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COMPARATIVE PERFORMANCE OF KHAKI CAMPBELL AND DESI DUCKS

By

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THESIS

Submitted in partial fulfilment of the
requirement for the degree

Master of Veterinary Science

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Kerala Agricultural University

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COLLEGE OF VETERINARY AND ANIMAL SCIENCES
Mannuthy - Trichur

1983

DECLARATION

I, hereby declare that this thesis entitled "COMPARATIVE PERFORMANCE OF KHAKI CAMPBELL AND DESI DUCKS" is a bonafide record of research work done by me during the course of research work 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.

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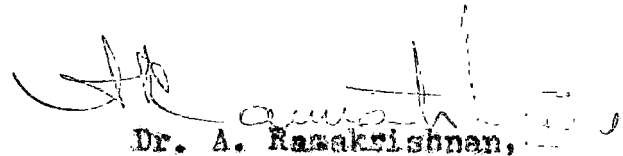


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CERTIFICATE

Certified that this thesis entitled "COMPARATIVE PERFORMANCE OF KHAKI CAMPBELL AND DESI DUCKS" is a record of research work done independently by Dr. K.R. Eswaran, 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.

Mannuthy,
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DEDICATED TO MY BELOVED PARENTS

ACKNOWLEDGEMENT

With immense pleasure, I place on record my sincere gratitude and indebtedness to Dr. A. Ramakrishnan, Professor and Head, Department of Poultry Science, for his timely planning, valuable guidance and constant encouragement throughout this study and in the preparation of this thesis.

I am grateful to Dr. A.K.K. Unni, Senior Scientist, AICRP on Poultry for Eggs, Mannuthy for his keen interest and guidance given.

I am highly grateful to Dr. C.K. Venugopalan, Associate Professor, Department of Poultry Science for his valuable suggestions from time to time and keen interest shown throughout the period of my experimentation and in the preparation of the thesis.

I am thankful to Dr. G. Nirmalan, Professor of Physiology for his constructive suggestions and help rendered.

I express my deep sense of gratitude to Dr. G. Reghunathan Nair, Associate Professor, Department of Poultry Science who has voluntarily rendered all help during the conduct of experiments by providing all facilities in the farm and thereafter during the preparation of the thesis.

I am extremely grateful to Sri. N. Raveendranath, Assistant Professor and his colleagues working in the

Department of Statistics including Sri. B.Gopakumar and Sri. T.V.Sathyanandan for their help in the analysis of the data.

I wish to thank Dr. C.K.Ramachandran, Dr. S.Shahul Hameed and Dr. T.K.Ravindran, my colleagues working in the Animal Husbandry Department for their whole hearted co-operation and support while conducting the experiments.

I profusely thank all the staff working in the University Poultry Farm, Mannuthy for all the assistance rendered by them.

I am highly grateful to Dr. P.K.Nambiar, Director of Animal Husbandry and to Government of Kerala, for having deputed me for this course.

I acknowledge the encouragement and support received from my wife and children in the face of the sufferings they had to undergo due to my absence from home throughout the period.

I wish to place on record my sincere thanks to Sri. V.S.Skandakumar for neatly typing the manuscript in time.

I take this opportunity to express my gratitude to Sri. T.R.Gopalan, Farm Assistant, who has drawn the graphs and figures.

Mannuthy,

28-2-1993.

Dr. K.R. Nwaran.

C O N T E N T S

			Page
INTRODUCTION	..	..	1
REVIEW OF LITERATURE	..	..	4
MATERIALS AND METHODS	..	..	20
RESULTS	..	..	28
DISCUSSION	..	..	59
SUMMARY	..	..	72
REFERENCES	..	..	75
ABSTRACT	..	..

INTRODUCTION

INTRODUCTION

The Agro-climatic environment and the wide stretching coastal belt form a natural gift to Kerala State, which is ideal for duck raising. Duck farming, in Kerala, is found to be a remunerative enterprise, because ducks require no elaborate housing, necessitates only low capital investment, brings quick returns from outlay and well distributed turn over throughout the first year of production as well as in subsequent years.

India's annual egg production has crossed the 12,500 million mark by 1979 and the value of poultry production has exceeded Rs. 6,300/- million (Anon, 1980). According to All India Livestock Census, 1972, the total poultry population has shown 18.5% increase over that existed in 1966.

Ducks occupy second place to chicken so far as table egg production is concerned in our country (Bulbule, 1981). According to 1972 census, the country's duck population was 9.01 million, which is 6.5% of the total poultry population of India, producing about 400 million eggs every year, amounting to five per cent of the total egg production. Ducks are mainly concentrated in eastern and southern states. West Bengal has the largest number of ducks and Kerala occupies the sixth place.

In Kerala, there are 42,9569 ducks, which are mostly of local variety (Anon, 1977, Annexure - VI). Ducks are mainly concentrated in Alleppey, Ernakulam, Kottayam and Trichur districts (Table 1). Ducks are reared by poor farmers who are financed by money lenders. Finance is provided right from hatching of the eggs till the ducks are sold as spent ducks. Hatching of duck eggs are synchronized with harvesting season. Ducklings are kept around their houses upto 6-8 weeks of age with some hand feeding. Thereafter, the ducklings are taken out to the harvested paddy fields, wet lands, backwaters and irrigation canals for feeding themselves. Ducks are transported from one place to the other using trucks, vallons or on foot, if the distance is short. The ducks are allowed to feed on post-harvested paddy fields by paying a premium in the form of eggs - 25 eggs per acre of land (Ravachandran and Ramakrishnan, 1982). During lean seasons, the ducks are fed with wheat, tapioca, palmirrah pith mixed with groundnut cake and fish.

In Kerala, duck eggs are mainly marketed within the State itself. A percentage of eggs are shipped to other States also. The price of duck egg is 10-15 paise more than chicken eggs. It is believed that duck egg has some medicinal value and therefore some people even prefer duck eggs over hen eggs in this State.

Considering the above facts, there is great scope for improving the duck farming practices in our State. Now, the duck population is mostly of desi type and their production potentialities have not been studied to a great extent. The egg production potentialities of these local ducks reported by different farmers vary greatly. There is every possibility of improving the productivity of desi flock by adopting appropriate scientific technologies in breeding, feeding and management practices. But, without authentic records about the genetic potentialities of the desi ducks, attempts directed to improve their production is likely to become futile. Therefore, an attempt has been made to collect data on the rate of growth, egg production and related traits of local desi as well as Khaki Campbell ducks, from hatch to one laying season. The study has been designed to explore the possibility of evolving a new duck germplasm suitable to our country by further research based on the present findings.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Many workers had studied the growth pattern, egg production and egg quality traits in chicken (Roberts 1964; Tanabe et al. 1965; Rao, 1970; Saproneva, 1971; Kumar and Acharya, 1980 and Raj et al. 1980), but the available literature gives only scanty information on the above traits with ducks. The relevant information that could be gathered are presented here.

Growth (Body Weight)

The body weight increase generally indicates growth and is one of the most important economic traits, which is influenced not only by genetic make-up, but also by environment. The early growth rate and quick attainment of the mature body weight were reported by Milby and Henderson (1937) as the main characteristics of duck and geese.

Hays (1952) reported that ducks under intensive system showed significantly higher body weight at the age of sexual maturity than those under semi-intensive system.

Kumar et al. (1971) reported that in groups of Pekin, Khaki Campbell, Pekin x Khaki Campbell and Khaki Campbell x Pekin ducklings, the body weights at hatching were 45.8, 35.8, 37.5 and 45.4g respectively. At four weeks of age,

the body weights of the above genetic groups were 462.3, 266.5, 326.4 and 425.7g and at 12 weeks, the body weights were 1955, 1366, 1771 and 1971 grams respectively. They had also shown that, in all groups, maximum rate of weight gain occurred between four and eight week of age.

Monstageer et al. (1971) studied the effect of crossing on the production of ducks. They recorded the body weights at first egg for four groups of Pekin, Khaki Campbell, Pekin x Khaki Campbell and Khaki Campbell x Pekin as 2.32, 1.57, 1.86 and 1.95kg.

Majna et al. (1973) observed an average body weight of 2512g at 53rd day in White Pekin ducks.

Moudgal (1974) reared White Pekin ducks under intensive system on deep litter and reported a body weight of 1932g at the end of seven weeks of age.

Basanowa (1974), while studying the productive value of Cherryvalley and Pekin ducks, reported that for groups of lines 102 and 151 (Cherryvalley parent lines and Pekins respectively) body weight at 180 days averaged 4262, 4583 and 3727 grams.

Rodolph and Hoppe (1975), in their studies with American Pekins and crossbred ducks observed a body weight of 2365 and 1948g in males as against 2262 and 1945g in females respectively.

Gibes (1975), while conducting experiments with Pekin and domestic ducks, observed that the weight gains were highest at four weeks of age and after five weeks of age, the rate of growth had declined in both genetic groups. He had also observed that in Pekin, weight gains and increases in linear measurements, were more rapid than in Mallards.

Abdel Malek and Yamani (1976) showed that the body weight of White Pekin ducks at 12 weeks of age averaged 1511 gram.

Singh et al. (1976) reared White Pekin ducks under three systems of housing namely, intensive system, semi-intensive system and battery system. They reported that male and female ducklings attained 1851g and 1971g body weights respectively at seven weeks of age in intensive system, which were significantly higher than the body weights attained in the other two systems of housing. They also reported that the intensive system of housing proved more conducive for growth, feed efficiency and livability than the other two systems of housing.

Singh and Moudgal (1976) observed that White Pekin ducklings on high levels of protein under intensive system of management had a faster growth rate and higher feed efficiency than those on low levels of protein and

in semi-intensive system of management. Body weight and growth rate were significantly lower in 17 per cent protein fed group than in the 21 per cent and 25 per cent protein fed groups.

Sharma (1977) in a study to evaluate reproductive performance of White Pekin ducks under intensive and semi-intensive systems of management reported that ducks under intensive system weighed significantly heavier (2441g) than those reared under semi-intensive system (2352g), at sexual maturity.

George (1977) raised desi ducklings on the floor and reported that the mean body weights at 7, 8, 9, and 10 weeks of age averaged 835.77, 1031.95, 1169.9 and 1343.57 grams respectively in the case of females. The corresponding figures in males were 891.33, 1103.72, 1291.8 and 1481.8g respectively.

George (1978) observed that the maximum body weight gains were achieved during the 3rd and 6th weeks of age in desi ducklings and there was a decrease in the rate of body weight gain from 7th week of age onwards. He had also observed that the feed efficiency was better at seven weeks of age when compared to the subsequent periods of growth.

Sharma and Singh (1978) reported that ducks reared under intensive management and semi-intensive management,

weighed 1794g and 1683g at seven weeks of age and body weights at 50% egg production were 2203g and 2303g respectively ($P/0.05$). For ducks under semi-intensive system, seven week body weight was significantly correlated with weight at sexual maturity (0.84) and age at sexual maturity with egg production to 400 days (-0.44). They further observed that the body weight of ducks at the age of sexual maturity was significantly higher in intensive system (2441g) than in semi-intensive system (2352g).

