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TESTS OF SUBTROPICAL PASTURE SPECIES UNDER IRRIGATION IN CENTRAL QUEENSLAND

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SUMMARY

In simple grass/legume mixtures, subtropical pasture legumes have shown no value for irrigated pastures in areas of subcoastal Central Queensland where mild to heavy frosts are experienced over winter. The limited range of grasses tested were better adapted. Further testing of these and a wider range of cultivars is warranted, both in pure grass swards with nitrogen fertilizer and in combination with temperate pasture species.

I. INTRODUCTION

In discussing the need for and role of irrigated pastures in Central Queensland, Cameron (1967) indicated that a range of subtropical species were to be studied. Four small experiments have now been completed and the results are reported here.

II. MATERIALS AND METHODS

Two of the experiments were located at Theodore Research Station on flood-irrigated, heavy grey clays and were grazed by sheep. The other two were at Biloela Research Station under spray irrigation and grazing by dairy cattle and on lighter grey brown, clay loams. Details of each experiment, together with the cultivars planted, are shown in Table 1.

TABLE 1

DETAILS OF INDIVIDUAL EXPERIMENTS AND CULTIVARS PLANTED

Expt. No.	Location	Date Planted	Design	Plot Size	Planting Rate (lb/ac)		Sampling Areas		Cultivars Planted	
					Grass	Legume	Population	Dry Matter	Grasses*	Legumes†
1	Theodore	26.ii.65	3 x 5 x 3 RB	30 ft x 15 ft	6	6	—	3 ft x 16 ft	B, C, F	1, 2, 4, 5, 9
2	Biloela ..	8.xii.65	2 x 8 x 3 RB	40 lk x 30 lk	6	4	Six 5 lk x 2 lk	3 ft x 16 ft	B, F	1, 2, 4, 5, 6, 7, 10, 11
3	Theodore	23.ii.67	3 x 4 x 3 RB	60 lk x 50 lk	3	4	Ten 5 lk x 2 lk	3 ft x 16 ft	B, D, F	2, 3, 4, 10
4	Biloela ..	1.iii.68	3 x 5 x 3 RB	40 lk x 30 lk	4	6	Forty 1 lk x 1 lk	3 ft x 16 ft	A, E, F	2, 4, 7, 8, 10

*GRASSES
- A *Festuca arundinacea* cv. Demeter (Demeter fescue)
- B *Panicum coloratum* var. *makarikariense* cv. Bambatsi (Bambatsi grass)
- C *Panicum maximum* var. *trichoglume* cv. Petrie (Petrie green panic)
- D *Phalaris arundinacea* x *tuberosa* (C4 polycross Ronpha)
- E *Setaria sphacelata* cv. Kazungula (Kazungula grass)
- F *Setaria sphacelata* cv. Nandi (Nandi setaria)

†LEGUMES
- 1 *Desmodium intortum* cv. Greenleaf (Greenleaf desmodium)
- 2 *Desmodium uncinatum* cv. Silverleaf (Silverleaf desmodium)
- 3 *Glycine wightii* cv. Clarence (Clarence glycine)
- 4 *Glycine wightii* cv. Cooper (Cooper glycine)
- 5 *Glycine wightii* cv. Tinaroo (Tinaroo glycine)
- 6 *Glycine wightii* cv. CPI 23411
- 7 *Lotononis bainesii* cv. Miles (Miles lotononis)
- 8 *Medicago sativa* cv. Hunter River (Hunter River lucerne)
- 9 *Phaseolus atropurpureus* cv. Siratro (Siratro)
- 10 *Trifolium repens* cv. Ladino (Ladino white clover)
- 11 *Vigna luteola* cv. Dalrymple (Dalrymple vigna)

Simple legume/grass mixtures were used. After the establishment phase they were regularly grazed at intervals of 4–6 weeks. Residues were removed after each grazing by slashing at 6–9 in. height. Dry-matter harvests were carried out at irregular intervals prior to grazing.

III. RESULTS

Results of main effects of grass cultivar on grass dry-matter yields and legume cultivar on legume dry-matter yields at various harvests are shown in Tables 2 and 3.

