336	-	-	-				
Blackwood	864	-	-	-				



Seed production also varied between legume species (Table 3). Total seed production of rose clover varieties was generally greater than subclover or crimson clover. Bur clover was also high yielding, and better than the other medics tested at the UCD site.

Seed size, as indicated by the weight of 1,000 seeds, varied considerably between varieties of subclover (Table 1), but very little between rose clover varieties (Table 3).

Table 3. Seed yield and seed size of species other than subclover (grown at the same site and year as the subclover in Table 1)

	Pounds seed per acre		Grams/1,000 seeds	
	UCD	Yolo	UCD	Yolo
<b>Medics</b>				
Bur Clover	1200	-	3.0	-
173 Barrel Medic	980	184	3.4	3.1
Cyprus Barrel Medic	461	-	3.5	-
<b>Crimson Clover</b>				
	490	-	2.7	-
<b>Rose Clover</b>				
Wilton	931	71	3.3	2.2
Kondinin	1037	122	3.4	2.2
Hyon	1200	-	3.4	-
Sirint	653	-	3.0	-
S-6	1066	-	3.2	-
T.O.2648	1517	-	3.1	-

Weed control, as the result of paraquat applications in the seeding year, often resulted in increased total seed production of both rose and subclover (Tables 4 and 5). Paraquat rates as low as 1/8 lb/acre were sufficient to produce this increase, and using higher rates of paraquat did not further increase seed yields.

Seed size was often larger in the buried fraction of subclover seed compared to the surface seed with most varieties (Tables 1, 3, 5). Weed control did not consistently influence seed size.

Table 4. Effect of weed control on the above and below ground seed production of three subclovers.

Paraquat lbs/acre	Pounds/acre		
	Above Ground	Below Ground	Total
<b>Geraldton</b>			
0	3	190	193
1/8	6	428	434
1/4	18	571	589
3/8	19	491	510
<b>Dwalganup</b>			
0	1	55	56
1/8	3	211	214
1/4	7	139	146
3/8	4	220	224
<b>Dinninup</b>			
0	1	30	31
1/8	12	187	199
1/4	3	69	72
3/8	1	153	154

Temperature effects on germination were different for subclover seed produced above ground compared to below ground (Table 6). Germinability of above ground seed was generally greater at all temperatures tested. Weed control treatments had significant effects on germination at some temperatures, sometimes increasing and sometimes decreasing germination.

#### Literature Cited

Kay, Burgess L., 1968. Rose clover--A preferred quail food. Transactions of the Western Section of the Wildlife Society 22:39-41.



Table 5. Effect of weed control during the clover establishment year on the seed yield and size of three clover species at one location for the first three growing seasons.

Paraquat lb/ac	Seed yield, lb/ac						Seed size g/1,000						Forage yield lb/acre	
	Above ground			Below ground			Above ground			Below ground			1967	1968
	1967	1968	1969	1967	1968	1969	1967	1968	1969	1967	1968	1969		
Rose clover														
0	84	6	68				2.7	2.3	2.3				3820	2520
1/4	274	18	196				2.9	2.4	2.2				4540	2450
1/2	409	17	155				3.3	2.4	2.2				3820	3600
Mt. Barker sub.														
0	92	11	21	57	50	63	5.1	4.2	4.7	6.9	4.6	4.9	4490	3290
1/4	142	11	26	98	41	55	4.9	3.5	5.1	5.8	4.4	5.2	4390	3050
1/2	97	14	37	125	48	79	4.7	3.5	5.1	5.9	4.3	5.0	4420	3070
Woogenellup sub.														
0	21	26	182	64	156	149	5.7	5.0	6.7	7.2	6.6	7.3	3280	2820
1/4	86	36	272	186	235	225	5.2	4.9	6.4	6.6	6.0	6.6	3940	3050
1/2	119	21	188	178	167	158	6.3	6.2	6.7	6.8	5.7	6.6	4270	3100

Table 6. Effects of weed control treatments and germination temperatures on the germinability of rose and subclover seed. Germination time was four weeks. Germination tests were by James A. Young, USDA, Reno, NV.

Temperature (deg. celsius)	Above ground seed					Below ground seed				
	5	10	15	20	30	5	10	15	20	30
Percent										
Rose clover										
Check	61	55	64	43	38					
1/4 lb paraquat	60	68	76	35	52					
1/2 lb paraquat	58	81	94	63	16					
Spray treatment	NS	NS	**	*	NS					
Mt. Barker subclover										
Check	100	97	77	88	26	70	78	62	69	35
1/4 lb paraquat	99	100	99	94	33	50	96	97	77	25
1/2 lb paraquat	97	100	92	57	38	80	94	97	95	26
Above ground seed vs. below ground.	**	*	NS	NS	NS					
Spray treatment	*	*	*	NS	NS					
Interaction	**	NS	NS	**	NS					
Woogenellup subclover										
Check	100	--	80	--	57	62	--	68	--	19
1/4 lb paraquat	85	97	78	87	15	53	64	73	82	--
1/2 lb paraquat	100	96	--	90	11	49	50	--	75	--
Above ground seed vs. below ground.	**	*	NS	*	*					
Spray treatment	NS	NS	NS	NS	*					
Interaction	NS	NS	NS	NS	NS					

\* Difference significant at the .05 level.

\*\* Difference significant at the .01 level.

NS Not significant.