

GRAZING OAT VARIETY TRIALS ON THE SOUTHERN DARLING DOWNS OF QUEENSLAND

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SUMMARY

Evaluation of 14 varieties was made in three consecutive seasons on the bases of vegetative yield, recovery after grazing, palatability, reaction to frost and rust, and grain yield.

Camellia was outstanding among the early-maturing varieties tested, viz. Belar, Benton, Bovah, Camellia, Floriland, Saia, Seminole and Vicland.

The late-maturing varieties Alber, Algerian, Klein, Landhafer, Santa Fe and Trispermia gave comparable results. Brigalow lacked yielding ability.

I. INTRODUCTION

Oats is a major source of feed for winter grazing on the Darling Downs of south-eastern Queensland. For example, in 1958 an area of 247,000 acres was planted. With fat lamb production rapidly increasing, oats will occupy still larger acreages in the future. The value of oats on mixed farms is widely recognized, as this crop produces nutritious grazing for stock at a difficult period during the winter and if properly managed will recover to give good yields of grain which can be economically produced and easily stored.

This paper reports studies of a selection of early-maturing and late-maturing varieties to determine their value for winter grazing in the Darling Downs area. The trials were conducted over 3 years (1958-1960) on a grey-brown sandy clay soil on the Hermitage Research Station near Warwick. The average annual rainfall for the Station is 27 in.

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II. METHODS AND MATERIALS

The trials took the form of a 7 x 4 long-faced randomized block experiment, with plots 180 ft x 6 ft in 1958 and 108 ft x 6 ft in 1959 and 1960. The planting dates were March 19, 1958, April 9, 1959, and March 23, 1960.

Yield of green material at each grazing was calculated by cutting and weighing material from three areas, each 6 ft x 1 ft 9 in., in every plot immediately prior to grazing (Figure 1). The sample areas were selected at random in the first plot and corresponding positions then fixed in the other plots. Hand shears were used, leaving a 2-in. stubble.

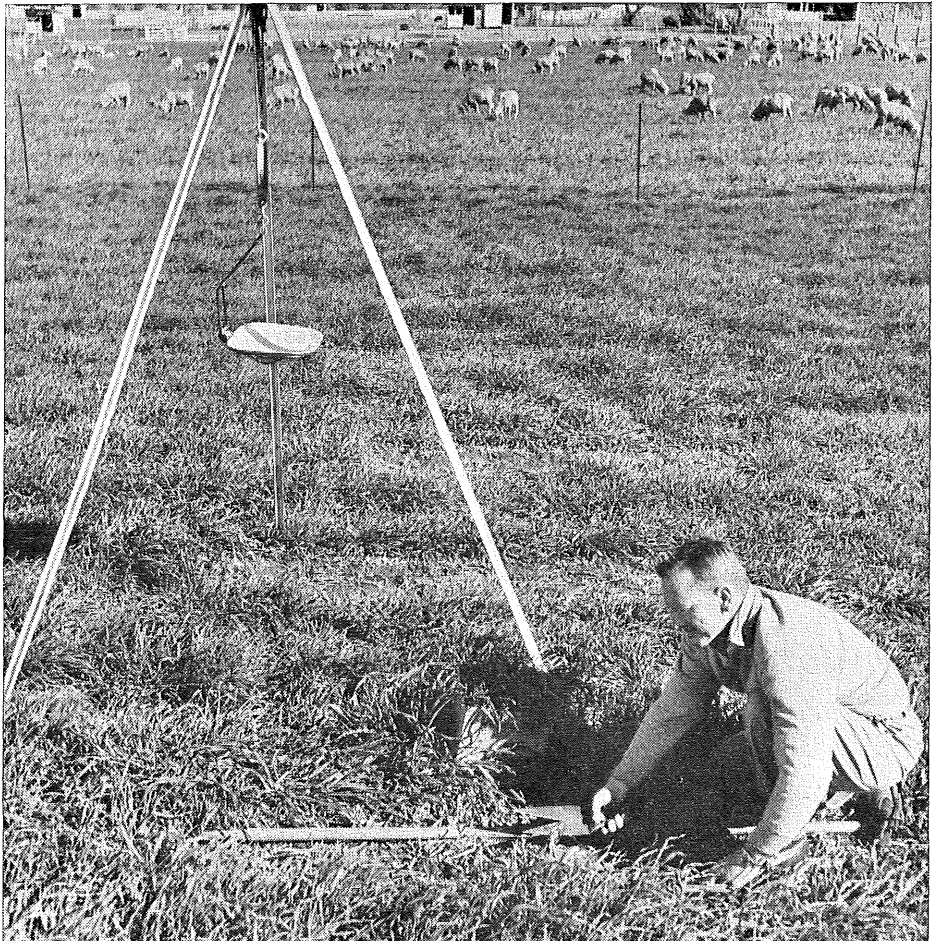


Fig.1.—Technique of cutting quadrats.

