

## COMPARATIVE PERFORMANCE OF DIFFERENT ECONOMIC TRAITS OF FOUR IMPORTED BROILER STRAINS UNDER LOCAL CONDITIONS OF PAKISTAN

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**ABSTRACT:** The study was initiated to compare the performance of economic traits of four internationally reputed broiler strains, imported in Pakistan, under the local environmental and management conditions. A total of 360 day old chicks of four broiler strains (90 from each strain) were procured from the local hatcheries and designated as four treatments i.e., A (Hubbard), B (Arbor Acres), C (Ross 308) and D (Hybro PN). The chicks were raised under recommended rearing requirements for 7 weeks and the economic traits measured were body weight, feed intake, feed conversion ratio (FCR), mortality, antibody titres, dressing percentage and economic evaluation as cost of broiler per kilogram live weight produced. The average body weights gained by the birds were 2264g, 2277g, 2256g and 1942g for A, B, C and D strains, respectively at 49 days of age. The birds in treatments A, B and C gained significantly ( $P < 0.05$ ) more weight than the birds in treatment D. On the contrary, the birds in treatment D (4371g) consumed significantly ( $P < 0.05$ ) less feed than birds in treatments A (4896g), B (4934g) and C (4905g) at 7 weeks of age. The FCR's in order of merit were 2.16(A), 2.17(B), 2.18(C) and 2.25(D) and differences were non-significant. The dressing percentage of birds in treatment A (71.4%) was significantly ( $P < 0.05$ ) higher than treatment C (68.1) and were non significant among the remaining treatments. The mortality in Hubbard strain (A) was significantly ( $P < 0.05$ ) low (4.4%) than Hybro PN, Ross 308 and Arbor Acres-strains. The overall performance of Hubbard strain seems better as the birds gained more body weight, gave better FCR, least mortality and least cost per kg live broiler produced as compared to other strains. The performance of strain D was poor as the birds gained less body weight, showed higher mortality rate, poor feed conversion ratio and incurred more cost to produce per kilogram live broiler as compared to other strains. The evaluation of different imported broiler strains must continue to remain abreast with the genetic improvement of broiler strains.

*Key Words: Broiler; Economic Traits; Feed Intake; Body Weight; Feed Conversion Ratio; Dressing Percentage; Immunity; Pakistan.*

### INTRODUCTION

The performance of the modern broiler represents one of the most marked increases in productivity achieved by selective breeding. In the last 30 years, the time taken to produce a chicken weighing 2 kg has

been halved from more than 10 wks to less than 6 wks (Mc Kay, 1997). It has been further argued that faster growth of selected strains of broiler is associated with increased appetite and accelerated rate of voluntary intake which in contrast to unselected strains, uses the digestive capacity of

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the gut almost to the full (McCarthy and Siegel, 1983). Moreover, broiler conserve energy through reduced activity and spent less time in walking/running and scratching, pecking litter and spent more time in sitting/resting as they grow older (Newberry et al., 1988).

Economic traits of nine broiler strains were compared by Jana (1989) under similar environmental conditions and concluded that 2.11 feed conversion ratio (FCR) of Starbro was better than others and Rs. 8.85 was the lowest cost of production per kg body weight at 7 weeks of age. Vencob and Hubbard strains attained highest (1963g) and lowest (1412g) body weight, respectively. In Pakistan, first Random Sample Test of commercial broiler strains was conducted by Hussain et al. (1993) at National Agricultural Research Centre, Islamabad. They used 5 broiler strains namely; Indian River, ISA, Arbor Acres, Lohmann and Hubbard and reared them upto 8 weeks of age and compared various growth traits. They observed significant differences ( $P < 0.0153$ ) in FCR. The highest and lowest FCR was observed for strains Arbor Acres (2.59) and ISA (2.70). The average cost of one kg live body weight was lowest for strain Arbor Acres and highest for the strains Indian River and ISA.

Random Sample Tests are a regular feature in advanced countries whereas the above mentioned (Hussain et al., 1993) series of Random Sample Tests were continued for about 10 years in Pakistan (Zahid and Hussain, 2002). So no scientific information is available regarding the comparative standard performance of different broiler strains under local conditions for the guidance of poultry farmers. Although the pace of

development of broiler production in Pakistan is very good yet per capita availability of poultry meat is very low (3.90 kg) as compared to other countries. For instance, per capita availability of poultry meat in UAE is 65kg, Kuwait 55kg, Brunei 55kg, USA 50kg, Netherlands 50 kg and in the World 12kg (Bootwala, 2007).

Still there is a big gap in per capita availability of poultry meat between Pakistan and other countries and it seems that broiler meat intake will continue to increase in coming years as a result of the demand for affordable and palatable animal protein. As all broiler strains are imported from Europe and USA and their adaptability to local environmental conditions must be regularly monitored at various locations and in different seasons. Therefore a research project was designed to examine the adaptability and to compare the growth/economic traits of four renowned broiler commercial strains. The main objectives were to study the comparative productive performance of economic traits including cost of production per kg live weight of these strains.

