EFFECTS OF SOYBEAN MILK–SKIMMILK MIXTURES ON DAIRY CALVES IN VEAL PRODUCTION

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Veal production in Southeast Asia is relatively a new industry. It is an important industry because of the planned development of the dairy industry in this region. The veal usually commands a good price, but it is costly to produce because it involves the use of large amounts of milk. The milk feeding period is the most expensive period in the raising of the calf. Milk fed to veal calves often returns less than if sold as fluid milk. This discourages production of high-quality veal and results in marketing calves at a very young age, or feeding grain with limited amounts of milk. In either case, the finish and quality are poor, compared to whole milk fed veal calves.

Vealers belong to a group of immature, milk-fed bovine animals, usually not over 3 months of age. Most surplus dairy calves are sold at a very early age; on the other hand, bull calves and females not intended to be raised for replacement are sold for meat, without any effort to produce acceptable veal. Veal calves are usually of dairy breeding and have been fed principally with milk or milk substitutes. Only very few veal calves come from cattle of the beef breeds.

The successful raising of calves on milk replacers in the tropics is subject to evperimentation. Because whole milk is lacking and expensive, the successful feeding of milk replacers to growing calves is an important problem. Henee,

this experiment was planned to study the use of soybean milk as one of the main constituents of milk replacers for raising veal calves.

OBJECTIVES

The specific objectives of the present study are as follows:

1. To study the effects of feeding different combinations of soy-bean milk and skimmilk as milk replacers on the growth performance of dairy calves raised for veal.

2. To determine carcass yield and veal quality of calves fed the milk replacers.

3, To analyze the meat tissue chemical composition of veal calves.

REVIEW OF LITERATURE

Thomas et al. (1959) confirmed the effects of feeding aureomycin to dairy calves and found that aureomycin reduced the incidence of diarrhea and this was of more importance than the temporary increase in growth rate.

Lassiter et al. (1959) reported the effects of aureomycin, erythromycin and hygromycin on the growth rate and well-being of young dairy calves. Either aureomycin or erythromycin added to the diet increased rate of gain and feed consumption and reduced the incidence of scours.

Rusoff et al. (1959) studied the effect of high levels of chlortetracycline at birth on the health and growth of young dairy calves, The high levels of antibiotic given in the first 3 days had no effect on subsequent growth rate, but calves given 50 mg daily after this, grew faster and ate more. It was suggested that the mode of action of antibiotics might involve a metabolic or endocrine effect.

Bush et al. (1959) reported that calves given chlortetracycline ate more

feed and gained significantlv more weight than the controls. Antibiotics had no effect on retention of ash or nitrogen or an apparent digestibility of cellulose, protein or dry matter. There was no evidence that chlortetracycline affected utilization of calcium.

Blaxter and Wood (1951, 1952) concluded that even at a very high level of milk intake, the full capacity of the tissues to retain calcium or phosphorus was not reached. This suggests that milk-fed calves may not be receiving adequate amounts of calcium and phosphorus. More important, it suggests that milk replacers containing non-milk nutrients need a supplementary source of calcium and phosphorus, because, while the availability of calcium and phosphorus in cow's whole milk is high, it may be lower in non-milk products.

The presence of chronic diarrhea in pre-ruminant calves affects the absorption of calcium and phosphorus, and decreases intestinal retention of these minerals, thus limiting whole-body retention. Blaxter and Wood (1953), Raven and Robinson (1958, 1959, 1960) found that mineral metabolism was related to nitrogen retention. The retention of calcium, phoshorus and magnesium were related to the retention of nitrogen that were also influenced by the degree of fat digestibility.

MATERIALS AND METHODS

The experiment was conducted at the Dairy Training and Research Institute and the Department of Animal Husbandry, College of Agriculture University of the Philippines, between October 1970 and January 1971.

Twelve male, one week old calves including four Jerseys and eight Holsteins were used to study the effects of feeding varying ratios of soybean milk to skimmilk as milk replacers on the growth and performance of dairy calves, their carcass yield and quality of ths veal.

Table 1. Composition of experimental diets.

