# TERMINAL REPORT

## Ipil-ipil (Leucaena Leucocephala) In Rations For Fattening Goats

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# IPIL-IPIL (Leucaena leucocephala) IN RATIONS FOR FATTENING GOATS*

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## A B S T R A C T

The scarcity of forage during the dry months and developments of pasture areas into residential sites pose as a big problem to Filipino goat raisers particularly in the urban areas. In order to aleviate the situation, experiments on raising goats in total confinement was undertaken to determine its effect on the growth rate of goat fatteners. One hundred twenty (120) castrated goats were utilized in a study conducted in Alabang, Muntinlupa, Metro Manila and in Iwahig Prison and Penal Farm in Iwahig, Palawan. The sixty (60) goats alloted in each experimental site were randomly picked and grouped into six, where each group was identified as a treatment. Identical procedure/methodology was adopted in Alabang and in Palawan experimental goats.

Different feeding managements however, were employed in each treatment group. Grass, banana leaves and stalks, and cassava leaves were fed to the goats, where five treatments were raised in total confinement and one treatment was allowed to graze at day time. Supplementary feeding of concentrates containing varying levels of dried ipil-ipil (Leucaena leucocephala) 20% and 40% were given the animals in the evening. Two times weighing and body measurements of the experimental goats were undertaken every month during the entire feeding trial. Likewise, the feed intakes of the confined animals were recorded as well as the proximate chemical

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analysis of feeds.

Upon evaluation of data gathered at Alabang, it appeared that incorporating 40% dried ipil-ipil leaves to the concentrate feeds will cause the goats to attain higher average daily gain in weight as well as an increase in body measurement. It was observed also that average lean-bone ratio was highest in the group fed with concentrates containing 40% dried ipil-ipil leaves. Cost benefit analysis indicated that the cost of production is much lower in that group as compared to the other treatment groups, both in Alabang and in Palawan.

## INTRODUCTION

Many Filipino farmers at present are becoming interested in goat production. They raise their animals either in backyard or in commercial scale. The country's total goat population in 1978 was 1,289,850 heads, with the Central Visayas region having the biggest number of 248,400 or 19 percent.

This was followed by Ilocos and Western Visayas regions with 240,570 (18 percent) and 130,610 (10 percent), respectively.

Through the Bureau of Animal Industry the Philippine government launched a livestock dispersal program which includes the distribution of breeding does to bonafide farmers. The program's objectives are to augment the farmer's income and to participate in the campaign for increased meat production. Raising goats is not expensive and laborious as in cattle and carabaos. Furthermore, they are docile and easy to manage, so that even women or children can look after them. Grazing and tethering are the two common systems of feeding management practised in the country.

There are two problems however, that confront the farmers who are engaged in goat raising. These are scarcity of forage during the dry season months and the reduction of grazing lands due to the fast developments of agricultural areas into residential subdivisions. During the months from January to May, grass in the pastures particularly in Luzon and the Visayan islands become dry. As a consequence of this long drought the goat lose weight and more often, their reproductive performance is adversely affected, Patricio and Navarro (1981).

The government encourages and supports researchers to undertake studies in goats particularly in the fields of nutrition and breeding. This move inspired researchers to conduct studies on goat feeding, utilizing non-conventional feeds such as farm by-products as supplementary rations. Ipil-ipil (Leucaena leucocephala) leaves which are available throughout the year were also utilized as feeds. However, only a few studies on the use of dried ipil-ipil leaves as component of rations for goats have been locally undertaken.

These researchers are intending to conduct a study where goats will be individually raised in stalls and fed with chopped grass, to be supplemented with concentrates containing varying levels of dried ipil-ipil leaves. With this study it is hoped that the two constraints aforesaid would find solutions.

## REVIEW OF LITERATURE

Bañes (1971) advocates that raising goats in total confinement will eliminate parasite infestation in the herd. The absence of goats

in the pasture interrupts the life cycle of parasites. Does fed in stalls with fodder and hay produced one kilogram milk daily even without concentrates (Maheswari and Talapatra, 1975). In Indonesia where most agricultural lands are irrigated and two or more crops are raised in a year, goats are never turned out in the pasture. According to Rumnch (1979) the animals are raised in confinement and fed with grass or ipil-ipil leaves with concentrate supplement. This worker further revealed that palm, mangrove, cassava and jackfruit tree leaves were also used to feed the goats.

In a feeding trial in feedlot cattle conducted by Marbella and associates (1979), feeding 50 percent rice straw plus 40 percent ipil-ipil leaves plus 10 percent concentrates yielded an average daily gain in weight of 0.70 kilogram per head. These workers concluded that utilization of rice straw and ipil-ipil as livestock feeds offers a good potential for big production as valuable feeds and additional income.

Arinto (1979) demonstrated that feeding 75 percent ipil-ipil leaves to does in the form of roughage gave significantly higher daily and total liveweight gains than those fed with 50, 37.5 and 19 percent. He further observed that the kidding rate averaged 1.5 per kidding. This result supported previous claim that ipil-ipil feeding to does even at 75 percent dry matter feeds is not harmful to their reproductive performance.

Based from Patricio's (1956) finding, mixing 5, 10 and 15 percent ipil-ipil leaf meal in rations for growing and fattening

pigs hastened growth and increased average daily gain in weight. The animals fed with 15 percent gave the highest average daily gain in weight, followed by those given 10 percent. The differences in average daily gain in weight among the three treatment however, were not highly significant. Falling of hair occured among animals in the treatment that were given the highest percentage of ipil-ipil leaf meal.

These level of feeding ipil-ipil leaf meal was corroborated by Castillo (1966), who recommended 5 to 15 percent for fattening and sow rations. For ruminants such as dairy cows, beef cattle and carabaos he is recommending a 20 percent level or slightly higher to be mixed with concentrates.

The dry matter and total digestible nutrient intake of breeding goats from initial feeding to kidding period was significantly affected by the 20 and 35 percent levels of dried ipil-ipil leaves, with or without urea and dicalcium phosphate (Faylon, et. al., 1981a; 1981b).

## O B J E C T I V E S

1. General

   To maximize the utilization of ipil-ipil leaves and evaluate its value in rations for fattening goats.

2. Specific

   a) To determine the effects of different levels of ipil-ipil leaves (fresh and dried) in rations for fattening castrated goats.

   b) To determine and compare the growth performance of castrated goats raised in stalls fed with ipil-ipil leaf meal and goats raised in the range or pasture.

c) Maximize the utilization of locally available crop residues and agro-industrial by-products.

d) To determine the economics of fattening goats in stalls.

## M E T H O D O L O G Y

The experimental aspects of the research project were conducted at the Bureau of Animal Industry's research station in Alabang, Muntinlupa, Metro Manila and at the Iwahig Prison and Penal Farm in Iwahig, Palawan. Sixty (60) castrated native goats with ages ranging from 6-7 months were utilized in each experiment station. Picking at random, the goats were equally grouped into six, where each group was identified as a treatment and each goat in the treatment as a replicate.

One month prior to the actual feeding trials, the experimental goats were pre-conditioned and given the time to become familiar with their new environment, since they were all raised in the extensive system by their former owners. For roughage the goats were fed with grass and farm by-products such as banana leaves and stalks, cassava and ipil-ipil leaves. Concentrate feeds containing varying levels of dried ipil-ipil leaves were also fed to the goats as feed supplement.

Except for the animals in Treatment I (control), which were allowed to graze during day time and confined at night, the rest were raised in total confinement and fed individually in stalls. Each treatment however, was given a specific feeding system and

with different feeds throughout the entire duration of the feeding trials (Table 1). The Complete Randomized Design was adopted as the experimental design.

The grass, banana leaves and stalks, and cassava leaves were chopped before feeding to the goats in confinement. Banana leaves and stalks and cassava leaves were fed to Treatment II goats twice a day, in the morning and at noon time. Grass was given in the afternoon. Treatment III animals were fed with fresh ipil-ipil leaves in the morning and grass in the afternoon.

Treatments IV, V and VI goats were fed grass three times daily with concentrate supplements given later in the afternoon and left to the animals until the following morning. The amount of feeds consumed by an individually confined animal during a 24-hour period was considered as its feed intake for that day. Determination of feeds intake is done by deducting the weight of left over from the weight of the feeds initially given to the animals. Laboratory examinations for proximate analysis of nutrient composition of the different feedstuffs given to the experimental goats were undertaken twice a month (Table 2).

The experimental goats were weighed twice a month in order to determine individual changes in liveweight. Likewise, the body conformation such as height, body length and heart girth were also determined and recorded after weighing the animal. One year after the experimental feedings were implemented, three goats from each treatment group in Alabang were slaughtered and their carcasses were evaluated for dressing percentage and meat quality. The above

procedures were not undertaken in Palawan due to lack of facilities and personnel who will do the job.

Different chevon products such as curry (caldereta), sausages, corned chevon and ham were made from the carcass. Those meat products were cooked and all were subjected to sensory evaluation by a panel composed of selected personnel from the Bureau of Animal Industry's Research Division. The cost benefit of production was also evaluated on the basis of total cost of feed consumed for every kilogram gain in liveweight.

## R E S U L T S

Tables 3 and 6 show the changes in the liveweights of the experimental goats in Alabang and Palawan research project sites, respectively. The goats in Treatment V at Alabang, which were fed chopped grass and supplemented with concentrate feeds containing 40 percent dried ipil-ipil leaves had the heaviest mean liveweight of 22.66 kilograms. The Treatment II goats which were fed chopped grass, banana leaves and stalks and cassava leaves, without concentrate supplement was lightest at 16.55 kilograms.

The results in Palawan was in contrast with Alabang. Treatment I goats which were allowed to graze during the day and without feed supplement had the heaviest mean liveweight of 19.51 kilograms and lightest was also Treatment II with 13.48 kilograms, which is the same as in Alabang. It was observed among the experimental goats in Palawan that thay refused to take in the concentrates

given to them during the early part of the feeding trials. A big number of experimental animals died during the third and fourth month, caused by pneumonia and stress.