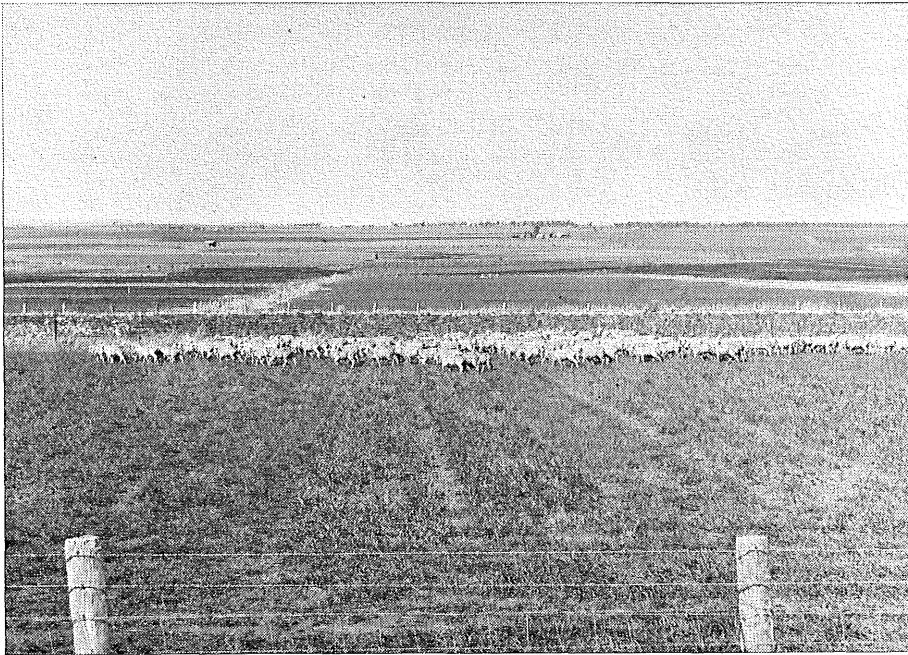


Fig. 2.—Sheep grazing the oats trial, 1960.

As many sheep as possible were used at each grazing (Figure 2), the object being to defoliate the area as quickly as practicable. This helped to avoid overgrazing of the more palatable varieties and minimized any effect due to plant growth during the actual grazing. The sheep were left on the area until they had grazed the bulk of the oats down to within approximately 2 in. of ground level.

Observations were made at regular intervals during growth and were concerned mainly with growth habit, tillering and height, defoliation at grazing, recovery after grazing, palatability, frost reaction and disease incidence.

In 1958, both early and late varieties were harvested for grain, but in 1959 the early varieties lodged due to heavy rain and were not harvested. In 1960, no evaluation of grain yield was possible. When harvested for grain, a whole plot constituted the sampling area.

The early varieties were Belar (1959 and 1960 only), Benton, Bovah, Camellia Q3023, Floriland Q3909, Saia Q3389, Seminole Q3910 (1958 only), and Vicland Q3201.

The late varieties were Alber Q2819, Algerian Q2820, Brigalow Q2835, Klein, Landhafer Q3390, Santa Fe Q3394, and Trispernia Q3395.

III. SEASONAL CONDITIONS

1958:—The rainfall overall from January 1 to November 7 (date of final grazing of late varieties) was 20·1 in., while the amount from March 19 (planting date) to November 7 was 12·3 in. Moisture was adequate for good growth throughout except in the second half of May. Severe cold was experienced in July, frosts of 13·9 and 12·7°F being recorded on successive days. Temperatures in August were mild.

1959:—The rainfall from January 1 to October 9 (date of final grazing of late varieties) was 17·6 in., and the amount from April 9 (planting date) to October 9 was 6·1 in. Seasonal distribution was poor, with a number of very dry periods during the growth of the crop. The weather during late May was favourable for the build-up of stem and crown rusts in the trial and some infection occurred. Until August, when 23 frosts were recorded, temperatures were quite moderate for this area. The minimum grass reading for this month was 15·2°, recorded on August 22; three frosts were recorded in September, with a minimum grass reading of 28·7° on September 23.

