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Haematological Profile, Immune Response, Performance and Meat Quality of Growing Rabbits as Affected By Probiotic and Organic Selenium Dietary Supplementation

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ABSTRACT

The present research was aimed to study the effects of diet supplemented with *Saccharomyces boulardii*, Bio-Plus® 2B (*Bacillus subtilis* and *Bacillus licheniformis*), organic selenium and their mixture on haematological profile, growth performance and meat quality of V-line rabbits. An average body weight of rabbits were six weeks old with of 750.5 g.Which divided into five groups , the control group (basal diet without any supplementation), 0.6g *Saccharomyces boulardii* strain CNCM I-745 / kg diet (T1), 0.4g Bio-Plus® (*Bacillus subtilis* and *Bacillus licheniformis*)/ kg diet (T2), 0.3mg organic selenium /kg diet (T3) and (T4) {T2+T3}.The results indicated to significantly increased in body weight of all treatments than control group, as well the feed conversion ratio, Red blood cells, white blood cells, hemoglobin and hematocrit improved in (T4) as compared with control and all treatment groups. Recorded (T4) significant increase in serum total protein and globulin concentration while albumin concentration was reduce in all treatment groups as compared with control group.Vitamin A,E and selenium concentrations increased in the meat of T1,T2,T3 and T4 rabbits as compared with the control group, while thiobarbituric acid reactive substance (TBARS) levels of meat was significantly lowered in treated groups as compared with control group . In conclusion, mixture of *S. boulardii*, Bio-Plus and organic selenium dietry supplementation improved haematological profile, immune response and growth performance of rabbits.

Keywords:

probiotic, rabbits, selenum, immune response, growth performance, blood parameters and meat quality**.**

Introduction

Rabbit's meat may be excellent to produce specific functional foods since its good properties such as fatty acid profile, mineral and vitamin contents which could be further enriched via feeding **(1)** Probiotics are live cultures of harmless bacteria or yeast species that equilibrate intestinal microflora to the benefit of the animal. It has been shown that, they may have a growth promoting activity by competing with harmful gut flora, and stimulating the immune system. Positive effects of probiotic supplementation were reported on growth performance and feed efficiency of weaning rabbits. Normal gut micro-flora provides normal mucosal function, increase digestibility and stimulates motility and immunity. Probiotics are defined as a live microbial feed supplement which beneficially affects the host animal by improving its intestinal balance. Probiotics can influence gastro-intestinal (GI) weight and also the microbial fermentation pattern in the caecum.

Review

Probiotics supplementation, more specifically *Lactobacillus acidophilus* improved digestibility and utilization of nutrients, body weight gain and feed conversion ratio. Improved digestive efficiency through optimization of the composition of gut microbiota has a direct impact on feed costs, and would also increase the use of low-cost fibrous feed **(2). (3)** Showed that *Saccharomyces boulardii* improved feed intake, feed conversion ratio, daily weight gain, total body weight, meat quality and overall acceptability of rabbit meat. **(4)** Reported that, *Saccharomyces boulardii* CNCM I-745 (*S. boulardii*) is non-pathogenic yeast discovered in 1923 by a French Microbiologist in Indochina. *S. boulardii* (flora norm) normally have ability to grow at 37°C, and its resistance to low gastric pH and to bile acids and improved the microflora. Selenium is an essential trace element, important for animal and human health (**5)**, it also acts an important metabolic role with enzyme glutathione peroxidase to protect body cells from damage caused by lipid peroxides and free radicals. It is required for the normal growth and reproduction; an adequate intake of selenium for animals is required to overcome the risks and problems of growth retardation, immunodeficiency, exudative diathesis, nutritional muscular dystrophy, and other diseases related to the deficiency of selenium. Selenium supplementation increased Se concentration in the meat of rabbits and plays an important role

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in enhancing the immune response in mammals. Positive effect of supplemental dietary organic Se on growth performance, carcass characteristics, meat quality, plasma antioxidative status and immune response of growing rabbit.

