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RESPONSE OF GROWING RABBITS FED DIETS CONTAINING DIFFERENT LEVELS OF STARCH AND FIBER TO PROBIOTICS SUPPLEMENTATION

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SUMMARY

A study was conducted to evaluate the effect of three experimental diets either with or without addition of Yea-Sacc on growth performance, digestibility of nutrients, carcass traits, economical efficiency and some physiological parameters in New Zealand White (NZW) rabbits during 25 to 81 days of age. One hundred and eight rabbits aged 25 days were divided into nine (3x3) experimental dietary groups. Three main diets differ in starch and fiber content were formulated, each was supplemented with three different levels of Yea-Sacc (0.0%, 0.20% or 0.30%).

Results obtained could be summarized as follows:-

- Yea-Sacc supplementation increased significantly final body weight and daily weight gain of rabbits.
- Rabbits received high starch level consumed significantly less feed than those fed the recommended levels of starch and fiber.
- Daily feed consumption decreased as well as feed conversion improved by adding yea-sacc to the different diets.
- Yea-Sacc addition lowered the harmful effects associated with diet contained high level of starch.
- Total weight of non-carcass fat (%) and caecum pH were significantly decreased by yea-sacc supplementation.
- Rabbits fed high starch diet plus 0.20% yea-sacc exhibited the better improvement in digestibility coefficients and nutritive values.
- Yea-Sacc administration decreased significantly the serum levels of those components reflecting the symptoms of enteritis.
- Rabbits fed the recommended levels of starch and fiber scored the highest economical efficiency, production index and production efficiency factor (PEF), so did yea-sacc supplemented groups.

Keywords: *Yea-Sacc, growth performance, digestibility, carcass, economical efficiency, physiological parameters, White rabbits*

INTRODUCTION

Several studies illustrated that, a low fiber, high starch diet resulted in gut conditions of cecal-colonic hypomotality, prolonged availability of substrate to bacteria in the caceum and a rich supply of starch allowing bathogenic bacteria to proliferate and produce toxins which kill the rabbit (Cheeke and Patton, 1980, Borriello and Carman, 1983).

On the other hand, the high fiber, low starch diet have a protective effect against the incidence of enteritis by avoiding prolonged cecal retention time and carbohydrate overload, but it depressed growth rate by restricting energy (De-Blas et al, 1986). Therefore, further studies should be given a considerable attention in remodeling a diet with sufficient indigestible fiber to maintain cecal motility as well as abundance but not excess of fermentable substrate to maintain acidic condition in the hindgut, through improvement of fiber and starch utilization in order to get the best efficiency of rabbit production.

Recently, probiotics are used in a large scale as a growth promoters for monogastric animals. Probiotics improve the growth rate, feed conversion decreased feed consumption and mortality rate of animal, also they prevent digestive disorders by maintaining the normal microbial balance of the gut (Hollister *et al.*, 1989 and Yamanei *et al.*, 1992).

Probiotics exert their mode of actions on animal performance through different ways such as improving the immune status, feed efficiency, secretion of some ezymes responsible for the digestion and absorption of food as well as, the antibiotics action of them against toxins (Guerrero and Hoyos, 1990 and Trejo, 1990). However, little and contradictory studies were conducted on the effect of Yea-Sacc as one of probiotics on rabbit performance (Stockland, 1993, Tag-El-Din et al.,1999 and Kermauner, 1994, Kermauner and Struklec, 1998).

The present study was conducted to determine the effect of different levels of fiber and starch with or without probiotics (Yea-Sacc) on the growth performance, digestibility coefficients, carcass traits, some blood parameters and economic efficiency of growing rabbits.

MATERIALS AND METHODS

This study was carried out at the Centre of Agricultural Studies and Consultations (CASC), Rabbits Production Unit (RPU), Faculty of Agriculture, Ain Shams University, Cairo, Egypt.

Experimental rabbits:

A total of 108 weaned, unsexed, purebred New Zealand White (NZW) rabbits of 25 days old were divided randomly into 9 treatment groups.. Rabbits of each treatment were nearly equal in live body weight and were divided into four replicates, each of 3 rabbits.