The daily gain in liveweight in Treatment V in Alabang was 49.09 grams, which is comparable to the results obtained by Devendra (1982), who reported an average daily gain in liveweight of 32.9 and 55.8 grams, using indigenous Katjang goats feed with 50 percent grass plus 50 percent ipil-ipil and 25 percent grass plus 75 percent ipil-ipil, respectively. Faylon, et al. (1981a) observed an increase in the daily gain in liveweight from 30.18 to 60.28 grams or an average of 45.23 grams, which is very close to the results gathered from this study. Those workers utilized female goats fed with rations containing 20 percent ipil-ipil with urea and CaHPO4 supplementation.

The final average height, body length and heart girth was proportional to the increase in liveweights both in Alabang and Palawan as presented in Tables 5 and 8, respectively. Treatment V in Alabang attained a final average height of 64.3 centimeters, body length of 118.0 centimeters and heart girth of 75.9 centimeters. Feed conversion efficiency (FCE) for Treatment V in Alabang was 14.81, which was most efficient feed converters is also shown in Table 5. In Palawan, Treatment III appeared to be the most efficient converters of feed which is also presented in Table 8. The FCE in Alabang experimental goats is closer to the reports of Devendra (1982), who observed 15.9 when he fed goats with 50 percent grass plus 50 percent ipil-ipil leaves and 11.5

FCE from goats fed with 25 percent grass plus 75 percent ipil-ipil leaves.

Tables 4 and 7 present the total daily dry matter intake (DMI) of goats in Alabang and Palawan, respectively. Treatment IV goats in Alabang which had the highest DMI, 766.35 grams per day had also the highest DMI as percentage body weight which was 3.89 percent. On the other hand, Treatment V goats in Palawan was highest in DMI at 557.15 grams per day and the DMI as percentage body weight was 3.46 percent. The total DMI and DMI as percentage body weight both in Alabang and Palawan are comparable to the results gathered by Devendra (1982), 505.3 grams to 550.3 grams with DMI as percentage body weight at 4.8 and 4.7 percent, respectively when he fed 50 percent grass plus 50 percent fresh ipil-ipil leaves and 25 percent grass plus 75 percent fresh ipil-ipil leaves to Katjang goats in Malaysia.

In other related findings Devendra (1980b, 1983b and 1983c) observed a daily DMI of 611.4 grams with a lower DMI as percentage body weight of 2.53 percent when pregnant goats were fed with grass and concentrates, 474.8 to 556.7 grams and DMI as percentage of body weight at 1.8 and 2.0 percent when goats were fed fresh rice straw and stored older rice straw, respectively. Using Kambing Katjang bucks, he gathered 307.4 to 303 grams DMI per day or 1.5 to 1.6 percent as DMI percentage body weight. Earlier reports of Sharma and Murida (1977) and Devendra (1978 and 1984) on DMI as percentage body weight are higher at 3.03 percent and 3.0 percent for meat goats and 5.0 to 7.0 percent for dairy goats respectively.

The feed conversion efficiency (FCE) in Alabang which is presented also in Table 5 shows Treatments V, VI and IV required the least amount of DMI to have increase in liveweights, such as 14.81, 15.92 and 18.04, respectively. Treatment II on the other hand, required the most amount of DMI at 30.77 grams. In Palawan, Treatment III animals had the least amount of DMI, 13.61 grams. This was followed by Treatments V and IV with 18.12 and 18.17, respectively. The same as in Alabang, Treatment II in Palawan required the most amount of DMI to have an increase in liveweight, which is 31.75. Feed conversion efficiency of experimental goats in Palawan is shown on Table 8.

Correlation coefficients as shown in Table 9 between liveweight and height, body length and heart girth in all experimental goats at Alabang were all significant at 1 percent level. In Palawan however, the height and body length were not significant, except the heart girth which was significant at 5 percent level.

Table 10 presents the dressing percentage and lean-bone ratio of the slaughtered experimental goats in Alabang. Treatment VI animals indicated the highest average dressing percentage 46.11 percent, followed by Treatments I and IV with 44.26 and 43.39 percent, respectively. Average lean-bone ratio was highest in Treatment V and VI, both having identical percentages of 75.0 for meat and 25.0 for bone. This was followed by Treatment I animals 71.0 and 26.0 percent meat and bone, respectively. These results are comparable to the observations made by de Guzman (1984), 47.06

percent from bucks and 45.87 percent from castrates, while Ibarra (1984) recorded 44.1 percent from Philippine goats weighing 19 kilograms, which are higher than the observation made by Laor (1978).

Devendra and Owens (1983) reported 44.21 and 51.39 percent from uncastrated goats weighing 15-20 and 20-30 kilograms, respectively. Devendra and Burns (1983) gathered 44.2 percent from 18.6 kilograms Kambing Katjang, McDowell and Bove (1977) had 42.0 to 50.0 percent dressing percentage, depending on age, sex and level of nutrition. Argañoza, et al. (1977) reported 43.1 percent from Philippine goats weighing 19.0 kilograms, Devendra (1983a) observed 40.9 percent from does and 41.6 percent from bucks, both from culled goats about 6 to 7 years. In Fiji Laor (1978) obtained 38.6 dressing percentage from goats slaughtered in the market which is lower than the dressing percentage of Treatment II in Alabang at 38.75 percent.

The percentage of lean meat gathered from this study is higher as compared to 60.04 percent lean and 18.82 percent bone from bucks and 70.62 percent lean, 29.27 percent bone from castrates (de Guzman, 1984). Ibarra (1984) reported 63.88 percent lean and 31.48 percent bone from Philippine goats. Lower percentages were observed by McDowell and Bove (1977), 60.04 percent lean and 19.86 percent bone for small and 60.30 percent lean and 23.08 percent bone for large goats. The ratios are 57.89 percent lean - 13.68 percent bone, 57.97 percent lean - 14.28 percent bone and 57.04 percent lean - 11.97 percent bone from goats given low, medium and high plane of nutrition, respectively (Devendra, 1983a).

The average cut-up yield in kilogram and percentage of slaughtered experimental goats in Alabang are presented in Table 11. In all the treatment groups, the leg, shoulder and breast yielded the highest percentage cut-up with 31.82, 26.05 and 13.60 percent, respectively. This trend is comparable to the report of Ibarra (1984), where his findings revealed that carcass yield of leg gave the highest percentage, which is followed by the cut-up yield of shoulder using Philippine goats. The slaughter by-products yield in kilogram and percentage of the slaughtered experimental goats are presented in Table 12.

Except for odor and general acceptability as presented in Table 13a, the other traits in all treatments did not have significant differences in the evaluation of plain soup of the slaughtered goats in Alabang. Table 13b shows that juiciness and general acceptability are both significantly different in the evaluation of ham. In the evaluation of sausage and corned chevon, significant difference is observed in taste and odor, as presented in Tables 13c and 13d, respectively. The analysis of variance for final average liveweight, height, body length and heart girth for Alabang experimental goats as shown in Appendix Tables 1, 2, 3, and 4, respectively are all significant at 1 percent level. The same observation was observed in Palawan, as shown in Appendix Tables 5, 6, 7, and 8.

Appendix Tables 9, 10 and 11 present the correlation analysis between final average liveweight and final average heart girth is significant at 5 percent level, which is reflected in Appendix Table 14. The correlation analysis between final average liveweight

and final average height and body length are both shown in Appendix Tables 12 and 13, respectively.

The analysis of variance for dressing percentage of the slaughtered experimental goats in Alabang is significant at 5 percent level as shown in Appendix Table 15. Analysis of variance for the organoleptic evaluation of ham color, odor, taste and texture are all insignificant as presented in Appendix Tables 16a, 16b, 16c, and 16d, respectively. However, Tables 16e and 16f show that there is significance in ham juiciness and general acceptability, respectively. The analysis of variance for organoleptic evaluation of sausage odor and taste are highly significant and significant, respectively as shown in Appendix Tables 17b and 17c, respectively.

There is no significance in color (Appendix Table 17a), texture (Appendix Table 17d), juiciness (Appendix Table 17e) and general acceptability (Appendix Table 17f). The analysis of variance for corned chevon color and taste are both significant as shown in Appendix Tables 18a and 18c, respectively. On the other hand it is highly significant for odor (Appendix Table 18b). Appendix Tables 18d, 18e, and 18f indicate that there is no significant difference in texture, juiciness and general acceptability, respectively in the analysis of variance for organoleptic evaluation of corned chevon.

Except for odor and general acceptability of plain soup, which are both significant (Appendix Tables 19b and 19f), the plain soup color, taste, texture and juiciness are all significant as shown

in Appendix Tables 19a, 19c, 19d and 19e, respectively.

Appendix Table 20 presents the feed cost benefit analysis, where Treatment 3 both in Alabang and Palawan proved to be more economical in terms of cost of concentrate to produce 1 kilogram liveweight. In Alabang, ₱13.65 was the cost of producing 1 kilogram gain in weight, while in Palawan, it was ₱17.06.

## C O N C L U S I O N

Raising goats in total confinement, fed with grass and concentrates yield better results (gain in weight and rate of growth) than those allowed to graze during day time without concentrate feeding. Comparing the treatments fed with 20 percent and 40 percent dried ipil-ipil leaves, the latter yielded higher average daily gain in liveweight, although there is no significant difference. Feeding goats with fresh ipil-ipil leaves, 50 percent of the total ration did not have any adverse effect on the growth of goat fatteners and proved to be a substitute to grass during the dry months when the fields dry up.

Incorporating 40 percent dried ipil-ipil leaves to the concentrate feeds proved to be economical compared to those containing 20 percent and the pure commercial concentrates. These results indicated that under proper management, raising goats in total confinement can be undertaken even in commercial scale production.