Reddy and Reddy (1979), while studying the growth pattern and feed efficiency in Khaki Campbell ducklings, observed that the body weight of ducklings showed a linear increase with age, as in the case of chicken. They had also observed that the body weight of ducklings increased two-fold by the end of first week, four-fold in second week and about ten-fold by the end of third week (35, 70, 150 and 325g at 0, 1, 2 and 3 weeks respectively), indicating their capacity to grow faster in the early stages of life. However, gain in body weight was reported to be comparatively less after the fifth week.

Kingston *et al.* (1979) reported that, in un-sexed Alabio ducklings reared in cages, body weights averaged 38g at hatching and 81g at ten days of age. Female,

averaged 142g at three weeks, 764g at eight weeks and 1583g at seventh month.

Gonzalez and Marta (1920) reported that the body weights of female Khaki Campbell ducklings at 1, 4 and 7 week of age averaged 85.6, 595.1 and 1113g, while that of males were 75.0, 594.4 and 1213.3g for the same period.

George et al. (1990) fed a standard ration to desi ducklings and found that the body weights at 7, 8, 9 and 10 weeks of age averaged 1033, 1139, 1201 and 1254g respectively and recorded a daily gain of 20.2, 19.6, 18.4 and 17.3g during the same period.

Jung and Zhou (1980) had reported that the body weight of White Pekin duck at eight weeks of age was about 54 times that at hatching.

George et al. (1981) studied certain economic traits in desi ducks and reported that body weights at 3, 6, 9 and 12 weeks of age averaged 301.80, 700.39, 1233.47 and 1490.80g respectively for ducks reared in battery until seven weeks of age and then transferred to deep litter, while those reared straight on deep litter weighed 361.28, 769.67, 1144.56 and 1337.45g for the same period. They had further observed that males had significantly higher body weights than females at all ages, irrespective of type of housing provided. Hatch weight was found to be

significantly correlated with body weight at 1, 4, 8 and 12 weeks of age for males kept on deep litter from hatching (0.46, 0.31, 0.35 and 0.25 respectively) with body weight at one and four week for males kept in batteries upto seven weeks of age (0.33 and 0.30) and with first week weight of females kept in batteries (0.35). The body weight of duckling raised in battery was significantly ($P/0.01$) higher than that of the ones raised on litter floor till eighth week of age. They had further observed that the rate of weekly body weight gain declined from 11th week of age. The mean body weight of ducklings at 12th week of age was 1443g.

Aggarwal et al. (1981) had reported that the body weight of White Pekin ducklings at sixth week of age averaged 1350g and at seventh week 1713g.

Age at sexual maturity

Hays (1952) had shown that ducks reared under intensive system matured earlier than those reared under semi-intensive system.

Monstagesar et al. (1971) studied the effect of crossing on the egg production of ducks. He made four genetic groups with Pekin, Khaki Campbell, Pekin x Khaki Campbell and Khaki Campbell x Pekin and recorded the age

at first egg as 206.3, 151.3, 179.4 and 175 days for the above four genetic groups respectively.

Basanowa (1974), studied the productive value of Cherryvalley and Pekin ducks and reported that all groups came into lay at 170-180 days of age when raised on litter floor.

Nair (1977) reported that Khaki Campbell ducks started laying on completion of four months at Duck Farm, Hirapur.

Sharma (1977) evaluated the productive performance of White Pekin ducks both in intensive and semi-intensive systems and found that ducks reared under intensive system reached sexual maturity at 162 days, while those reared under semi-intensive system attained sexual maturity at 172 days only.

Chavez and Lasnini (1978) compared the production performance of three varieties of native Indonesian egg type ducks by housing them in individual cages and found that the age at first egg for the three varieties (Tegal, Alabio and Bali) averaged 178, 179 and 185 days respectively.

Robinson *et al.* (1978) reported that Alabio ducks began to lay at seven months of age.

Ramakrishnan et al. (1981), while studying some characters relating to productive traits in desi ducks, observed that the age at sexual maturity in desi ducks was 182 days.

Egg Production

Abakumov (1968) reported that ducks (breed not specified) with access to ponds produced 137-230 eggs per year compared to 90 eggs produced by ducks which had no access to wallowing facilities.

Monstageer et al. (1971) reported the effect of crossing on the egg production of ducks. The egg production to 300 days recorded for four groups of Pekin, Khaki Campbell, Pekin x Khaki Campbell and Khaki Campbell x Pekin were 41, 71.5, 55.6 and 66.6 eggs respectively.

Abakumov (1968) analysing the records from 1959 to 1966, reported that ducks which had access to ponds had a production of 137 eggs per duck per year in 1960 and 213 eggs per duck per year in 1966. The corresponding figure for ducks without access to water in 1959 was 90 eggs.

Basanova (1974) reported that the yearly egg production from Cherryvalley and Pekin ducks was 179 and 196 eggs respectively.

Doehl et al. (1975) recorded the egg production of

ducks housed in cages. They reported that 100 day egg production averaged 85, 92 and 89 in those which were kept singly in cages allowing $0.14m^2$ /bird (Group I), in cages containing three females ($0.094m^2$ /female) and hand mated (Group II), or in cages with one male and four females ($0.14m^2$ /bird) and mated naturally (Group III) in serial order. In the extensively managed controls, the egg production to 100 days was 80 eggs. In the three caged groups, 180 day production averaged 133, 145 and 122 eggs and 250 day production 157, 164 and 143 eggs. They had further reported that there were significant differences between genotypes in suitability for cage breeding with lighter birds normally performing better than heavy birds.

Sharma (1977), while evaluating the production performance of White Pekin ducks under intensive and semi-intensive systems of management, observed that egg production was not significantly affected by system of housing, although production was higher (104 eggs per duck) under intensive system than in semi-intensive system (95 egg/duck), when calculated on hen-day basis at the age of 400 days. He had further observed that the clutch size of ducks laying under intensive system was significantly higher.

Mohapatra (1978) opined that in Khaki Campbell, the individual egg production of almost an egg a day for over twelve months was very common and flock averages in excess

of one hundred eggs per annum were obtained. He further stated that the average egg production from Indian runner ranged from 250-300 eggs per duck per year.

Sivadas (1978) reported that the egg production for desi ducks after eight months of age and four months in production had reached a little under 15 per cent. He opined that the lower production in desi ducks was attributable to the effect of exposure to aflatoxin contaminated feed very early in their life.

Chavez and Laxmini (1978) compared the egg production of three varieties of native Indonesian egg type ducks, taking one hundred ducks from each variety and putting them in individual cages. They observed that the number of days from age at first egg to 50% production averaged 33, 32 and 24 days and per cent peak production 83.2, 92.7 and 58.6, in the three types respectively.

Robinson et al. (1978) reported that Alabio ducks began to lay at seven months of age, moulting was induced after an eight month laying season by feed restriction and ducks were brought back into production after three months by a high protein diet. They had further reported that the ducks produced approximately 500 eggs with an average egg production percentage of 70 over the two years of lay.

Chopra et al. (1979) conducted studies on 191 ducks

from age at sexual maturity to 100 day, 100-200 day, 200-300 day and 300-400 day laying periods to find out the most economical age at which breeding flocks of ducks should be replaced. The results contradicted the earlier belief that the duck breeders could be retained for 2-3 years without any decrease in their performance. It was found that the ducks performed best in terms of number of eggs per duck and feed efficiency, when maintained from sexual maturity to first 100 day laying period. The results indicated that the breeders should not be maintained after 200 day egg production in any case.

Jung and Zhou (1980) reported that the first egg is laid in White Pekin ducks at 5-6 months of age and the annual egg production averaged 200-220 eggs.

Chopra et al. (1981) reported that the egg production for the 1st, 2nd, 3rd and 4th 100-day laying periods in White Pekin ducks, averaged 51.01, 33.45, 13.23 and 15.17 eggs respectively ($P/0.01$).

Ramakrishnan et al. (1981) while studying some characters in desi ducks, observed that the egg production potential of desi ducks averaged 80 eggs per annum. They had also reported that, in the production cycle of desi ducks, there were two peaks - one around June-July and the other during November. They attributed these two peaks to possible

differences in the release of luteinizing hormone (L.H) due to variation in the micro-climatic environment during these periods.

Egg Quality

Egg qualities are those characteristics of an egg, which are mostly preferred by the consumers, whether they are rational or irrational. Some important egg quality characteristics are: shell colour, shell porosity, shell strength, condition of albumen, condition of yolk's shape and colour, flavour, presence of blood and meat spots (Singh, R.A., 1991).

Romanoff and Romanoff (1949) reported that the shape index of eggs from Pekin, Muscovy, Runner and Mallard ducks were 72.73, 72.58, 73.77 and 71.49 respectively. They further reported that the shape index of medium type chicken egg is 73.68.

Bose and Mahadevan (1956) reported that the mean weight of duck egg varied from 62-72g.

Romanoff (1967) reported the egg weight of different breeds of ducks such as Pekin, Mallard, Muscovy and Runner as follows:

<u>Breed</u>	<u>Egg Weight (in g)</u>
Pekin	85
Mallard	80

<u>Breed</u>	<u>Egg Weight (in g)</u>
Muscovy	70
Runner	60

Sullivan (1961) reported that the egg weights in four groups of Khaki Campbell duck eggs varied from 50-75 grams.

Ahamed et al. (1971) compared the eggs from 100 Khaki Campbell ducks and 100 White Leghorn hens for three months in the middle of their first year of lay. Mean egg weight was 53.4 and 49.5g, mean albumen thickness 4.62 and 4.32mm, albumen weight 28.53 and 26.20g, weight of yolk 15.35 and 13.96g, shell thickness 0.33 and 0.29mm, shell weight 4.5 and 3.8g and shell membrane weight 0.55 and 0.35 g respectively.

Monstageer et al. (1971), while studying the effect of crossing between Pekin and Khaki Campbell breeds of ducks on egg quality traits found that the shell thickness for the four groups were 0.35, 0.34, 0.37 and 0.40mm (Pekin, Khaki Campbell, Pekin x Khaki Campbell and Khaki Campbell x Pekin respectively). They had also reported the egg weight in the above four genetic groups as 70.24, 58.55, 61.66 and 66.8g respectively. They had further observed that differences between pure breeds were significant for albumen weight, yolk weight and shell thickness.

Sergeeva (1975a) reported that the egg shape index

averaged 73.5, 74.5, 62.0, 65.5, 75.0 and 76.0 for fowl, Turkey, Duck, Goose, Guinea fowl and partridge eggs. He had further stated that the correlation between egg hatchability and shape index for duck eggs was 0.15-0.26 and that of fowls was 0.14-0.20.

Sergeeva (1975b) conducted estimation of quality in duck eggs. He studied the morphological, physical and chemical properties of duck eggs at different stages during the laying season. He reported that, during the first month of lay, eggs were light in weight, had an oblong shape, high shell quality, a low amount of thick albumen and low vitamin content. By the 11th month of age, eggs had lower specific gravity, then shape became rounder and albumen and yolk indices decreased.