Ingredients	Experimental Diets			
	I (Control)	II (Replacer I)	III (Replacer II)	IV (Replacer III)
	%	%	%	%
Whole milk	100	0	0	0
Skimmilk [a]	0	75	50	25
Soymilk [b]	0	25	50	75
Vitamin-Antibiotic Premix [c]	+	+	+	+

[a] Skimmilk powder : water ratio = 1 : 10

[b] Soybean : water ratio = 1 : 10

[c] Vitamin-Antibiotic premix was obtained from Pfizer Philippines, Incorporated.

The calves were raised on individual calf stalls made with wooden slatted floors and elevated 2 feet from a concrete floor and fitted with adjustable calf neck restrainers, feeding and drinking pails. The milk replacer diets were supplemented with vitamin-antibiotic preparation. The calves were fed with colostrum from birth to 7 days of age. They were fed the milk replacers at the rate of 20% of their body weights, divided into two equal feedings (7 a.m. and 4 p.m.). The calves were weighed twice a week and body heights at withers were measured at weekly intervals. At the end of 45 days' feeding, all the calves were slaughtered weighed, and the carcasses, including entrails and skin were chilled for 24 hours. After chilling, the carcasses were separated into selected wholesale cuts. The loin muscles from the carcasses were roasted in an electric oven at 325°F and an internal meat temperature of 160°F. The roasted meat was served to a panel of ten judges who evaluated the quality of the meat.

RESULTS AND DISCUSSION

The average chemical composition of the soymilk, skimmilk and whole cow's milk used in this experiment is shown in Table 2.

Table 2. Chemical composition of soymilk, skimmilk and whole cow's milk.

kind of milk	a/ ratio	dry matter %	ash %	crude protein %	crude fat %	crude fiber %	n f e %
Soymilk (B 256)	1 : 10	7.05	0.46	2.87	2.08	0	1.64
Soymilk (Bavao)	1 : 10	8.69	0.40	3.61	1.64	1.02	2.02
Soymilk (Bavao)	1 : 10	6.83	0.38	2.51	1.05	0.02	2.87
Skimmilk (New Zealand)	1 :10	3.20	0.25	1.24	0	0	1.71
Cow's milk (DTRI)	—	12.34	0.77	3.15	4.15	0	4.27

a/ Soybean or skimmilk : water = 1 : 10

Although Soymilk contained almost the same amount of crude protein as cow's milk. soymilk was lower in dry matter, ash, crude fat and NFE.

Table 3. Chemical composition of whole cow's milk and milk replacers used.

treatment	a/ ratio	dry matter %	ash %	crude protein %	crude fat %	crude fiber %	n f e %
I (Whole cow's milk)	—	12.34	0.77	3.15	4.15	0	4.27
II (Soymilk : skimmilk = 25 : 75)	1 : 10	5.23	0.41	2.28	0 52 b/	0.01	2.01

III (Soymilk : skim milk = 50 : 50)	1 : 10	5.32	0.33	2.43	1.04[b/]	0.01	1.51
IV (Soymilk : skim-milk = 75 : 25)	1 : 10	5.72	0.34	2.86	1.56[b/]	0.01	0.95

[a/] Soybean or skimmilk : water = 1 : 10

[b/] Values are calculated from chemical composition of soymilk.

Table 3 presents the chemical composition of milk replacers. The chemical constituents in the three replacers were far below those of whole milk.

Liveweight Gain Performance

Calves fed whole milk (control) and those fed the mflk replacers were highly significantly different. In treatment I (calves fed with whole milk), the weight gains were significantly different at 5 % level ($P < .05$) from treatments II and III, and highly significantly different from treatment IV ($P < .05$). This result shows that daily gain from treatment I was highly significantly greater than treatments II, II and IV ($P < .01$).

Table 4. Mean liveweight of calves.

treatment	initial weight kg	final weight kg	total weight gain kg	daily gain kg
Whole milk	32.27	78.60[a]	46.33[a]	1.03[a]
Replacer I (25 SM : 75 SK)	32.00	45.60[b]	13.60[b]	0.30[b]
Replacer II (50 SM : 50 SK)	37.93	46.53[b]	8.60[b]	0.19[b]
Replacer III (75 SM : 25 SK)	26.07	32.07[b]	6.00[b]	0.13[b]

Any two means with same superscript are not statistically different from each other at $P < .05$.