A C K N O W L E D G E M E N T

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Table 1. Composition of Daily Rations Given to the Experimental Goats.

| Treatment | No. of Animals | Forage[a/] | Concentrate Supplement [b/] |
|---|---|---|---|
| I | 10 | Pasture grazing without concentrate supplement. | - |
| II | 10 | Chopped grass, banana leaves and stalks, and cassava leaves No concentrate supplement given. | - |
| III | 10 | Chopped grass and fresh ipil-ipil leaves. No concentrate supplement given. | - |
| IV | 10 | Chopped grass supplemented with concentrates containing 20% ipil-ipil leaf meal. | 0.3-0.5 kg./hd. |
| V | 10 | Chopped grass supplemented with concentrates containing 40% ipil-ipil leaf meal. | 0.3-0.5 kg./hd. |
| VI | 10 | Chopped grass supplemented with commercial concentrates. | 0.3-0.5 kg./hd. |

a/ 1) Guinea grass (*Panicum maximum*), 2) Para grass (*Brachiaria mutica*) and 3) Ipil-ipil (*Leucaena leucocephala*)

b/ Composed of 1) Rice bran (*Oryza sativa*), 2) Corn bran (*Zea mayz*), 3) Copra meal (*Cocos nucifera*), 4) Fish meal, Molasses and Minerals.

Table 2. Average Chemical Composition of Feeds and Treatment Diets.

(% Dry Matter Basis)

A. Alabang

| NAME OF FEEDS | DM* (%) | CP (%) | CF (%) | ASH (%) |
|---|---|---|---|---|
| 1. Para grass | 18.07 | 14.48 | 28.60 | 11.50 |
| 2. Guinea grass | 19.70 | 12.40 | 29.10 | 12.80 |
| 3. Banana Leaves + Stalk | 23.45 | 12.00 | 22.10 | 9.60 |
| 4. Banana Cassava Mixture | 19.16 | 12.50 | 27.70 | 13.10 |
| 5. Fresh Ipil-ipil Leaves | 25.25 | 27.40 | 14.20 | 8.60 |
| 6. 20% ipil-ipil (dry) + 80% Concentrate | 88.94 | 16.90 | 11.00 | 11.90 |
| 7. 40% ipil-ipil (dry) + 60% Concentrate | 89.08 | 18.80 | 10.90 | 11.70 |
| 8. Concentrate | 88.80 | 15.30 | 9.90 | 12.50 |

*DM in the fresh material

B. Palawan

| NAME OF FEEDS | DM* (%) | CP (%) | CF (%) | ASH (%) |
|---|---|---|---|---|
| 1. Para grass | 19.75 | 13.90 | 31.20 | 12.50 |
| 2. Guinea grass | 20.90 | 12.10 | 18.80 | 10.70 |
| 3. Banana Leaves + Stalk | 20.20 | 8.20 | 25.70 | 11.20 |
| 4. Fresh Ipil-ipil Leaves | 28.45 | 25.30 | 18.60 | 9.60 |
| 5. 20% Ipil-ipil (dry) + 80% Concentrate | 88.86 | 17.80 | 10.80 | 11.80 |
| 6. 40% Ipil-ipil (dry) + 60% Concentrate | 88.92 | 19.40 | 12.90 | 11.30 |
| 7. Concentrate | 88.80 | 15.30 | 9.05 | 12.50 |

*DM in the fresh material

Table 3. Total Gain in Weight (Kg), Daily Gain in Weight (g) and Mean Liveweight (Kg) of the Experimental Goats in Alabang.

(August 1983 to July 1984 - 365 days)

| TREATMENT | INITIAL LIVEWEIGHT | FINAL LIVEWEIGHT | TOTAL GAIN IN WEIGHT | DAILY GAIN IN WEIGHT (g) | MEAN LIVEWEIGHT (Kg) |
|---|---|---|---|---|---|
| 1 | 13.54 | 30.56 | 17.02 | 46.63 | 22.05 |
| 2 | 13.25 | 19.85 | 6.60 | 18.08 | 16.55 |
| 3. | 13.41 | 25.29 | 11.88 | 32.55 | 19.35 |
| 4 | 11.96 | 27.47 | 15.51 | 42.49 | 19.72 |
| 5 | 13.71 | 31.61 | 17.90 | 49.04 | 22.66 |
| 6 | 14.18 | 30.66 | 16.48 | 45.15 | 22.42 |

Table 4. Dry Matter Intake (g/day) and Dry Matter Intake as Percentage of Bodyweight (%) of the Experimental Goats in Alabang.

(August 1983 to July 1984)

| TREATMENT | DRY MATTER INTAKE (g/day) | MEAN LIVEWEIGHT (Kg) | DMI AS % BODYWEIGHT (%) |
|---|---|---|---|
| I | - | - | - |
| II | 556.38 | 16.55 | 3.36 |
| III | 701.52 | 19.35 | 3.62 |
| IV | 766.35 | 19.72 | 3.89 |
| V | 726.74 | 22.66 | 3.21 |
| VI | 718.67 | 22.42 | 3.20 |

Table 5. Final Average Liveweight (Kg), Variables of Body Measurements (cm) and Feed Conversion Efficiency (FCE) of the Experimental Goats in Alabang.

| TREATMENT NO. | FINAL LIVEWEIGHT (Kg) | FINAL HEIGHT (cm) | FINAL BODY LENGTH (cm) | FINAL HEART GIRTH (cm) | FCE |
|---|---|---|---|---|---|
| 1 | $30.56^{abc}$ | $63.60^{ac}$ | $118.10^{ab}$ | $74.20^{abc}$ | - |
| 2 | $19.85^{f}$ | $57.20^{e}$ | $106.10^{e}$ | $63.30^{f}$ | 30.77 |
| 3 | $25.29^{e}$ | $60.95^{cd}$ | $112.00^{d}$ | $68.70^{e}$ | 21.55 |
| 4 | $27.47^{d}$ | $61.89^{cd}$ | $114.00^{abcd}$ | $72.56^{bcd}$ | 18.04 |
| 5 | $31.61^{a}$ | $64.30^{a}$ | $118.40^{a}$ | $75.90^{a}$ | 14.82 |
| 6 | $30.60^{a}$ | $63.80^{ab}$ | $116.00^{abc}$ | $74.80^{ab}$ | 15.92 |

Note: Treatment means having a common superscript per column are not significantly different.

Table 6. Total Gain in Weight (Kg), Daily Gain in Weight (g) and Mean Liveweight of the Experimental Goats in Palawan.

(January 1984 to July 1984 - 213 days)

| TREATMENT | INITIAL LIVEWEIGHT (Kg) | FINAL LIVEWEIGHT (Kg) | TOTAL GAIN IN WEIGHT (Kg) | DAILY GAIN IN WEIGHT (g) | MEAN LIVEWEIGHT (Kg) |
|---|---|---|---|---|---|
| 1 | 14.50 | 24.52 | 10.02 | 47.04 | 19.51 |
| 2 | 12.25 | 14.70 | 2.45 | 11.50 | 13.48 |
| 3 | 10.83 | 17.40 | 6.57 | 30.84 | 14.12 |
| 4 | 13.00 | 19.32 | 6.32 | 29.67 | 16.16 |
| 5 | 12.85 | 19.40 | 6.55 | 30.75 | 16.12 |
| 6 | 12.38 | 16.22 | 3.84 | 18.03 | 14.30 |

Table 7. Dry Matter Intake (g/day) and Dry Matter Intake as Percentage of Bodyweight (%) of the Experimental Goats in Palawan.

(January 1984 to July 1984)

| TREATMENT | DRY MATTER INTAKE (g/day) | MEAN LIVEWEIGHT (Kg) | DMI AS % BODYWEIGHT (%) |
|---|---|---|---|
| 2 | 365.18 | 13.48 | 2.71 |
| 3 | 419.84 | 14.12 | 2.97 |
| 4 | 539.26 | 16.16 | 3.34 |
| 5 | 557.15 | 16.12 | 3.46 |
| 6 | 414.53 | 14.30 | 2.90 |

Table 8. Final Average Liveweight (Kg), Variables of Body Measurements and Feed Conversion Efficiency (FCE) of the Experimental Goats in Palawan.

| TREATMENT NO. | FINAL LIVEWEIGHT (Kg) | FINAL HEIGHT (cm) | FINAL BODY LENGTH (cm) | FINAL HEART GIRTH (cm) | FCE |
|---|---|---|---|---|---|
| 1 | $24.52^{a}$ | $54.00^{a}$ | $120.00^{a}$ | $69.50^{a}$ | - |
| 2 | $14.68^{de}$ | $51.75^{b}$ | $104.25^{b}$ | $54.75^{b}$ | 31.75 |
| 3 | $17.39^{bcd}$ | $51.89^{b}$ | $106.22^{b}$ | $59.33^{b}$ | 13.61 |
| 4 | $19.32^{bc}$ | $52.12^{b}$ | $111.00^{b}$ | $54.12^{b}$ | 18.17 |
| 5 | $19.40^{b}$ | $45.40^{b}$ | $106.60^{b}$ | $61.55^{b}$ | 18.12 |
| 6 | $16.22^{de}$ | $49.88^{b}$ | $104.25^{b}$ | $57.00^{b}$ | 22.99 |

Note: Treatment means having a common superscript per column are not significantly different.