Chavez and Lagmini (1973) worked with three varieties of native Indonesian egg type ducks and recorded an egg weight of 63.0, 60.0 and 59.4g respectively.

Reddy et al. (1979), while studying the shape index and hatchability in Khaki Campbell duck eggs, reported that the mean egg weight was $56 \pm 0.4g$ and shape index 75 ± 0.2 .

George et al. (1980) reported the egg weight and shape index of 572 eggs collected from desi ducks. They reported that the mean egg weight as 68.86g and mean shape index as 72.9.

Reddy et al. (1991) studied the effect of dietary protein and energy at different levels on egg quality characteristics of Khaki Campbell duck eggs. They observed that egg weights both at 15% and 19% protein levels were significantly ($P/0.05$) lower than at 17%. They also showed that dietary energy had no effect on egg weight. They further observed that Haugh Unit score ($P/0.01$) and albumen index were significantly ($P/0.05$) affected by dietary protein, but not by energy, yolk index was unaffected by either protein or energy content of the diet.

MATERIALS AND METHODS

MATERIALS AND METHODS

To compare the relative performance of Khaki Campbell and desi ducks, 123 female and 49 male Khaki Campbell ducklings at day-old age were brought from the Government Duck Farm, Niranam. They belonged to two hatches of one week difference. These ducklings were wing banded and weighed individually to obtain the hatch weight. The female ducklings were randomly divided into three groups. Out of the 123 female ducklings group I contained 40 ducklings, group II contained 39 ducklings and group IV had 44 ducklings. Group III contained 49 male ducklings. Among these four groups, group IV belonged to 11.2.1981 hatch, while the ducklings of all other groups belonged to 4.2.1981 hatch.

All the ducklings were brooded under infra-red lamps (Fig. 1) for a period of three weeks under identical conditions of management. During the brooding period, anti-stress medicaments were provided in drinking water with a view to counteract possible stress. The ducklings received a ration computed at the Kerala Agricultural University Duck Farm (Table 2). While formulating the ration every care was taken to avoid aflatoxin in the feed. The feed was given after soaking with water in shallow plates ad libitum. Drinking water was also provided in adequate number of

waterers. The litter was removed daily. Fresh litter was put under the brooder on the floor every day to keep the area clean and dry. At the end of three weeks, the ducklings were transferred to identical deep litter houses. Feed and water were given ad libitum. The houses were kept clean by removing the wet litter and adding fresh litter daily. The ducklings were fed with the same ration given to them earlier.

At the end of eight weeks, each group of ducks were divided into two lots at random and housed in two adjacent pens, since the floor area was found to be insufficient. At the end of each week, the individual body weights of ducklings were recorded (Fig. 2). Weekly and daily feed consumption of each group of ducklings were recorded by supplying measured quantities of feed to each group. The feed was given after soaking with water twice in the morning and once in the evening upto eighteen weeks of age. Two kilograms of chopped green grass was also supplied once daily for the entire experimental ducks. Mean weekly feed consumption of ducks in each group was calculated.

At eighteen weeks of age, 96 good females were selected based on body weight and type. All the selected ducks were provided with plastic wing badges for identification. They were divided at random into eight groups of 12 ducks each.

The ducks were housed in eight pens serially numbered from 1 to 8. The ducks were raised under semi-intensive system. Each house consisted of a pen at the centre measuring 4.4m length and 4.4m breadth (19.36 m² floor area) and a yard measuring 23.7m length and 17.7m breadth (409.1m² area) around the house. Wood shavings formed the litter material in the house. Each house was also equipped with trap nests (Fig. 3), water troughs and feed troughs for 12 ducks. The yard around the house had plenty of green grass and shady trees.

At 18th week, the body weight of the males were also recorded and 16 males were selected based on their body weight and phenotypic conformation. Two males were introduced to each of the above pens so as to give a male female ratio of 1:6.

Feed consumption

Ration prepared for ducklings (Table 2) was given in the form of wet mash in shallow containers upto three weeks of age twice in the morning and once in the evening. Measured quantity of feed was given to each group of ducklings and at the end of every week, the quantity of feed consumed was calculated by weighing out the balance left over in the feed troughs. This process was continued

upto the end of 18 weeks. The feed consumption per bird per day of the four different groups was calculated and recorded.

At the end of 18 weeks, ducks were provided with adult duck mash (Table 2) ad libitum in the form of wet mash, in measured quantities. At 28 day periods, feed consumption by each group of ducks housed in eight different pens were calculated taking into account the balance left over in the feed troughs. The daily feed consumption per duck during the 28 day periods was calculated and recorded. The feed efficiency in terms of dozen of eggs produced at different periods was also recorded.

Age at maturity

From 18th week onwards, each pen was provided with adequate number of trap nests and each duck was put in the trap nest box in the evening at about 4.30 pm and released the next day morning at 7.30 a.m. after recording eggs, if any in the trap nest. Thus, the age at first egg of each group of ducks housed in different houses was recorded. The average age of flock at first egg was also calculated after taking all the eight groups pooled together and noted.

The age at 10% production and 50% production was also worked out for each group separately based on the number of eggs received from each group of ducks housed. The average age of the whole flock at 10% and 50% production was also arrived at from the production data.

Egg production

By trap nesting each bird, from beginning, the individual egg production was recorded. Total egg production for 100 days from date of first egg and upto 230 days of age was also recorded. The hen-day number and per cent and the hen-housed number and per cent for each group was calculated and recorded. The weight of the first egg laid by individual ducks was also noted. The weights of the eggs laid at 28-day periods were also arrived at by taking the weights of three consecutive eggs of each duck in a period. The data on livability of all experimental ducks during brooding (0-8 weeks), growing (9-18 weeks) and laying (19 and above) periods were recorded.

For undertaking the egg quality studies, one hundred eggs from Khaki Campbell ducks were prepared on different dates. The study was carried out at about the middle of the laying cycle, extending for a period of ten days. The eggs were collected clean and allowed to hold for one day.

The next day morning the egg quality studies were carried out. The egg weight, shape index, albumen index, yolk index, Haugh unit score, shell thickness, shell membrane thickness and the presence of blood spot and meat spot were studied (Table 8).

The eggs of Khaki Campbell ducks procured were weighed to a fraction of 0.01g. The shape index of all the above one hundred eggs were calculated as per method suggested by Schultz (1953). Albumen index, yolk index and Haugh unit values were determined as per the methods of Helman and Carver (1936), Funk (1948) and Haugh (1937) respectively. The thickness of the egg shell with membranes and without membranes were measured separately and recorded and from the figures obtained, the thickness of the shell membranes alone were calculated by subtraction. The data obtained were analysed as per Snedecor and Cochran (1967).

The study conducted with Khaki Campbell ducklings was extended on same lines using desi (local) ducks also. The desi ducklings for the investigation were obtained from the University Duck Farm itself. Hatching eggs were procured from the foundation stock available in the farm. A total number of 730 eggs were used in four settings and four hatches were taken consecutively at one week interval. A total of 334 ducklings were obtained in four hatches during September-October, 1981.

The data obtained from both Khaki Campbell and desi breeds were subjected to statistical analysis as per Rao (1958) and Snedecor and Cochran (1967).

The method suggested by Rao (1958) for the comparison of rate of growth between the groups has been adopted in the analysis. Let Y_i denote the increase in body weight at the time 'i' and g_i mean of all ' Y_i 's in the experiment. Then g_i is the time meta meter. The difference in the values of Y_i are due to the time factor g_i . Hence we may write

$$Y_i = b g_i$$

and the method of least squares leads to

$$b = \frac{Y_i g_i}{g_i^2}$$

The growth parameter 'b' values of the individual birds belonging to four groups of Khaki Campbell males, Khaki Campbell females, desi males and desi females were found out separately. Obviously, the comparison of the difference in the rate of growth between groups would be a comparison of 'b's'. The 'b' values may be affected by initial body weight. Hence a covariance analysis of the 'b' values taking as concomitant variable was adopted for comparing the growth rate of groups.

At the time of calculation of 'b' values, a uniform

size of one hundred ducks were taken and the large 'b' values were reduced to manageable size by dividing with 10^6 .

The growth parameter thus calculated had a mean 'b' value as indicated below:

Khaki Campbell (Male)	$\bar{b} = 12.1653$
Khaki Campbell (Female)	$\bar{b} = 12.3967$
Devi (Male)	$\bar{b} = 17.9503$
Devi (Female)	$\bar{b} = 16.6315$

The analysis of covariance of 'b' values taking initial body weight as concomittant variable is presented in table 4.



Fig. 1. Ducklings under infra-red brooder.



Fig. 2. Ducks being weighed.

RESULTS

RESULTS

Growth

The average weekly body weights of the males and females of Khaki Campbell and desi ducklings from day-old to 18th week of age is presented in table 3. The day-old body weight of Khaki Campbell males was 38.76 ± 0.35 g, while that for females was 39.07 ± 0.65 g. The corresponding weight for desi males and females were 42.64 ± 0.76 and 43.33 ± 0.96 g respectively.

At eighth week, the body weight of Khaki Campbell males was 893.93 ± 14.21 g and that of females was 920.41 ± 13.65 g. The corresponding weights for males and females of the desi group were 1057.06 ± 28.97 and 1046.95 ± 28.62 g respectively.

At 18th week, the Khaki Campbell males and females weighed 1355.24 ± 12.89 g and 1359.95 ± 10.95 g respectively. For the desi males and females, the respective mean body weights for the corresponding period were 1525.79 ± 18.09 and 1467.31 ± 19.0 g.

The statistical analysis of the body weights between the two genetic groups and between the two sexes is presented in table 4. The analysis indicated that there was significant difference between genetic groups and between sexes in

respect of body weight. It also indicated that desi ducks registered higher body weight when compared to Khaki Campbell ducks, irrespective of the sex at any given age. The results further showed that the body weights among these four groups were in the following descending order: desi males, desi females, Khaki Campbell females and Khaki Campbell males. The growth pattern of Khaki Campbell and desi ducklings from 0-18 weeks of age is presented in Fig. 4 and 5.

The coefficient of correlation between the $\frac{d}{\Delta}$ h^och weight and weight at 8th and 18th week was also worked out and is presented in table 5(a). Further, the coefficient of correlation between body weight at housing (18th week) and body weight at 280 days of age were also calculated and is presented in table 5(b). The average body weights of both groups of ducks housed, were noted during 28 day periods and given in table 6.

Feed consumption

The mean daily feed consumption of Khaki Campbell males and females and that of desi ducklings (straight-run) from day-old to 18th week of age is presented in table 7. The average feed consumption per day by Khaki Campbell male and female ducklings during the first week of age was 28.0g

and 22.03g respectively, while the corresponding figure for desi ducklings (combined sexes) during the same period was 27.84g.

During the 5th week, the daily feed consumption for Khaki Campbell males and females was 174.2g and 160.95g respectively, while that of desi ducklings (straight-run) during the same period was 148g.