The average body weight gain (BWG) , body weight (BW) and feed conversion ratio (FCR) improved in rabbits fed diet supplemented with Se from the first to the eighth weeks of age **(5).** Supplementation of *L. acidophilus* alone or in combination with *B. subtilis* at a half of dose could enhance number of gut beneficial bacteria populations, nutrient digestibility, fermentation, feed efficiency, and growth performance of rabbits **(6**). Also, they reported that, Bio- Plus in growing rabbit diets improved growth performance and reduced mortality. Improvement in feed conversion in young rabbits was noticed with different probiotics used in summer. Bio- Plus (*Bacillus subtilis* and *Bacillus Liicheniformis*) increased in BWG and FCR with no significant changes in carcass traits, composition and fatty acid profile and optimization of composition of the gut microbiota which has a direct impact on feed costs (7**).**

This study aimed to study the effect of dietary supplementation with *Saccharomyces boulardii,* Bio-Plus (*Bacillus subtilis* and *Bacillus iicheniformis*) and organic selenium on haematological profile, immune response, meat quality and productive performance of V-line growing rabbits.

Materials and Methods

Experiment Animal:

This work was conducted in animal farm - rabbit research and development unit / Agriculture - Cairo University**.** Fifty growing V-line rabbits were randomly divided into five homogeneous groups (n=10 each) with 750.5 g average live body weight. Rabbits were housed individually in stainless steel cages (50×40×35 cm^3) provided with feeders and automatic nipple drinkers. Diet and water were offered *ad libitum*.The experimental pelleted diet was formulated to cover nutrients requirements of growing rabbits as recommended by (8).

Design of experiment:

The experimental diets and their composition analysis are presented in table (1).Treatments were the control group (basal diet without any supplementation) and the other four experimental groups were supplemented by 0.6g *Saccharomyces boulardii* strain CNCM I-745 / kg diet (T1), 0.4g Bio-Plus® (*Bacillus subtilis* and *Bacillus licheniformis*)/ kg diet (T2), 0.3mg organic selenium (Sel-Plex, Alltech) /kg diet (T3) and their mixture (T4), respectively. During the experimental period (42 d of age). Feed intake (FI), Body gain (BG) and Feed conversion ratio (FCR) were calculated. No mortality was recorded through the experimental period.

Table (1): Feed ingredients and chemical analysis of basal diet (%DM basis) of growing rabbits.

Feed Ingredients (%)		Chemical analysis (%DM basis)	
Soybean meal (48% CP)	9.0	Dry matter (DM)	87.88
Barley	11.0	Organic matter (OM)	90.88
Wheat bran	14.0	Crude protein (CP)	17.56
Corn	19.0	Crude fiber (CF)	13.26
Clover hay	29.0	Ether extract (EE)	1.980
Fennel hay	13.0	Nitrogen free extract (NFE)	58.08
Molasses	3.00	Ash	9.120
		Digestible energy (Kcal/Kg DM)	2700
Di- calcium phosphate	1.0		
DL-Methionine	0.40		
Sodium chloride	0.30		
Vit.-Min. premix[a]	0.30		
Total	100		

Mineral and vitamin mixture supplied per kg of diet: Vitamin A 10,000 IU, Vitamin D3,1,800 UI; Vitamin E, 40 mg; vitamin K3, 4.5 mg; Vitamin B1, 2 mg; Vitamin B2, 4 mg; VitaminB62 mg: Vitamin B12, 0.001 mg; Folic acid, 0.1 mg; Pantothenic acid, 7 mg; Nicotinic acid, 20 mg; I, 1 mg; Mn, 60 mg; Cu, 5.5 mg, Zn, 75 mg; Fe, 40 mg; Co, 0.3 mg; ; Robenidine, 52.8 mg.

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Measurements:

1. Blood samples from the slaughter animals were tested shortly after collection for blood pictures determination including, red blood cells (RBCs, 10^6 /mm^3) and white blood cells count (WBCs, 10^3 /mm^3), hemoglobin concentration (Hb, g/dl), hematocrite value (Hct, %) and defrantion white blood cells .The blood samples were centrifugated at 3000 r.p.m. for 20 minutes to obtain blood plasma then stored at -20 ^oC for biochemical analysis. Total protein and albumin was determined according to (**9)**.Total lipid were determined according to (**10)**.Globulins values were obtained by subtracting albumin values from total protein values. Lipid peroxidation in meat was measured in the form of Thiobarbituric acid reactive substance (TBARS) as described by **(11)**.

