

THE EFFECT OF YEAST CULTURE ON CALF PERFORMANCE

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Story in Brief

The effect of supplementing corn or wheat based rations with yeast culture (*Saccharomyces cerevisiae*, YEA-SACC⁴) on dry matter intake and weight gain and on ruminal pH was evaluated in a 70 day trial using 48 Holstein calves approximately 3 weeks of age (24 bulls, initial weight 109 lb and 24 heifers, 99 lb). Calves were randomly assigned to either corn or 30% wheat-based high concentrate diets containing 15% dehydrated alfalfa pellets, with or without added yeast culture. Yeast culture was added at the rate of 2 lb/ton to those diets containing yeast. Additionally, calves were fed whole milk (8%/body weight⁷⁵) during the first 2 weeks of the experimental period. The average dry matter intake for days 1 to 70 was similar, being 4.39, 4.01, 3.99 and 4.11 lb per day for corn, corn-yeast, wheat and wheat-yeast treatments, respectively. Live weight gains were 1.89, 1.74, 1.56 and 1.67 lb/day for the same treatments, respectively. Improved daily gain (1.82 vs 1.62 lb/day) and feed efficiency (2.3 vs 2.5 lb feed/lb gain) were noted for animals fed corn based diets compared to those diets containing wheat. Neither feed intake, weight gain nor pH of the ruminal fluid was affected by the addition of yeast.

(Key Words: Corn, Wheat, Yeast, Calves.)

Introduction

Feeding and managing dairy calves is an important phase of dairy production. The need to develop good dairy replacement animals and to properly feed young, male dairy calves not to be sold for veal (e.g. dairy stocker and feedlot steers) and the need to divert less milk to calf feeding has led to many changes in calf feeding practices. Proper feeding of very young,

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early weaned beef calves also is becoming increasingly important in some beef operations.

Grains such as corn or wheat provide an excellent source of dietary energy in the rearing of calves. However, it has been suggested that young calves may lack adequate salivary amylases and other carbohydrate digesting enzymes for proper starch utilization (Rose, 1970). The inclusion of yeast culture in the concentrate rations for dairy calves has been proposed as a potential means to improve digestion. According to Lyons (1987), yeast contains both protein (proteases) and starch digesting (amylases) enzymes and supplies protein, vitamins and other nutrients in the diet. Some have suggested that yeast may improve diet digestibility. Few reports exist on supplementing dairy calf rations with yeast cultures. This experiment was conducted, therefore, to determine the effect of adding yeast culture to corn and wheat based rations for dairy calves.

Materials and Methods

Twenty-four Holstein bull calves (109 lb) and 24 Holstein heifer calves (99 lb) were blocked according to sex, then randomly assigned at 3 wk of age to the following treatments: a) Control, consisting of a corn based diet (C); b) C plus 2 lb of yeast (*Saccharomyces cerevisiae*, YEA-SACC)/ton (CY); c) 30% wheat based diet (W); and d) W plus yeast (WY). Diets contained 15% dehydrated alfalfa pellets (Table 1) and were formulated to meet NRC (1978) requirements for growing dairy calves. Diets were calculated to be isonitrogenous and approximately equal in energy content. Calves were fed whole milk (8%/body weight⁷⁵) during the first two weeks of the trial. Animals were individually penned. Feed and water were available at all times. Feed orts were removed and weighed weekly. Feed samples were taken weekly for analyses. Calves were weighed weekly. During the fourth and ninth weeks, ruminal samples were obtained by stomach tube to determine ruminal pH. Ruminal fluid pH was measured immediately, and rumen fluid was strained through a double layer of cheesecloth. Fifty milliliters of strained rumen fluid were mixed with 0.5 ml of saturated mercuric chloride and then frozen for later volatile fatty acid (VFA) determination. Data were analyzed as a 2 x 2 factorial experiment with a randomized, complete block design with sex as the blocking factor (Steel and Torrie, 1980). The adjusted treatment means were compared using pre-planned orthogonal contrasts as follows: corn-wheat; yeast-no yeast; and grain x yeast.

Table 1. Composition of diets.