At 16th week of age, Khaki Campbell males and females recorded an average daily feed consumption of 206.0g and 199.2g respectively, while desi ducks consumed 189.42g.

The period-wise (28-day period) average feed consumption per duck per day for both Khaki Campbell and desi ducks was recorded and is presented in table 8. The feed consumption data during the first 28-day period revealed that Khaki Campbell and desi ducks consumed 192.08 and 182.29g of feed respectively, during the second period 198.07 and 181.06g and during the sixth period 190.37 and 185.5g for the above two genetic groups respectively. For Khaki Campbell feed consumption for such 15 periods were recorded, whereas for desi ducks only six such periods were arrived at, since the experiments were conducted at two different occasions for want of space. The feed consumption during these periods varied from 177g to 197g for Khaki Campbell ducks.

Information on some of the productive traits of Khaki Campbell and desi ducks, is presented in table 9 and 10. The mean age at first egg was 189 and 158 days for Khaki Campbell and desi ducks respectively.

The frequency distribution of age at first egg in days for Khaki Campbell and desi ducks is presented in table 11. In Khaki Campbell ducks, 70% of ducks laid their first egg between 166-200 days. In this breed, the first egg among the flock was laid at 163 days of age and 4.17% of ducks laid between 163-166 days of age. The per cent of ducks that matured after 200 days of age recorded was 22.91.

In desi ducks, 60% of the ducks came into lay between 141-170 days and about 85% laid their eggs in between 156-175 days. The first egg among the flock of desi ducks was obtained at 134 days of age. Per cent of ducks that laid eggs before 150 days of age was 15.95 only, while those matured after 175 days accounted for 14.91% of the total. The Khaki Campbell and desi ducks attained 10% production at 175 days and 146 days respectively and 50% production at 167 and 155 days in that order.

Frequency distribution (percentage) of egg production of Khaki Campbell and desi ducks upto 300 days of age is presented in table 12. The results showed that Khaki Campbell was superior in egg production. In this breed,

73.12 per cent of the ducks laid between 50-89 eggs.

Percentage of ducks that laid more than 90 eggs was 0.33%, while 13.55% of the ducks laid less than 50 eggs only.

In desi ducks, 67.96% of the ducks laid between 50-89 eggs. Percentage of ducks that laid more than 90 eggs was 2.13 only, while those laid less than 50 eggs accounted 31.91%.

The frequency distribution of egg production during the 28-day periods from both Khaki Campbell and desi groups was also worked out and presented in table 13. Period wise mean egg production of both Khaki Campbell and desi ducks are presented in table 14.

Among desi group, 12 ducks laid 6-15 eggs during the first period. During the second period 48 ducks laid 11-25 eggs. Higher egg production was noticed during 2nd, 3rd and 4th periods and thereafter, during 5th period the egg production was slightly decreased and again egg production was increased during the 6th period.

In the Khaki Campbell group, seven ducks laid 6-15 eggs during the first period. During the second period, 37 ducks laid 11-25 eggs and two ducks laid more than 26 eggs. In this breed, increased egg production was observed during the 2nd, 3rd, 4th, 5th and 6th 28 periods. There

was no decline in egg production after the fourth period as noted in desi flock.

The best record obtained from a duck within the Khaki Campbell and desi flock, which are also the highest producers among all ducks from both groups included in the study are presented in Fig. 6 and 7. The Fig. 6 revealed that the best Khaki Campbell layer duck (Wing Badge No. 470) laid 228 eggs in a production period of 335 days with an intensity of laying of 65.07%, while the best desi record (Fig. 7) indicated 96 eggs in 170 days of production with 56.4% intensity (Wing Badge No. 2011).

The percentage hen-housed production was 65.7 and 42.7 for Khaki Campbell and desi ducks respectively, while the corresponding figures relating to per cent hen-day production were 66.45 and 43.93 for the above genetic groups. The per cent egg production to 280 days of age observed in Khaki Campbell and desi flocks were 60.17 and 52.14 respectively.

The average weight of the first egg was 52g and 53g respectively for Khaki Campbell and desi ducks.

The overall feed efficiency from first 28 day period till the ducks attained 300 days of age (six periods in total) was calculated and presented in table 15. The mean feed efficiency for egg production was 5.21 for Khaki

**Fig. 4. GROWTH PATTERN OF KAKHI CAMPBELL DUCKLINGS
FROM 0-18 WEEKS OF AGE**

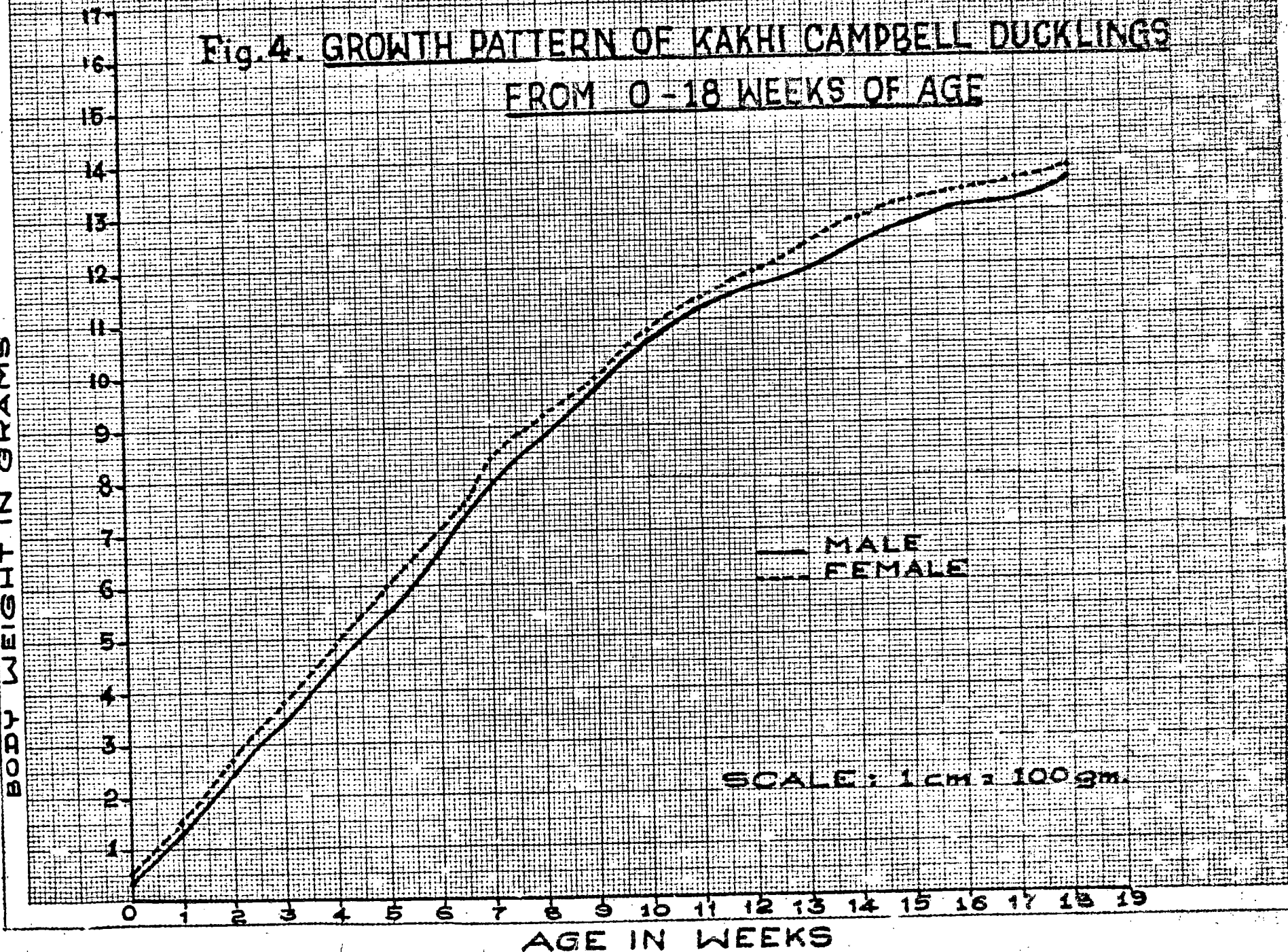
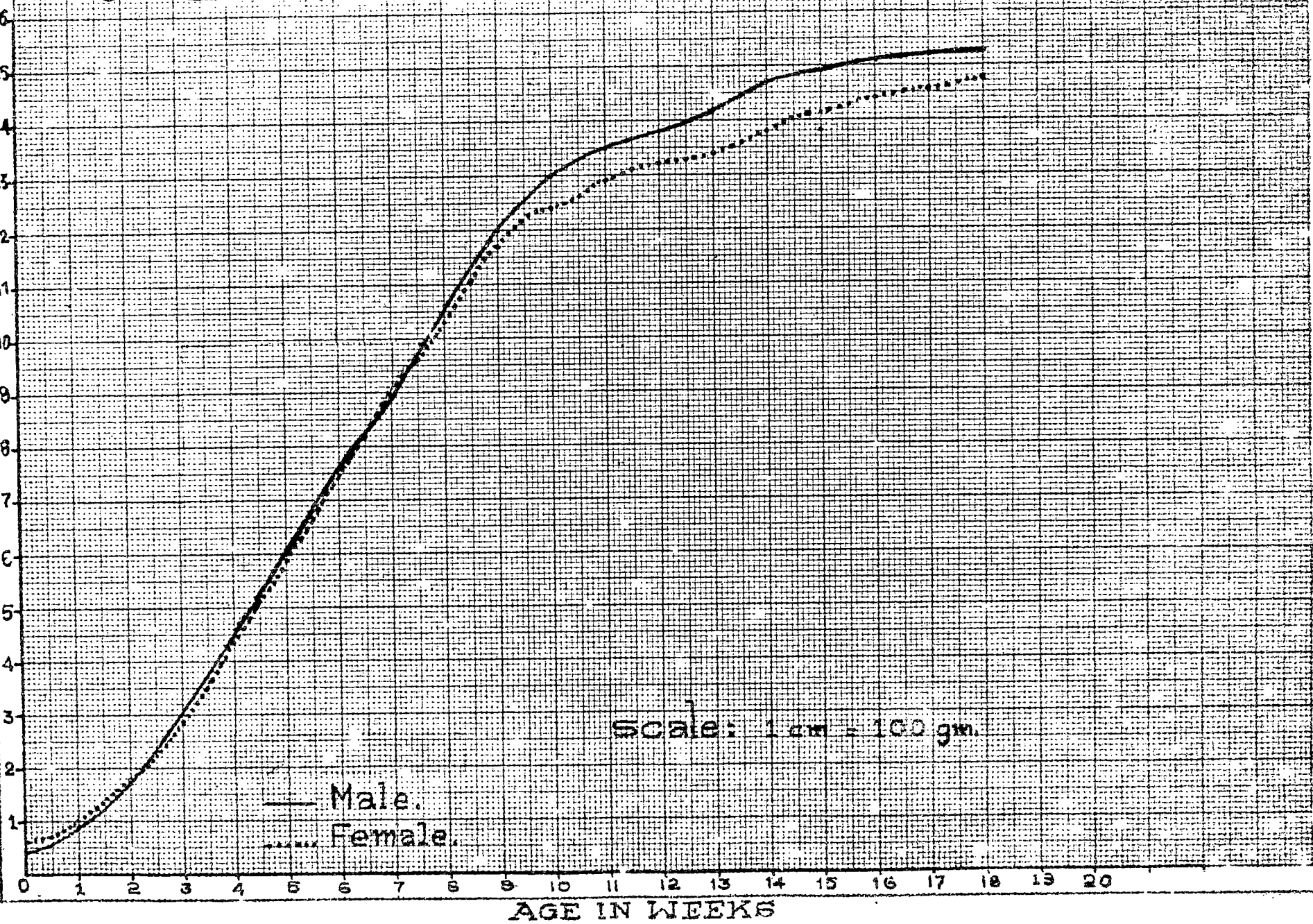


Fig. 5. GROWTH PATTERN OF DESI DUCKLINGS FROM 0-18 WEEKS OF AGE



— FIG. 6 —

INDIVIDUAL EGG RECORD FOR DUCK No. 470 (KHAKI CAMPBELL)

BREED : KHAKI CAMPBELL.
 HATCHING DATE: 4 - 2 - 1981.
 MATURITY : 204 DAYS.