## **MATERIALS AND METHOD**

The study was planned to compare the economic traits of four broiler strains, namely Hubbard (A), Arbor Acres (B), Ross 308 (C) and Hybro PN (D). The trial was conducted in an open-sided poultry shed measuring 8'x25'x10' (LxWxH) at Poultry Research Institute, Rawalpindi (PRI). The shed was divided into two main blocks. Each block was further subdivided into 6 small pens each measuring 9'x4'x10' (LxWxH). There was a central passage of 5 ft wide to provide service to birds.

A total of 360 one-day-old unsexed broiler chicks (90 from each strain) were procured from commercial hatcheries located in Rawalpindi and Lahore. There were four treatments and each broiler strain was considered as treatment. The 90 chicks of each strain were further divided into 3 replicates each having 30 chicks and randomly assigned to pens in each treatment.

During brooding, the chicks were provided temperature, humidity, ventilation rate etc., as per brooding requirements. Room temperatures and relative humidities during the trial ranged between 70° and 95°F and 65 and 80%, respectively. The chicks were provided with 0.5ft<sup>2</sup> floor space during the first 4 weeks of age and then 1 ft<sup>2</sup> floor space till the termination of the trial. A 24h continuous light during the first week and 23h dim light and one hour darkness (23L:1D) in the remaining weeks was provided. The birds were vaccinated against Infectious Bronchitis, Newcastle Disease, Gumboro (Infectious Bursal Disease) and Hydropericardium Syndrome. Antibody response was measured against ND only and all birds were vaccinated with ND live vaccine on 3<sup>rd</sup> and 24<sup>th</sup> day and blood samples (1ml) for HI test were collected on 32<sup>nd</sup> day of age.

All the broiler strains were supplied with a standard broiler starter and finisher ration during brooding and finisher stages respectively. The samples of experimental rations were collected and analyzed (AOAC, 2000; Table 1). The routine chores were carried out during the morning hours. Feed and water were provided manually and remained available during 24h. The trial continued for 7weeks starting

from November 10 to December 28, 2007.

**Table 1. Chemical analysis of broiler starter and finisher rations (%)**

Item	Broiler starter ration	Broiler finisher ration
Dry matter	89.30	89.00
Moisture	10.70	11.00
Crude fat	13.30	16.00
Crude fiber	6.00	5.00
Crude protein	20.10	18.13
Aflatoxin B <sub>1</sub> (PPB)*	14.00	19.00
Total ash	7.50	6.00
Metabolizable energy		
Kcal kg <sup>-1</sup> **	2800	2900

\* PPB=Parts per billion

\*\* As per manufacturer chemical composition label

## Measurements

The data on average body weight, average feed consumption, feed conversion ratio (FCR), mortality, dressing percentage, economic evaluation and immunity against Newcastle Disease were collected on weekly basis. However, dressing percentage and economic evaluation were carried out at the end of the trial. The immunity response against Newcastle Disease (ND) was measured once at day 32<sup>nd</sup> of age.

The data thus collected were analyzed by analysis of variance techniques using Completely Randomized Design and the mean differences were compared by Duncan's Multiple Range Test (Steel and Torrie, 1980).

## RESULTS AND DISCUSSION

A comparative study was undertaken on four reputed broiler strains namely, Hubbard, Arbor Acres, Ross 308 and Hybro PN regarding growth rate, feed intake, feed conversion ratio, dressing percentage, mortality rate and economics of

raising these strains.

### Body Weight

The body weights of birds on treatments A, B and C were significantly ( $P<0.05$ ) higher than birds on treatment D and there was no difference among treatments A, B, and C (Table 2). The results of this trial are in agreement with Chew (1977), Joya et al. (1979), Leotta et al. (1987) and Souza et al. (1994) and disagree with Hergouth (1988) and Soares et al. (1992) and differences could be attributed to management, genetic, environment and feed.

**Table 2. Comparative performance of different economic traits of four commercial broiler strains**

Strain	Body weight (g)	Feed consumption (g)	FCR	Mortality (%)	Dressing percentages
Hubbard (A)	2264 <sup>a</sup> ±50.6	4896 <sup>a</sup> ±29.6	2.16±0.032	4.4 <sup>a</sup> ±1.11	71.4 <sup>a</sup> ±0.48
Arbor (B)	2277 <sup>a</sup> ±48.4	4934 <sup>a</sup> ±59.5	2.17±0.023	7.8 <sup>ab</sup> ±2.93	70.0 <sup>a</sup> ±0.82
Ross 308 (C)	2256 <sup>a</sup> ±49.2	4905 <sup>a</sup> ±33.2	2.18±0.034	12.2 <sup>ab</sup> ±1.11	68.1 <sup>a</sup> ±1.27
Hybro (D)	1942 <sup>b</sup> ±122.4	4371 <sup>b</sup> ±225.7	2.25±0.026	18.9 <sup>b</sup> ±6.18	71.0 <sup>a</sup> ±0.82

*Means followed by same letters do not differ significantly.*

### Feed Consumption

The birds showed substantial differences in feed consumption and birds in treatments A, B and C consumed significantly ( $P<0.05$ ) more feed than the birds in treatment D, whereas the differences were non-significant ( $P<0.05$ ) among treatments A, B and C. The results of the present study are in agreement with those of Kumar et al. (1976), Joya et al. (1979), Indirabai et al. (1986), Baghel and Pradhan (1990) Turkoglus and Akin (1991) and Garcia et al. (1992) who used different internationally reputed broiler strains in their studies and obtained significant ( $P<0.05$ ) differences in feed

consumption.