Table 9. Correlation Coefficients between Liveweight and Variables of Body Measurements in Alabang and Palawan.

| | r CORRELATION COEFFICIENT (Alabang) | (Palawan) | r(n-2) 5% | 1% |
|---|---|---|---|---|
| Liveweight (Kg) to Height (cm) | 0.99** | $0.25^{ns}$ | 0.811 | 0.917 |
| Liveweight (Kg) to Body Length (cm) | 0.93** | $0.18^{ns}$ | | |
| Liveweight (Kg) to Heart Girth (cm) | 0.99** | 0.84* | | |

**Significant at 1% level

*Significant at 5% level

$^{ns}$Not Significant

Table 10. Average Dressing Percentage and Lean-Bone Ratio of the Slaughtered Experimental Goats in Alabang.

| TREATMENT | AVERAGE LIVEWEIGHT* (Kg) | AVERAGE DRESSED WEIGHT (Kg) | AVERAGE DRESSING PERCENTAGE (%) | AVERAGE LEAN-BONE RATIO LEAN (%) | BONE (%) |
|---|---|---|---|---|---|
| 1 | 31.86 | 14.10 | 44.26 | 71.00 | 26.00 |
| 2 | 18.40 | 7.13 | 38.75 | 66.00 | 34.00 |
| 3 | 27.07 | 11.13 | 41.12 | 66.00 | 32.00 |
| 4 | 28.00 | 12.15 | 43.39 | 69.00 | 30.00 |
| 5 | 33.20 | 13.60 | 40.98 | 75.00 | 25.00 |
| 6 | 30.06 | 13.86 | 46.11 | 75.00 | 25.00 |

*Three animals/treatment

Table 11. Average Cut-Up Yield (Kg) and Percentage Cut-Up Yield (%) of Slaughtered Experimental Goats in Alabang.

| TREATMENT | | CUT-UP YIELD | | | | |
|---|---|---|---|---|---|---|
| | | LEG[a] | SHOULDER | RACK | LOIN | BREAST[b] |
| 1 | (Wt) | 4.90 | 3.28 | 1.37 | 2.00 | 2.50 |
| | (%) | 34.75 | 23.26 | 9.72 | 14.18 | 17.73 |
| 2 | (Wt) | 2.30 | 1.99 | 0.59 | 0.85 | 1.35 |
| | (%) | 32.26 | 27.91 | 8.27 | 11.92 | 18.93 |
| 3 | (Wt) | 3.60 | 3.01 | 0.82 | 1.36 | 2.25 |
| | (%) | 32.35 | 27.04 | 7.36 | 12.22 | 20.22 |
| 4 | (Wt) | 3.80 | 3.20 | 1.19 | 1.70 | 2.20 |
| | (%) | 31.28 | 26.34 | 9.79 | 13.99 | 18.11 |
| 5 | (Wt) | 4.32 | 3.21 | 1.20 | 2.13 | 2.72 |
| | (%) | 31.76 | 23.60 | 8.82 | 15.66 | 20.00 |
| 6 | (Wt) | 3.96 | 3.90 | 1.17 | 1.89 | 2.89 |
| | (%) | 28.57 | 28.14 | 8.44 | 13.64 | 20.85 |
| Mean | | 3.81 | 3.10 | 1.06 | 1.65 | 2.31 |
| | | 31.82 | 26.05 | 8.73 | 13.60 | 19.31 |

a. Leg - includes both hindlimbs

b. Breast - includes breast down to the forelimbs

Table 12. Slaughter By-Products Yield (kg) (%) of the Slaughtered Experimental Goats in Alabang.

| TRAIT | | TREATMENT | | | | | |
|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI |
| Blood | (kg) | 0.65 | 0.56 | 0.65 | 0.77 | 0.80 | 0.74 |
| | (%) | 2.04 | 3.04 | 2.40 | 2.75 | 2.40 | 2.46 |
| Heart | (kg) | 0.11 | 0.07 | 0.11 | 0.09 | 0.16 | 0.11 |
| | (%) | 0.35 | 0.38 | 0.41 | 0.32 | 0.48 | 0.37 |
| Kidney | (kg) | 0.10 | 0.07 | 0.09 | 0.09 | 0.10 | 0.08 |
| | (%) | 0.31 | 0.38 | 0.33 | 0.32 | 0.30 | 0.27 |
| Liver | (kg) | 0.52 | 0.28 | 0.42 | 0.37 | 0.45 | 0.62 |
| | (%) | 1.63 | 1.52 | 1.55 | 1.32 | 1.36 | 2.06 |
| Spleen | (kg) | 0.56 | 0.03 | 0.04 | 0.04 | 0.05 | 0.37 |
| | (%) | 1.76 | 0.16 | 0.15 | 0.14 | 0.15 | 1.23 |
| Lung | (kg) | 0.35 | 0.20 | 0.26 | 0.29 | 0.22 | 0.31 |
| | (%) | 1.10 | 1.09 | 0.96 | 1.04 | 0.66 | 1.03 |
| Leaf fat | (kg) | 1.65 | 0.46 | 1.35 | 1.88 | 2.50 | 2.32 |
| | (%) | 5.18 | 2.50 | 4.99 | 6.71 | 7.53 | 7.72 |
| Stomach (cleaned) | (kg) | 1.20 | 0.75 | 1.07 | 0.97 | 1.22 | 1.19 |
| | (%) | 3.77 | 4.08 | 3.95 | 3.46 | 3.67 | 3.96 |
| Small Int. (cleaned) | (kg) | 0.69 | 0.42 | 0.68 | 0.68 | 0.88 | 0.67 |
| | (%) | 2.17 | 2.28 | 2.51 | 2.43 | 2.65 | 2.23 |
| Large Int. (cleaned) | (kg) | 0.98 | 0.49 | 0.79 | 0.80 | 1.08 | 0.78 |
| | (%) | 3.08 | 2.66 | 2.92 | 2.86 | 3.25 | 2.59 |
| Head | (kg) | 2.32 | 1.73 | 2.33 | 2.23 | 2.45 | 2.30 |
| | (%) | 7.28 | 9.40 | 8.61 | 7.96 | 7.38 | 7.65 |
| Hide | (kg) | 3.15 | 1.93 | 3.03 | 3.02 | 3.48 | 3.67 |
| | (%) | 9.89 | 10.49 | 11.19 | 10.79 | 10.48 | 12.21 |
| Shank | (kg) | 0.77 | 0.49 | 0.62 | 0.61 | 0.88 | 0.70 |
| | (%) | 2.42 | 2.66 | 2.29 | 2.18 | 2.65 | 2.33 |

Table 13a. Mean Organoleptic Evaluation Scores of Plain Soup of the Slaughtered Experimental Goats in Alabang.

| TRAITS | TREATMENTS | | | | | |
|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI |
| Color | $6.75^{ns}$ | $6:63^{ns}$ | $6.63^{ns}$ | $6.63^{ns}$ | $6.50^{ns}$ | $6.50^{ns}$ |
| Odor | $6.88^{b}$ | $7.13^{a}$ | $6.63^{c}$ | $6.50^{c}$ | $6.25^{c}$ | $6.50^{c}$ |
| Taste | $7.0^{ns}$ | $7.25^{ns}$ | $6.88^{ns}$ | $6.88^{ns}$ | $7.0^{ns}$ | $6.75^{ns}$ |
| Texture | $6.63^{ns}$ | $6.63^{ns}$ | $6.50^{ns}$ | $7.25^{ns}$ | $7.0^{ns}$ | $6.88^{ns}$ |
| Juiciness | $6.68^{ns}$ | $7.0^{ns}$ | $6.75^{ns}$ | $6.63^{ns}$ | $6.75^{ns}$ | $6.25^{ns}$ |
| General Acceptability | $7.0^{a}$ | $7.0^{a}$ | $6.75^{c}$ | $7.0^{a}$ | $7.0^{a}$ | $6.88^{b}$ |

$^{ns}$Not Significant

Treatment means per traits having a common superscript are not significantly different.

Table 13b. Mean Organoleptic Evaluation Scores of Ham of the Slaughtered Experimental Goats in Alabang.

| TRAITS | TREATMENTS | | | | | |
|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI |
| Color | $7.1^{ns}$ | $6.56^{ns}$ | $6.44^{ns}$ | $7.44^{ns}$ | $7.0^{ns}$ | $6.44^{ns}$ |
| Odor | $6.33^{ns}$ | $5.67^{ns}$ | $6.11^{ns}$ | $6.11^{ns}$ | $5.78^{ns}$ | $6.11^{ns}$ |
| Taste | $7.11^{ns}$ | $6.56^{ns}$ | $6.44^{ns}$ | $7.44^{ns}$ | $7.0^{ns}$ | $6.44^{ns}$ |
| Texture | $6.67^{ns}$ | $6.56^{ns}$ | $6.78^{ns}$ | $6.56^{ns}$ | $6.11^{ns}$ | $6.33^{ns}$ |
| Juiciness | $7.11^{a}$ | $6.67^{abc}$ | $6.78^{ab}$ | $7.11^{a}$ | $6.22^{bcd}$ | $6.11^{bcd}$ |
| General Acceptability | $7.11^{a}$ | $6.89^{ab}$ | $6.56^{abd}$ | $6.78^{abc}$ | $6.11^{cde}$ | $6.44^{bcde}$ |

$^{ns}$Not Significant

Treatment means per traits having a common superscript are not significantly different.

Table 13c. Mean Organoleptic Evaluation Score of Sausage of the Slaughtered Experimental Goats in Alabang.

| TRAITS | TREATMENTS | | | | | |
|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI |
| Color | $6.67^{ns}$ | $6.11^{ns}$ | $6.67^{ns}$ | $7.67^{ns}$ | $6.89^{ns}$ | $7.33^{ns}$ |
| Odor | $6.0^{bc}$ | $5.89^{cd}$ | $5.56^{ade}$ | $7.0^{ab}$ | $5.22^{cde}$ | $7.69^{a}$ |
| Taste | $6.38^{bc}$ | $5.75^{bcde}$ | $5.63^{bcde}$ | $6.5^{ab}$ | $6.0^{bcd}$ | $7.38^{a}$ |
| Texture | $6.56^{ns}$ | $7.22^{ns}$ | $6.56^{ns}$ | $6.11^{ns}$ | $6.56^{ns}$ | $6.67^{ns}$ |
| Juiciness | $7.5^{ns}$ | $7.38^{ns}$ | $6.88^{ns}$ | $7.63^{ns}$ | $6.25^{ns}$ | $7.63^{ns}$ |
| General Acceptability | $6.67^{ns}$ | $6.78^{ns}$ | $7.22^{ns}$ | $7.22^{ns}$ | $6.56^{ns}$ | $7.33^{ns}$ |

$^{ns}$Not Significant

Treatment means per traits having a common superscript are not significantly different.

