

Research Note

THE FEEDING OF DAIRY CALVES WITH PANGOLA AND STAR GRASS HAYS¹

This study was conducted at the University of Puerto Rico Agricultural Experiment Substation at Gurabo. Twenty-four Holstein dairy calves (12 males and 12 females), born between January 30 and May 1, 1974, were utilized. The limited availability of female calves justified the inclusion of male calves in the study. Calves were randomly assigned at birth, as they became available, to individual pens under 4 experimental treatment groups, utilizing a randomized block design². Calves were evaluated up to their 181st day of age.

After colostrum feeding for the first 3 days, each calf was fed a commercial milk substitute. From the 10th day, each calf received up to .45 kg of a 20% crude protein (CP) commercial feed per day, with increments of .45 kg for each subsequent 30-day period up to the 181st day.

Commercial milk substitute feeding was discontinued when the calf consumed .90 kg of feed daily on 3 consecutive days. With hay as the only variable among the four experimental groups, 30-day or 45-day Pangola or Star grass hay was offered ad libitum to each calf from its 22nd day of life. Groups A, B, C and D consumed hay made from 30- and 45-day Pangola and Star grasses, respectively.

Feed and hay offered were weighed daily. The daily hay ration was increased by .45 kg daily, if there were no refusals from the previous day in the trough. A daily 10% hay refusal was estimated in all cases. Quantities of feed and hay refusals from each calf, as well as each calf, were weighed every 14 days. On alternate dates, calves were weighed on three consecutive days to verify animal weights. Periodically composite feed and hay samples were collected and analyzed for DM and CP³. The data were subjected to variance analyses and to the *t* test⁴.

Mean data on birth and final weights, on total and daily weight gains and on Pangola hay, Star hay, and concentrate feed intake of 24 dairy calves on four hay treatments are presented in tables 1 and 2. Except for CP intake, no significant differences were obtained among treatment

¹ Manuscript submitted to editorial Board October 7, 1977.

² Snedecor, G. W., and Cochran, W. G., *Statistical Methods*, 6th ed, The Iowa State Univ. Press, Ames, Iowa, 1967.

³ Association of Official Analytical Chemists, *Official Methods of Analysis*, 11th ed, Washington, D. C., 1970.

⁴ Snedecor et al., loc. cit.

groups in the parameters studied. Hay CP intakes (table 2) were found to differ significantly between A calves consuming 30-day Pangola hay and B calves consuming 45-day Pangola hay ($P < .05$); C calves consuming 30-day Star hay ($P < .01$) and D calves consuming 45-day Star hay ($P < .01$); and C calves with B calves ($P < .01$) and D calves ($P < .01$).

The difference of 2.0 kg in mean birth weights (table 1) between A and B calves widened to 11.6 kg at 181 days of age. With similar mean feed intakes by the two groups (table 2), A calves consumed 23.4 kg more of

TABLE 1.—Mean weights at birth and at 181 days of age, and total and daily weight gains of 24 Holstein calves consuming 30- and 45-day Pangola and Star hays

	Pangola hay		Star hay	
	30-day A	45-day B	30-day C	45-day D
Calves, number	6 ¹	6 ²	6 ³	6 ³
Birth weight, kg	41.2 ^{a4}	39.2 ^a	40.5 ^a	39.1 ^a
Final weight, kg	164.5 ^a	152.9 ^a	165.4 ^a	154.2 ^a
Weight gain, kg				
Total	123.3 ^a	113.7 ^a	124.9 ^a	115.1 ^a
Daily	.68 ^a	.63 ^a	.69 ^a	.64 ^a

¹ Includes 4 males.

² Includes 2 males.

³ Includes 3 males.

⁴ Mean values for the same weight category followed by the same letter do not differ significantly at the 5% level.

the 30-day Pangola hay DM than B calves of the 45-day Pangola hay DM. Mean CP content was 3.4 percentage units greater in 30-day than in 45-day Pangola hay, associated with more leafiness and tenderness of the former. Arroyo-Aguilú et al.⁵ and Yazman et al.⁶ also obtained reductions in CP content and in vitro digestibility with increases in the fiber fractions in Pangola and Star hays of similar ages. Both factors were similarly influential in the difference of 9.6 kg in mean total gain in favor of the 30-day Pangola hay. For dairy calf feeding, Thomas and Tinnimit⁷ indicated that both DM intake and CP content were about equally important from

⁵ Arroyo-Aguilú, J. A., Tessema, S., McDowell, R. E., Van Soest, P. J., Ramírez, A., and Randel, P. F., Chemical composition and in vitro digestibility of five heavily fertilized tropical grasses in Puerto Rico, *J. Agri. Univ. P. R.* 59(3): 186-98, 1975.

