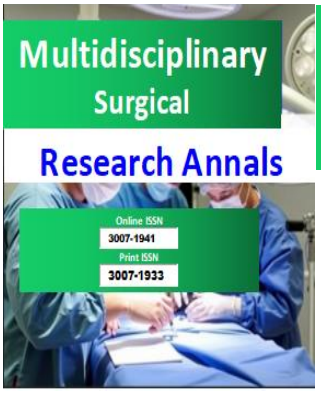

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Effect of Baker's Yeast on the Hematology, Serum Biochemistry and Growth Performance of Broilers

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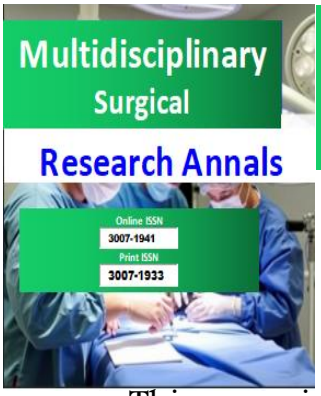
Abstract

The most important and major baker yeast is Saccharomyces cerevisiae, which is cheap and easily available source of B-complex, vitamins, amino acid and mineral. The mainobjectives of this study were to determine the effect of Saccharomyces cerevisiae on growth performance, weight gain, feed intake and feed conversion ratio in broiler. This experiment was conducted at experimental poultry farm of Faculty of Veterinary and Animal Sciences, Gomal University, D. I. Khan.



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Vol. 2 No. 4 (2024)

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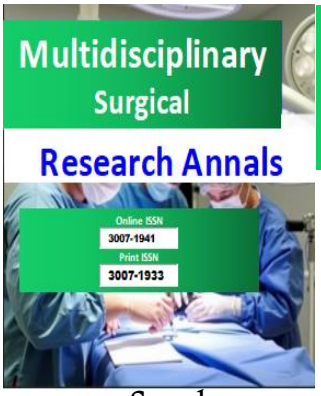
This experiment was performed on one fifty (n=150) broilers. The experiment design and all procedures were approved from animal ethical committee of Gomal University, D. I. Khan. The Saccharomyces cerevisiae contained 8×109 cfu/g. This SC was thoroughly mixed in the basal diet. Theexperimental chicks of all groups were fed with starter at first phase of study in which Saccharomyces cerevisiae was mixed @ rate of 0.5 gm/kg feed expect group A. However, from second phase of study, the Saccharomyces cerevisiae was mixed in feed: @ dose rate of 1.5 gm/kg feed in group B, 2 gm/kg feed in group C, 2.5 gm/kg feed in group D and 3 gm/kg feed in group E. However, the group A was kept as a control group with no addition of Saccharomyces cerevisiae in its feed. The parameters we studied in this experiment was body weight gain, feed intake, feed conversion ratio,hematological and biochemical parameters. The results showed that group E had gain significantly highest body weight (1776±62 gm/birds; P<0.001) as compared to other treatment and control groups throughout the research. The results showed that group E chicken had significant daily feed intake (P<0.001) as compared to other treatment and control groups during experimental trail, and the feed conversion ratio was improved after feeding



Multidisciplinary Surgical Research Annals
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Vol. 2 No. 4 (2024)

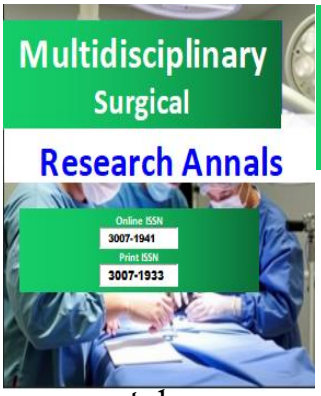
ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

Saccharomyces cerevisiae. The hematological values of RBCs, WBCs, HB level and MCV was significantly improved in group E as compared to other groups however ESR and PCV was non- significant between groups.

Key words: Poultry, Saccharomyces cerevisiae, Hematological parameters, Yeast,Biochemical parameters, weight gain, FCR

Introduction

The demand of food is increasing gradually worldwide due to a rise of human population globally. Therefore, the unprecedented rise of an animal population needed in the subtropical and tropical areas to fulfill the demand of food of human population. But unfortunately, this rise could not fulfill the demand of food for human consumption (WHO). So, for this purpose poultry production especially, broiler production is needed to fulfill the demand of foodglobally (Abdelrahman et al., 2013). Poultry industry is one of the largest sector in Pakistan as goat industry. This sector was first established in 1962 in our country to fulfill the protein demand of growing population. Poultry sector not only supply food and protein to human population but also income generating sector for the people of Pakistan (Adebiyi 2012). Poultry industry has



Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

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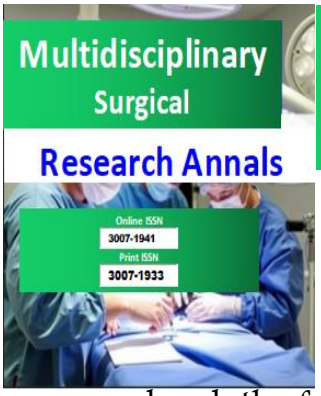
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

taken a special place globally because this industry is providing 27percent of the total meat production globally as well as in our country. Therefore, for the achievement of good meat production and quality from poultry industry especial managemental practices should be taken to decreasing the mortality and morbidity ratein this sector (Aluwong et al., 2012).

There are major concerns on broiler production such as high impact is the climatic change, which is serious issue for broiler production (Awais et al., 2019). Due to this climatic change, heat stress may be expected which affected the weight gain and production of broiler. The antioxidants and nutrient supplementation are mandatory to adjust this climatic change and heat stress (Bansal et al., 2011). The growth rate of broiler can be optimal by addition of manyproducts which neutralize the impact of harsh environment and the negative influence of seasonal change in broiler (Borchani et al., 2016). The commercial broiler birds have economical when it has high growth rate and good feed conversion ratio. Therefore, the desired factors are only be achieved provision of best poultry feed, antioxidants and probiotics that are balanced to the broiler feed and keep intestinal florahealthy to



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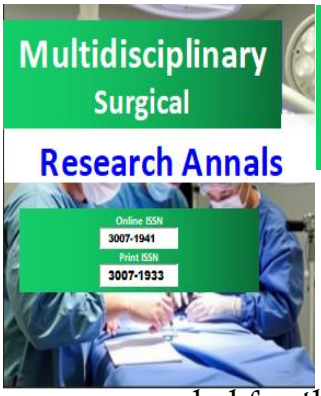
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

absorb the food nutrients (Chowdhury et al., 2005).

