AGRONOMY OF LATHYRUS SPECIES IN SOUTH AUSTRALIA

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ABSTRACT
Agronomic studies on *Lathyrus sativus* and *L. cicera*, promising forage and/or grain legumes, are presented. Time of seeding, seeding rate and grain recovery following grazing were investigated in preparation for the release of the first Australian commercial cultivars of *Lathyrus*. Clear optimal seeding rate, time of seeding, and guidelines for grazing have been identified. A seeding rate of 45-60 kg/ha and an early sowing time (June 6 in this experiment) were identified for maximum grain yield. Grain yield following grazing can be equal to ungrazed crops although sufficient time between grazing and flowering is required to ensure adequate grain yields. *Lathyrus* appears to have considerable potential as a dual purpose forage-grain legume crop.

KEYWORDS
Sheep, grazing, *Lathyrus*, forage legume, grain legume, low rainfall, agronomy

INTRODUCTION
Lathyrus is a genus of legumes containing more than 160 species and 45 subspecies. A number of Lathyrus spp have potential to be grown as grain, green manure or forage legumes for the Australian wheat belt. In particular, *Lathyrus* species are adapted to low soil fertility and low rainfall (<300 mm) environments (Saxena et al. 1993). In addition, *Lathyrus* has a number of agronomic advantages including high grain yield potential, tolerance to most common pests and diseases of traditional grain legumes, the potential to compete well with weeds, and nodulates freely under a range of soil conditions. *Lathyrus* species also have potential as pasture legumes and in general are more grazing tolerant than other grain legumes. Despite these desirable attributes, currently there are no commercial cultivars of Lathyrus in Australia. *Lathyrus* has potential as a dual purpose forage-grain legume for low-rainfall, alkaline soil areas where currently in Australia there are no well adapted grain legumes.

A major collection of *Lathyrus* germplasm has been assembled by The Centre for Legumes in Mediterranean Agriculture (CLIMA), (Siddique *et al*. 1994) including accessions from the International Centre for Agricultural Research in the Dry Areas (ICARDA), representing the West Asia and North Africa region, and also from India, Pakistan and Bangladesh. These accessions have been evaluated for low levels of the seed neurotoxin ß-N-oxalyl-:L, ß-diaminopropianic acid (ODAP, syn. BOAA), and for grain yield, in a network of trials across Australia. The outcome of the national *Lathyrus* project will be two or more commercial cultivars in the next two to three years. However, there is little agronomic information available on *Lathyrus* species in Australia. This paper presents research on identifying agronomic management of new potential cultivars under dryland farming systems for suitable time of sowing, seed rate and guidelines for dual purpose grazing and grain recovery.

METHODS
Time of Sowing Experiment: This experiment was conducted at Roseworthy Campus, University of Adelaide, South Australia in 1995. A two factor factorial experiment was laid out in a Randomised Complete Block design with four replications. The factors were *Lathyrus* species at two levels (*L sativus*, LS 34; and *L cicera* BC) and date of sowing at four levels (May 23, June 06, June 20 and July 04). The eight treatment combinations were sown with an 8-row cone seeder at a depth of 3-4 cm at the rate of 60 kg/ha seed.. The plots were 10 m long and 1.36 m wide (8 rows, 17 cm apart).

Seeding Rate Experiment: This study was also conducted in split-plot design with four replications on Roseworthy campus, University of Adelaide, South Australia in 1995. The main plots were either irrigated or non-irrigated (control). The subplot treatments were the factorial combinations of four genotypes (*L. sativus* ATC80504, ATC80512, and *L. cicera* ATC80141, ATC80134) and five seed rates (30, 45, 60, 75 and 90 kg/ha). Sowing method and the unit plot sizes were the same as the time of sowing experiment.

Experiment on Grazing and Grain Recovery: A field experiment was conducted at Winulta, York Peninsula, South Australia in a farmers field in 1995. *L cicera* (BC) was sown in a dry seed bed on April 15 1995, but the crop did not emerge until May 12, 1995 due to lack of sufficient soil moisture. The experiment was laid out in a randomised block design with four treatments:
1. control (ungrazed),
2. early grazed at 45 days after emergence (DAE) for 30 days,
3. early grazed at 45 DAE for 57 days and
4. late grazed at 75 DAE for 29 days.

