EFFECT OF ANTIBIOTIC AND MULTIVITAMINS ADMINISTRATION AT DAY OLD STAGE ON GROWTH PERFORMANCE OF BROILERS

THESIS

Submitted

In partial fulfillment of the requirements for the degree of

MASTER OF VETERINARY SCIENCE

IN

POULTRY SCIENCE

BY

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Enrollment No: V/02/610

DEPARTMENT OF POULTRY SCIENCE

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(INDIA)

2009

DECLARATION OF STUDENT

I hereby declare that the experimental research work and interpretation of the thesis entitled **"EFFECT OF ANTIBIOTIC AND MULTIVITAMINS ADMINISTRATION AT DAY OLD STAGE ON GROWTH PERFORMANCE OF BROILERS"** or part thereof has not been submitted for any other degree or diploma of any University, nor the data have been derived from any thesis/publication of any University or scientific organization. The sources of materials used and all assistance received during the course of investigation have been duly acknowledged.

Date: 31/08/09

Signature

(Mangesh Kailash Mendhe)

Enrolment No: V/02/610

31/08/09

Counter signed by
Chairman, Advisory Committee
with date

DECLARATION OF ADVISORY COMMITTEE

Shri. **MANGESH KAILASH MENDHE** has satisfactorily prosecuted his course of research for a period of not less than one semester and that the thesis entitled, **"EFFECT OF ANTIBIOTIC AND MULTIVITAMINS ADMINISTRATION AT DAY OLD STAGE ON GROWTH PERFORMANCE OF BROILERS"** submitted by him is the result of research work is sufficient to warrant its presentation to the examination in the subject of **POULTRY SCIENCE** for the award of **Master of Veterinary Science** degree by the Maharashtra Animal and Fishery Sciences University, Nagpur.

We also certify that the thesis or part there of has not been previously submitted by him/her for a degree of any other University.

Signature

Place: Nagpur
Date: 31/08/09

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CERTIFICATE

This is to certify that the thesis entitled, **"EFFECT OF ANTIBIOTIC AND MULTIVITAMINS ADMINISTRATION AT DAY OLD STAGE ON GROWTH PERFORMANCE OF BROILERS"** submitted by Shri. **MANGESH KAILASH MENDHE** to the Maharashtra Animal and Fishery Sciences University in partial fulfillment of the requirement for the degree of **Master of Veterinary Science** has been approved by the Student's Advisory Committee after examination in collaboration with the External Examiner.

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"I take this opportunity to dedicate this work to my beloved AAI, BABA and little angle DHRITI".

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Place :- Nagpur
Date :- 31/08/09

Mangesh Kailash Mendhe

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LIST OF ABBREVIATIONS

GDP	Gross Domestic Product
Hrs	Hours
mg	Milligram
g	Gram
kg	Kilogram
Rs	Rupees
Fig	Figure
HA	Haemagglutination
HI	Haemagglutination inhibition
NCD	New Castle Disease
et al.	Ethically all
s/c	Subcutaneous
d	day
BIS	Beuro of Indian Standard
cfu	Colony forming unit
DM	Dry matter
CF	Crude Fibre
CP	Crude Protein
E.E.	Ether Extract
i.e	That is
Kcal	Kilocalories
ME	Metabolic energy
°C	Degree Celsius
%	Per ent
viz.	Videlict namely
NS	Non-significant
/	Per

LIST OF ABBREVIATIONS

TVC	Total viable count
SEM	Standard error for mean
FCR	Feed conversion ratio
ml	Milliliter
µl	Microliter
PBS	Phosphate buffer solution
v/v	Volume by volume
RBC	Red blood cell
VFA	Volatile fatty acid

INTRODUCTION

Now a days Poultry farming has become an industry with enormous potential to bring rapid economic growth in agricultural sector. Currently, poultry industry has strength of 215 million layers and 1600 million broilers, contributing about Rs. 350 billion to national GDP i.e 1% of the India's GDP and 10% of that livestock GDP (The Hindu Survey of Indian Agriculture, 2008). It provides continuous flow of income round the year through egg and meat production. The growth rate of chicken industry is 5-7% in egg production and 12-15% in broiler production with significant contribution to GDP. Poultry meat and eggs are rich and pure source of high quality nutrient including protein, vitamins and minerals with excellent biological value.

Over the past decades, agriculture has markedly improved its efficiency in order to provide for the ever-increasing nutritional needs of the human population. Thirty years ago, ninety days were required to produce 2 to 2.25 kg chicken, whereas in present situation the broiler achieves this weight within 35 to 40 days. These changes were made possible because of genetic selection of bird for growth performance, better knowledge of dietary needs, improved management systems such as confinement rearing and better disease control measures. This reduction of rearing period make the first week of life more crucial compared with the next coming weeks, which could affect on growth, feed efficiency, uniformity and finally economic viability.

In confinement rearing system, increased densities enhance transmission of infectious agents. Prevention then becomes critical, especially in young susceptible birds. Most infectious diseases are enzootic, in that many organisms are present and circulating in the flock. Simultaneously, there is also an increase in pathogen loads in poultry due to climatic, management and nutritional stress which affect directly or indirectly on immune system of the birds and once the immunity goes down it result into economic loss to poultry farmer. Mortality of chicken especially in early life is of great concern to broiler producers. Early mortality in chickens has been attributed to a variety of bacteria including *Enterobacter,*

Bacillus, Escherichia, Micrococcus, Proteus, Salmonella, Pseudomonas, Staphylococcus, and Streptococcus. In recent years *E. coli* and *Salmonella* has drawn attention of people by emerging as a most serious threat for the poultry due to their wide spreading nature and various sources of contamination. These organisms not only unsafe for human consumption but also cause huge economic loss to the farmers. *E.coli* is an opportunistic bacterium and a major pathogen affecting broiler (GI tract) in the early rearing period in the chicken. To illustrate the importance of prevention, broiler chicks are vaccinated at different stage of there life against commonly occurring diseases. Several diet formulations like prophylactic drugs, growth-promoter and other nutritional compounds are fed from hatching to marketing of birds to enhance the immunity and growth performance.

At present the broiler industry places much emphasis on supplementing broiler starter rations with antibiotics and vitamins to stimulate growth and reduce early mortality. Environmental stress and disease factors at this stage can seriously affect health and performance. Antibiotics such as Oxytetracycline or Gentamicin have been shown to alleviate the impact of stress (Brackett *et al.,* 1960) and control subclinical diseases caused by pathogenic organism (Brackett *et al.,* 1960; Hebert & Chang 1969; Vernimb 1976). Antibiotic and vitamins have been used in combination in both turkeys (Moreng 1970) & chickens (Jensen *et al.,* 1956) with resultant increase in growth and livability. Vitamins A or E, in addition to being essential for proper growth and help to stimulate immunity, thus provide increased protection against *E.coli* infection (Tengerdy & Nockels 1975). Oral route is most common for administration of these drugs. This method, although effective, does not insure proper dosage in all birds in free choice system.

The majority of the medication in poultry is used on a preventive basis. Antibiotics in poultry should be viewed as health management tools, used with caution and under a regulatory system. Unfortunately, most of the medication used in our country is available without professional advice and it is only when first-line therapy fails that professional aid is sought. Agriculture and the use of antibiotics in livestock have often been singled out as being responsible for the appearance of antibiotic resistance in human pathogens. It plays a role in the selection of antibiotic-

resistant bacteria in animals (Nadeau *et al.*, 1999). Even if evidence for the crossover of resistance from animal bacteria to human strains is scarce, but we cannot pretend that the problem does not exist. Antibiotic usage needs rationalization, but not to the point of being detrimental to bird's health and at the expense of poultry farmers. In developed countries, the use of antibiotics has been restricted under strict monitoring. A ban of antibiotics in food animals is not the answer to the problem of antibiotic resistance; it would have serious consequences for the economics of the food industry and animal welfare.

Antibiotics are used in the livestock industry not only to treat diseases but also to promote growth and increase feed efficiency in less than ideal environmental conditions (Doyle, 2001). In the modern poultry industry antibiotics are used in high quantities not only for therapy and prevention of bacterial diseases, but also as antimicrobial growth promoters (AMGPs). However, in most of countries 26% of the veterinary used antibiotics were intended for poultry mainly broilers, resulting in yearly exposure of 430 mg of antibiotics/kg/year for poultry (Bogaard *et al.*, 2002).

To combat all the way situation, large number of 18-day-old commercial chicken's embryos are now a day vaccinated *in ovo* and simultaneously receive an antibiotic injection (Ceftiofur or Gentamicin) to prevent them from developing a potential infection which could occur secondarily. Day-old chicks vaccinated subcutaneously at the hatchery are also injected with a single dose of antibiotic (Ceftiofur or Gentamicin) to prevent omphalitis. Generally this infection occurs when there is incomplete closure of the navel followed by contact with a contaminated surface. 95% of chicks are dry when they pulled out from hatchery, but still some chicks are at high risk of developing omphalitis during the first hours of their life.

Keeping in view that broiler has greater susceptibility to pathogenic micro-organism (*E.coli* and *Salmonella*) in early rearing period due to hatchery born infection, transit period (more than 12 hrs) and thus subjecting the chicks to delayed initiation of feeding after hatching. Now a day two drugs (Ceftiofur Sodium and

Gentamicin Sulfate) are approved in developed countries for chicks (one-day-of-age). Neither drug is absorbed gastro intestinally on the contrary helps to protect the chick from injection-site abscesses after vaccination for Marek's disease and protect the chicks from early mortality. Therefore, the present research work is proposed with following objectives.

Objectives:

1. To study the effect antibiotic and multivitamin administration at day old stage on growth performance and organ weight of broiler chicks
2. Assessment of immune status of antibiotic (Gentamicin and Ceftiofur) and multivitamin injected chicks and un-injected chicks
3. To study the economics of broiler production, with and without antibiotic and multivitamin treatment at day old stage.

REVIEW OF LITERATURE

Mortality of chicken especially in early life is of great concern to broiler producers. Early mortality in chickens has been attributed to a variety of bacteria including *Enterobacter, Bacillus, Escherichia, Micrococcus, Proteus, Salmonella, Pseudomonas, Staphylococcus, and Streptococcus.* In recent years *E. coli* and *Salmonella* has drawn attention of scientist by emerging as a most serious threat for the poultry industry due to their wide spreading nature and various sources of contamination. These organisms are not only unsafe for human consumption but also cause huge economic loss to the poultry producers. Antibiotic especially Gentamicin administered by injection is an effective prophylactic and therapeutic agent against *Salmonella typhimurium* (Olesiuk *et al.*, 1973). Injection of antibiotics separately or in combination with vitamins has been reported to improve livability and growth rate in young broiler chicks to variable degrees (Vernimb *et al.*, 1976; Magonigle *et al.*, 1983; Peterson *et al.*, 1991).