TABLE 2

MAIN EFFECTS OF GRASS CULTIVARS ON GRASS DRY-MATTER YIELD (lb/ac)

Expt. No.	Date Harvested	Demeter Fescue	Bambatsi Grass	Petrie Green Panic	C4 Ronpha Grass	Kazungula	Nandi Setaria	L.S.D. 5%
1	24.v.66		2,270	1,210			0	738
	15.xii.66		1,260	60			3	
	29.iii.67		2,640	0			0	
	Total ..		6,180	1,270			3	
2	30.v.67		360				1,630	315
3	8.xi.67		1,680		280		2,720	630
	27.v.68		1,250		70		4,145	495
	11.xii.68		2,665		240		1,670	510
	3.ii.69		2,400		15		1,580	420
	19.iii.69		1,150		20		1,170	280
	8.i.70		1,310		0		830	330
	19.v.70		180		0		450	150
	Total ..		10,630		620		12,570	
4	3.x.68	240				90	80	106
	23.xii.68	580				955	1,240	320
	13.iii.69	230				2,140	1,920	490
	10.vi.69	170				120	200	70
	16.ix.69	260				190	270	
	9.i.70	40				830	690	350
	31.iii.70	20				1,360	1,240	290
	2.vii.70	10				40	70	10
	14.x.70	40				115	43	50
	13.i.71	10				1,010	750	260
	Total ..	1,600				6,840	6,510	

Individual experiments may be summarized as follows:—

Experiment 1.—Initially Petrie green panic was the best species but it disappeared rapidly. Bambatsi grass established and persisted well but yield was not outstanding. The Nandi setaria seed sample proved to be faulty. Initially Cooper and Tinaroo glycines established best, but they did not retain an adequate stand. Siratro performance fluctuated. Silverleaf desmodium was the most persistent legume. Greenleaf desmodium performed poorly.

TABLE 3

MAIN EFFECT OF LEGUME CULTIVAR ON LEGUME DRY-MATTER YIELDS (lb/ac)

Expt. No.	Date Harvested	Greenleaf Desmodium	Silverleaf Desmodium	Clarence Glycine	Cooper Glycine	Tinaroo Glycine	CPI 23411 (Glycine)	Miles Lotononis	Hunter River Lucerne	Siratro	Ladino White Clover	Dalrymple Vigna	L.S.D. 5%
1	24.v.66	440	1,220		3,130	2,350				1,670			1,170
	15.xii.66	320	500		700	30				150			390
	29.iii.67	390	535		310	70				830			330
	Total	1,150	2,250		4,155	2,450				2,650			—
2	30.v.67	40	260		960	230	230	30			90	0	350
3	8.xi.67		390	130	70						700		330
	27.v.68		740	760	840						0		560
	11.xii.68		970	380	100						30		440
	3.ii.69		460	410	90						2		290
	19.iii.69		250	390	110						20		250
	8.i.70		433	410	50						0		300
	Total		3,240	2,490	1,270						750		—
4	3.x.68		30		30			0	980		390		210
	23.xii.68		460		575			10	2,360		90		350
	13.iii.69		270		660			0	1,880		90		350
	10.vi.69		25		40			0	885		240		140
	16.ix.69		*		*			*	2,150		1,730		—
	9.i.70		2		30			0	2,370		360		440
	31.iii.70		4		30			0	1,110		10		260
	2.vii.70		*		*			*	1,800		10		400
	4.x.70		*		*			*	2,000		800		230
	13.i.71		*		*			*	1,470		190		280
	Total		790		1,360			10	17,015		3,910		—

* Negligible yield and not calculated.

Experiment 2.—Summer weedy grasses such as *Echinochloa crus-galli* (barnyard millet) severely hampered legume establishment but the grasses established well. Nandi setaria was the outstanding grass. The stand of silverleaf desmodium (0·23 plants/lk²) was the best 10 months after planting but Cooper glycine (0·04 plants/lk²) had given the best dry-matter yield at 6 months. In the absence of adequate legumes the grasses rapidly showed intense nitrogen deficiency.