Figure 1 shows the weekly trend in growth rate of calves on the four experimental rations. It was evident that the growth of calves on whole milk was quite rapid as compared to the growth rate of calves on the soymilk : skimmilk replacers.

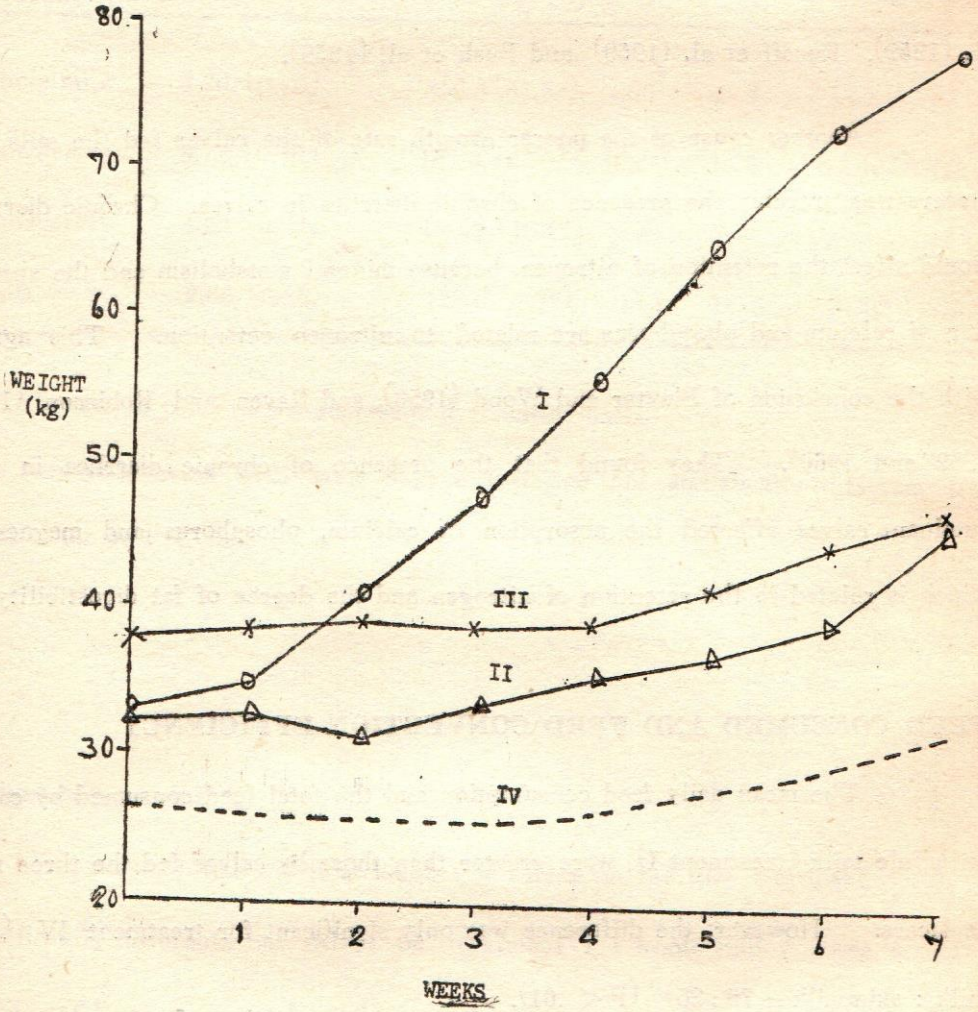

Figure 1. Mean weekly weight of calves.
I = Whole milk, 100 %
II = Soymilk : skimmilk = 25 : 75 %
III = Soymilk : skimmilk = 50 : 50 %
IV = Soymilk : skimmilk = 75 : 25 %

During the experiment, when the calves showed symptoms of diarrhea, their weights remained stable or otherwise decreased. After recovery from diarrhea, the animals gained weight again. This seems to show that the antibiotic and vitamin supplements reduced the incidence of diarrhea and increased feed intake. These results are similar to those obtained by Thomas et al. (1959), Lassiter et al. (1959), Rusoff et al. (1959) and Bush et al. (1959).