Hence the present research work was aimed to study the effect of antibiotic and multivitamins administration at day old stage of broilers. While reviewing the literature emphasis was given on effect of antibiotic and multivitamins administration on growth performance of broilers.

AL-Mayah *et al.* (2005) studied that the use of antibiotic (ampicillin, enrofloxacine or amoxicillin) for five consecutive days in day old chicks resulted into fall in hematological values (PCV, HB, RBC, WBC, MCV, MCH and MCHC) compared with control birds. In antibiotic treated birds the erythrocytes were microcytic, showing antibiotic have an affinity to produce microcytosis as well as anemia.

Ashraf *et al.* (2002) studied the effect of intrayolk injection of Gentamicin on experimentally induced omphalitis in broiler chicks. No bird died in control group during the experiment. Mortality in non-medicated group was 50% and in treated group was 7.14%. Feed intake after treatment in infected non-medicated group was 4.66g and in treated group was 6.33 g per day per bird. It was inferred

that the mortality in treated group was lower and feed intake was higher than the infected, non-treated group.

Bailey *et al.* (2001) studied the effect of *in ovo* Gentamicin and mucosal starter culture (MSC) to control salmonella in broiler production. They concluded that Gentamicin, at a commercial rate of 0.4 mg per egg administered *in ovo* on Day 18, had no adverse effect on the Competitive Exclusion product. They found statistically significant ($p<0.05$) cumulative effect and an almost total elimination of salmonella in all replicate when the chicks received the Gentamicin *in ovo*, the salmonella immediately after hatch, and then the MSC 1 day later. Showing the additive effect of combination of Gentamicin and MSC on reduction of Salmonella, which enters the chick on the day of hatch.

Barnes *et al.* (1979, 1980a,b) stated that in newly hatched chicks the VFA concentration and pH are not sufficient to chemically exclude pathogens.

Bickford (1975) observed highest Gentamicin residue in liver, skin/fat and muscle (4.0-4.4mg/kg), in one day old chicks treated with 0.2mg Gentamicin by subcutaneous injection within three hours of treatment. Further at 7th day post treatment, no Gentamicin was detectable in muscle, while residues detected in fat/skin and liver (0.1 &1.1mg/kg respectively).

Chaudhry *et al.* (2008) studied the effect of Excenel^{TM},(Ceftiofur sodium) on the immune system of broilers and their weight gain. The results showed that the Ceftiofur sodium was safe to be used and did not have any immunosuppressive effects. They indicated that treatment of birds with Ceftiofur sodium did not adversely affect the body weight gains of the birds. The weight gain of the Ceftiofur treated birds were in fact higher than those of non treated birds throughout the study period at different ages. The birds treated with the Ceftiofur sodium developed significantly higher titers of antibodies as compared with immuno-compromised birds and the titers of the untreated vaccinated control group. It also showed that Ceftiofur sodium did not have significant difference on the weight of thymus, spleen and the bursa of fabricius.

Donaldson *et al.* (1991) observed that liver stores are depleted in turkey poults by stressful procedures including antibiotic injections administered at commercial hatchery level.

Donaldson (1994) recorded that any kind of stress through managemental/dietary origin or either deplete glycogen reserve put newly hatched poults at risk for mortality.

Donaldson *et al.* (1995) studied the possible toxic effect of Gentamicin at dose rate of 1mg and 10mg per poult subcutaneously in the neck of newly hatched turkey poults. Gentamicin injections at levels of 1 or 10 mg/poult had no effect on body weight, blood glucose, or body protein content. The 10 mg dose reduced renal PEPCK activity, while 1 mg was without effect. Both doses lowered hepatic G-6-Pase and impaired the kidney function. They also stated that the possible toxic effect of antibiotic is due to decreased water content of body resulting from long post-hatch holding time. If antibiotic injections are considered to be essential, consideration should be given to the use of antibiotics that neither impair kidney function nor alter carbohydrate metabolism.

Edens *et al.* (1997) observed that the *in ovo* administration of *L. reuteri* (10^6 cfu per embryo) or Gentamicin (0.2 mg per embryo) or both to chicks and poults had significant positive effects. Gentamicin and *L. reuteri* reduce *E. coli*-associated chick mortality, the combination of *L. reuteri* and Gentamicin had an additive effect by further decreasing *E.coli*-associated mortality.

Freeman (1965) studied that newly hatched avian species have low glycogen stores in liver and muscles because of depletion by the hatching process.

Gast and Beard (1989) found that chicks inoculated orally between 1 and 8 day post hatch with S. typhimurium showed decreasing mortality with increasing age. S. typhimurium adhered to the epithelium of the caeca in the birds inoculated at 1 day more readily than in the birds inoculated at 3, 5 or 7 day post hatch. Turnbull and Snoeyenbos (1974) who found decrease penetration of salmonella through the intestinal mucosa of chicks of increasing age.

Jensen *et al.* (1956) reported that early growth of chickens was improved when they were injected with vitamins during the first two weeks after hatching.

Jordan (1990) stated that during early age of life, omphalitis (yolk sac infection) is the most frequent cause of death in chicks.

Khan *et al.* (2004) stated that yolk retention and yolk sac infection is an important cause of early chick mortality. Factors contributing for yolk retention include post-hatch starvation, yolk sac infection of bacterial origin, type of initial feed, brooding temperature, prolonged exposure to hatcher environment and size of birds. Among these factors yolk sac infection of bacterial origin is most important, *Escherichia coli* was frequently the main one involved followed by *Salmonella spp.* Main sources of infection are faecal contamination of hatching eggs, contaminated hatchery equipments, poor hatcher environment and unhygienic chick boxes. The cases of yolk retention and yolk sac infection were recorded upto 10 days of age but high rate of mortality was observed upto 3 days of age.

Magonigle *et al.* (1983) studied the effect of subcutaneous injection of Oxytetracycline and vitamins in day-old broiler chicks. Day-old broiler chicks were divided into two treatment groups; one received single injection of Oxytetracycline (10mg) and vitamins; the second one remained non-medicated. Individual body weights were taken on days 7, 14 and 56 post-treatment. A significant difference due to Oxytetracycline (10mg) and vitamins was observed at 7 and 14 days post treatment. By day 56 the difference were no longer significant ($p<0.05$), although there was an advantage ($p<0.1$) in final body weight to the medicated group. The incidence of mortality was not significant during the experiment.

Marty *et al.* (1975). Efficacy of Gentamicin against induced infections was investigated. Chicks treated 1 hour after infection showed the antibiotic to be highly effective at very low levels in reducing mortality from *E. coli.* Similar testing against *Pseudomonas aeruginosa* showed significant, but less dramatic, *in vivo* activity. Investigation of the effect of treatment time after infection with *E. coli.*

Showed significant efficacy at 3 and 6 hours post-infection, but none at 12 and 24 hours.

McReynolds *et al.* (2000) observed that, *in ovo* or subcutaneous administration of Gentamicin sulfate (0.1 or 0.2 mg) or Ceftiofur sodium (0.1mg) was associated with detectable levels of antibiotic residues in yolk sac or blood serum samples. This is associated with reduced levels of Competitive Exclusion (CE) culture establishment when caecal propionate level, an indicator of PREEMPT (CE) establishment, was determined following PREEMPT application by oral gavage on the day of hatch compared with un-injected control chicks.

Moreng *et al.* (1970) observed that oral injection of vitamins and neomycin alone or in combination significantly reduced the actual mortality in comparison to the control during the first eight days following hatching. Control birds were highly significantly lighter in body weight at nine days of age than the vitamin and vitamin plus neomycin treated birds.

Nurmi and Rantala (1973) and Rantala And Nurmi (1973). In their studies they determined that very low challenge doses of salmonella (1 to 10 cells into the crops) were sufficient to initiate Salmonellosis in chickens. Additionally they determined that it was during the first week post hatch that the chick was most susceptible to salmonella infection.

Saleemi *et al.* (2008) observed depression, decreased feed consumption, increased water intake, loose watery droppings and reduced body weights in a dose-related manner in chicks administered Gentamicin intramuscularly at 30mg/kg or higher dose levels. The no observable effect level of a single intramuscular administration of Gentamicin in day-old broiler chicks was 10 mg/kg body weight.

Samara (2003) conducted trials to determine the effect of early chlortetracycline administration and farm clean-up on growth and mortality in broiler chicks. It was found that chlortetracycline at dose rate of 0.5g/liter drinking water for course of 7 or 10 days. They reported that the use of chlortetracycline resulted in

consistent effects on weight gain, feed conversion and mortality regardless of the duration of chlortetracycline administration.

Smith and Tucker (1980) have reported that the newly hatched chick is very susceptible to *salmonella* infections, but as the chick ages through 5 day post hatch its resistance increase.

Tengerdy & Nockels (1975) stated that vitamin A or E in addition to being essential for proper growth metabolically, have also been shown to help stimulate immunity and thus provide increased protection against *E. coli* infection.

Vernimb *et al.* (1975) reported Gentamicin as safe at several higher concentrations than the recommended dose when administered in day-old chicks. Pharmacokinetics data demonstrated good Gentamicin serum and tissue distribution. This may explain the generally good efficiency report.

Vernimb *et al.* (1976) demonstrated that subcutaneous injection of 0.2 mg Gentamicin at one day old age reduced bacteria-caused deaths in White Leghorn and broiler chicks in field and floor-pen trial. Day-old chicks were injected subcutaneously in the back of the neck with 0.1 or 0.2 mg of a 50mg/ml Gentamicin solution diluted to 0.2ml with sterile saline. Mortality data were collected on broiler chickens until slaughter and on White Leghorn to 14 days of age. Dead chickens were examined bacteriologically. Mortality was significantly ($P<0.05$-0.001) less in Gentamicin injected White Leghorn chickens to 14 days of age. At necropsy lesion appeared, if any, are less severe among Gentamicin treated White Leghorn chicks. Mortality in broiler trials was significantly ($P<0.001$) lower for Gentamicin treated broilers in two trials at both 14 and 56-57 days after injection. Weight gain and feed efficiency in the groups treated with 0.2mg Gentamicin were equal or significantly ($P<0.05$-0.001) better than in either the 0.1mg Gentamicin or control. Antibacterial minimal inhibitory concentrations against 31 randomly selected organism isolated during this study is carried out. Gentamicin, with 99% of the isolates susceptible, was superior to all other antibacterial tested.

Wages (2000) stated the placement of antibiotics at the site of contamination i.e. yolk sac and stated that Gentamicin and Ceftiofur were most commonly used antibiotics.

Ziprin et al. (1989) concluded from their study that the newly hatched chick is very susceptible to *salmonella* infections, but as the chick ages through 5 day post hatch its resistance increase. Increasing resistant to *salmonella* infections could be attributed to development immune system and also through acquired resistance through colonization of the intestinal tract of beneficial micro-flora, such *L. reuteri*.