2. Chemical analyses of the hind leg meat were carried out according to **(12)** for crude protein (CP), ether extract (EE), crude fiber (CF) and ash. The analytical procedure was performed using an ICP-MS (Perkin Elmer-SCIEX, Thornhill, Canada), the concentration of total selenium was taken from the calibration curve.Vitamin E (α –tocopherol) in rabbit meat was assayed using HPLC, according to **(13)** and vitamin A determination using HPLC, according to **(14)**.

3. Statistically analysis:

   The differences among experimental groups were statistically analyzed using the General Linear Model procedures of (**15),** applying a one-way analysis of variance (ANOVA). The significant differences among treatments were compared using Duncan's multiple range tests **(16).**

Results and Discussion

The effect of dietary *S.boulardii*, Bio-Plus, organic selenium and their mixture supplementation on growth performance of growing rabbits is presented in Table (2). The mixture dietary supplementation with *S. boulardii*, Bio-Plus and organic selenium (T4) were significantly increased body weight at 8, 10 and 12 weeks of age as compare with the control group and other treatments. Concerning to feed intake, non-significant differences between groups were obtained (Table 2). Results demonstrated that there were significant effects on FCR at (6-8 week) and (10-12 weeks). Generally, all over of experiment, the rabbits was the highest group in daily gain (36.34 g/d) followed by rabbit of T3, T2 and T1 (33.6, 33.2 and 33 g/d), respectively While the lowest one was the control group (30.50g/d).

Supplementation with *S. boulardii*, Bio-Plus, organic selenium and their mixture significantly improved FCR. The best FCR (2.59 g feed/g gain) was achieved by the dietary mixture (*S. boulardii*, Bio-Plus and organic selenium). The results indicated that dietary supplementation of yeast *S. boulardii*, Bio-Plus, organic selenium and their mixture had a positive effect on growth performance of V-line rabbits. Treated with Bioplus (*Bacillus subtilis* and *Bacillus iicheniformis*) increased body weight gain and feed conversion in young rabbits and composition of the gut microbiota optimization. This enhancement may be due to supplementation of Bioplus (*L. acidophilus* and *B. subtilis)* enhanced number of gut beneficial bacteria populations, nutrient digestibility, fermentation, feed efficiency, and growth performance **(6).** Also attributed the improvement in feed efficiency by probiotics to an increase in the efficiency of nutrient absorption and nutrient utilization **(17), (18)** and **(19)**.

The mode of action of Bioplus 2B may be related to its production of significant amount of enzymes, which reduces the viscosity of intestinal contents and support digestion and absorption of nutrients, especially CP and CF digestibility coefficients. Feed conversion ratio tended to be improved with supplementation with Bioplus 2B due to the relatively lower feed intake and better digestibility of the nutrients. **(5)** Reported that, the average body weight, body weight gain and feed conversion ratio improved in rabbits fed diet supplemented with Se. This improvement may be due to the positive effects of Se role as an antioxidant agent which protect nutrients from oxidation particularly vitamin A and D3. Selenium has important biological functions and is an essential element for animal growth. (20) It also acts an important metabolic role with enzyme glutathione peroxidase to protect body cells from damage caused by lipid peroxides and free radicals. It is required for the normal growth.

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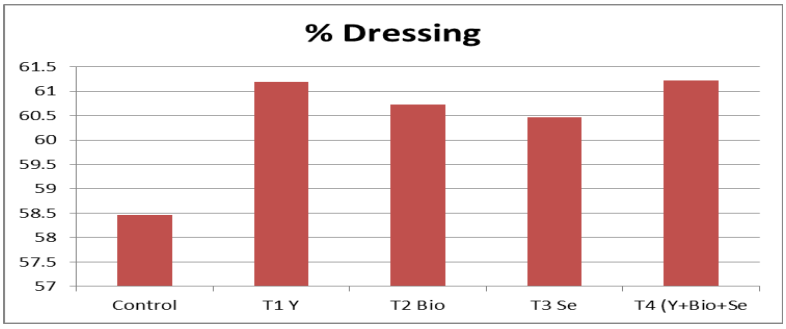
Table 2- Effect of Probiotic (*S. boulardii*, Bio-Plus), selenium and their mixture on growth performance of V-line rabbits.

