STUDIES ON GROWTH RESPONSE, FEED EFFICIENCY AND CARCASS CHARACTERISTICS OF PIGS REARED UPTO DIFFERENT MARKET WEIGHTS ON TWO DIETARY TREATMENTS

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THESIS

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DECLARATION

I hereby declare that this thesis entitled "STUDIES ON GROWTH RESPONSE, FEED EFFICIENCY AND CARCASS CHARACTERISTICS OF PIGS REARED UPTO DIFFERENT MARKET WEIGHTS ON TWO DIETARY TREATMENTS" is a bona fide record of research work done by me during the course of research and the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

P. Ramachandran.

Mannuthy,
20-7-1977.

CERTIFICATE

Certified that this thesis entitled "STUDIES ON GROWTH RESPONSE, FEED EFFICIENCY AND CARCASS CHARACTERISTICS OF PIGS REARED UPTO DIFFERENT MARKET WEIGHTS ON TWO DIETARY TREATMENTS" is a record of research work done independently by Sri. P. Ramachandran under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to him.

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C O N T E N T S

INTRODUCTION

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Increased food production for human beings is the prime objective of all planning in the developing countries. It is inadequately realised that animal products like milk, meat, egg and fish provide nutrients, both in quality and quantity, that can be efficiently utilised by human beings.

Acute scarcity of animal protein in India is reflected from the fact that the per capita consumption of the same per day is only 5.6 g against the recommended daily allowance of 20 g. (Borgstrom, 1973). The animal protein shortage becomes more and more acute with rise in population and increased consumption owing to better purchasing power of the people. The indicative World Plan for Agricultural Development projected an increase of not less than 166 per cent in the demand for meat from 1965 to 1985. The anticipated production of beef, mutton and chevon will be insufficient to meet this requirement. The modern swine industry can play a vital role in meeting this increasing protein needs (FAO Report, 1971).

The contribution of pigs to global meat production stands second only to that of beef cattle. Of the total meat production of 95 million metric tonnes in 1969-70, pork formed 35.3 per cent as against 41.0 per cent and 15.2 per cent respectively by beef and chicken (Borgstrom, 1973).

The world wide distribution of swine evidently demonstrates their adaptability to varying conditions while their heavy concentration in certain areas suggests their preference over those elsewhere. The hog production is closely related to dairy industry in Denmark and Holland, to that of barley and potato production in Germany and Poland, to corn production in United States and to wheat production in Australia. In China, the high hog population is supported mainly by agricultural byproducts and household wastes.

In India, pig raising is still not in a satisfactory state, with a hog population of only 68.84 lakhs (1972 Census) and is almost entirely in the hands of people with little resources, who continue to follow primitive methods of rearing. The common Indian pig is a scrub animal, slow grower, small sized and producer of small litters. Recognising the merits and potential of exotic breeds of pig as a source of animal protein, the Government of India is paying considerable attention to the development of pig industry. A number of pig production centresand bacon factories have been established in several States and the farmer is being educated on scientific lines.

The pigs are the ideal suppliers of high quality meat. Pigs excel all other meat producing animals except perhaps well kept broilers in feed conversion efficiency in as much as they require only 2.5 to 3 kg. of feed for each kilogram of meat produced. It has been shown that while 20 per cent of the gross

energy in the feed is converted into human food by the pig, it is 15 per cent by the dairy cows and 7 per cent for egg production by hens (Maynard, 1946). Swine can effectively utilise agricultural byproducts and industrial waste materials as rubber seed cake, tapioca starch waste etc. One important economic advantage which favours hog production is the ability of the pigs to multiply faster and to attain early sexual maturity. Compared to other meat animals, pigs yield higher dressing percentage. Also pork has higher energy value than either beef or mutton.

Feed contributes 70 to 80 per cent of the total cost of pork production. Scientific feeding of pigs has contributed much to better growth rate, feed efficiency and carcass quality in pigs and has helped in reducing production costs and increasing profits.

Growth rate, feed efficiency and carcass quality are vital factors influencing the cost of fattener production in swine enterprise. These factors are related to live body weight and age, quality and quantity of feed, genetic potential, environment and miscellaneous factors. The main factors that exert a dominating influence on feed conversion efficiency, growth rate and carcass quality are the body weight of the animal and the dietary protein level.

The feed efficiency is maximum at the early stages of growth and it decreases with increasing age and liveweight (Field

et al. 1961; McCampbell and Baird, 1961; Blair et al. 1969; Ranjhan et al. 1972 and Kumar et al. 1974). Live weight of the pigs affects the carcass composition and quality of pork (Mullins et al. 1960; McCampbell and Baird, 1961; Cuthbertson and Pomeroy, 1962; Stant et al. 1968; Narayana Rao et al. 1968 and Shuler et al. 1970). Obviously, the weight of the animal at which it is slaughtered, influences the economics of fattener production.

National Research Council (1969) has recommended protein levels of 14 and 13 per cent in the diets of fattening pigs beyond 35 kg. and 60 kg. live body weight respectively. Several workers have reported higher average daily gains on higher protein levels (Robinson et al. 1964; Lee et al. 1967; Jurgens et al. 1967 and Cole et al. 1969) while no such effect has been noticed by certain others (Aunan et al. 1961; Hale et al. 1967 and Lucas et al. 1971). It has been found that feed efficiency was higher at higher protein levels in the initial growing period of the pig (Robinson et al. 1964; Seymour, 1964; Lee et al. 1967; Cole et al. 1969; Kornegay et al. 1973 and Wahlstrom et al. 1971). Better carcass quality for pigs fed higher protein levels was reported by Ashton et al. (1955); Seymour et al. (1964); Wallace, (1966); Hale et al. (1967); Blair et al. (1969) and Bereskin et al. (1976).

From the foregoing paragraphs, it is evident that informations on the level of dietary protein for fattening pigs for

most efficient gains and on the most economical weight at which the pigs have to be slaughtered are conflicting. A detailed investigation was, therefore, taken up to study the growth rate, feed conversion efficiency and carcass characteristics of fattening pigs maintained on two dietary regimens and reared upto three different live body weights in order to assess the comparative economics of production and to make suitable recommendations to the farmer.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Providing an adequate supply of good quality protein in the diet is the most important pre-requisite for efficient and economical gains in swine. The total daily protein requirements of pigs increase with age and body size but decrease per unit weight and in relation to energy requirement. According to National Research Council (1969), a pig weighing 10 kg. requires 22 per cent protein in feed while a pig weighing 60 kg. requires only 13 per cent protein.

Clawson (1967) reported that daily feed intake of pigs is not significantly influenced by level of protein in the diet as long as the amino acid balance of the ration is adequate. He found significant depression in caloric intake with increasing levels of dietary calories when protein level was inadequate and even more depressed caloric intake with an amino acid imbalance. Boomgart and Baker (1973) stated that the expression of amino acid requirements as a percentage of dietary crude protein is preferable to that as a percentage of total diet. In his studies with growing pigs he found the tryptophan requirements to be 0.71, 0.67 and 0.66 per cent at the dietary protein levels of 10, 14 and 18 per cent respectively. Baker et al. (1975) found that the amino acid requirements of the pigs are affected by protein levels in the diet. According to them, the dietary lysine requirement of growing pigs decreased by 0.02 per cent of the diet for each one per cent decrease in the level of dietary protein.

Influence of protein level on growth and feed efficiency has been extensively studied. Several reports indicate that growth response and feed efficiency are significantly increased only during the growth period. Woodman et al. (1939) recorded significantly lower growth performance with pigs on low protein diets in the growing period but there was no significant difference between high and low protein rations, over the whole feeding period. Robinson et al. (1964) in their studies using 19, 14, 16 and 12 per cent protein levels found significant growth response only in the early stages of growth. Cole and Luscombe (1969) reported a significant increase in growth rate in pigs of 50 to 120 lbs live weight over those above 120 lbs live weight, with dietary crude protein levels of 17.1 to 13.7, 13.8 to 12.0 and 11.2 to 10.3 per cent. Blair et al. (1969) did not find any increase in weight gain of pigs by increasing protein levels beyond 16, 14, 12 and 12 per cent in weight groups of 50-100 lbs, 100-150 lbs, 150-200 lbs and 200-250 lbs. respectively. However, the feed efficiency was improved significantly by increasing protein level upto 18 per cent till 100 lbs. live weight. Pay and Davies (1973) obtained positive growth response and feed efficiency upto 55 kg. live weight and negative response beyond 55 kg. live weight while the overall feed efficiency was not significantly different at higher protein levels.

Higher overall feed efficiency and weight gains on

higher levels of protein in the diets of pigs have been reported by several workers. Seymour et al. (1964) found increased feed efficiency on higher protein levels in their studies using protein levels of 20-17-14 and 16-13-10 per cent. Higher daily gain and feed efficiency have been reported by Jurgens et al. (1967) at 16 per cent than at 12 per cent dietary protein level. Lee et al. (1967) also obtained similar results with protein levels of 21-18-15, 18-15-12 and 15-12-9 per cent. Wallace et al. (1967) using 19-17, 17-15 and 13-11 per cent protein levels found similar efficiency and gains on the first two treatments while animals on 13-11 per cent grew slower and less efficiently. Cunningham et al. (1973) found that pigs fed a 14 per cent protein diet had higher gain and feed efficiency than those fed 10 per cent protein diet. Higher feed efficiency and daily gains were obtained only in the higher protein sequences used in their studies by Kornegay et al. (1973). Crammer et al. (1970); Tanksley (1970) and Wahlstrom et al. (1971) have obtained similar results. Bellis (1965) got beneficial results on a higher dietary protein level throughout the growing and fattening period. Braude and Rowell (1968), on the other hand, could get only slight improvement in feed efficiency in similar studies. No significant improvement in the average daily gain and feed efficiency was noted on higher protein levels by Aunan et al. (1961); Hale et al. (1967); Wong et al. (1968) and Wallace et al. (1969).

Meade et al. (1965) found increased feed intake on a low

protein diet but no significant increase was noticed on daily gain. Baird et al. (1975) observed greater efficiency of protein conversion on low protein diets.

The conflicting reports on the biological and economical efficiency of different levels of protein in the diet are attributed to variability in the levels and sources of protein and stages at which the levels are changed. Robinson et al. (1964) have emphasised the need to give due regard to the quality of the carcass in setting up the needs of pigs, as the criteria of growth and feed efficiency alone may give rise to suboptimal protein level recommendations.

Energy is an important factor governing the total food allowance. The maintenance component of the total energy requirements during the growth increases regularly with body size but the additional demand for growth varies with the rate and composition of tissue formed. Per unit body weight, the amount of energy represented by growth tissue formed decreases with age, reflecting the declining rate of body increase measured on a percentage basis. The energy cost per kilogram of protein and fat synthesised by piglets was estimated to be 7.43 and 12.05 Kcal. Metabolizable energy respectively (Burlacu et al., 1973). Agricultural Research Commission (Britain) states that a pig weighing 20 kg. gaining 500 g. daily requires 3.05 Mcal. of digestible energy while the pig weighing 60 kg. gaining 790 g. daily requires only 6.68. Mcal. daily. National Research Council

(1973) recommends 3,500 Kcal·per kg of feed for pigs weighing upto 20 kg. live weight and 3,300 Kcal·per kg for finishing pigs.

Several workers have studied the influence of energy level in the diet on daily gain and feed efficiency in pigs. Shorrock (1940) and Thompson (1940) found that considerable economy was gained by restricting feed during the fattening period of 100-200 lbs live weight. Barber et al. (1957) found that pigs fed to appetite gained faster but less efficiently than scalefed pigs. Braude et al. (1958) observed that feed conversion was better for pigs on restricted feeding than for those fed adlibitum. Plank and Berg (1963) also noted that liberal feeding caused inferior feed conversion in pigs. Vanschoubrock et al. (1967) reported a decrease in daily gain and increase in feed efficiency on feed restriction. Blair et al. (1969) found an increased feed efficiency with increased feed levels in pigs of 50-100 lbs live weight.

Energy utilisation is influenced by crude fiber level and its source. Baird et al. (1970) found that higher crude fiber levels increased feed requirements and reduced daily gain. Bowland and Bickel (1970) reported that fiber levels at constant energy levels had no effect on rate of gain, feed efficiency or carcass leanness. Baird et al. (1975) found that crude fiber levels had no effect on growth rate provided the energy density is adequate. Troelson and Bell (1963) opined that source of crude fiber may also be a factor in its

utilisation.