Another cause of the poorer growth rate of the calves fed the milk replacers was probably the presence of chronic diarrhea in calves. Chronic diarrhea would affect the retention of nitrogen, because mineral metabolism and the absorption of calcium and phosphorus are related to nitrogen retention. This agreed with the conclusion of Blaxter and Wood (1953), and Raven and Robinson (1958, 1959 and 1960). They found that the presence of chronic diarrhea in preruminant calves affected the absorption of calcium, phosphorus and magnesium which is related to the retention of nitrogen and the degree of fat digestibility.

FEED CONSUMED AND FEED CONVERTION EFFICIENCY

The mean daily feed consumption and the total feed consumed by calves on whole milk (treatment I) were greater than those by calves fed the three milk replacers. However, the difference was only significant for treatment IV (soymilk : skimmilk = 75 : 25) ($P < .01$).

Feed conversion efficiency of calves on whole milk was also highly significant.

Table 5. Mean feed consumption and feed conversion efficiency.

treatment	daily feed consumption kg	total feed consumed kg	daily wt. gain kg	total wt. gain kg	feed conversion efficiency f/g
Whole milk	5.70 (0.70)^{a} a/b/	256.3 (31.63)	1.03^{a}	46.3	5.53 (0.70)^{a}
Replacer I	3.72 (0.19)^{ab}	167 3 (8.75)	0.30^{b}	13.6	12.40 (0.64)^{ab}
Replacer II	4.22 (0.22)^{ab}	190.0 (10.11)	0.19^{b}	8.6	22.11 (1.18)^{b}
Replacer III	2.85 (0.16)^{b}	128.0 (7.32)	0.13^{b}	66.0	21.92 (1.22)^{b}

a/ Figures in parentheses represent dry matter basis.

b/ Any two means with same superscripts are not statistically different from each other at $P < .05$.

Heiget Measurements

Mean initial and final heights of calves on the four treatment were not significantly different, but calves on treatment I (whole milk) made a highly signifi.ant incaease in total height at withers over calves on treatments II, III and IV ($P < .01$). There was no significant difference in the daily increase in height at withers among the four treatments.

Table 6. Mean measurements of height at withers of calves fed whole milk and milk replacers.

treatment	initial height cm	final height cm	total increase in height cm	daily increase in height cm
I	69.85	80.43	10.58[a]	0.24[a]
II	67.31	72.81	5.50[b]	0.12[b]
III	73.66	77.47	3.81[b]	0.08[b]
IV	66.89	71.97	5.08[b]	0.10[b]