MATERIALS AND METHODS

The experiment was conducted on 240 commercial broiler chicks procured from M/s. Atharvaraj Hatcheries, Wardha. The research trial was conducted at department of Poultry Science, Nagpur Veterinary College, Nagpur for a period of 35 days (from April 3 to May 8, 2009). The objectives of the study were:

1. To study the effect of antibiotic and multivitamins administration at day old stage on growth performance and organs weight of broilers
2. Assessment of immune status of antibiotic (Gentamicin and Ceftiofur) and multivitamin injected chicks and un-injected chicks
3. To study the economics of broiler production, with and without antibiotic and multivitamin treatment at day old stage.

3.1 Experimental design:

The day old broiler chicks, immediately after hatch, were randomly divided into four groups namely A, B, C and D containing sixty birds in each. Each group was further subdivided into four replicate of fifteen birds each. Each of this group was allotted to one of the following treatments:

A. Un-injected control (without any antibiotic or multivitamins).
B. *Routine Farm Practice (Antibiotic/multivitamins supplementation as if routine farm practice).
C. Chicks were injected with Gentamicin and Multivitamins at day old stage (s/c, hatchery level).
D. Chicks were injected with Ceftiofur and Multivitamins at day old stage (s/c, hatchery level).

In this experiment selected antibiotics and multivitamins were administered subcutaneously, in the neck region (immediately caudal to the base of the skull and cranial to the thoracic vertebrae) of chicks at hatchery level. Subcutaneous administrations of antibiotics and multivitamins were performed using an automatic injector by adjusting the dose 0.2 ml in all the groups.

Broiler Experimental Unit

Experimental Birds

*Routine Farm Practice: In this group the antibiotic (Neomycin & Doxycycline) and multivitamin was given through drinking water as a routine farm practice followed at commercial broiler farms. Supplementation of liver tonic in the last phase of broiler rearing was also done.

3.2 Content and dose of multivitamins and antibiotic:

The sample of antibiotic (Ceftiofur, Gentamicin, Neomycin and Doxycycline) and Multivitamins (HiVit) were procured from RFCL, Gurgaon.

Multivitamins:

Vitamin A, D_3 and E, Niacinamide, Cyanacobalamine. Thiamine, Pyridoxine, Riboflavin, Sodium, Biotin. (1ml/kg body weight). Each chick received 0.2ml through subcutaneously

Gentamicin sulphate:

Day old chicks were injected subcutaneously in the back of neck with 0.2mg of 40mg/ml Gentamicin solution diluted to 0.2ml with sterile water.

Ceftiofur sodium:

Day old chicks were injected subcutaneously in the back of neck with 0.2mg of 50mg/ml Ceftiofur solution diluted to 0.2ml with sterile water.

Neomycin & Doxycycline:

1 g in 10 liter of water for initial five days (through drinking water).

3.3 Housing and management:

Before the start of experiment, all required waterers and feeders were cleaned, washed, disinfected. The poultry house was disinfected with the help of flame gun and white wash was done for the floor and sidewall. All the chicks were reared on deep litter system using rice husk as a litter material. All groups were provided with similar environment and managemental condition through out the experimental period. An ideal and identical feeding and watering space was allotted to all the birds. The brooding was carried out for three weeks using electric bulbs. Adequate temperature was provided by adjusting height of brooder as per environmental temperature and comfort of birds in the compartment.

3.3.1 Vaccination and medication:

Immediately after arrival, all the chicks were provided with glucose through drinking water for the first day. Chicks were vaccinated against Ranikhet Disease (B1 strain) and Infectious Bursal Disease (Georgia strain) at 7^{th} and 14^{th} day of age respectively.

3.3.2 Feeding and watering:

The commercial broiler feed were procured from M/s Supreme Agrovet, Nagpur. The starter mash was offered for the first three weeks of age and finisher mash was offered thereafter upto five weeks of age. The ration has adequate in all nutrient requirement as per the BIS 1992. The starter and finisher mashes for all the groups were formulated as shown in Table 1.

The group feeding practice has followed for all the groups throughout the experimental period. The weighed quantity of feed was offered to each group of birds twice a day. The group-wise refusal was collected weekly and weighed to calculate the actual feed consumption in that week. Fresh & clean water was offered three times a day during experimental period.

Table 1 The composition of broiler diet

Ingredients	Starter Mash	Finisher Mash
Maize	56.8	59.2
Soybean meal	33.7	31.3
Vegetable oil	2.5	2.5
Rice bran	5	5
DCP	1.5	1.5
Trace mineral mixture	0.2	0.2
Salt	0.3	0.3
Other supplement (g/100kg)		
a) Vitamin premix	25	25
b) Methionine	170	140
c) Lysine	40	-
d) Choline chloride	60	60
e) Maduramycin	50	50
f) Toxin binder	100	100

3.4 Proximate composition of experimental diet:

The chemical analysis of the experimental starter and finisher mash was carried out as per AOAC (1995) in the Department of Animal Nutrition, Nagpur Veterinary College, Nagpur and presented in Table 2.

Table 2. Proximate composition of experimental diet (% dry matter basis)

Nutrients	Starter mash	Finisher mash
D.M.	90.10	90.40
C.P	22.50	20.00
E.E	4.1	4.7
C.F	5.5	5.0
N.F.E	61.70	64.08
Total Ash	6.20	6.22
ME (calculated) kcal/kg	2901	3003

3.5 Parameters studied:

During experiment following parameters were studied

A. Growth parameters
   a. Live body weight
   b. Gain in weight
   c. Feed consumption
   d. Feed conversion ratio
   e. Mortality as and when occurred
B. Immunological parameter
   a. Antibody titer against NCD
C. Bacteriological parameter
   a. Total viable count (TVC)
   b. Coliform count
   c. E. Coli count

a) Haemagglutination (HA) test:

Procedure-

HA test was performed in 'U' bottom microtitre plate as per O.I.E. procedure.

1. 40 µl of PBS (0.1% & 7.2 pH) was added in first well of 'U' bottom microtitre plate.
2. 25 µl of PBS was distributed in subsequent wells (11 wells).
3. 10 µl of antigen was added in first well.
4. Two fold serial dilution were made upto 11^{th} well and last well was kept as control.
5. 25 µl chicken RBC (1% v/v) was added to each well.
6. After gentle mixing the plates were covered and then kept at 37°C for 45 minutes for incubation.
7. The microtitre plates were read under bright light.
8. The reciprocal of highest dilution of the antigen showing 50% hemagglutination was considered as HA titer.
9. The original virus was diluted to contain 4HA units and was used as HA antigen in the HI test.

b) Heamagglutination inhibition (HI) test:

Procedure-

HI test was carried out as per the procedure of O.I.E. (1992).

1. 40 µl of PBS (0.1% & 7.2 pH) was added in first well of 'U' bottom microtitre plate.
2. 25 µl of PBS was distributed in subsequent wells (11 wells).
3. 10 µl of test serum was added to first well and serial two fold dilution of serum was done.
4. 25 µl of 4 HA units of antigen was added in each well.

5. 25 µl of chicken RBC (1% v/v) was added to each well and mixed gently.
6. The plate was incubated at 37°C.
7. The results were recorded after 45 minutes
8. The HI titer was expressed as the highest dilution of serum causing complete inhibition of antigen.

c) Total viable count, coliform count and E. coli count:

Carried out as per Difco manual procedure (1977)

Sample collection:

At 21 day of age, four birds from each treatment were sacrificed. Aseptically cecal content were collected in glass vials. The sample were marked for identification and stored below 0°C till further processing.

Materials-

- Autoclave
- Sterile Petri plates
- Incubator
- Pipette
- Sterile phosphate buffered saline

PBS composition & preparation:

1. Potassium dihydrogen phosphate (KH_2Po_4)
2. Sodium hydroxide (1N)
3. Magnesium chloride ($MgCl_2$)
4. Distilled water

Procedure:

a) To prepare stock solution:
   - Add 3.4 gm KH_2PO_4 in 50 ml distilled water.

- Adjust pH to 7.2 using 1N NaOH and adjust the volume to 100 ml using distilled water.
- Autoclave at 121°C at 15 psi for 15 minute.

b) To prepare $MgCl_2$:
- Add 3.8 g $MgCl_2$ in 100 ml distilled water and autoclave.

c) To prepare the working stock:
- Take 5 ml $MgCl_2$ solution, 1.25 ml of stock solution and 1 liter of distilled water.
- Mix them properly.
- Autoclave at 121°C and 15 psi for 15 minutes.

(Note: - The pH should be adjusted at 7.2 ± 0.2)

Serial dilution method:

Principle-

Total viable count (TVC) was estimated by standard plate count method using nutrient agar medium and for total coliforms M. endo media was used.

Procedure-

1. Transfer 1 g of the sample to 9 ml of PBS (sterile) aseptically.
2. Mix the sample thoroughly (5-10 minutes).
3. Using the sterile pipette, aseptically transfer 1 ml to the subsequent PBS containing test tube (9 ml) this is 10^{-2} dilution.
4. Similarly, transfer 1 ml to the subsequent tubes till the dilution reach 10^{-7}.
5. Discard 1 ml of mixed sample from the last dilution tube.

Spread plate method:

1. Pour the desired autoclaved media (Nutrient agar/M.rendo) into the pre-sterilized plates and let the agar solidify. Pre-dry plates inverted so that there is water loss overnight with lids on.
2. Add 1 ml aliquot from 10^{-7} dilution onto the plate with agar medium and spread using the sterile glass spreader in all directions until dry.
3. The plates were covered and kept at 37°C for incubation.
4. The media plates were read under colony counter after 24 hours.

Statistical analysis:

All the data obtained were analyzed by using the technique of Completely Randomized Design as per Snedecor and Cochran (1968)

RESULTS AND DISCUSSION

Keeping in view that broiler has greater susceptibility to pathogenic micro-organism in early rearing period especially *E. coli and Salmonella*. The present experiment was conducted to evaluate the effect of antibiotic (Ceftiofur and Gentamicin) and multivitamin administration at day old stage on growth performance, bacteriological, immunological parameters and economics.

4.1 Growth parameters

4.1.1 Live body weight

The live body weight of broilers treated with antibiotic plus multivitamins are presented in Table 3. The graphical representation of the same is given in Figure 1.

Table- 3: Live body weights (g) of broiler chicken at different age (d).

