THE GROWTH, CARCASS CHARACTERISTICS AND ECONOMICS OF REARING OF INDIGENOUS AND EXOTIC PIGS

BY

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THESIS

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DECLARATION

I hereby declare that this thesis entitled "THE GROWTH, CARCASS CHARACTERISTICS AND ECONOMICS OF REARING OF INDIGENOUS AND EXOTIC PIGS" is a bonafide record of research work done by me during the course of research and that 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.C. Saseendran.

Mannuthy,

28 -8-1979.

CERTIFICATE

Certified that this thesis entitled "THE GROWTH, CARCASS CHARACTERISTICS AND ECONOMICS OF REARING OF INDIGENOUS AND EXOTIC PIGS" is a record of research work done independently by Sri. P.C. Saseendran 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.

Dr. T.G. Rajagopalan
Professor
(Chairman, Advisory Committee).

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C O N T E N T S

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INTRODUCTION

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The urgent necessity for improving and multiplying all the important meat producing animals needs emphasis, in the light of the present day food problem in the country with special reference to the higher requirement of animal protein. The increased demand for meat can be met to a large extent by utilising pigs.

Pigs can play an important role in this respect because of their high prolificacy, shorter generation interval, faster growth rate and efficiency of feed utilisation.

Pigs belong to the genus Sus Linn. Besides domesticated species of pigs there are several wild species. It is believed that the black Indian pigs have been evolved through gradual domestication of the wild varieties.

Rearing of pigs, in this country, has been a traditional occupation of weaker sections of the community and hence served as an important source of their income.

In India there are just over 6.5 million pigs (1972 census) which constitute less than one per cent of the World's swine population. According to the Directorate of Marketting and Inspection, the annual production of pork and pork products

is about 50,000 tonnes which is less than 10 per cent of the total meat produced in the country.

According to Raina (1977) four types of pigs are recognised in this country.

1. Wild type
2. Domesticated indigenous pigs
3. Exotic breeds of pigs and
4. Upgraded type with exotic breeds.

The domesticated indigenous pigs are generally black or grey in colour with long face tapering towards the nostrils, heavier head and shoulders with comparatively lighter hind quarters and slightly arched back and drooping rump.

No systematic work appears to have been conducted to assess the performance of these indigenous pigs in respect to various economic traits simultaneously along with pigs of exotic breeds.

This work is undertaken to study the growth potentialities and qualities of the indigenous pigs found in Kerala and to compare it with exotic breeds of pigs maintained under the same agro-climatic conditions prevalent in this part of the country.

REVIEW OF LITERATURE

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Considerable amount of work has been carried out in Western countries on the birth weight, weaning weight, rate of growth, rate of gain, feed efficiency and carcass qualities in exotic breeds of pigs. Relatively very little work only has been conducted on these aspects in India especially on indigenous varieties of pigs. The work relevant to the present study is reviewed and presented under the following heads.

Rate of growth and gain
Feed efficiency and
Carcass characteristics

Rate of Growth and Gain

Growth is pliable. It can be accelerated or delayed with little influence on the final mature body size (Crichton et al., 1959; 1960; Hanssen, 1956; Reid et al., 1964). Growth in all farm animals consists of an increase in body size and weight as well as maturation of the reproductive system (Swanson, 1967). Brody (1945) stated that each animal has an inherent mature body size towards which it grows at a genetically controlled rate.

Male and female pigs of different breeds differ considerably in the birth weight, mature size and weight. Therefore, they also show variation in the rate of growth to reach mature size.

Fairly rapid growth is desirable in almost all kinds of animals. Hammond (1955) reported that the rate at which an animal grows is of greater importance to the stock owners than its mature size as only few animals live long enough to reach the mature weight.

Exotic breeds.

Paiva (1969) reported the body weight of Landrace breeds of pigs at 28 days, 122 days, 168 days and 365 days as 7.15, 34.5, 52.7 and 113.8 kg respectively.

Kronka et al. (1977) reported the body weight of the same breed of pigs at 56 days, 126 days and 186 days as 15.8, 58.6 and 97.7 kg respectively. He has further reported the same in Duroc breed of pigs as 14.35, 52.24 and 97.72 kg respectively.

Fredrick (1977) has reported the average birth weight and weight gain at one month of the village pigs of Solomon Islands as one kg and 2.4 kg respectively.

Various workers have reported about the birth weight and rate of growth of exotic breeds of pigs in India.

Johar and Saibaba (1973) reported an average birth weight of imported Middle White Yorkshire pigs maintained at Jabalpur as 1.06 ± 0.01 kg. Nair et al. (1977), Singh et al. (1977) and Madhavan and Raja (1978) reported the birth weight as 1.22 ± 0.01 kg, 1.56 ± 0.0026 kg and 1.20 ± 0.03 kg in Large White Yorkshire pigs.

Gupta et al. (1967) reported a weaning weight of 18.15 kg and 17.46 kg in male and female Large White Yorkshire pigs respectively. Whereas Singh et al. (1977) reported the same as 8.5 to 9 kg.

In Middle White Yorkshire pigs the average weaning weight observed was 8.5 ± 0.056 kg (Johar et al., 1974).

Indigenous pigs.

No systematic work appears to have been conducted to study the potentialities of the indigenous stock of pigs in India. But on comparable terms growth rate of indigenous pigs indicated a slower rate of growth but reach adult body weight early.

Bhat (1977) reported the average birth weight of local,

Large White and cross bred pigs at Sikkim as 1.07, 1.64 and 1.12 kg respectively. He has further reported the birth weight and weaning weight of local West Bengal and Large White breeds of pigs as 0.68, 0.91 and 5.18, 9.30 kg respectively.

In a further report Bhat (1977) has reported the birth weight of Desi, Middle White and cross bred breeds of pigs of Indo-gangetic area as 0.90 ± 0.02, 1.34 ± 0.03 and 1.23 ± 0.04 kg respectively.

Gain in Weight

Exotic breeds.

Kabanov and Zhirnov (1976) reported an average daily gain of 579 g and 650 g in Russian Large White of lean type and Large White of lean/lard type of pigs.

In Large White pigs Belic et al. (1967) reported a daily gain of 186 g upto 56 days of age. Whereas a higher daily gain in the same breed has been reported by other workers (400 g, Nikulina et al., 1968; 639.8 g, Kroeske, 1966; 715 g, Jovicic et al., 1977).

Pfeiffer (1962) reported an average daily gain of 654 g in German Landrace pigs. Daily gain of Landrace pigs upto

28 days of age has been reported as 241 g and 285 g for first and second farrowing respectively (Popovici et al., 1965). Kroeske (1966) reported a daily gain of 620.4 g in Dutch Landrace pigs. A higher daily gain of 715 g in Landrace pigs (Kudrjavcev and Cuk, 1969) and 765 g in Swedish Landrace pigs (Jovicic et al., 1977) has also been reported.

Darmadja et al. (1976) reported an average daily gain in Japanese pigs as 252 g. Fredrick (1977) reported the mean daily gain in the village pigs of Solomon Islands upto one month of age as 80 g.

In India Agarwala (1961) observed an average daily growth rate of 418 g in Yorkshire graded pigs.

Bhagwat and Sahasrabuddhe (1971) observed a daily gain of 453.2 g in Large White Yorkshire pigs. A lower daily gain of 294.9 g has been reported in the same breed by Rao et al. (1978). Whereas Singh et al. (1977) observed only a daily gain of 125.35 g upto 56 days of age in the same breed of pigs.

In Middle White Yorkshire pigs Johar et al. (1974) observed a daily gain of 133.12 g upto 56 days of age. Bhat (1977) reported an average daily gain of 108 g upto weaning and 237 g from weaning to one year in the same breed of pigs.

Indigenous pigs.

Agarwala (1961) has reported an average daily growth rate of 280 g in Desi pigs.

In a study with different group of Desi pigs Agarwala (1962) reported an average daily gain of 110 g.

Bhat (1977) has reported the daily gain upto weaning and from weaning to one year in Desi pigs of Indo-gangetic area as 73 g and 117 g respectively. He has also reported that the cross breds of these pigs with Middle White Yorkshire breed of pigs showed an average daily gain upto weaning and from weaning to one year as 102 g and 205 g respectively.

Various factors like breed, sex and feed have been found to influence the rate of growth and gain.

Influence of breed on growth rate and daily gain at various stages of life have been reported by several workers. A significant influence of breed on birth weight (Barbosa, 1962; Belic et al., 1967 and Muthorotov, 1968) and weaning weight (Teter and Hanson, 1959 and Belic et al., 1967) have been reported. On the contrary non significant effect of breed on birth weight and weaning weight have been reported by many workers (Legault, 1966 and Orlov and Tarasova, 1969).