The experiment was located within a 16 ha paddock and consisted of small exclosures (5 x 10m), replicated four times. The paddock was stocked with Merino ewes at 22 DSE/ha from 45-104 DAE.

RESULTS AND DISCUSSION
Time of Sowing: The grain yield of *Lathyrus* species was significantly influenced by different dates of sowing (Fig 1). For both *L. sativus* and *L. cicera*, the optimum time of sowing under the experimental conditions was June 6. There was no significant species interaction with time of sowing. Grain yield from the earliest sowing date (23 May) was most likely limited by slightly lower emergence density (not significant) caused by the delayed emergence of seedlings due to lack of seedbed moisture at this early time of seeding. Grain yield from the later sowing dates (20 June and 4 July) was lower than the optimum date due to the shorter duration for flowering and seed production coinciding with the onset of terminal moisture stress. For example, for *L. sativus* the number of days from sowing until 50% flowering decreased from 120 for the earliest sowing date to 112 for the latest sowing date. Date of flowering for the four sowing dates was 19 September, 28 September, 12 October, and 23 October. Further research is investigating the relationship between time of seeding and grain yield in *Lathyrus* but it is evident from this research that an optimum time of sowing is likely to be identified.

Experiment on seed rate: Under dryland (rain fed) or irrigated conditions, a seeding rate of 45-60 kg/ha was adequate for achieving highest grain yields. There was a trend for increasing grain yield for seeding rates above 45 kg/ha, but these increases were, in most cases, not significant. Both *L. cicera* and *L. sativus* behaved in a similar manner. With these species and accessions, a seeding rate of 60 kg/ha resulted in an emerged plant density of 35-45 plants/m^2. Seed size can vary from 7.4 to 9.1 g/100 seed in *L. cicera* and 7.5 to 17.5 g/100 seed in *L. sativus*, so it will be necessary to adjust seeding rate to achieve target plant densities.

Experiment on grazing and grain recovery: The highest grain yield was obtained from Treatment 2 (early grazed for 30 days), even

though it was not significantly different from the ungrazed control (Figure 2). Both Treatment 3 (early grazed for 57 days) and Treatment 4 (late grazed for 30 days) had similar grain yields which were significantly lower than Treatments 1 and 2. The high yield of Treatment 2 may be due to reduced competition from weeds and increased branching and subsequent flower production. In particular, sheep grazing reduced the amount of non-Lathyrus species from 730 kg/ha in the ungrazed control to 480 kg/ha in Treatment 2. This reduction in competing vegetation allowed greater utilisation of light, water and nutrients by the Lathyrus crop. The lower grain yields in Treatments 3 and 4 reflect the insufficient time for recovery of photosynthetic area following defoliation and prior to commencement of flowering. These results indicate the potential of Lathyrus as a dual purpose forage-grain legume but also warn that careful management will be needed to realise this potential.

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Figure 1

Effect of time of sowing on grain yield of *Lathyrus sativus* (LS) and *Lathyrus cicera* (LC).

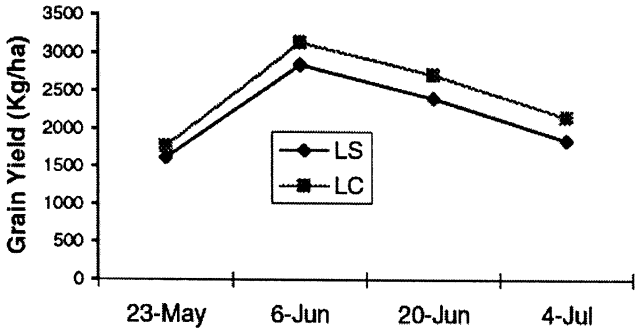

Figure 2

Grain yield of *Lathyrus cicera* (BC) in response to varying periods of grazing by sheep.