Energy protein inter-relationship in the diet of pigs has been well established. The need for a higher protein level with increased level of dietary calories has been emphasised by Sewell et al. (1961); Clawson et al. (1962); Manners and McCrea (1963); Anderson and Bowland (1970); Allee et al. (1971) and Leibbrandt et al. (1975). Clawson (1962) found that a narrow protein energy ratio supported the most rapid gain during the first 28 days. But this difference was not apparent at the time the animals reached market weight.

Daily gain and feed efficiency are markedly influenced also by age and live body weight. A progressive decrease in feed efficiency with increasing live weight has been reported by several workers suggesting a negative correlation between live weight and feed efficiency (Field et al. 1961; McCampbell et al. 1961; Blair et al. 1969; Ranjhan et al. 1972 and Kumar et al. 1974). McCampbell et al. (1961) have observed a decrease in average daily gain in pigs beyond 170 lbs. live body weight while Blair et al. (1969) have obtained a linear increase in a similar study.

Influence of environmental factors like temperature, humidity and season on the feed efficiency and energy requirement has been well studied. Capstick and Wood (1922) and Mount (1959) found that energy expenditure was lower at higher temperature. Moustgard et al. (1959); Sorenson et al. (1966)

and Pfeiffer et al. (1973) in different independent studies have established the optimum range of temperature for fattening pigs as that lies between 11°c and 22°c. Feed consumption, rate of gain and feed efficiency were found to be lower at temperature above 23°c and lowest at temperature above 30°c (Heitman and Hughes, 1949; Heitman et al. 1958 and Moustgard et al. 1959). Houghton et al. (1964) concluded that energy requirements of pigs in the humid tropics were lower than those in temperate areas. Holmes (1973) obtained reduced growth rate in pigs exposed to continually high ambient temperature. He also found a reduced nitrogen retention at higher temperature suggesting other possible metabolic changes in the animals. Bruner and Swiger (1968) have reported better feed efficiency in pigs farrowed in summer than those farrowed in fall. Seerly et al. (1975) have also found higher feed efficiency in summer.

Sex has a marked influence on growth and feed efficiency. Wong et al. (1968) reported a faster growth rate for boars than for gilts or barrows. Higher feed efficiency (Wallace et al. 1964; Charette, 1961 and Pay and Davies, 1973) and higher protein requirements (Luce et al. 1975, 1976) have been reported for boars as compared to barrows. Faster growth rate, higher feed consumption and lesser feed efficiency have been found in barrows than in gilts (Baird, 1964; Clawson et al. 1962; Hale et al. 1967, 1968; Bruner and Swiger, 1968; Baird et al. 1970 and Cunningham et al. 1973). Wallace (1968, 1971); McBee et al. (1969); Tanksley (1970) and Cunningham et al. (1973) have

reported higher protein requirements for gilts than for barrows. No such differences were noticed by Tjong A. Hung et al. (1971); Wong, Boyland and Stothers (1968) and Wahlstrom et al. (1971).

Aunan et al. (1961) have established the relationship between feed efficiency and genotype of the animal. Heitman et al. (1961) found a lowered feed consumption and feed efficiency in pigs with less space allowance. Livingstone (1973) could not see any significant effect on performance of pigs subjected to rapid changes in the composition of diet. Walker et al. (1968) observed that an increase in rate of gain tends to improve feed efficiency.

Feed additives such as antibiotics improve feed efficiency and rate of gain in pigs. Solnev and Vasilanko (1968) observed reduced growth stimulating effect on continued feeding of antibiotics in pigs. Smith et al. (1964) found a better growth response in pigs when fed a mixture of Oleandomycin and Oxytetracyclin than Oleandomycin alone. A beneficial effect on the growth of pigs is seen on adding copper sulphate to the diet of pigs (Braude and Ryder, 1973).

The level of dietary protein has been found to influence the carcass quality. Higher levels of protein in the diet are found to increase lean growth (Ashton et al. 1955; Robinson et al. 1964; Seymour, 1964; Lee, 1964; Hale et al. 1967; Blair et al. 1969; Cunningham et al. 1973; Baird et al. 1975 and

Mervin et al. 1975), decrease backfat (Seymour et al. 1964; Wallace, 1966; Hale et al. 1967; Wong et al. 1968; Mervin et al. 1975 and Bereskin et al. 1976) and increase dressing percentage (Robinson, 1965). Jurgens et al. (1967) and Kornegay et al. (1973), on the other hand, noticed no significant effect on backfat thickness of pigs fed at different dietary protein levels. Several other workers could not find any influence on the length of the carcass by varying protein levels (Lee et al. 1967; Young et al. 1968; Meade et al. 1969; Tanksley, 1970 and Wahlstrom et al. 1971). Aunan et al. (1961) did not find any significant effect on any quality of the carcass at two dietary protein levels.

Carcass quality is influenced by energy level in the ration. McMeekan and Hammond (1939), Braude et al. (1969) and Baird et al. (1970) have observed adverse effects on carcass quality on ration with high energy levels. With increasing levels of energy, Blair et al. (1969) obtained fatter carcasses at all live weights. They have reported lesser fat, longer body and greater eyemuscle area for feed restricted pigs. Babatunde et al. (1967) found higher percentage of body protein in energy restricted pigs. Robinson (1965) could not find any significant effect on any of the carcass characteristics except carcass length, with high energy diets. Elseley et al. (1964) reported only slight differences in the relative proportion of bones and muscles in different parts of the body

of pigs with large differences in feeding pattern. Braude and Townsend (1958) and Babatunde et al. (1967) found softer fat and higher per cent unsaturated fatty acids under restricted feeding. Lee et al. (1973) have stated that the increase in lean percentage in restricted feeding is primarily due to a reduced backfat thickness.

Live body weight markedly influences carcass characteristics. Smith (1957), Emmerson (1964), Agarwala,(1963), Kanev (1963), Gudilin (1966), Narayana Rao et al. (1968), Lavrentjeva et al. (1970) and Kumar et al. (1974) have found positive correlation between dressing percentage and live weight. McCampbell et al. (1961), Bellis and Taylor (1961), Emmerson et al. (1964) and Lavrentjeva et al. (1970) observed that carcass length increases with increasing live weight. Backfat thickness (Mullins et al. 1960; Field et al. 1961; Bellis et al. 1961; McCampbell et al. 1961; Cutbertson et al. 1962 and Kanev, 1963) and eyemuscle area (Loeffel, Derrick and Peters 1943; Bellis et al. 1961 and Kumar et al. 1974) are also reported to be positively correlated with live weight. Mullins et al. (1960), Emmerson et al. (1964), Stant et al. (1968) and Shuler et al. (1970) have reported negative correlation between dressing percentage and per cent of primal cuts.

Effects of environmental factors like temperature and climate on the carcass quality in pigs have been studied by

Moody et al. (1961) and Bruner et al. (1968), who found fatter carcasses in pigs maintained in summer while Baird et al. (1970) observed shorter fatty carcass with larger loineye area in winter fed pigs.

Sex of the animal is found to have marked influence on the quality of carcass. Gilts are found to produce superior carcasses with lesser backfat (Braude et al. 1959; Handlin et al. 1961; Charette, 1961; Moody et al. 1961; Buck, 1963; Laird, 1964 and Hale et al. 1967), larger eyemuscle area (Handlin et al. 1961; Charette, 1961; Hale et al. 1967, 1968; Wong et al. 1968; Cunningham et al. 1973 and Mervin et al. 1975) and higher percentage of primal cuts (Buck, 1962; Doornebal, 1967; Hale et al. 1967 and Leroy, 1969), than barrows. Prescott et al. (1964) and Pay et al. (1973) reported that boar carcasses were leaner and had larger eyemuscle area and decreased backfat thickness than barrows. Wallace (1944) and Zobrisky (1959) have found greater development of head and shoulders and higher bone percentage for boar carcasses than for barrows. Moody et al. (1961) obtained a higher yield of lean and larger loineye area for boar carcasses as compared to their litter mate barrows and gilts.

MATERIALS AND METHODS

MATERIALS AND METHODS

Animals

Large White Yorkshire pigs belonging to the University Pig Breeding Farm, Mannuthy formed the animals for the study. Thirty six weaner pigs from five litters were divided under two dietary treatments with eighteen animals each (Dietary treatment A and B). The animals in each of the dietary treatments were further divided into three groups of six animals each (Group I, II and III). The animals were allotted randomly into the different treatments and groups as uniformly as possible, in regard to their age, sex and weight. The males used in this study were castrated at six weeks of age. The experimental animals in each group were housed in a closed fully roofed pen of 11.5 sq. metres with facilities for feeding and watering. The animals were dewormed and sprayed against ectoparasites before the commencement of the experiment.

Diets

The different experimental diets and their percentage chemical composition are given below.

Percentage composition of the experimental diets

Ingredients	Crude protein levels		
	18%	16%	14%
Tapioca	44.0	50.0	53.0
Deoiled groundnut cake	25.0	23.0	18.0
Dried fish (unsalted)	15.0	10.0	10.0
Rice bran	15.0	16.0	18.0
Mineral mixture	1.0	1.0	1.0

Salt, Aurofac 2A and Vitamin AB_2D_3 were added at the rate of 2.5 kg, 5.0 kg and 100 g per metric tonne respectively in all the diets.

Percentage chemical composition of the experimental diets

	Crude protein levels		
	18%	16%	14%
Moisture	9.7	9.8	9.7
Crude protein	18.2	16.1	13.9
Crude fiber	6.9	7.1	7.4
Ether extract	5.9	5.7	5.7
Total ash	11.4	9.9	9.8
Nitrogen free extract	47.9	51.4	53.5
Acid insoluble ash	4.9	5.1	5.1
Calcium	0.96	0.88	0.88
Phosphorus	0.62	0.63	0.68

Methods

The animals in the three groups I, II and III under diet A were fed on the diets containing 18 per cent protein upto an average live weight of 20 kg, 16 per cent protein upto 35 kg and 14 per cent protein till they were slaughtered while those in groups I, II and III under diet B were fed on a diet containing 16 per cent protein throughout the experimental period, until they were slaughtered.

All the animals were fed the diets semi-ad libitum, allowing access to the feed for thirty minutes every day morning and evening. Water was provided ad libitum. Records of feed intake and body weights of animals were maintained for the entire period of the experiment.

Pigs belonging to the groups I, II and III under both dietary treatments A and B were slaughtered when they attained body weights of 55, 70 and 85 kg respectively for the purpose of gathering data on carcass characteristics. All the animals were fasted for fourteen hours and their weights recorded before they were slaughtered.

The dressed weights of the carcass with and without head were recorded, the head being removed at the atlanto-occipital joint. Length of the carcass was measured from the anterior aspect of the first rib to the anterior aspect of the pubic symphysis. Measurement of backfat thickness was made at three sites viz., at the region of the first rib, last rib and last lumbar vertebra. The cross sectional area of the eyemuscle was calculated from its measurement of maximum length and breadth taken at the region of the 10th rib. By two vertical straight line cuts, one at the 3rd rib and the other in front of the crest of the ilium, the shoulder and the middle cuts were taken out. The trotters were removed at the hock joint to obtain the ham. Weights of all cuts were recorded. Samples

of body fat were collected for the estimation of fat constants. Melting point, Iodine value and Saponification value were determined by the methods described in A.O.A.C. (1970). Statistical analysis was done following the methods given by Snedecor and Cochran (1967).

R E S U L T S

RESULTS

Data on live body weights of animals maintained on the experimental rations are presented in Tables 1 to 6. Tables 7 to 12 show data on average daily gain and age of slaughter of the animals under experiment. The values of weight gain till the first animal in each group (I, II and III) under diet A and B reached slaughter weight are represented in Figures 1 to 3. Data showing feed efficiency of the experimental animals are given in Table 13 and represented in Figures 4 to 6. The above results are summarised in Table 14. The sex wise data on daily gains is given in Table 14b. Data on daily gains have been statistically analysed in Table 15.