Various workers have reported significant influence of breed of pigs on average daily gain (Aunan et al., 1961; Kroeske, 1966; Comberg et al., 1972; Jovicic et al., 1977 and Watkins et al., 1977). Whereas Bereskin et al. (1976) noted non significant effect of breed on average daily gain in Duroc and Yorkshire breeds of pigs.

Sex effects on birth weight and body weight at various stages of life have been reported by many workers in most of the farm animals (Brody, 1945; Aumaitre et al., 1966; Pour and Havorka, 1971; Hladkg, 1973 and Johar et al., 1974), whereas most of the workers have reported non significant effect of sex on birth weight and weaning weight in pigs (Soares, 1969; Paiva, 1969; Tsanov, 1972 and Bhatia and Sharma, 1979).

But the effect of sex on subsequent weight have been reported to be significant. Paiva (1969) reported significant difference in the body weight of Landrace male and female pigs at 112 days (34.6 and 32.4 kg respectively), at 168 days (56 and 49.4 kg respectively) and at 365 days of age (122.6 and 105.05 kg respectively).

Feed Efficiency

Various factors like breed, stage of growth, sex, nutrition, housing and environmental factors have been found

to affect the feed efficiency in pigs.

Breed.

A significant influence of breed on feed efficiency has been reported by various scientists (Hlebov, 1966; Ostapcuk and Kadievskaja, 1966; Nikulina et al., 1966; Hale and Southwell, 1967; Daniljuk, 1969 and Bereskin et al., 1976). On the contrary Kroeske and Verver (1966) reported non significant influence of breed on feed efficiency.

Kudrjavcev and Cuk (1969) reported a feed efficiency of 4.3, 4.5 and 4.8 in Landrace, Duroc and Poland China breeds of pigs respectively. In Large White, Swedish Landrace and cross bred pigs Jovicic et al. (1977) reported a mean feed efficiency of 3.8, 3.6 and 3.6 respectively.

Whereas Kronka et al. (1977) has reported a better feed efficiency of 3.3 and 3.2 in Landrace and Duroc breed of pigs.

Agarwala (1961) reported an average feed consumption per kg of growth in the Desi pigs of India as 4.73 kg.

In Large White Yorkshire pigs Kumar et al. (1974) reported a feed efficiency of 4.0 at 50 to 70 kg body weight. Whereas Bhagwat and Sahasrabuddhe (1971) reported a feed conversion of 1:4.2 in the same breed maintained in India.

Stage of growth.

A decrease in feed efficiency in pigs with increase in live weight has been reported by several workers (Field et al., 1961; Mc Campbell and Baird, 1961; Sreckovic et al., 1971; Linton, 1971; Ranjhan et al., 1972 and Bochno and Lewczuk, 1977). On the contrary Moen and Standal (1971) and Leiber (1972) reported no decrease in feed efficiency with increase in live weight in pigs.

Sex.

A higher feed efficiency in gilts than barrows has been reported by many workers (Laird, 1964; Hale et al., 1967; Bruner and Swiger, 1968; Baird et al., 1970; Cunningham et al., 1973 and Mazurenko, 1974). Whereas Matassino et al. (1970) and Siers (1975) reported non significant influence of sex on feed efficiency.

Carcass Characteristics

Carcass characters include dressing percentage, length of carcass, loin eye area, thickness of back fat, percentage of lean cuts, percentage of fat cuts, carcass score and muscle quality.

Dressing percentage and carcass length.

A significant influence of breed on the dressing percentage has been reported by various workers (Ostapcuk and Kadievskaja, 1966; Daniljuk, 1969 and Bereskin and Davey, 1976). On the contrary certain workers have reported non significant influence of breed on dressing percentage (Nikulina et al., 1966; Nikulina et al., 1968; Horst and Bader, 1969 and Jovicic et al., 1977).

Kroeske (1966) reported a significant influence of breed on carcass length between Dutch Landrace and Large White Yorkshire breed of pigs. Kroeske and Verver (1966) reported a significantly shorter length in the carcass in Belgian breed of pigs than Dutch Landrace pigs. Daniljuk (1969) has reported highest carcass length in Landrace pigs than Large White and Mirgorod breeds.

But non significant influence of breed on carcass length has been reported by Bereskin and Davey (1976).

It has been reported that dressing percentage is significantly higher in female carcass than male carcass (Hale and Southwell, 1967; Matassino et al., 1970; Mazurenko, 1974 and Hansson et al., 1975).

But non significant difference in dressing percentage between sexes has also been reported (Zarnecki, 1966 and Horst and Bader, 1969).

Significantly greater carcass length has been reported in gilt carcasses than boar or barrow carcasses (Laird, 1964; Zarnecki, 1966 and Gilster and Wahlstrom, 1973). On the other hand certain workers have reported non significant effect of sex on carcass length (Benkov et al., 1969; Horst and Bader, 1969 and Cunnigham et al., 1973).

Back fat thickness.

A highly significant effect of breed on back fat thickness has been reported by Aunan et al. (1961). But Cox (1963) and Kuhlers et al. (1977) reported non significant influence of breed on back fat thickness.

In Swedish Large White Yorkshire pigs Hansson et al. (1975) noted a back fat thickness of 2.0 and 1.63 cm at 70 kg and 2.33 and 1.94 cm at 90 kg for males and females respectively. The corresponding figures he reported for Swedish Landrace pigs were 1.68 and 1.56 cm at 70 kg and 2.12 and 1.95 cm at 90 kg for males and females respectively. Jovicic et al. (1977) reported a significant difference in back fat thickness of Swedish Large White and their crosses (4.06 cm and 3.63 cm respectively).

In India, a back fat thickness of 3.69 cm at 90 kg (Kumar et al., 1974) and 2.79 cm at 80 to 90 kg (Rai et al., 1974) body weight in Large White Yorkshire pigs has been reported.

It was observed that gilt carcass contain significantly less back fat than boar carcass (Laird, 1964; Zarnecki, 1966; Benkov et al., 1969 and Siers, 1975) and barrow carcass (Moody et al., 1961; Laird, 1964; Gilster and Wahlstrom, 1973; Meisner, 1977 and Watkins et al., 1977). Whereas Matassino et al. (1970) reported a significantly less back fat in male than female carcass (2.5 Vs 3.0 cm) in cross breds.

Loin eye area.

Many workers have reported about the loin eye area of various breeds of pigs.

Loin eye area of Hampshire breed has been reported as 3.61 square inches and 4.39 square inches at 72.72 kg and 100 kg body weight respectively (Field et al., 1961). Mc Campbell and Baird (1961) noted a loin eye area of 4.24 square inches in Poland China breed of pigs. A loin eye area of 31.42, 27.74 and 25.60 cm^2 in Landrace, Duroc and Poland China breed of pigs (Kudrjavcev and Cuk, 1969) and 51.1 and 55.5 cm^2 in Large White and Large Black breed of pigs (Nikulina et al., 1968) has also been reported.

Kumar et al. (1974) has reported a loin eye area of 82 cm^2 in Large White Yorkshire pigs maintained in India. Whereas Rai et al. (1974) reported the same as 33 cm^2 at 90 kg body weight in the same breed of pigs.

No such report on indigenous breed of pigs could be collected.

Live weight at slaughter.

The information on the optimum slaughter weight and age are meagre. Desirable slaughter weight suggested by many workers differ from 113 kg (Gilster and Wahlstrom, 1973) to 80 to 100 kg (Rai et al., 1974) and 70 kg (Ranjhan et al., 1972 and Kumar et al., 1974).

Linton (1971) reported an increase in dressing percentage with successive increase in slaughter weight. Rai et al. (1974) also observed this increase in dressing percentage upto 100 kg body weight. Whereas Mc Campbell and Baird (1961) observed a similar dressing percentage when the pigs slaughtered at different live weights of 77.27, 86.36, 95.45 and 104.55 kg.

Mc Campbell and Baird (1961) reported an increase in carcass length from 26.2 to 28 cm when the slaughter weight increased from 77.27 to 104.5 kg. Similarly Kumar et al.(1974)

noted significantly higher carcass length from pigs slaughtered at 70 kg body weight than at 50 kg body weight.

A significant increase in back fat thickness was reported with increasing slaughter weight (Mc Campbell and Baird, 1961; Babatunde et al., 1966; Linton, 1971 and Sreckovic et al., 1971).

Significant decrease in lean cuts has been reported with increasing slaughter weight (Mc Campbell and Baird, 1961; Babatunde et al., 1966; Lohse et al., 1969; Shuler et al., 1970; Linton, 1971 and Kumar et al., 1974).

