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Effect of Finishing Crossbred Meat Goats with a Similar Total Quantity of Finisher Ration Over Variable Duration

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Summary

The objective of this research was to assess the effect of finishing weaned crossbred meat goats with a similar total quantity of finisher ration over variable duration on meat goat production performance measures. Thirty weaned crossbred kids were blocked by body weight and genotype and assigned to three different lengths of finishing periods (45 days, 90 days or 135 days). Each finishing period treatment was replicated in two 0.4 ha Joy chicory (*Cichorium intybus* L.) plots with 5 kids in each and supplemented with 138 kg of commercial finisher ration over 45 days, 90 days or 135 days. While total finisher-ration consumption (27.30 kg, 27.49 kg and 28.26 kg/head) and cost ($9.90, $9.83 and $9.76 for the 45-day, 90-day and 135-day-finishing durations, respectively) did not differ statistically, finisher ration cost-per-kg gain ($1.89, $1.54 and $1.39, respectively) decreased linearly ($P < 0.05$) and total live-weight gain (5.18 kg, 6.42 kg and 7.23 kg) and return-over-finisher ration ($4.42, $7.79 and $19.82, respectively) increased linearly ($P < 0.05$) with increase in length-of-finishing period. Finishing weaned meat goats over a longer duration with the same quantity of finisher ration was economically beneficial if labor costs are not included. When labor cost was factored into the equation, cost per kg gain increased and return-over-feed cost and labor decreased linearly ($P < 0.05$) with increase in length-of-finishing period from 45 days to 135 days of finishing. Finishing over a longer period resulted in negative return, which decreased linearly from -$0.08 for the 45 days, to -$1.21 for the 90 days and -$3.36 for the 135-day finished groups. It was not economically beneficial to finish crossbred meat goats using paid labor. Boneless-retail cut from the leg, loin, shoulder and rack increased linearly ($P < 0.05$) from 45 days to 135 days of finishing. No significant difference was observed in back-fat thickness while kidney, pelvic and heart fat tended to be higher for the 45-day-finished group

Key Words: Meat Goat, Finishing Period, Chevon Production, Return Over Finisher Ration Cost

Introduction

With the ever-increasing ethnic population in the United States, the demand for goat meat is on the rise. Forages/browse constitute the major feed resources for meat-goat producers in Tennessee during much of the year (Ball et al., 1991). Considering the high-nutrient need of weaned meat goats in their active stage of growth, it may be practically impossible to meet their nutrient needs for finishing on a forage diet alone. This is more so during the winter and summer seasons when native forages precipitously decline in nutrient quality and quantity. As a consequence, growth rate of weaned kids remains sub-optimal, and they take longer to attain market weight (Lema et al., 2008).

Any finishing diet for meat goats should be carefully assessed in terms of its cost effectiveness and ability to meet the animal's nutrient needs. Provision of supplemental commercial grower/finisher ration for meat goats is widely practiced in Tennessee, often without any guideline or standard. This condition can result in under feeding or over feeding of animals, which may indirectly affect the return from a meat-goat enterprise.

To ameliorate this situation, evaluation of the economics of alternative-finishing methods and their effect on other performance variables is of paramount significance. The general belief held by livestock producers is that finishing on a high plane of nutrition over a short duration is more economical in contrast to finishing over a longer period of time. This is because the longer the animal is finished, the higher the feed and labor costs. To date, there is no research information on the influence of finishing meat goats using the same total quantity of finisher ration over variable duration on meat-goat-performance measures.

The objective of this study was to evaluate the effect of finishing crossbred meat goats with a similar total quantity of finisher ration for 45 days, 90 days or 135 days on growth rate, chevon production (boneless-retail cut), carcass characteristics and return-over-feed cost.

