

LUCERNE CULTIVARS IN NEW ZEALAND

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ABSTRACT

Results from lucerne cultivar trials at Lincoln, mid-Canterbury and Tara Hills are reviewed. Several wilt resistant cultivars yielded as much or more than Wairau in the absence of wilt. Cultivar x locality and cultivar x season interactions are recorded. A trial is proposed to assess the importance of regional differences in adaptability of cultivars in New Zealand.

INTRODUCTION

Lucerne culture in New Zealand has changed considerable in the last five years. In the North Island the area of lucerne harvested for hay and silage increased from 16,000 hectares in 1971 to 32,000 hectares in 1972. Harvested area in the South Island increased from 72,000 to 80,000 hectares in the same period. Since 1972 the area in the North Island has probably increased more rapidly than the area in the South Island.

In the North Island lucerne is grown in wetter areas than in South Island areas, and in some parts with milder winters. Cultivars other than those adapted in South Island climates may be better in some parts of the North Island.

It is now known that bacterial wilt [*Corynebacterium insidiosum*] shortens productive life of irrigated lucerne in the South Island, and in the North Island generally. The commonly grown cultivars Wairau, Chanticleer and Hunter River, do not resist this disease. Verticillium wilt [*Verticillium albo-atrum*] and root-knot nematodes [*Meloidogyne* spp] may be important pathogens in North Island, so that cultivars resistant to them may be

valuable. Stem eelworm [*Ditylenchus dipsaci*], and in some years crown-rot (*Fusarium* spp) may also reduce productivity of lucerne.

Wairau, Chanticleer, Hunter River and College Glutinosa are on the N.Z. list of acceptable herbage cultivars. These differ somewhat in winter-dormancy, but not in susceptibility to bacterial wilt, or as far as is known to any other important pathogens. Saranac, a wilt-resistant cultivar has been added to the list, and application has been made to add Washoe, which is resistant to both stem eelworm and bacterial wilt. Other cultivars — resistant to bacterial wilt, or resistant to other important pathogens, or capable of high yield or longer seasonal production, may be worth growing in New Zealand generally, or in some parts of it.

In this paper results of trials of lucerne cultivars, especially those including bacterial-wilt resistant cultivars, are reviewed, a future programme of cultivar trials is outlined, and the effect on the lucerne growing industry of the criteria limiting the addition of cultivars to the N.Z. list of acceptable herbage cultivars is discussed.

TABLE 1: Yields relative to trial mean = 100

Harvests Cultivar	Winchmore				Winslow		Lincoln							
	5 74/5	4 72/3	4 73/4	4 74/5	5 73/4	4 74/5	2** 72/3	4 73/4	5 74/5	8/74	12/74	1/75	3/75	4/75
Wairau	102	103	95	88	97	97	110	111	105	112	106	100	100	115
Washoe*	91	91	95	96	87	100	88	94	105	117	105	103	100	113
Saranac	113	113	111	108	104	99	101	101	99	81	101	97	100	105
Caliverde	103	103	99	96	95	90	92	102	103	148	99	102	95	104
530	108	110	112	109	95	96	109	102	107	106	106	106	109	109
520	106	108	114	110	101	117	111	107	108	105	109	109	113	102
Iroquios	100	106	102	100	122	116	85	87	93	71	96	93	93	100
Lahontan*	91	84	91	97	107	99	91	100	106	120	115	100	100	104
Kanza	96	92	95	99	90	101	103	104	100	97	98	103	106	92
Dawson	98	103	99	102	116	94	90	102	84	74	80	90	85	85
Vernal	98	100	97	102	93	96	108	97	95	72	94	99	97	94
Ranger	94	90	96	92	95	94	110	102	95	93	96	99	97	81
LSD P = .01	11	6	7	13	14	NS	10	6	6	15	8	NS	13	19
Interactions														
CV x harvest		**		**				*	**					
CV x years					**			**						

* significant P = .05

** significant P = .01

+ also resistant to stem eelworm

++ number of harvests reduced by drought

Yields bold are above or below the mean for that cultivar

TABLE 2: Yields relative to Saranac = 100

Cultivar	74/5	Lincoln			Winslow		Winchmore
		72/3	73/4	74/5	73/4	74/5	74/5
AS13	97						84
Thor	99						102
WL 309	103						
WL 306		95	108	108	101	93	94
520	99	110	105	109	97	118	93
530	103	108	102	108	91	97	95
Atra 55	101	102	103	106	106	108	
KO612	96						84