Average body weight.							
Items	Control	T1 (yeast) (y)	T2(Bioplus) (bio)	T3 (T1+T2)	T4(Se)	T5(y+Bio+Se)	p.value
6 week	754.0 ± 4.6^{a}	751.0 ± 3.6^{a}	750.1 ± 2.7^{a}	752± 2.7^{a}	747.5 ±2.7^{a}	749.0 ± 4.0^{a}	0.322
8 week	1142.0± 5.0^{e}	1201.0 ± 4.4^{c}	1212.0 ±1.7^{b}	1213. ±3.6^{b}	1194.0 ±3.6^{d}	1225.0 ±3.6^{a}	0.0001
10 week	1588.0 ± 7.5^{e}	1672.0 ± 4.6^{bc}	1676.0 ± 3.6^{b}	1667 ± 3^{c}	1650.0± 4.6^{d}	1744.0 ± 4.0^{a}	0.05
12 week	2035.0 ± 3.6^{e}	2139.0 ± 4.6^{c}	2146.0 ± 3.0^{c}	2143.0 ± 5.6^{c}	2162.0 ±4.6^{b}	2276.0 ± 6.1^{a}	0.0001
Body weight gain							
6 -8 week	388.0 ± 2.65^{e}	450.0 ± 4.0^{c}	461.9 ± 1.65^{b}	461 ± 1^{b}	444.5. ±3.50^{d}	476.0 ± 3.0^{a}	0.0001
8 - 10 week	446.0 ± 3.61^{e}	471.0 ±1.0^{b}	464.0 ± 2.0^{c}	454.0 ± 3.61^{d}	456.0 ±3.0^{d}	519.0 ±3.61^{a}	0.0001
10 12 week	447.0± 4.58^{e}	467.0 ±4.36^{d}	470.0 ±5.29^{cd}	476 ±3^{c}	512.0 ± 2.65^{b}	532.0 ± 2.65^{a}	0.0001
Feed intake							
6 -8 week	930.0 ±4.36^{c}	940.0 ± 3.61^{b}	920.0 ±5.20^{d}	910.0 ±1.0^{e}	930.0 ±4.0^{c}	950.0 ± 5.29^{a}	0.71
8 - 10 week	1350.0 ± 5.57^{b}	1320.0 ±4.0^{e}	1330.0 ±4.36^{d}	1340.0 ±4.58^{c}	1330.0 ±1.0^{d}	1360.0 ± 5.29^{a}	0.68
10 -12 week	1680.0 ± 4.58^{b}	1640.0 ±3.0^{f}	1660.0 ±5.0^{d}	1670.0 ±4^{c}	1650.0 ±3.61^{a}	1690.0 ± 5.57^{a}	0.7
Feed conversion ratio%.							
6 -8 week	2.39 ± 0.05^{a}	2.08 ± 0.11^{a}	1.99 ±0.04^{b}	1.97 ±0.14^{b}	2.08 ± 0.03^{b}	1.99 ± 0.11^{b}	0.003
8 - 10 week	3.03 ± 0.15^{a}	2.80 ± 0.34^{a}	2.86 ±.0.31^{a}	2.92 ±.0.18^{a}	2.90 ±0.26^{a}	2.62 ±0.13^{a}	0.509
10 - 12 week	3.75 ± 0.16^{a}	3.50 ±0.30^{ab}	3.53 ± 0.16^{ab}	3.56 ± 0.12^{ab}	3.23 ±0.27^{b}	3.17 ± 0.17^{c}	0.042
Duration period, 42days.							
Average daily(FI)g	94.0 ±2.0^{a}	93.50 ±1.73 ^{a}	93.09 ± 1.0^{a}	93.33 ± 0.78^{a}	93.09 ±2.17^{a}	95.22 ±1.62^{a}	0.602
Average daily gain(g)	30.50 ± 1.71^{c}	33.04 ± 0.99^{b}	33.23 ± 0.59^{b}	33.11± 1.42^{b}	33.67±0.95^{b}	36.34 ±2.06^{a}	0.008
Average(FCR)	3.05 ±0.08^{a}	2.80 ±0.18^{a}	2.79 ± 0.14^{a}	2.79 ± 0.71^{a}	2.97 ± 0.33^{a}	2.59 ± 0.27^{a}	0.0086

Means a, b and c are significant different (P< 0.05).control (basal diet), T1 (0.6g *S. boulardii* /1kg diet), T2 (0.4g Bio-Plus/1kg diet), T3 (0.3mg organic selenium/1kg diet) and T4was Mixture (T1+T2+T3).

