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Walton, G H. (1976), *1976 Alternative grain legume species evaluation*. Department of Agriculture and Food, Western Australia, Perth. Report.

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ALTERNATIVE GRAIN LEGUME SPECIES EVALUATION
1976 SUMMARY

1. Alternative species to Lupinus
2. Time of Flowering Response of Cicer Arietinum
to temperature and daylength.

G. Walton, Plant Research

1. ALTERNATIVE LEGUME SPECIES EVALUATION

TECHNICAL

Location: D. Ferguson, Bannister (76PE6)

Comparison of the Cicer with three lupin cultivars, was made in 3 replicate blocks. Eight lines were sown in rows 6 metres length and 20 cm apart. In one block an extra row of Cicer arietinum line CN-26 was included. Weight of seed for about 60 seeds was sown (with a single row cone seeder) in each row. 400 kg/ha plain super was broadcast on the site. Simazine at 1.5 kg/ha was sprayed at seeding. The trial was sown on May 17, 1976.

Vicia

Comparison of 9 introduced Vicia was made with V. sativa cv Lanquedoc in cone seeded single rows 6m length and 1m apart. About 5g seed sown per row.

Peas

Comparison of 3 South Australian bred cultivars with Dun and Derrimut was made in cone seeded single rows 6m length and 50 cm apart. About 10g seed was sown in each row.

Lathyrus

Comparison of 10 introduced lines, cone seeded in single rows 6m length and 50 cm apart. About 9g seed was sown per row. All comparisons had 400 kg/ha superphosphate broadcast and Simazine sprayed at 1.5 kg/ha at seeding. The paddock was old subclover land and the soil a red gravelly loam.

Location: Merredin Research Station (76M11)

Comparison of Vicia, Peas, Lathyrus and three lupins was sown May 18, 1976, exactly as described for the Bannister location.

The paddock was a subclover pasture, the soil a yellow loamy sand, the clay content increasing with depth.

SEASON

Rainfall very much below average, with May to July receiving very low rainfall (Table 1). The Merredin location had drought conditions with less than 25 mm falling per month during the winter.

GROWTH

Bannister: Red Legged Earth Mites devastated Pea, Lathyrus and Vicia seedlings in June.

The extent of the damage being accentuated by the lack of rain for adequate plant growth. The Cicer seedlings were not affected, while almost all Uniharvest and Unicrop lupin plants had their main stem chewed out by rabbits early in August.

Cicer, Lathyrus and Vicia made very little appreciable growth during winter. The lupins grew rapidly and the peas began petiole elongation early August.

Merredin: All species established well in the dry weather, however growth was negligible and practically no seed produced.

HARVESTING

Bannister: Most lines of Cicer (exceptions 53006, 52984 and 56564), all Peas, Lathyrus cicera and L. ochrus were hand harvested November 22. The lupins, Vicia, remaining Cicer and Lathyrus sativa were harvested December 22.

The Cicer had a minor budworm (Heliothis spp) problem on the green pods. At harvest, it was found that all Pea cultivars were infested with Pea Weevil (Brucus pisoram) which had bored into the centre of the seed.