	Corn	Corn & yeast	Wheat	Wheat & yeast
Ingredients, % as fed				
Corn	30.0	30.0	----	----
Wheat ^a	----	----	30.0	30.0
Sorghum grain	17.5	17.5	20.0	20.0
Soybean meal, solv.	20.0	20.0	16.5	16.5
Oats	7.0	7.0	8.0	8.0
Fixed portion ^b	25.5	25.5	25.5	25.5
Yeast culture (YEA-SACC) ^c	-	+	-	+
Nutrient analyses:				
Net energy, Mcal NE _g /100 lb ^d	49.8	49.8	49.2	49.2
Total protein, %	17.0	17.0	17.0	17.0
Rumen undegradable protein, %	7.14	7.14	5.78	5.78
Calcium, %	.56	.56	.55	.55
Phosphorus, %	.51	.51	.51	.51

^aHard red winter wheat, No. 2 grade.

^bFixed portion of concentrate mix: Alfalfa dehy pellets, 15.0, molasses liquid 5.0, dicalcium phosphate 1.0, salt .5, sodium bicarbonate 4.0%.

^cProduct produced by ALLTECH, Nicholasville, KY; included in mix at a level of 2.0 lb/ton.

^dCalculated

Results and Discussion

Feed intake was similar ($P > .05$) on all treatments, averaging 4.39, 4.01, 3.99 and 4.11 lb per day on the C, CY, W and WY treatments, respectively (Table 2). Calves fed corn based diets had slightly greater feed intake than those fed 30% wheat, but the differences were not significant ($P > .05$). These results are in agreement with previous Oklahoma observations with lactating dairy cows. Wheat starch is generally more readily fermented in the rumen than corn starch (Axe et al., 1987), which may reduce intake. However, no differences in ruminal fluid pH were noted in this study, averaging 5.7 on both corn and wheat treatments. Since feed was available at all times, frequent consumption may have moderated feed intake at any one time and thus any potential changes in pH.

Calves fed corn rations gained more (1.81 lb/day, $P < .02$) than animals fed wheat rations (1.61 lb/day). This is in agreement with results of Oklahoma studies in which lactating dairy cows produced more milk on corn than on wheat based diets. Increased gain on corn diets is probably, in part, a

Table 2. Feed intake and liveweight gains by dairy calves.

	Corn	Corn & yeast	Wheat	Wheat & yeast	Statistical significance			SE
					Grain type	Yeast	Inter-action	
Number of animals	10	12	9	12	--	--	--	--
Initial body weight, lb	106	106	99	105	--	--	--	--
Final body weight, lb	240	229	209	223	--	--	--	--
Liveweight gain, lb/day	1.89	1.74	1.56	1.67	P<.02	NS	NS	.12
Dry matter intake, lb/day	4.39	4.01	3.99	4.11	NS	NS	NS	.22
Feed conversion, lb feed/lb gain	2.31	2.29	2.54	2.44	P<.001	NS	NS	.05
Ruminal fluid pH	5.7	5.7	5.6	5.8	NS	NS	NS	.09

NS = Not significant (P>.05).

Table 3. Effect of diet on total concentration and molar proportion of ruminal VFA of dairy calves.

	Corn	Corn & yeast	Wheat	Wheat & yeast	Statistical significance			SE
					Grain type	Yeast	Inter-action	
Total conc., mmol/l	408	370	363	369	NS	NS	NS	39.7
<u>Molar %</u>								
Acetic	50.7	49.4	51.8	54.7	P<.04	NS	NS	1.51
Propionic	36.4	37.3	38.4	35.7	NS	NS	NS	1.12
Butyric	7.8	8.7	6.0	6.0	P<.002	NS	NS	.67
Isovaleric	.65	.36	.44	.76	NS	NS	NS	.15
Valeric	4.36	4.20	3.37	2.73	P<.004	NS	NS	.39

NS = Not significant (P>.05)

consequence of improved feed intake. Feed efficiency also was improved ($P < .001$) on corn over wheat diets (2.3 vs 2.5 lb feed/lb gain). Though not significant, feed intake, daily gain and feed efficiency tended to show a slight improvement when the wheat based diet was supplemented with yeast. The inclusion of yeast had no effect on either the total concentration of VFA or the molar proportion of individual fatty acids (Table 3). Under the conditions of this trial, inclusion of yeast (YEA-SACC) in either corn or wheat based diets for calves did not improve performance.

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