The successful and profitable poultry rearing is only achievable through correct formulation of good quality feed and its utilization. Due to economic crises during covid-19, the livestock and poultry feed prices are raised, there is scarcity of protein and energy availability for broilers. Due to this reason many scientists search alternative and cheaper protein and energy source for broilers (Churchil, al., 2002). There are many sources of conventional and non-conventionalfeeds for broiler worldwide such as rubber seed. Rubber seed can be a prominent non- conventional poultry source of feed in Bangladesh and other countries of the world. The total digestible nutrients are higher in rubber seed meal and cake than soybean mealand are major source of a protein additive (Churchil, et al., 2009). Rubber seed meal is the rich source of tryptophan and lysin, that make it a good consort with maize in poultry (El et al., 2016). Yeast are also used as a probiotic and fermenter, whichcan improve feed quality as well as enhance feed utilization in broiler. The most important and major baker yeast is Saccharomyces cerevisiae, which is cheap and easilyavailable source of B-complex, vitamins, amino acid and mineral. Especial attention is



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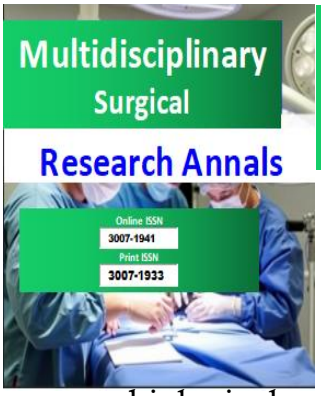
Journal Frequency: 4 Issue Per Year

needed for the preservation of feed from any type of toxins growth, such as Aflatoxins. In the early ages, the poultry industry was prevented from these toxins by the mean of absorbent-based which slightly remove the Aflatoxins from poultry feeds (Fazelnia et al., 2016). But unfortunately, the absorbenttechnique damages the nutrient ingredients and also affects the feed efficiency in broiler feed. The other methods which were used for the removal of Aflatoxin toxins is usage of biological chemicals which detoxify the Aflatoxin and minimum effect on nutritional ingredients and the nutritive value remain high (Gao et al., 2008) Feeding of Saccharomyces cerevisiae Improves the heave constituent's quality of meat in broilers and Lymphocyte numbers improve in yeast containing poultry diet. Saccharomyces cerevisiae improve the production of many compounds from biomass to this work through multi enzyme path way (Ghasemi et al., 2014).

Use of probiotic Saccharomyces cerevisiae improve the digestibility through effect on intestinal wall hence it increases the performance of the broilers (Kabir et al., 2004).). Saccharomyces cerevisiae as feed additive effect on the blood glucoses level and cholesterol in the body. The polymers of yeast β-glucans play role as



Multidisciplinary Surgical Research Annals
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Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

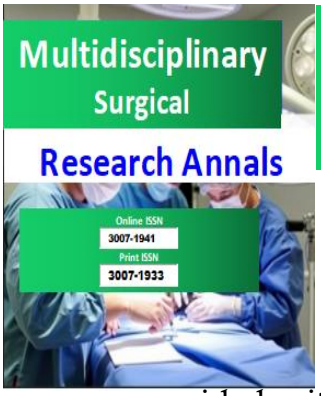
biological response modifiers and because of their The hematological and serum biochemical profile is enhanced by the supplementation of Saccharomyces cerevisiae, which indicate improved immunity in broilers.

Aim of the present study is the use of Saccharomyces cerevisiae yeast as a growth promotor to assess the different concentration of Saccharomyces cerevisiae on the growth performance of broilers to increase the production and decrease the morbidity and mortality rate economically and also for the availability of best alternate of antibiotics.

Materials and Methods

Experimental Animals and Management

This experiment was conducted at experimental poultry farm of Faculty of Veterinary and Animal Sciences, Gomal University, D. I. Khan. This experiment was performed on one fifty (n=150) broilers of Avian (SB chicks). The experiment design and all procedures were approved from animal ethical committee of Gomal University; D. I. Khan vide letter No:91/ERB/GU Dated:28/02/2023. This experiment was divided into two phases: the first phase was from day 1 to day 7 and the second phase was from day 8 to end of the experiment. In the first phase birds were



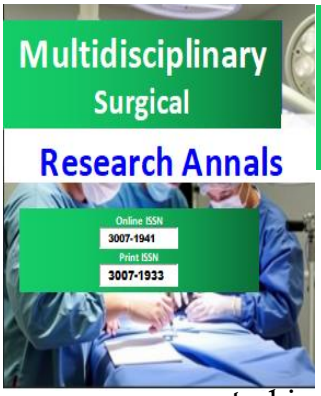
Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

provided with starter feed and in the second phase finisher feed to the experimental broilers. The feed of the experimental birds was formulated to fulfill the feed requirement of the broilers, and all feed was was provided in mash form Table 1. The 5 feeding pens were placed in each treatment groups for broiler feeding, and 30 broiler chickens per feeding pen with replicates. The poultry farm was cleaned at weekly intervals during the experimental procedure. The temperature of the farm was maintained at 28 C from first day till the end of the experiment. The humidity was maintained about 50-60% throughout the broilers rearing. The four automatic drinker nipples provided to each experimental group for freely access of water. The feed and drinking water were provided at ad-libitum to all experimental broiler chickens.

Preparation of Probiotics (Saccharomyces cerevisiae)

The dried Saccharomyces cerevisiae was used as a probiotic in this experiment. The Saccharomyces cerevisiae was purchased from SB Chick, Co. Ltd, Rawalpindi, Pakistan. The SC contained 8×109 cfu/g. This Saccharomyces cerevisiae was thoroughly mixed in the basal diet. The chemical composition of active yeast Saccharomyces cerevisiae is



Multidisciplinary Surgical Research Annals
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Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

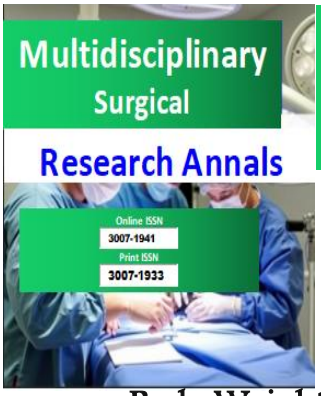
presented in table 2.

Experimental Design

This experiment was performed on one fifty (n=150) broilers chicks. All experimental chicks were divided into five different groups as follow: group A- E and n=30 broiler chicks in each group. The experimental chicks of all groups were fed with starter at firstphase of study in which Saccharomyces cerevisiae was mixed @ rate of 0.5 gm/kg feed expect group A. However, from second phase of study, the Saccharomyces cerevisiae was mixed in feed: @ dose rate of 1.5 gm/kg feed in group B, 2 gm/kg feed in groupC, 2.5 gm/kg feed in group D and 3 gm/kg feed in group E. However, the group A was kept as a control group with no addition of Saccharomyces cerevisiae in its feed. The chicks of each group were separated from each other by applying a small partition between them. The duration of the experiment was 35 days.