Table 13d. Mean Organoleptic Evaluation Score of Corned Chevon of the Slaughtered Experimental Goats in Alabang.

| TRAITS | TREATMENTS | | | | | |
|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI |
| Color | $7.20^{ab}$ | $6.10^{cde}$ | $6.60^{bcd}$ | $6.70^{abc}$ | $6.40^{bcde}$ | $7.60^{a}$ |
| Odor | $6.0^{cd}$ | $6.56^{bc}$ | $5.56^{cde}$ | $7.0^{b}$ | $5.22^{de}$ | $7.67^{a}$ |
| Taste | 5.89 | 5.33 | 5.22 | 6.0 | 5.56 | $6.78^{a}$ |
| Texture | $6.56^{ns}$ | $7.22^{ns}$ | $6.56^{ns}$ | $6.11^{ns}$ | $6.56^{ns}$ | $6.67^{ns}$ |
| Juiciness | $6.67^{ns}$ | $6.56^{ns}$ | $6.11^{ns}$ | $6.89^{ns}$ | $5.56^{ns}$ | $6.78^{ns}$ |
| General Acceptability | $6.67^{ns}$ | $6.78^{ns}$ | $7.22^{ns}$ | $7.22^{ns}$ | $6.56^{ns}$ | $7.33^{ns}$ |

$^{ns}$Not Significant

Treatment means per traits having a common superscript are not significantly different.

Appendix Table 1. Analysis of Variance for the Final Average Liveweight of the Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular 5% | F-Tabular 1% |
|---|---|---|---|---|---|---|
| Treatment | 5 | 1698.93 | 339.78 | 210.08** | 2.36 | 3.38 |
| Error | 54 | 87.34 | 1.62 | | | |
| Total | 59 | 1786.27 | | | | |
| Coefficient of Variation (CV) | = | 4.6% | | | | |

**Significant at 1% level

Appendix Table 1a. Test of Significance (DMRT) for the Final Average Liveweight of the Experimental Goats in Alabang.

| TREATMENT | TREATMENT MEAN | STATISTICAL SIGNIFICANCE* |
|---|---|---|
| 1 | 30.56 | abc |
| 2 | 19.85 | f |
| 3 | 25.29 | e |
| 4 | 27.47 | d |
| 5 | 31.61 | a |
| 6 | 30.60 | ab |

*Treatment means having a common letter are not significantly different.

Appendix Table 2. Analysis of Variance for the Final Average Height of the Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular 5% | F-Tabular 1% |
|---|---|---|---|---|---|---|
| Treatment | 5 | 4127.10 | 825.42 | 95.09** | 2.36 | 3.38 |
| Error | 54 | 468.81 | 8.68 | | | |
| Total | 59 | 4595.91 | | | | |
| Coefficient of Variation (CV) | = 4.8% | | | | | |

**Significant at 1% level.

Appendix Table 2a. Test of Significance (DMRT) for the Final Average Height of the Experimental Goats in Alabang.

| Treatment | Treatment Mean | Statistical Significance* |
|---|---|---|
| 1 | 63.60 | ac |
| 2 | 57.20 | e |
| 3 | 60.95 | cd |
| 4 | 61.89 | cd |
| 5 | 64.30 | a |
| 6 | 63.80 | ab |

*Treatment means having a common letter are not significantly different.

Appendix Table 3. Analysis of Variance for the Final Average Body Length of the Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular 5% | F-Tabular 1% |
|---|---|---|---|---|---|---|
| Treatment | 5 | 13867.40 | 2773.48 | 91.96** | 2.36 | 3.38 |
| Error | 54 | 1628.40 | 30.16 | | | |
| Total | 59 | 15495.80 | | | | |
| Coefficient of Variation (CV) | = | 4.8% | | | | |

**Significant at 1% level

Appendix Table 3a. Test of Significance (DMRT) for the Final Average Body Length of the Experimental Goats in Alabang.

| Treatment | Treatment Mean | Statistical Significance* |
|---|---|---|
| 1 | 118.10 | ab |
| 2 | 106.10 | e |
| 3 | 112.00 | d |
| 4 | 114.00 | abcd |
| 5 | 118.40 | a |
| 6 | 116.00 | abc |

*Treatment means having a common letter are not significantly different.

Appendix Table 4. Analysis of Variance for the Final Average Heart Girth of the Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular 5% | F-Tabular 1% |
|---|---|---|---|---|---|---|
| Treatment | 5 | 6182.41 | 1236.48 | 197.84** | 2.36 | 3.38 |
| Error | 54 | 337.52 | 6.25 | | | |
| Total | 59 | 6519.93 | | | | |
| Coefficient of Variation (CV) | = | 3.5% | | | | |

**Significant at 1% level

Appendix Table 4a. Test of Significance (DMRT) for the Final Average Heart Girth of the Experimental Goats in Alabang.

| Treatment | Treatment Mean | Statistical Significance* |
|---|---|---|
| 1 | 74.20 | abc |
| 2 | 63.30 | f |
| 3 | 68.70 | e |
| 4 | 72.56 | bcd |
| 5 | 75.90 | a |
| 6 | 74.80 | ab |

*Treatment means having a common letter are not significantly different.

Appendix Table 5. Analysis of Variance for the Final Average Liveweight of the Experimental Goats in Palawan.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular 5% | F-Tabular 1% |
|---|---|---|---|---|---|---|
| Treatment | 5 | 757.17 | 151.43 | 19.95** | 2.44 | 3.49 |
| Error | 42 | 318.96 | 7.59 | | | |
| Total | 47 | 1076.13 | | | | |
| Coefficient of Variance (CV) | = | 14.82% | | | | |

**Significant at 1% level

Appendix Table 5a. Test of Significance (DMRT) for the Final Average Liveweight of the Experimental Goats in Palawan.

| Treatment | Treatment Mean | Statistical Significance* |
|---|---|---|
| 1 | 24.54 | a |
| 2 | 14.68 | de |
| 3 | 17.39 | bcd |
| 4 | 19.32 | bc |
| 5 | 19.40 | b |
| 6 | 16.22 | de |

*Treatment means having a common letter are not significantly different.

Appendix Table 6. Analysis of Variance for the Final Average Height of the Experimental Goats in Palawan.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular 5% | F-Tabular 1% |
|---|---|---|---|---|---|---|
| Treatment | 5 | 2908.71 | 581.74 | 4.64** | 2.44 | 3.49 |
| Error | 42 | 5268.79 | 125.45 | | | |
| Total | 47 | 8177.50 | | | | |
| Coefficient of Variation (CV) | = | 22.03% | | | | |

**Significant at 1% level

Appendix Table 6a. Test of Significance (DMRT) for the Final Average Height of the Experimental Goats in Palawan.

| Treatment | Treatment Mean | Statistical Significance* |
|---|---|---|
| 1 | 54.00 | a |
| 2 | 51.75 | b |
| 3 | 51.89 | b |
| 4 | 52.12 | b |
| 5 | 45.40 | b |
| 6 | 49.88 | b |

*Treatment means having a common letter are not significantly different.

Appendix Table 7. Analysis of Variance for the Final Average Body Length of the Experimental Goats in Palawan.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular 5% | F-Tabular 1% |
|---|---|---|---|---|---|---|
| Treatment | 5 | 13022.11 | 2604.42 | 42.42** | 2.44 | 3.49 |
| Error | 42 | 2578.20 | 61.39 | | | |
| Total | 47 | 15600.31 | | | | |
| Coefficient of Variance (CV) | = | 7.21% | | | | |

**Significant at 1% level

Appendix Table 7a. Test of Significance (DMRT) for the Final Average Body Length of the Experimental Goats in Palawan.

| Treatment | Treatment Mean | Statistical Significance* |
|---|---|---|
| 1 | 120.00 | a |
| 2 | 104.25 | b |
| 3 | 106.22 | b |
| 4 | 111.00 | b |
| 5 | 106.60 | b |
| 6 | 104.25 | b |

*Treatment means having a common letter are not significantly different.

Appendix Table 8. Analysis of Variance for the Final Average Heart Girth of the Experimental Goats in Palawan.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular 5% | F-Tabular 1% |
|---|---|---|---|---|---|---|
| Treatment | 5 | 4713.36 | 942.67 | 5.12** | 2.44 | 3.49 |
| Error | 42 | 7740.12 | 184.29 | | | |
| Total | 47 | 12453.48 | | | | |

| | | |
|---|---|---|
| Coefficient of Variation (CV) | = | 22.87% |

**Significant at 1% level

Appendix Table 8a. Test of Significance (DMRT) for the Final Average Heart Girth of the Experimental Goats in Palawan.

| Treatment | Treatment Mean | Statistical Significance* |
|---|---|---|
| 1 | 69.50 | a |
| 2 | 54.75 | b |
| 3 | 59.33 | b |
| 4 | 54.12 | b |
| 5 | 61.55 | b |
| 6 | 57.00 | b |

*Treatment means having a common letter are not significantly different.

Appendix Table 9. Correlation analysis between the Final Average Liveweight (Kg) and the Final Average Height (cm) of the Experimental Goats in Alabang.

| TREATMENT | FINAL LIVEWEIGHT (kg) | FINAL HEIGHT (cm) | r | r(n-2) 5% | r(n-2) 1% |
|---|---|---|---|---|---|
| 1 | 30.56 | 63.60 | 0.997** | 0.811 | 0.917 |
| 2 | 19.85 | 57.20 | | | |
| 3 | 25.29 | 60.95 | | | |
| 4 | 27.47 | 61.89 | | | |
| 5 | 31.61 | 64.30 | | | |
| 6 | 30.60 | 63.80 | | | |
| Mean | 27.56 | 61.96 | | | |

**Significant at 1% level

Appendix Table 10. Correlation Analysis between the Final Average Liveweight (Kg) for the Final Average Length (cm) of the Experimental Goats in Alabang.

| Treatment | Final Liveweight (kg) | Final Body Length (cm) | r | r(n-2) 5% | r(n-2) 1% |
|---|---|---|---|---|---|
| 1 | 30.56 | 118.10 | 0.93** | 0.811 | 0.917 |
| 2 | 19.85 | 106.10 | | | |
| 3 | 25.29 | 112.00 | | | |
| 4 | 27.47 | 114.00 | | | |
| 5 | 31.61 | 118.40 | | | |
| 6 | 30.60 | 116.00 | | | |
| Mean | 27.56 | 114.1 | | | |

**Significant at 1% level.

Appendix Table 11. Correlation Analysis between the Final Average Liveweight (Kg) and Final Average Heart Girth (cm) of the Experimental Goats in Alabang.