Data on carcass characteristics are detailed in Tables 16 to 27, summarised in Table 28 and statistically analysed in Tables 29 to 39. Tables 40 and 41 present details of production cost of pig per kilogram live body weight and the same is represented in Figure 7.

Table 1. Data on body weight (kg) of pigs maintained on the experimental rations.

Diet A - Group I

Pig number	Sex	Weeks															
		0	2	4	6	8	10	11	12	13	14	15	16	17	18	19	20
1/127	M	12.4	18.0	21.7	27.0	32.0	36.0	38.5	42.0	47.3	50.5	53.5	53.5				
2/135	M	14.4	20.0	27.0	35.4	45.5	52.5	57.2									
5/135	M	14.5	20.5	25.5	33.5	41.0	46.5	51.5	57.0								
6/127	F	14.0	19.5	24.5	29.2	35.0	40.0	42.5	45.8	52.3							
7/127	F	13.0	17.5	19.9	22.5	28.5	31.5	34.0	36.5	40.8	42.5	46.4	47.5	47.4	50.5	52.5	55.0
9/137	F	11.5	16.5	20.7	26.0	32.5	38.0	42.0	46.8	53.3							
Average		13.5	18.7	23.2	28.9	35.7	40.7	44.3	45.6	48.4	46.5	49.9	50.5	47.4	50.5	52.5	55.0

Table 2. Diet A - Group II

Pig number	Sex	Weeks																	
		0	2	4	6	8	10	11	12	13	14	15	16	17	18	19	20	21	22
3/127	M	13.5	18.5	21.6	27.0	33.0	37.5	40.5	43.0	46.0	49.0	52.0	54.5	55.5	59.0	63.3	67.0	69.9	74.2
5/127	M	15.7	21.2	26.3	34.0	41.0	47.5	50.2	54.0	57.0	60.2	64.5	66.5	67.0	71.0				
3/135	M	13.7	19.5	24.3	32.1	41.0	46.0	50.5	55.0	59.7	64.0	70.5							
7/131	F	11.8	16.0	20.2	22.8	29.0	30.0	34.0	38.0	40.5	43.3	46.0	49.5	50.5	54.0	59.3	61.0	64.4	70.0
10/137	F	14.0	20.3	24.5	31.0	37.0	41.5	45.5	49.0	52.2	55.8	60.0	62.5	61.5	66.0	64.3	70.0		
11/137	F	11.6	17.3	21.5	28.0	34.0	37.5	42.0	46.0	50.0	54.5	60.5	63.5	64.5	68.5	72.3			
Average		13.4	18.8	23.1	29.1	35.8	40.0	43.8	47.5	50.9	54.5	58.9	59.3	59.8	63.7	64.8	66.0	67.1	72.1

Table 3. Diet A - Group III

Weeks																				
0	2	4	6	8	10	12	14	15	16	17	18	19	20	21	22	23	24	25	26	27
.5	18.2	22.1	26.0	33.0	36.0	41.7	46.0	51.0	50.5	50.5	55.0	58.3	62.5	63.4	65.7	69.0	72.0	74.5	78.8	82.0
.6	19.5	25.0	31.0	38.5	45.0	55.5	62.9	67.0	68.5	71.0	76.0	78.5	81.5	86.0						
.1	16.8	20.8	25.0	32.0	36.5	43.8	50.7	55.5	58.0	58.5	64.0	60.5	61.5	63.4	62.2	65.0	69.0	74.5	79.5	83.5
.8	19.8	25.0	31.0	38.5	44.0	52.0	59.2	64.5	67.0	68.5	70.0	73.5	77.0	80.5	81.2	82.0	86.5			
.0	18.5	23.7	29.5	36.0	41.5	49.5	58.7	61.0	57.5	58.5	63.0	65.5	69.5	71.4	74.2	77.0	82.5	87.0		
.5	17.8	22.1	27.1	34.0	38.5	45.5	54.1	58.0	61.5	62.5	60.0	64.5	70.5	69.4	72.2	79.0	81.5	87.5		
.4	18.4	23.1	28.3	35.3	40.2	48.0	55.3	59.4	60.5	61.6	64.6	66.8	70.4	72.3	71.1	74.4	78.3	80.9	79.1	82.7

Table 4. Diet B - Group I

Pig Number	Sex	Weeks													
		0	2	4	6	8	10	11	12	13	14	15	16	17	18
1/130	M	13.0	16.5	21.8	26.0	31.5	36.5	40.0	44.5	51.0	51.5	55.5			
3/131	M	14.3	19.5	25.5	32.0	38.0	46.0	50.0	54.0						
5/137	M	12.5	16.5	22.5	27.0	33.0	41.0	44.0	48.0	55.0					
9/131	F	13.4	19.2	23.3	27.4	32.5	38.5	42.0	46.5	50.0	48.5	53.0	56.0		
6/135	F	12.7	15.5	19.7	24.5	27.5	33.2	36.0	39.2	43.0	44.5	49.0	49.5	52.5	56.0
11/135	F	14.7	18.8	22.0	24.5	27.5	32.0	35.0	39.5	43.0	44.5	48.5	50.5	53.5	55.0
Average		13.4	17.7	22.5	26.9	31.6	37.8	41.2	45.3	48.4	47.2	51.5	52.0	53.0	55.5

Table 5. Diet B - Group II

Pig number	Sex	Weeks																		
		0	2	4	6	8	10	11	12	13	14	15	16	17	18	19	20	21	22	23
2/130	M	12.6	16.0	18.8	22.0	25.5	28.5	32.5	37.5	39.0	41.0	45.0	46.5	50.5	53.0	57.3	55.5	60.1	65.2	72.0
3/136	M	13.9	19.8	25.8	32.0	39.5	50.5	55.0	60.0	63.0	67.0	73.0								
7/137	M	12.0	16.0	19.9	23.5	28.5	30.5	34.5	39.0	42.3	46.5	53.0	55.5	57.5	63.0	64.1	66.5	71.0		
8/131	F	14.6	20.0	24.6	28.5	33.5	38.0	42.3	46.5	48.8	52.5	53.0	53.5	55.5	57.5	62.3	63.5	67.0	72.7	
10/131	F	13.0	18.2	22.5	26.8	32.5	37.0	40.0	44.5	47.5	51.1	56.5	61.5	62.0	66.0	71.8	73.0			
7/136	F	14.5	19.5	22.5	28.5	35.0	42.2	47.5	53.0	56.0	59.0	64.5	62.5	65.5	70.0					
Average		13.4	18.2	22.3	26.8	32.4	37.8	41.9	46.7	49.4	52.8	57.5	55.9	58.2	61.9	63.9	64.6	66.0	68.9	72.0

Table 6. Diet B - Group III

er	Weeks																			
r	0	2	4	6	8	10	12	14	15	16	17	18	19	20	21	22	23	24	25	26
	13.9	19.5	24.5	28.9	35.0	43.0	49.2	57.5	63.5	63.5	66.5	71.0	73.5	77.5	83.5	85.2				
	12.5	16.0	20.7	25.5	32.5	38.5	48.7	55.5	61.0	60.5	62.5	68.0	68.0	69.0	73.8	77.2	85.7			
	12.5	17.0	21.5	25.5	30.5	37.0	42.2	50.5	55.0	53.5	59.0	64.0	66.0	68.0	73.0	75.2	83.2	83.5		
	14.8	21.0	26.0	30.9	38.5	43.5	50.2	57.2	61.0	61.5	61.5	63.0	66.0	69.0	73.0	77.2	84.6			
	14.8	21.0	26.5	32.2	40.0	47.5	55.2	63.8	70.0	69.5	71.5	75.0	79.0	83.5	87.0					
	12.4	15.5	20.1	25.5	31.5	36.5	44.2	51.5	57.0	53.0	49.5	51.5	56.0	61.5	66.4	68.2	73.5	77.5	81.5	87.0
e	13.5	18.3	23.2	28.2	34.6	41.0	48.3	56.0	61.2	60.2	61.7	65.4	68.1	71.4	76.1	76.6	81.7	80.5	81.5	87.0

Table 7. Average daily gain and age at slaughter of pigs maintained on the experimental rations.

Diet A - Group I

Pig number	Sex	Age at start of the experiment (in days)	Initial body weight (kg)	Final body weight (kg)	Weight gain (kg)	Number of days under experiment	Average daily gain (g)	Age at slaughter (in days)
1/127	M	67	12.4	53.5	41.1	114	360	181
2/135	M	64	14.4	57.2	42.8	78	548	142
5/135	M	64	14.5	57.5	43.0	87	494	151
6/127	F	67	14.0	54.4	40.4	98	412	165
7/127	F	67	13.0	55.0	42.0	144	291	211
9/137	F	61	11.5	54.0	42.5	98	433	159
Average		65	13.3	55.2	41.9	103.1	406.3	168.3
S.E.		±1.0	±0.5	±0.7	±0.4	±9.5	±37.5	±10.1

Table 8. Diet A - Group II

Pig number	Sex	Age at start of the experiment (in days)	Initial body weight (kg)	Final body weight (kg)	Weight gain (kg)	Number of days under experiment	Average daily gain (g)	Age at slaughter (in days)
3/127	M	67	13.5	74.0	60.5	156	387	223
5/127	M	67	15.7	72.0	56.3	130	433	197
3/135	M	64	13.7	69.4	55.7	107	520	171
7/131	F	66	11.8	70.5	58.7	156	376	222
10/137	F	61	14.0	68.2	54.2	142	381	203
11/137	F	61	11.6	72.0	60.4	135	447	196
Average		64.3	13.4	71.0	57.6	137.6	418.6	202.0
S.E.		±1.1	±0.6	±0.8	±1.1	±7.5	±22.6	±7.9

Table 9. Diet A - Group III

Pig number	Sex	Age at start of the experiment (in days)	Initial body weight (kg)	Final body weight (kg)	Weight gain (kg)	Number of days under experiment	Average daily gain (g)	Age at slaughter (in days)
2/127	M	67	13.5	82.0	68.5	192	356	260
5/136	M	63	13.6	86.0	72.4	149	485	212
2/137	M	61	12.1	84.5	72.4	192	377	253
6/131	F	66	13.8	88.5	74.7	170	439	236
10/135	F	64	15.0	87.0	72.0	176	409	240
8/137	F	61	12.5	88.5	76.0	176	431	237
Average		63.6	13.4	86.1	72.7	175.8	413.3	239.6
S.E.		±1.0	±1.2	±1.0	±1.1	±6.5	±18.8	±6.7

Table 10. Diet B - Group I

Pig number	Sex	Age at start of the experiment (in days)	Initial body weight (kg)	Final body weight (kg)	Weight gain (kg)	Number of days under experiment	Average daily gain (g)	Age at slaughter (in days)
1/130	M	66	13.0	56.3	43.3	107	404	173
3/131	M	66	14.3	55.5	41.2	85	484	151
5/137	M	61	12.5	56.3	43.8	95	461	156
9/131	F	66	13.4	55.9	42.5	114	372	180
6/135	F	64	12.7	56.0	43.3	128	338	192
11/135	F	64	14.7	55.0	40.3	128	314	192
Average		64.5	13.4	55.8	42.4	109.5	387.2	174.0
S.E.		±0.8	±0.3	±0.2	±0.5	±7.1	±27.5	±7.1

Table 11. Diet B - Group II

Pig number	Sex	Age at start of the experiment (in days)	Initial body weight (kg)	Final body weight (kg)	Weight gain (kg)	Number of days under experiment	Average daily gain (g)	Age at slaughter (in days)
2/130	M	66	12.6	74.3	61.7	163	378	229
3/136	M	63	13.9	72.3	58.4	107	545	170
7/137	M	61	12.0	71.0	59.0	149	395	210
8/131	F	66	14.6	73.0	58.4	156	374	222
10/131	F	65	13.0	74.2	61.2	142	430	208
7/136	F	63	14.5	71.5	57.0	130	438	193
Average		64.3	13.4	72.7	59.3	141.3	419.9	205.3
S.E.		±0.8	±0.4	±0.5	±0.7	±8.2	±26.0	±8.7