Sampling and Measurements Growth Performance

Each group was considered as experimental unit and growth performance of each unit was determined. There are following parameters were measured for growth performance: body weight gain, feed intake and feed conservation ratio.



Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

Body Weight Gain

The chicks of all experimental groups were weighted at day 0 (start of experiment) by the help of weighing balance. Then on weekly basis (0, 7, 14, 21, 28 and 35 days) the weight of the chicks was weighted, so total weight gain and daily weight gain were calculated.

Daily Body Weight Gain = $\frac{\text{Total weight gain in a week}}{\text{Days}}$

Feed Intake

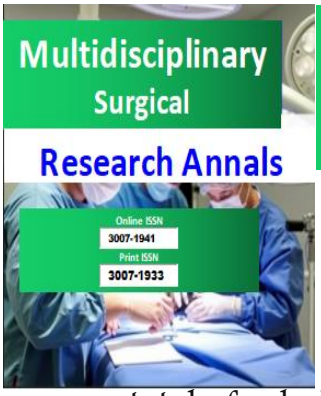
Weighing the feed when put into the feeder and again weighing the feed at the time of replacing with fresh feed. Then calculate the feed intake per time, on daily basis and total feed intake throughout the experiment.

Feed Intake = Fresh feed weight – Remaining feed weigsht

Daily Feed Intake = Total fresh feed weight in a day – Total remaining feed weight in a day.

Total Feed Intake during Experiment = Daily feed intake × Duration of experiment indays.

Feed Conversion Ratio: On weekly basis the weight of the chicks of each groupwas measured and weekly basis feed intake measured to calculate the FCR on weekly basis. Total weight gain of chicks was measured and



Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

total feed intake was measured to calculate the FCR of whole experiment.

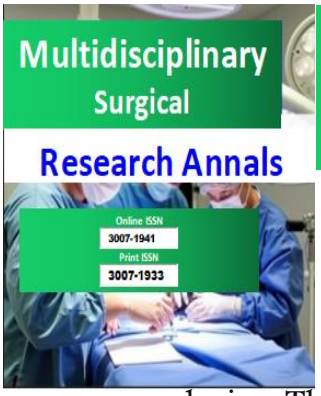
FCR on Weekly Basis = $\frac{\text{Total feed consumed by the flock of each group in a week}}{\text{Total weight gain in a week}}$

FCR at the End of Experiment = $\frac{\text{Total feed consumed by the flock of each group}}{\text{Total weight gain in an experiment}}$

Blood Collection and Measurements

The study was end after 35 days, blood was collected from wing vein by means of a 5ml sterile syringe 24-gauge needle from ten chickens per group randomly. For blood parameters the blood was preserved in EDTA anticoagulant screw top vacutainer and for biochemical analysis the blood was allowed to clot for serum collection for serum. The blood parameters like RBCs, lymphocytes, granulocytes, monocytes, HB, PCV, ESR and MCV was determined by using an automatic analyzer (Balio 0V360 France) for veterinary use in research lab of FVAS, Gomal University, D. I. Khan.

The samples were centrifuged at 5000×g for 10 min to separated serum samples. The serum samples were stored at -40C until biochemical



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https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

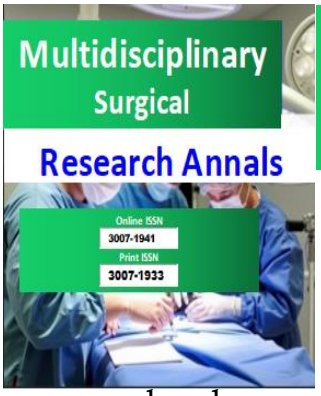
analysis. The biochemical parameters such as serum glucose and cholesterol were measured by chemistry analyzer.

Measurement of Blood Parameters Through Hematological Analyzer

The hematological analyzer is the classic and time-tested technology for analyzing the blood parameters. The electrodes of the analyzer were placed in the isotonic solution (NaCl 0.4% and sodium sulphate anhydrous 0.98%). This solution was first passed through the aperture to create vacuum then flow of current on electrodes. Then anticoagulated blood sample is aspirated into the hematology analyzer. Which was divided into two portions and was mixed with diluent. The diluent contains following components: NaCl, Na2SO4, ethylene diamine tetra acetic acid and formaldehyde. For RBCs counting one dilution passed through this aperture and one for platelet counting.The one dilution was passed for WBCs counting in WBCs aperture bath, on this bath the RBCs were lysis by addition of reagents to count HB level. The HB was estimated by light transmission at 535 nm.

HB Level Measurement

In the hematological analyzer the HB was converted to cyanmethemoglobin by addition of potassium ferricyanide. The



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https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

absorbance was check at 540nm. The PCV and ESR values were determined through the hematological analyzer directly.

RBCs and MCV Estimation

The RBCs and mean cell volume were directly counted without the light scatter involvements. In hematological analyzer the RBCs were plotted on y-axis and MCV was plotted on x-axis. The machine read the RBCs count and MCV count from this histogram.

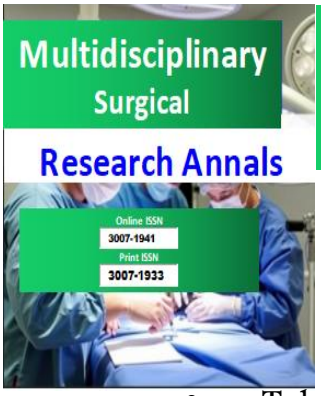
Measurement of Differential Count of WBCs

The WBC was measured through Hematology analyzers, which can generate various parts like lymphocytes, monocytes, and granulocytes counts or measurements, the other measurement possibility was 5 various parts for all these parameters. The first part was calculating the leukocytes measurement by the electrical imbedding. After determination in the machine the histogram plat of WBCs was generated the numbers of WBCs was plotted on Y-axis and while the cell size was plotted on X-axis.

Measurement of Cholesterol

The procedure was as follow:

1. Take 1000 µl cholesterol solution in a test tube.



Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

2. Take 10 µl serum sample
3. Then run the serum sample through biochemical analyzer and measured the cholesterol level.

Measurement of Glucose

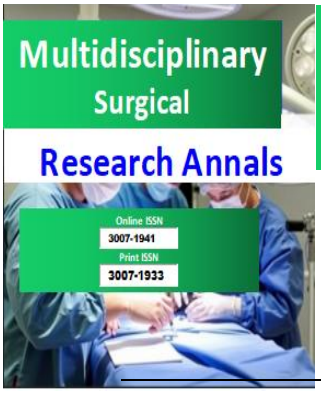
The procedure was as follow:

1. Take glucose solution 1000 µl
2. Take serum sample 10 µl
3. Mixed it in one test tube and then incubated for 10 min
4. Run the sample in the biochemical analyzer and measured the glucose level.