TABLE 3: Yields relative to trial mean = 100

Harvest Date	Tara Hills		Lincoln			
	10.10.66	26.9.67	5.9.68	3.9.69	8.9.70	7.9.71
Wairau	110	108	111	92	90	80
Chanticleer	106	101	120	105	106	98
Du Puits	107	105	73	82	88	85
Zamora	76	86	95	121	116	136
D.M. kg/ha	1500	2400	1900	2400	2000	2000

MATERIALS AND METHODS

Results discussed are from a number of trials conducted by Crop Research Division, DSIR, Lucerne Division of Fletcher Industries Ltd., and Winchmore Irrigation Research Station of the Ministry of Agriculture & Fisheries. All results are from reasonably good lucerne plots, and management, particularly cutting schedules, although not standardised has been within the normal range of management.

RESULTS

Bacterial wilt resistant cultivars

Results from four trials at Winslow, Winchmore and Lincoln which included 12 cultivars in common are in Table 1. Yield of each cultivar is given relative to the mean (=100) of the twelve cultivars at that harvest.

The low yield of Wairau in the trial at Winchmore in 1974/75 is presumed to result from bacterial wilt.

Several wilt resistant cultivars yielded as well as or better than Wairau. The more winter dormant cultivars, Kanza, Dawson, Vernal and Ranger yielded less than Wairau. as did the stem-eelworm resistant cultivars Washoe and Lahontan. Iroquois yielded comparatively poorly at Lincoln, 530 comparatively poorly at Winslow, and Saranac comparatively well at Winchmore. These

interactions may have resulted from differences in the physical environments or management systems of the trials. Within year between harvest interactions for Lincoln in 1974/75 arose mainly from the differences in early spring and late autumn yield of cultivars.

Two cultivars, 520 and 530, yielded as well as Saranac. In these and other trials, other cultivars have yielded as well as Saranac (Table 2).

Wilt susceptible cultivars

Tara Hills and Lincoln. Early spring production from cultivars chosen to illustrate cultivar x environment interactions are given in Table 3.

The relevant parts of the analysis of variance are given in Table 4.

Mean October temperatures at Tara Hills are about the same as August temperatures at Lincoln. At Lincoln, Zamora, a regional cultivar from northern Spain is not limited by the short August days which limit Wairau, but at Tara Hills it is limited by low temperatures.

At Lincoln, cultivar production differs most in late winter and early spring.

Yield from about 1 April to the date of harvest of less winter dormant cultivars is compared with yield of Wairau = 100 in Table 5.

TABLE 4: Analysis of variance of Lincoln, Tara Hills results

	DF.	M sq.	F.
Error	168	482	
Cultivars	3	4257	8.83**
Cultivars x Trials	3	9208	19.10**
Cultivars x Years			
Tara Hills	3	433	0.90
Lincoln	9	2127	4.41**

TABLE 5: Cultivar yields at Lincoln in late autumn and early spring relative to Wairau = 100

	Late Autumn			early Spring		
	25/5/75	20/5/59	26/5/60	2/9/59	23/8/60	
Trial 1						
Chanticleer ¹	126	160	210	105	77	
Hunter River ²	122	159	210	95	85	
Caliverde ³	130	162	217	98	73	
Wairau kg/ha	900	930	740	1850	970	
Trial 2	21/5/59	25/5/60		20/8/59	7/9/59	22/8/60
Caliverde ³	116	155		120	99	91
Zia ³	102	139		122	108	117
Indian ³	116	176		121	95	91
African ³	105	160		132	103	117
Saladina ⁴	149	174		120	97	101
Wairau kg/ha	1250	960		850	2120	710
Trial 3	26/6/74	9/6/75		1/10/74		
Eldorado ³	125	271		100		
UCSW 44 ³	140	270		100		
Wairau kg/ha	1100	450		3970		
Trial 4	29/6/70			5/9/68	3/9/69	8/9/70
Chanticleer ¹	133			112	114	118
Aragon ⁵	178			116	164	129
Zamora ⁵	161			88	131	129
Tierra de Campos ⁵	184			146	154	155
Wairau kg/ha	700			1500	2260	2160
Trial 5	7/5/74	21/4/75		28/9/73	30/8/74	
Florida 66 ⁶	116	99		99	160	
Aragon ⁵	80	105		91	170	
Caliverde ³	103	91		90	132	
Chanticleer ¹	108	104		95	145	
Wairau kg/ha	1800	2800		4350	1920	