Field et al. (1961) noted that the pigs slaughtered at 72.72 kg yielded significantly more lean cuts, ham, loin, picnic and boston and butt than that slaughtered at 90 kg. Whereas Gilster and Wahlstrom (1973) noted a very acceptable muscular development and fat content from pigs at 113 kg body weight.

Lean cut percentage.

Aunan et al. (1961) reported a highly significant effect of breed on all carcass measures of carcass leanness and fat between pure breds.

Kroeske (1966) reported a significant difference in

percentage of lean between breeds of Dutch Landrace and Large White pigs (56.78 and 55.95). Kudrjavcev and Cuk (1969) reported the weight of ham in the Landrace, Duroc and Poland China breeds as 8.4, 8.3 and 8.2 kg respectively. Hansson et al. (1975) reported a higher percentage of lean in Swedish Landrace breed of pigs than Swedish Large White breed.

Loeffel et al. (1959) reported a ham percentage of 18.91 and 19.03 from pigs slaughtered at 150 and 175 lb body weight. Field et al. (1961) reported the percentage of ham as 21.32 for pigs slaughtered at 160 lb and 20.22 for pigs slaughtered at 200 lb.

In India Kumar et al. (1974) reported a non significant decrease in ham percentage from 15 to 13.14 and increase in liver weight from 0.97 to 1.55 kg, when the pigs were slaughtered at 50 to 90 kg body weight respectively. Rai et al. (1974) stated that proportionate growth of muscle is more in the weight group of 40 to 60 kg. He has further reported the percentage of ham as 25.9 for pigs slaughtered at the body weight of 40 to 60 kg.

MATERIALS AND METHODS

MATERIALS AND METHODS

Twelve weaned indigenous and exotic piglets of two months of age were used for the study for a period of five months. Indigenous pigs were purchased from village farmers at Koothattukulam - Kerala. Exotic pigs used were Large White Yorkshire pigs maintained in the Pig Breeding Farm of the Kerala Agricultural University, Mannuthy. These twelve indigenous and exotic pigs were divided equally into two groups of males and females of uniform body weight. All the animals received the same ration of constant level of protein throughout the experiment.

The ingredients and percentage chemical composition of the ration are as below:

Percentage composition of ration

Ingredients	Parts
Maize	14
Groundnut cake	22
Tapioca chips	33
Fish (Dried unsalted)	15
Rice bran	15
Mineral mixture	1
	100

Cost per kg of the ration - Rs.1.35

Salt, Vitablend AB_2O_3 and Aurofac were added at the rate of 2.5 kg, 1.6 kg and 100 g per metric tonne respectively in the ration.

Percentage chemical composition

Proximate principles	Percentage
Moisture	3.66
Crude protein	18.07
Crude fibre	5.24
Ether extract	17.46
Total ash	10.08
Nitrogen free extract	40.49
Acid insoluble ash	4.9
Calcium	1.08
Phosphorus	0.70

Each group of animals was housed in separate pens having a floor space area of 9.56 square meters. The animals were dewormed and sprayed against ecto parasites before the commencement of the experiment. Deworming was repeated in every month.

The mean climatological norms of the location is as follows:

Average atmospheric temperature (Min.) - 77.5°F
Average atmospheric temperature (Max.) - 84.1°F
Average relative humidity - 72.3%

The animals in each group were fed and watered ad libitum in the morning as well as in the evening during the period of study. The quantity of food consumed daily by each group was recorded. The fortnightly weight gains of animals were recorded throughout the entire period of study. During the period of study one indigenous male pig died due to causes beyond the control of the experiment. After the period of five months study, three pigs from each group were randomly selected and slaughtered at the Bacon Factory, Edayar, Kootha-ttukulam - Kerala after 24 hours of fasting.

The animals were weighed just before slaughter. Weights of dressed carcasses with head were recorded immediately after slaughter. The weights of viscera, lungs, heart, liver and kidney were also recorded, before chilling. After recording the weight the carcass was cut into two-halves exactly at the middle except the head. The dressed carcass was chilled for 18 hours at 2 to 3°C. The chilled carcass was weighed and its length was measured from the anterior aspect of the first rib

to the anterior aspect of pubic symphysis. The head was removed at the atlanto-occipital joint and its weight was recorded. Back fat thickness at first rib, last rib and last lumbar vertebrae were measured and recorded. The cross sectional area of eye muscle was calculated from its maximum length and breadth taken at the region of the 10th rib.

The whole carcass was divided into three cuts of shoulder, middle and ham. Shoulder and middle cuts were obtained by two vertical straight line cuts, one at the third rib and the other in front of the crest of the ilium. The ham was obtained by removing the trotters just above the hock joint. The weights of three cuts were recorded separately.

Statistical method of analysis of variance and correlation were worked out as suggested by Snedecor and Cochran (1967).

RESULTS

RESULTS

Data on rate of growth and gain of indigenous and exotic animals under observation are presented in Tables 1 to 4 and represented in Fig. 1. Feed efficiency of experimental animals is given in Table 5. Carcass characteristics of the male and female animals in both exotic and indigenous breed of pigs are presented in Tables 6 to 14. Tables 15 to 19 show data on various cuts and its percentage against cold carcass weight. The weight and percentage of internal organs against live weight are presented in Tables 20 to 24. Details of production cost of pig per kilogram live body weight are presented in Tables 25 and 26 and in Fig. 2.

Table 1. Mean weight of animals.

Breed	Sex	Initial weight (kg)	Final weight (kg)
Indigenous	Male	3.80 ± 0.215	17.10 ± 1.380
	Female	4.00 ± 0.258	25.58 ± 3.900
	Average	3.92 ± 0.161	21.73 ± 1.990
Exotic	Male	15.08 ± 3.168	83.66 ± 6.377
	Female	13.58 ± 1.020	79.66 ± 6.173
	Average	14.33 ± 3.320	81.66 ± 4.229

In the indigenous pigs males were less in weight at the beginning of the study (0.2 kg). This difference was larger at the end of the study (8.4 kg).

On the contrary exotic males were heavier than females both at the beginning (1.5 kg) and at the end of the study (4.00 kg).

But when the breeds were taken on an average the indigenous animals were much less in weight at the beginning (3.92 kg as against 14.33 kg) and at the end of the experiment (21.73 kg as against 81.66 kg).

Table 2. Average fortnightly weight of pigs. (kg)

Fortnight	Indigenous			Exotic		
	Male	Female	Average	Male	Female	Average
Initial weight	3.80	4.00	3.92	15.08	13.58	14.33
1	4.50	4.46	4.37	16.72	15.35	16.04
2	4.54	5.62	5.08	19.42	18.50	18.96
3	6.90	7.73	6.45	21.24	26.08	22.83
4	7.60	9.92	8.86	33.08	32.58	32.83
5	9.20	12.61	11.06	40.75	39.82	40.29
6	10.30	14.58	12.64	47.33	46.74	47.04
7	10.50	15.58	13.27	53.00	51.16	52.08
8	11.60	17.58	14.86	57.25	57.00	57.13
9	13.30	20.73	17.36	64.66	63.41	64.04
10	15.44	23.41	19.79	72.66	70.83	71.75
11	17.10	25.58	21.72	83.66	79.66	81.67
Average daily gain	86 g	140 g	115 g	442 g	426 g	434 g

It may be seen from the table that the average daily rate of growth of animals varied from 86 g in the indigenous male to 442 g in the exotic males.

In the indigenous stock the females were showing a better rate of growth than the males. Whereas in exotic animals

