# PASTURE PRODUCTION AND WEANED HEIFER PERFORMANCE FROM TROPICAL GRASSES

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## ABSTRACT
The purpose of this experiment is to determine the influence of energy supplement (molasses 80% and cottonseed meal 20% slurry) fed to heifers while grazing Florico and Florona stargrass (*Cynodon nlemfuensis* Vanderyst var *nlemfuensis*) and Florakirk bermudagrass (*C. dactylon*) pastures. Stocking rate of heifers was 5.9 animals $ha^{-1}$ averaging 230 kg. Heifers were rotated weekly and were on a 4 pasture rotation. Grasses were allowed a 3-wk regrowth period. Mean forage growth rate $cycle^{-1}$ $day^{-1}$ was not different (P>0.05) between grasses; however Florico and Florona yielded 8 and 21% more $cycle^{-1}$ than Florakirk. Mean herbage accumulation $cycle^{-1}$ was not different between the stargrasses, but mean herbage on offer $cycle^{-1}$ was always higher (P<0.05) for Florona. Mean heifer average daily gain (ADG) $cycle^{-1}$ (P>0.05) between Florico and Florona was 0.38 and 0.33, respectively over a 3 yr. period. Heifers consuming 1.4 kg $hd^{-1}$ $d^{-1}$ of molasses slurry gained 0.1 kg $hd^{-1}$ $d^{-1}$ more than heifer not fed molasses slurry. Data suggest molasses-slurry consumed at 1.4 kg $hd^{-1}$ $d^{-1}$ provided a 32% ADG increase on stargrasses and a higher increase under stress conditions.

## KEYWORDS
Stargrass, molasses, supplementation

## INTRODUCTION
One of the most expensive practices in cattle production is the development of replacement heifers so they can calve at two years of age. Heifers weaned at 230 kg must gain about 0.45 kg $day^{-1}$ or more, from weaning to breeding (180 d) to reach a target breeding weight of 315 kg. Under many conditions this goal is difficult to achieve because many tropical grasses have low forage quality and/ or a prostrate growth habit, resulting in plant inundation by surface water resulting in a mid season slump. Stargrasses (Mislevy et al., 1989a, 1989b; Mislevy and Brown, 1991; Mislevy et al., 1982 and Adjei et al., 1980) and bermudagrasses (Mislevy et al., 1995) have the potential to produce high yields of quality forage over an extended period of time and produce a major portion of the forage in an upright manner. An alternative would be to supplement heifers grazing stargrass or bermudagrass pasture. The purpose of this experiment was to determine the influence of molasses slurry on the performance of weaned heifers grazing *Cynodon* grasses.

## METHODS
The experiment was conducted 1993-1995 on a sandy, siliceous, hyperthermic Ultic Haplaquod (Pomona fs) at the University of Florida, Range Cattle Research and Education Center 27° 25' North latitude, 81° 55' west longitude) at an elevation of 26 m. The experimental design was a split plot with grass entries (‘Florakirk’ bermudagrass; Florico and Florona stargrass) as the main plots and energy levels (with molasses 80% - cotton seed meal 20% slurry and without a molasses slurry) as subplots with 3 replications. The well established grasses were fertilized annually with 224-25-93 kg $ha^{-1}$N-P-K, respectively. All of the P and K and 65 kg $ha^{-1}$ N was applied in late March followed by the removal of approximately 5.3 Mg $ha^{-1}$ hay 28-35 days later. Nitrogen only, was applied at 39 kg $ha^{-1}$ prior to each grazing cycle. Soil Ca and Mg were adequate, with a pH of 6.4.

Cross bred heifers weaned at 8 months of age and averaging 240 kg were fed 4.5 kg $hd^{-1}$ $day^{-1}$ of a weaning ration for 21 days, the last 14 days heifers were on bermudagrass and stargrass pasture prior to the start of the study. Heifers were rotated weekly allowing a rest period of 3 wks between grazing, resulting in a 4-pasture rotation. Stocking rate was 5.9 heifers $ha^{-1}$. Half the heifers on each grass treatment consumed 1.4 kg $hd^{-1}$ $d^{-1}$ molasses slurry and half received no molasses slurry. Individual heifers were weighed full and shrunk (without feed or water for 16 hrs) prior to initial grazing, and then weighed full at the end of every 28 d cycle. After 5 cycles of grazing (140 d) animals were weighed full and shrunk for final weight. Mineral supplements and water were supplied *ad libitum*.