1960:—The rainfall from January 1 to September 30 (date of final grazing of late varieties) was 15·58 in., and the amount from March 23 (planting date) to September 30 was 7·12 in. Temperatures from April to September were low. Coldest months were June (22 frosts) and August (25 frosts), with a minimum reading of 14° on June 12. In addition, cold winds were prevalent, especially in May and July. Climatic conditions were not favourable for rust development and all varieties were rust-free.

IV. FIELD OBSERVATIONS

(a) Early Varieties

All early varieties were erect with the exception of *Camellia* (mid-habit), *Belar* (semi-prostrate) and *Floriland* (prostrate). Most varieties tillered to a comparable degree, but *Camellia* was consistently better than average. There were no consistent correlations of height with variety. *Saia* was the only narrow-leaved variety; the others were medium-wide to wide.

As a consequence of the high sheep density employed in the grazings, all varieties were heavily defoliated. However, *Camellia* and *Floriland* were consistently defoliated to a somewhat lesser extent than the other varieties due to their more prostrate habit of growth. Recovery from grazing was good in all varieties except *Benton*, which had medium recovery in the 1958 trial and medium to poor recovery in 1960.

Palatability was good in all varieties, with *Saia* outstanding.

The severe frosts of July 1958 revealed varietal differences in frost susceptibility. Camellia, Saia, Vicland and Floriland were resistant to these frosts, while the remainder were susceptible with Seminole very badly affected. Frost damage was mainly in the form of severe leaf frosting, although some plants and tillers were completely killed.

In May 1959, good rain and mild conditions provided favourable conditions for the rapid build-up and dissemination of crown rust in the trial. By June 1 stem rust was also present on all varieties except Saia. Belar, Benton and Vicland were affected most with crown rust; Saia was the only variety not affected. The relative infestation with crown rust and stem rust of the various varieties is shown in Table 1. Saia was the most resistant variety. Camellia, Floriland and Bovah escaped serious infestation with crown rust, but the latter appears to be particularly susceptible to stem rust.

TABLE 1

VARIETAL REACTION OF EARLY VARIETIES TO STEM AND CROWN RUSTS IN 1958 AND 1959

Variety	Stem Rust			Crown Rust		
	16.x.58	1.vi.59	6.xi.59	17.vi.58	1.vi.59	6.xi.59
Benton	1	1	3	0	-2	2
Camellia	1	Tr	3	Tr	Tr	1
Floriland	5	-1	4	0	0	0
Belar .. .. .	..	1	3	..	3	3
Vicland	1	1	5	Tr	1	3
Saia	R	0	0	0	0	0
Bovah	1	1	5	0	Tr	1
Seminole	5	..	..	0	..	..

0, no rust present; Tr, trace; -1, trace to light; 1, light; 2, light; -3, light to medium; 3, medium; 4, medium; -5, medium to heavy; 5, heavy; 6, heavy; R, resistant reaction

(b) Late Varieties

All late varieties were prostrate with the exception of Brigalow (semi-prostrate) and Landhafer (semi-prostrate to prostrate). All varieties tillered well, with Klein outstanding. The relative heights of varieties differed from year to year. The leaves of Klein were narrow, while those of Algerian, Brigalow and Trispermia were narrow-medium and those of Landhafer, Alber and Santa Fe were of medium width.

Santa Fe and Klein were not so closely grazed as the other five varieties. In general, recovery from grazing was good for all varieties, with Santa Fe slightly better than the others. Santa Fe appeared to be the least palatable of all varieties. The rest appeared good.

Damage caused by the severe frosts of July 1958 varied from the complete killing of plants and new tillers in susceptible varieties to slight leaf-tip frosting in resistant varieties. Klein and Alber proved resistant. Santa Fe suffered considerable damage. The remaining varieties were fairly susceptible, with *Trispernia* the worst affected. However, in 1960, Klein was affected by frost.

Good rain and mild conditions during late May 1959 favoured the build-up and dissemination of both crown and stem rust in the trial. By June 3, all varieties except Landhafer and Santa Fe were showing at least a trace of crown rust and all varieties were affected by stem rust to varying degrees. The disease did not build up at all during June and July despite the mild conditions. This trend continued into August and September, five of the varieties being free of stem rust and four free of crown rust when observations were made on September 24. By November the diseases had built up to a considerable degree in some varieties. Brigalow, Klein and Algerian were the only varieties affected by crown rust, and all the varieties were affected by stem rust to the extent indicated in Table 2. Also shown in Table 2 are the varietal susceptibilities to crown and stem rust in 1958. Landhafer, Santa Fe, *Trispernia* and Alber were not seriously affected by crown rust over the three years of the trial. Stem rust infestation, on the other hand, assumed importance in all varieties.