| Treatment | Final Liveweight (kg) | Final Heart Girth (cm) | r | r(n-2) 5% | r(n-2) 1% |
|---|---|---|---|---|---|
| 1 | 30.56 | 74.20 | 0.99** | 0.811 | 0.917 |
| 2 | 19.85 | 63.30 | | | |
| 3 | 25.29 | 68.70 | | | |
| 4 | 27.47 | 72.56 | | | |
| 5 | 31.61 | 75.90 | | | |
| 6 | 30.60 | 74.80 | | | |
| Mean | 27.56 | 71.58 | | | |

**Significant at 1% level

Appendix Table 12. Correlation Analysis between the Final Average Liveweight (Kg) and Final Average Height (cm) of the Experimental Goats in Palawan.

| Treatment | Final Liveweight (kg) | Final Height (cm) | r | r(n-2) 5% | r(n-2) 1% |
|---|---|---|---|---|---|
| 1 | 24.52 | 54.00 | $0.25^{ns}$ | 0.811 | 0.917 |
| 2 | 14.68 | 51.75 | | | |
| 3 | 17.40 | 51.89 | | | |
| 4 | 19.32 | 52.12 | | | |
| 5 | 19.40 | 45.40 | | | |
| 6 | 16.22 | 49.88 | | | |
| Mean | 18.59 | 50.84 | | | |

$^{ns}$Not Significant

Appendix Table 13. Correlation Analysis between the Final Average Liveweight (Kg) and Final Average Body Length (cm) of the Experimental Goats in Palawan.

| Treatment | Final Liveweight (kg) | Final Body Length (cm) | r | r(n-2) 5% | r(n-2) 1% |
|---|---|---|---|---|---|
| 1 | 24.52 | 120.00 | 0.18$^{ns}$ | 0.811 | 0.917 |
| 2 | 14.68 | 104.25 | | | |
| 3 | 17.39 | 106.22 | | | |
| 4 | 19.32 | 111.00 | | | |
| 5 | 19.40 | 106.60 | | | |
| 6 | 16.22 | 104.25 | | | |
| Mean | 18.59 | 108.72 | | | |

$^{ns}$Not Significant

Appendix Table 14. Correlation Analysis between the Final Average Liveweight (Kg) and Final Average Heart Girth (cm) of the Experimental Goats in Palawan.

| Treatment | Final Liveweight (kg) | Final Heart Girth (cm) | r | r(n-2) 5% | r(n-2) 1% |
|---|---|---|---|---|---|
| 1 | 24.52 | 69.50 | 0.84* | 0.811 | 0.917 |
| 2 | 14.68 | 54.75 | | | |
| 3 | 17.39 | 59.33 | | | |
| 4 | 19.32 | 54.12 | | | |
| 5 | 19.40 | 61.55 | | | |
| 6 | 16.22 | 57.00 | | | |
| Mean | 18.59 | 59.37 | | | |

*Significant at 5% level

Appendix Table 15. Analysis of Variance for the Dressing Percentage of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular 5% | F-Tabular 1% |
|---|---|---|---|---|---|---|
| Treatment | 5 | 105.93 | 21.19 | 3.77* | 3.11 | 5.06 |
| Error | 12 | 67.39 | 5.62 | | | |
| Total | 17 | 173.32 | | | | |

*Significant at 5%

Appendix Table 15a. Test of Significance (DMRT) for the Dressing Percentage of the Slaughtered Experimental Goat in Alabang.

| TREATMENT | TREATMENT MEAN | STATISTICAL SIGNIFICANCE* |
|---|---|---|
| 1 | 44.26 | ab |
| 2 | 38.75 | de |
| 3 | 41.12 | bcd |
| 4 | 43.39 | abc |
| 5 | 40.98 | bcde |
| 6 | 46.11 | a |

Appendix Table 16a. Analysis of Variance for the Organoleptic Evaluation of Ham (COLOR) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 7.72 | 1.54 | $1.20^{ns}$ | 2.37 |
| Panelists | 8 | 18.00 | 2.25 | | |
| Error | 53 | 67.78 | 1.28 | | |
| Total | 66 | 93.50 | | | |

$^{ns}$Not Significance

Appendix Table 16b. Analysis of Variance for the Organoleptic Evaluation of Ham (ODOR) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 2.00 | 0.40 | $0.33^{ns}$ | 2.37 |
| Panelists | 8 | 8.16 | 1.02 | | |
| Error | 53 | 64.84 | 1.22 | | |
| Total | 66 | 75.00 | | | |

$^{ns}$Not Significant

Appendix Table 16c. Analysis of Variance for the Organoleptic Evaluation of Ham (TASTE) of the Slaughtered Experimental Goats in Alabang.

| Sum of Variance | df | Sum of Squares | Mean Squares | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 7.75 | 1.55 | $1.25^{ns}$ | 2.37 |
| Panelists | 8 | 21.30 | 2.66 | | |
| Error | 53 | 65.48 | 1.23 | | |
| Total | 66 | 94.53 | | | |

$^{ns}$Not Significant

Appendix Table 16d. Analysis of Variance for the Organoleptic Evaluation of Ham (TEXTURE) of the Slaughtered Experimental Goats in Alabang.

| Sum of Variance | df | Sum of Squares | Mean Squares | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 2.50 | 0.50 | $1.02^{ns}$ | 2.37 |
| Panelists | 8 | 57.00 | 7.12 | | |
| Error | 53 | 26.00 | 0.49 | | |
| Total | 66 | 85.50 | | | |

$^{ns}$Not Significant

Appendix Table 16e. Analysis of Variance for the Organoleptic Evaluation of Ham (JUICINESS) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Squares | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 8.22 | 1.64 | 2.45* | 2.37 |
| Panelists | 8 | 28.33 | 3.54 | | |
| Error | 53 | 35.45 | 0.67 | | |
| Total | 66 | 72.00 | | | |

*Significant

Appendix Table 16e.1. Test of Significance (DMRT) for the Organoleptic Evaluation of Ham (JUICINESS) of the Slaughtered Experimental Goats in Alabang.

| TREATMENT | TREATMENT MEAN | STATISTICAL SIGNIFICANCE* |
|---|---|---|
| 1 | 7.11 | a |
| 2 | 6.67 | abc |
| 3 | 6.88 | ab |
| 4 | 7.11 | a |
| 5 | 6.22 | bcd |
| 6 | 6.11 | bcd |

Appendix Table 16f. Analysis of Variance for the Organoleptic Evaluation of Ham (GENERAL ACCEPTABILITY) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Sample | 5 | 5.65 | 1.13 | 2.74* | 2.37 |
| Panelists | 8 | 24.82 | 3.10 | | |
| Error | 53 | 21.85 | 0.41 | | |
| Total | 66 | 52.34 | | | |

*Significant

Appendix Table 16f.1. Test of Significance (DMRT) for the Organoleptic Evaluation of Ham (GENERAL ACCEPTABILITY) of the Slaughtered Experimental Goats in Alabang.

| TREATMENT | TREATMENT MEANS | STATISTICAL SIGNIFICANCE* |
|---|---|---|
| 1 | 7.1 | a |
| 2 | 6.8 | ab |
| 3 | 6.5 | abd |
| 4 | 6.7 | abc |
| 5 | 6.1 | cde |
| 6 | 6.4 | bcde |

Appendix Table 17a. Analysis of Variance for the Organoleptic Evaluation of Sausage (COLOR) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 13.5 | 2.70 | $1.89^{ns}$ | 2.37 |
| Panelists | 8 | 8.00 | 1.00 | | |
| Error | 53 | 75.84 | 1.43 | | |
| Total | 66 | 97.34 | | | |

$^{ns}$Not Significant

Appendix Table 17b. Analysis of Variance for the Organoleptic Evaluation of Sausage (ODOR) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 38.73 | 7.75 | 5.10* | 2.37 |
| Panelists | 8 | 22.73 | 2.84 | | |
| Error | 53 | 81.94 | 1.55 | | |
| Total | 66 | 143.40 | | | |

*Highly Significant

Appendix Table 17b.1. Test of Significance (DMRT) for the Organoleptic Evaluation of Sausage (ODOR) of the Slaughtered Experimental Goat in Alabang.

| TREATMENT | TREATMENT MEANS | STATISTICAL SIGNIFICANCE* |
|---|---|---|
| 1 | 6.0 | bc |
| 2 | 5.8 | cd |
| 3 | 5.6 | cde |
| 4 | 7.0 | ab |
| 5 | 5.2 | cde |
| 6 | 7.6 | a |

Appendix Table 17c. Analysis of Variance for the Organoleptic Evaluation of Sausage (TASTE) of the Slaughtered Experimental Goat in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 16.35 | 3.27 | 2.53 | 2.37 |
| Panelists | 7 | 68.65 | 9.80 | | |
| Error | 47 | 60.48 | 1.29 | | |
| Total | 59 | 145.48 | | | |

*Significant

Appendix Table 17c.1. Test of Significance (DMRT) for the Organoleptic Evaluation of Sausage (TASTE) of the Slaughtered Experimental Goats in Alabang.

| TREATMENT | TREATMENT MEANS | STATISTICAL SIGNIFICANCE* |
|---|---|---|
| 1 | 6.35 | bc |
| 2 | 5.75 | bcde |
| 3 | 5.63 | bcde |
| 4 | 6.50 | ab |
| 5 | 6.00 | bcd |
| 6 | 7.38 | a |

Appendix Table 17d. Analysis of Variance for the Organoleptic Evaluation of Sausage (TEXTURE) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 5.88 | 1.18 | $0.74^{ns}$ | 2.37 |
| Panelists | 8 | 14.16 | 1.77 | | |
| Error | 53 | 85.00 | 1.60 | | |
| Total | 66 | 105.04 | | | |

$^{ns}$Not Significant

Appendix Table 17e. Analysis of Variance for the Organoleptic Evaluation of Sausage (JUICINESS) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 10.59 | 2.12 | $1.35^{ns}$ | 2.37 |
| Panelists | 8 | 13.37 | 1.67 | | |
| Error | 53 | 83.08 | 1.57 | | |
| Total | 66 | 107.04 | | | |