Materials and Methods

Joy forage chicory (*Cichorium intybus* L.) was planted in six 0.4 ha plots on Arlington silt loam (Fine-silty, mixed, thermic cumulic hapludoll) soil at Tennessee State University, Agricultural Research and Education Center (36° 7' N, 86° 41' W; Nashville, Tenn.) at the rate of 23 kg per ha according to vendor recommendation. Before planting, soil samples were taken and plots were fertilized with 30 kg/ ha of ammonium nitrate according to soil test.

In the summer of 2009, thirty weaned F1 crossbred does (Kiko x Boer, Kiko x Spanish and Spanish x Boer) 120 days ± 8 days old were dewormed with Ivomec at 1ml per 21 kg body weight for internal parasite, blocked by body weight and genotype and randomly assigned to the six plots with 5 kids per plot. Subsequently, replicated plots with five kids in each were randomly assigned to 45-day, 90-day or 135-day-finishing-period treatments and group fed a total of 138 kg of commercial-finisher ration at the rate of 3.1 kg, 1.52 kg and 1.03 kg per day/per group, respectively over the entire finishing duration. The total of 138 kg finisher ration used was determined based on previous related experiments.

Animals in each plot were fed daily at 9:00 AM CST with their respective quantity of finisher ration and refusals recorded at 9:00 AM CST the next morning. Finisher-ration feeding was started as soon as the does were placed in their respective plots. Animals were continuously grazed throughout the finishing period. Based on visual observation, all the plots were comparable in pre-grazing herbage mass at the start of grazing. Stocking rate in each plot was deliberately kept low so that animals on the longer finishing durations would still have sufficient forage until the end of the finishing period, and forage availability would not influence the difference between the short- and long-finishing durations. Finisher-ration consumption was closely monitored and adjusted to keep total consumption for the finishing durations similar.

Water and a mineral and vitamin supplement (20 percent Na Cl, 16 percent Ca, 7 percent P, 1 percent Mg, 1 percent K, 1.25 percent S, 600 ppm CO, 70 ppm I, 2000 ppm Fe, 3000 ppm Mn, 60 ppm Se, 5000 ppm Zn, 225,000 IU/lb vitamin A, 40,000 IU/lb vitamin D-3 and 210 IU/lb vitamin E; Zinpro Corporation, Chaska, Minn.) was available free choice in each plot throughout the finishing period.

Does were weighed at two-week intervals and daily, biweekly and season-long average-weight gain estimated by regressing body weight gain over time. Finisher-ration samples were composited daily dried at 60 C° in a forced draft oven ground to pass 1-mm screen in a Wiley Mill and stored in air-tight Ziploc bags for chemical analysis at the end of the experiment. Feed samples were analyzed for dry matter (DM) (AOAC, 1995). Crude protein (CP), acid-detergent fiber (ADF) and neutral-detergent fiber (NDF) were determined using NIRS. Net energy (NE) was calculated according to Moore and Undersander (2002). The macro- and micro-mineral elements (P, K, Ca and Mg) were assayed using Perkin-Elmer SCIEXELAN600 Inductively Coupled Plasma Mass Spectrometry (Applera Corporation, Norwalk, Conn.).

At the end of the finishing period, final body weight was recorded, and does were kept off finisher ration over the weekend before being transported to an abattoir in Chapel Hill, Tenn. and slaughtered for carcass-characteristic determination. Slaughter weight and hot-carcass weight (HCW) were recorded, and carcasses chilled for 24 h before recording chilled-carcass weight (CCW). Hot-carcass weight and CCW were used to calculate hot-dressing percentage (HDP), and chilled- dressing percentages (CDP), respectively. Kidney, pelvic and heart fat (KPH) was removed and recorded. Carcasses were ribbed between the 12th and 13th ribs and back-fat thickness measured in mm. Subsequently, carcasses were separated into the four, major retail cuts (leg, shoulder, loin and the rack), and the leg and shoulder were de-boned and weights recorded.

Growth rate, chevon production (boneless-retail cut), carcass characteristics, feed-cost-per-kg gain and return-over-finisher-ration cost were used as major criteria for evaluating treatment effects. The data generated from the experiment was analyzed via ANOVA for a randomized complete block design (SAS, 1995) with the model including duration of finishing, block, genotype and interaction effects. Treatment means were separated using Least Square Means procedure.