Table 12. Diet B - Group III

Pig number	Sex	Age at start of the experiment (in days)	Initial body weight (kg)	Final body weight (kg)	Weight gain (kg)	Number of days under experiment	Average daily gain (g)	Age at slaughter (in days)
1/131	M	66	13.9	85.5	71.6	156	459	222
1/135	M	64	12.5	85.3	72.8	163	446	227
1/137	M	61	12.5	83.5	71.0	170	417	231
4/131	F	66	14.8	83.1	68.3	163	419	229
5/131	F	66	14.8	87.0	72.2	149	484	215
8/135	F	64	12.4	87.0	74.6	184	405	248
Average		64.5	13.5	85.2	71.7	164.1	437.1	228.6
S.E.		±0.8	±0.5	±0.7	±0.8	±4.9	±12.2	±4.5

FIGURE. 1

AVERAGE WEIGHT GAINS ON THE DIETARY TREATMENTS A & B OF ANIMALS GROUP I

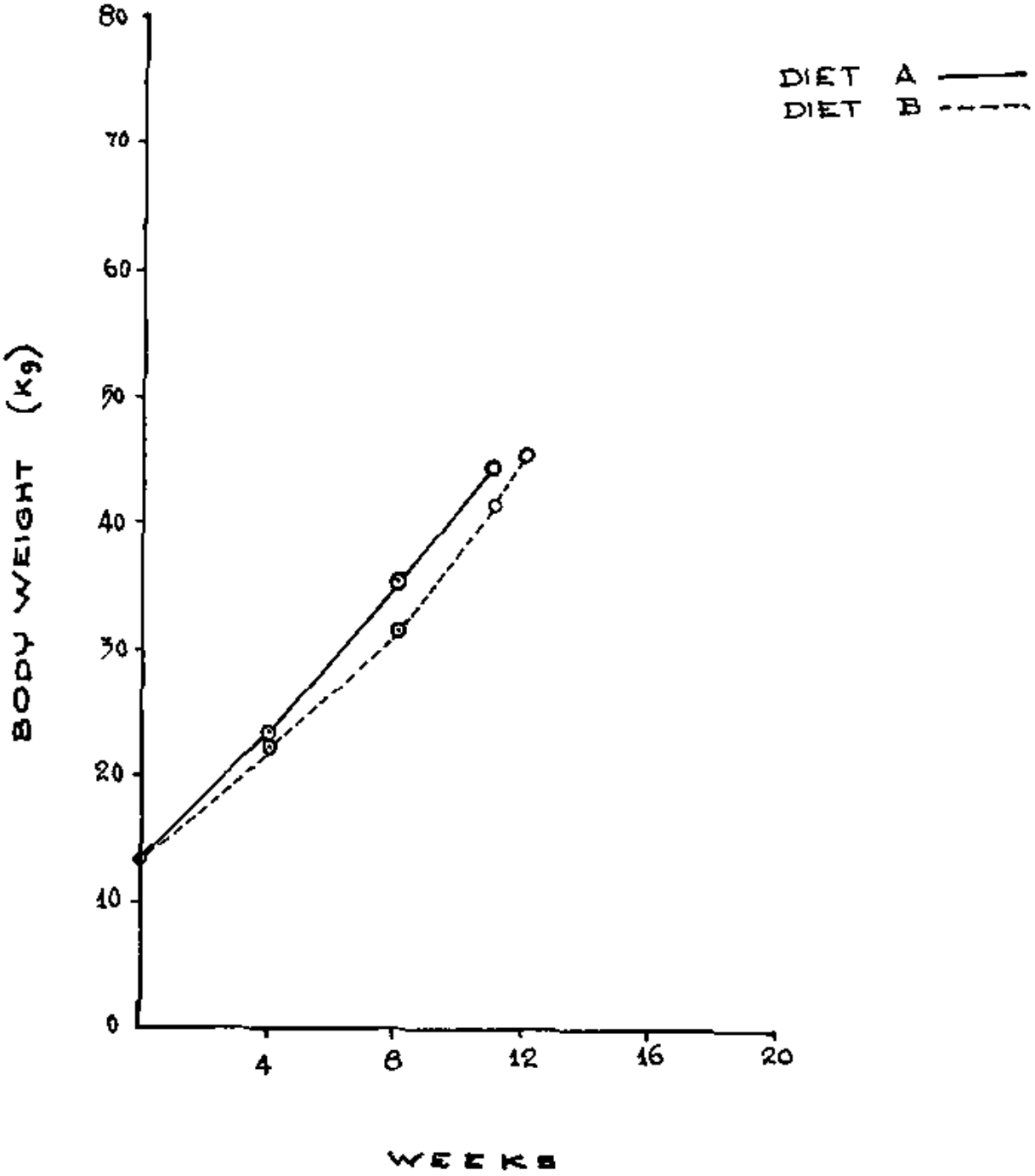


FIGURE. 2.

AVERAGE WEIGHT GAIN OF ANIMALS

GROUP II

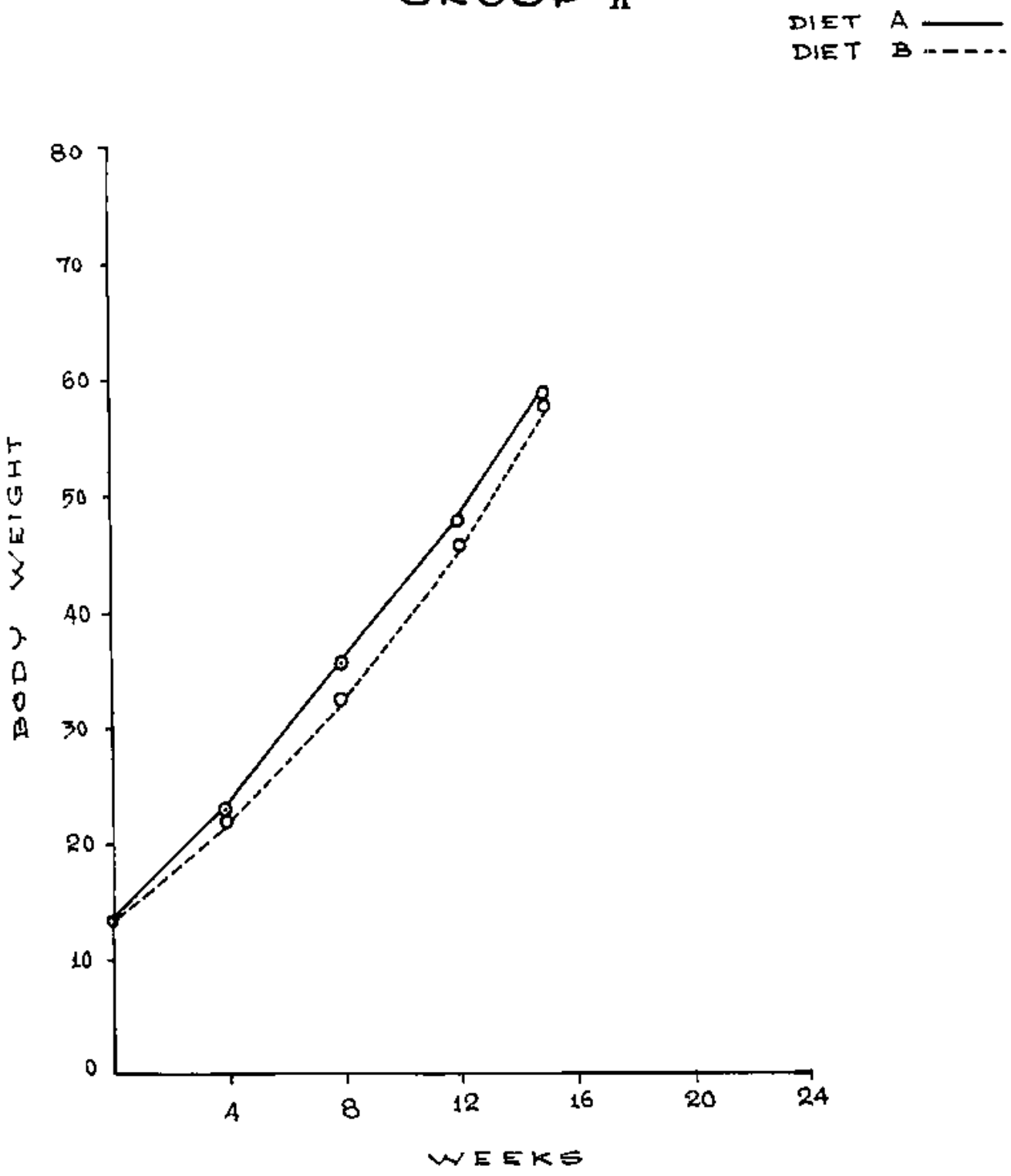


FIGURE. 3.

AVERAGE WEIGHT GAIN OF ANIMALS

GROUP III

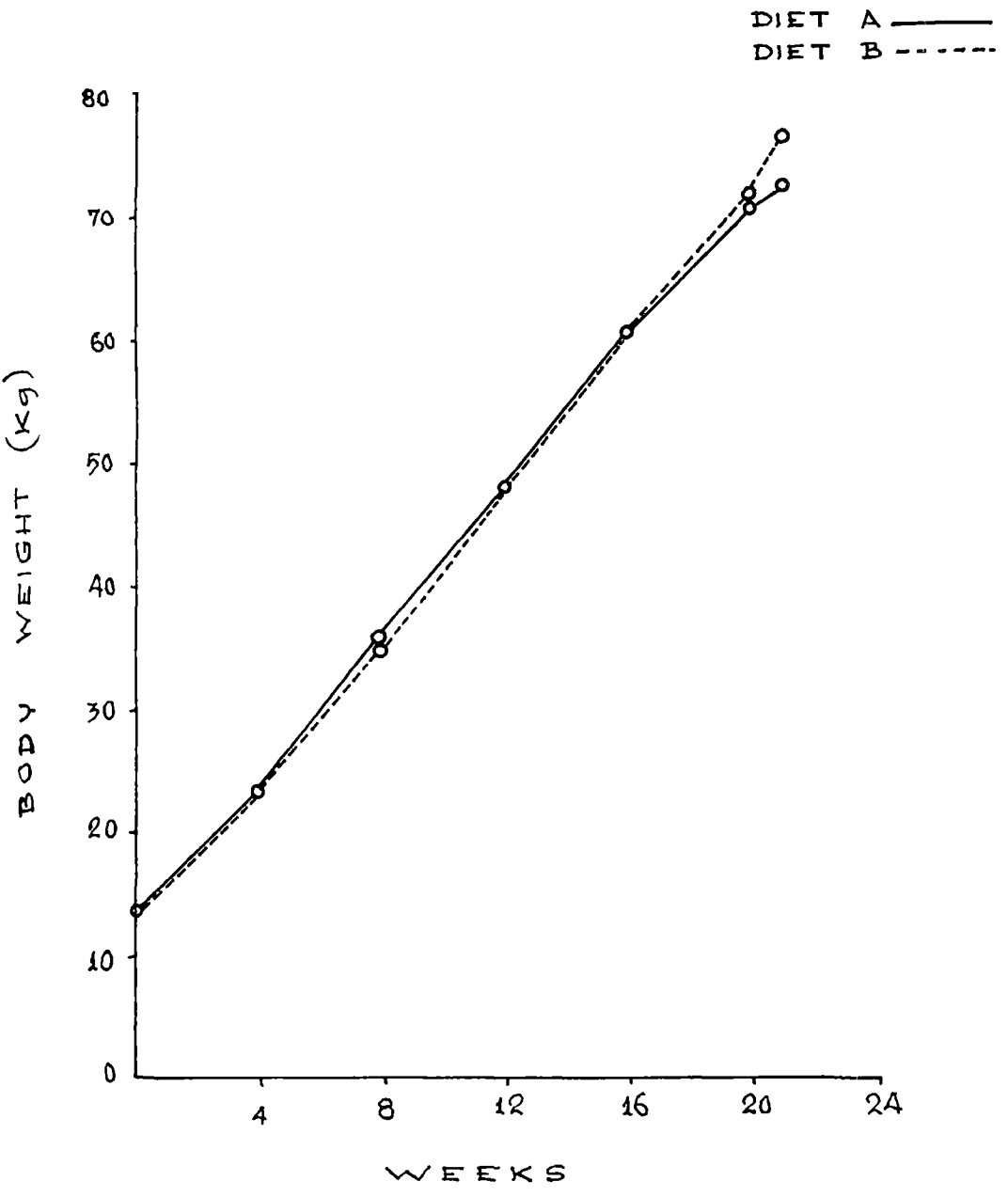


Table 13. Data showing feed efficiency of pigs maintained on experimental dietary regimes.