Treatments	Days					
	0	7	14	21	28	35
Control (A)	48.58	140.17^{b}	348.15	651.87	949.64	1183.94
Routine Farm Practice (B)	47.7	149.37^{a}	365.1	685.28	999.61	1223.99
Gentamicin + Multivitamin (C)	48.15	142.76^{b}	356.6	672	995.14	1218.7
Ceftiofur + Multivitamin (D)	47.3	141.66^{b}	352.68	656.54	984.35	1213.34
SEM	0.314	1.312	3.307	5.566	7.525	6.126
P value	0.554	0.042	0.332	0.111	0.057	0.078
Significance	**NS**	**P<0.05**	**NS**	**NS**	**NS**	**NS**

SEM : Standard error for mean NS : Non significant (P>0.05)

^{a,b} Values bearing different superscripts in column differ significantly (P<0.05)

It is observed that the live body weight at the end of 35th day were 1183.94, 1223.99, 1218.70 and 1213.34 g for group A, B, C, and D. From these it is revealed that the live body weight of birds from routine farm practice group and

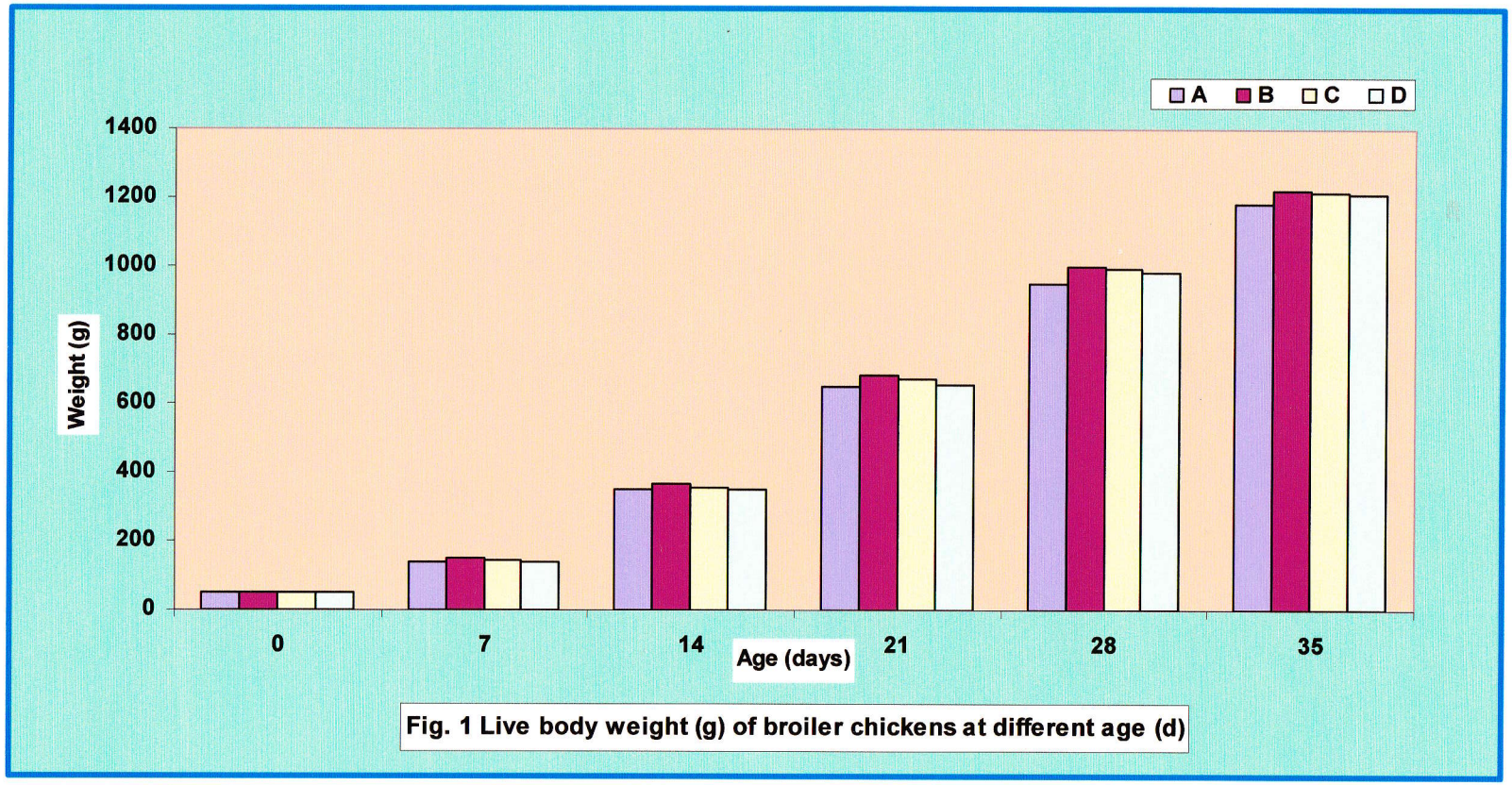

Fig. 1 Live body weight (g) of broiler chickens at different age (d)

antibiotic plus multivitamin treated group were significantly not differ than control group. However, the live body weights of birds were apparently higher irrespective of treatment groups compared to the birds from control group. At 7th day of age the live body weight was significantly ($P<0.05$) higher in birds received routine farm practice treatment as compare to control and antibiotic plus multivitamins injected groups.

The present findings are analogous with the findings of Magonigle *et al.* (1983) who studied subcutaneous injection of Oxytetracycline and vitamins in broiler chicks and observed the significant ($P<0.05$) difference in live body weight due to treatment at 7th and 14th days of age. Moreover he concluded that there were no significant differences in live body weight at 56 day of age.

At the age of 14th, 21st, 28th and 35th day the live body weight was significantly not differ among the treatment but the trend of higher live body weight was maintained till the termination of experiment. The birds received routine farm practice treatment had highest live body weight compared to other treatment groups. However, the control group showed the lowest live body weight.

In present study the live body weight of chick has significantly ($P<0.05$) affected in early (0-7 day) period of life but subsequently at the end of experiment (35th day) difference were no longer significant.

4.1.2 Gain in body weight

The mean body weight gain (g) were recorded at 7th, 14th, 21st, 28th and 35th day of age for different treatment groups and are presented in Table 4. The body weight gain is graphical depicted in Figure 2.

Table- 4: Live weight gains (g) of broiler chicken at different age (d).

Treatments	Days					
	7	14	21	28	35	0-35
Control (A)	91.60[b]	207.98	303.72	297.77	234.31	1135.37
Routine Farm Practice (B)	101.67[a]	215.74	320.18	314.33	224.39	1176.29
Gentamicin + Multivitamin (C)	94.61[b]	213.85	315.4	323.14	223.56	1170.55
Ceftiofur + Multivitamin (D)	94.36[b]	211.02	303.87	327.82	228.99	1166.04
SEM	1.392	3.323	4.22	7.877	8.906	6.34
P value	0.045	0.885	0.445	0.596	0.975	0.081
Significance	**P<0.05**	**NS**	**NS**	**NS**	**NS**	**NS**

SEM : Standard error for mean NS : Non significant (P>0.05)

[a,b] Values bearing different superscripts in column differ significantly (P<0.05)

The total gain in body weight during 35 days of experiment were 1135.365, 1176.285, 1170.545 and 1166.035 for birds from group A, B, C and D respectively. From the Table 4 it is evident that similar trend as that of live body weight has seen with respect to gain in body weight. The body weight gain of birds received antibiotic plus multivitamins injection were significantly (P<0.05) not differ than the birds received routine farm practice treatment and control groups. However the body weight gain of birds received routine farm practice as a treatment revealed numerically higher body weight gain than those of birds receiving antibiotic plus multivitamins injection at day old stage.

At 7 day of age body weight gain was found to be significantly (P<0.05) higher in routine farm practice treatment supplemented with antibiotics and commercial vitamins through drinking water. However, when overall period of study has considered, there has no significant difference in gain in body weight due to antibiotic and multivitamin treatment. Routine farm practice group had highest gain in body weight and other side control group recorded lowest gain in body weight.

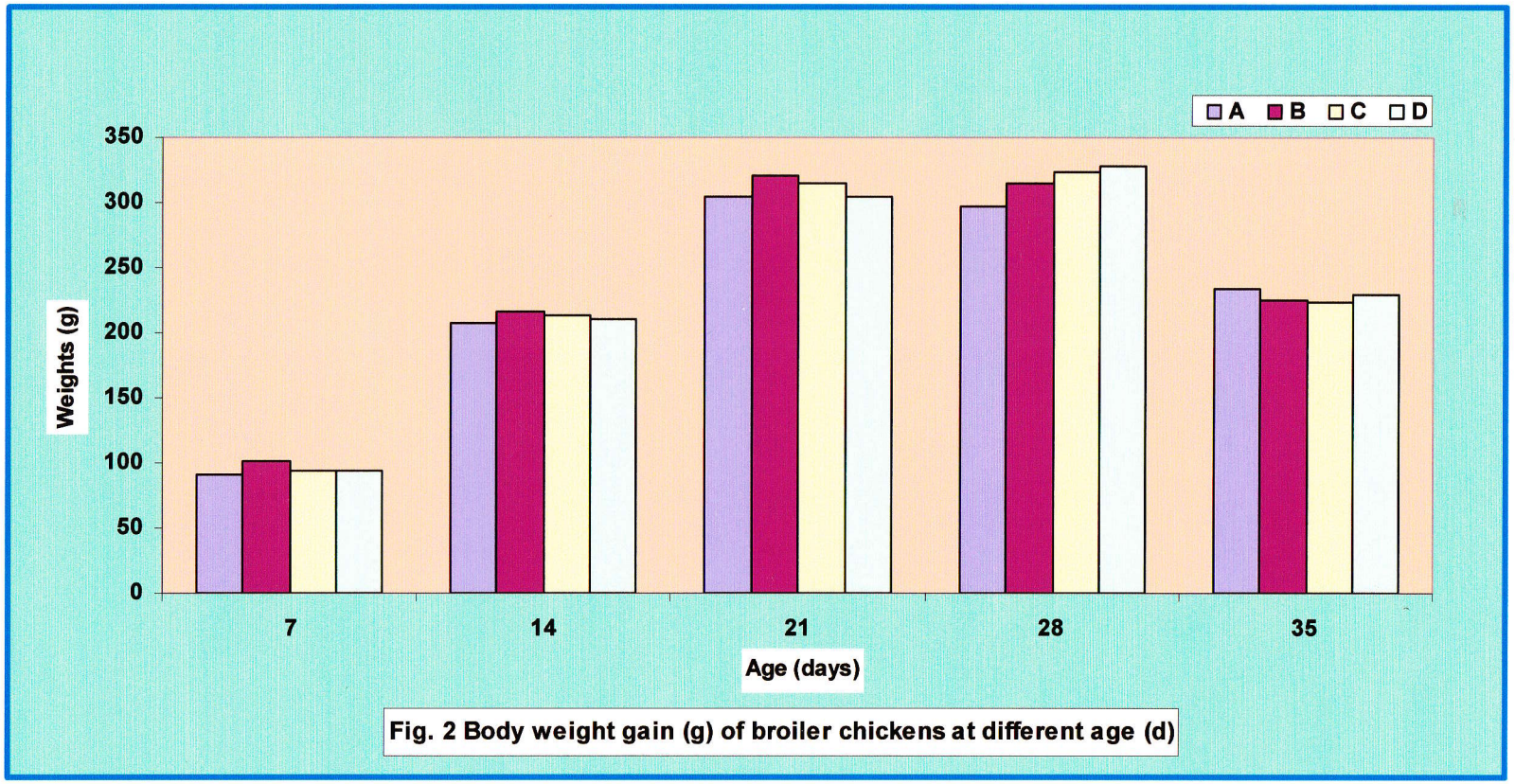

Fig. 2 Body weight gain (g) of broiler chickens at different age (d)

In accordance to present study Donaldson *et al.* (1995) found no significant effect on body weight when Gentamicin given at 1 or 10 mg/ poult. The results were in agreement with that of Vernimb (1976) who observed weight gains and feed efficiency in the groups treated with 0.2 mg Gentamicin were equal to or significantly (P<0.05-0.01) better than either 0.1mg Gentamicin or control. Similarly, Chaudhry *et al.* (2008) observed that treatment of birds with Excenel^{TM} (Ceftiofur sodium) did not adversely affect the body weight gains of the birds. The weight gains of the ExcenelTM treated birds were numerically higher than those of non treated birds throughout the study period at different ages. Where as Samara (2003) found significantly (P<0.05) different weight gain at 7 days of age in group supplemented with chlortetracycline at dose rate of 0.5g/liter for seven days.