Selenium is an important auxiliary factor for the key enzyme of 5´-deiodinase, which synthesizes triiodothyronine (T3) in animals. Triiodothyronine is a main hormone that regulates animal growth by controlling the body's energy and protein anabolism. Se deficiency can cause the reduction of T3 synthesis and growth inhibition **(21)**.Furthermore, Se is linked with the thyroid activity and specifically with the activity of the thyroid deiodinases and selenoenzymes, which catalyze the activation of T3 from T4, explains the con- structive effect of Se on growth.



(Fig.1) Effect of probiotic (*S. boulardii* + Bio- Plus) and selenum on dressing of growing rabbit %.

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(Fig.1) showed the dressing percentage slightly increased in rabbit of T4, mixture (Y+Bio+Se), the improvement was 4.61% as with control and other treatments. These results are in agreement with those observed by **(22),** the growth performance values were higher for rabbits diet containing yucca extract than those fed diet with probiotic. **(23)** reported that**,** carcass weight, dressing percentage; cuts of mid part and hind part as a percentage of live body weight were significantly affected by probiotic supplementation. (**24)** Reported that dietary supplementation with probiotic led to significant higher dressing percentage with improvement of 9.52%. **(25)** and **(26)** reported that, the Se improve content of hind leg rabbits meat. Selenium can be used as sources in growing rabbit diets without causing any adverse effects on growth performance. **(27)** Reported that organic Se is metabolized much more efficiently the inorganic Se forms and could be efficiently utilized for synthesis of selenoproteins under stress conditions.

Table 3- Chemical compositions of growing rabbit's meat, concentration of selenium, vitamin A, E and Thiobarbituric acid reactive substances (TBARs) as effected by probiotic and selenum dietary supplementation.

Chemical compositions	Control	*S. boulardii* , (T1)	Bio-Plus® 2B (T2)	Organic Se (T3)	Mixture (T1+T2+T3) (T4)	P.Value
Moisture%	72.15±0.15^{b}	72.99 ± 0.35^{a}	72.6± 0.54^{ab}	72.3± 0.61^{ab}	72.05± 0.16^{b}	0.148
Ash%	1.19± 0.02^{a}	1.23± 0.18^{a}	1.2± 0.22^{a}	1.37±0.03^{a}	1.34± 0.08^{a}	0.411
Fat% (EE)	3.90± 0.26^{a}	3.5± 0.65^{a}	3.3± 0.28^{a}	3.2± 0.48^{a}	3. 1± 0.64^{a}	0.541
Protein% (CP)	22.76±0.73^{a}	22.28±0.13^{a}	22.9± 0.54^{a}	23.13±0.50^{a}	23.51±0.81^{a}	0.21
Selenium mg/kg meat	0.106± 0.01^{b}	0.12±0.03^{b}	0.105±0.01^{b}	0.33±0.04^{a}	0.35±0.12^{a}	0.0001
TBARS µg/kg meat	11.63±0.30^{a}	9.80±0.20^{b}	10.81±0.36^{ab}	7.90±0.57^{c}	7.52±0.85^{c}	0.0001
Vit. A mg/kg meat	30.00±1.00^{c}	32.33±1.53^{ab}	31.33±0.58^{bc}	33.00±1.00^{ab}	34.00±1.00^{a}	0.011
Vit. E mg/kg meat	2.43±0.15^{b}	2.53±0.21^{ab}	2.60±0.20^{ab}	2.80±0.10^{a}	2.73±0.15^{ab}	0.013

Means a, b and c are significant different (P< 0.05).control (basal diet), T1 (0.6g *S. boulardii* /1kg diet), T2 (0.4g Bio-Plus/1kg diet), T3 (0.3mg organic selenium/1kg diet) and T4was Mixture (T1+T2+T3).Thiobarbituric acid reactive substances (TBARs), Vitamin A (Vit. A) and Vitamin E (Vit. E).

Table (3) showed results, It could be noticed that supplementation of dietary rabbits by *S. boulardii*, Bio-Plus, organic selenium and their mixture significantly decreased EE content as compared to the control group. Meat of rabbits fed diet supplemented with mixture of *S. boulardii*, Bio-Plus and organic selenium was the lowest group in EE meat content. On the other hand, it could be observed that there was a significant increase in CP and ash meat content with supplementing of *S.boulardii*, Bio-Plus, organic selenium and their mixture as compared to the control group.