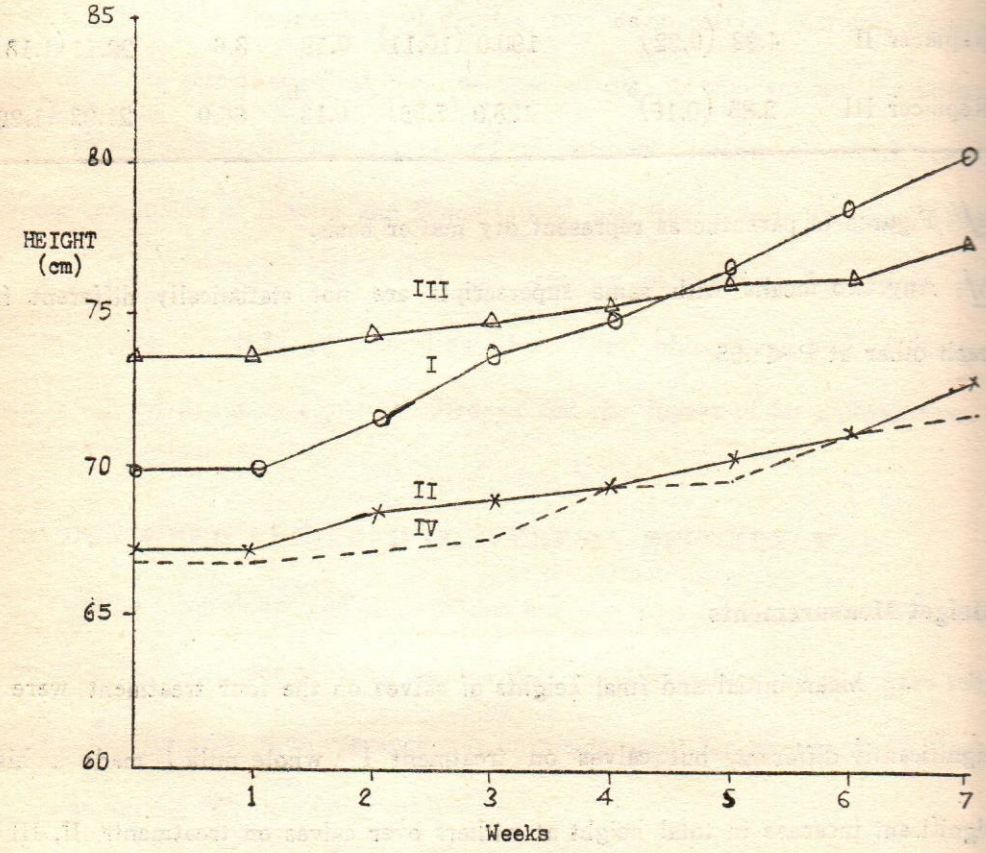

Figure 2. Mean weekly height of calves.

I = Whole milk, 100%
II = Soymilk : skimmilk = 25 : 75%
III = Soymilk : skimmilk = 50 : 50%
IV = Soymilk : skimmilk = 75 : 25%

Some probable causes of the poor growth and performance of calves fed the soymilk : skimmilk replacer diets are : poor utilization of the soymilk : skimmilk replacer; lower nutritive value (based on chemical composition) of the milk replacers, especially those with higher proportions of soymilk; high incidence of diarrhea and loss of hair in calves fed the milk replacers. The last probable cause might be related to a mineral deficiency or imbalance in the nutrition of the calves. Poor utilization of the soymilk replacers could have been brought about by the failure of the calves to digest the carbohydrate and fat components of soymilk, since it has been shown that young pre-ruminant calves do not possess the enzymes necessary for the digestion of certain food substances in the diet (Raven and Robinson, 1958; Olson and Williams, 1959).

Meat Yields from Veal Calves.

Table 7. Mean slaughter data for calves fed whole milk and milk replacers.

Treat Ment	Live Weight	Hot Carcass Weight	Carcass Length		Carcass Width		Dressing Percentage
			Left	Right	Left	Right	
	kg	kg	cm	cm	cm	cm	%
I	78.60[a]	40.83[a]	71.93[a]	72.00[a]	36.50[a]	33.60[a]	51.70[a]
II	45.60[b]	22.92[b]	62.30[a]	62.33[a]	32.00[a]	28.77[a]	49.44[a]
III	46.53[b]	23.50[b]	65.43[a]	65.50[a]	31 50[a]	29.33[a]	51.37[a]
IV	32.07[b]	15.50[b]	58.40[b]	58.50[b]	29.30[b]	26.50[b]	47.39[a]

a/ Any two means with same superscript are not statistically different from each other at $P < .05$.

It is apparent that, although the veal calves were different in conformation and liveweight, the carcass growth in calves were the same for both whole milk and milk replacer groups. These results agree with the results of Butterfield et al. (1966), who found that at a given age, the calves which did not suffer a nutritional check were heavier and yielded heavier carcasses, and that dressing percentage was affected much more by age than by diet or liveweight.

Table 8. denote that the carcass yields from the veal calves on treatments II and III were almost the same as those of calves on whole milk. It is apparent that milk replacers I and II can replace whole milk, but the water composition should be reduced to the ratio of from 10 : 1 to 5 : 1 (5 parts of water and 1 part of bean or skimmilk). This will increase the chemical composition in milk replacers and help improve the growth rate of the calves. Zabana et al. (1964) also obtained the same results when they used soy milk in rations for calves as partial replacement for whole milk.