Diet	Group	Total initial weight (kg)	Total final weight (kg)	Total weight gain (kg)	Total feed intake (kg)	Feed efficiency
A	I	79.8	331.6	251.8	957.9	3.80
	II	80.3	426.1	345.8	1447.4	4.18
	III	80.5	516.5	436.0	1978.9	4.54
B	I	80.6	335.0	254.4	1048.1	4.12
	II	80.6	436.3	355.7	1484.7	4.17
	III	80.9	511.4	430.5	1816.7	4.22

FIGURE. 4.

FEED EFFICIENCY OF ANIMALS ON THE DIETARY TREATMENTS A & B

GROUP I

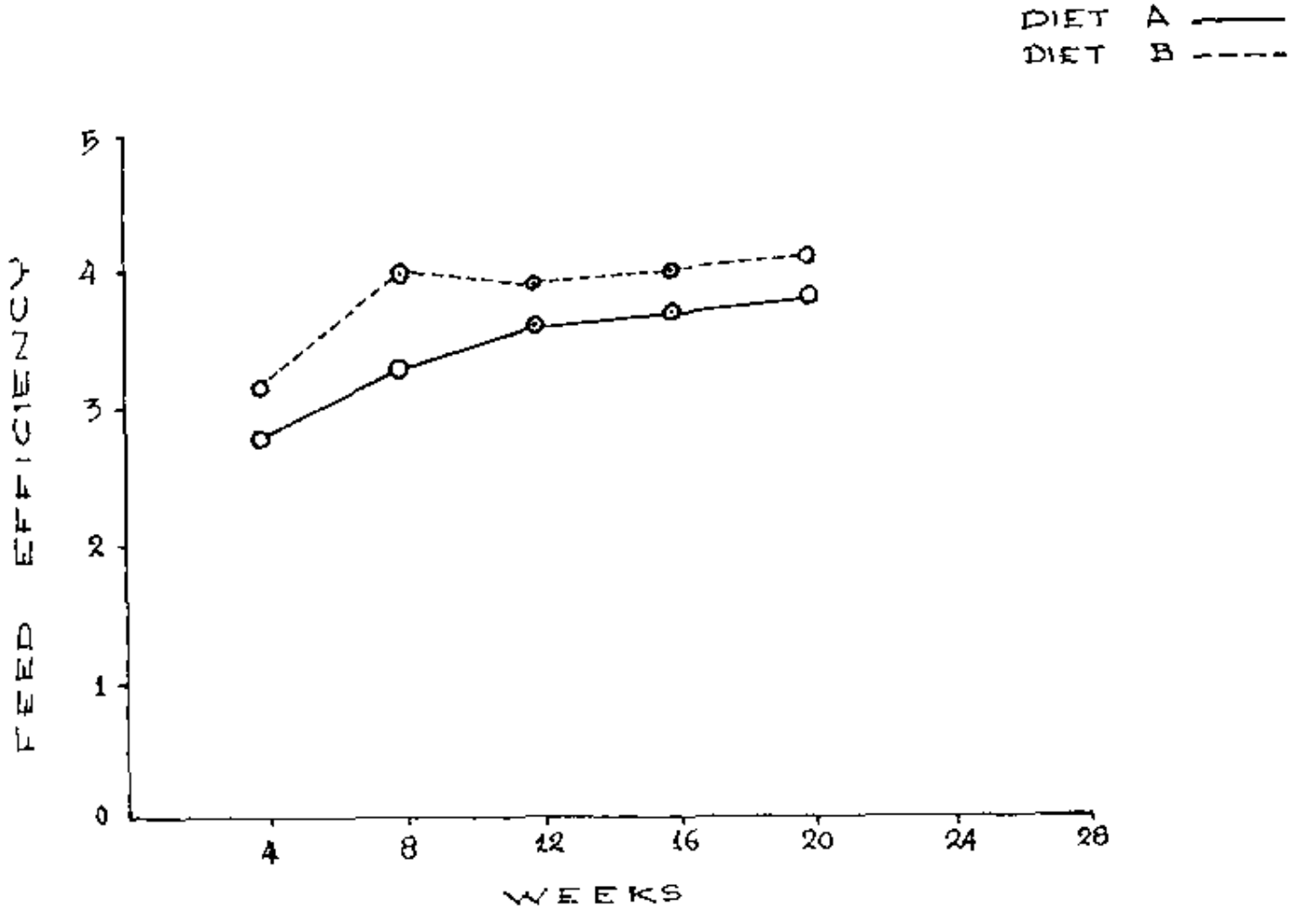


FIGURE 5

FEED EFFICIENCY OF ANIMALS

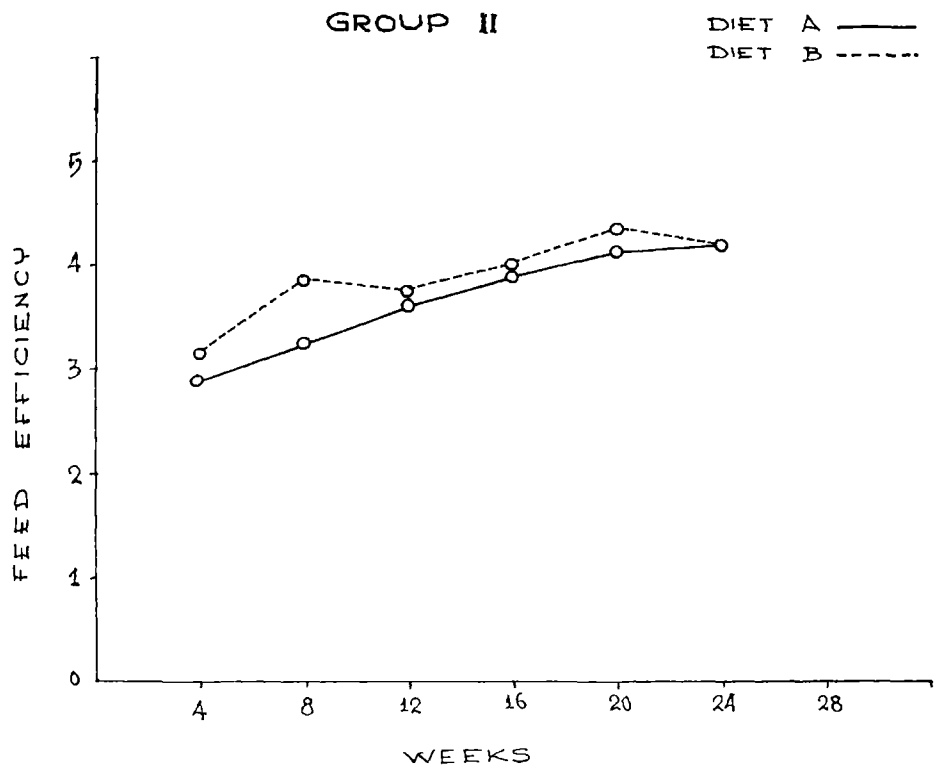


FIGURE. 6.

FEED EFFICIENCY OF ANIMALS

GROUP III

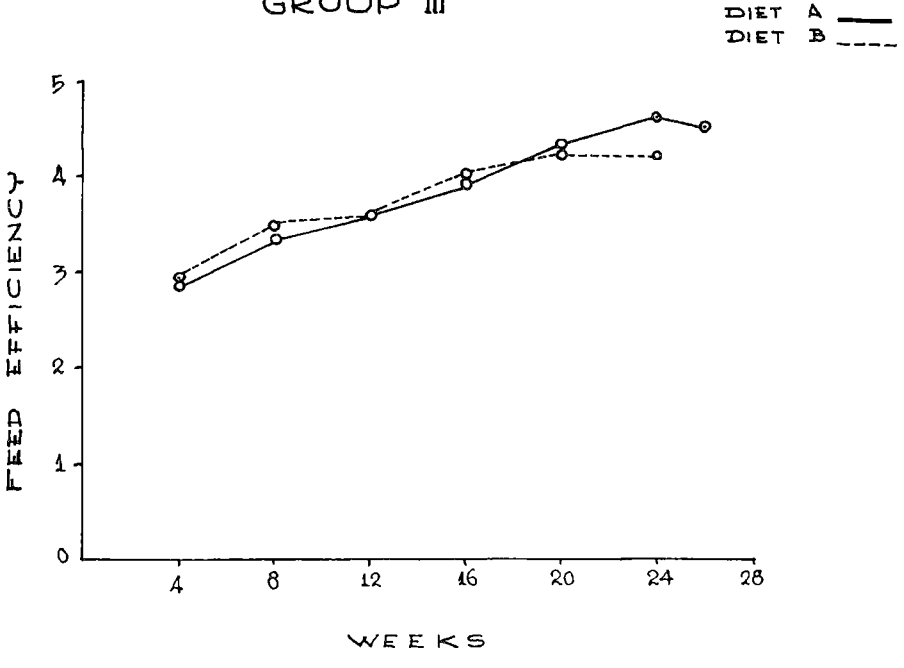


Table 14. Summarised data on average daily gain, feed intake, feed efficiency and age at slaughter of pigs maintained on different rations.

Diet	A			B		
Group	I	II	III	I	II	III
Number of pigs	6	6	6	6	6	6
Average initial age of pigs (in days)	65.0 ±1.0	64.3 ±1.1	63.6 ±1.0	64.5 ±0.8	64.3 ±0.8	64.5 ±0.8
Average initial live body weight (kg)	13.3 ±0.5	13.4 ±0.6	13.4 ±1.2	13.4 ±0.3	13.4 ±0.4	13.5 ±0.5
Average final live body weight (kg)	55.2 ±0.7	71.0 ±0.8	86.1 ±1.0	55.8 ±0.2	72.7 ±0.5	85.2 ±0.7
Average weight gain (kg)	41.9 ±0.4	57.6 ±1.1	72.7 ±1.1	42.4 ±0.5	59.3 ±0.7	71.7 ±0.8
Number of days under experiment	103.1 ±9.5	137.6 ±7.5	175.8 ±6.5	109.5 ±7.1	141.3 ±8.2	164.1 ±4.9
Average daily gain (g)	406.3 ±37.5	418.6 ±22.6	413.3 ±18.8	387.2 ±27.5	419.9 ±26.0	437.1 ±12.2
Average feed consumption (kg)	159.4	241.2	329.8	174.7	247.4	302.8
Average feed efficiency	3.80	4.18	4.54	4.12	4.17	4.22
Average age at slaughter(in days)	168.3 ±10.1	202.0 ±7.9	239.6 ±6.7	174.0 ±7.1	205.3 ±8.7	228.6 ±4.5

Table 14b. Sexwise daily gain of pigs maintained on experimental rations. (g)

Diets	A			B		
Groups	I	II	III	I	II	III
Males	467.3	446.6	406.0	449.6	439.3	410.0
Females	378.6	401.3	426.3	341.3	414.0	444.6

Table 15. Analysis of variance - Average daily gain.

Source	df	SS	MSS	F
Treatment	1	7.11	7.11	0.002
Group	2	2345.39	1172.69	0.31
Error	32	119564.06	3736.37	
Total	35	121916.56		

Table 16. Carcass characteristics of animals maintained on the experimental diets.