TABLE 2

VARIETAL REACTION OF LATE VARIETIES TO STEM AND CROWN RUSTS IN 1958 AND 1959

Variety	Stem Rust			Crown Rust		
	10.xii.58	3.vi.59	6.xi.59	1.vii.58	3.vi.59	6.xi.59
Algerian	5	1	5	2	3	3
Brigalow	3	Tr	2	1	4	1
Klein	5	-2	3	Tr	-2	2
<i>Trispernia</i>	3	-2	3	Tr	Tr	0
Landhafer	5	1	3	0	0	0
Alber	3	-2	5	Tr	1	0
Santa Fe	3	1	3	Tr	R	0

0, no rust present; Tr, trace; -1, trace to light; 1, light; 2, light; -3, light to medium; 3, medium; 4, medium; -5, medium to heavy; 5, heavy; 6, heavy; R, resistant reaction

V. GREEN YIELD

The green yields as determined by quadrat sampling are as shown in Tables 3 and 4. *Camellia* and *Floriland* returned the highest total yields for early varieties. There seems to be little difference in the yielding ability of the late varieties. While not superior to the older varieties, the four new varieties—Santa Fe, Alber, *Trispernia* and Landhafer—yielded creditably.

TABLE 3
VEGETATIVE YIELDS OF EARLY VARIETIES, 1958-1960
Yields in tons per acre

Year	Grazings	Camellia	Floriland	Vicland	Saia	Benton	Bovah	Seminole or Belar†	Min. sig. diff.	
									P = .05	P = .01
1958	1st (7.v.58) ..	2.12	1.68	1.95	1.40	2.21	2.02	2.07		
	2nd (17.vi.58) ..	2.94	3.18	2.72	2.87	2.50	2.55	2.74		
	3rd (13.vii.58) ..	4.63	5.24	3.02	2.82	2.37	2.19	2.43		
	4th (16-24.x.58)*	6.91	3.90	5.61	5.61	6.02	4.84	3.56		
	Total	16.60	14.00	13.30	12.70	12.10	11.60	10.80	2.0	2.7
1959	1st (2.vi.59) ..	3.15	2.70	3.57	3.46	4.62	3.30	3.32		
	2nd (3.viii.59) ..	2.72	4.12	2.59	2.75	2.67	2.67	2.73		
	3rd (9.x.59) ..	3.27	2.16	2.30	1.79	2.33	1.91	2.75		
	Total	9.14	8.98	8.46	8.00	9.62	7.88	8.80	1.07	1.47
	1960	1st (5.v.60) ..	1.89	1.40	2.03	1.29	2.39	1.52	1.58	
2nd (27.vi.60) ..		1.69	1.82	1.87	1.85	1.69	1.88	1.99		
3rd (18.viii.60) ..		1.94	2.42	1.09	1.19	0.84	1.32	1.64		
4th (28.ix.60) ..		1.27	1.16	0.95	0.85	0.82	0.83	1.18		
Total		6.84	6.80	5.93	5.18	5.74	5.56	6.39	0.73	1.01

* There was no grazing corresponding to the 4th quadrat sampling. The trial was left ungrazed to set seed

† Seminole was replaced by Belar in the 1959 and 1960 trials

TABLE 4
VEGETATIVE YIELDS OF LATE VARIETIES IN TONS PER ACRE IN THE YEARS 1958-1960

Year	Grazings	Santa Fe	Klein	Alber	Trispernia	Algerian	Landhafer	Brigalow	Min. sig. diff.	
									P = .05	P = .01
1958	1st (19.v.58)	3.64	3.44	3.27	3.18	3.32	3.29	3.09		
	2nd (1.vii.58)	5.46	4.41	4.67	5.94	4.46	4.18	3.93		
	3rd (27.viii.58)	3.63	4.22	3.91	3.24	3.11	3.00	2.98		
	4th (6.x.58)	3.19	3.63	3.54	2.41	2.67	2.33	2.74		
	5th (7.xi.58)	1.63	1.59	1.20	1.65	1.52	1.48	1.48		
	Total	17.50	17.30	16.60	16.40	15.10	14.30	14.20	1.65	2.26
1959	1st (3.vi.59)	3.64	2.98	3.33	3.87	3.32	4.00	3.46		
	2nd (3.viii.59)	4.12	3.21	3.57	5.02	3.78	3.70	2.98		
	3rd (9.x.59)	2.21	2.79	2.99	1.91	2.92	2.44	2.53		
	Total	9.97	8.98	9.90	10.80	10.02	10.14	8.96	0.57	0.79
1960	1st (10.v.60)	1.88	1.69	1.67	1.87	1.71	1.84	1.16		
	2nd (1.vii.60)	2.45	1.97	2.29	2.39	2.40	1.95	2.23		
	3rd (22.viii.60)	2.19	2.29	2.37	2.05	1.96	1.89	2.35		
	4th (30.ix.60)	1.31	1.49	1.58	1.00	1.10	1.04	1.15		
	Total	7.83	7.43	7.91	7.32	7.17	6.72	6.89	n.s.d.	n.s.d.