Table 8. Mean slaughter data for chilled carcasses.

Treatment	Shoulders	Ribs	Loin	Legs	Fore Saddle	Hind Saddle	Long Saddle	Veal Back
	kg	kg	kg	kg	kg	kg	kg	kg
I	14 29^{a}	7.03^{a}	7.38^{a}	10.44^{a}	21.32^{a}	17.82^{a}	24.84^{a}	14.40^{a}
II	8.47^{bc}	3.60^{b}	3.39^{b}	7.33^{b}	12.07^{b}	10.73^{a}	14.33^{a}	6.99^{b}
III	8.66^{ac}	3.72^{b}	3.30^{b}	7.78^{b}	12.38^{b}	11.08^{a}	14.79^{a}	7.02^{b}
IV	6.36^{ba}	2.57^{b}	2.14^{b}	5.32^{b}	8.93^{b}	7.46^{b}	10.03^{b}	4.71^{b}

Any two means with the same superscripts are not statistically different from each other at $P < .05$.

Treatment II (Replacer I), soymilk 25 % : skimmilk 75 %

Treatment III (Replacer II), soymilk 50 % : skimmilk 50 %

Treatment IV (Replacer III), soymilk 75 % : skimmilk 25 %

The milk replacer diets were supplemented with a vitamin-antibiotic preparation obtained from a commercial drug firm.

The calves were allowed colostrum from their dams and were separated at 7 days of age, and then transferred to the calf stalls. A preliminary whole-milk feeding period of about 7 days was allowed for the calves to adjust to the stalls and to teach them to drink milk from the pail. They were then fed the milk replacers at the rate of 20 per cent of their body weights. The milk replacers were fed from the pails at a temperature of approximately 37°C twice daily at about 7.00 a.m. and 4.00 p.m. The calves were weighed at 6.00 a.m. twice a week before feeding. Height at withers of the calves was measured at weekly intervals. Feed intake was recorded daily. At the end of 45 days feeding, all the calves were slaughtered. Weights of the different by-products were taken immediately after removal from the carcasses. Each dressed carcass was chilled for approximately 24 hours after which they were separated into selected wholesale cuts as veal shoulder, ribs, lion, and legs. Each portion was weighed. Parts were randomly selected for the chemical analyses and sensory evaluation tests.

The lion musles from the calves on the four treatments were roasted in an electric oven at 325°F to an internal meat temperature of 160°F. Raw weights, cooking loss, percentage dripping and cooking time were recorded. The roasted meat was served to a panel of ten judges in individual booths in a taste panel room. The scoring instrument included a 9-point rating scale for color, flavor, off-flavor, juiciness, tenderness, and general acceptability.

Chemical Composition of Meat.

A summary of the chemical composition of meat is given in Table 9.

Table 9. Mean chemical composition of meat.

treatment	dry matter %	moisture %	ash %	crude protein %	crude fat %	gross energy %
I	33.19[a]	66.81	2.96[a]	57.06[a]	22.48[a]	7454.89[a]
II	27.51[b]	72.49	3.73[b]	65.02[ab]	6.74[b]	5059.53[a]
III	27.44[b]	72.56	3.76[b]	67.94[b]	4.80[b]	5127.95[a]
IV	27.72[b]	72.28	4.12[b]	64.37[ab]	3.07[b]	5010.40[a]

Any two means with the same superscripts are not statistically different from each other at $P < .05$.

CONCLUSIONS.

Twelve one-week old male calves including four Jerseys and eight Holsteins were used to study the effects of feeding different combinations of soybean milk and skimmilk as liquid milk replacers on the growth performance of dairy calves and carcass yield and quality of their veal.

The calves were raised on individual calf stalls elevated two feet from the concrete floor of a calf shed. Each stall was equipped with feeding and drinking pails supported by metal rings and adjustable calf neck restrainers.

Four experimental diets were used. They consisted of the following :

Treatment I (Control) whole fresh milk alone.

From the results of this study, the following conclusions were drawn :

1. The chemical composition of the soymilk : skimmilk replacers contained almost the same amount of crude protein as whole cow's milk but were lower in dry matter and crude fat content. The chemical composition (dry matter, crude protein, crude fat) of the three milk replacers increased and those of ash and N F E decreased, as the proportion of soymilk in the milk replacer was increased from 25 to 75 percent.