Diet A - Group I

Pig number	1/127	2/135	5/135	6/127	7/127	9/137	Average
Sex	M	M	M	F	F	F	
Live body weight (kg)	53.5	57.2	57.5	54.4	55.0	54.0	55.2
Dressed weight with head (kg)	41.6	41.9	44.0	41.0	42.7	42.0	42.2
Dressing percentage with head	77.7	73.2	76.5	75.3	77.6	77.7	76.3
Dressed weight without head (kg)	37.3	37.9	39.8	37.4	38.7	38.5	38.2
Dressing percentage without head	69.7	66.2	69.2	68.7	70.3	71.3	69.2
Length of body (cm)	65.0	65.0	68.0	65.0	68.0	68.0	66.5
Average backfat thickness (cm)	3.10	2.27	2.43	2.30	2.40	2.36	2.47
Eyemuscle area (cm^2)	22.50	20.00	19.60	19.11	29.25	28.20	23.11
Weight of shoulder (kg)	10.3	12.3	12.4	10.6	10.4	10.1	11.0
Percentage of shoulder against live weight	19.2	21.5	21.5	19.5	18.9	18.7	19.9
Weight of middle (kg)	13.8	14.9	15.0	14.0	13.8	14.5	14.3
Percentage of middle against live weight	25.7	26.0	26.1	25.7	25.1	26.8	25.9
Weight of ham (kg)	10.9	11.9	11.8	11.4	11.6	11.8	11.5
Percentage of ham against live weight	20.3	20.8	20.5	20.9	21.1	21.8	20.9

Table 17. Diet A - Group II

Pig number	3/127	5/127	3/135	7/131	10/137	11/137	Average
Sex	M	M	M	F	F	F	
Live body weight (kg)	74.0	72.0	69.4	70.5	68.2	72.0	71.0
Dressed weight with head (kg)	59.7	54.6	52.1	55.6	53.3	53.7	54.8
Dressing percentage with head	80.6	75.8	75.1	78.8	78.1	74.5	77.2
Dressed weight without head (kg)	54.4	49.8	47.0	50.2	48.9	48.9	49.8
Dressing percentage without head	73.5	69.1	67.7	71.2	71.7	67.9	70.2
Length of body (cm)	72.0	72.0	74.0	71.0	75.0	78.0	73.6
Average backfat thickness (cm)	4.40	3.26	2.73	2.20	2.80	2.10	2.98
Eyemuscle area (cm^2)	22.75	31.80	32.35	36.00	32.50	26.60	30.33
Weight of shoulder (kg)	12.5	12.6	13.6	13.4	12.1	12.2	12.7
Percentage of shoulder against liveweight	16.9	17.5	19.6	19.0	17.7	16.9	17.9
Weight of middle (kg)	24.5	24.8	17.5	19.1	20.8	19.9	20.7
Percentage of middle against live weight	33.1	31.6	25.2	27.1	30.5	27.6	29.5
Weight of ham (kg)	12.8	14.1	13.1	14.6	14.7	13.5	13.8
Percentage of ham against live weight	17.3	19.5	18.8	20.7	21.5	18.7	19.4

Table 18. Diet A - Group III

Pig number	2/127	5/136	2/137	6/131	10/135	8/137	Averag
Sex	M	M	M	F	F	F	
Live body weight (kg)	82.0	86.0	84.5	88.5	87.0	88.5	86.1
Dressed weight with head (kg)	65.8	66.1	66.0	71.5	66.7	67.1	67.2
Dressing percentage with head	80.2	76.8	78.1	80.8	76.6	75.8	78.1
Dressed weight without head (kg)	60.7	60.0	60.5	66.1	60.4	61.8	61.5
Dressing percentage without head	74.0	69.7	71.6	74.6	69.4	69.8	71.5
Length of body (cm)	75.0	79.8	81.0	75.6	79.5	79.0	78.3
Average backfat thickness (cm)	3.73	2.96	3.70	2.93	2.93	3.83	3.34
Eyemuscle area (cm^2)	26.46	33.60	28.80	35.00	28.20	33.60	30.94
Weight of shoulder (kg)	17.5	16.4	16.2	18.6	16.1	15.0	16.6
Percentage of shoulder against live weight	21.3	19.0	19.2	21.0	18.5	16.9	19.3
Weight of middle (kg)	23.7	23.8	24.5	25.1	24.1	25.1	24.5
Percentage of middle against live weight	28.9	27.6	28.9	29.5	27.7	28.3	28.5
Weight of ham (kg)	16.3	16.3	15.4	17.8	16.4	17.3	16.5
Percentage of ham against live weight	19.8	18.9	18.2	20.1	18.8	19.5	19.2

Table 19. Diet B - Group I

Pig number	1/130	3/131	5/137	9/131	6/135	11/135	Average
Sex	M	M	M	F	F	F	
Live body weight (kg)	56.3	55.5	56.3	55.9	56.0	55.0	55.8
Dressed weight with head (kg)	41.4	40.6	41.3	43.6	43.5	42.3	42.1
Dressing percentage with head	73.5	73.1	73.3	77.9	77.6	76.9	75.4
Dressed weight without head (kg)	37.5	36.6	37.9	39.3	39.0	38.3	38.1
Dressing percentage without head	66.6	65.9	67.3	70.3	69.6	69.6	68.2
Length of body (cm)	69.0	67.0	67.0	66.0	68.0	70.0	67.8
Average backfat thickness (cm)	2.60	2.03	2.73	2.50	1.93	2.53	2.39
Eyemuscle area (cm^2)	17.50	20.50	26.04	29.00	24.36	24.78	23.69
Weight of shoulder (kg)	9.8	10.2	10.2	11.4	10.7	10.5	10.4
Percentage of shoulder against live weight	17.4	18.3	18.1	20.4	19.1	19.1	18.7
Weight of middle (kg)	15.9	15.0	15.4	14.5	14.1	13.6	14.7
Percentage of middle against live weight	28.2	27.0	27.3	25.9	25.1	24.7	26.4
Weight of ham (kg)	9.8	10.6	10.5	11.6	11.3	10.5	10.7
Percentage of ham against live weight	17.4	19.1	18.6	20.7	20.2	19.1	19.2

Table 20. Diet B - Group II

Pig number	2/130	3/136	7/137	8/131	10/131	7/136	Average
Sex	M	M	M	F	F	F	
Live body weight (kg)	74.3	72.3	71.0	73.0	74.2	71.5	72.7
Dressed weight with head (kg)	55.6	53.9	55.1	58.7	56.5	54.3	55.6
Dressing percentage with head	74.8	74.5	77.6	80.4	76.1	75.9	76.5
Dressed weight without head (kg)	49.9	48.1	49.9	53.3	50.9	49.5	50.2
Dressing percentage without head	67.1	66.5	70.3	73.0	68.6	69.2	69.1
Length of body (cm)	74.0	76.0	72.8	70.0	74.0	73.0	73.6
Average backfat thickness (cm)	3.26	2.46	3.03	2.06	2.23	2.23	2.52
Eyemuscle area (cm^2)	30.00	32.33	30.80	32.45	38.68	30.10	32.39
Weight of shoulder (kg)	13.5	14.1	12.2	14.7	13.7	14.0	13.7
Percentage of shoulder against liveweight	18.1	19.5	17.2	20.1	18.4	19.6	18.8
Weight of middle (kg)	20.0	17.5	19.0	21.8	21.5	17.5	19.5
Percentage of middle against live weight	26.9	24.2	26.7	29.8	28.9	24.4	26.8
Weight of ham (kg)	13.2	14.0	14.6	13.8	14.0	15.4	14.1
Percentage of ham against live weight	17.7	19.3	20.5	18.9	18.8	21.5	19.5

Table 21. Diet B - Group III

Pig number	1/131	1/135	1/137	4/131	5/131	8/135	Average
Sex	M	M	M	F	F	F	
Live body weight (kg)	85.5	85.3	83.5	83.1	87.0	87.0	85.2
Dressed weight with head (kg)	67.8	62.9	66.7	65.6	68.5	66.5	66.3
Dressing percentage with head	79.3	73.7	79.8	78.9	78.7	76.4	77.8
Dressed weight without head (kg)	61.5	58.3	61.3	60.0	62.4	61.0	60.7
Dressing percentage without head	71.9	68.3	73.4	72.2	71.7	70.1	71.2
Length of body (cm)	72.0	75.5	78.0	76.0	79.5	79.5	76.7
Average backfat thickness (cm)	3.07	3.10	4.00	3.80	2.87	2.60	3.24
Eyemuscle area (cm^2)	33.39	29.25	36.40	37.70	39.76	33.12	34.94
Weight of shoulder (kg)	16.4	15.0	14.6	15.6	16.0	17.6	15.8
Percentage of shoulder against live weight	19.2	17.5	17.4	18.7	18.4	20.2	18.6
Weight of middle (kg)	25.4	23.1	25.4	24.4	24.7	22.5	24.2
Percentage of middle against live weight	29.7	27.1	30.4	29.3	28.4	25.8	28.4
Weight of ham (kg)	15.9	16.0	16.3	16.7	18.6	17.6	16.8
Percentage of ham against live weight	18.6	18.7	19.5	20.1	21.3	20.2	19.7

Table 22. Bodyfat characteristics of pigs maintained on the experimental rations.

Diet A - Group I

Pig number	Sex	Melting point (°c)	Saponification value	Iodine number
1/127	M	44.0	201.09	57.69
2/135	M	43.0	197.80	56.13
5/135	M	44.0	190.82	58.15
6/127	F	45.0	207.27	50.44
7/127	F	44.0	198.52	54.06
9/137	F	44.0	187.22	53.74
Average		44.0	197.12	55.03

Table 23. Diet A - Group II

Pig number	Sex	Melting point (°c)	Saponification value	Iodine number
3/127	M	46.0	203.80	56.00
5/127	M	44.0	211.37	61.07
3/135	M	46.0	202.11	47.90
7/131	F	41.0	194.30	53.99
10/137	F	44.0	192.80	53.42
11/137	F	45.0	192.57	53.45
Average		44.3	199.49	54.30

Table 24. Diet A - Group III

Pig number	Sex	Melting point (°c)	Saponification value	Iodine number
2/127	M	44.0	193.38	53.41
5/136	M	45.0	197.21	53.14
2/137	M	46.0	209.75	50.68
6/131	F	46.0	197.05	51.20
10/135	F	43.0	201.80	52.38
8/137	F	45.0	193.42	50.10
Average		44.8	198.76	51.98

Table 25. Diet B - Group I

Pig number	Sex	Melting point (°c)	Saponification value	Iodine number
1/130	M	42.0	193.72	54.26
3/131	M	44.0	201.28	55.59
5/137	M	43.0	200.29	53.16
9/131	F	44.0	187.82	56.75
6/135	F	45.0	208.81	53.54
11/135	F	43.0	199.81	64.25
Average		43.5	198.62	56.25

Table 26. Diet B - Group II

Pig number	Sex	Melting point (°c)	Saponification value	Iodine number
2/130	M	45.0	189.33	56.25
3/136	M	45.0	195.76	57.61
7/137	M	45.0	202.20	56.02
8/131	F	44.0	197.51	51.77
10/131	F	44.0	201.89	52.04
7/136	F	43.0	200.73	62.71
Average		44.3	197.90	56.06

Table 27. Diet B - Group III

Pig number	Sex	Melting point (°c)	Saponification value	Iodine number
1/131	M	43.0	196.96	53.71
1/135	M	45.0	200.32	49.89
1/137	M	44.0	196.43	51.69
4/131	F	46.0	195.78	58.61
5/131	F	45.0	207.66	54.82
8/135	F	46.0	194.25	56.03
Average		44.8	198.56	54.12

Table 28. Summarised data on carcass characteristics of pigs maintained on experimental diets.

Diets	A			B		
Groups	I	II	III	I	II	III
Average liveweight (kg)	55.2±0.7	71.0±0.8	86.1±1.0	55.8±0.2	72.7±0.5	85.2±0.7
Dressing percentage with head	76.3±0.7	77.2±0.9	78.1±0.8	75.4±0.9	76.5±0.8	77.8±0.9
Dressing percentage without head	69.2±0.7	70.2±0.9	71.5±0.9	68.2±1.8	69.1±0.9	71.2±0.7
Length of carcass (cm)	66.5±0.6	73.6±1.0	78.3±0.9	67.8±0.6	73.6±0.8	76.7±1.1
Backfat thickness (cm)	2.47±0.12	2.98±0.34	3.34±0.18	2.39±0.13	2.52±0.19	3.24±0.22
Eyemuscle area (cm^2)	23.11±1.84	30.33±1.79	30.94±1.45	23.69±1.68	32.39±1.35	34.94±1.54
Percentage of shoulder	19.9±0.5	17.9±0.4	19.3±0.6	18.7±0.4	18.8±0.4	18.6±0.4
Percentage of middle	25.9±0.2	29.5±1.2	28.5±0.3	26.4±0.5	26.8±0.9	28.4±0.7
Percentage of ham	20.9±0.2	19.4±0.6	19.2±0.3	19.2±0.4	19.5±0.5	19.7±0.4
Melting point of bodyfat	44.0±0.26	44.3±0.76	44.8±0.47	43.5±0.43	44.3±0.30	44.8±0.47
Saponification value of bodyfat	197.1±2.94	199.4±3.08	198.7±2.53	198.6±2.92	197.9±2.00	198.5±1.99
Iodine number of bodyfat	55.03±1.18	54.30±1.74	51.98±0.61	56.25±1.68	56.06±1.64	54.12±1.26

Table 29. Analysis of variance - Dressing percentage with head.