In contrast to present study Samara (2003) recorded significant (P<0.05) effect on body weight due to chlortetracycline (0.5g/liter/day) dose for course of 7 to 10 days of early life of chicks at 21 day of age.

From present study it revealed that the birds receiving Gentamicin plus multivitamins and routine farm practice were shown higher body weight gain compare to control group.

4.1.3 Feed consumption

The feed intake (g/bird) emanated at 7th, 14th, 21st, 28th and 35th day of age for different treatment are given in Table 5 and the same is graphically shown in Figure 3.

It was observed from the data that the total feed consumption at 35th day were 2074.87, 2031.01, 2057.84 and 2078.72g in Group A, B C, and D respectively. The feed intake was not differed significantly (P>0.05) due to any treatment throughout the experimental period (0-35day). Comparatively higher feed

Table- 5: Feed consumption (g/bird) of broiler chicken at different age (d).

Treatments	Days					
	7	14	21	28	35	0-35
Control (A)	128.75	336.77	535.26	594.93	479.17	2074.87
Routine Farm Practice (B)	136.32	343.19	550.01	586.63	414.89	2031.01
Gentamicin + Multivitamin (C)	132.06	341.82	540.44	617.37	426.17	2057.84
Ceftiofur + Multivitamin (D)	131.24	336.44	523.31	627.91	459.83	2078.72
SEM	1.579	4.49	5.419	9.895	10.22	12.002
P value	0.42	0.944	0.395	0.455	0.079	0.529
Significance	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

SEM : Standard error for mean NS : Non significant (P>0.05)

consumption was recorded in Ceftiofur plus multivitamins (D) group, whereas lowest feed consumption was recorded in routine farm practice (B) during study period. Environmental temperature plays an important role in feed consumption of birds.

In present study, the temperature ranged from 28.5 °C (min) to 47.4 °C (max). However, in last week (28-35day) of experimental study feed consumption was lowered due to environmental temperature and restricted feeding during afternoon part of day.

Feed intake did not influence due to 0.2mg Gentamicin at day old stage in earlier study (Vernimb, 1976). Scanty information is available on the influence of subcutaneous injection of antibiotic (Gentamicin/Ceftiofur) on feed consumption. Therefore, it may concluded that feed consumption of birds did not differed irrespective of any treatment.

4.1.4 Feed conversion ratio (FCR):

The weekly feed conversion ratio (FCR) in term of feed intake per unit gain in weight for birds from different treatment groups are presented in Table 6. The same data are also presented graphically in Figure 4.

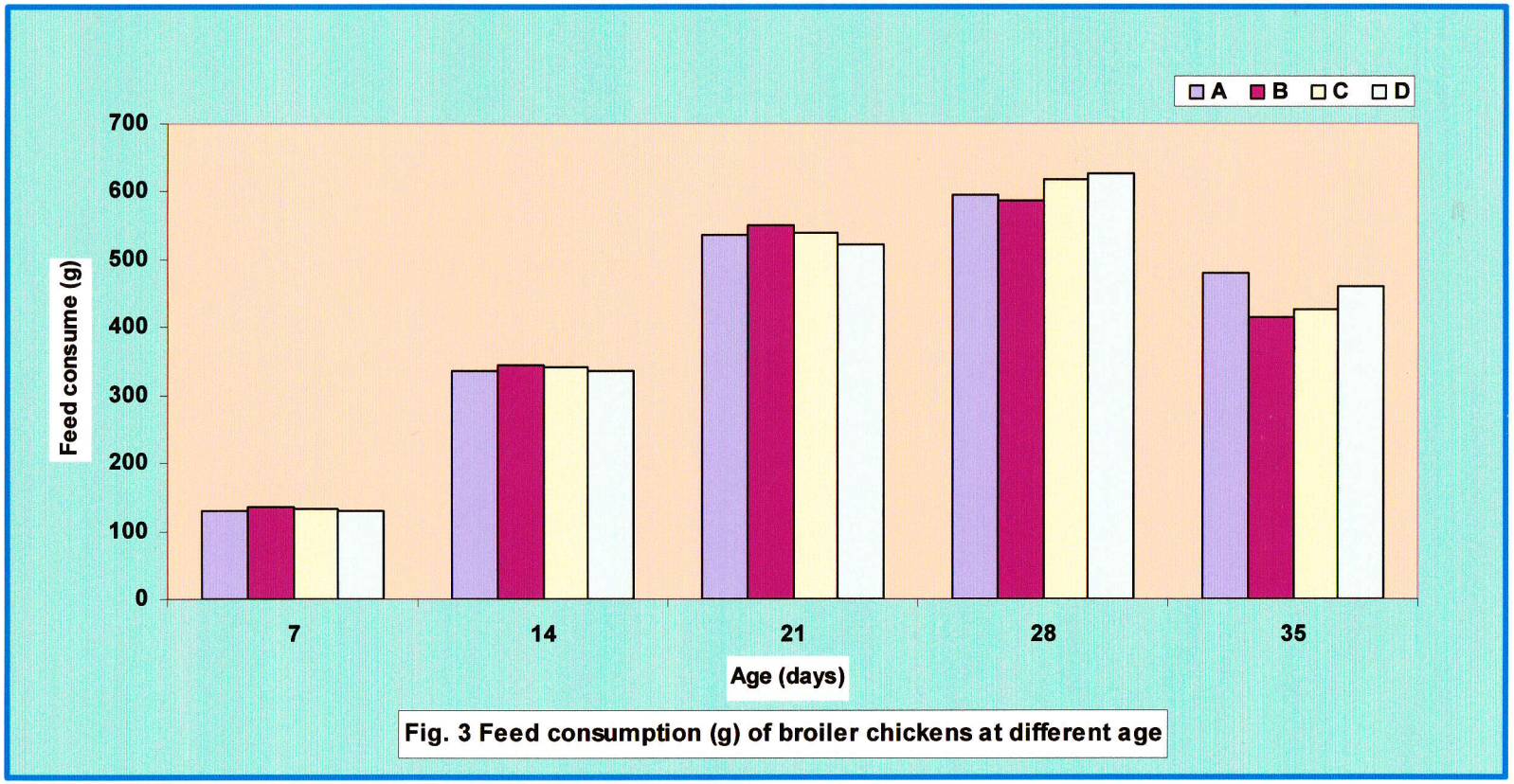

Fig. 3 Feed consumption (g) of broiler chickens at different age

Table- 6: Feed conversion ratio of broiler chicken at different age (d).

Treatments	Days					
	7	14	21	28	35	0-35
Control (A)	1.41	1.61	1.77	2.01	2.12	1.82
Routine Farm Practice (B)	1.35	1.6	1.72	1.86	1.89	1.72
Gentamicin + Multivitamin (C)	1.4	1.59	1.71	1.91	1.92	1.76
Ceftiofur + Multivitamin (D)	1.39	1.61	1.72	1.92	2.01	1.79
SEM	0.02	0.03	0.012	0.031	0.074	0.014
P value	0.668	0.994	0.46	0.404	0.719	0.056
Significance	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

SEM : Standard error for mean NS : Non significant (P>0.05)

It is studied from the Table 6 that feed conversion ratio (0-35day) for group A, B, C, and D were 1.82, 1.72, 1.76 and 1.79 respectively. The FCR calculated for 0-35days of age were significantly not differ due to antibiotic plus multivitamin injection or routine farm practice group. Better FCR has obtained in routine farm practice group from early stage of life, which were maintained till the last days of the experimental period. The birds from control group recorded poorest FCR among all the groups considering the span of experimental period (0-35day). The present experimental study is analogous with the results obtained by Samara (2003) who stated that FCR did not affected by Oxytetracycline (5g/liter) for first seven day treatment. However, it has numerically improved due to preventive antibiotic dose. There was a considerable (P<0.05-0.01) improvement in feed efficiency in groups treated with 0.2mg Gentamicin (Vernimb 1976) which was in contrast to present study.

It is revealed that different treatment had no significant effect on feed conversion ratio of birds. However, there has numerically lower FCR in antibiotic plus multivitamin treated groups. Thus it concluded that antibiotic plus multivitamins treatment has useful for improvement in feed conversion ratio of birds.