ex Southern France¹, Australia², South West U.S.A.³, Argentine⁴, Spain⁵, South east U.S.A.⁶.

In late autumn, these cultivars have generally yielded more than Wairau, the difference being greatest when the yield of Wairau was lowest. This suggests that growth of Wairau stopped sooner in some years than in others, while less dormant cultivars continued to grow most years. There was no obvious correlation with temperature variations in April and May.

In early spring, Tierra de Campos yielded more than Wairau in three years, and other cultivars did so inconsistently. There was no obvious correlation between mean July, August temperatures and response. The extra early spring production is usually only temporary, and by the time Wairau is ready for its first harvest in October at Lincoln, early cultivars have not yielded more than Wairau. In milder climates the difference might be larger and more consistent.

Cultivars less dormant than Wairau generally produce during last autumn, and if grazed early in the spring may produce more. For hay or for dehydration they are no better than Wairau in spring.

DISCUSSION

Cultivars resistant to bacterial wilt can be expected to yield as well as Wairau in New Zealand. Some less winter dormant cultivars may be better than Wairau in milder areas than Canterbury. Cultivars resistant to other important pathogens may produce more and better

quality forage, and remain productive longer, where these pathogens are important. Trials are needed to assess these possibilities.

A list of cultivars proposed for inclusion in trials by Research Division, Ministry of Agriculture & Fisheries, and Crop Research Division DSIR at Lincoln, Blenheim, Helensville, Wairakei, Takapau and Flock House is given in Table 6.

Cultivars from eastern U.S.A. may be more resistant to leaf diseases and cultivars from southern U.S.A. may have a longer season, and produce more in milder areas of New Zealand. Some U.S.A. cultivars combine resistance to bacterial wilt and stem eelworm and are resistant to root knot nematode and some European cultivars have resistance to Verticillium wilt. Sown in the localities suggested, they should indicate the importance of some pathogens, and allow better recommendations of cultivars for particular districts.

When adequate data are available from further trials several new varieties should be available for growers and processors in New Zealand.

Saranac is the only wilt resistant cultivar on the New Zealand list of acceptable cultivars. Some others have yielded at least as well as Saranac. At present a cultivar cannot be added to the list unless it is better than one already on the list, so that only one of a group of cultivars of equal merit may be included, and freely traded within New Zealand. This restricts freedom of choice of growers

and processors, and closes the New Zealand market to breeders of cultivars as good as those being sold here. Cultivars shown to be as good as cultivars already on the list should also be acceptable.

TABLE 6 : Cultivars proposed for trials

Cultivar	Origin	Winter growth compared to Wairau	Bacterial wilt	Disease Resistance Stem eelworm	Resistance Leaf diseases	^a Resistant to other diseases
Wairau	N.Z.	=				
Chanticleer	France	+				
Hunter River	Aust.	+				
Saranac	U.S.A.,N	=	r		MR	
Vernal	U.S.A.,N	—	R		MR	1MR
Apallachee	U.S.A.,S	=		R	MR	
Arc	U.S.A.,S	=	R		MR	4MR
Florida 66	U.S.A.,S	++			MR	
Gladiator	U.S.A.,S	=	R	R	MR	4MR
Mesilla	U.S.A.,SW	+	R			3MR
Washoe	U.S.A.,SW	=	R	R		
Aragon	Spain	+				
Europe	France	=				
Maris Kabul	U.K.	=				2R
Maris Phoenix	U.K.	=	R			
Vertus	Sweden	=				2R

Resistant levels R = resistant MR = some resistance

^a Other diseases 1 = Root Knot nematode
 2 = **Verticillium** wilt
 3 = **Fusarium** root & crown rot
 4 = Chewing insects