Statistical Analysis

The data was analyzed by statistical packages for social sciences version 21 software. The data of weight gain, FCR and feed intake was analyzed by using Generalized Linear Model (GLM) and tukey post hoc test to determine the level of significant between and with groups. The hematological and serum biochemical parameters were analyzed by using one-way ANOVA. The level of significant was ($P<0.05$). The was expressed mean ± S.E.

Table 1:Broiler feed composition during experiment



Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

Ingredients %	Stater feed	Finisher
	(phase 1: 1-7 days)	(phase 2: 8-35 days)
Corn	36.24	38.31
Wheat	13	16
Soybean meal	39.1	34.3
Corn gluten meal	2.1	3.8
Animal fat	2.9	5.8
Mono-di-calcium phosphate	1.31	1.02
Limestone	1.7	1.7
Salt	0.3	0.3
Choline	0.12	0.12
Lysine	0.35	0.35
Methionine	0.21	0.23
Vitamin premix	0.12	0.12
Mineral premix	0.1	0.1
Calcium	1	0.9

Table 2 The concentration of active yeast for treatment groups

Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)
ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

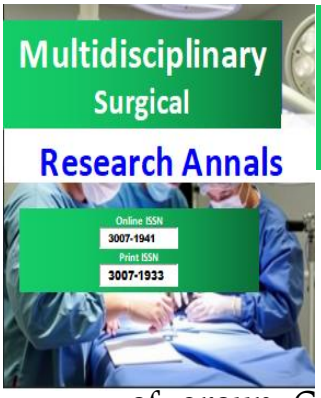
	Starter feed	Finisher feed
Saccharomyces		8×10^9
cerevisiae	220	430
Crude protein		
Dry matter	910	935
Ash	32	45
Crude fiber	54	24

Results

Ramification of Saccharomyces cerevisiae on Body Weight gain

The results of ramification of Saccharomyces cerevisiae on weight gain are presented in table 3 and (fig 1-7). At the start of experiment, the weight of broilers chicken was similar around 13.4-13.6 gm/birds, as shown in table 3 and figure 1. The result of weight gain at day 7 (1st week) showed that the broiler chicken fed Saccharomyces cerevisiae @ of 0.5gm/kg feed had no significantly ($P>0.05$) gain in body weight at day 7 of all experimental groups and control (Fig. 2).

The results showed that group E of Saccharomyces cerevisiae had highest body weight gain (416.1±10.9 gm/birds; $P<0.01$) at day 14 as compared to other treatment and control groups. The body weight gain



Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
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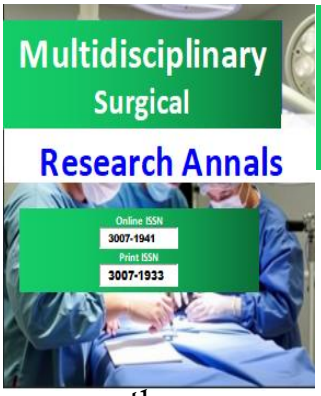
Journal Frequency: 4 Issue Per Year

of group C and group D was non-significant between each other (370.6±10.3 and 394.8±10.7, respectively; P>0.05) but significantly(P<0.05) higher than group A and B (357.4±9.8 and 356.3±9.9, respectively) (Fig. 3). The results showed that group E had gain significantly highest body weight (751.2±17.5 gm/birds; P<0.001) as compared to other treatment and control groups at day 21. The body weight gain of group D chicken were significantly higher than group A-C(725.3±19.8 gm/birds; P<0.01). The body weight gain of group C broilers were significantly higher than group A and B, however group A and B was non-significant between each other (687.3±15.7 vs 653.4±17.8 and 641.1±16.5, respectively; P<0.05) (Fig 4). The body weight gain of group E chicken were significantly highest than other treatment and control groups (1111.3±29.9; P<0.01). However, the body weight gainin group C and D broilers were significantly higher than group A and B at day 28 (1024.6±28.2 and 1057.9±31.2 vs 976.5±20.8 and 983.8±26.5, respectively; P<0.05) (Fig 5).

The body weight gain at the end of the investigation was significantly highest in group E chicken (1776±62 gm/birds; P<0.01) as collate to group A-D. The body weight of group D chicken was higher



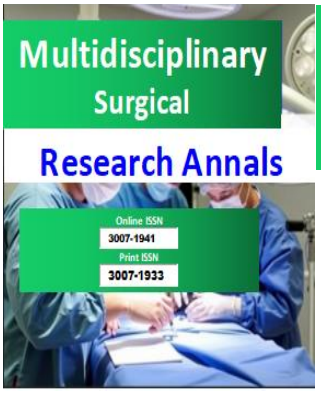
Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

than group A-C at the end of research (1712±56 gm/birds; P<0.05). However, the body weight of group B and C was non-significance between each other but slightly higher than untreated group at the end of investigation (1641.1±51 and 1689.2±49 vs 1511.3±45 gm/bird) (Fig 6). The daily weight gain in group E broilers chicken was 50.7±5.1 gm/birds, which was significantly highest than group A-D. The daily weight gain in group C and D was 48.9±4.7 and 48.2±5.3 gm/birds, respectively, which was significantly higher than group A and B (43.1±4.2 and 46.8±6.1 g/birds, respectively) (Fig. 7). The bodyweight gain was significantly higher within groups in all treatment as well in control broilers (Table 3).

Table 3. Effect of Saccharomyces cerevisiae on body weight gain of broilers

Groups	Body weight gain (gm/birds)					
	Day 0	1st week	2nd week	3rd week	4th week	5th week	Daily weight gain

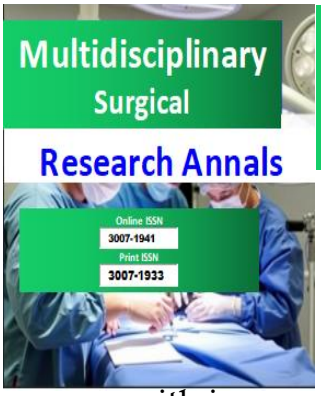


Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

G A	13.6±1.2^{F}	153.4±4.6^{aE}	357.4 ±9.8^{cD}	641.1±16.5^{dC}	976.5± 20.8^{cB}	1511.3±45^{dA}	43.1 ±4.2^{d}
G B	13.4±1.4^{F}	164.1±5.4^{aE}	356.3± 9.9^{cD}	653.4±17.8^{dC}	983.8±2 6.5^{cB}	1641.1±51^{cA}	46.8± 6.1^{c}
G C	13.5±1.1^{F}	164.2±9.5^{aE}	370.6±10.3^{bcD}	687.3±15.7^{cC}	1024.6±28.2^{bB}	1689 .2±49^{cA}	48.2±5.3^{b}
G D	13.4±1.4^{F}	164.5±7.4^{aE}	394.8±10.7^{bD}	725.3±19.8^{bC}	1057.9±31.2^{bB}	1712±56^{bA}	48.9±4.7^{b}
G E	13.5±1.3^{F}	164.3±6.8^{aE}	416.1±10.9^{aD}	751.2±17.5^{aC}	1111.3±29.9^{aB}	1776±62^{aA}	50.7±5.1^{a}