INITIAL BODY WEIGHT
 AT HOUSING : 1470 g.

YEAR: 1981 - 82
 WING BADGE No: 470

DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL				
																																MONTH	TO DATE	X EGG WEIGHT		
AUG.																																		2	2	60
SEP.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	21	23	64
OCT.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	29	52	70
NOV.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	25	77	60
DEC.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	23	102	60
JAN.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	26	123	59
FEB.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	19	147	62
MAR.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	22	189	62
APR.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	17	136	64
MAY.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	15	201	66
JUNE	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	8	203	-
JULY	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	19	228	64

— Fig. 7 —

INDIVIDUAL EGG RECORD OF DUCK No. 2011 (DESI DUCK)

BREED.. .. - DESI (LOCAL)
 HATCHING DATE - 29-9-1981
 MATURITY.. .. - 143 DAYS.

INITIAL BODY WEIGHT AT HOUSING: 1400 g.

YEAR.. .. 1981-82
 WING BADGE No. 2011

MONTH	DATE																															TOTAL		X EGG HEIGHT	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	MONTH	TO DATE		
FEB.																																	8	8	54
MAR.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	16	24	52	
APRIL	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	21	45	56	
MAY	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	18	63	58	
JUNE	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	10	73	60	
JULY	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	13	86	62	
AUG.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	10	96	76	

Campbell and 10.45 for desi ducks for the entire 168 days of recording.

The livability of Khaki Campbell and desi ducks during the three phases of growth - namely the brooding (0-8 weeks) growing (9-16 weeks) and laying periods (19 weeks - 300 days of age) is presented in table 16. The result indicated that the per cent livability during the brooding period for Khaki Campbell and desi ducklings were 80.9 and 67.9% respectively. The corresponding figures for the growing period were 100% and 94% and for the laying period 83.4% for both genetic groups. It was observed that the mortality was higher during the early days of brooding which was due to non specific reasons and thereafter the losses were negligible. The mean egg weights of both Khaki Campbell and desi ducks during the 28-day periods are presented in table 17.

The means of various egg quality attributes are presented in table 18. The weight of one hundred Khaki Campbell eggs studied gave a mean egg weight of 73.98 g with a range of 54 to 76g; while that of one hundred desi duck eggs studied gave a mean egg weight of 75.32g with a range of 54 to 82g. The shape index for the eggs of the two genetic groups were 73.98 and 75.32 respectively. Khaki Campbell and desi duck eggs had a mean albumen index of 0.089 and 0.108, yolk index of 0.408 and 0.405, Haugh

unit value of 86.40 and 85.54, shell thickness of 0.36 and 0.38 and shell membrane thickness of 0.12 and 0.11. The incidence of blood spot in Khaki Campbell and desi duck eggs were 9% and 4% respectively. No meat spot could be detected from eggs of both genetic groups.

The egg quality traits of Khaki Campbell and desi ducks revealed that there was no significant difference between the two groups except some variations in the size of desi duck eggs.

TABLES

Table 1. Poultry population in Kerala

District	Fowls	Ducks
Trivandrum	1114273	7884
Quilon	1379485	19762
Alleppey	1545893	159617
Kottayam	1132951	53660
Idukki	613230	9691
Ernakulam	1444649	105935
Trichur	1247528	30690
Palghat	965379	18289
Malappuram	1353587	8784
Kozhikode	1006589	11184
Cannanore	1132622	7073
State	12956186	429569

Source : Livestock Census - 1977 (Annexure - VI).

Table 2. Composition of experimental rations

Ingredients(Parts/1000 kg)	For ducklings (0-8 weeks)	For adult ducks (Above 8 weeks)
Protoliv ¹	150 kg	150 kg
Wheat	350 kg	350 kg
Wheat bran/Rice bran	200 kg	200 kg
Unsalted dried fish	250 kg	250 kg
Shell grit	-	20 kg
Salt	5 kg	5 kg
Mineral Mixture ²	25 kg	25 kg
Revivix ³	300 g	300 g

1. Protoliv : Protein supplement (Aries Agro-vet Industries Pvt. Ltd.).
2. Poultryain : (Aries Agro-vet Industries Pvt. Ltd) the mineral mixture contained 3% moisture, 32% calcium, 6% phosphorus, 0.27% manganese, 0.01% iodine, 0.26% zinc, 0.03% fluorine, 100 ppm iron.
3. Revivix A + B₂ + D₃ (Roche Products India Ltd.) contained vitamins A, B₂ and D₃ at levels of 40,000 i.u., 20 mg and 5000 i.u. per g respectively.

Table 3. Average weekly body weights (g) of Khaki Campbell and desi ducks from day-old to 18th week of age

Treatment	Age in weeks									
Group	0	1	2	3	4	5	6	7	8	9
Khaki Campbell (Male)	38.76 ± 0.35	133.33 ± 2.96	241.07 ± 4.45	344.05 ± 5.95	454.29 ± 6.14	550.75 ± 6.75	666.31 ± 8.82	786.19 ± 12.25	883.93 ± 14.21	978.21 ± 15.49
Khaki Campbell (Female)	39.07 ± 0.65	135.51 ± 4.61	264.65 ± 8.53	380.44 ± 10.73	490.69 ± 11.77	604.64 ± 12.11	751.06 ± 9.73	842.77 ± 11.47	920.41 ± 13.65	989.87 ± 13.91
Desi (Male)	42.64 ± 0.76	91.02 ± 3.37	179.35 ± 14.59	307.20 ± 14.61	455.01 ± 18.81	605.49 ± 21.15	758.98 ± 22.02	899.56 ± 30.75	1057.06 ± 28.97	1205.35 ± 34.52
Desi (Female)	43.33 ± 0.96	94.43 ± 4.18	181.85 ± 8.86	304.67 ± 14.35	443.62 ± 18.27	594.71 ± 25.27	761.36 ± 23.69	905.38 ± 28.17	1046.35 ± 28.62	1178.07 ± 29.28

(contd.....)

Table 3 (contd). Average weekly body weights of Khaki Campbell and desi ducks from day-old to 18th week of age (in g)

Treatment Group	Age in weeks								
	10	11	12	13	14	15	16	17	18
Khaki Campbell (Male)	1067.38 ± 16.18	1120.71 ± 16.53	1153.06 ± 17.71	1195.71 ± 17.33	1247.38 ± 16.44	1283.81 ± 15.87	1306.19 ± 14.74	1318.93 ± 13.91	1355.24 ± 12.89
Khaki Campbell (Female)	1070.44 ± 13.72	1140.10 ± 14.02	1189.24 ± 14.68	1247.00 ± 13.96	1292.60 ± 13.38	1320.51 ± 13.38	1338.67 ± 12.41	1358.89 ± 11.13	1359.95 ± 10.95
Desi (Male)	1305.78 ± 31.87	1352.46 ± 25.71	1381.51 ± 23.24	1420.61 ± 21.34	1466.71 ± 20.96	1486.90 ± 19.32	1507.22 ± 19.57	1521.25 ± 21.16	1525.79 ± 18.09
Desi (Female)	1236.24 ± 21.44	1293.87 ± 19.95	1319.28 ± 19.89	1349.25 ± 19.82	1334.64 ± 19.75	1414.63 ± 19.82	1437.61 ± 19.97	1452.70 ± 19.64	1467.31 ± 19.00

Table 4. Analysis of covariance of initial body weight y_0 and b values of males and females of Khaki Campbell and desi ducklings by Rao's method

Source	df	SS (y_0)	SS (y_0, b)	SS (b)	(Adjusted) SS	MSS	F
Between groups	3	1375.405	1643.959	2252.159	1827.780	609.26	187.696***
Error	364	5338.462	38.454	1178.700	1178.423	3.246	
Total	367	6713.867	1682.413	3430.859			

Table 5 (a). Coefficient of correlation between hatch weight and 8th week and 10th week body weight of Khaki Campbell and desi ducks

Sl No	Genetic Group	Hatch weight and 8th week body weight	Hatch weight and 10th week body weight
1	<u>Khaki Campbell ducks</u>		
	Male	0.3303	0.3656
	Female	0.0159	-0.2199
2	<u>Desi ducks</u>		
	Male	0.2988	0.0189
	Female	0.3955	0.1626

Table 5 (b). Coefficient of correlation between weight at 18th week and body weight at 280 days of age

Treatment Group	Pen Number	Coefficient of correlation between weight at 18th week and weight at 280 days of age
<u>Khaki Campbell</u>	1	0.5686
	2	0.7461
	3	0.6431
	4	0.3133
	5	-0.0334
	6	0.2442
	7	0.9346
	8	0.4075
<u>Desi ducks</u>	1	0.8182
	2	0.5426
	3	0.7713
	4	0.2655
	5	0.7287

Table 6. Mean body weight recorded during six 29-day periods for Khaki Campbell and teal ducks

Treatments	29-day periods					
	1	2	3	4	5	6
<u>Khaki Campbell</u>						
<u>Pen No.</u>						
1	1350.83 ± 14.59	1416.67 ± 23.30	1433.33 ± 19.73	1404.17 ± 17.90	1418.18 ± 26.04	1427.27 ± 23.60
2	1370.85 ± 9.65	1416.67 ± 12.81	1420.00 ± 10.66	1412.50 ± 17.54	1408.33 ± 16.09	1405.83 ± 16.17
3	1356.67 ± 25.18	1429.17 ± 33.10	1445.00 ± 28.15	1415.00 ± 39.73	1394.40 ± 43.83	1400.00 ± 34.52
4	1335.83 ± 29.99	1366.67 ± 28.54	1391.67 ± 16.57	1416.67 ± 19.90	1391.67 ± 27.00	1354.00 ± 18.46
5	1375.00 ± 20.87	1358.33 ± 12.05	1395.80 ± 15.64	1387.50 ± 13.90	1362.50 ± 20.50	1381.00 ± 20.60
6	1333.30 ± 20.72	1345.80 ± 19.90	1378.33 ± 21.70	1406.67 ± 17.70	1365.00 ± 12.50	1375.00 ± 11.68
7	1411.67 ± 26.06	1379.17 ± 24.44	1409.00 ± 18.85	1400.00 ± 17.85	1368.18 ± 23.62	1372.73 ± 21.70
8	1354.17 ± 16.34	1395.83 ± 19.77	1416.67 ± 18.50	1433.30 ± 16.18	1404.17 ± 19.70	1379.17 ± 16.34

(contd.....)