Source	df	SS	MSS	F
Treatment	1	3.23	3.23	0.71
Group	2	25.23	12.61	2.80
Error	32	144.06	4.50	
Total	35	172.52		

Table 30. Analysis of variance - Dressing percentage without head.

Source	df	SS	MSS	F
Treatment	1	5.16	5.16	1.25
Group	2	44.33	22.16	5.37**
Error	32	132.29	4.13	
Total	35	181.78		

Groups	I	II	III	C.D. of groups at 5% level 2.29
Mean A	69.2	70.2	71.5	C.D. of groups at 1% level 3.02
Mean B	68.2	69.1	71.3	

* Indicates significance at 5% level.
** Indicate significance at 1% level.

Table 31. Analysis of variance - Carcass length.

Source	df	SS	MSS	F
Treatment	1	0.07	0.07	0.014
Group	2	658.32	329.16	64.642**
Error	32	162.96	5.092	
Total	35	821.35		

Groups	I	II	III	
Mean of Diet A	66.5	73.6	78.3	C.D. of groups at 5% level 2.60
Mean of Diet B	67.8	73.6	76.7	C.D. of groups at 1% level 3.55

Table 32. Analysis of variance - Backfat thickness.

Source	df	SS	MSS	F
Treatment	1	0.34	0.34	1.323
Group	2	4.59	2.29	8.945**
Error	32	8.21	0.256	
Total	35	13.14		

Groups	I	II	III	C.D. of groups at 5% level 0.56
Mean of Diet A	2.47	2.98	3.34	C.D. of groups at 1% level 0.74
Mean of Diet B	2.39	2.52	3.24	

Table 33. Analysis of variance - Eyemuscle area.

Source	df	SS	MSS	F
Treatment	1	31.81	31.81	1.81
Group	2	654.71	327.35	18.64**
Error	32	561.83	17.57	
Total	35	1248.35		

Groups	I	II	III	C.D. of group at 5% level 4.74
Mean of Diet A	23.11	30.33	30.94	C.D. of group at 1% level 5.81
Mean of Diet B	23.69	32.39	34.94	

Table 34. Analysis of variance - Percentage of shoulder.

Source	df	SS	MSS	F
Treatment	1	0.99	0.99	0.62
Group	2	5.32	2.61	1.64
Error	32	50.97	1.59	
Total	35	57.28		

Table 35. Analysis of variance - Percentage of middle.

Source	df	SS	MSS	F
Treatment	1	3.65	3.65	1.027
Group	2	36.34	18.17	5.143*
Error	32	113.68	3.553	
Total	35	153.67		

Groups	I	II	III	C.D. of group at 5% level 2.12
Mean of Diet A	25.9	29.5	28.5	C.D. of group at 1% level 2.79
Mean of Diet B	26.4	26.8	28.4	

Table 36. Analysis of variance - Percentage of ham.

Source	df	SS	MSS	F
Treatment	1	1.44	1.44	1.03
Group	2	1.60	1.30	0.93
Error	32	44.92	1.40	
Total	35	48.96		

Table 37. Analysis of variance - Melting point.

Source	df	SS	MSS	F
Treatment	1	0.25	0.25	0.19
Group	2	7.05	3.52	2.66
Error	32	42.34	1.32	
Total	35	49.64		

Table 38. Analysis of variance - Saponification value.

Source	df	SS	MSS	F
Treatment	1	0.09	0.09	0.002
Group	2	6.68	3.34	0.086
Error	32	1246.37	38.94	
Total	35	1253.14		

Table 39. Analysis of variance - Iodine number.

Source	df	SS	MSS	F
Treatment	1	26.26	26.26	3.301
Group	2	45.87	22.93	2.882
Error	32	254.58	7.95	
Total	35	326.71		

Table 40. Details of calculation of other costs (in rupees) of pigs maintained on the two dietary regcmes.

Diets		A			B		
Groups		I	II	III	I	II	III
Number of animals		6	6	6	6	6	6
Number of days under experiment		103.1	137.6	175.8	109.5	141.3	164.1
Initial cost per pigling	Rs.	119.70	120.45	120.75	120.90	120.90	121.35
Feed cost per pig		157.47	236.16	321.61	175.91	249.18	304.90
Details of other costs							
Veterinary aid @ Rs.2.00 per pig		12.00	12.00	12.00	12.00	12.00	12.00
Labour charges @ Rs.17.33p per pig per day ie. 1.3 labourers for 75 fatteners @ Rs.10/day		107.26	143.13	182.82	113.85	146.77	170.69
Water charges @ 1.3p per pig per day ie. 200lit. per day @ 40p per 1000 liters.		8.04	10.73	13.71	8.54	11.01	12.80
Interest for veterinary aid, labour and water charges @ 6%.		2.15	3.75	6.02	2.41	3.93	5.27
Interest for feed cost @ 6%		16.02	32.06	55.77	18.99	34.69	49.36
Interest @ 12% for the initial cost of piglings @ Rs.9 per kg liveweight.		24.35	32.70	41.88	26.11	33.66	39.29
Interest @ 12% for the cost of building @ Rs.20/- per Sq. ft. at 20 Sq. ft. per pig.		81.39	108.61	138.73	86.40	111.77	129.52
Depreciation for building @ 5%		33.91	45.25	57.80	36.00	46.40	53.97
Total other costs		285.12	388.23	508.73	304.30	400.23	472.90
Average other costs per pig		47.52	64.70	84.78	50.71	66.70	78.81

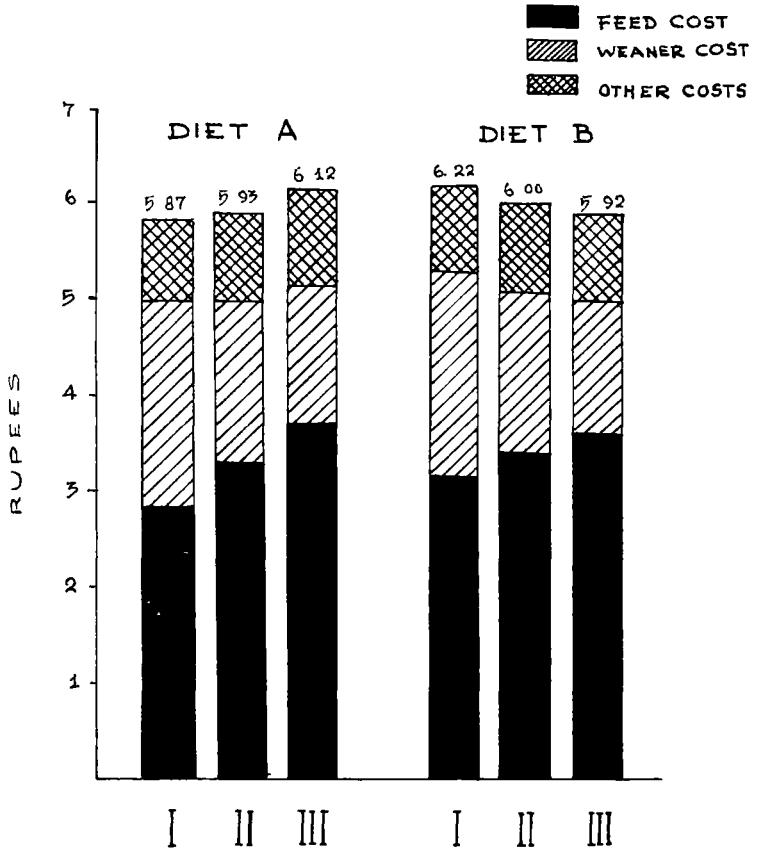
Table 41. Details of production cost per kilogram liveweight of pigs maintained on different dietary regemes.

Diets		A			B		
Groups		I	II	III	I	II	III
Average initial cost of pigling @ Rs.9.00 per kg.	(Rs.)	119.70	120.45	120.75	120.90	120.90	121.35
Average feed cost per pig		157.47	236.16	321.61	175.91	249.18	304.90
Average other costs per pig		47.52	64.70	84.78	50.71	66.70	78.81
Total cost per pig		324.69	421.31	527.14	347.52	436.78	505.06
Average weight at slaughter	(kg)	55.26	71.0	86.1	55.8	72.7	85.2
Cost of production per kilogram liveweight	(Rs.)	5.87	5.93	6.12	6.22	6.00	5.92
Breakup of production cost per kg liveweight							
Initial cost of pigling		2.16	1.69	1.40	2.17	1.66	1.42
Feed cost		2.85	3.33	3.74	3.15	3.43	3.58
Other costs		0.86	0.91	0.98	0.90	0.91	0.92
Total		5.87	5.93	6.12	6.22	6.00	5.92

FIGURE 7

COST OF PRODUCTION

PER KILOGRAM LIVE BODY WEIGHT



DISCUSSION

DISCUSSION

Growth

From the summarised data presented in Table 14, represented in Figures 1 to 3 and statistical analysis of the results set out in Table 15, it will be seen that the animals in group I receiving diet A showed higher overall daily gains than those in group I receiving diet B, the average daily gains being 406.3 and 387.2 g. respectively. The higher gains of animals receiving diet A may be attributed to the higher level of protein (18%) in the diet given to these animals during the early period of their growth, when the protein requirement is maximum. The results obtained during the course of this study are in agreement with those obtained in the studies of Blair et al. (1969) and Cole et al. (1969) who found improvement in live weight gains in pigs fed on higher levels of protein in the initial growth period. The animals belonging to group II under both the dietary regimes (Diets A & B) showed almost similar weight gains, while higher gains were shown by animals in group III under diet B when compared to those under diet A (Table 14). The identical gains of animals in group II and the higher weight gains of animals in group III under diet B clearly indicate that a level of 14 per cent protein in the diet A after the animals attain 35 kg. live weight is less efficient for weight gain than the level of 16 per cent protein in the diet fed throughout the feeding period. Though there are many reports indicating higher overall

gains in pigs on higher protein levels, a general conclusion could not be drawn due to differences in the sources of protein and levels of protein employed in these studies. Seymour et al. (1964) using 20-17-14 and 16-13-10 per cent protein levels in the diets, found significantly faster gains on the higher protein sequences from 3 weeks of age till slaughter. Higher daily gains were obtained by Jurgens et al. (1967) in pigs fed on a ration containing 16 per cent protein, when compared to those on 12 per cent protein diet. Lee et al. (1967) also obtained similar results with protein levels of 21-18-15, 18-15-12 and 15-12-9 per cent. However, Hale et al. (1967) failed to find higher rate of gain on increased protein levels, using 18-15, 16-13 and 14-11 per cent protein levels, the higher levels in each case being fed upto 100-110 lbs body weight. The results obtained in the present studies are almost in agreement with those obtained by Braude and Rowell (1968) who found improvement in overall gains in pigs fed on higher protein levels throughout the feeding period, as compared to the gain obtained using lower levels of protein in the finishing rations. While the animals under diet B in all the three groups (Groups I, II and III) showed linear increase in overall daily gain of 387.2, 419.9 and 437.1 g. at the final body weights of 55, 70 and 85 kg. respectively, those under diet A showed increase in gains only upto a live weight of 70 kg. Linear increase in daily gain with increase in live weight was observed by Blair et al. (1969). It can be seen (Table 14b) that while barrows in group I and II under both the

dietary treatments grew faster than females, those under group III had lower average daily gains than females.