Results and Discussion

Table 1 shows the chemical composition of the commercial finisher ration used in the study.

Total finisher-ration intake for the entire finishing period for the three finishing durations was similar (Table 2), as planned. Table 3 shows live-weight gain, cost-of-finisher-ration consumed, finisher-ration cost per gain and return-over-finisher ration and labor cost associated with the three finishing durations.

Table 1. Chemical composition of commercial finisher ration used in the study (DM basis)

Nutrient	
Crude protein, %	15.50
Ether extract, %	3.46
Acid -detergent fiber, %	22.00
TDN, %	80.50
Ash, %	8.00
Net Energy[1], Mcal/kg	1.60
Ca, mg/kg	12,400.00
P, mg/kg	5820.00

[1] Calculated

Slaughter weight, though not statistically different among the three finishing durations, showed an increasing trend with increase in finishing duration. Average-daily gain decreased linearly ($P < 0.05$) with increase in length of finishing period. The opposite was true for total live-weight gain. Finisher-ration efficiency (kg weight gain divided by kg finisher-ration consumption) was lowest for the 45-day duration and increased linearly ($P < 0.05$) with increase in length-of-finishing period. In spite of similar total finisher-ration consumption, dollar value of live weight increased linearly ($P < 0.05$) with length of finishing period.

Table 3. Effect of finishing crossbred meat goats with similar total quantity of finisher ration for 45, 90 or 135 days while grazing Joy chicory.

	Duration of finishing, Days			
	45	90	135	SEM
Initial weight, kg	21.06	21.50	21.03	1.01
Slaughter weight, kg	26.24	27.92	28.26	1.22
Finisher ration intake, kg	27.30	27.47	28.00	0.16
Live weight gain				
Start to slaughter, kg	5.18[a]	6.42[b]	7.24[c]	0.85
Daily, g	115.22[a]	71.33[b]	53.60[c]	23.14
Finisher ration efficiency[1]	0.19[c]	0.23[b]	0.26[a]	0.06
Dollar value of live weight gain[2]	14.25[c]	17.68[b]	19.90[a]	0.11
Cost of finisher ration[3], $	9.83	9.89	10.08	-
Finisher ration cost / kg weight gain, $	1.89[a]	1.54[b]	1.39[c]	0.10
Return over finisher ration, $	4.42[c]	7.79[b]	9.82[a]	0.02
Labor cost[4], $	4..50[c]	9.00[b]	13.50[a]	-
Return over grower ration and labor, $	-0.08	-1.21	-3.36	-

[1] Kg weight gain / kg finisher ration consumed
[2] at $2.75/kg,
[3] At $0.36/kg,
[4] At $8.00/hr,
[a,b,c] Means in the same row with different superscripts are different ($P < 0.05$)

To date, there is a dearth of research data and information regarding the effect of finishing meat goats on similiar quantity of finisher ration with variable finishing period on meat-goat performance. Hence no direct comparison can be made between our results and those of other workers on the subject.

Holding total finisher-ration intake constant for the different finishing durations in the present study was essential to avoid confounding effects of finisher-ration intake, thus enabling us to measure the effect of length of finishing period independent of feed intake with respect to finisher-ration consumption. Although keeping total finisher ration constant resulted in lower daily finisher-ration allowance and consumption per animal as finishing duration increased, animals on the longer durations (90 days and 135 days) appeared to still get their daily nutrient needs as evidenced by the available post grazing herbage mass and quality.

The increase in total weight gain observed with increased length of finishing may be partly explained by the normal physiological increase in organ growth and development as the animals increase in age. Correspondingly, increased digesta-retention time typically observed at lower feeding levels might have also positively contributed to the observed improvement in total weight gain with longer finishing duration, since daily supplemental feed intake decreased as finishing duration increased.

Table 2. Finisher ration intake of crossbred meat goats.