Similar results were reported by **(27)** they observed high Se concentration in muscles of broilers fed diets enriched with organic Se. Additionally; the organic selenium is more deposited into the muscle tissue and animal organs **(28)**. **(29)** Concluded that dietary selenium yeast supplementation at 0.5 mg/kg level improved rabbit's meat oxidative stability. Regarding Se content, the dietary supplementation of organic selenium significantly increased (P<0.05) Se content of rabbit's meat of hind leg compared to the other tested rabbits' groups. Data of Table (3) provided that vitamin C and vitamin A concentration in rabbit meat supplemented with *S. boulardii*, Bio-Plus, organic selenium and their mixture were significant increased as comparable with control group, this enhancement of vitamins A and E concentration in rabbit meat may be due to the positive effects of Se, its role as an antioxidant agent which protect nutrients from oxidation particularly vitamin A and E **(20)** Lipid oxidation of the rabbit muscle (TBARS) is illustrated in (Table 3).

It was found that TBARS values were lowered by the supplementation of *S.boulardii*, Bio-Plus, organic selenium and their mixture. The negative correlation between the α-tocopherol content of the muscle and the rate of lipid oxidation (TBARS value) as was found in present study is supported by previous studies of **(30)**, **(31)**, **(32)** and **(33)**

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where vitamin E increased the oxidative stability of muscular lipids, or in other terms, delayed lipid oxidation. The effect of vitamin E was probably because of quenching free radicals originating from lipid oxidation **(34)** or by the reduction in lipid oxidation. The results shown in (Table 3), T5 lower than T4 in fat's ratio in meat by (15.1%) and (17.17%) in and it's the lowest as compared the control and other treatments. **(35)** and **(25)** were agreement these results. (Table 4) V-line rabbit with *S. boulardii*, Bio-Plus and organic selenium enhanced red blood cells (RBCs) count as compared to control group. Haemoglobin (Hb) , haematocrit (PCV) , white blood cells(WBC) and Lymphocytes followed the same trend of red blood cells being increased for rabbits fed *S. boulardii*, Bio-Plus, organic selenium and their mixture than control group . These results are in agreement with the findings of **(36)** was reported that probiotic contain *Bacillus subtilis* caused increases in total erythrocyte and leukocyte cell counts and marked increase in percentage of lymphocytes and monocytes , the effect may be direct on the lymphatic tissues **,**similar results founded by **(37)** was reported that diet supplemented with organic selenium enhancement RBCs , Hb , HCT and lymphocytes , the improved may be to the protective of se on cell membrane and organelles against oxidative damage and increase their life span.

Table 4- Effect of Probiotic (*S. boulardii* + Bio- Plus) and selenum on blood parameter.

Blood parameter	Control	*S. boulardii* (T1)	Bio-Plus® 2B (T2)	Organic Se (T3)	Mixture (T1+T2+T3) (T4)	P.Value
RBC x10^6/µl	5.53±0.52^a	5.6±0.44^a	5.53±0.42^a	5.75±0.47^a	5.81±0.52^a	0.7611
HGB (g/dl)	12.3±1.27^a	12.73±1.42^a	12.63±0.91^a	12.85±0.62^b	13.2±0.40^{ab}	0.711
HCT %	29.80±2.98^{bc}	32.3±1.76 ^{ab}	31.8±1.07	32.8±1.07^c	33.87±1.60^a	0.8
WBC x10^3/Ul	8.48±1.05^a	9.02±2.36^a	9.36±0.73^a	9.52±2.43^a	9.64±1.01^a	0.95
NEUT x10^3/Ul	1.62±0.32^b	1.85±0.12^b	1.68±0.48^b	1.66±0.42^b	1.7±0.46^b	0.33
LYMPHx10^3/Ul	6.15±0.68^a	6.15±0.68^a	6.15±0.68^a	6.83±0.59^a	6.9±0.75^a	0.6328
MONO x10^3/Ul	0.13±0.08^c	0.13±0.08^c	0.13±0.02^b	0.49±0.09^b	0.27±0.14^c	0.05
EO x10^3/Ul	0.23±0.12^a	0.23±0.06^a	0.23±0.08^a	0.23±0.08^a	0.34±0.02^a	0. 72
BASO x10^3/Ul	0.35±0.10^{ab}	0.26±0.03^b	0.32±0.14^{ab}	0.31±0.14^{ab}	0.43±0.07^a	0. 57