G A to G E indicated the groups of SC supplementation, such as group A: no addition of SC supplementation; group B: 1.5 g/kg feed supplementation of SC; group C: 2.0 g/kg feed supplementation of SC; group D: 2.5 g/kg feed supplementation of SC and group E: 3 g/kg feed supplementation of SC. The different super scripts a-e showed level of significant between groups ($P<0.05$) and A-E showed level of significant



Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

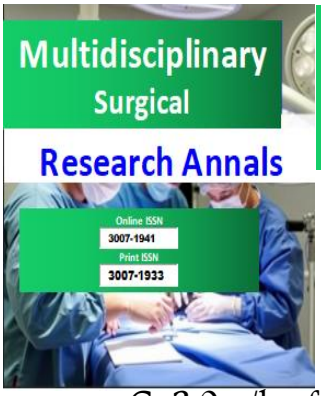
with in groups (P<0.01).

Table 4. Effect of *Saccharomyces cerevisiae* on daily feed intake in broilers.

Groups	Daily feed intake (gm/bird/day)				
	Day 0	1st week	2nd week	3rd week	4th week	5th week
G A	12.4 ± 0.2^{F}	37.4 ± 1.6^{aE}	67.4 ± 1.8^{bD}	84.1 ± 1.6^{dC}	96.5 ± 2.1^{cB}	128.3 ± 4.5^{bA}
G B	13.3 ± 0.4^{F}	39.1 ± 1.4^{aE}	68.3 ± 1.9^{bD}	85.4 ± 1.7^{dC}	98.8 ± 2.6^{cB}	135.1 ± 5.1^{cA}
G C	12.6 ± 0.1^{F}	39.2 ± 1.5^{aE}	51.1 ± 1.3^{aD}	76.3 ± 2.1^{cC}	90.6 ± 2.8^{bB}	127.2 ± 4.9^{bA}
G D	13.7 ± 0.4^{F}	39.5 ± 1.4^{aE}	51.8 ± 1.7^{aD}	72.3 ± 1.9^{bC}	88.1 ± 3.1^{bB}	125 ± 5.6^{aA}
G E	12.5 ± 0.3^{F}	39.3 ± 1.8^{aE}	50.1 ± 1.9^{aD}	67.2 ± 2.7^{aC}	83.3 ± 2.9^{aB}	126 ± 6.2^{aA}

G A to G E indicated the groups of Saccharomyces cerevis

G A to G E indicated the groups of Saccharomyces cerevisiae supplementation, such as group A: no addition of SC supplementation; group B: 1.5 gram/kg feed additive of Saccharomyces cerevisiae; group



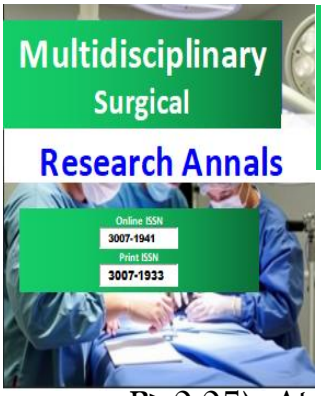
Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

C: 2.0 g/kg feed supplementation of Saccharomyces cerevisiae; group D: 2.5 gram/kg feed supplementation of SC and group E: 3 g/kg feed supplementation of Saccharomyces cerevisiae, different superscripts showed the level of significance.

Effect of Saccharomyces cerevisiae on feed conversion ratio in broilers

The results of feed conversion ratio are presented in table 5. The results showed that at1st week of experiment, there was non-significantly differed in FCR of broilers of group B to E. At 2nd week of experiment, we found significantly better FCR of group E chicken (1.7; P<0.01) than other groups, which indicated that Saccharomyces cerevisiae improved the growth performance in broilers. The chicken of group D had significantly better FCR than control and treatment group chicken (1.8 vs 2.0-2.3, respectively; P<0.05). The broilers of group D and E had better FCR (1.4-1.5; P<0.01)as collate to Group A and Group C. The group C broilers were increased ability to convert feed into weight gain than control and group B (1.7 vs 1.9-2.0, respectively; P<0.05). The results of FCR at 4th week showed that group E broilers had gain 1.6 FCRwhich was significantly better than all other groups. the poorest FCR was found in control and lowered Saccharomyces cerevisiae; group (2.0;



Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

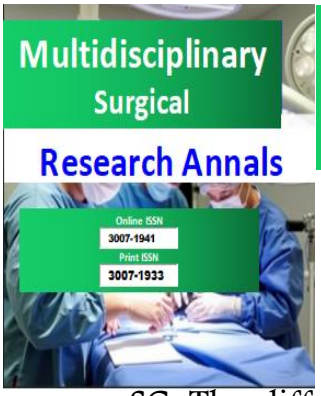
ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

P>0.05). At the end of experiment, the group E chicken had achieved higher FCR (1.3; P<0.001), while group C and D chicken had high valuable FCR at the end of investigation as compared to group A and B (1.4 vs 1.6-1.7, respectively; P<0.01). However, in all groups the valuable FCR was found at the end of experiment in broilers.

Table 5. Effect of Saccharomyces cerevisiae on FCR in broilers (Mean±S.E) Groups Feed conversion ratio (FCR) ± S.E

	1st week	2nd week	3rd week	4th week	5th week	
G A	1.8^{B}	2.1^{dD}	2.0^{dC}	2.0^{cC}	1.7^{cA}	0.2
G B	1.7^{B}	2.3^{eE}	1.9^{cC}	2.0^{cD}	1.6^{cA}	0.3
G C	1.7^{B}	2.0^{cD}	1.7^{bB}	1.8^{bC}	1.4^{bA}	0.2
G D	1.7^{C}	1.8^{bD}	1.5^{aB}	1.8^{bD}	1.4^{bA}	0.1
G E	1.7^{C}	1.7^{aC}	1.4^{aB}	1.6^{aC}	1.3^{aA}	0.2

G A to G E indicated the groups of SC supplementation, such as group A: no addition of SC supplementation; group B: 1.5 gram/kg feed additive of Saccharomyces cerevisiae; group C: 2.0 gram/kg feed additive of Saccharomyces cerevisiae; group D: 2.5 g/kg feed supplementation of Saccharomyces cerevisiae; and group E: 3 g/kg feed supplementation of



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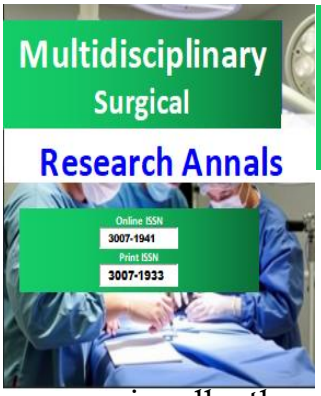
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

SC. The different super scripts a-e showed level of significant between groups (P<0.05) and A-E showed level of significant with in groups (P<0.01).