Table 6. Mean body weight recorded during six 28-day periods for Khaki Campbell and desi ducks (continued

Treatments	28-day periods					
	1	2	3	4	5	6
<u>Desi ducks</u>						
<u>Pen No.</u>						
1	1485.00 ± 28.35	1465.00 ± 24.09	1450.00 ± 25.65	1440.00 ± 23.11	1442.50 ± 21.50	1457.50 ± 21.50
2	1479.95 ± 21.73	1460.53 ± 17.35	1436.94 ± 19.40	1434.00 ± 20.61	1442.11 ± 17.21	1488.24 ± 22.00
3	1471.05 ± 20.35	1457.89 ± 17.21	1434.21 ± 16.60	1410.53 ± 16.40	1402.63 ± 16.40	1413.16 ± 17.03
4	1405.33 ± 20.00	1413.16 ± 13.16	1410.53 ± 11.20	1413.16 ± 11.37	1414.71 ± 14.71	1406.25 ± 17.01
5	1441.18 ± 30.99	1447.06 ± 26.94	1452.94 ± 27.60	1452.94 ± 35.01	1458.80 ± 26.80	1461.76 ± 27.90

Table 7. Mean daily feed consumption data of Khaki Campbell and desi ducklings from 0-18 weeks of age (in g)

Genetic Group	Age in weeks								
	1	2	3	4	5	6	7	8	9
KC (Male)	28.00	36.43	104.50	120.20	135.19	146.30	160.20	174.20	181.18
KC (Female)	22.03	34.90	97.96	109.60	128.50	134.20	149.90	160.96	154.00
Desi sucklings (straight-run)	27.84	43.11	70.88	81.25	93.74	105.65	116.36	147.97	154.34
	Age in weeks								
	10	11	12	13	14	15	16	17	18
KC (Male)	181.18	186.70	192.00	188.50	184.66	191.60	192.80	196.00	206.00
KC (Female)	171.16	172.06	169.90	172.20	163.35	169.39	166.17	176.75	199.20
Desi ducklings (straight-run)	163.31	171.15	173.24	178.11	181.94	181.99	186.58	184.32	189.42

Table 3. Mean daily feed consumption data of Khaki Campbell and desi ducks during the experimental period after housing (18th week)

Treatment Group	22-day periods							
	1	2	3	4	5	6	7	8
KC ducks	192.08	198.07	193.20	202.70	186.26	190.37	195.82	191.68
Desi ducks	185.30	181.06	189.40	182.04	177.26	183.50	--	--

Treatment Group	23-day periods							Mean
	9	10	11	12	13	14	15	
KC ducks	186.61	177.03	184.95	187.13	187.00	197.45	193.83	191.42
Desi ducks	Recorded only for six periods							183.09

Table 9. Productive traits of Khaki Campbell ducks

Sl No	Parameter	Groups								Overall Mean
		1	2	3	4	5	6	7	8	
1	Number of ducks housed	12	12	12	12	12	12	12	12	96
2	Age at first egg of the flock in days	173	164	166	166	181	175	176	165	170.50
3	Average age of flock at first egg in days	188.75	171.17	180.00	195.17	208.18	194.80	189.16	179.75	188.37
4	Average age of flock at 10% production in days	178	164	167	171	185	184	177	165	173.88
5	Average age of flock at 50% production in days	185	168	172	195	209	199	191	175	186.75
6	Average weight of first egg (g)	49.91	50.25	53.83	50.16	51.66	49.67	50.83	52.80	51.14
7	Average egg production for 100 days from first egg	57.90	64.67	59.25	61.83	47.50	66.50	67.50	67.00	61.50
8	Average egg production upto 280 days of age	57.75	60.66	58.08	63.41	42.25	62.25	68.33	68.16	60.16
9	Average egg production upto 500 days of age	136.83	144.16	103.92	120.25	120.08	163.50	163.16	172.00	138.58

(contd.....)

Table 9 (contd...). Productive traits in Khaki Campbell ducks

Sl No	Parameter	Groups								Overall Mean
		1	2	3	4	5	6	7	8	
10	Hen-housed number (280 days)	57.75	60.66	58.00	63.42	42.25	62.25	68.83	68.16	60.17
11	Hen-housed per cent (280 days)	63.46	55.65	58.08	67.83	63.24	73.23	75.64	68.16	65.67
12	Hen-day number (280 days)	60.80	60.66	60.87	63.42	42.25	62.25	68.89	68.16	60.91
13	Hen-day per cent (280 days)	66.81	55.65	60.87	67.85	63.34	73.23	75.71	68.16	66.45

Table 10. Productive traits of desi ducks

Sl No	Parameter	Groups					Overall Mean
		1	2	3	4	5	
1	Number of ducks housed	20	19	19	19	19	96
2	Age at first egg of the flock in days	134	135	141	142	141	138.60
3	Average age of flock at first egg in days	159.90	148.21	160.89	168.47	150.99	157.67
4	Average age of flock at 10 per cent production in days	140	141	150	155	146	146.40
5	Average age of flock at 50 per cent production in days	155	146	158	163	151	154.60
6	Average weight of first egg(g)	52.6	51.79	56.35	54.00	51.00	53.14
7	Average egg production for 100 days from first egg	31.60	37.63	26.47	42.39	37.10	35.13
8	Average egg production upto 280 days of age	42.60	60.68	44.84	54.00	48.00	51.06
9	Hen-housed number (280 days)	42.60	60.68	44.84	54.00	48.00	51.06
10	Hen-housed per cent(280 days)	35.30	45.90	42.10	53.00	37.20	42.70
11	Hen-day number (280 days)	42.60	60.68	53.20	63.40	48.00	53.56
12	Hen-day per cent (280 days)	35.30	45.90	44.70	56.60	37.20	43.98

Table 11. Frequency distribution of age at first egg in days - the range and per cent among desi and Khaki Campbell ducks

Sl No	Age of first egg in days (range)	Desi ducks	Per cent	Khaki Campbell ducks	Per cent
1	131-135	1	1.07	-	-
2	136-140	6	6.38	-	-
3	141-145	10	10.64	-	-
4	146-150	15	15.95	-	-
5	51-55	14	14.89	-	-
6	156-160	11	11.70	-	-
7	161-165	4	4.25	4	4.17
8	166-170	11	11.70	12	12.50
9	171-175	9	8.51	12	12.50
10	176-180	9	9.58	13	13.54
11	181-185	3	3.19	13	13.54
12	186-190	1	1.07	6	6.25
13	191-195	-	-	5	5.21
14	196-200	4	4.07	9	9.38
15	201 and above	-	-	22	22.91
Total	131-201 and above	94	100.00	96	100.00

Table 12. Frequency distribution (percentage) of egg production of Khaki Campbell and desi ducks upto 300 days of age

Sl No	Range (Number of Eggs)	Khaki Campbell ducks		Desi ducks	
		Number	Per cent	Number	Per cent
1	Less than 50	13	13.55	30	31.91
2	50-59	14	14.59	23	24.47
3	60-69	19	19.79	17	18.09
4	70-79	20	20.83	14	14.89
5	80-89	22	22.91	8	8.51
6	90-99	8	8.33	2	2.13
7	100 and above	-	-	-	-
Total		96	100.00	94	100.00

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Table 13. Frequency distribution of egg production of Khaki Campbell and desi ducks during 28-day periods

Sl No	No of eggs laid (Range)	28-day periods from age at first egg to 300 days of age					
		1	2	3	4	5	6
<u>Khaki Campbell</u>							
1	1-5	13	26	3	6	3	2
2	6-10	6	20	4	3	11	5
3	11-15	1	13	17	14	9	12
4	16-20	-	13	21	22	35	36
5	21-25	-	11	28	32	29	27
6	26 and above	-	2	6	16	2	3
<u>Desi ducks</u>							
1	1-5	24	19	12	39	19	13
2	6-10	9	14	16	30	17	17
3	11-15	3	23	25	22	3	24
4	16-20	-	20	21	5	1	19
5	21-25	-	5	5	1	1	11
6	26 and above	-	1	-	-	-	1

Table 14. Period wise mean egg production (No) of Khaki Campbell and desi ducks

Sl No	Treatments	28-day periods						Total (168 days)
		1	2	3	4	5	6	
1	Khaki Campbell ducks	8.12	16.15	18.88	19.03	18.31	15.46	95.95
2	Desi ducks	1.79	9.51	11.04	7.96	2.56	12.64	45.49

Table 15. Feed efficiency of Khaki Campbell and desi ducks during 28-day period of egg production upto 300 days of age

Sl No	Genetic Groups	28-day periods						Overall Mean (132-300 days)
		1	2	3	4	5	6	
<u>Khaki Campbell (96 Nos)</u>								
1	Total feed consumed during 28-day periods in kg	471.3	558.45	593.5	607.00	559.00	539.00	554.70
2	Dozen of egg produced	9.16	82.66	137.16	145.16	132.00	133.25	106.565
3	Feed efficiency = $\frac{\text{Feed consumed}}{\text{Dozen of eggs produced}}$	57.75	6.75	4.33	4.15	4.23	4.04	5.21
<u>Desi ducks (96 Nos)</u>								
1	Total feed consumed during 28-day periods in kg	533.2	521.3	531.3	532.7	512.6	524.3	525.90
2	Dozen of eggs produced	14.25	76.09	96.5	62.33	20.5	43.69	50.55
3	Feed efficiency = $\frac{\text{Feed consumed}}{\text{Dozen of eggs produced}}$	37.43	6.85	6.14	8.54	25.0	12.00	10.401

Table 16. Liveability of Khaki Campbell and desi ducks during brooding, growing and laying periods

Breed	Brooding (0-3 weeks)	Growing (9-18 weeks)	Laying (19 weeks & above)
Khaki Campbell (Total-172)	90.9%	100%	83.4%
Desi (Total - 534)	87.9%	94%	83.4%

Table 17. Mean egg weight of Khaki Campbell and desi ducks during the 28-day period

Sl No	Treatments	28-day periods					
		1	2	3	4	5	6
1	Khaki Campbell	50.20	51.30	54.72	58.76	60.94	62.41
2	Desi	53.14	56.24	58.76	62.12	64.44	71.4