2. The mean daily feed consumption in treatment I (whole milk) was not significantly different from that in treatments II and III (soymilk : skimmilk = 25 : 75, 50 : 50), but was significantly greater ($P < .05$) than that in treatment IV (soymilk : skimmilk = 75 : 25). The calves on whole milk made the highest body weight gain (1.03 kg/day). Those on the three milk replacers made only 0.13 to 0.3 kg/day. The calves fed whole milk were more efficient in converting feed to meat than the calves fed the milk replacers (5.53 kg vs. 12.4, 22.1 and 21.9 kg for treatments II, III and IV, respectively), but calves on treatment I did not show a significantly greater feed conversion efficiency than those on treatment II. The data showed that the calves would have to consume more milk replacers than whole milk to get the same effect on wight gain.

3. The initial weights were comparable, but the final weights and daily gains of calves fed whole milk were significantly greater ($P < .01$) than those fed the milk replacers (treatments II, III and IV).

4. The mean initial and final height measurements of the calves on the four treatments were not significantly different, but the daily increase in height of calves on treatment I was significantly greater ($P < .01$) than those on treatments II, III and IV.

5. Meat yields from veal calves fed whole milk were significantly higher than those of calves fed the milk replacers, but the dressing percentage of carcasses of calves on all the treatments was not significantly different. The mean weight of the different slaughter by-products from treatment I was significantly higher ($P < .05$) than mean weight of those from treatments II, III and IV.

6. The chemical composition of the meat of calves on treatment I was significantly greater in dry matter ($P < .01$) than that of calves on treatments II, III and IV. The protein content of the meat from all treatmants were almost the same, and the fat content of the meat of calves on treatment I was significantly greater ($P < .05$) than treatments II, III and IV. The meat of calves on all treatments had almost the same amount of gross energy per gram.

7. There was a highly significantly difference in weight of fresh meat of calves on the four treatments. The percentage of loss in cooking after roasting was not significantly different except, in treatment IV which differed significantly ($P < .05$). Veal from treatment I significantly needed more ($P < .05$) cooking time than veal from treatment III. However, it was not significantly different from treatments II and IV.

8. The flavor of the roasted meat from all treatments was graded low good or good flavor but there was no off-flavor for meat from any of the treatments. Tenderness of the meat from all the treatments was graded slightly tender to moderately tender. The general acceptability seemed to indicate that these meats were liked slightly or moderately.

สาระสังเขป

ในการทดลองเพื่อศึกษาการเจริญเติบโตของลูกโค เปอร์เซ็นต์ของซาก และคุณภาพของเนื้อลูกโค โดยใช้อาหารซึ่งประกอบด้วยน้ำนมถั่วเหลืองผสมกับนมผงละลายน้ำและเพิ่มปฏิชีวนะในอัตราส่วนการผสมต่าง ๆ กัน โดยเริ่มให้ลูกโคกินอาหารทดลองเมื่ออายุได้เจ็ดวัน ซึ่งใช้ลูกโคทั้งหมดสิบสองตัว เป็นพันธุ์เจอร์ซีเสียสี่ตัวและเป็นพันธุ์โฮลสไตน์แปดตัว ลูกโคเหล่านี้ นำไปเลี้ยงในคอกที่เตรียมไว้พิเศษ โดยทำเป็นคอกขังเดี่ยวพื้นไม้สูงจากพื้นคอนกรีตสองฟุต แต่ละคอกมีรางอาหารและถังน้ำเตรียมไว้โดยเฉพาะ และที่คอมีห่วงบังคับเพื่อบังคับไม่ให้ลูกโคออกกำลังมากเกินไป