Effect of Saccharomyces cerevisiae on hematological parameters in broilers

The results of hematological parameters were showed that the RBCs in higher Saccharomyces cerevisiae feeding broilers of group of E and D were significantly higher level as collate to control and other groups that were fed with Saccharomyces cerevisiae; (2.45±0.18 and 2.24±0.12, respectively; P<0.01). That indicated the good health condition of broilers, as shown in table 6. The control group chicken was lowered level RBCs (1.93±0.13), it means the Saccharomyces cerevisiae improved the health status of broilers. The results of HB level indicated that the chicken of group E was in good health due to higher HB level than control and other treatment groups (9.63±0.63;P<0.05). The lowest level of HB of the control group chicken showed that these chickens were in poor health condition and with high risk of diseases. The WBCs levelwas higher in group E (33.2±2.2; P<0.05), while the lowered level of WBCs was in control group (20.1±1.2). The WBCs level was moderate



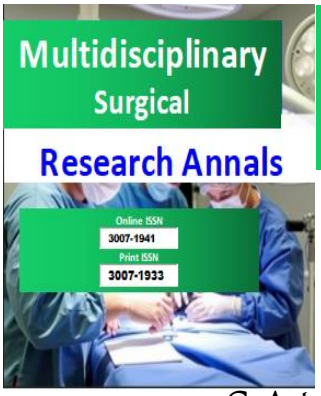
Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

in all other Saccharomyces cerevisiae feeding groups. The monocytes level was significantly higher in group C-E than group A and B. the highest MCV value was found in group E chickens (1645±89;P<0.05), however the lowest MCV level was found in group C broilers, as shown in table 6. The result of PCV and ESR was non-significantly difference between groups, as shown in table 6.

Table 6. Effect of SC on hematological parameters (Mean±S.E)

Parameters	ExperimentalGroups				
	A	B	C	D	E
RBCs	1.93 ± 0.13^{c}	2.04 ± 0.17^{b}	2.08 ± 0.12^{b}	2.24 ± 0.19^{a}	2.45 ± 0.18^{a}
HB	7.91 ± 0.52^{c}	7.82 ± 0.38^{c}	8.46 ± 0.55^{b}	8.95 ± 0.72^{b}	9.63 ± 0.63^{a}
WBCs	20.1 ± 1.2^{e}	23.5 ± 1.8^{d}	26.5 ± 2.1^{c}	29.7 ± 2.5^{b}	33.2 ± 2.2^{a}
Lymphocytes	42.1 ± 2.4^{b}	45.8 ± 2.8^{c}	47.3 ± 2.1^{c}	39.5 ± 3.6^{a}	40.3 ± 3.8^{a}
Monocytes	3.0 ± 0.2^{b}	3.2 ± 0.3^{b}	5.0 ± 0.2^{a}	5.0 ± 0.4^{a}	5.0 ± 0.3^{a}
MCV	1542 ± 88^{b}	1537 ± 81^{b}	1356 ± 74^{c}	1604 ± 94^{b}	1645 ± 89^{a}
PCV (%)	31.11	30.18	29.4	28.12	28.09
ESR (min/hrs)	1.3±0.3	1.3±0.2	1.3±0.3	1.3±0.1	1.3±0.2



Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

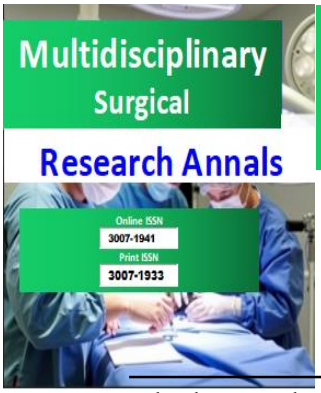
G A to G E indicated the groups of SC supplementation, such as group A: no addition of SC supplementation; group B: 1.5 gram/kg feed additive of Saccharomyces cerevisiae;group C: 2.0 gram/kg feed supplementation of SC; group D: 2.5 g/kg feed supplementation of SC and group E: 3 g/kg feed supplementation of SC. The different super scripts a-e showed level of significant between Groups ($P<0.05$).

Effect of SC feeding on serum biochemical parameters in broilers

The results of serum profile are presented in table 7. The results represented that therewas non- significant difference in cholesterol level between control and Saccharomyces cerevisiae feeding broilers chicken. However, the glucose significantlevel was higher in group E chicken than other treatment and control group (311.7 ± 20.4; $P<0.01$). The group D and C broiler chickens were significantly higher glucose level as compared to control group (305.2 ± 18.3 and 291 ± 15.4 vs 275.3 ± 9.4 respectively; $P<0.05$).

Table. 7. Effect of Saccharomyces cerevisiae on serum biochemical parameters (Mean±S.E)

Parameters	G A	G B	G C	G D	G E



Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

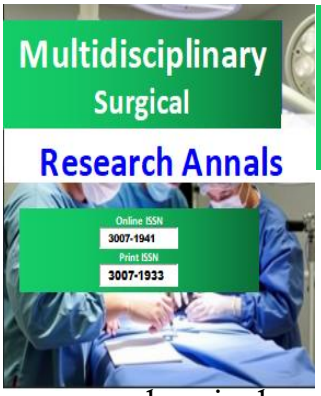
ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

Cholesterol (mg/100 dl)	175.1±11.2	170.3±13.2	155.4±9.7	150.4±14.3	150.3±11.2
	275.3±9.4^{c}	279.1±13.5^{c}	291±15.4^{bc}	305.2±18.3^{b}	311.7±20.4^{a}
Glucose (mg/100dl)					

G A to G E indicated the groups of SC supplementation, such as group A: no addition of SC supplementation; group B: 1.5 gram/kg feed additive of Saccharomyces cerevisiae;group C: 2.0 gram/kg feed supplementation of SC; group D: 2.5 g/kg feed supplementation of SC and group E: 3 g/kg feed supplementation of SC. The different super scripts a-e showed level of significant between groups ($P<0.05$) and A-E showedlevel of significant with in groups ($P<0.01$).