Table 18. Quality parameters of Khaki Campbell and desi duck eggs

Weight Group(g)	No. of observations	Shape Index	Albumen Index	Yolk Index	Khaki Campbell duck eggs			Incidence of meat spot	Incidence of blood spot
					Haugh unit value	Shell thickness (mm)	Shell membrane thickness (mm)		
54-60	26	74.50 +0.6405	0.0996 +0.0065	0.41 +0.009	87.65 +2.1476	0.367 +0.0095	0.096 +0.005	-	3
61-65	28	74.49 +0.7254	0.0988 +0.0051	0.405 +0.008	84.79 +1.8675	0.348 +0.0053	0.099 +0.0048	-	-
66-70	36	72.94 +0.540	0.098 +0.0043	0.404 +0.006	86.10 +1.687	0.366 +0.0086	0.105 +0.0054	-	4
71-75	8	75.19 +1.2114	0.11 +0.018	0.408 +0.024	89.6 +7.243	0.383 +0.024	0.10 +0.011	-	-
76 and above	2	72.115 +0.9123	0.14 +0.003	0.485 +0.005	103.0 +3.0	0.350 +0.030	0.10 +0.020	-	2
Overall mean	100	73.93 +1.022	0.099 +0.0402	0.408 +0.0042	86.406 +0.641	0.3593 +0.004	0.1236 +0.029	-	9
Desi duck eggs									
54-60	6	73.835 +1.483	0.108 +0.0065	0.420 +0.0036	91.22 +1.315	0.368 +0.0125	0.093 +0.004	-	-
61-65	15	75.54 +0.743	0.104 +0.0063	0.40 +0.0074	88.33 +2.820	0.355 +0.0112	0.103 +0.007	-	-
66-70	39	75.87 +0.653	0.098 +0.004	0.409 +0.013	85.77 +1.440	0.372 +0.0022	0.111 +0.005	-	2
71-75	25	74.45 +0.524	0.096 +0.005	0.406 +0.008	84.84 +2.007	0.381 +0.008	0.114 +0.004	-	-
76 & above	15	75.74 +0.498	0.102 +0.006	0.413 +0.009	86.385 +2.109	0.3715 +0.011	0.118 +0.008	-	2
Overall mean	100	75.32 +0.3313	0.103 +0.003	0.405 +0.006	86.34 +0.306	0.380 +0.007	0.110 +0.0037	-	4

Table 19. Overall performance of Khaki Campbell and desi ducks during the entire experimental period

Sl No	T r a i t s	Treatment Groups	
		Khaki Campbell	Desi
1	Average age of flock at first egg in days	188	158
2	Age at first egg in the flock recorded in days	163	134
3	Age at 10 per cent production in days	175.88	146
4	Age at 50 per cent production in days	186.75	155
5	Average egg production for 100 days from first egg	61.50	35.13
6	Average egg production upto 280 days of age (Number)	60.16	51.06
7	Average egg weight at 280 days of age (g)	62.41	71.40
8	Mean shape index	73.98	75.32
9	Mean albumen index	0.089	0.108
10	Mean yolk index	0.41	0.41
11	Mean Haugh unit score	86.41	86.34
12	Mean shell thickness	0.36	0.39
13	Mean shell membrane thickness	0.12	0.11
14	Average daily feed consumption at 280 days of age (g)	190.37	183.50
15	Feed efficiency	5.21	10.40
16	Livability (per cent)	88.10	88.43

DISCUSSION

DISCUSSION

Data on the body weights of Khaki Campbell and desi ducklings from day-old to 18th week of age (Table 3) revealed that the day-old weight of Khaki Campbell male was 38.76g and that of female, 39.07g. The corresponding day-old weight of desi male and female ducklings were 42.64g and 43.33g respectively. From this, it was evident that the Khaki Campbell female ducklings recorded a higher weight than the male ducklings, whereas in the case of desi ducklings a reverse phenomenon was noticed. The weights recorded at weekly intervals upto 18th week of age also showed that desi ducklings, in general, attained heavier weights at all ages compared to Khaki Campbells. Further, it was also evident from the results that the difference in body weights at any given age was not very much apparent between sexes in Khaki Campbell ducklings whereas in the case of desi ducklings males tended to put on more weight than females, as the age advanced, even though the sexual dimorphism in body weight was not spectacular during the early periods of growth. Highly significant variation in body weight between sexes in desi ducks after third week of age has been reported by George *et al.* (1931). However, in the present study, though desi male ducklings recorded a slightly higher body weight than females from third week of

age, perceptable differences in body weight between sexes in desi ducks could be observed only from ten weeks of age. This could perhaps be due to changes in management practices adopted in the two studies.

In general, irrespective of sex, the pattern of growth, both in Khaki Campbell and desi ducklings showed a linear increase from day-old to the age of housing at 18th week (Fig. 4 and 5). The rate of growth was faster in Khaki Campbell ducklings which registered a weight increase of three-fold by the end of first week, six-fold by the end of second week and ten-fold by the end of third week. ^(38, 133, 241 and 344 g at 0, 1, 2 and 3 Weeks) Corresponding weight increase in desi ducklings was two-fold, four-fold and eight-fold at one, two and three weeks respectively (42, 91, 179 and 307g at 0, 1, 2 and 3 weeks). Rate of growth observed in Khaki Campbell ducks was found to be higher than the rate of growth reported by Reddy and Reddy (1979).

In the present study, the increased rate of growth in both genetic groups was observed upto 11th week of age and thereafter the rate in gain was comparatively less, unlike the growth increase reported by Reddy and Reddy (1979), wherein the rate of growth was significant upto fifth week of age and afterwards the rate of increase was lesser. The variation observed in the growth pattern might partly be

due to changes in the management practices followed and mostly due to the differences in the genetic make-up of the ducks selected for the two studies. The difference in body weight gain observed in the two genetic groups might also be due to the difference in their dates of hatch. When Khaki Campbell ducklings both males and females, registered a ten-fold increase over hatch weight by third week of age, the same body weight could be attained by desi ducklings only at the end of fourth week. This findings in the case of desi ducklings are supported by George et al. (1981).

The statistical analysis of growth revealed that there was significant difference between the rate of growth of the four groups. Each group had a rate of growth distinct from the other groups. The method used for the analysis also indicated that the rate of growth of desi males, desi females, Khaki Campbell females and Khaki Campbell males, were in the descending order. It was also observed that the rate of growth after four weeks was higher in desi ducks, when compared to Khaki Campbells.

The correlation between hatch weight and weight at specific age pointed out that there was no significant correlation between the hatch weight and the weights at 8th and 18th weeks in both genetic groups. Significant

correlation between hatch weight and body weight of desi males kept on floor at the end of first, fourth and 12th weeks of age observed by George et al. (1977) was not recorded in this study, during 8th and 13th weeks of age. However, he could not find any significant correlation in the case of desi females at the end of 12th week of age, though significant correlations between hatch weight and body weights at 1st, 4th and 8th weeks were observed as in the case of desi males. However, the coefficient of correlation between body weight at housing (18th week) and at 260 days of age was highly positive.

The mean body weights after housing of both Khaki Campbell and desi ducks recorded during 28-day periods (Table 6) indicated that the body weights of ducks belonging to both genetic groups slightly decreased as the age of ducks advanced from first period to the sixth period during which the body weights were recorded. During the first period, all ducks, in both groups had not started to lay their first egg. During this phase, the highest body weights were recorded. Thereafter as laying progressed the ducks maintained their weights almost uniform in the subsequent periods. In fact, the average body weights in both genetic groups were slightly lesser in the second through six periods when the birds were laying at a higher rate. This tendency among laying birds is a usual phenomenon.

Feed consumption

The mean daily feed consumption of desi ducklings from first week to 18th week of age (Table 7) indicated that the quantity of feed consumed at different weeks of age was slightly higher than the feed consumption rates reported earlier by George et al. (1981). However, the quantum of increase was not significantly higher and whatever the increased rate that was observed now could be attributed to the changes in management practices adopted and also to changes in the environment of the two studies.

The mean weekly feed consumption of Khaki Campbell ducklings recorded was found to be higher than the rates reported by Balbule (1982). The obvious reasons for the difference in the quantities of the feed consumed might be attributed to changes in feed composition and germplasm involved in the two studies.

The monthly (28-day period) average feed consumption per duck per day for both Khaki Campbell and desi ducks (Table 8) also showed that Khaki Campbell ducks consumed more feed during the first eight months of production while desi ducks showed no significant differences in the daily feed intake throughout the 168 days of experimental period.

The higher feed intake by Khaki Campbell ducks may be

largely due to their higher rate of egg production compared to desi ducks. The variation may also be due to differences in the genetic constitution of the two groups.

Age at first egg

The information regarding some of the productive traits of Khaki Campbell and desi ducks (Table 9 and 10) studied showed that the average age at first egg among Khaki Campbell and desi ducks were 183 and 158 days respectively. In this study the first egg among the Khaki Campbell ducks was obtained at 163 days of age, while the desi flock laid their first egg at 134 days.

Significant differences in the age at sexual maturity for various breeds of ducks have been reported by earlier workers (Monstageer et al. 1977; Sharma and Singh, 1978; Chavez and Lasmini, 1978; Nair, 1977; Robinson et al. 1979 and Ramakrishnan et al. 1981). In an earlier study with Khaki Campbell ducks, the age at first egg was reported to be 151.3 days (Monstageer et al. 1977), but in the present study great variations were observed in the age at sexual maturity among a flock of 96 Khaki Campbell ducks. In this group, the first egg was recorded at 163 days of age, 16 per cent of ducks laid their first egg between 134-150 days of age, 60 per cent of ducks reached their sexual

maturity in between 141-170 days of age and the remaining 6 per cent of ducks laid their first egg beyond 170 days of age. In an earlier work, Ramakrishnan et al. (1981) had reported that the age at first egg of desi ducks was 182 days but in the present study, the average age at first egg of the desi flock was only 158 days. The variation observed may be due to genetic factors and changes in the management practices followed.

The results suggested that desi ducks mature early than Khaki Campbells by about one month. The probable reason for the early maturity among desi flock observed, may be due to the selection procedures adopted in the University Duck Farm, Mannuthy.

Egg production

The average age of the flock of Khaki Campbell and desi ducks at 10 per cent production was 176 days and 147 days respectively and that of 50 per cent production averaged 187 and 155 days respectively. The per cent hen-housed egg production for the above two genetic groups were 65.7 and 42.7 respectively, while the corresponding figures relating to hen-day production were 66.45 and 43.98. The egg production on hen-housed number basis upto 250 days of age recorded for Khaki Campbell and desi ducks were 60.17 and 52.14 in the same order (Table 9 and 10).

The percentage distribution of egg production of Khaki Campbell and desi ducks upto 300 days of age (Table 12) revealed that 90 per cent of Khaki Campbell ducks laid between 50-99 eggs and only 60 per cent of desi ducks laid between 50-99 eggs. Percentage of Khaki Campbell ducks that laid less than 50 eggs during the same period accounted only 13.55 while the figure relating to desi ducks was 31.91. From this it is evident that Khaki Campbell ducks laid more number of eggs than desi ducks.