$^{ns}$Not Significant

Appendix Table 17f. Analysis of Variance for the Organoleptic Evaluation of Sausage (GENERAL ACCEPTABILITY) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 5.11 | 1.02 | $0.94^{ns}$ | 2.37 |
| Panelists | 8 | 8.50 | 1.06 | | |
| Error | 53 | 56.39 | 1.06 | | |
| Total | 66 | 70.00 | | | |

$^{ns}$Not Significant

Appendix Table 18a. Analysis of Variance for the Organoleptic Evaluation of Corned Chevon (COLOR) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 12.8 | 2.56 | 3.24* | 2.37 |
| Panelists | 8 | 29.03 | 3.63 | | |
| Error | 53 | 42.04 | 0.79 | | |
| Total | 66 | 83.87 | | | |

*Significant

Appendix Table 18a.1. Test of Significance for the Organoleptic Evaluation of Corned Chevon (COLOR) of the Slaughtered Experimental Goats in Alabang.

| TREATMENT | TREATMENT MEANS | STATISTICAL SIGNIFICANCE* |
|---|---|---|
| 1 | 7.2 | ab |
| 2 | 6.1 | cde |
| 3 | 6.6 | bcd |
| 4 | 6.7 | abc |
| 5 | 6.4 | bcde |
| 6 | 7.6 | a |

Appendix Table 18b. Analysis of Variance for the Organoleptic Evaluation of Corned Chevon (ODOR) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 38.00 | 7.60 | 5.3* | 2.37 |
| Panelists | 8 | 22.00 | 2.75 | | |
| Error | 53 | 76.00 | 1.43 | | |
| Total | 66 | 136.00 | | | |

*Highly Significant

Appendix Table 18b.1. Test of Significance for the Organoleptic Evaluation of Corned Chevon (ODOR) of the Slaughtered Experimental Goats in Alabang.

| TREATMENT | TREATMENT MEANS | STATISTICAL SIGNIFICANCE* |
|---|---|---|
| 1 | 6.00 | cd |
| 2 | 6.50 | bc |
| 3 | 5.55 | cde |
| 4 | 7.00 | b |
| 5 | 5.20 | de |
| 6 | 7.60 | a |

Appendix Table 18c. Analysis of Variance for the Organoleptic Evaluation of Corned Chevon (TASTE) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Means Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 14.53 | 2.91 | 2.47* | 2.37 |
| Panelists | 8 | 141.92 | 17.74 | | |
| Error | 53 | 62.31 | 1.17 | | |
| Total | 66 | 218.76 | | | |

*Significant

Appendix Table 18c.1. Test of Variance for the Organoleptic Evaluation of Corned Chevon (TASTE) of the Slaughtered Experimental Goats in Alabang.

| TREATMENT | TREATMENT MEANS | STATISTICAL SIGNIFICANCE* |
|---|---|---|
| 1 | 5.80 | abc |
| 2 | 5.30 | bcde |
| 3 | 5.20 | bcde |
| 4 | 6.00 | ab |
| 5 | 5.60 | bcd |
| 6 | 6.70 | a |

Appendix Table 18d. Analysis of Variance for the Organoleptic Evaluation of Corned Chevon (TEXTURE) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 5.73 | 1.15 | 0.71$^{ns}$ | 2.37 |
| Panelists | 8 | 14.00 | 1.75 | | |
| Error | 53 | 85.10 | 1.60 | | |
| Total | 66 | 104.83 | | | |

$^{ns}$Not Significant

Appendix Table 18e. Analysis of Variance for the Organoleptic Evaluation of Corned Chevon (JUICINESS) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Sqaures | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 12.15 | 2.43 | 1.57$^{ns}$ | 2.37 |
| Panelists | 8 | 25.87 | 3.23 | | |
| Error | 53 | 82.00 | 1.55 | | |
| Total | 66 | 120.02 | | | |

$^{ns}$Not Significant

Appendix Table 18f. Analysis of Variance for the Organoleptic Evaluation of Corned Chevon (GENERAL ACCEPTABILITY) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 5.04 | 1.01 | $0.95^{ns}$ | 2.37 |
| Panelists | 8 | 8.93 | 1.12 | | |
| Error | 53 | 55.96 | 1.06 | | |
| Total | 66 | 69.93 | | | |

$^{ns}$Not Significant

Appendix Table 19a. Analysis of Variance for the Organoleptic Evaluation of Plain Soup (COLOR) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Sample | 5 | 0.37 | 0.074 | $1.57^{ns}$ | 2.37 |
| Panelist | 7 | 34.66 | 4.95 | | |
| Error | 47 | 2.47 | 0.052 | | |
| Total | 59 | 37.50 | | | |

$^{ns}$Not Significant

Appendix Table 19b. Analysis of Variance for the Organoleptic Evaluation of Plain Soup (ODOR) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Sample | 5 | 3.85 | 0.77 | 3.67* | 2.37 |
| Panelist | 7 | 54.15 | 7.74 | | |
| Error | 47 | 10.98 | 0.23 | | |
| Total | 59 | 68.98 | | | |

*Significant

Appendix Table 19b.1. Test of Significance (DMRT) for the Organoleptic Evaluation of Plain Soup (ODOR) of the Slaughtered Experimental Goats in Alabang.

| TREATMENT | TREATMENT MEAN | STATISTICAL SIGNIFICANCE* |
|---|---|---|
| 1 | 6.1 | b |
| 2 | 6.3 | a |
| 3 | 5.8 | c |
| 4 | 5.7 | c |
| 5 | 5.5 | c |
| 6 | 5.7 | c |

*Treatment means having a common letter are not significantly different.

Appendix Table 19c. Analysis of Variance for the Organoleptic Evaluation of Plain Soup (TASTE) of the Slaughtered Experimenal Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Sample | 5 | 1.04 | 0.21 | $1.38^{ns}$ | 2.37 |
| Panelist | 8 | 285.15 | 35.64 | | |
| Error | 53 | 7.96 | 0.15 | | |
| Total | 66 | 294.15 | | | |

$^{ns}$Not Significant

Appendix Table 19d. Analysis of Variance for the Organoleptic Evaluation of Plain Soup (TEXTURE) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 1.23 | 0.25 | $0.96^{ns}$ | 2.37 |
| Panelists | 8 | 289.17 | 36.15 | | |
| Error | 53 | 13.94 | 0.26 | | |
| Total | 66 | 304.34 | | | |

$^{ns}$Not Significant

Appendix Table 19e. Analysis of Variance for the Organoleptic Evaluation of Plain Soup (JUICINESS) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 1.50 | 0.30 | $0.68^{ns}$ | 2.37 |
| Panelists | 7 | 28.00 | 4.00 | | |
| Error | 47 | 20.50 | 0.44 | | |
| Total | 59 | 50.00 | | | |

$^{ns}$Not Significant

Appendix Table 19f. Analysis of Variance for the Organoleptic Evaluation of Plain Soup (GENERAL ACCEPTABILITY) of the Slaughtered Experimental Goats in Alabang.

| Source of Variance | df | Sum of Squares | Mean Square | F Observed | F-Tabular |
|---|---|---|---|---|---|
| Samples | 5 | 0.30 | 0.06 | 3.00* | 2.37 |
| Panelists | 8 | 289.33 | 36.16 | | |
| Error | 53 | 3.87 | 0.02 | | |
| Total | 66 | 293.50 | | | |

*Significant

Appendix Table 19f.1. Test of Significance (DMRT) for the Organoleptic Evaluation of Plain Soup (GENERAL ACCEPTABILITY) of the Slaughtered Experimental Goats in Alabang.

| Treatment | Treatment Mean | Statistical Significance* |
|---|---|---|
| 1 | 7.00 | a |
| 2 | 7.00 | a |
| 3 | 6.75 | c |
| 4 | 7.00 | a |
| 5 | 7.00 | a |
| 6 | 6.88 | b |

*Treatment means having a common letter are not significantly different.

Appendix Table 20. Feed Cost Benefit Analysis for Alabang and Palawan.

| Treatment | ALABANG (365 days) | | | | PALAWAN (181 days) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total Gain in Weight (kg) | Amt. of Concentrate Consumed (kg) | Amt. of Conc. to Produce 1 kg. LWG (kg) | Cost of Conc. to Produce 1 Kg. LWG | Total Gain in Weight (kg) | Amt. of Concentrate Consumed (kg) | Amt. of Conc. to Produce 1 Kg. LWG (kg) | Cost of Conc. to Produce 1 kg. LWG (₱) |
| 4 | 15.51 | 107.44 | 6.93 | 19.96 | 6.32 | 48.97 | 7.75 | 22.31 |
| 5 | 17.90 | 84.84 | 4.74 | 13.65 | 6.55 | 38.80 | 5.92 | 17.06 |
| 6 | 16.46 | 162.94 | 9.90 | 28.51 | 3.84 | 29.96 | 7.80 | 22.47 |

NOTE:

One (1) bag concentrate weighing 40 kg.
cost ₱115.30 or ₱2.88/kg.

Plate 1. Inside view of the experimental goats' house at Alabang, showing the individual stalls.

Plate 2. Treatment 1 animals in the pasture.

Plate 3. Treatment 2

Plate 4. Treatment 3


Plate 5. Treatment 4


Plate 6. Treatment 5

Plate 7. Treatment 6


Plate 8. Treatment 1 goat prior to slaughtering.


