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Seed production of *Stylosanthes hamata* cv. Verano in the Douglas Daly district, Northern Territory, Australia

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Abstract

Seed production of *Stylosanthes hamata* cv. Verano was monitored in a tropical monsoonal environment in 1989. Yield of seed standing in the crop peaked at 483 kg/ha in early June and remained at this level for such a short time that delaying harvest by one week resulted in a yield reduction of 67%. Correct timing of header harvesting is critical as harvest would have to be undertaken close to the time of attaining maximum yield for the operation to be worthwhile. Maximum fallen seed yield, attained in early July, was 903 kg/ha and remained at a similar level for 3 weeks before declining to 777 kg/ha at the final harvest. Suction harvesting is preferable to direct heading in this environment as it allows access to a greater seed yield and, more importantly, can be undertaken over a much longer time period.

Resumen

La producción de semilla de Stylosanthes hamata *cv. Verano, en un clima tropical de monzón, fue registrada durante 1989. El rendimiento máximo de semilla en pie fue 483 kg/ha, obtenido al inicio del mes de Junio, la cual permaneció por muy poco tiempo en pie, al grado que un retraso de una semana en la cosecha resultó en una perdida de 67%. El momento correcto de cosecha de la semilla en pie es crítico, debido al hecho de que la cosecha debe realizarse justo al tiempo de máxima producción para que la operación valga la pena. El rendimiento máximo de semilla caída, alcanzada al inicio del mes de Julio, fue 903 kg/ha y permaneció a un nivel similar durante tres semanas antes de reducirse a 777 kg/ha en la cosecha final. En este medio ambiente, la cosecha por succión es preferible a la cosecha directa de la semilla en pie, debido a que permite el acceso a una cantidad mayor de semilla y, más importante aún, puede realizarse en un período mayor de tiempo.*

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Introduction

Stylosanthes hamata cv. Verano is a tropical pasture legume which acts either as an annual or short-lived perennial plant (Edye *et al.* 1975). For seed production purposes, higher yields are obtained if it is managed as an annual crop (English and Hopkinson 1985). Verano exhibits a quantitative short day flowering response (Cameron and t'Mannetje 1977) although the onset of soil moisture deficit also stimulates flowering (Ison and Humphreys 1984).

The major Verano seed producing region in Australia is on the Atherton Tableland in Queensland where experienced growers commonly obtain yields of 330 kg/ha (English and Hopkinson 1985). In the Northern Territory the majority of seed production has occurred in the Katherine district (14 °S, 132 °E, average annual rainfall 1018 mm), but with the development of the Douglas Daly region (13 °S, 131 °E, average annual rainfall 1144 mm) interest exists in the potential of this district to grow pasture seeds. Since Verano crops at Katherine have yielded 300 kg/ha of header harvested seed (L.J. Phillips pers. comm.), the reported yields (Stockwell *et al.* 1986) of only 83 kg/ha in the Douglas Daly region during a year of slightly below average rainfall (1084 mm) seem unduly low.

The following study used a method of sequential sampling previously applied to other species of *Stylosanthes* by Loch *et al.* (1976) and

Thomson and Medeiros (1981). Similar research has not been undertaken with *S. hamata*. The objectives of this work were to assess the seed production potential of Verano stylo in the Douglas Daly region and to determine the correct timing for direct heading and suction harvesting.

Materials and methods

A commercial, dryland crop in the Douglas Daly district was studied in 1989. Rainfall during the wet season (1 November 1988–30 April 1989) was 1208 mm, marginally greater than the long term average, 1106 mm (Mollah 1986). The final major rain event (25 mm) occurred in the last week of March. The crop grew on a sandy-surfaced red earth, classified as Gn 2.12 (Northcote 1971), which had no previous cropping history. Sowing occurred in December 1987, but due to abnormally dry conditions poor establishment occurred. Substantial early wet season rain resulted in establishment of a dense self-sown crop in November 1988. At this time 100 kg/ha of single superphosphate was applied.

A uniform area of the crop was selected and divided into 4 blocks, each representing a replication of a randomized complete block design. Blocks were randomly subdivided into 11 plots, each harvested on different dates at irregular intervals between May 10 (Harvest 1 — H1, 130th day of year) and August 8 (H 11, day 220). Plots were 1 m by 2 m and an area of 0.5 m^2 was harvested. Seed held in the crop (standing seed) was harvested when standing plant matter was cut at 2 cm and that which had fallen to the ground (fallen seed) was collected with a vacuum cleaner. Harvested material was dried in a forced draught dehydrator at 80 °C for 72 hours before threshing. All harvested material was hand sieved, and then further cleaned to obtain pure seed samples.