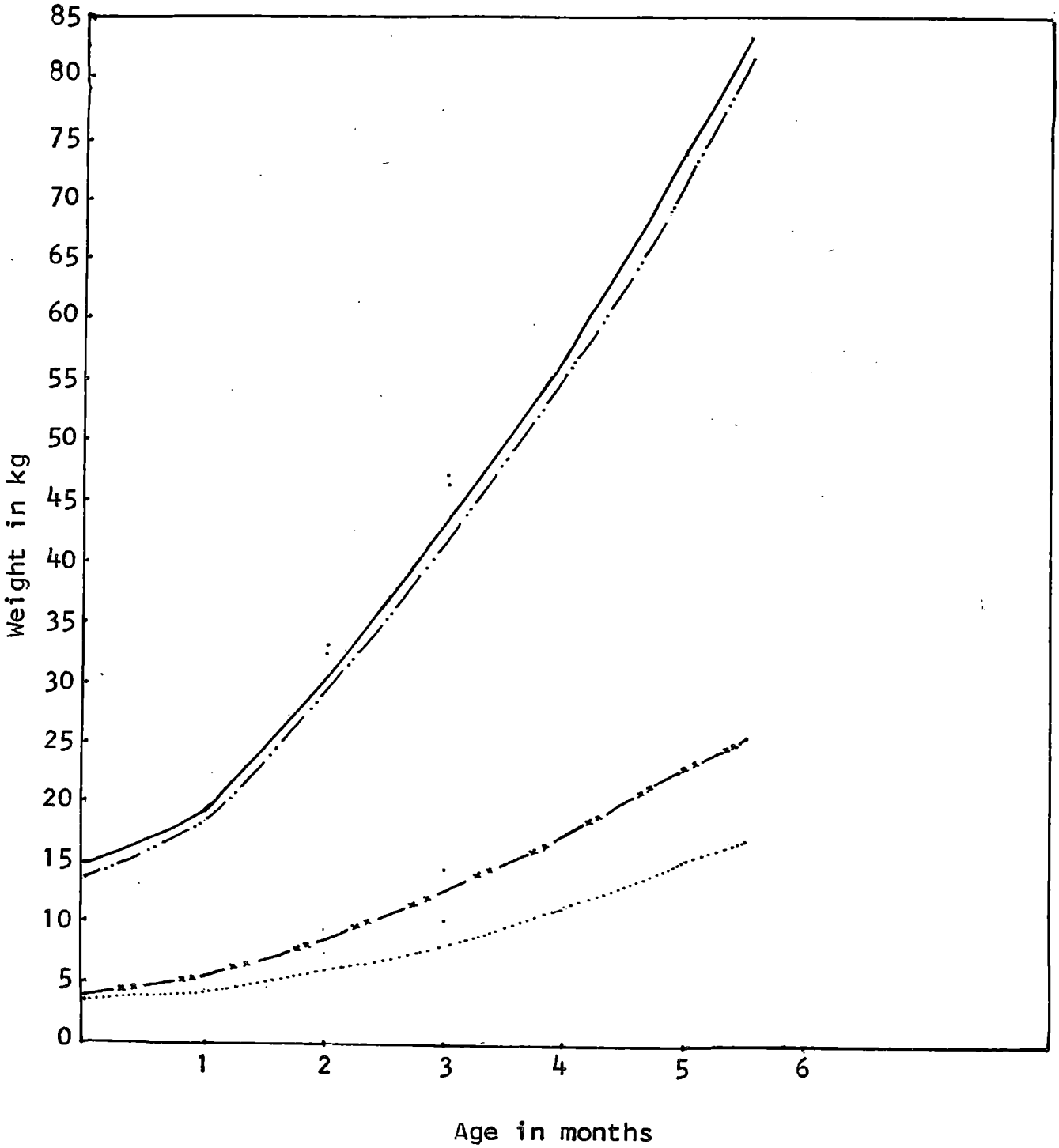


Fig. 1. Average weight gains of animals.

——— Exotic male

—·—·— Exotic female

—××— Indigenous female

..... Indigenous male

the males were slightly better in rate of growth than females.

On an average there was considerable variation in the rate of growth when the indigenous stock was compared with exotic stock (115 g against 434 g daily).

Table 3. Average fortnightly rate of gain. (kg)

Fortnight	Indigenous		Exotic	
	Male	Female	Male	Female
1	0.460	0.460	1.650	1.770
2	0.280	1.160	2.680	3.150
3	2.360	2.110	2.000	7.580
4	0.700	2.190	11.670	6.500
5	1.600	2.700	7.670	7.250
6	1.100	1.970	6.580	6.916
7	0.200	1.000	5.670	4.416
8	1.100	2.000	4.250	5.840
9	1.700	3.150	7.416	6.416
10	2.140	2.680	8.000	7.416
11	1.660	2.166	11.000	8.830
Average	1.210	1.960	6.240	6.010

Analysis of variance table.

Source	df	SS	MSS	F
Between age	10	90.78	9.78	0.40
Between groups	3	229.63	76.54	3.13*
Error	30	733.25	24.44	
Total	43	1053.54		

*Significant at 5% level.

Test of difference.

Indigenous Male | Indigenous Female | Exotic Male | Exotic Female

Table 4. Test of significance of rate of gain between breeds.

Groups	Average fortnightly gain (kg)
Mean Indigenous	1.62
Mean Exotic	6.12
't' value	5.76**

**Significant at 1% level.

The average fortnightly rate of gain varied from 1.21 kg in the indigenous male to 6.24 kg in the exotic male.

Eventhough there was a difference of 0.75 kg in the fortnightly gain between the male and female pigs in the indigenous stock the difference due to sex was not found to be significant. Similarly the sex effect in the exotic stock also was found to be non significant.

But the fortnightly gain of the indigenous male was found to be significantly lower than that of exotic male and female pigs.

Similarly when the breed was taken as a whole the rate of gain was found to be highly significant (Table 4).

Table 5. Feed efficiency.

Group	Indigenous		Exotic	
	Male	Female	Male	Female
Initial weight (kg)	19.16	24.00	90.50	81.50
Final weight (kg)	85.50	153.50	502.00	478.00
Gain in weight (kg)	66.34	129.50	411.50	396.50
Feed consumed (kg)	339.61	496.51	1622.50	1519.59
Feed efficiency	5.12	3.83	3.94	3.83

Lowest feed efficiency was noted in the indigenous male (5.12) and the highest in females of both the exotic and indigenous varieties of pigs (3.83). The feed efficiency of male exotic group was also comparable to the female group (3.94) eventhough slightly lower.

Table 6. Carcass characteristics of animals under the experiment.

Groups	Animal No.	Live body weight (kg)	Dressed weight with head (kg)		Weight of head (kg)	Weight of cold carcass (kg)	Back fat thickness (cm)	Loin eye area (cm^2)	Weight of cuts (kg)		
			Hot	Cold					Shoulder	Middle	Ham
Indigenous male	2	16.5	13.0	12.8	1.5	11.3	1.33	6.0	3.7	3.5	3.0
	5	15.5	11.5	11.3	1.4	9.9	1.50	12.0	3.3	3.1	2.5
	6	11.0	8.0	7.5	1.0	6.5	1.00	4.5	1.8	1.9	1.8
Indigenous female	7	21.5	14.0	13.7	1.7	12.0	1.67	10.0	2.4	4.6	3.4
	9	8.5	6.0	5.9	0.8	5.1	1.33	3.0	1.5	1.4	1.0
	12	33.0	26.0	25.9	2.5	23.4	2.33	12.5	5.5	9.9	6.8
Exotic male	1/40	90.5	69.0	68.0	5.9	62.1	2.50	36.0	17.8	18.1	21.5
	2/41	57.2	44.0	43.0	3.8	39.2	2.00	16.5	11.5	13.5	11.5
	1/41	55.5	41.0	40.0	4.3	35.8	1.50	18.0	10.2	11.9	10.5
Exotic female	9/40	75.4	60.0	59.0	5.0	54.0	2.17	30.0	14.2	20.2	16.2
	5/41	74.0	59.0	57.0	4.9	52.1	2.33	30.0	14.7	17.5	17.1
	6/41	78.0	59.0	58.0	5.0	53.0	1.67	21.0	15.1	18.2	17.0

Table 7. Dressing percentage.

Groups	Hot carcass	Cold carcass		Shrinkage (%)
	With head	With head	Without head	
Indigenous male	75.24	73.79	63.81	1.44
Indigenous female	71.50	70.54	62.24	0.96
Exotic male	75.68	74.13	67.19	1.55
Exotic female	78.32	76.55	68.57	1.77

Table 8. Dressing percentage of hot carcass with head.

No. of animals	Indigenous male	Indigenous female	Exotic male	Exotic female
1	78.79	65.12	76.24	79.58
2	78.19	70.59	76.92	79.73
3	72.73	78.79	73.87	75.64
Average	75.24	71.50	75.68	78.32

Analysis of variance table.

Source	df	SS	MSS	F
Between groups	3	70.9	23.63	1.45 NS
Error	8	130.7	16.34	
Total	11	201.6		

NS - Non significant.

The dressing percentage with head was lowest in indigenous female (71.50) and highest in exotic females (78.32). In the case of males of both the breeds it was found to be almost the same.

But this difference noted in the dressing percentage was found to be statistically non significant.

Table 9. Dressing percentage of cold carcass with head.

No. of animals	Indigenous male	Indigenous female	Exotic male	Exotic female
1	77.58	63.72	75.14	78.25
2	72.90	69.41	75.17	77.03
3	70.90	78.48	72.07	74.36
Average	73.79	70.54	74.13	76.55

Analysis of variance table.

Source	df	SS	MSS	F
Between groups	3	54.9	18.30	0.99 NS
Error	8	148.5	18.56	
Total	11	203.4		

NS - Non significant.

The dressing percentage after chilling was lowest in indigenous female (70.54) and highest in exotic females (76.55).

