

PRODUCTION FROM COWS AND CALVES SET-STOCKED ON TAGASASTE, A PERENNIAL LEGUMINOUS FODDER SHRUB

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SUMMARY

A trial was conducted to measure the growth rate of cows and calves set-stocked on tagasaste growing on deep sands. At a stocking rate of around 1 breeding cow/ha.year the regrowth was restricted to ≤ 5 cm in length over the summer and autumn. In this "broccoli" form of production the tagasaste continued to grow over summer in the absence of rain. When this tagasaste provided the only source of feed in the paddock calves continued to grow at 0.6-1 kg/hd.day and their mothers maintained liveweight.

Keywords: tagasaste, fodder shrub, "broccoli" form, cattle, liveweight.

INTRODUCTION

Tagasaste (*Chamaecytisus palmensis*) was selected approximately 150 years ago from the barren volcanic hills of Palma, one of the Canary Islands, located in the Atlantic Ocean just off the coast of Morocco (Snook 1986).

The edible fraction of tagasaste consists of leaf and stem up to a diameter of about 3 mm for sheep and 6 mm for cattle. In 1985/87, cutting studies using tagasaste growing on very deep sands at New Norcia, approximately 130 km north of Perth (500 mm annual rainfall with 400 mm in winter), yielded 3,000 kg dry leaf and edible stem/ha.year (Southern 1988). Parallel grazing studies yielded around 3,000 sheep grazing days (sgd)/ha.year or an estimated 3,000 kg edible dry matter (EDM)/ha.year (Oldham and Mattinson 1990). These yields were approximately 4 times the 700 sgd/ha.year (2 dse) obtained from annual pastures on the same paddock in previous years.

In summer and autumn, the edible fraction of tagasaste contains 15-18% crude protein (Southern 1988) and the pepsin-cellulase method indicated an *in vitro* digestibility of 68-70% (J. Fortune and A. Bailey unpublished). However, in a number of experiments over a number of years, sheep and cattle gained liveweight slowly while grazing tagasaste over summer and autumn (Oldham *et al.* 1991).

Borens and Poppi (1990) concluded, after a series of grazing and pen-feeding studies, "that the real potential of tagasaste as a production feed would not be realised until a grazing system was devised that supplied a majority of leaf in the diet". New leaf was > 25% crude protein and up to 80% digestible dry matter compared with edible stem of 9% and 46%, respectively. With sheep it has not been possible to control the length of regrowth by set-stocking, since bark eating and preferred grazing of some areas caused tree deaths (CM. Oldham unpublished). However, in 1989/90, the manager of "Newdale", the farm involved in the tagasaste research, set-stocked a paddock of tagasaste at New Norcia with heifers for about a year. The cattle appeared to have grown satisfactorily while restricting the maximum length of regrowth of tagasaste to ≤ 5 cm. The hedgerows in most of the paddock took on the appearance of rows of giant "broccoli", up to 1.5 m high. As the paddock was about 50% gravel soils supporting subterranean clover/ryegrass pastures, it was difficult to assess the contribution of the tagasaste to the overall productivity of the paddock. However, this observation gave us sufficient confidence to set up a more controlled study at another property, "Dunmar", at Badgingarra, 230 km north of Perth, where tagasaste is grown exclusively on deep sands and inter-row pasture production makes a minor contribution to the feed on offer, particularly over the summer (Oldham 1992). It was hypothesised that tagasaste could be kept in a short regrowth or "broccoli" form by set-stocking with cattle and that this would provide a leaf-rich diet that would prove to be more productive than previous grazing systems.

MATERIALS AND METHODS

In July 1991, 30 Shorthorn-cross heifers (around 280 kg liveweight and 14 months-of-age) were joined for 10 weeks in 24 ha of tagasaste (paddock #105). After joining, 6 heifers were selected at random and allocated to a second paddock of tagasaste (paddock #108; 6 ha). Each paddock of tagasaste had been established in 1988 as more or less continuous hedgerows 5 m apart exclusively on deep sands. The tagasaste in #108 had never been mechanically pruned. The trees were around 2 m high with a dense cover of short regrowth, as the paddock had been grazed by the heifers off and on all the previous summer. By contrast, the hedgerows in #105 had been cut in April while being grazed by sheep. Subsequently, the tagasaste regrowth was maintained at a length of ≤ 5 cm, or in the "broccoli" form by

grazing. In the following 600 days, the tagasaste did not require mechanical trimming and no hay was fed to the cattle . All of the heifers in #108 calved and reared their calves and were present at each weighing. However in #105, only 20 cows calved, and one failed to rear its calf. In addition, not all cows and calves were mustered at each weighing. Thus, the data presented in Figure 1 applies to all cows and calves from #108 and only the 10 cow-calf units from #105 for which an entire data set was available. The farm manager estimated the mean calving date to be mid May 1992.

There was a problem with bulls at the second joining and 25% of the cows did not calve in 1993. Thus, the trial in #108 was abandoned and the cows in #105 were replaced by 24 mature cows with calves at foot in August 1993.