Feed Efficiency

It can be seen from Table 14 and figures 4 to 6 that the animals in group I under diet A showed higher overall feed efficiency as compared to those under diet B. This can be attributed to the beneficial effects of the higher protein level in the diet A during the early growth period. A protein level of 16 per cent in the diet does not seem to be adequate to meet the protein needs of growing animals. This finding is in agreement with those reported by Cole et al. (1969), Blair et al. (1969) and Pay et al. (1973) who could find significant increase in feed efficiency in pigs only during the early growth period. It can be further seen that there is little difference in feed efficiency between the animals in group II under diets A and B. The animals in group II under diet A containing a lower level of 14 per cent protein after the pigs attained 35 kg body weight showed almost similar overall feed efficiency when compared to those under diet B containing 16 per cent protein. This may be due to the high level of protein in the diet provided to the animals during their early growth period. The higher overall feed efficiency shown by animals in group III under diet B when compared to those under diet A clearly indicates that a level of 14 per cent protein in the diet after the attainment of 35 kg.

live weight is less efficient than 16 per cent protein in the diet to sustain proper growth in pigs. These results are in agreement with the findings of Seymour et al. (1964), Jurgens et al. (1967), Wallace et al. (1967) and Lucas et al. (1971) who obtained higher overall feed efficiency on higher protein levels. According to Bellis (1965) and Braude et al. (1968), a higher protein level throughout the feeding period is more efficient than changing to a lower protein level in the finishing ration. It can be further seen that the overall feed efficiency decreases with increase in live weight in both the dietary treatments A and B, the efficiency being 3.80, 4.18, 4.54 in groups I, II and III respectively under diet A and 4.12, 4.17 and 4.22 under diet B. These results are in agreement with the works of Field et al. (1961), McCampbell et al. (1961) and Blair et al. (1969). Ranjhan et al. (1972) reported a feed efficiency of 3.0 upto 50 kg, 4.11 from 50 to 70 kg. and 5.7 from 70 to 90 kg. live weights while Kumar et al. (1974) reported a feed efficiency of 3.4, 4.0 and 4.5 upto 50 kg, 50-70 kg. and 70-90 kg. respectively. The values for feed efficiency of the animals obtained in the present study are comparable to the values of 4.2 at 70 kg. live weight reported by Bhagwat et al. (1971) for exotic pigs in India.

Carcass Characteristics

Summarised data on carcass characteristics presented in Table 28 and their statistical analysis set out in Tables 29 to

39 indicate that the different carcass characteristics studied do not show significant differences between the two dietary treatments A and B. This may be due to the small differences in protein levels used in the experimental diets. Similar results are reported by Aunan et al. (1961) in their studies with pigs using rations with protein levels of 18 and 14 per cent. Several workers, on the other hand, have obtained, on higher protein levels, increased lean growth (Ashton et al. 1955; Robinson et al. 1964; Seymour et al. 1964; Cunningham et al. 1973; Baird et al. 1975 and Mervin et al. 1975) and decreased backfat (Seymour et al. 1964; Wallace 1966; Hale et al. 1967; Wong et al. 1968; Mervin et al. 1975 and Bereskin et al. 1976). The results of the present study, however, indicate that several of the carcass characteristics studied showed significant differences among the groups I, II and III.

Dressing percentage with head.

Dressing percentage with head showed a linear increase with live weight under both the dietary treatments A and B. The differences, however, were not significant. The values obtained were 76.3, 77.2 and 78.1 for diet A and 75.4, 76.5 and 77.8 for diet B in the three groups I, II and III respectively (Tables 28 and 29).

Dressing percentage without head.

Dressing percentage without head showed marked increase with

increase in live weight under both dietary treatments A and B, the differences between groups I and III being significant (Tables 28 & 30). The increase in dressing percentage with live weight increase in pigs has been found by several other workers (Smith et al. 1957; Zobrisky et al 1959; Bellis et al. 1961; Emmerson et al. 1964; Gudilin, 1966; Narayana Rao et al. 1968 and Lavrentjeva et al. 1970). Zobrisky et al (1959) has pointed out that the dressing percentage is a valuable single measure of live hog value. Bratzler et al (1953) concluded that dressing percentage is a major factor in conjunction with weight, length and backfat in determining the yields of preferred cuts.

Length of carcass.

It can be seen from Tables 28 and 31 that carcass length showed significant increase with increase in live weight in all the three live weights studied, the valuesfor the three groups under A and B being 66.5, 73.6 and 78.3 and 67.8, 73.6 and 76.5 cm. respectively. This finding is in general agreement with those reported by Loeffel, Derrick and Peters (1943), Emmerson et al. (1964), Lavrentjeva et al. (1970) and Shuler et al. (1970). Kumar et al. (1974) found significant increase in carcass length of pigs between live weights of 50 and 70 kg but no such increase was obtained in animals between 70 and 90 kg body weights. The increase in carcass length is an important measure which corresponds to the portion that forms the bacon. The increase in carcass length obtained for pigs

in all the weight groups upto 85 kg live weight, in the present studies points to show that the animals were still in the growing stage.

Backfat thickness.

Backfat thickness was found to increase with increasing live weight, significant differences being observed between groups I and III under both dietary treatments A and B (Tables 28 & 32). This positive correlation observed between backfat thickness and bodyweight is in agreement with those reported by Loeffel, Derrick and Peters (1943), Mullins et al. (1960), Field et al. (1961), McCampbell et al. (1961), Cutbertson et al. (1962), Blair et al. (1969), Shuler et al. (1970) and Kumar et al. (1974). Puyaoan et al. (1963) found an increase in backfat thickness of 0.40 cm. in Duroc crosses and 0.37 cm. in Berkshire crosses for every 10 kg. increase in live weight. It has been well established that backfat thickness is correlated with total body fat. Leat et al. (1964) found that in pigs there is at least twice as much subcutaneous fat as intramuscular fat. Thronton (1968) reported that fatness is strongly linked with palatability and juiciness. Though a certain amount of fat is always desirable on account of the above facts, a higher body fat will reduce the percentage of desired cutsand therefore the emphasis should be on production of pigs with high lean and low fat. Higher protein levels in the rations used in the present studies tend to produce carcass with lesser backfat in as much as lower valuesfor backfat thick-

ness were obtained under diet B when compared to those under diet A, the values being 2.39, 2.52 and 3.24cm in diet B and 2.47, 2.98 and 3.34cm in diet A respectively in all the three groups (Groups I, II and III). This finding is in agreement with those of Hale et al. (1967), Wallace et al. (1967), Cole et al. (1969) and Bereskin et al. (1976).

Eyemuscle area.

It can be seen from the Tables 28 and 33 that the area of eyemuscle was found to increase with increasing body weight under both the dietary treatments as indicated by the values of 23.11, 30.33 and 30.94 and 23.69, 32.39 and 34.94 cm^2 respectively for groups I, II and III under the diets A and B. The results further indicate that while there is significant linear increase in the eyemuscle area in the three groups, (Groups I, II and III) under diet B, significant increase is seen only in groups I and II under diet A. Increase in eyemuscle area with increase in live weight has been reported by Bellis and Taylor (1961), Shuler et al. (1970), Lavrentjeva et al. (1970) and Kumar et al. (1974). Positive correlation between eyemuscle area and percentage of lean has been reported by several workers (Henry et al. 1963; Smith and Carpenter 1973; Shonin 1973 and Bochno and Rak 1973).

Percentage of shoulder.

While almost similar values were obtained for percentage

of shoulder for all the groups under both dietary treatments A and B in the present studies (Tables 28 & 34), a negative correlation between percentage of shoulder and live weight has been reported by Narayana Rao et al. (1968).

Percentage of middle.

A linear increase in percentage of middle was obtained in all the three groups under diet B while such an increase could be seen only between groups I and II and I and III, under diet A (Tables 28 & 35). Narayana Rao et al. (1968) reported significant increase in the middle as the live weight of pigs increased from 40 kg. to 120 kg. Increase in the percentage of middle obviously improves the yield of bacon, which commands a premium price for the meat due to its high palatability and cooked product image. Smith et al. (1975) found that the most desirable bacon contained 40 per cent muscle with a good distribution of muscle and fat.

Percentage of ham.

The almost similar values obtained for percentage of ham in all the three groups under both the dietary treatments A and B (Tables 28 & 36) are in agreement with the findings of Kumar et al. (1974) who found no significant difference in ham percentage among different body weight groups. Narayana Rao et al. (1968) reported negative correlation between percentage of ham and live weight.

Fat constants.

Summarised data on fat constants (Table 28) and their statistical analysis (Tables 37 to 39) indicate that there is no significant difference in melting point, saponification value or iodine value of body fat of animals maintained under the two dietary treatments and slaughtered at the three body weights of 55, 70 and 85 kg. This may be due to the fact that the experimental diets used in the study were essentially similar in all respect except for the little difference in the percentage of crude protein, to exert any marked influence on any of the fat characteristics studied.

Economics

The cost of production calculated per unit live weight of the animal presented in Tables 40 and 41 indicate an inverse relation between feed cost and weaner cost as the live weight increases. The cost worked out for animals in groups I, II and III under diet A are Rs.5.87, Rs.5.93 and Rs.6.12 respectively, while that for the animals in the three groups under diet B are Rs.6.22, Rs.6.00 and Rs.5.92 respectively. The linear increase in cost of production with increasing liveweights of animals under diet A can be attributed to the lowered overall feed efficiency of these animals resulting in higher feed cost, which dominated over the decreased weaner cost. It can be seen that under diet B there is a linear decrease in cost of production

S U M M A R Y

SUMMARY

An investigation was carried out on thirtysix weanling Large White Yorkshire pigs divided under two dietary treatments with protein levels of 18-16-14 per cent (diet A) and 16 per cent (diet B) to assess the growth rate, feed efficiency, carcass quality and economics of production when maintained upto and slaughtered at body weights of 55, 70 and 85 kg.

The salient observations made during the course of the investigation and the inferences drawn from the results obtained are given below:

1. Higher protein level of 18 per cent in the diet promoted better overall body weight gains in pigs during the early period of growth.

2. The animals receiving diets containing 16 per cent protein throughout the experimental period, showed linear increase in average daily gain, at all body weights.

3. The animals on diet with 18-16-14 per cent protein levels showed a linear increase in daily gains only upto a live weight of 70 kg.

4. Increased overall feed efficiency was evident in animals receiving diets containing higher protein level during the early growth period.

5. The lowering of protein level in the diet from 18 to 16 and to 14 per cent brought about marked reduction in overall feed efficiency. On the other hand, a protein level of 16 per cent throughout the feeding period had no such unfavourable effect on feed efficiency of the animal, at the three body weights studied.

6. Protein levels used in the diet do not seem to exert any significant influence on the various carcass characteristics studied.

7. Carcass characteristics such as dressing percentage, length of carcass, backfat thickness and eyemuscle area are positively correlated with body weight under both the dietary treatments.

8. Fat constants like melting point, iodine value and saponification value are not influenced either by protein levels or by body weights.

9. The cost of production per kilogram body weight is found to be the least at 55 kg. under diet A and at 85 kg. under diet B.

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STUDIES ON GROWTH RESPONSE, FEED EFFICIENCY AND CARCASS CHARACTERISTICS OF PIGS REARED UPTO DIFFERENT MARKET WEIGHTS ON TWO DIETARY TREATMENTS

By

P. Ramachandran

ABSTRACT OF A THESIS

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Faculty of Veterinary and Animal Sciences

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1977

ABSTRACT

A detailed investigation was carried out to study the growth rate, feed efficiency, carcass quality and economics of production of fattening pigs maintained on two dietary treatments differing in protein levels and reared upto three different body weights.

Thirtysix weaner pigs of Large White Yorkshire breed belonging to the University Pig Breeding Farm, Mannuthy were distributed under two dietary treatments and divided into three groups I, II and III of six animals each, the animals in the three groups being slaughtered at body weights of 55, 70 and 85 kg. respectively.

Higher dietary protein level of 18 per cent promoted better weight gains in pigs during the initial period of their growth. Lowering of protein level in the finishing ration reduced the weight gain and feed efficiency of the animals. A dietary protein level of 16 per cent throughout the feeding period brought about linear increase in overall average daily gain at all body weights studied.

Though the protein level does not seem to influence any of the carcass characteristics studied, the dressing percentage, carcass length, backfat thickness and eyemuscle area are

positively correlated with body weights under both the dietary treatments. Fat constants are not affected either by protein levels or by live weights.

The overall results obtained during the course of the present investigation indicate that the unit cost of production of fattening pigs is least at 55 kg. live weight on the dietary treatment A having 18-16-14 per cent protein and at 85 kg. live weight on the dietary treatment B having 16 per cent protein level throughout.