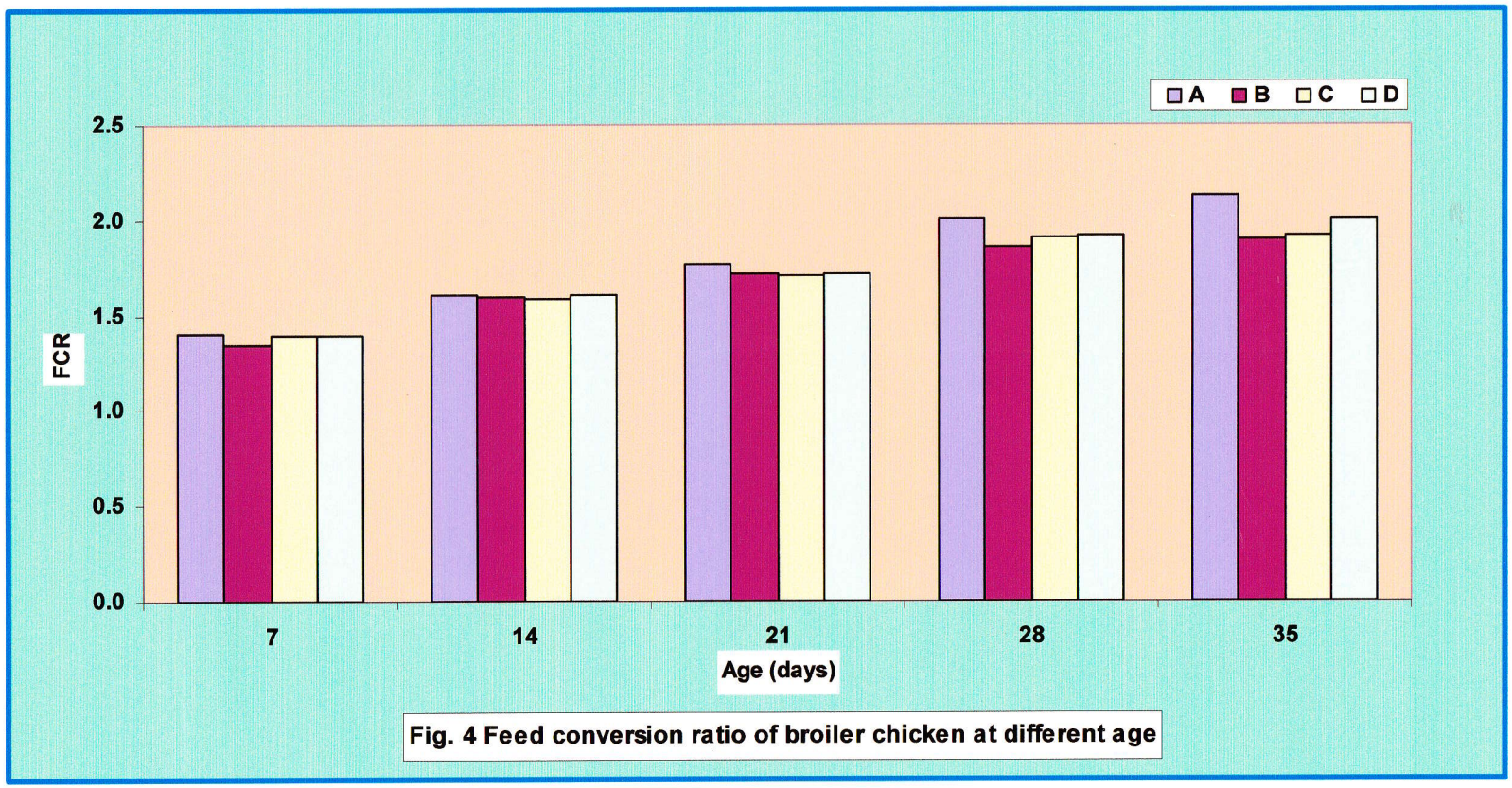

Fig. 4 Feed conversion ratio of broiler chicken at different age

4.2 Digestive and lymphoid organ weight

Table- 7: Digestive and lymphoid organ weight (% live weight) of birds at 21 day of age.

Treatments	Organ weights %				
	Proventriculus	Gizzard	Liver	Spleen	Bursa
Control (A)	0.50	2.88	2.71	0.13	0.10
Routine Farm Practice (B)	0.57	2.89	2.66	0.14	0.11
Gentamicin + Multivitamin (C)	0.47	2.95	2.90	0.10	0.18
Ceftiofur + Multivitamin (D)	0.48	2.74	2.40	0.13	0.16
SEM	0.017	0.074	0.081	0.006	0.02
P value	0.100	0.815	0.196	0.573	0.532
Significance	NS	NS	NS	NS	NS

SEM : Standard error for mean NS : Non significant (P>0.05)

There was no significant (P>0.05) difference of digestive and lymphoid organ weight comparing un-injected control and treatment group at 21day of age (Table 7). However, the relative weight of gizzard, liver and bursa was comparatively higher in Gentamicin plus multivitamins injected group. Irrespective of treatment all the birds reared with antibiotic plus multivitamins treatment and in routine farm practice group had higher digestive and lymphoid organ weight. The birds received Gentamicin plus multivitamin recorded highest weight of liver as compared to its counterpart and control group.

Chaudhry *et al.* (2008) observed that Excenel^{TM} (Ceftiofur sodium) did not have adverse effects on the thymus, spleen and the bursa of fabricius in broilers and the weight of these organs in drug treated birds were comparable with the vaccinated untreated control group.

It may concluded that the birds received Gentamicin plus multivitamins injection at day old age may help in development of gizzard, liver and bursa for better digestive and immunological status of bird.

4.3 Bacteriological study

Table- 8: Bacterial count (cfu/g) of broiler chickens intestine at 21 day of age.

Treatments	TVC	Coliform	E. coli
Control (A)	8.90^{a}	8.70^{a}	8.65^{a}
Routine Farm Practice (B)	8.40^{b}	8.36^{ab}	8.23^{ab}
Gentamicin + Multivitamin (C)	8.04^{b}	7.83^{b}	7.74^{b}
Ceftiofur + Multivitamin (D)	8.14^{b}	8.09^{b}	8.07^{b}
SEM	0.098	0.114	0.111
P value	0.003	0.032	0.021
Significance	**P<0.01**	**P<0.05**	**P<0.05**

SEM : Standard error for mean

^{a,b} Values bearing different superscripts in the column differ significantly

4.3.1 Total viable count of intestinal content

The values for total viable count (TVC) of ileo-caecal content of group A, B, C and D were 8.90, 8.40, 8.04 and 8.14 respectively. It is observed that TVC values were significantly (P<0.01) decreased by treatment compare to control group. The birds received Gentamicin plus multivitamins showed best effect (8.04) of treatment compare to its counterpart and control group. Values revealed from (Table 8 and Figure 5) showed routine farm practice group and birds received antibiotic plus multivitamin were significantly (P<0.05) not differed among themselves.

The inhibitory effect of antibiotic plus multivitamin on intestinal microflora colonization reported in previous researches. Smulikowska *et al.* (2005) obtained decreasing of *clostridium* count in faeces with the antibiotic treatments. The diet fed with supplementation of salinomycin and zinc bacitracin alone or in combination resulted in significant decrease in *Clostridium perfringenes* (Engberg *et al.*, 2000).

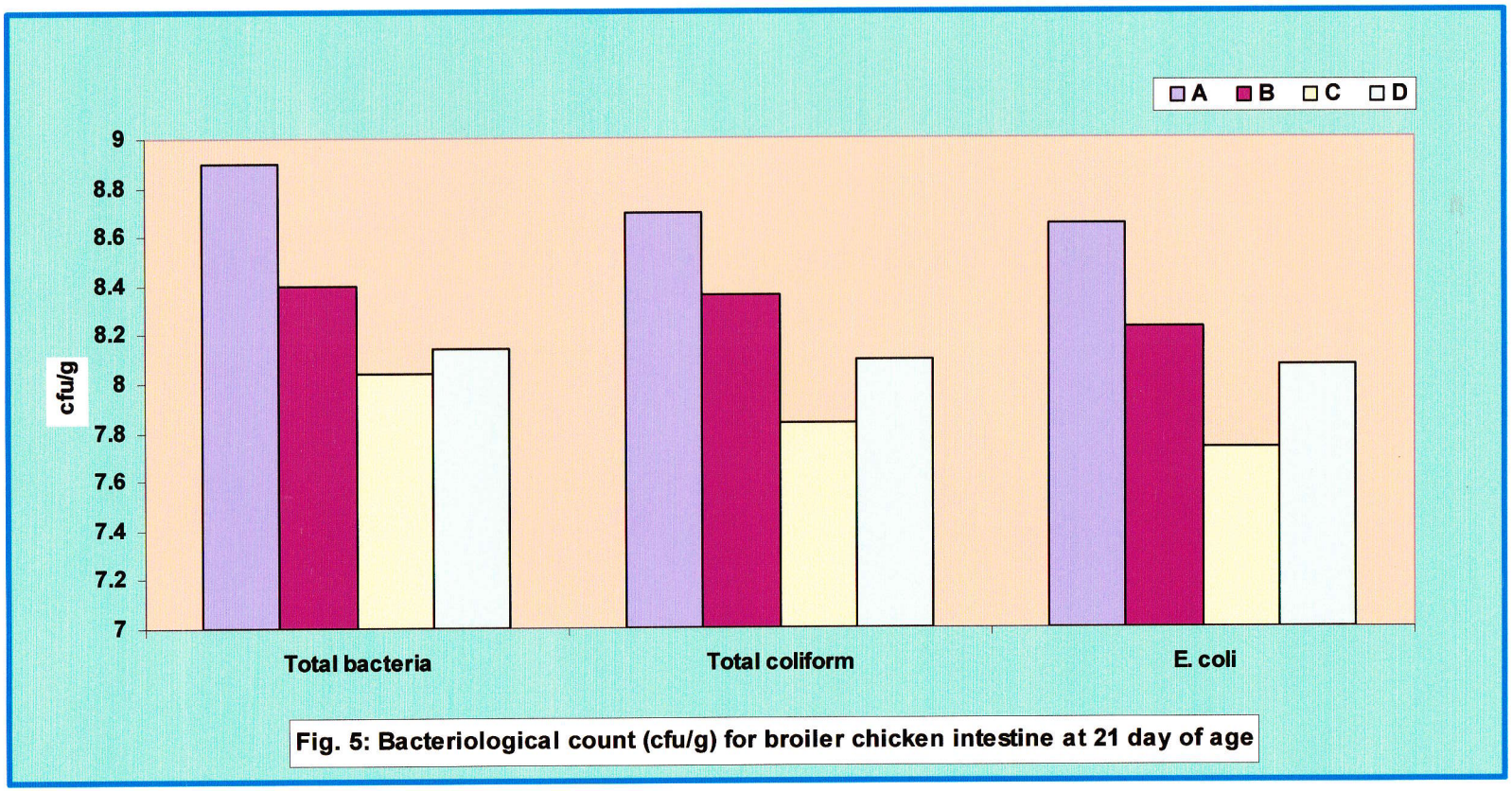

Fig. 5: Bacteriological count (cfu/g) for broiler chicken intestine at 21 day of age

It may conclude that the antibiotic (Gentamicin & Ceftiofur) plus multivitamins treatment at early age of birds may help to reduce total viable count.

4.3.2 Total coliform and *E. coli* count

The total coliform and *E. coli.* count of ileo-caecal content of Gentamicin (C) and Ceftiofur (D) received birds were significantly ($P<0.05$) decreased than control (8.70 & 8.65) group. The coliform and *E. coli.* count of birds received routine farm practice were comparable non significant ($P>0.05$) with control and antibiotic plus multivitamin injected groups. The birds received injection of Gentamicin plus multivitamin were showed lowest values for coliform and *E. coli.* count (7.83 and 7.74) irrespective of treatment.