VI. GRAIN YIELD

Grain yields are presented in Table 5. Because of severe lodging of early varieties due to rain in the 1959 trial, this section was not harvested for grain. No grain harvest was made in 1960.

In 1958, Camellia significantly outyielded all other early varieties except Saia, and Seminole yielded significantly less than all the other early varieties. Of the late varieties, Brigalow was outstanding in 1958 but mediocre in 1959.

TABLE 5
GRAIN YIELDS IN 1958 AND 1959

Variety	Yield (bus/ac)	
	1958	1959
Early		
Camellia	17.2	..
Saia	16.5	..
Vicland	14.4	..
Benton	14.4	..
Floriland	11.4	..
Bovah	8.9	..
Seminole	6.4	..
Late		
Brigalow	11.2	8.6
Landhafer	6.9	7.2
Trispernia	5.9	6.8
Klein	5.2	11.3
Alber	4.5	15.5
Algerian	4.5	8.6
Santa Fe	4.4	9.0

	Early	Late
Necessary differences for		
significance (1958 yields)	1.38	1.38
	1.89	1.80

VII. DISCUSSION

An oat variety to be successful for grazing on the Darling Downs must provide a good bulk of green palatable feed at each grazing, be fairly resistant to frost and both crown and stem rust, and show rapid recovery after being heavily defoliated. Very few of the varieties tested possess all these attributes.

Generally speaking, early-maturing varieties of oats are quick-growing and should be sown late, whereas late-maturing varieties, having a longer growing period, should be sown early.

(a) Early Varieties

Camellia in all three years gave exceptionally good yields of green material. Moreover, its uniformity of yield at grazings seemed to be bettered only by Belar. The latter variety, although tested for only two years, also gave above-average green yields. Floriland in all three years gave good total weights, but uniformity of yield was poor.

The only variety to show up somewhat poorly with respect to recovery after grazing was Benton. This variety proved very palatable and this factor, coupled with its very erect habit, may have contributed to the poor recovery ability shown, plants being over-grazed. The variety, however, is popular commercially.

Frost tolerance is an important character of oat varieties on the Darling Downs, as many quite severe frosts are usual during the growing period of oats in this area. Camellia impressed by proving resistant to the severe frosts of July 1958. Other varieties exhibiting good frost tolerance were Floriland, Vicland and Saia.

Saia proved resistant to both stem and crown rust, but gives poor vegetative yields in this area. However, Camellia was only slightly affected by stem and crown rust. Floriland proved resistant to crown rust, but was fairly heavily infected with stem rust. Other varieties were intermediate in their susceptibility to stem rust. Heavy infestations of crown rust were not observed; Belar and Vicland were the worst affected.

Good grain yield, though not of pressing importance in an oat variety for grazing, must be given some consideration in the assessment of overall suitability. In 1958, the only year in which grain was harvested from the early trial, Camellia yielded significantly more grain than all other varieties except Saia.

(b) Late Varieties

Brigalow seems to lack good yielding ability in this area. Klein demonstrated the ability to yield fairly uniformly at all grazings. Algerian, a popular variety for many years, compared favourably with most of the other varieties tested.

Alber was the outstanding variety for frost tolerance, maintaining an attractive green appearance at most times. Santa Fe appears to be most susceptible to frost damage.

No variety proved resistant to stem rust, and most showed medium to heavy infestation in 1959. Algerian over the 3-year trial period showed the least resistance to crown rust, while the newer varieties—Landhafer, Santa Fe, Trispernia and Alber—were little affected.

No variety was outstanding for grain production. Brigalow did not repeat its promising yields of 1958 in the following year. It is noted that careful grazing management must be followed if a good yield of grain is required.

VIII. ACKNOWLEDGEMENTS

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