Means a, b and c are significant different (P< 0.05).control (basal diet), T1 (0.6g *S. boulardii* /1kg diet), T2 (0.4g Bio-Plus/1kg diet), T3 (0.3mg organic selenium/1kg diet) and T4was Mixture (T1+T2+T3).RBC: Red Blood Cells Count; Hb: Hemoglobin; HCT: Hematocrit; WBCs: White Blood Cells; EO: Eosinophils; MONO: Monocyte; LYMPH; Lymphocyte; NEUT: Neutrophils.

It could be noticed that dietary supplementation *S. boulardii*, Bio-Plus, organic selenium and their mixture significantly decreased blood plasma glucose and total lipids, while significantly increased total protein level (Table 5) the same trend was observed for globulin. It means that the higher level of globulin associated with probiotic treatments may be considered as a good indicator for increasing in immunoglobulin and in turn enhances immunity status. **(38)** Reported that total protein and globulin levels in blood are considered as a good indicator of immune response and the albumin level reflects liver function. **(20)** Stated that dietary treatment with organic Se at 0.3 mg/kg diet increased globulin concentration and found that globulin findings were in agreement with immune responses. This increase in total protein and globulin which may be partly due selenium is present in two biologically active forms, Se-containing enzymes and Se-containing proteins in animals (**39)**. Selenium is assumed to be built into the protein structure similarly like it is into se-enriched yeast (**40)**, so se-enriched spirulina may be used as a potential form of organic selenium supplementation.

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Table5-Effect of Probiotic (*S. boulardii* + Bio- Plus) and selenum on metabolic parameters of growing rabbit.

Treatment	Control	(T1) Yeast	(T2) Bioplus	(T3) Se	Mixture (T1+T2+T3) (T4)	P. Value
Glucose	93.00±1.00^{c}	95.00±2.00^{bc}	98.00±1.00^{ab}	98.00±2.00^{ab}	100.002.00^{a}	0.002
T.Lipids	420.00±3.00^{d}	450.00±3.00^{c}	480.00±2.00^{b}	475.00±2.65^{b}	520.00±4.36^{a}	0.0001
T.Protein	6.15±0.18^{d}	6.45±0.10^{c}	6.76±0.04^{ab}	6.70±0.07^{b}	6.91±0.09^{a}	0.022
Albumen	3.45±0.07^{a}	3.35±0.08^{a}	3.47±0.10^{a}	3.34±0.07^{a}	3.41±0.04^{a}	0.848
Globulin	2.71±0.23^{b}	3.10±0.28^{a}	3.30±0.25^{a}	3.36±0.13^{a}	3.50±0.19^{a}	0.009

Means a, b and c are significant different (P< 0.05).control (basal diet), T1 (0.6g *S. boulardii* /1kg diet), T2 (0.4g Bio-Plus/1kg diet), T3 (0.3mg organic selenium/1kg diet) and T4was Mixture (T1+T2+T3).

The results Table (5) showed that T4 in glucose and protein wereT4 as compered other treatments. smaller than **(41).**The results showed in (Fig.2) the effect of probiotic (*S. boulardii* + Bio- Plus) and selenum on paramiter of immunity, an improvement rate in IgM, IgA and IgG in T4 which fed (*S. boulardii* + Bio- Plus and Se) (23.89%),(19.74%) and (14.64%) compered control, these results of present study agree with **(42).**The use of some organic substances, possessed to improve the growth performance of animals, through enhancing feed efficiency and immune response. (**43)** And (**44)** are agree with the present results, the mode of action of probiotics may be enteric diseases of rabbits can be prevented by probiotics that contain yeast, live bacteria or bacterial spores.