The scanty information is available on the influence of antibiotic plus multivitamins on coliform and *E. coli.* count of ileo-caecal content of birds. Bailey and Line (2001) observed cumulative beneficial effect of Gentamicin and the MSC (Mucosal Starter Culture) on reduction of salmonella, which enters the chick on the day of hatch.

The study of *E. coli.* and coliform count revealed that Gentamicin plus multivitamin had a significant effect on coliform and *E. coli.* count which ultimately affect the health status of birds.

4.4 Humoral immune response for NCD virus

Though there were no significant difference ($P>0.05$) in HI titer in control and treatment group. However, the HI titer were comparatively higher in Gentamicin plus multivitamins and Ceftiofur plus multivitamins injected birds (Table 9). HI titer were lower in birds received routine farm practice treatment than Gentamicin plus multivitamins and Ceftiofur plus multivitamins injected birds.

In contrary Chaudhry *et al.* (2008) recorded significantly ($P<0.05$) higher titer of antibodies for birds treated with Excenel ^{TM} (Ceftiofur sodium) than that

of immuno-compromised birds and the titers of the untreated vaccinated control group.

It may concluded that injection of antibiotic (Gentamicin and ceftiofur) with supplementation of multivitamins boost the immune status of birds and had no negative effect of immunity.

Table- : 9 Haemaglutination inhibition (HI) titer to different treatments group at 21 day of age

Treatments	HI titer
Control (A)	160
Routine Farm Practice (B)	192
Gentamicin + Multivitamin (C)	256
Ceftiofur + Multivitamin (D)	256
SEM	17.507
P value	0.128
Significance	NS

SEM : Standard error for mean NS : Non significant (P>0.05)

4.5 Mortality record

The incidences of mortality during the entire experimental period are presented in Table 10.

Table- 10: Weekly mortality in different treatment groups.

Treatments	Days				
	7	14	21	28	35
Control (A)	4(6.67)	1(1.67)	0	0	5(8.33)
Routine Farm Practice (B)	1(1.67)	1(1.67)	0	2(3.33)	5(8.33)
Gentamicin + Multivitamin (C)	1(1.67)	0	0	1(1.67)	5 (8.33)
Ceftiofur + Multivitamin (D)	1(1.67)	0	0	1(1.67)	5(8.33)
Total (%)	7(2.92)	2(0.83)	0	4(1.67)	20(8.33)

Figures in the parenthesis denote % chick mortality

The revealed data indicate that the mortality percentage (6.67%) were higher in control group during the first week of study period. However, the mortality percentages were well within limit for treatment groups. The post mortem examination revealed that the mortality was due to omphalitis and *E. coli*.

In accordance with present study Vernimb (1976) observed significantly ($P<0.05$-0.01) less mortality in Gentamicin injected White Leghorn chickens till 14 days of age.

The incidence of mortality was more during last week (28-35day) of experiment. The post mortem examination showed the heat stress has the cause of death. The temperature during last week of experiment touched to 47.5 °C.

It is concluded that the subcutaneous injection of antibiotic and multivitamins give better health status to chicks and had no ill effect on birds health.

4.6 Economics

Table- : 11 Overall performance and Economics of broilers experiment (0-35day).

	Particulars	A	B	C	D
1	Chick cost (Rs.)	18	18	18	18
2	Cost of antibiotic and Multivitamins (Rs./bird)	0.00	0.38	0.45	0.25
3	Feed Cost (Rs./Kg)	17.85	17.85	17.85	17.85
4	Miscellaneous cost (Rs.) Litter, vaccine etc.	2.5	2.5	2.5	2.5
5	FCR	1.82	1.72	1.76	1.79
6	Total feed consumed (g/bird)	2075	2031	2058	2079
7	Final Body Weight (g)	1184	1224	1219	1213
8	Total Mortality	10	9	7	7
9	Total feed cost(Rs./bird)	37.04	36.25	36.74	37.11
10	Production cost(Rs./kg)	48.60	46.37	46.95	47.49
11	Total Selling price (Rs./kg body weight)	55	55	55	55
12	Net profit (Rs./Kg body weight)	6.40	8.63	8.05	7.50

The overall performance and calculated economics are presented in Table 11. The overall result of the experiment indicated beneficial effect of antibiotic

(Gentamicin and Ceftiofur) plus multivitamins injection on growth performance and feed conversion ratio. However the birds received routine farm practice treatment showed highest live body weight and maximum net profit compare to control and antibiotic plus multivitamins injected group. Feed conversion ratio of the birds received routine farm practice had best among all the treatment and control group. Considering the health status of flock, mortality recorded in Gentamicin plus multivitamins group was lowest compare to its counterpart as well as control group. Overall result indicated that Gentamicin plus multivitamins injection at day old stage give better start in the early chick life, which represent in term of better health till market age. However, routine farm practice gives better growth performance and net returns.

SUMMARY AND CONCLUSIONS

Incubation, hatching and hatchery processing can be a primary source of pathogen exposure for the chicks, and this exposure can lead to early chick mortality. Whereas, the newly hatched chick is very susceptible to *salmonella* and *E. coli* infections, but as the chick ages through five day post hatch its resistance increases. Increasing resistant to bacterial infections could be attributed to development of immune system. Therefore to protect the chicks in early life, the present study was conducted to assess the effect of antibiotic and multivitamins administration at day old stage on growth performance, gut health status and immune response.

The study was conducted on 240 broiler chicks. On the first day of hatch the day old chicks were distributed in four treatments namely A, B, C and D consisting sixty chicks in each group. The chicks of group A were kept as un-injected control (not receiving any injection). The chicks of group B reared as sham control receiving antibiotic (Neomycin and Doxycycline) and commercial vitamins supplement through drinking water from first five days as routine farm practice followed at commercial broiler farm. The group C and D were injected (s/c) with Gentamicin plus multivitamins and Ceftiofur plus multivitamins, respectively at day old stage at hatchery level with dose 0.2 mg/chick.

The experiment has conducted for five weeks during the month of April–May. The parameters studied during research trial were live body weight, weight gain, feed intake and feed conversion ratio. The digestive organ weight, gut bacteriological study and immunological status (HI titer) of birds were observed on 21st day of experiment. Mortality was recorded as when occurred.

The observations of weekly live body weight at the end of 35th day were 1183.94, 1224.00, 1218.70 and 1213.34 g for group A, B, C, and D. The birds received routine farm practice with antibiotics and commercial vitamins through drinking water for first five days supported better live body weight at the end of experiment followed by Gentamicin plus multivitamins and Ceftiofur plus multivitamins injected (s/c) group at dose of 0.2mg at day old stage.

The total gain in body weight at the end (35) of experiment were 1135.37, 1176.29, 1170.55 and 1166.04 g for birds from group A, B, C and D respectively. The body weight gain of birds received antibiotic plus multivitamins injection were significantly ($P>0.05$) not differ than the birds received routine farm practice treatment and un-injected control groups. However the body weight gain of birds received routine farm practice as a treatment revealed numerically higher body weight gain than those of birds received antibiotic plus multivitamins injection at day old stage. At 7 day of age body weight gain was found to be significantly ($P<0.05$) higher in routine farm practice treatment supplemented with antibiotics and commercial vitamins through drinking water. However, when overall period of study was considered, there was no significant difference in gain in body weight in all groups. The birds of routine farm practice group had highest gain in body weight.

There has no significant ($P>0.05$) difference found in treatments throughout the study in respect to feed consumption. The total feed consumption at 35^{th} day was lowest for routine farm practice treatment group.

The feed conversion ratio for group A, B, C, and D were 1.82, 1.72, 1.76 and 1.79 respectively. The calculated FCR were significantly ($P>0.05$) not differ due to antibiotic plus multivitamin injection or routine farm practice group. Better FCR was obtained in routine farm practice group from early stage of life, which were maintained till the last days of the experimental period.

There was no significant ($P>0.05$) difference in of digestive and lymphoid organ weight comparing un-injected control and treatment group at 21day of age. However, the relative weight of gizzard, liver and bursa was comparatively higher in Gentamicin plus multivitamins injected group.

The mortality percentages were higher in control group (6.67%) during the first week of experimental period. However, the mortality percentages were well within limit for treatment groups. The post mortem examination revealed that the mortality was due to omphalitis and *E. coli.* infection.

The count of total bacteria were affected significantly ($P<0.01$) by antibiotic (Gentamicin and Ceftiofur) plus multivitamins treatments. Antibiotic plus multivitamins injection at day old stage in broilers decreased significantly ($P<0.05$) ileo-caecal total bacteria counts at 21^{st} day as compare to the un-injected control group.

The total coliform bacterial count from ileo-caecal content at 21th day of age was found to be significantly ($P<0.05$) lower in birds receiving Gentamicin plus multivitamins and Ceftiofur plus multivitamins at day old stage than the un-injected control group. Whereas, there was no significant difference found within the treatments group B, C and D.

The E. *coli.* count from ileo-caecal content were affected by antibiotic plus multivitamins treatments significantly at 5 % level. The Gentamicin plus multivitamins treated birds revealed 7.74 Log_{10}cfu/g, which was significantly lowest than un-injected control group. However, the un-injected control group showed highest *E. coli.* count (8.65 cfu/g).

The HI titer for NCDV at 21 day of age from routine farm practice group and antibiotic plus multivitamin treated group were significantly not differ than un-injected control group. However, the bird treated with antibiotics (Gentamicin and Ceftiofur) plus multivitamins shows numerically higher HI titers than that of un-injected control birds.

The overall result of the experiment indicated beneficial effect of antibiotic (Gentamicin and Ceftiofur) plus multivitamins injection on growth performance and feed conversion ratio. However the birds received routine farm practice treatment showed highest live body weight and maximum net profit compare to control and antibiotic plus multivitamins injected group. Gentamicin plus multivitamins injection at day old stage give better start in the early chick life, which represent in term of better health till market age. However, routine farm practice gives better growth performance and net returns.

Conclusion

The results and discussion led to conclude that

1. The routine farm practice (Neomycin plus Doxycycline through drinking water) is best treatment to achieve highest body weight gain and best feed conversion ratio.
2. The Gentamicin (0.2mg/chick) plus multivitamins s/c injection at day old stage gave better health status in early stage of chick life.
3. The Ceftiofur (0.2mg/chicks) plus multivitamins s/c injection at day old stage may help for immunity in chick life.
4. The antibiotic (Gentamicin and Ceftiofur) plus multivitamin help in gut condition by reducing pathogenic (*E. coli.*) bacterial count.

Future Scope:

1. Optimizing the performance of other potential antibiotics and nutrients for enhancement of early growth of chick.
2. Establishment of specific nutrient injection which will help the bird in term of growth and health status.