Results and discussion

Estimates of quantities of seed present at each harvest date are presented in Figure 1. Standard errors of means, each calculated individually and expressed as a percentage of its mean, averaged 23% for standing yield and 17% for the yield of fallen seed. Standing seed yield peaked on H3 (7 June, day 158) at 483 kg/ha and then fell rapidly so that by H4 (14 June, day 165) only 159 kg/ha was retained indicating that a 67% yield reduction resulted from delaying harvest for one week after peak yield. This highlighted the fact

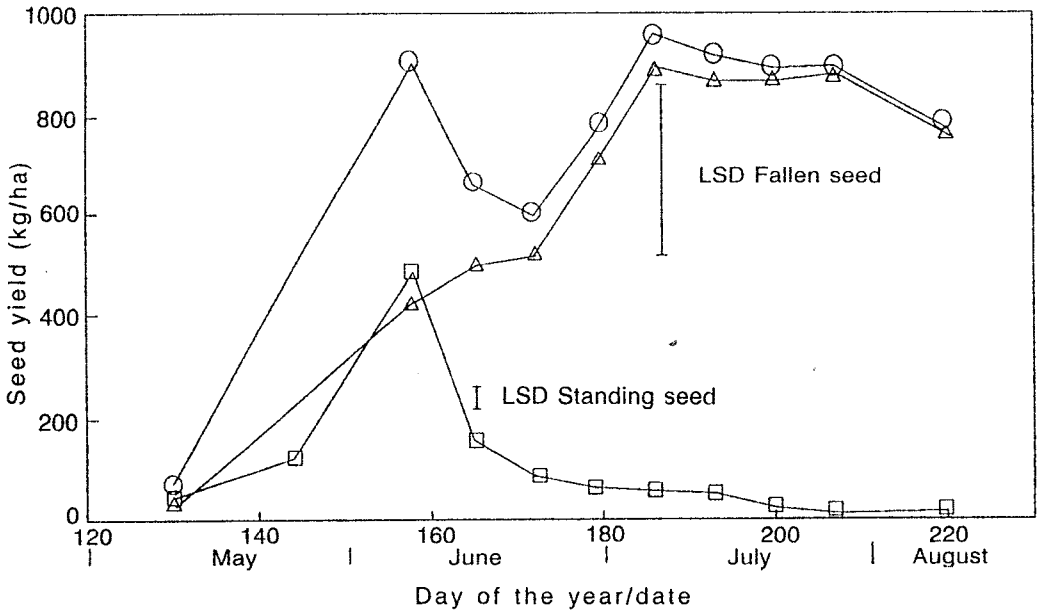

Figure 1. Changes in standing (-□-), fallen (-△-) and total (-o-) seed yield of *Stylosanthes hamata* cv. Verano. Bars represent the LSD, P = 0.05.

that timeliness of direct header harvesting is critical. Notwithstanding the randomization and replication undertaken it appears that an artefact resulted in the productivity of plots harvested at H3 being greater than those of H4 and H5 (21 June, day 172). While this may exaggerate the yield reduction observed between H3 and H4, it does not affect the percentage of total yield present as standing seed at any harvest. At H3 53% of total yield was standing in the crop whereas within 7 days (H4) this figure had fallen to 24%.

The abrupt end to the wet season in 1989, a common phenomenon in this environment (Mollah 1986), probably contributed to uniformity of flowering, and the rapid onset of dry conditions hastened seed maturation and also contributed to the marked seed shedding observed. Reproductive growth in Verano stylo follows an indeterminate pattern, the level of expression of which is probably dependent upon the rate of termination of conditions conducive to plant growth and the intensity of desiccating conditions experienced during seed maturation. Previous research monitoring seed production of *Stylosanthes spp.* has been undertaken in the cooler Atherton Tableland region (17 °S, 145 °E) where peak standing seed yield was observed either to decline at the rate of 3 to 4 percent per day in the case of *S. guyanensis* (Loch *et al.* 1976), or to plateau for more than 20 days in *S. scabra* (Thomson and Medeiros 1981). Although our results are not directly comparable, we suggest that the higher rate of seed shedding in the Douglas Daly region is largely attributable to its hotter, more desiccating environment.

Peak fallen seed yield (for suction harvest) occurred on H7 (5 July, day 186) with 903 kg/ha and remained at a similar level until H10 (26 July, day 207), after which it declined to 777 kg/ha at H11 (8 August, day 220). Harvest should begin as soon as fallen seed yield peaks because ants are able to consume significant quantities of *Stylosanthes spp.* seed in this environment (A. Allwood pers. comm.).

This study has demonstrated that while yields of header harvested seed are comparable to those obtained in other Verano stylo seed producing regions of Australia, the very short period over which standing seed yield peaks suggests that crops should, as a general rule, be suction harvested. While minor variations in crop phenological development and consequent optimal dates for direct or suction harvesting can be expected from year to year, we suggest that the general pattern of seed production will be as outlined in this paper.

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