Discussion

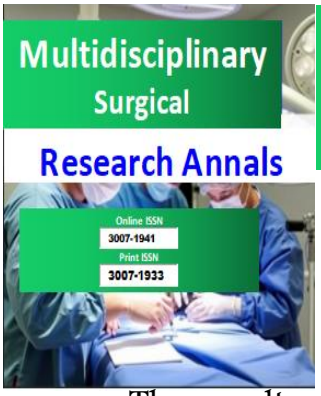
There are many metabolic stimulators used in livestock and poultry in recent past years. The Saccharomyces cerevisiae is one of the metabolic stimulators in livestock and broiler, which play important and necessary role in the metabolism of food materials (Katina et al., 2004). Because Saccharomyces cerevisiae contain very needful ingredient such as 1,3-1,6 D mannanoligosaccharides and fructooligosaccharides. All these



Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

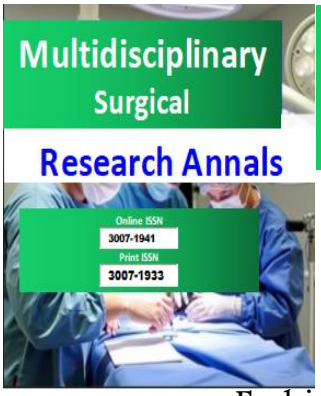
chemical compounds are metabolic stimulus as well as used as a growth promoting agents (Kumar et al., 2019). As we kept 150 birds in our experiment and divided them into five groups that is, group A: no addition of Saccharomyces cerevisiae supplementation; group B: 1.5 gram/kg feed additive of Saccharomyces cerevisiae; group C: 2.0 gram/kg feed supplementatiosn of Saccharomyces cerevisiae; group D: 2.5 g/kg feed supplementation of Saccharomyces cerevisiae and group E: 3 g/kg feed supplementation of Saccharomyces cerevisiae. According to the results the daily weight gain in group E broilers chicken was 50.7±5.1 gm/birds, which was significantly highest than group A-D. The daily weight gain in group C and D was 48.9±4.7 and 48.2±5.3 gm/birds, respectively, which was significantly higher than group A and B (43.1±4.2 and 46.8±6.1 g/birds, respectively). The intake of feed was significantly daily increased from start to end of the experiment in all treatment and control groups. At the end of experiment, the group E chicken had achieved higher FCR (1.3; $P<0.001$), while group C and D chicken had high valuable FCR at the end of investigation as compared to group A and B (1.4 vs 1.6-1.7, respectively; $P<0.01$). However, in all groups the valuable FCR was found at the end of experiment in broilers.



Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

The results of hematological parameters were showed that the RBCs in higher Saccharomyces cerevisiae feeding broilers of group of E and D were significantly higher level as collate to control and other groups that were fed with Saccharomyces cerevisi That indicated the good health condition of broilers. The control group chicken was lowered level RBCs, it means the Saccharomyces cerevisiae improved the health status of broilers. The results of HB level indicated that the chicken of group E was in good health due to higher HB level than control and other treatment groups. The lowest level of HB of the control group chicken showed that these chickens were in poor health condition and with high risk of diseases. The WBCs level was higher in group E, while the lowered level of WBCs was in control group. The WBCs level was moderate in all other Saccharomyces cerevisiae feeding groups. The monocytes level was significantly higher in group C-E than group A and B. the highest MCV value was found in group E chickens . The result of PCV and ESR was non- significantly difference between groups. The results represented that there was non- significant difference in cholesterol level between control and Saccharomyces cerevisiae feeding broilers chicken. However, the glucose significant level was higher in



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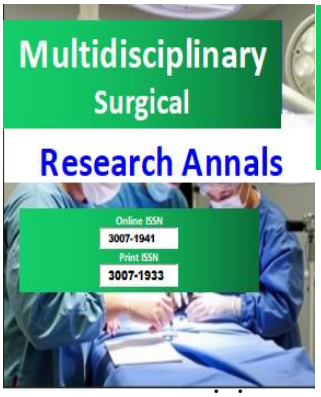
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

group E chickenthan other treatment and control group. The group D and C broiler chickens were significantly higher glucose level as compared to control group.

In view our findings, we found that when Saccharomyces cerevisiae given to broiler a @ 0.5 gm/kg feeding ration to all treatment groups had no numerically improvement (P>0.05) in growth rate (weight gain of the body) as collate to untreated group at the age of 1st week. it was supported by previous studies (Lawrence et al., 2018), that at fixed rate Saccharomyces cerevisiae feeding to broilers had no significantly differed gain in body weight as collate to the untreated group found that Saccharomyces cerevisiae supplementation improved weightgain of the body in broilers after 1st week age, the results are in accordance to our results. The previous reports showed that in addition of probiotics in broiler feed improved the growth promoting factors as compared to others (Macelline et al., 2008). In another reports (Onwurah et al., 2014) showed that body weight gain at early ages dependent on percentage of Saccharomyces cerevisiae addition in feeds. Theaddition of 1.5 percent Saccharomyces cerevisiae in broilers enhanced the weight gain as compared to 0.1 or 0.2% Saccharomyces

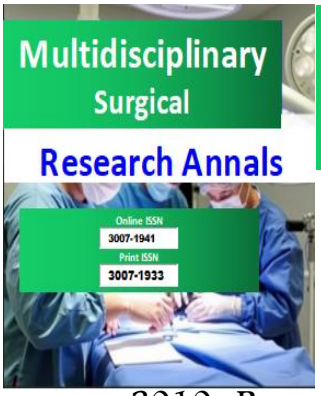


Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

cerevisiae supplementation. The possible reason of enhancement in body production may be due to the reestablishing of digestivebacteria or beneficial microorganisms by Saccharomyces.

The difference in the findings in production between groups may be due to mixing of SC or method of utilization of Saccharomyces cerevisiae was different or may be due to variation in birds (Gao et al., 2008). The other previous studies showed that addition of Saccharomyces cerevisiae in early age in broilers not improved the body weight gain (Panda et al., 2011). These studies report with in agreement to our reports regarding effect ofSaccharomyces cerevisiae on production in early age broilers. The difference in our findings with previous reports perhaps owing to increase or decrease of bacteria such as Saccharomyces cerevisiae increased the Lactobacillus in the chicken gut. The difference in the findings between various studies perhaps owing to improvement of intestinal lumen health. Several reports showed that Saccharomyces cerevisiae improved immunity which leads to improved digestive system and its metabolic activity (Onwurah and Okejim 2014). The Saccharomyces cerevisiae entertainments as acause of supplement to the creation and balances of other gastrointestinal microbes (Ferreira et al.,

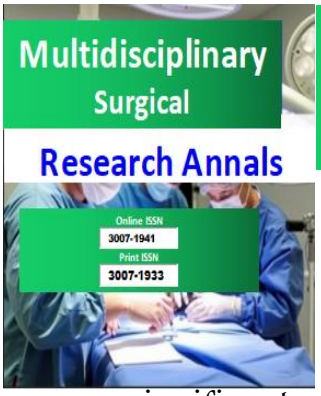


Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

2010; Paryad et al., 2011). Hence, enhancement of growth and body weight gain due to supplement Saccharomyces cerevisiae uses maybe drop the pathogenic agents burden and an increase the beneficial effect of microscopic organisms in the digestive system of broilers (Poutanen et al., 2007). The ileal digesta of broiler chickens took care of Saccharomyces cerevisiae either used in wet form or in dry form in the feed of poultry, which improved the absorption of nutrients in the gastrointestinal tract as the fermentation decreases the stomach exhausting material in livestock and leads to upgraded the digestion process therefore in advancement of weight gain. Our study showed no significant difference between group in weight gain in early age. The possible reason for this agreement in the result of current findings with old findings may perhaps owing to deficiency of amino acids, oligosaccharides, and other growth factors which put bad effect on the growth of broilers at early age (Adebiyi et al., 2012).