The computer programme GrazFeed (CSIRO 1990) was used to estimate the feed that must have been eaten from the paddocks from April 1992 to April 1993 and hence the carrying capacity of each paddock in terms of production of digestible DM or dse's given;

1. the age and reproductive state of each animal present (wet cow, calf or dry cow),
2. the liveweights and changes in liveweights of each class of animal in each period,
3. a conservative estimate of 70% for the digestibility of the feed on offer, and
4. a starting biomass of 1,500 kg/ha of green edible tagasaste (35% DM).

RESULTS

There was no difference in the pattern or magnitude of weight gains by either cows or calves between the 2 paddocks. The heifers weighed 305 kg when first weighed in September 1991 and 488 kg with calves at foot weighing 305 kg with 8 mm of fat on 9 March 1993. The heifers gained around 120 kg in the first 180 days and then plateaued at around 410 kg for the next 140 days (Figure 1). After the first 10 weeks of their first lactation, they added a further 80 kg before stabilising at around 490 kg in mid November 1992.

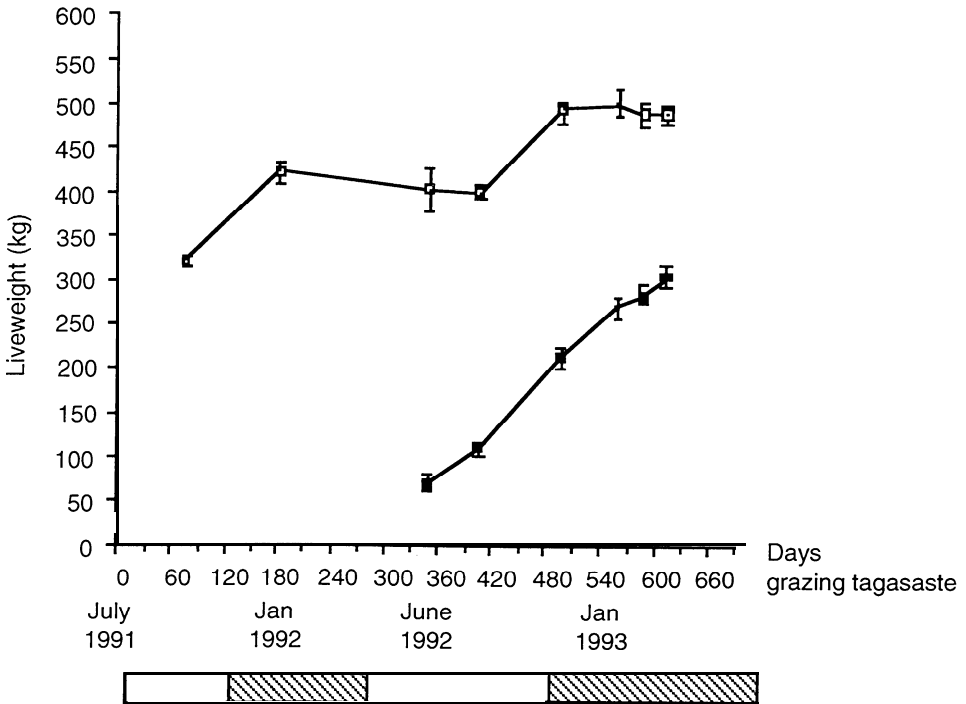


Figure 1. The pattern of change of liveweight (kg $\pm$ sem) for 16 cows (open squares) and their calves (closed squares), with complete weighing records, set-stocked on tagasaste at 1 cow/ha from conception (around July 1991) to weaning on 9 March 1993 (availability of green (open) or dry (diagonal hatch) inter-row pasture is indicated by the bar)

The calves maintained a steady growth rate of around 1 kg/hd.day between their first weighing in June 1992 and weaning on 9 March 1993. The first summer was unusually wet (575 mm of rainfall for the year and 200 mm between December and March). However, the second year (492 mm of annual rainfall and only 35 mm between December and March) was typical of the long term average.

In 1992/93 the estimates of the feed eaten by the various classes of cattle between weighings during the last year of the experiment were derived using the GrazFeed model (CSIRO 1990). Using these estimates of intake, the cattle consumed around 4,350 kg DM/ha.

The cows introduced into paddock #105 in August 1993 were in very poor condition (mean 330 kg liveweight; Figure 2). However, over the 105 days to 25 November they gained nearly 100 kg to plateau at about 420 kg. Overall the growth rate of their calves was 944 g/hd.day, however, it slowed to 630 g/hd.day in December and January (Figure 2). In 1994, the calves were weaned at around 230 days old, more in line with normal district practice and because the cattle were beginning to remove all the tagasaste from the hedgerows in some parts of the paddock. However, the tagasaste recovered quickly after the calves were removed. A total of 530 mm of rainfall fell between February 1993 and February 1994 with no significant rain from November 1993 to February 1994.