In the case of males of both the exotic and indigenous stock the difference in dressing percentage was not appreciable.

Table 10. Shrinkage percentage.

No. of animals	Indigenous male	Indigenous female	Exotic male	Exotic female
1	1.21	1.40	1.10	1.33
2	1.29	1.18	1.75	2.70
3	1.83	0.31	1.80	1.28
Average	1.44	0.96	1.55	1.77

Analysis of variance table.

Source	df	SS	MSS	F
Between groups	3	0.9	0.30	0.88 NS
Error	8	2.7	0.34	
Total	11	3.6		

NS - Non significant.

Test of significance

Groups	Dressing percentage		Shrinkage (%)
	Hot carcass	Cold carcass	
Mean indigenous	73.20	72.17	1.03
Mean exotic	77.00	75.34	1.66
't' value	1.65 NS	1.67 NS	1.90 NS

NS - Non significant.

It may be seen from the table that the percentage of shrinkage was lowest in indigenous female (0.96) and highest in exotic female (1.77). In the case of indigenous male and exotic male this difference was not found to be appreciable (1.44 and 1.55 respectively).

Similarly when the breed was compared on the whole, there was a difference of 3.80 per cent and 3.17 per cent in the dressing percentage of hot and cold carcass. But the variations noted also were found to be statistically non significant.

Table 11. Dressing percentage of cold carcass without head.

No. of animals	Indigenous male	Indigenous female	Exotic male	Exotic female
1	68.48	55.81	68.62	71.52
2	63.87	60.00	68.53	70.41
3	59.09	70.91	64.41	67.95
Average	63.81	62.24	67.19	68.57

Analysis of variance table.

Source	df	SS	MSS	F
Between groups	3	107.54	35.85	1.56NS
Error	8	183.87	22.98	
Total	11	291.41		

NS - Non significant.

Test of significance

Groups	Dressing percentage
Mean indigenous	63.03
Mean exotic	68.57
't' value	2.16 NS

NS - Non significant.

Eventhough the dressing percentage of cold carcass without head showed a difference of 6.33 between the indigenous female and exotic female this difference was found to be statistically non significant.

Similarly there was non significant difference between the dressing percentage of cold carcass without head when the exotic animals were compared with indigenous.

Table 12. Correlation coefficient between live weight and carcass length of pigs.

Groups	Live weight (kg)	Carcass length (cm)	'r'	byx	$\hat{y}$
Indigenous male	14.33	42.00	0.94NS	1.16	1.16X + 25.33
Indigenous female	21.00	45.33	0.99NS	0.73	0.73X + 30.03
Exotic male	67.73	73.33	0.99NS	0.29	0.29X + 53.69
Exotic female	75.80	71.33	0.82NS	1.24	1.24X + 22.66

NS - Non significant.

Values of correlation coefficient between live weight and carcass length in all the four groups were found to be high. But these values were found to be statistically non significant, probably because of the smaller sample size.

Since the values of correlation coefficient were high, regression coefficient between live weight and carcass length also were calculated (Table 12).

Prediction equations for carcass length from live weight also were calculated individually for all these four groups (Table 12).

Table 13. Back fat thickness.

No. of animals	Indigenous male	Indigenous female	Exotic male	Exotic female
1	1.33	1.67	2.5	2.17
2	1.50	1.33	2.0	2.33
3	1.00	2.33	1.5	1.67
Average	1.27	1.77	2.0	2.06

Analysis of variance table.

Source	df	SS	MSS	F
Between groups	3	1.14	0.38	2.24 NS
Error	8	1.39	0.17	
Total	11	2.53		

NS - Non significant.

Eventhough back fat thickness of the indigenous pigs and exotic pigs showed a variation from 1.53 cm to 2.03 cm, it was observed to be non significant.

Table 14. Loin eye area (cm^2).

No. of animals	Indigenous male	Indigenous female	Exotic male	Exotic female
1	6.0	10.0	36.0	30.0
2	12.0	3.0	16.5	30.0
3	4.5	12.5	18.0	21.0
Average	7.5	8.5	23.5	27.0

Analysis of variance table.

Source	df	SS	MSS	F
Between groups	3	912.56	304.19	6.586*
Error	8	369.50	46.19	
Total	11	1282.06		

* Significant at 5% level.

Test of difference

Indigenous male	Indigenous female	Exotic male	Exotic female

Loin eye area varied from 7.5 cm^2 in the indigenous male to 27.0 cm^2 in the exotic female pigs. The difference noticed in the loin eye area was found to be significant.

When the groups were tested individually it was found that there was significant difference between both sexes of indigenous pigs with that of exotic pigs whereas the difference noticed between sexes in indigenous pigs and the same in exotic pigs were found to be non significant.

Table 15. Weight of various cuts (kg).

Groups	Shoulder	Middle	Ham
Indigenous male	2.93	2.83	2.43
Indigenous female	3.13	5.30	3.73
Exotic male	13.17	14.50	14.50
Exotic female	14.67	18.63	16.77

The carcass was split into three cuts viz., (1) shoulder (2) middle and (3) ham, and the weight of each cut in all the four groups were measured and recorded.

Table 16. Percentage of shoulder.

No. of animals	Indigenous male	Indigenous female	Exotic male	Exotic female
1	32.74	20.00	28.66	26.30
2	33.33	29.41	29.33	28.22
3	27.69	23.50	28.53	28.49
Average	31.25	24.03	28.84	27.67

Analysis of variance table.

Source	df	SS	MSS	F
Between groups	3	75.19	25.06	2.96NS
Error	8	67.69	8.46	
Total	11	142.88		

NS - Non significant.

The percentage of shoulder was highest in indigenous male (31.25) and lowest in indigenous female (24.03). In exotic male and exotic female this was found to be almost similar.

Eventhough there was a difference of 7.22 per cent between the lowest and highest shoulder percentage, the variation noticed was found to be non significant, when tested.

Table 17. Percentage middle.

No. of animals	Indigenous male	Indigenous female	Exotic male	Exotic female
1	30.97	38.33	29.15	37.41
2	31.31	27.45	34.44	33.59
3	29.23	42.31	31.61	34.34
Average	30.50	36.03	31.73	35.11

Analysis of variance table.

Source	df	SS	MSS	F
Between groups	3	63.03	21.01	1.75NS
Error	8	143.04	17.88	
Total	11	206.07		

NS - Non significant.

Highest percentage of middle was noticed in the indigenous female group (36.03) and lowest in indigenous male group (30.50). When percentage of middle was compared, it was noticed that male pigs of both the indigenous group and exotic group were comparable. Similarly the female pigs of indigenous group were also like that of exotic group.

But this variation noticed was found to be non significant, when tested.

Table 18. Percentage of ham.

No. of animals	Indigenous male	Indigenous female	Exotic male	Exotic female
1	26.55	28.33	34.62	30.00
2	25.25	19.61	29.33	32.82
3	27.69	29.06	29.37	32.07
Average	24.50	25.67	31.11	31.63

Analysis of variance table.

Source	df	SS	MSS	F
Between groups	3	85.29	28.43	2.807 NS
Error	8	81.05	10.13	
Total	11	166.34		

NS - Non significant.

Percentage of ham when measured was found to be highest in both exotic male and female and lowest in both sexes of indigenous pigs.

However, the difference noticed in the percentage of ham when tested was found to be non significant between four groups.

Whereas when the indigenous stock was compared as a whole with exotic stock the difference noticed was found to be highly significant (Table 19).

Table 19. Test of significance.

Groups	Shoulder (%)	Ham (%)	Middle (%)
Mean indigenous	27.78	25.08	33.27
Mean exotic	28.25	31.37	34.42
't' value	0.214NS	3.18**	0.018NS

**Significant at 1% level; NS - Non significant.

Table 20. Weight of different internal organs. (kg)

Groups	Liver	Heart	Lung	Kidney	Viscera
Indigenous male	0.270	0.060	0.243	0.056	1.0
Indigenous female	0.386	0.086	0.456	0.100	1.6
Exotic male	1.13	0.260	1.15	0.240	7.0
Exotic female	1.30	0.230	1.04	0.230	7.5

When the carcass was opened, the liver, heart, lung, kidney and viscera were separated, measured and recorded.

Table 21. Percentage of liver against live weight.

No. of animals	Indigenous male	Indigenous female	Exotic male	Exotic female
1	2.30	2.42	1.80	1.72
2	1.81	1.65	1.20	1.72
3	1.36	1.52	1.89	1.69
Average	1.82	1.86	1.65	1.71

Analysis of variance table.

Source	df	SS	MSS	F
Between groups	3	0.09	0.03	0.2^{NS}
Error	8	1.18	0.15	
Total	11	1.27		

NS - Non significant.