### Feed Conversion Ratio (FCR)

The mean FCR values in the order of merit were 2.16, 2.17, 2.18 and 2.25 for treatments A, B, C and D, respectively (Table 2). The results showed non-significant differences among the four treatments. The results are in agreement with those of Kumar et al. (1976), Hergouth (1988), Turkoglus and Akin (1991) and Soares et al. (1992) who used many reputed broiler strains in their studies and obtained non-significant ( $P>0.05$ ) differences in FCR but some authors obtained contrary results when they raised broilers in different seasons (Baghel and Pradhan, 1990; Hussain et al. 1993).

### Mortality

The mortality in Hubbard strain was very low as compared to Arbor Acres, Ross 308 (Table 2). However, the differences were non significant but when compared with Hybro PN strain, the differences became significant ( $P<0.05$ ). There were no significant differences in mortality among treatments B, C and D. On postmortem examination, it was found that main cause of mortality was Omphalitis, Ascities, Colibacillosis, Mycoplasmosis and Enteritis.

### Dressing Percentage

The average dressing percentages for treatments A, B, C and D were 71.4, 70.0, 68.1 and 71.0, respectively (Table 2). The dressing percentage of birds in treatment A was significantly ( $P<0.05$ ) better than treatment C. There were non-significant ( $P<0.05$ ) differences in dressing percentages in treatments B,

C and D and A, B and D. The research studies conducted by Singh (1981), Leotta et al. (1987), Honigmann (1990), Skrivan and Tomova (1992) and Anjum (2001) found significant ( $P < 0.05$ ) differences in dressing percentages which are partly in line with this study and partly disagree with Mahapatra et al. (1984) Forssido (1987) and Mendes et al. (1993) who found non-significant differences in dressing percentages among various strains.

### Economic Evaluation

The cost of production per kg live weight was very similar among treatments A, B and C, and higher in treatment D (Table 3). Cost of producing one kg of live broiler is highly variable from farm to farm, season to season and country to country as reported by North and Bell (1994). The results of present study (Table 3) are different from those of Chhikara (1990), Sahota et al. (1998-99) and Thirumalesh and Mallikarjunappa (2005). As the prices of inputs like feed ingredients, medicines, vaccines, electricity, farm rents, and farm equipments as well as labour and fuel charges are continuously increasing so this trend of higher cost of production will continue in future (Table 3).

### Immunity Against Newcastle Disease (ND)

Haemagglutination inhibition (HI) test was used to measure the antibody response to ND vaccine. The birds of four broiler strains showed normal immunity titres and Geometric Mean Titres (GMT) values ranged between 8.0 and 14.4 and these differences were non-significant. The sensitivity, specificity and predictive accuracy of the HI was

quite high and substantiated by Koch et al. (1998). It was observed that overall GMT values for Hybro PN was better than the other three broiler strains.

**Table 3. Cost (Rs.) per kg live weight of four different broiler strains**

Parameter	Treatments			
	A	B	C	D
Cost / chick (Rs.)	08.00	08.00	08.00	08.00
Feed consumed / bird (g)	4896.00	4934.00	4905.00	4371.00
Feed cost / kg (Rs.)	19.54	19.54	19.54	19.54
Feed cost / bird (Rs.)	95.66	96.41	95.84	85.41
Cost of medicine+ vaccine (Rs.)	05.00	05.00	05.00	05.00
Miscellaneous charges (Rs.)	09.00	09.00	09.00	09.00
Total cost / bird (Rs.)	117.66	118.41	117.84	107.41
Average live weight (g)	2264.00	2277.00	2256.00	1942.00
Cost / kg live weight (Rs.)	51.97	52.00	52.23	55.30
	$\pm 1.100$	$\pm 1.625$	$\pm 2.667$	$\pm 1.567$

**Table 4. GMT values of antibody titre against NDV in four different broiler strains**

Strain	Geometric Mean Titres
A	9.1 $\pm$ 1.10
B	8.3 $\pm$ 1.62
C	10.7 $\pm$ 2.67
D	14.4 $\pm$ 1.57

Geneticists have tried to produce a fast growing commercial broiler through genetic selection. At the moment, there are a large number of broiler strains which are being imported and reared under different managerial conditions. Therefore it is difficult to compare all the strains. Broilers developed in USA, Europe etc. and with different genetic make up will definitely respond differently when imported to Pakistan and reared in different ecological zones of Pakistan. Therefore, the performance testing of various broiler strains should be a continuous process to observe their level of acclimatization under our climatic conditions.

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