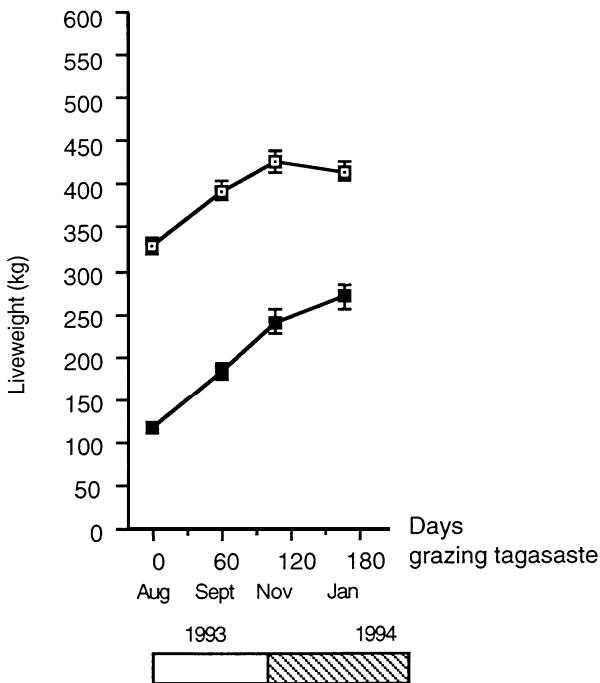


Figure 2. The pattern of change of liveweight (kg $\pm$ sem) for 24 mature cows (open squares) and their calves (closed squares), set-stocked on tagasaste (paddock #105 at Dunmar, Badgingarra) at 1 cow-calf unit/ha from 3 August 1993 until the calves were weaned on 10 January 1994 at around 230 days-of-age (availability of green (open) or dry (diagonal hatch) inter-row pasture is indicated by the bar)

DISCUSSION

In this study we have shown that the fodder shrub tagasaste can provide adequate feed for commercial production of breeding beef cattle. In paddocks on deep sand, with 4-year-old continuous hedgerows of tagasaste 5 m apart, a stocking rate of a breeding cow/ha kept regrowth on the tagasaste to ≤ 5 cm long during summer and autumn. This gave the hedgerows the appearance of giant "broccoli". By November, the dry annual pasture species in the inter-row space had been completely removed and so contributed nothing to the nutrition of the cattle. Lactating cows maintained liveweight and their calves gained about 1 kg/hd.day until weaned in late summer. In both years the rate of gain for the calves over late spring and summer was roughly 3 times better than for cattle grazing tagasaste with at least 6 months of

regrowth at the start of grazing (Oldham *et al.* 1991). In 1993, the rate of gain was nearly sufficient to finish the calves into the peak of the seasonal market for “baby beef” in Western Australia.

The typical farm in the area does not run cattle and would only carry about 2 sheep/ha (Oldham 1992). In our study the average stocking rate, equivalent to about 11 sheep/ha for the year in both 1992/93 and 1993/94, was around 5 times the district average for annual pastures growing on deep sands (M. Shallow pers. comm.). This stocking rate kept tagasaste regrowth in what appeared to be a leaf-rich form over summer and strongly supports the hypothesis put by Borens and Poppi (1990) “that the real potential of tagasaste as a production feed would not be realised until a grazing system was devised that supplied a majority of leaf in the diet”. The “broccoli” form of management of tagasaste appears to be such a system. The growth rates of lactating cows and their calves in this study indicate relatively unrestricted intake of herbage that was about 70% digestible with ample available protein.

When the stocking rate and growth data from this experiment in 1992/93 was used to simulate the seasonal pattern of herbage production (Oldham 1993) the annual pattern was very similar to that described by Southern (1988). In Southern’s study, individual trees were cut back to about 5 cm of edible leaf and stem each 3 months. He found rates of growth were minimal in early to mid winter and maximum rates, roughly twice as high, were observed in late spring/early summer. Southern’s trees continued to grow at a moderate rate through late summer as did the “broccoli” hedgerows in the current study. By contrast, in both the summers of 1992/93 and 1993/94, with no rain after November, ungrazed hedgerows or hedgerows with > 3 months regrowth, were wilted and/or dropped a high proportion of their leaf in the same period (C.M. Oldham unpublished). Our observation that relatively close-cropped, hedgerows will continue growing through the driest conditions, was also supported by the experimental data reported by Wiley and Maughan (1993). This is undoubtedly an important feature of cattle production from tagasaste, as is the apparent maintenance of the high “feeding value” of the edible dry matter throughout the year. There are no similar published studies in domestic cattle to refer to. However, moose and white-tailed deer frequently rebrowse the same pine or birch trees. It is thought that the rebrowsing in this case actually increases the “feeding value” of regrowth. “Repeat browsing on birch trees produced larger shoots with larger and more chlorophyll-rich leaves. Browsed trees had a longer growing season and the available forage increased because of substantial compensatory growth” (Tahvanainen *et al.* 1991).

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