The percentage of liver was lowest in exotic males (1.65) and highest in indigenous females (1.86). When the breeds were taken separately the percentage of liver in both sexes of indigenous pigs were appeared to be similar in size. The same was the case between the sexes in exotic pigs.

However, these difference noticed when tested were found to be non significant.

Table 22. Percentage of heart against live weight.

No. of animals	Indigenous male	Indigenous female	Exotic male	Exotic female
1	0.30	0.42	0.42	0.27
2	0.52	0.47	0.35	0.27
2	0.46	0.39	0.38	0.35
Average	0.43	0.43	0.38	0.30

Analysis of variance table (After converting the values by multiplying them with 100)

Source	df	SS	MSS	F
Between groups	3	3.38	1.13	2.51^{NS}
Error	8	3.59	0.45	
Total	11	6.97		

NS - Non significant.

Lowest percentage of heart (0.30) was obtained for the exotic females group. The highest heart percentage of 0.43 was observed in both indigenous male and female groups.

The difference was statistically non significant, when tested.

Table 23. Percentage of lung against live weight.

No. of animals	Indigenous male	Indigenous female	Exotic male	Exotic female
1	1.70	3.16	1.54	1.46
2	2.07	2.94	1.57	1.22
3	1.18	1.33	2.09	1.43
Average	1.65	2.48	1.73	1.37

Analysis of variance table.

Source	df	SS	MSS	F
Between groups	3	2.005	0.668	2.28^{NS}
Error	8	2.341	0.293	
Total	11	4.346		

NS - Non significant.

Percentage of lung varied from 1.37 in exotic females to 2.48 in indigenous females. Percentage of lung of indigenous male and exotic female was comparable (1.65 and 1.73).

But when the groups were tested, it showed that the variations were statistically non significant.

Table 24. Percentage of kidney against live weight.

No. of animals	Indigenous male	Indigenous female	Exotic male	Exotic female
1	0.42	0.56	0.33	0.28
2	0.32	0.59	0.28	0.30
3	0.45	0.39	0.38	0.33
Average	0.40	0.51	0.33	0.30

Analysis of variance table (After converting the values of multiplying them with 100)

Source	df	SS	MSS	F
Between groups	3	7.89	2.63	5.42*
Error	8	3.88	0.485	
Total	11	11.77		

* Significance at 5% level.

Test of difference

Exotic female	Exotic male	Indigenous male	Indigenous female

It may be seen from the tables that the percentage of kidney in the indigenous pigs was higher than that of exotic pigs.

The highest percentage of kidney was observed in indigenous females (0.51). The percentage of kidney of both the exotic males and females was almost comparable (0.33 and 0.30).

When groups were tested the percentage of kidney of indigenous female was found to be significantly different ($P < 0.05$) from that of both exotic males and females.

Table 25. Cost of production of different groups of pigs under study.

Groups	Indigenous male	Indigenous female	Exotic male	Exotic female
Number of animals	5	6	6	6
No. of days under study	155.00	155.00	155.00	155.00
Initial cost per pigling (Rs.)	48.67	50.67	150.83	135.83
Feed cost per pig (Rs.)	91.69	111.72	365.06	341.91
Details of other costs				
Veterinary aid Rs.2.00 per pig	10.00	12.00	12.00	12.00
Labour charges Re.0.20p per pig per day ie., 2 labourers for 100 fatteners @ Rs.10/- per day	155.00	186.00	186.00	186.00
Water charges @ 1.33 Paise per pig per day ie., 200 lit. per day @ 40 Paise per 1000 lit.	10.30	12.36	12.36	12.36
Interest for veterinary aid, labour and water charges @ 6%	4.46	5.35	5.35	5.35
Interest for feed cost @ 6%	11.68	17.08	55.80	52.27
Interest @ 12% for the initial cost of piglings @ Rs.10/- per kg live weight	14.88	15.49	46.11	41.53
Interest @ 12% for the cost of building @ Rs.20/- per Sq. ft. (1 pen is 120 Sq. ft.)	122.30	122.30	122.30	122.30
Depreciation for building @ 5%	50.84	50.84	50.84	50.84
Total other costs	379.46	421.42	490.42	482.65
Average other cost per pig	75.89	70.23	81.79	80.44

(Table 25 contd.....)

Groups		Indi-genous male	Indige-nous female	Exotic male	Exotic female
Average initial cost of pigling	(Rs)	48.67	50.67	150.83	135.83
Average feed cost per pig	(Rs)	91.69	111.72	365.06	341.91
Average other costs per pig	(Rs)	75.89	70.23	81.79	80.44
Total cost per pig	(Rs)	216.25	232.62	597.68	558.18
Average weight at the end of study (kg)		17.10	25.58	83.66	79.66
Cost of production per kg live weight	(Rs)	12.63	9.09	7.14	7.01
Breakup of production cost per kg live weight					
Initial cost of pigling	(Rs)	2.84	1.97	1.80	1.71
Feed cost		5.36	4.36	4.36	4.29
Other cost		4.43	2.76	0.98	1.01
Total		12.63	9.09	7.14	7.01

Average cost of production per kg live weight (Rs)

Indigenous - 10.52
Exotic - 7.07

(Table 25 concl.)

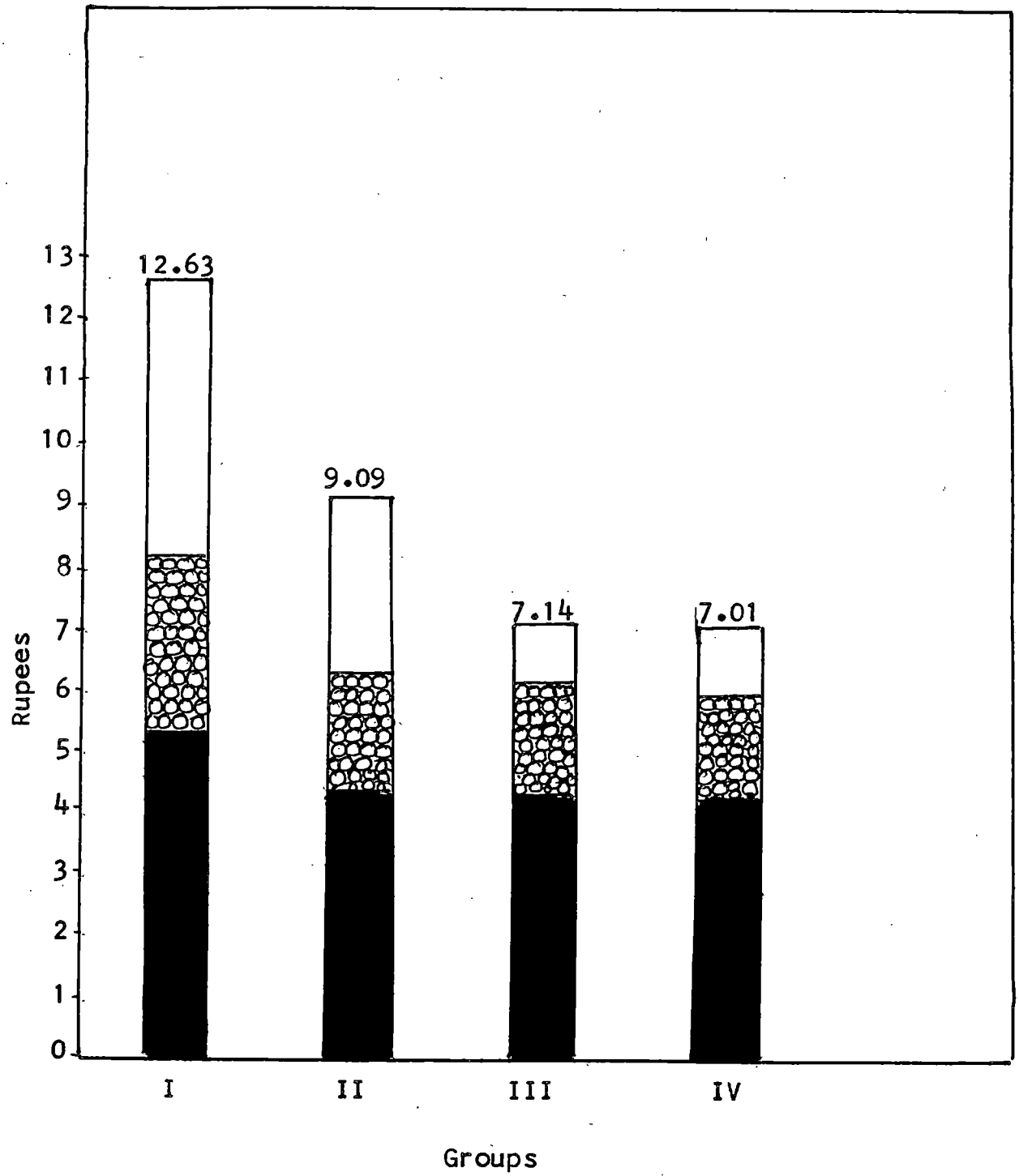


Fig. 2. Cost of production per kilogram live body weight.