Although, the mechanism of useful probiotic has not been elucidated, it might include reduction of toxin production, stimulation of enzyme production by the host, production of some vitamins or antimicrobial substances, competition for adhesion to epithelial cells, increase resistance to colonization, stimulation of the immune system of the host and reduction of stress in rabbits. Similar results were observed by **(3) .**They showed that ***S***. *boulardii* improved meat qualities of rabbits. **(7)** And **(22)** reported that, this improvement may be due to *Saccharomyces boulardii* (*S. boulardii*) resistance to low gastric pH and to bile acids and microflora improvement**.**

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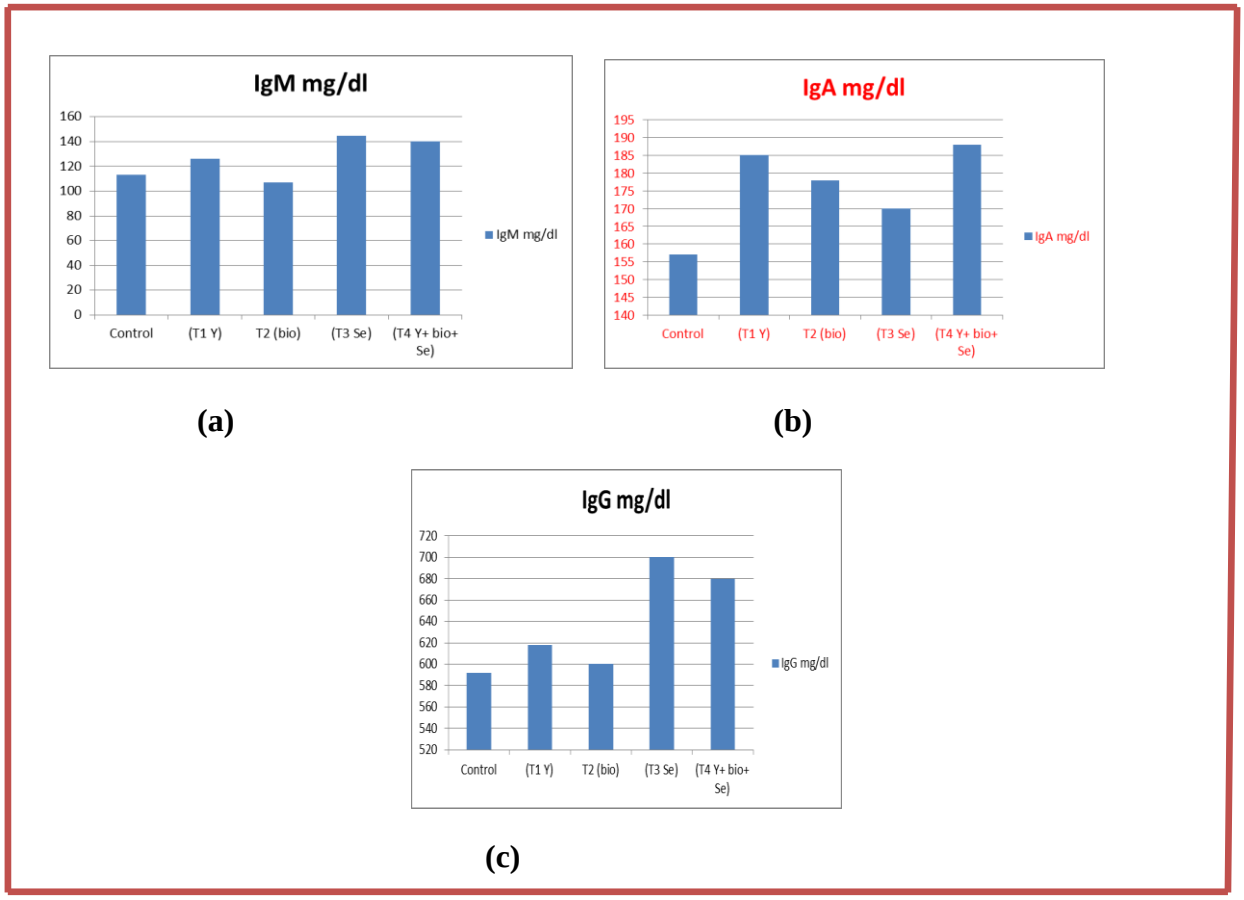

Fig. (2) Effect of Probiotic (*S. boulardii* + Bio- Plus) and selenum on paramiter of immunity, a: (IgM), b: (IgA) and c: (IgG) of growing rabbits.

Conclusion:

It can be concluded generally, that dietary supplementation with mixture of probiotic (*S boulardii* and Bioplus 2B) and organic selenium may improve body weight gain, feed conversion ratio, hematological profile, and immune response and meat quality so it had a beneficial effect on health and overall growth performance of rabbits.

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