The per cent egg production of Khaki Campbell and desi ducks during the 23-day periods (Table 13) indicated that higher rates of egg production were recorded during the 2nd, 3rd, 4th, 5th and 6th periods in both genetic groups, but the rate of production slightly declined in the 5th period in desi ducks.

The highest record of egg production obtained from Khaki Campbell and desi ducks (Fig. 6 and 7), which are also the highest producers among all the ducks included in the above two genetic groups, indicated that Khaki Campbell duck laid 223 eggs in 335 days of production period with an intensity of laying 65.97 per cent while desi ducks laid 96 eggs in 170 days of production (56.4 per cent).

Many factors influence the total number of eggs laid by

a duck during an year's production. Some are hereditary and some are environmental. In the present study, every effort was made to keep the environmental variations to the minimum possible so that, if at all any significant difference in production characteristics occurred, it could be attributed to the geno-typic differences inherent in the two genetic groups, relating to egg production traits. The hatch effect might have played a role in the production performance of these two groups, since they were hatched out at two different occasions.

The present study revealed that there was not much difference in the production characteristics of Khaki Campbell ducks with those reported by Monstageer et al. (1971) and Mohapatra (1973), while in the case of desi ducks, significant improvement in egg production was observed from that reported by Ramakrishnan et al. (1981). The variation in egg production observed in desi ducks in this study may be attributed to improvements in egg laying ability of the farm stock due to continued selection and also due to more refined feeding and management practices followed year after year.

The recorded results of egg production showed that desi ducks matured much earlier than Khaki Campbell ducks by about 30 days. Started laying the first egg at 134 days of age, the desi ducks continued to lay at a gradually increasing rate

upto four periods of the study (Table 13 and 14) reaching the peak by then. Thereafter, the production was declined at the fifth period and then again the production was increased reaching almost with the level of the fourth laying period. The peak production noticed in desi flock was during June and this is in agreement with the earlier report of Ramakrishnan et al. (1981), who observed that there are two peaks in the production cycle of desi ducks around June-July and November. They had also attributed these peaks to possible difference in the release of luteinizing hormone (L.H.) due to variation in the micro-climatic environment during these periods.

In the case of Khaki Campbell ducks, eventhough they came into lay at a much later age (165 days), continued to lay at an increasing rate throughout the six periods, without any pause. The Khaki Campbells are well known for their intensity and persistency of production and are capable of producing about 300 eggs per annum. The desi ducks are known to have definite seasons of egg production with intermittent pauses (Fig. 6 and 7), on range rearing. This also holds good, when they are reared in confinement, as revealed from the present study. However, the early sexual maturity shown by them is a highly favourable production characteristic which could be well exploited. Also research may have to be directed to enforce the desi ducks to lay continuously in confinement as in the case of Khaki Campbells.

The late maturity of Khaki Campbells is a disadvantage inspite of their excellent persistency in egg production. Therefore, appropriate research has to be directed to bring them in early lay.

Egg quality

The various egg quality attributes presented in table 18 revealed that the mean egg weights of Khaki Campbell and desi ducks were 65g and 70g respectively and were in close agreement with those reported by Bose and Mahadevan (1956) and Romanoff (1967). The eggs procured from Khaki Campbell ducks for the study varied from 54g to 73g and about 90 per cent of the eggs were between 54-70g, while among desi duck eggs only 60 per cent were of this group and the rest were weighing more than 70g.

Desi layers produced significantly heavier eggs than Khaki Campbell ducks (Table 17) as the period of laying advanced. Egg weight of desi ducks also increased faster than Khaki Campbells. During the initial periods of production in Khaki Campbell ducks, the egg weights recorded were in between 50-58g and these were agreeable with the figures reported by Monstageer (1971), Reddy et al. (1979) and Ahmed et al. (1971).

The mean egg weight of desi ducks recorded in the present

study (70g) was almost in agreement with that (68.86g) reported by George et al. (1980).

The mean shape index of Khaki Campbell and desi duck eggs was 73.98 and 75.32 and these agree with the figures reported by Romanoff and Romanoff (1949), for different breeds of ducks, Sergeeva (1975a), Reddy (1979) and George et al. (1980).

The mean albumen index for Khaki Campbell and desi duck eggs was 0.089 and 0.108 respectively and these values were closely related to the figures reported by Singh et al. (1980) for White Pekin ducks. The yolk index for the above two genetic groups were 0.41 and 0.40 and these values are also similar to that reported by Singh et al. (1980).

The mean Haugh unit score obtained for Khaki Campbell and desi duck eggs were 86.4 and 86.34 respectively and these figures were in agreement with the values (86-89) reported by Singh et al. (1980) in White Pekin ducks.

The mean thickness of the shell and shell membranes of the two breeds were 0.36, 0.38, 0.12 and 0.11mm respectively.

It was also observed that the incidence of blood spot was more in Khaki Campbell (9 per cent) than desi duck eggs (4 per cent). No meat spot could be detected while conducting the study in both genetic groups. The higher incidence of

blood spot in Khaki Campbell ducks may be attributed to hereditary reasons.

Duck eggs are larger than chicken eggs by about 1.4 times and the yolk is at a greater proportion which contains less water. Duck eggs have a thin and porous shell when compared to hen eggs and therefore they are prone to breakages in transportation and evaporative losses on storage. The shell of duck eggs is of less pleasing appearance, unlike in chicken eggs. The shell membrane is tough which causes a disadvantage in peeling hard boiled eggs and some people take this as an objection to consume duck eggs (Kondiah *et al.* 1976).

The various quality factors studied in both Khaki Campbell and desi duck eggs in terms of shape index, albumen index, yolk index, Haugh unit score, shell and shell membrane thickness indicate that there are no significant difference between the two genetic groups with regard to internal egg quality. However, the desi duck appeared superior in terms of heavier eggs as evidenced from the results of this study.

SUMMARY

SUMMARY

An experiment to evaluate and compare the performance of Khaki Campbell ducks and the locally available desi ducks (*Anas platyrhynchos*) was undertaken and the observations are presented.

In the first phase, one hundred and twenty nine females and forty nine male Khaki Campbell ducklings (one day-old) were brought from the State Government Duck Farm, Niranam. They belonged to two hatches of one week difference and reared upto 13 weeks of age on deep litter. The ducklings were initially weighed, wing banded and brooded under infra-red lamps upto three weeks. Afterwards, they were divided at random into four replicates, keeping males separately upto 13 weeks.

Data on initial body weight, body weights at weekly intervals, weekly feed consumption on the basis of different replicate groups were recorded.

At 13th week, 96 good females were selected depending on body weight and type and they were distributed to eight pens at random. They were kept under semi-intensive system. Each house contained 12 ducks, provided with trap nests and recording of data on productive traits carried out. After housing at 13th week, recording of body weight, feed

consumption and egg production were done at 28 day periods only. In the second phase, the experiment was repeated using 334 desi ducklings hatched out at the University Poultry Farm. The management practices and parameters studied were fairly identical to that followed for Khaki Campbell ducklings.

Data on productive traits recorded from both Khaki Campbell and desi ducks revealed the following observation (Table 19). The average age of the flock at first egg in Khaki Campbell and desi ducks were 188 and 158 days, even though the first egg from the above two flock was obtained at 163 and 134 days respectively. The ages at 10% and 50% production were 174 and 187 days in Khaki Campbell ducks, while those in desi ducks were 146 and 155 days in the same order. The average egg weights at 280 days of age were 62.41 and 71.40g in Khaki Campbell and desi groups. The average egg production upto 280 days of age in the above two genetic groups were 60.16 and 51.06 and mean feed efficiency was 5.21 and 10.40 respectively. The livability per cent for Khaki Campbell and desi ducks were 88.1 and 88.43 respectively.

The various egg quality parameters like egg weight, shape index, albumen index, yolk index, Haugh unit score, shell thickness and shell thickness for the above two genetic groups showed not much difference, except for egg

weight. The average feed consumption during the sixth period was 190g and 184g for Khaki Campbell and desi ducks. The feed efficiency for desi was 10.4 which was about two-fold than that of Khaki Campbells.

The early maturity with good egg size observed in desi ducks are quite advantageous and the flock may be improved upon by appropriate research, better feeding and management practices so that the native germplasm available can be preserved and utilized effectively.

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* Originals not consulted.

COMPARATIVE PERFORMANCE OF KHAKI CAMPBELL AND DESI DUCKS

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ABSTRACT OF A THESIS

Submitted in partial fulfilment of the
requirement for the degree

Master of Veterinary Science

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1983

ABSTRACT

A trial was conducted to evaluate the comparative performance of Khaki Campbell ducks and desi (local) ducks. Khaki Campbell ducklings required for the experiment were brought from the Government Duck Farm, Miranpur, at day-old and reared into four groups on deep litter upto 18 weeks of age. Initial body weight and body weights at weekly intervals of all the ducklings were recorded. The average daily feed consumption from first to 18 weeks of age were also noted.

After 18 weeks of age, 96 numbers of good ducks were selected and divided at random and housed in eight different pens in semi-intensive system. Body weights and feed consumptions were recorded at 28 day period intervals. Trap nests were provided for all individual birds. All the ducks were put into the trap nest box in the evening of the day at about 4.30 p.m. and releasing them the next day morning after verifying for eggs inside the trap nest. The age at first egg of all individual ducks, the weight of first egg, age at 10 per cent production, age at 50 per cent production, total egg production upto 280 days of age, feed efficiency and livability per cent of the flock were calculated and recorded.

The same procedure was repeated using desi ducklings

hatched out at the University Duck Farm. The desi ducklings were reared as straight-run as they were not sexed at day-old into four groups on deep litter upto 18 weeks of age and at 18th week 96 females were selected and distributed at random into five pens in semi-intensive system at the rate of 19 ducks in four pens and 20 ducks in the fifth one. All the ducks of the two genetic groups were managed under identical conditions.

At the end of the trial the egg quality studies were also carried out using one hundred eggs from each group.

The overall performance of both Khaki Campbell and desi ducks in respect of the different parameters studied is presented in table.

The first egg among the flock of Khaki Campbell was obtained at 163 days of age and that of desi ducks laid at 134 days of age. The average age of the above two flock at first egg was 188 and 158 days. The age at 10 per cent and 50 per cent production recorded was 174 and 187 days in Khaki Campbell and 146 and 155 days respectively in desi ducks. The average egg production upto 280 days of age was 60.16 and 51.06 for the two groups in the same order. The egg weight averaged 62.41g and 71.4g for Khaki Campbell and desi ducks. The feed efficiency for the above two genetic groups in terms of the number of eggs produced was 5.21 and 10.40.

Though the size of Khaki Campbell duck eggs was smaller than desi duck eggs, the other quality factors were almost similar.

The study has thrown some light on the fact that the locally available germplasm can be improved by thorough continued research and better feeding and management practices. This will help to attain better production from desi stock in terms of egg number and better size of eggs.