The findings of current research represented that group E of Saccharomyces cerevisiae had highest body weight gain as collate to other treatment and untreated group at day 14. The body weight gain of Group C and D broilers were non-significant between each other but



Multidisciplinary Surgical Research Annals
https://msra.online/index.php/Journal/about
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ISSN Online: 3007-1941
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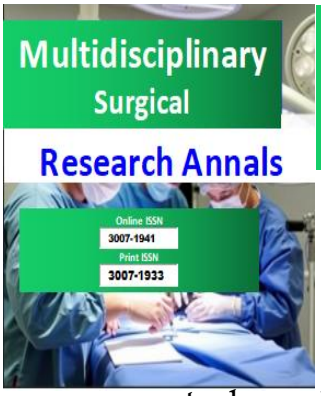
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

significant difference from other treatment and control group. Moreover, the results at day 21 showed that group E had gain significantly highest body weight as compared to other treatment and control group. There was highly potential and preferable food used to enhancement and preservation of health of the broilers worldwide (Saied et al., 2011). The used of probiotics such as Saccharomyces cerevisiae used previously mainly to improved body weight gain and immunity of the broilers. These probiotics contain mannan-oligosaccharides and fructo- oligosaccharides which is present in the cell wall of yeasts. Various scientists also observed that addition of probiotic in the broiler feed improved the blood and serum parameters In comparison of our results with previous studies, the various reports showed that weight gain was significantly ($p<0.05$) differed between feed supplemented at age of 2-3 weeks in broilers in finishing stage (Adebiyi et al., 2012; Gao et al., 2008). These studies supported our results, the possible reason of supporting might be that Saccharomyces cerevisiae put effect.

The results of serum biochemical profile of current study represented that no significant difference in cholesterol level between



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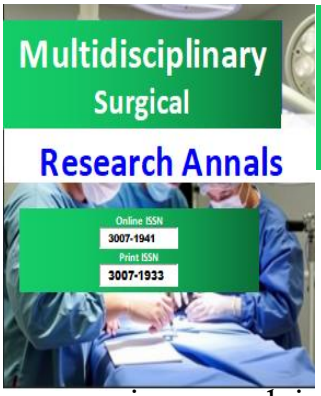
https://msra.online/index.php/Journal/about
Vol. 2 No. 4 (2024)

ISSN Online: 3007-1941
ISSN Print: 3007-1933
Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

control and Saccharomyces cerevisiae feeding broilers chicken. However, the glucose level was significantly higher in Saccharomyces cerevisiae feeding broilers as compared to control group chickens. The literature showed that by supplementation of baker's yeast had no impact on serum biochemical profile including glucose, ALT, AST, total protein, calcium, cholesterol, creatinine, triglyceride in broilers (Aluwong et al., 2012). In one another study showed that the levels of yeas from 1.5 to 2.5% had significantly improved the serum protein and glucose levels in broilers and in other livestock animals (Shareef and Al-Dabbagh, 2009). Shareef and Al-Dabbagh (2009) and Aluwong et al., (2012) reported that the addition of Saccharomyces cerevisiae decreased serum cholesterol in broilers. High blood protein level in previous study may be due to some signs of bone marrow diseases.

Conclusion and Future Prospects

The final findings of this research represented that the addition of Saccharomyces cerevisiae in feeding ration of broilers improved the weight gain from lowered feed intake, which indicated improved FCR.The hematological and serum biochemical profile is enhanced by the supplementation of Saccharomyces cerevisiae, which indicate



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Vol. 2 No. 4 (2024)

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Name of Publisher: EDUCATION RESEARCH ASSOCIATES
Journal Frequency: 4 Issue Per Year

improved immunity in broilers.sIn this regard, we suggested that in future evaluated the Saccharomyces cerevisiae supplementation against diseases in broilers and determine its effect on meat quality.

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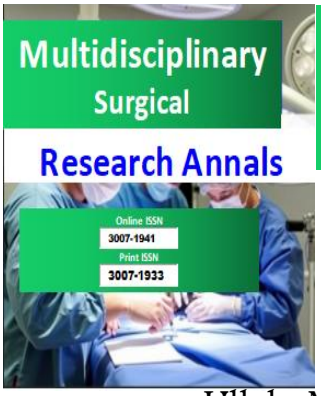

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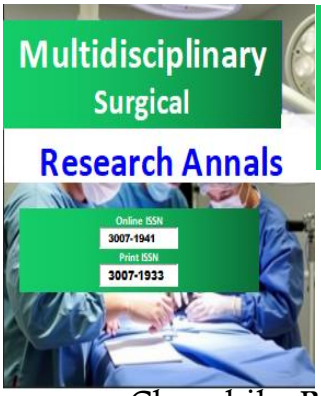

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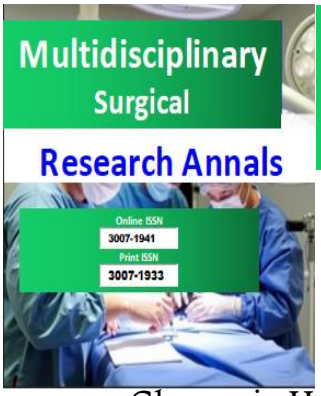

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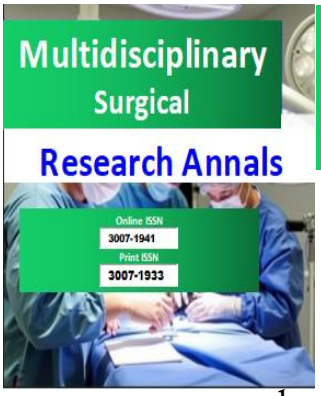

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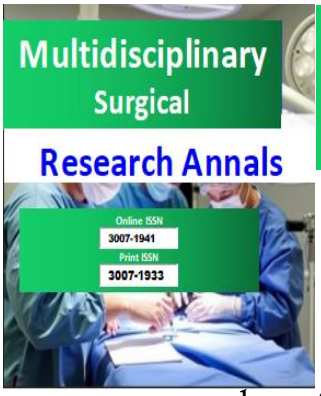

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