Other costs

Weaner cost

Feed cost

I. Indigenous male

II. Indigenous female

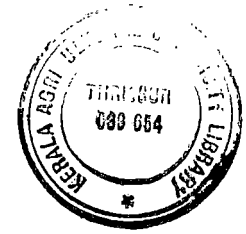
III. Exotic male

IV. Exotic female

Table 26. Feed cost per kilogram live weight gain.

Groups	Indigenous	Exotic
Total feed consumed (kg)	836.12	3142.09
Total feed cost @ Rs.1.35 per kg feed	1128.76	4241.82
Total gain (kg)	195.84	808.00
Cost of production per kg live weight (Rs)	5.76	5.24

DISCUSSION



DISCUSSION

Rate of growth and gain

Average weight of the male and female indigenous pigs studied at 60 days was found to be 3.8 and 4.0 kg respectively, in comparison to that in Large White Yorkshire pigs of 15.08 and 13.58 kg respectively. When the breeds were taken separately the indigenous pigs recorded a weight of 3.92 kg at 60 days as against 14.33 kg in the exotic pigs.

This finding is found to be lower than that reported by Gupta et al. (1967) who found an average weaning weight of 18.15 kg and 17.46 kg in male and female Large White Yorkshire pigs respectively. On the contrary the result obtained is much higher than that observed by Singh et al. (1977) in the same breed of pigs (8.5 to 9 kg) and Johar et al. (1974) in Middle White Yorkshire pigs (8.5 kg).

The weight of indigenous pigs at 60 days of age noticed in the present study is found to be lower than that reported by Bhat (1977) in local West Bengal breed of pigs (5.18 kg).

Gain in weight

The average fortnightly rates of gain observed in the

present study were 1.21, 1.96, 6.24 and 6.01 kg in the indigenous males, indigenous females, exotic males and exotic females respectively. Correspondingly the daily gain observed in the above groups were 86, 140, 442 and 426 g in the indigenous males, indigenous females, exotic males and exotic females respectively.

The difference in gain observed between indigenous and exotic breeds is found to be highly significant ($P \leq 0.01$).

The daily gain of exotic pigs observed in the present study is higher than that reported by Nikulina et al. (1968) in Large White Yorkshire pigs (400 g). However, many workers have reported a higher daily gain of 639.8 g (Kroeske, 1966), 715 g (Jovicic et al., 1977) in Large White Yorkshire pigs and 654 g (Pfeiffer, 1962), 620 g (Kroeske, 1966), 750 g (Kudrjavcev and Cuk, 1969), 765 g (Jovicic et al., 1977) in Landrace breed of pigs. But most of the Indian workers have noted a lower daily gain of 480 g (Agarwala, 1961), 237 g (Bhat, 1977) and 294.2 g (Rao et al., 1978) than the present study.

The gain in weight observed in the present study in indigenous male pigs is found to be equal to that reported by Agarwala (1962) in Desi pigs (110 g) and Bhat (1977) in

pigs of Indo-gangetic area (117 g). But the gain observed is found to be much inferior to that reported by Agarwala (1961) in Desi pigs itself (280 g).

No sex effect in gain in weight could be observed in both the exotic and indigenous pigs.

Highly significant effect on gain in weight could be observed between the indigenous breed of pigs and exotic breed of pigs. This finding is also in agreement with the reports of many previous workers (Kroeske, 1966; Comberg et al., 1972; Jovicic et al., 1977 and Watkins et al., 1977).

Feed Efficiency

A feed efficiency of 5.12, 3.83, 3.94 and 3.83 was observed in the indigenous male, indigenous female, exotic male and exotic female pigs respectively upto seven months of age.

The feed efficiency observed in Large White Yorkshire pigs upto seven months of age is similar to that reported by Kumar et al. (1974) and Jovicic et al. (1977) in the same breed of pigs. Whereas the same is better than that reported by Bhagwat and Sahasrabuddhe (1971) in the Large White Yorkshire pigs maintained in India.

In Landrace and Duroc breeds of pigs Kronka et al. (1977) has reported a better feed efficiency of 3.3 and 3.2 respectively. On the contrary Kudrjavcev and Cuk (1969) reported a feed efficiency of 4.5 and 4.8 in Landrace and Duroc breed of pigs.

The feed efficiency of indigenous pigs observed in the present study (4.26) is higher than that reported by Agarwala (1961) in Desi pigs (4.73). Within the indigenous stock male pigs showed a lower feed efficiency than the female pigs (5.12 Vs. 3.83).

Carcass Characteristics

Dressing percentage of hot carcass with head observed in the present study was 75.24, 71.51, 75.68 and 78.32 in the indigenous male, indigenous female, exotic male and exotic female group of pigs.

The same in cold carcass was 73.79, 70.54, 74.13 and 76.55 per cent in the indigenous male, indigenous female, exotic male and exotic female respectively.

Dressing percentage of cold carcass without head was found to be 63.81, 62.24, 67.19 and 68.57 in the indigenous male, indigenous female, exotic male and exotic female group

of pigs.

The shrinkage percentage observed in the present study was 1.44, 0.96, 1.55 and 1.77 in indigenous male, indigenous female, exotic male and exotic female pigs respectively.

The difference noticed in the dressing percentage of hot carcass, cold carcass and shrinkage percentage were found to be non significant, between sexes in indigenous and exotic group of pigs and between exotic and indigenous pigs when taken as a whole.

This finding is in agreement with that of Nikulina et al. (1966), Nikulina et al. (1968), Horst and Bader (1969) and Jovicic et al. (1977). Whereas Ostapcuk and Kadlevskaja (1966), Daniljuk (1969), Bereskin and Davey (1976), Hale and Southwell (1967), Matassino et al. (1970) and Hansson et al. (1975) observed significant influence of breed and sex on dressing percentage in various breeds of pigs.

The correlation coefficient between live weight and carcass length in male and female of exotic and indigenous pigs were found to be of high value but non significant statistically. The non significant value obtained may be due to the smaller sample size of pigs under observation.

Back fat thickness.

Back fat thickness observed in the present study was 1.27, 1.77, 2.0 and 2.06 cm in indigenous male, indigenous female, exotic male and exotic female pigs respectively. No significant difference could be observed in the back fat thickness of either male and female pigs of indigenous or exotic pigs or between exotic and indigenous breeds of pigs.

Back fat thickness observed in the exotic animals in the present study is slightly higher than that reported by Hansson et al. (1975) in Large White Yorkshire and Landrace breed of pigs, whereas this result is lower than that observed by Jovicic et al. (1977), Kumar et al. (1974) and Rai et al. (1974) in Large White Yorkshire pigs.

No significant difference in back fat thickness could be noticed between breeds. The result is in agreement with that of Cox (1963) and Kuhlers et al. (1977) who observed non significant influence of breed on back fat thickness, whereas this finding is not in agreement with Aunan et al. (1961) who has observed highly significant effect of breed on back fat thickness.

Loin eye area.

The loin eye area observed in the present study was

7.5 cm^2, 8.5 cm^2, 23.5 cm^2 and 27.07 cm^2 in the indigenous male, indigenous female, exotic male and exotic female respectively. The difference observed between male and female of indigenous and that of exotic pigs was found to be non significant. But when the exotic breed was compared with that of indigenous breed the difference was found to be significant ($P < 0.05$) indicating that the loin eye area of the indigenous pigs was much inferior than that of exotic breed.

The results of the present study in exotic pigs are comparable with those of Kumar et al. (1974) and Rai et al. (1974) in Large White Yorkshire pigs maintained under Indian condition and slaughtered at 90 kg body weight. This result is also in agreement with that reported by Kudrjavcev and Cuk (1969) in Duroc and Poland China breed of pigs.

Percentage of shoulder.

Weight of the shoulder in the indigenous male, indigenous female, exotic male and exotic female were found to be 2.93, 3.13, 13.17 and 14.67 kg respectively.

The percentage of shoulder against cold carcass weight when compared between breeds was found to be non significant (Table 16).

Percentage of middle.

Weights of middle cut in the indigenous male, indigenous female, exotic male and exotic female were found to be 2.83, 5.30, 14.50 and 18.63 kg respectively. The corresponding percentage of middle against cold carcass weight were found to be 30.50, 36.03, 31.73 and 35.11 in indigenous male, indigenous female, exotic male and exotic female respectively.