	Duration of Finishing, Days		
	45	90	135
Total, kg	27.30	27.49	28.00
Per day, g	606.70	305.40	208.00
Per kg live weight, g/day	28.22	14.50	9.95
Net energy intake, Mcal/day	0.97	0.49	0.33

Regardless of finishing duration, average-daily gains of animals under the three finishing treatments were relatively low. This might suggest that the amount of nutrient offered or available to the animals might have been insufficient for maximal weight gain, or as reported by Lema et al. (2008) that meat goats generally do not respond well in growth rate to concentrate supplementation similar to beef cattle, and it may be more economical to raise meat goats on good quality browse/forage alone (Wildeus et al., 2004).

While cost-of-finisher-ration consumed remained similar for the three finishing periods, cost per kg of weight gain decreased and return-over-finisher ration increased ($P < 0.05$) linearly with length of finishing. However, when labor cost, which included number of hours needed to feed, water and care for the animals under each finishing duration was factored into the equations, the extra return obtained as a result of prolonging finishing period was not sufficient to offset the increased labor cost associated with longer finishing period. With labor cost included, none of the three finishing periods were economically beneficial. The data suggest that, if unpaid, family labor is utilized it is beneficial to finish crossbred meat goats over a longer period of time with the same quantity of finisher ration rather than to attempt to finish them in a short duration.

Both chilled- and hot-carcass-dressing percentages increased linearly ($P < 0.05$) with increasing length of the finishing period (Table 4). Because the animals were off feed (concentrate feed) over the weekend before they were slaughtered, dressing percentages for all the three finishing durations were relatively low. Boneless-retail cut from the leg, loin, shoulder and rack also showed a similar trend (Table 4). Likewise, boneless leg, loin weight, rack and boneless shoulder weights tended to increase with length of finishing. Back-fat thickness and carcass-fat cover were similar among the three finishing durations. On the other hand, kidney, pelvic and heart fat was highest ($P < 0.05$) for the 45 day than for the 90-day and 135-day finished groups, suggesting that when meat goats are finished within a short duration on a high plane of nutrition, excess consumed energy is preferentially deposited as fat in these regions of the carcass

Conclusions

Based on the results of this research, we conclude that provided unpaid, family labor is available and other conditions are not limiting, it is economically advantageous and provides enhanced return from meat-goat enterprises by finishing crossbred meat goats using the same quantity of finisher ration over a longer finishing period rather than attempting to finish them fast over a short period. Finishing meat goats using paid labor is not cost effective. If family labor is not available, it may be more economically sound to finish meat goats on good quality pasture or browse alone.

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Table 4. Effect of finishing crossbred meat goats while grazing Joy chicory on major retail cuts and carcass characteristics.

	Duration of Finishing, Days			
	45	90	135	SEM
Slaughter wt. kg	26.24	27.92	28.26	1.01
Hot carcass weight, kg	9.32[a]	9.36[a]	13.11[b]	0.40
Chilled carcass weight, kg	8.84[a]	9.12[a]	12.79[b]	0.41
Hot carcass dressing percentage	31.59[a]	34.05[b]	46.39[c]	0.91
Chilled carcass dressing percentage	29.97[a]	33.18[b]	45.26[c]	0.11
Boneless shoulder, kg	1.32[a]	1.39[a]	2.18[b]	0.05
Boneless leg, kg	2.03[a]	2.07[a]	2.83[b]	0.02
Loin weight, kg	0.52[a]	0.62[a]	0.99[b]	0.52
Rack, kg	2.29[a]	2.99[a]	4.19[b]	0.34
Boneless retail cut[2], kg	6.18[a]	7.07[b]	10.20[c]	0.71
Back-fat thickness,mm	0.18	0.18	0.16	0.01
Kidney, pelvic and heart fat, g	0.17[a]	0.04[b]	0.05[b]	0.01

[1] Boneless shoulder + Boneless leg + Loin weight + Rack
[a,b,c] Means in the same row with different superscripts are different ($P < 0.05$)