สำหรับอาหารที่ใช้ในการทดลองมีส่วนผสมดังต่อไปนี้

สูตรที่ หนึ่ง ซึ่งเป็นอาหารที่ใช้เปรียบเทียบ ใช้น้ำนมโคอย่างเดียว

สูตรที่ สอง น้ำนมถั่วเหลือง ๒๕% ต่อ นมผงผสมน้ำ (๑ ต่อ ๑๐) ๗๕%

สูตรที่ สาม น้ำนมถั่วเหลือง ๕๐% ต่อ นมผงผสมน้ำ (๑ ต่อ ๑๐) ๕๐ %

สูตรที่ สี่ น้ำนมถั่วเหลือง ๗๕% ต่อ นมผงผสมน้ำ (๑ ต่อ ๑๐) ๒๕ %

ก่อนที่จะให้กินอาหารทดลอง ปล่อยให้ลูกโคดูดนมแม่ก่อนเจ็ดวัน แล้วจึงนำไปเลี้ยงในคอกที่เตรียมไว้และให้อาหารทดลองประมาณเจ็ดวัน เพื่อให้ลูกโคคุ้นเคยกับอาหารใหม่ก่อน จากนั้นจึงเริ่มทำการทดลองโดยให้อาหารประมาณ ๒๐% ของน้ำหนักตัวต่อวัน โดยแบ่งให้สองเวลาคือตอนเช้าประมาณ ๖.๐๐ น. และตอนเย็นประมาณ ๔.๐๐ น. การชั่งน้ำหนักลูกโคกระทำสองครั้งต่อหนึ่งอาทิตย์ และการวัดส่วนสูงที่ไหล่กระทำอาทิตย์ละครั้ง และอาหารที่ให้กินแต่ละวันจดไว้ทุก ๆ วัน เมื่อทำการทดลองครบ ๔๕ วันแล้วทำการฆ่าลูกโคทั้งหมด อวัยวะทุกส่วนจดน้ำหนักไว้หมดเพื่อเปรียบเทียบถึงผลที่ได้ สำหรับซากนำเข้าห้องเย็นเก็บไว้ประ-

มาณ ๒๔ ชั่วโมง นำออกมาตัดเป็นชิ้นส่วนตามมาตรฐานคือ Veal shoulder, ribs, lion และ legs และใช้วิธีคัดเลือก (Random) เอาเพียงส่วนเดียวไปวิเคราะห์ทางเคมีและทดลองคุณภาพเนื้อ

จากการศึกษาพอจะสรุปได้ดังต่อไปนี้

๑. ถึงแม้ว่าส่วนประกอบของน้ำนมถั่วเหลืองที่ผสมกับนมผงละลายน้ำจะมีจำนวนโปรตีนเท่ากับจำนวนโปรตีนในน้ำนมโคก็ตาม แต่ส่วนประกอบอย่างอื่นไม่เท่ากันโดยเฉพาะพวก dry matter และ fat content

๒. ค่าเฉลี่ยของ Daily feed consumption สูตรที่ หนึ่ง ไม่แตกต่างกับสูตรที่ สองและสาม แต่แตกต่างกับสูตรที่ สี่ มาก ลูกโคที่เลี้ยงด้วยน้ำนมโคจะให้น้ำหนัก ๑.๐๓ กก/วัน ส่วนที่เลี้ยงด้วยอาหารทดลองจะให้น้ำหนักเพียง ๐.๑๓ ถึง ๐.๓ กก/วัน เท่านั้น

๓. ความสูงของลูกที่เลี้ยงด้วยน้ำนมโคจะมากกว่าพวกที่เลี้ยงด้วยอาหารทดลอง

๔. ลูกโคที่เลี้ยงด้วยน้ำนมโค จะให้เนื้อมากกว่าพวกที่เลี้ยงด้วยอาหารทดลอง

๕. โปรตีนในเนื้อที่เลี้ยงด้วยน้ำนมโคและอาหารทดลองมีจำนวนที่ใกล้เคียงกันและให้ gross energy ต่อกรัมเท่านั้น

๖. เปอร์เซ็นต์ที่สูญเสียในการย่างด้วยเตาไฟฟ้าไม่แตกต่างกัน เว้นแต่สูตรที่สี่เท่านั้น

๗. ความนุ่ม (Tenderness) ของเนื้อทุกสูตรจัดอยู่ในขั้นมาตรฐานที่เรียกว่า Tender ถึง Moderately tender.

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