Experiment 3.—Despite some weed problems all but fertile C4 Ronpha grass and Ladino white clover established adequately. Legume stands declined slowly but the grasses persisted better.

TABLE 4

MAIN EFFECTS OF GRASS CULTIVAR ON GRASS STAND AND LEGUME CULTIVAR ON LEGUME STAND—EXPERIMENT 3
Plants per sq lk

Cultivar	Date of Assessment			
	29.iii.67	16.x.68	17.x.69	12.x.70
Nandi setaria	0·6	0·14	0·2	0·3
Ronpha (C4 polycross) ..	0·1	0·03	0	0
Bambatsi grass	1·4	0·33	0·4	0·5
Cooper glycine	0·2	0·02	0·01	0·01
Clarence glycine	0·4	0·13	0·1	0·05
Silverleaf desmodium	0·6	0·24	0·23	0·05
Ladino white clover	3·2	0·17	0	0·23

Nandi setaria was the best grass and Clarence glycine and silverleaf desmodium the best legumes. *Chloris gayana* (Rhodes grass) invasion of the area was severe by the third year. Severe drought conditions from June 1968 onwards led to an exhaustion of water supplies from March to October 1969.

Experiment 4.—*Trianthema portulacastrum* (black pigweed) interfered with establishment, but except for Miles lotononis, final stands were adequate. Kazungula setaria and Demeter fescue stands were borderline. In the first autumn Nandi setaria and Cooper glycine were the outstanding plants. Subsequently Hunter River lucerne has been by far the best line. The subtropical legumes have gradually disappeared. Despite its poorer initial stand, Kazungula grass has given similar yields to Nandi setaria.

IV. DISCUSSION

In these experiments the legumes tested proved difficult to establish unless extremely clean seedbeds were available. When adequate stands were achieved they proved non-persistent. Silverleaf desmodium was the most persistent of the subtropical species planted.

In all cases in which it was sown Ladino white clover failed to establish adequately despite its known adaptation to the area (Grof 1961; Cameron 1967). These sowings were all made in midsummer; the clover is usually planted in autumn in this area. It is noted that Jones *et al.* (1968) also had to replant it in autumn following failure of the initial January planting at Samford, in south-eastern Queensland. In the present experiments it has tended to develop in paddocks that previously carried temperate species pastures, such as in experiment 4, where it has invaded all but the lucerne plots.

The limited range of grasses planted all established adequately where good seed was used. Petrie green panic had previously shown very poor persistence under frequent irrigation (Cameron 1967) and behaved this way again. The remainder persisted well but in the absence of adequate legume stands soon exhibited intense nitrogen deficiency.

These grasses and a number as yet untested appear likely to be able to perform either of two roles. These are, firstly, as pure grass swards heavily fertilized with nitrogen; this would particularly apply to *Digitaria decumbens* (pangola grass), which has yet to be tested. The second role is that used by Jones *et al.* (1968) as summer-growing components of temperate species pastures to reduce the risk of summer weed invasion. *Setaria sphacelata* cv. Narok, as yet untested, and Nandi setaria in particular appear likely to be able to fulfil this role. The basic temperate species for the area would be Ladino white clover and *Bromus unioloides* cv. Priebe. These pastures would require intensive year-round irrigation.

One possible method of utilization of the subtropical species that was considered was as autumn-saved feed. This is was hoped would supplement normal irrigated pastures, such as the low winter-producing paspalum/white clover stands at Theodore, over winter. The failure to achieve strong and persistent legume stands has frustrated this possibility. The grasses alone rapidly became mature and of low quality, with little likely value in this regard. Sufficient was seen of the legumes, however, to realize that they also had little likely value. Once frosted, the legume foliage rapidly became quite dry and brittle and rapidly powdered to dust when grazing commenced. It appeared that effective utilization would have been quite inadequate for them to have value as standover winter feed.

Unless frost-tolerant cultivars are developed there appears little value in further testing subtropical legumes under irrigation in the subcoastal sections of Central Queensland. The range of grass cultivars available, however, warrants further study and could well provide a most effective component of irrigated pastures.

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