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RESULTS - Bannister

Species	Introduction No. or cultivar	Estimated Date of Flowering	Total D. Wt. (top)/ plant (g)	Seed Wt./plant (g)	Harvest Index	Wt of 100 seeds (g)	Ratio Seeds (1:2) / pod	Seed Colour
<u>Cicer arietinum:</u>								
	53006	Sept 8	8.67	3.90	0.4264	13.54	0:100	Buff
	53007	Sept 15	11.69	5.03	0.4416	13.47	25:75	Light brown
	53009	Sept 8	9.13	4.29	0.4699	13.43	50:50	" "
	56330	Sept 15	11.31	4.84	0.4460	15.32	100:0	" "
	56565	Sept 15	13.08	4.47	0.3482	16.93	0:100	White
	56564		9.56	2.76	0.2854	15.98	35:65	Light brown
	56566		14.04	5.27	0.3666	22.19	50:50	" "
	52984		12.55	5.54	0.3400	22.81	70:30	Cream
	CN-26*	Aug 25	17.0	6.23	0.3667	14.73	60:30:10	Black
							<u>Seeds/pod</u>	
<u>Lupinus angustifolius:</u>								
	Unicrop	Sept 1	21.19	8.19	0.3694	18.61		Whits
	Uniharvest	Sept 22	24.62	7.68	0.3209	16.70		"
	albus:							
	Ultra	Sept 1	28.77	11.14	0.3899	34.66		"
<u>Vicia sativa:</u>								
	Adeza 46-A	Oct 10	6.54	0.31	0.0471	6.23		
	" 46-B	Oct 20	18.75	3.80	0.2027	6.87		
	" 46-C	Oct 10	7.92	0.92	0.1158	7.11		
	" 64	Oct 10	7.80	3.58	0.4590	6.23	4-6	Charcoal
	" 83	Oct 10	10.00	4.78	0.4775	6.17	6	"
	" 118	Oct 20	5.62	2.12	0.3778	6.47		
	Lanquedoc	Sept 15	5.00	2.84	0.5680	5.94	6	Charcoal
	ervillia:							
	35586	Oct 10	17.50	7.95	0.4543	3.04		
<u>Pisum arvense:</u> (Peas)								
	WP-3	Sept 15	46.75	29.68	0.6348	19.07	5	White
	WP-7	Sept 15	49.83	24.22	0.4860	20.53	5-7	"
	TRC-1	Sept 15	44.70	21.01	0.4700	18.73	5	Buff
	Dun		34.00	15.58	0.4583	18.02	5	White
	Derrimut	Sept 15	43.75	22.71	0.5191	15.09	6	Buff

* 3 plants only.

(cont.)

(cont.)

Species	Introduction No. or cultivar	Estimated Date of Flowering	Total D.Wt. (top)/plant (g)	Seed Wt./plant (g)	Harvest Index	Wt of 100 seeds (g)	Ratio Seeds (1:2) pod	Seed Colour
<u>Lathyrus cicera:</u>								
	300001	Sept 30	21.93	12.23	0.5578	7.06	5	Grey speckled
	300004	"	28.90	15.60	0.5405	6.56	5	"
	300010	"	22.70	11.19	0.5152	6.92	6	Buff
	300017	"	31.13	14.06	0.4520	7.20	5	Buff speckled
<u>sativa:</u>								
	310021	Oct 10	14.16	5.33	0.3765	13.18		
	310028	"	19.16	6.70	0.3496	17.49		
	310041	"	26.18	9.76	0.3730			Light brown
<u>ochrus:</u>								
	32001	Sept 15	11.40	5.18	0.4544	13.45	6	White
	320004	"	9.80	4.98	0.5082	11.54	6	White
	320010	"	9.50	4.73	0.4974	11.34	6	White

Species Comparison: The highest seed yielding line in each species relative to lupin (base 100).

Lupin angust.	L.albus	Cicer	Vicia sativa	V.ervillia	Pea	Lathyrus cicera	L.sativa	L.ochrus
100	136	67.6	58.4	97.1	362.4	190.5	119.2	63.2

Comments:

In comparison to lupin, the Pea cultivars gave an outstanding result, although the magnitude of the Pea Weevil problem is worrying. Consideration must be given to peas in terms of protein forage. The Waite hybrids (WP-3, WP-7) outyielded the commercial cultivars;

The Lathyrus cicera and L. sativa gave vigorous and well branched growth and high seed yields. Investigation of this species for forage and grain protein potential must be continued;

Vicia ervillia compares well against lupins and would be an interesting species to evaluate on slightly alkaline soils. It is alkaloid free;

Cicer arietinum again compares unfavourably with lupins,

however as a specialised European commodity several lines appear better than others (52984, 56566). The introduced line CN-26 is interesting from the breeding aspect in that it is 2 to 3 weeks earlier flowering than the others, and contained a proportion of pods with 3 seeds.

The vetches (Vicia sativa) and L. ochrus compared unfavourably with lupins.

Plant Parameters as indicators to performance -

- . Harvest Index gives a low correlation with seed yield per plant.
- . Total weight of tops per plant gave a high positive correlation with seed yield, approximating: $Y = 0.4(W)$.
- . Seed size and flowering date gives no indication of seed yield.