Five forage sub-samples (0.25 m) were removed from one paddock within each experimental unit prior to and immediately after grazing each cycle to calculate mean forage growth rate $cycle^{-1}$, kg $d^{-1}$, mean herbage accumulation $cycle^{-1}$, Mg $ha^{-1}$ and mean herbage on offer $cycle^{-1}$, Mg $ha^{-1}$. In addition, randomly plucked samples (clipped to a grazing stubble height) were taken at the same time as pregraze samples and were used to estimate the nutritive value (CP and IVOMD) of the herbage consumed. A statistical analysis was used to compare all 3 grasses over a 2 yr period and 2 grasses (Florico and Florona) over a 3 yr period.

## RESULTS AND DISCUSSION
Forage parameters consisting of herbage growth rate $cycle^{-1}$ $d^{-1}$, mean herbage accumulation $cycle^{-1}$, mean herbage on offer $cycle^{-1}$, CP, and IVOMD pooled over 2 or 3 yr were not effected by energy treatment. Mean herbage growth rate $cycle^{-1}$ $d^{-1}$ was not different (P>0.05) between the three grass cultivars, ranging from 35 kg $ha^{-1}$ $d^{-1}$ for Florona to 28.8 kg $ha^{-1}$ $d^{-1}$ for Florakirk (Table 1). However, this 21% increase in growth rate for Florona and 9% increase for Florico above Florakirk occurred throughout the growing season. This increased growth rate by Florona and Florico stargrass was expressed by the mean herbage accumulation and mean herbage on-offer $cycle^{-1}$. In both parameters Florona stargrass yielded 3.1 and 7.8 Mg $ha^{-1}$, respectively.

It appeared that mean herbage accumulation and mean herbage on-offer $cycle^{-1}$ are excessively high, however, due to saturated soil conditions and excessive water (2.5 - 7.5 cm) on the soil surface for 40 to 60 days during the warm season grazing period, higher amounts of herbage on-offer appear justified. Low rates of N (39 kg $ha^{-1}$), but frequent applications (28 d intervals) tend to encourage quality herbage to develop from axillary buds 7 to 10 cm above the soil surface, providing weaned heifers with high quality forage.

Since Florakirk bermudagrass was continuously lower than Florico and Florona stargrass for most pasture and animal parameters, Florakirk was dropped from the experiment in 1995. Florico and Florona were then statistically compared over 3 yr with results being similar to the two yr comparison for most parameters (Table 1).

Crude protein concentration and IVOMD was highest (P<0.05) for Florico (130 and 594 g $kg^{-1}$) and Florakirk (128 g $kg^{-1}$ CP) when pooled over 2 yr and 5 grazing cycles. Florona stargrass was always lower (P<0.05) in both CP concentration and IVOMD when compared with Florico. Earlier studies by Mislevy et al. (1982) indicate similar CP and IVOMD differences between Florico and Florona. Forage quality data for Florico and Florona pooled over 3 yr followed a similar pattern, with Florico averaging 74 g $kg^{-1}$ higher IVOMD than Florona.

Grass cultivar, when pooled over 2 or 3 yr, was independent of energy supplementation for ADG $cycle^{-1}$, mean ADG, and live weight gain. Mean ADG over a 28 d cycle for weaned heifers pooled over 2 yr ranged from 0.21 kg for Florakirk to 0.37 kg for Florico (Table 2).

Florico was responsible for highest (P<0.05) ADG, producing 0.37 kg when pooled over 2 yr. All grasses exhibited a mid season slump. When comparing ADG for Cycles 1, 2, 4 and 5 for Florakirk, Florico, and Florona, data reveal the mid season slump resulted in 96, 64, and 55% decrease respectively during the wet humid conditions of late August-late September. Forage quality during cycle 3 was equal to the other 4 grazing cycles when averaged over 1993 and 1994. This indicates that environmental conditions (standing surface water, mosquitos, etc.) may be the main reason for mid summer slump.