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VITA

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THESIS ABSTRACT

a)	Title of the thesis	:	**"EFFECT OF ANTIBIOTIC AND MULTIVITAMINS ADMINISTRATION AT DAY OLD STAGE ON GROWTH PERFORMANCE OF BROILERS"**
b)	Full name of student	:	**Mangesh Kailash Mendhe**
c)	Name and Address of Major Advisor	:	**Dr. M. M. Kadam** Assistant Professor, Department of Poultry Science, Nagpur Veterinary College, Seminary hills, Nagpur.
d)	Degree to be awarded	:	**Master of Veterinary Science**
e)	Year of award of degree	:	**2009**
f)	Major Subject	:	**Poultry Science**
g)	Total number of pages in the thesis	:	**36**
h)	Number of words in the abstract	:	**466**
i)	Signature of student	:	
j)	Signature, Name and address of forwarding authority	:	**(Dr. B. P. Dandge)** Associate Dean Nagpur Veterinary College, Nagpur

ABSTRACT

The present study was undertaken to study the effect of antibiotic and multivitamin administration at day old stage on growth performance of broilers. The experimental trial was conducted on 240 broilers for a period of 35 days. The chicks

were belonging to single hatch. These chicks were weighed individually and distributed into four equal treatments viz. A, B, C and D. Each treatment contained sixty chicks with four replicates having fifteen birds each.

The chicks of group A were kept as un-injected control (not receiving any injection). The chicks of group B reared as sham control receiving antibiotic (Neomycin and Doxycycline) and commercial vitamins supplement through drinking water from first five days as routine farm practice followed at commercial broiler farm. The group C and D were injected (s/c) with Gentamicin plus multivitamins and Ceftiofur plus multivitamins at day old stage at hatchery level with dose 0.2 mg/chick, respectively. Growth performance, immunological and bacteriological parameter were studied.

The live body weight at the end of 35th day were 1183.94, 1223.99, 1218.70 and 1213.34 g for group A, B, C, and D. The live body weight of treatments were significantly not differ than control group. The live body weight of birds were apparently higher irrespective of treatment groups compared to the birds from control group. When overall period of study has considered, there was no significant difference in body weight gain among all the treatment. The feed intake was not differed significantly ($P>0.05$) due to any treatment throughout the experimental period.

The FCR calculated for 0-35days of age were significantly ($P>0.05$) not differ due to antibiotic plus multivitamin injection or routine farm practice group. However, there has lowest FCR recorded in bird received routine farm practice.

There was no significant ($P>0.05$) difference in the weight of digestive and lymphoid organ weight compare to un-injected control and treatment group at 21day of age.

The total viable bacterial count of ileo-caecal content of experimental broilers from different treatment groups at 21 day of age revealed 8.90, 8.40, 8.04 and 8.14 Log_{10} cfu/g values in A, B, C, and D group respectively. The result indicated significantly ($P<0.01$) lower total bacteria count in antibiotic plus multivitamins treatment groups. The total coliform and E. coli count from caecal content at 21th day

of age was found to be significantly ($P<0.05$) lower in birds receiving antibiotic (Gentamicin and Ceftiofur) plus multivitamins than the un-injected control.

The mortality (6.67%) was higher in control group during the first week of study period. However, the mortality percentages were well within limit for treatment groups. The antibiotic plus multivitamins injected birds showed higher antibody titers (NCDV) compare routine farm practice.

The economics of broiler production in present study indicates higher net profit of Rs.8.63 was recorded in routine farm practice supplemented with antibiotic plus commercial multivitamins.

प्रबंध सारांश

क)	प्रंबध शिर्षक	:	एक दिवस वय असलेल्या मांसल कोंबडीच्या पिल्लांना प्रतिजैविके व जिवनसत्वे देऊन त्यांच्या वाढीवर होणाऱ्या परिणामांचा अभ्यास
ख)	विद्यार्थ्यांचे संपुर्ण नाव	:	मंगेश कैलाश मेंढे
ग)	मुख्य मार्गदर्शकाचे संपुर्ण नाव आणि पत्ता	:	डॉ. एम.एम. कदम सहाय्यक प्राध्यापक कुक्कुटपालन शास्त्र विभाग, नागपूर पशुवैद्यक महाविद्यालय, नागपूर–६.
घ)	प्रदान करण्यात येणारी पदवी	:	मास्टर ऑफ व्हेटरनरी सायन्स
च)	पदवी प्रदान वर्ष	:	२००९
छ)	मुख्य विषय	:	कुक्कुटपालन शास्त्र
ज)	प्रबंधातील एकुण पृष्ठ	:	३६
झ)	सारांशातील एकुण शब्द	:	४४२
त)	विद्यार्थ्यांची सही	:	
थ)	शोधप्रबंधक पूढे पाठवीणाऱ्या अधिकाऱ्याची सही नाव व पत्ता	:	(डॉ. भ.पं. दांडगे) सहयोगी अधिष्ठाता नागपूर पशुवैद्यक महाविद्यालय, नागपूर

सारांश

एक दिवस वय असलेल्या मांसल कोंबडीच्या पिल्लांना प्रतिजैविके आणि जिवनसत्वे देऊन त्याच्या वाढीवर होणाऱ्या परिणामांचा अभ्यास करण्यासाठी हा प्रयोग घेण्यात आला. वरील प्रयोग पस्तीस दिवसापर्यंत घेण्यात आला. एक दिवसीय वयाची दोनशे चाळीस मांसल कोंबडयाची पिल्ले अथर्वराज व्यावसायिक केंद्र, वर्धा येथून खरेदी करण्यात आली. हया पिल्लांचे व्यक्तिगतरित्या वजन घेऊन त्यांची अ,ब,क,ड प्रमाणे चार गटात विभागणी केली, प्रत्येक गटातील चार उपगटात प्रत्येकी पंधराप्रमाणे साठ पक्षी विभागण्यात आले.

अंडी उबवणी केंद्रात एक दिवस वय असलेल्या क व ड गटातील पिल्लांना मानेत त्वचेखाली प्रत्येकी प्रतिजैविके जेंटामायसीन व जिवनसत्वे आणि सेप्टीओफर व जिवनसत्वे देण्यात आली. ब गटातील पिलांना प्रतिजैविके निओमायसीन व डॉक्सीसायक्लीन आणि जिवनसत्वे सलग पाच दिवस पाण्याद्वारे देण्यात आली. अ गट नियंत्रित गट असल्यामूळे त्यात अशाप्रकारचे कुठलेही औषधे देण्यात आली नाही. या प्रयोगात कोंबडयाच्या वाढीची क्षमता, रोगप्रतिकारकक्षमता आणि जिवाणूविरोधी क्षमता या घटाकांचा अभ्यास करण्यात आला.

प्रयोगाच्या पस्तीसाव्या दिवसाअंती अ,ब,क,ड गटातील पक्षांचे शारिरिक वजन अनुक्रमे ११८३.९४, १२२३.९९, १२१८.७० व १२१३.३४ ग्राम असे होते. औषध दिलेल्या गटातील पक्षांचे वजन व नियंत्रित गटातील पक्षांचे वजन यात विशेष फरक दिसून आला नाही. तरीसुध्दा प्रयोगाच्या सातव्या दिवशी ब गटातील पक्षांचे सरासरी वजन नियंत्रित आणि प्रतिजैविके व जिवनसत्वे टोचण्यात आलेल्या गटातील पक्ष्यांच्या सरासरी वजनाच्या तुलनेत परिणामकारकरित्या जास्त आढळून आले.

प्रयोगाच्या सातव्या दिवशी पाण्याद्वारे औषध दिलेल्या ब गटात शारिरिक वजनातील वाढ परिणामकारकरित्या होती. तरी प्रयोगातील सर्वकश काळाचा विचार केल्यास विशेष फरक आढळला नाही. प्रयोगातील संपूर्णकाळात औषधीप्रयोग केलेल्या पक्षांच्या अन्नग्रहनावर परिणामकारकरित्या फरक आढळला नाही.

प्रयोगाच्या शुन्य ते पस्तीसाव्या दिवसाअंती पक्ष्यांची खाद्य रूपांतरण क्षमता काढली असता असे निदर्शनास आले की प्रतिजैविके व जिवनसत्वे टोचलेल्या किंवा पाण्याद्वारे औषधीप्रयोग केलेल्या गटामध्ये विशेषरित्या फरक आढळलेला नाही, तरीही प्रतिजैविके व जिवनसत्वे टोचलेल्या पक्ष्यांची खाद्य रूपांतरण क्षमता सांखिकदृष्टया कमी दिसून आली.

प्रयोगाच्या एकविसाव्या दिवशी नियंत्रित गटाच्या आणि औषधीप्रयोग केलेल्या गटातील पक्ष्यांच्या डायजेस्टीव व लिम्फॉईड अवयवाच्या वजनात परिणामकारकरित्या फरक आढळला नाही.

प्रयोगात एकविस दिवस वयाच्या मांसल कोंबडीच्या सिकम अवयवातील जिवंत जिवाणूचे प्रमाण अ,ब,क,ड या गटात अणूक्रमे ८.९०, ८.४०, ८.०४ व ८.१४ Log_{10}, cfu/g असे आढळून आले. या निकालाअंती असे लक्षात आले की प्रतिजैविके व जिवनसत्वांचा प्रयोग केलेल्या पक्ष्यांमध्ये जिवंत जिवाणूचे प्रमाण विशे ारित्या कमी दिसून आले. तसेच प्रयोगाच्या एकविसाव्या दिवशी क

आणि ड गटातील पक्षांच्या सिकम अवयवातील संपूर्ण कोलीफॉर्म जिवाणूचे आणि इ. कोलाय चे प्रमाण परिणामकारकरित्या नियंत्रित गटापेक्षा कमी दिसून आले.

सदर प्रयोगादरम्यान पहिल्या आठवडयात नियंत्रित गटात मृत्युदराचे प्रमाण ६.६७ टक्के एवढे आढळून आले तसेच औषधीप्रयोग केलेल्या गटात पक्षांचा मृत्युदर मर्यादित प्रमाणात दिसून आला. पक्षांचे शवविच्छेदन केले असता पक्षांचा मृत्यु ओमफायलायटीस व इ. कोलाय मूळे झाले असल्याचे दिसून आले.

प्रयोगाच्या एकविसाव्या दिवशी प्रतिजैविके व जिवनसत्वे दिलेल्या पक्षांमध्ये एन.सी.डी.व्ही. विषाणू विरूध्दचे एच.आय. टायटर परिणामकारकरित्या जास्त दिसून आले.

प्रयोगाचा अर्थशास्त्रीय दृष्टीकोणातून अभ्यास केला असता असे आढळून आले की पाण्याद्वारे प्रतिजैविके व जिवनसत्वे दिलेल्या ब गटातील प्रत्येक पक्षामागे ८.६३ रूपयांचा फायदा झाला, आणि हा फायदा क,ड व अ गटांमध्ये अनुक्रमे कमी होत गेल्याचे आढळून आले.