TABLE 1 MONTHLY RAINFALL DATA(mm) 1976

Location	April	May	June	July	August	Sept.	Oct.	Nov.	Total
Bannister	60	56	34	52	110	47	37	41	437
Merredin	28.0	21.6	21.2	12.9	51.4	31.6	26.7	24.7	165.4
Lancelin	38.0	20.8	27.2	37.6	86.9	63.0	25.8	35.0	334.3

2. TIME OF SOWING CHICK PEA (Cicer arietinum)

OBJECTIVE

To examine the influence of temperature and photoperiod on flowering date of Cicer arietinum.

TECHNICAL

Three introduced lines, the early flowering, cold tolerant 53007 (India), mid flowering, low habit 53012 (India) and late flowering, tall habit 56567 (Russia), were sown on three dates at two locations. The warmer location was on J. Wood's property, Lancelin, on yellow sand (loam increasing with depth) in a new land paddock. The cooler location was on D. Ferguson's property, near Wandering, on an old clover paddock with gravelly loam soil.

At each time of sowing (April 22, June 16 and August 11), three rows of each line was sown with a cone seeder, with the rows 6m long and 20 cm apart. The centre row was taken as the treatment row. The varietal plots were 50 cm apart. At seeding, 400 kg/ha superphosphate was broadcast and 2 kg/ha simazine sprayed.

GROWTH

At Lancelin, rabbits consumed all the seedlings in the first sowing date. At both locations, poor seedling emergence 56567 restricted plant number in the treatment sows to 6 - 9, whereas the Indian lines gave more than double this plant number. At both locations, the winter growth of Cicer was severely restricted by low soil moisture with the additional problem at Bannister of severe Red Legged Earth Mite attack. During the green pod stage at Bannister, Budworm damage also occurred.

RESULTS - BANNISTER

Sowing Date	Introduction Number	Estimated date of flowering	Total (Top)wt per plant (g)	Seed wt per plant (g)	Wt of 100 seeds (g)	Ratio 1:2 seeds/pod	No. days sowing to flowering	Total mean Daily temp. (°C)	Total Photo-Period (Hrs)
April 22	53 007	Aug 20	17.93	6.13	10.80	55:45	120	1 463	1 310.4
	53 012	" 10	14.75	3.23	15.00	70:30	110	1 347	1 201.5
	56 567	Sept 5	17.17	3.73	18.32	100:0	136	1 632	1 490.4
June 16	53 007	Oct 6	5.05	2.58	13.28	40:60	112	1 266	1 245.7
	53 012	" 6	2.72	1.23	12.82	50:50	112	1 266	1 245.7
	56 567	" 15	5.78	2.09	17.68	75:25	121	1 395	1 359.1
August 11	53 007	Oct 29	3.06	1.94	14.36		70	872	838.6
	53 012	" 25	2.00	0.95	13.06		75	975	903.8
	56 567	" 25	2.50	1.00	18.90		75	975	903.8
- LANCELIN									
June 17	53 007	Sept 20		6.26	13.45		95	2 003	1 074.5
	53 012	" 17		4.91	15.46		92	1 954	1 038.4
	56 567	Oct 12		3.57	27.93		117	2 370	1 348.3
August 12	53 007	Oct 25		1.04	12.49		74	1 213	902.3
	53 012	" 25		0.40	13.20		74	1 213	902.3
	56 567	" 27		0.60	-		76	1 251	928.5

Mean Daily Temperature and Photoperiod accumulation figures are from sowing to flowering.

		BANNISTER	LANCELIN
		<u>Ave. daylength(hrs/day)</u> <u>sowing to flowering</u>	<u>Ave. daylength(hrs/day)</u> <u>sowing to flowering</u>
April sown	53007	10.92	
	53012	10.92	
	56567	10.966	
June	53007	11.12	11.3
	53012	11.12	11.3
	56567	11.23	11.5
Aug.	53007	11.98	12.19
	53012	12.05	12.19
	56567	12.05	12.22

COMMENT

From the very limited figures obtained, it is apparent when looking at the correlation between total accumulated Daily mean temperature and the Mean daylength for the period Sowing to Flowering, that flowering in the three Cicer lines is dependant both upon temperature and photoperiod. The variety 56567 is slightly more sensitive to photoperiod than the others.

Time of sowing influence upon plant yield is apparent in the significantly reduced top growth and seed yield but little effect on seed size.

Cicer arietinum T.O.P