Average daily gain from the molasses slurry supplement pooled over 2 or 3 yr was independent of grass cultivars. Mean ADG by heifers fed molasses slurry, over three grasses, was 0.35 kg compared to 0.23 kg for heifers not fed molasses slurry (Table 2). Molasses slurry tended to provide the greatest benefits when the heifers were under stress conditions (cycle 3). Consumption of molasses slurry by heifer was not different (P>0.05) between grass cultivars averaging 1.4 kg $hd^{-1}$ $d^{-1}$.

In conclusion, a molasses slurry fed on pasture at a rate 1.4 kg $hd^{-1}$ $d^{-1}$ to weaned cross-bred heifers grazing Florico and Florona stargrass can provide an additional 0.1 kg $hd^{-1}$ $d^{-1}$ gain above herbage alone.

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**Table 1**
Influence of grass cultivar on forage parameters during the warm season. Data represents an average of five grazing cycles, two energy levels and three replications.

| Item | Grass | | |
|---|---|---|---|
| | Florakirk | Florico | Florona |
| | | 2 yr $\bar{x}$ | |
| Mean growth rate/cycle/day, kg | 28.8 a | 31.4 a | 35.0 a |
| Mean herbage accumulation/cycle Mg $ha^{-1}$ | 2.1 b | 2.6 ab | 3.1 a |
| Mean herbage on-offer/cycle, Mg $ha^{-1}$ | 5.0 b | 6.1 b | 7.8 a |
| Crude protein g $kg^{-1}$ DM | 128 a | 130 a | 123 b |
| IVOMD g $kg^{-1}$ OM | 529 b | 594 a | 520 b |
| | | 3 yr $\bar{x}$ | |
| Mean growth rate/cycle/day, kg | | 38.0 a | 42.7 a |
| Mean herbage accumulation/cycle Mg $ha^{-1}$ | | 2.9 a | 3.4 a |
| Mean herbage on-offer/cycle, Mg $ha^{-1}$ | | 6.4 b | 7.9 a |
| Crude protein g $kg^{-1}$ DM | | 125 a | 123 a |
| IVOMD g $kg^{-1}$ OM | | 587 a | 513 b |

*a,b,c* Means within rows followed by different letters are significantly different at the 5% level (Waller and Duncan procedure K=100).

**Table 2**
Influence of Cynodon grass and energy treatments on average daily gain (ADG) per grazing cycle, mean ADG, and live weight gain of weaned heifers over 140 day period.

| Grass | Grazing cycle 1 | 2 | 3 | 4 | 5 | Mean | Total live weight gain |
|---|---|---|---|---|---|---|---|
| | ADG, kg | | | | | | kg |
| | | | 2 yr $\bar{x}$ | | | | |
| Florakirk | 0.28 a | 0.29 a | -0.012 b | 0.20 b | 0.29 b | 0.21 c | 70 c |
| Florico | 0.30 a | 0.42 a | 0.15 a | 0.42 a | 0.55 a | 0.37 a | 124 a |
| Florona | 0.33 a | 0.33 a | 0.15 a | 0.25 b | 0.42 ab | 0.30 b | 99 b |
| Energy | | | | | | | |
| With molasses slurry | 0.37 b | 0.36 a | 0.24 a | 0.35 a | 0.44 a | 0.35 a | 119 a |
| Without molasses slurry | 0.23 a | 0.34 a | -0.05 b | 0.23 b | 0.39 a | 0.23 b | 77 b |
| | | | 3 yr $\bar{x}$ | | | | |
| Grass | | | | | | | |
| Florico | 0.38 a | 0.46 a | 0.20 a | 0.39 a | 0.49 a | 0.38 a | 129 a |
| Florona | 0.41 a | 0.38 a | 0.19 a | 0.31 a | 0.39 a | 0.33 a | 112 a |
| Energy | | | | | | | |
| With molasses slurry | 0.43 a | 0.43 a | 0.30 a | 0.43 a | 0.45 a | 0.41 a | 138 a |
| Without molasses slurry | 0.35 a | 0.41 a | 0.10 b | 0.26 b | 0.43 a | 0.31 b | 104 b |

*a,b,c* Means within columns for grass and energy not followed by the same letter are significantly different at the 5% level (Waller-Duncan k-ratio k=100).