⁶ Yazman, J. A., Arroyo-Aguilú, J. A., McDowell, R. E., Van Soest, P. J., and Cestero, H., Voluntary intake and apparent digestibility of artificially dried Stargrass fed to Holstein bull calves, *J. Agri. Univ. P. R.* 61: 429, 1977.

⁷ Thomas, J. W. and Tinnimit, P., Amounts and sources of protein for dairy calves, *J. Dairy Sci.* 59: 1967-84, 1976.

41 to 72 days of age; and, after this age, DM intake was of much greater importance than CP intake.

Similarly, the difference of 1.4 kg in mean birth weights (table 1) between C and D calves widened to 11.2 kg at 181 days of age. C calves consumed 4.7 kg less of the feed and 46.5 kg more hay DM than D calves, with 7.8 percentage units more of hay CP, for a difference of 9.8 kg in mean total gain in their favor. Yazman et al.⁸ determined that voluntary intake of 30-day Star hay by calves was greater than that of the 45-day hay, although only differences in CP intake were significant ($P < .05$).

Mean weights at birth and at 181 days, and feed intakes of calves in groups A and C were similar (tables 1, 2). The facts that 30-day Star grass hay had higher DM and CP content than 30-day Pangola hay, and

TABLE 2.—Mean Pangola and Star hay and concentrate feed intakes of Holstein dairy calves

	Pangola hay		Star hay	
	30 day A	45 day B	30 day C	45 day D
Hay intake, kg	193.0 ^a	168.9 ^a	249.6 ^a	200.2 ^a
DM ¹ , %	86.4	84.9	90.2	89.2
DM intake, kg	166.7 ^a	143.3 ^a	225.1 ^a	178.6 ^a
CP, %	16.3	12.9	17.2	9.4
CP intake, kg	27.2 ^a	18.5 ^b	38.6 ^c	16.8 ^b
Feed intake, kg	275.6 ^a	274.7 ^a	277.4 ^a	282.1 ^a
DM intake, kg	248.0 ^a	247.2 ^a	249.6 ^a	253.9 ^a
CP intake, kg	49.6 ^a	49.4 ^a	49.9 ^a	50.8 ^a
Total DM intake, kg	414.7	390.6	474.7	432.4
Total CP intake, kg	76.8	67.9	88.6	67.6

¹ DM, dry matter; CP, crude protein.

² Mean values for the same feed component followed by the same letter do not differ significantly at the 5% level.

group C calves consumed 58.4 kg more DM than group A calves to attain similar body weights, indicate an overall better utilization of the 30-day Pangola grass hay by the heifers.

Except for a 6.7-kg greater feed DM intake of D calves over B calves through the 181-day period, mean birthweight and final liveweight were correspondingly similar for these 2 groups. The fact that B and D calves made similar weight gains while D calves consumed 35.3 kg more DM than B calves, tends again to indicate a better utilization of the 45-day Pangola hay.

⁸ Vicente-Chandler, J., Abruña, F., Caro-Costas, R., Figarella, J., Silva, S., and Pearson, R. W., Intensive grassland management in the humid tropics of Puerto Rico, Agri. Exp. Stn., Univ. P. R., Bull. 233, 1974.

Treatment A calves consumed 8.7 kg more of hay CP than B calves, for a difference of 9.6 kg in liveweight gain; for a similar difference in weight gain, C calves consumed 21.8 kg more of hay CP than D calves. Similar comparisons for hay DM intakes indicated that A calves consumed 23.4 kg more than B calves, and C calves 46.5 kg more than D calves.

Mean weight gains per calf through the 181-day period, in the range of 113.7 to 124.9 kg, indicated that tropical grass hay fed to young calves as the only source of fiber propitiates their fast healthy development. Yazman et al.⁹ indicated that artificially dried Star grass hay can make a significant contribution to the nutrition of Holstein calves as early as 112 days of age.

Star grass is easier to handle than Pangola grass in hay making, and it takes more time to reduce the moisture content in Pangola grass to desirable levels of dryness. However, as reported by Arroyo-Aguilú et al.¹⁰ Pangola grass tends to maintain a constant nutritive value for a longer period of time, an important factor in situations where it is not possible to harvest and process hay in a short period of time. Grass hay is preferred over green-chopped grass for rearing young calves from the 22nd day of age on because it permits higher DM and CP intake, supplies a more uniform quality of roughage, and sharply decreases the chances of gastrointestinal parasitosis.

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⁹ Yazman et al., loc. cit.

¹⁰ Arroyo-Aguilú et al., loc. cit.