Plate 9. Treatment 2


Plate 10. Treatment 3

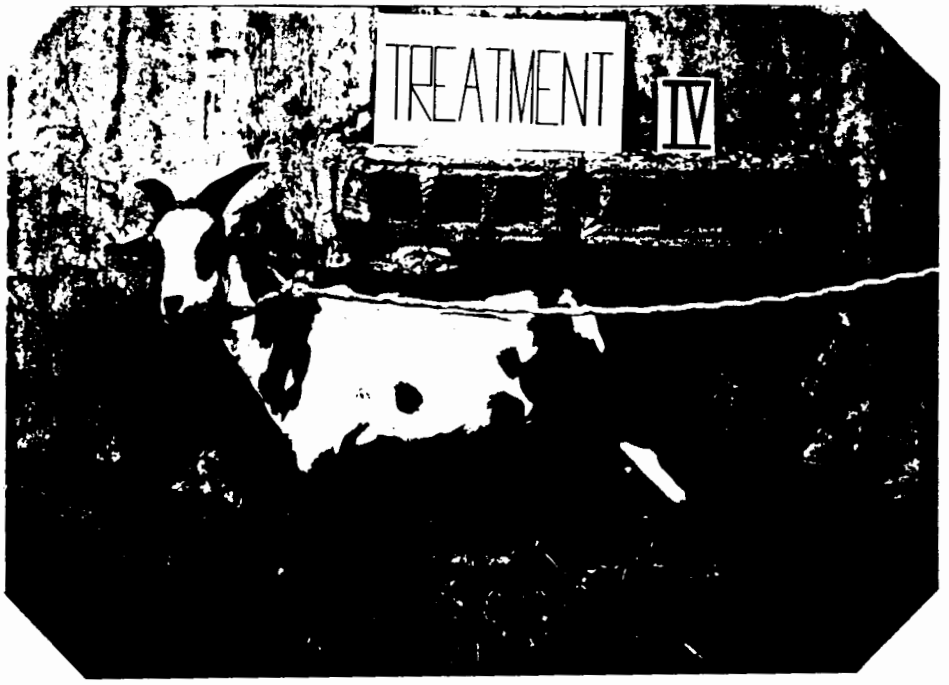


Plate 11. Treatment 4

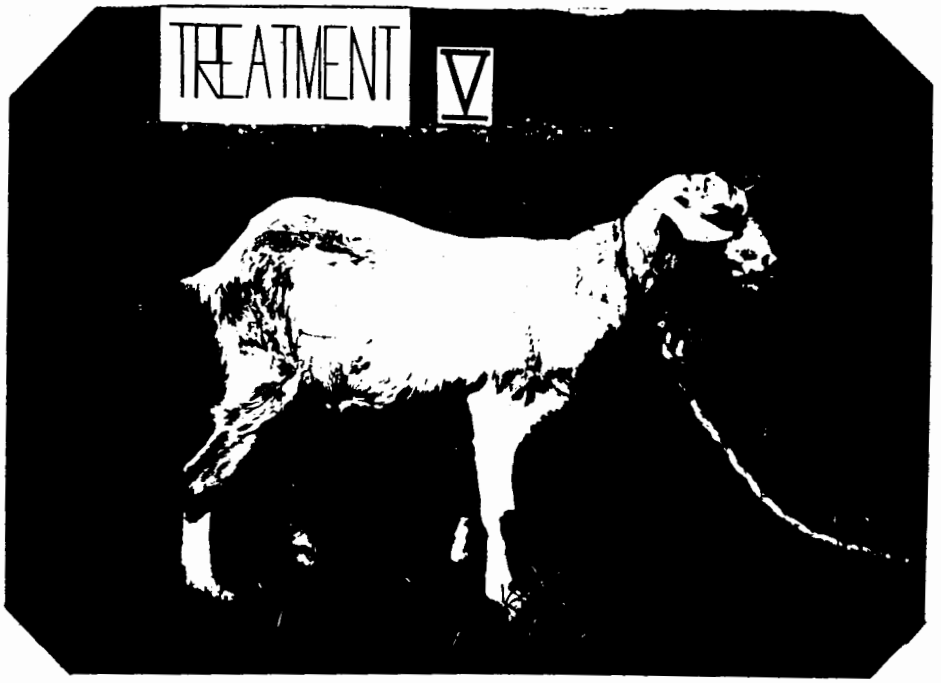


Plate 12. Treatment 5


Plate 13. Treatment 6

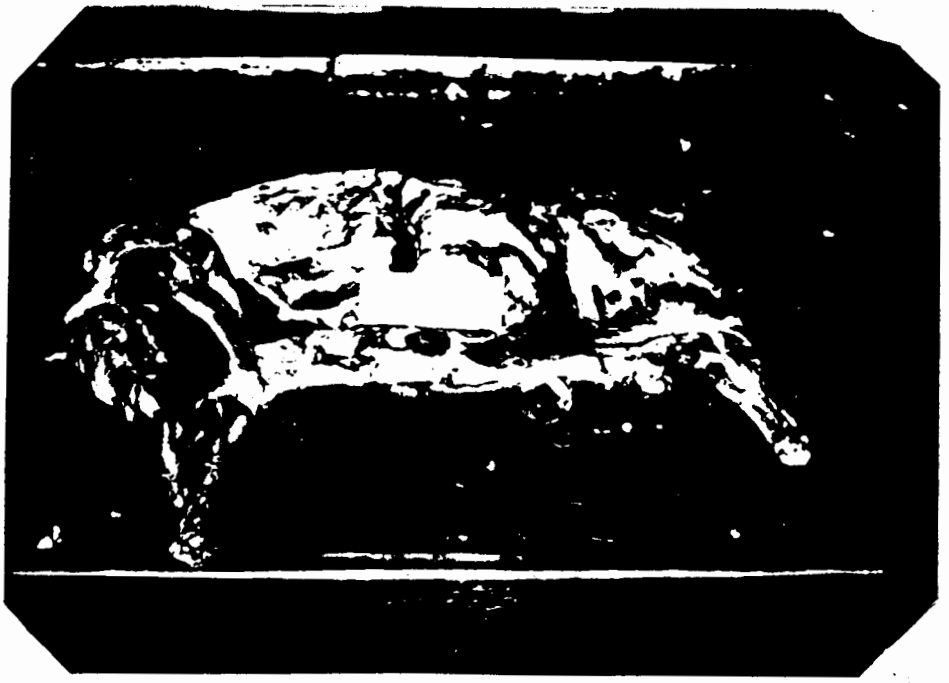

Plate 14. Carcass of Treatment 1 goat

Plate 15. Treatment 2

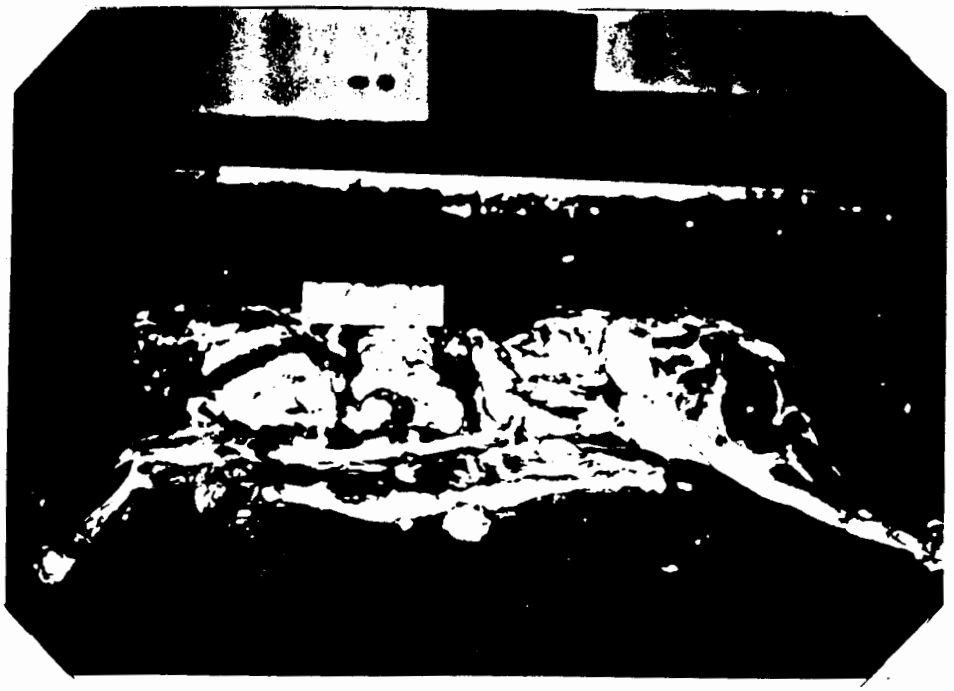

Plate 16. Treatment 3

Plate 17. Treatment 4

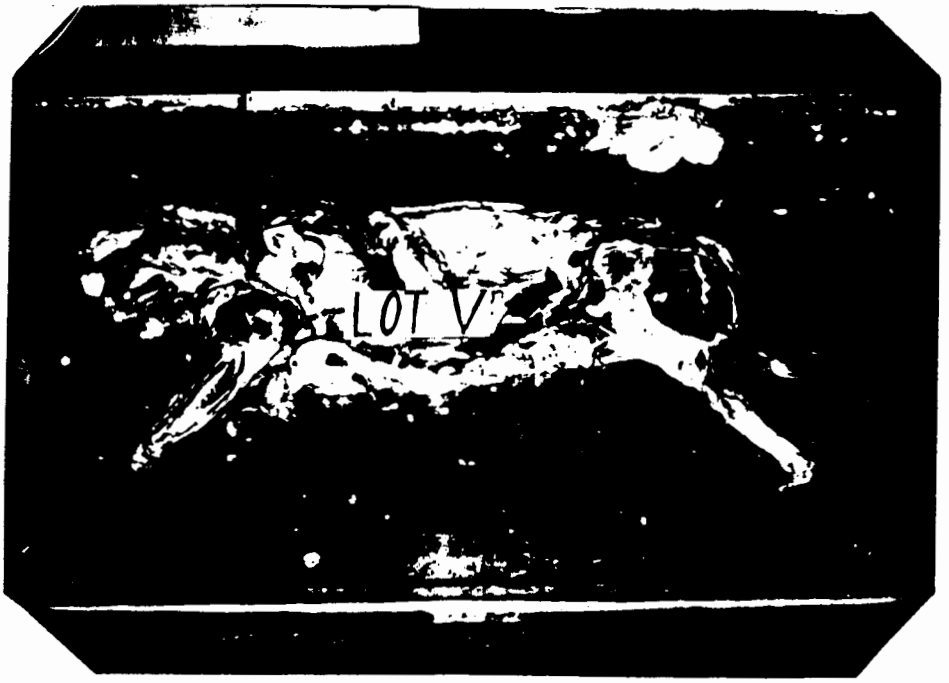


Plate 18. Treatment 5


Plate 19. Treatment 6