The weights of middle cut obtained showed considerable variation from 2.83 kg in indigenous male to 18.63 kg in the exotic female. In both the exotic and indigenous breeds the females showed better middle cut than the males.

When compared in terms of percentage of middle to cold carcass weight the difference obtained was found to be non significant.

Percentage of ham.

Weights of the ham in indigenous male, indigenous female, exotic male and exotic female pigs were found to be 2.43, 3.73, 14.50 and 16.77 kg respectively. The corresponding values of percentage of ham against cold carcass weight were 24.50, 25.67, 31.11 and 31.63 respectively.

A difference of 12.55 kg was noticed between the ham weight of indigenous and exotic breeds of pigs. Eventhough there was variation between male and female of indigenous and that of exotic pigs in the percentage of ham this difference was found to be non significant. But when the breed is taken as such the difference, noticed in the percentage of ham, was found to be highly significant (Table 19).

Weight of internal organs.

Weight of liver, heart, lungs, kidney and viscera of males and females of indigenous as well as exotic breeds of pigs obtained are tabulated in Table 20.

Percentage of liver.

The percentage of liver against live weight obtained in indigenous male, indigenous female, exotic aale and exotic female were 1.82, 1.86, 1.65 and 1.71 respectively.

The variation observed in the percentage of liver was found to be non significant.

Percentage of heart.

The percentage of heart against live weight observed were 0.43, 0.43, 0.38 and 0.30 in indigenous male, indigenous

female, exotic male and exotic female respectively.

Eventhough the percentage observed in the exotic group were less than that of indigenous group, it was found to be non significant.

Percentage of lungs.

The percentage of lungs was highest in indigenous female (2.48). The corresponding values in indigenous male and exotic females were 1.65 and 1.73 per cent respectively. The lowest percentage of lungs against live weight was found to be in the exotic females (1.37).

The difference noticed in the percentage of lung against live weight was found to be statistically non significant.

Percentage of kidney.

The percentage of kidney against live weight varied from 0.30 in the exotic females to 0.51 in indigenous females.

The difference observed in the percentage of kidney against live weight was found to be significant ($P < 0.05$).

Highest percentage of kidney was noticed in the indigenous female, which was found to vary significantly different

between both sexes of exotic breeds of pigs.

Economics of rearing

Cost of production of indigenous male, indigenous female, exotic male and exotic female pigs for unit live weight are presented in Tables 25 and 26.

Highest production cost per kg live weight gain was observed in indigenous male (Rs.12.63) and lowest in exotic female (Rs.7.01).

The production cost of indigenous stock is much higher than that of exotic pigs (Rs.10.52 Vs. Rs.7.07). This may be attributed to the low live weight of the indigenous stock than that of exotic stock at the end of the study.

Within the indigenous stock the production cost of female pigs is much lower than that of male pigs (Rs.12.63 Vs. Rs.9.09), which may be due to the high feed efficiency and live weight obtained for female indigenous than that of male indigenous pigs.

In exotic stock, females produced unit gain with less production cost eventhough the live weight of males at the

end of seven months was higher than that of females. This may be due to the higher feed efficiency observed for females than that of males (3.83 Vs. 3.94).

But when the production cost is calculated, in terms of feed cost alone, it has been found that the cost of production of indigenous pigs for unit gain is not much different from that of exotic Large White Yorkshire pigs (Rs.5.75 against Rs.5.24 per kg gain).

SUMMARY

SUMMARY

A study was carried out using 12 indigenous and 12 exotic pigs of two months of age under the same managemental conditions to assess the growth rate, carcass quality and economics of rearing of indigenous pigs of Kerala in comparison with the exotic breed of pigs for a period of five months.

The result obtained and conclusions drawn from the study are summarised below.

The indigenous pigs showed an increase of 17.81 kg in body weight from 3.91 ± 0.161 kg to 21.73 ± 1.99 kg during the period of 155 days study. Whereas correspondingly the Large White Yorkshire pigs showed an increase of 67.33 kg in the body weight.

Average fortnightly gains of indigenous male, indigenous female, exotic male and exotic female were 1.21, 1.96, 6.24 and 6.01 kg respectively. The indigenous male pigs were found to be much inferior in growth rate when compared to the Large White Yorkshire pigs.

In indigenous group the growth rate of male was lower than that of female, but in exotic group the male pigs have shown a better growth rate. But the sex effect on growth rate was found to be non significant.

A significantly higher ($P < 0.01$) fortnightly gains was observed in the exotic breed of pigs than that of indigenous breed (6.21 kg Vs. 1.618 kg).

But the indigenous female pigs were similar in feed efficiency when compared with that of exotic female and was even better than exotic male in feed efficiency. Whereas when the breed was compared as such feed efficiency of indigenous group was found to be less than that of exotic group (4.26 Vs. 3.88).

It appears that breed has no significant influence on dressing percentage, eventhough the dressing percentage obtained from exotic group was slightly higher than that of indigenous group of pigs (75.34 Vs. 72.17).

A non significantly less back fat (1.53 cm) was observed in indigenous group than that of exotic group (2.03 cm) eventhough there was a difference of 32 per cent between the back fat thickness of indigenous and exotic breeds of pigs. The non significant difference observed may be probably due to the smaller sample size.

A significantly high ($P < 0.01$) loin eye area in exotic breed of pigs (25.25 cm^2) could be noticed than that of indigenous breed of pigs (8.0 cm^2). Since the loin eye

area is a measure of carcass leanness, it may be assumed that the exotic stock contain more lean than the indigenous stock.

In respect of percentage of cuts it seems that breed and sex exerts no significant influence on percentage of shoulder and middle. But the percentage of ham was significantly less ($P < 0.01$) in indigenous breed than that of exotic breed of pigs.

Similarly percentage of liver, heart, lung, were not influenced by breed and sex. But the percentage of kidney of indigenous female (0.51) was significantly higher than both exotic male (0.33) and female (0.30) pigs.

Total cost of production per kilogram body weight of indigenous stock was found to be higher than that of exotic stock (Rs.10.52 against Rs.7.07). But when the feed cost alone was taken the cost of production of indigenous stock per kg body weight was comparable with that of exotic stock (Rs.5.75 against Rs.5.24).

The difference in body weights of indigenous pigs at the beginning of the study and at the end of the study were 3.78 times and 4.58 times less respectively than that of exotic pigs. The gain in weight observed in exotic group was 3.78 times more than that of indigenous group.

When the increase in body weight is taken as such the indigenous pigs had 5.54 times increase in the body weight as against 5.69 times in exotic breed of pigs.

It appears from the result that the gain in body weight and efficiency are comparable for both exotic and indigenous pigs in terms of equal body weight. Whereas when compared at same age the exotic animals had 4.5 times more weight than that of indigenous pigs.

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THE GROWTH, CARCASS CHARACTERISTICS AND ECONOMICS OF REARING OF INDIGENOUS AND EXOTIC PIGS

BY

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ABSTRACT OF A THESIS

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ABSTRACT

In order to have a comparative knowledge of growth rate, carcass quality and economics of rearing of indigenous and exotic pigs under the same agro-climatic condition, this work has been carried out.

Twelve indigenous and twelve exotic pigs of two months of age were equally divided into two groups and reared for a period of 155 days, on ad libitum feed and water. At the end of the experiment half of the pigs from each group were randomly selected, slaughtered and the carcass characteristics were studied.

A significantly higher fortnightly gains was observed in exotic pigs than that of indigenous pigs (6.21 kg against 1.618 kg).

Feed efficiency of indigenous pigs was inferior than that of exotic pigs (4.26 against 3.88). But feed efficiency of indigenous female was equal to that of exotic female (3.83) and better than that of exotic male (3.92).

Dressing percentage of indigenous pigs and exotic pigs were not significantly different (75.34 against 72.17).

Back fat thickness observed were 1.53 cm and 2.03 cm

in indigenous pigs and exotic pigs respectively.

Loin eye area of indigenous and exotic pigs were significantly different (8.0 cm^2 and 25.25 cm^2 respectively).

Percentage of shoulder, middle and ham against cold carcass weight were 27.78, 33.27 and 25.08 respectively for indigenous pigs. The corresponding figures for exotic pigs were 28.25, 34.42 and 31.37 per cent respectively. The ham percentage was significantly lower ($P < 0.01$) in indigenous breed.

Total cost of production per kilogram live weight was estimated to be very high in indigenous pigs than that of exotic pigs (Rs.10.52 against Rs.7.07). But when the feed cost alone is taken, the cost of production of indigenous stock was not much different from that of exotic stock (Rs.5.75 Vs. Rs.5.24).