Experimental diets:

This study included nine diets in pelleted form. Three experimental diets were prepared: optimum starch/optimum fiber (as recommended by Morisse et al., (1985), high starch and high fiber. Such diets contained 20% starch / 14% fiber, 28% starch / 9% fiber and 14% starch / 17% fiber. The diets were enriched with three levels of supplemental probiotics, (Yea-sacc) (0.00, 0.20 and 0.30%, respectively). Probiotic, Yea-sacc, is a biological feed additive, which contains Saccharomyces Cerevisiae yeast culture. The experimental period was 8 weeks. All experimental diets were formulated to meet the recommended nutrient requirements of rabbits according to NRC (1977) and Cheeke (1987). Ingredients and chemical composition of the experimental diets are shown in Table 1. Feed and water were provided ad libitum during the experimental period.

Management:

Animals were housed in galvanized metal wire cages (60 x 50 x 40 cm) and provided with feeders and automatic watering system, with three rabbits per each cage. All animals were kept under the same managerial and hygienic conditions. Rabbits were individually weighed at the beginning of the experiment, then at weekly intervals until

Table (1): Composition of the experimental diets and their chemical analysis.

Ingredients (%)	Recommended	High starch	High fiber
Yellow corn	22.00	32.00	12.50
Wheat bran	31.50	37.00	25.00
Soy bean meal (44% CP)	6.00	12.00	4.00
Sunflower seed meal (28% CP)	18.00	8.00	22.00
Clover hay	20.00	8.00	32.00
Sunflower oil	-	-	2.00
Limestone	1.50	2.00	1.50
Salt (NaCl)	0.30	0.30	0.30
Rabbit premix*	0.60	0.60	0.60
DL-Methionine	0.10	0.10	0.10
Total	100.00	100.00	100.00
Chemical analysis (As fed basis)			
A- Determined analysis			
Dry matter (DM%)	92.19	91.86	91.77
Organic matter (OM%)	85.19	83.50	83.32
Crude protein (CP%)	17.19	17.07	17.19
Starch (%)	20.11	28.02	14.00
Crude fiber (CF%)	14.00	9.15	17.03
Ether extract (EE%)	4.00	4.71	5.01
Nitrogen free extract (N.F.E. %)	50.00	52.22	44.00
Crude ash (%)	7.00	8.36	8.45
B- Calculated analysis			
DE (kcal/kg)	2659	2700	2656
Neutral detergent fiber (NDF%)**	33.00	26.56	35.67
Acid detergent fiber (ADF%)**	17.30	12.51	21.26
Methionine + cystine (%)	0.85	0.71	0.81
Lysine (%)	0.87	0.82	0.89
Calcium (%)	0.95	0.95	1.03
Total phosphorous (%)	0.72	0.73	0.70

*** One kilogram of premix provides: 2000.000 IU vit. A, 150.000 IU vit. D, 8.33g vit. E, 0.33g vit k, 0.33g vit. B1, 1.0g vit. B2, 0.33g vit. B6, 8.33g vit. B5, 1.7 mg vit. B12, 3.33g pantothenic acid, 33mg Biotin, 0.83g folic acid, 200g choline chloride, 11.7g Zn, 12.5g I, 16.6 mg SE, 16.6 mg Co, 66.7g Mg and 5g Mn.**
**** As percent of crude fiber.**

the end of the experiment. Daily weight gain, daily feed consumption, feed conversion ratio and mortality rate were calculated.

Digestibility trials :-

At the end of the experimental period, digestibility trials were conducted using 36 rabbits (four rabbits from each treatment group), which were housed individually in metabolism cages that allow faeces and urine separation. The preliminary period continued for 7 days and the collection period extended for 5 days. Feed intake was exactly determined. Faeces were collected daily , weighed and dried at 60-70°C for 24 hours, bulked, finely ground and stored for chemical analysis. The apparent digestibility coefficients of DM, OM, CP, CF, EE and NFE for the tested diets were estimated.

Blood samples and carcass traits :-

At the end of the growth trial, five randomly chosen rabbits (81 days of age) representing each group were slaughtered according to the standard technique of Cheeke et al., (1987).

Blood samples were collected at slaughtering in non heparinized glass tubes (5 samples per each treatment group). A portion of the blood was used for hematocrit determination using heparinized capillary tubes and mircohematocrit centrifuge. The hematocrit figures were measured after spinning micro hematocrit tubes for 15 minutes. Blood serum was separated by centrifugation at 3000 rpm for 15 minutes. A drop of blood from each sample was used to make smears for the differential leucocytic counts. Differential counts of 100 leucocytes were made using slides stained with Wrightś stain and Neutrophils/Lymphocytes ratio(N:L ratio) was measured.The collected serum was stored at -20°C until assay. Values of total protein, albumin, glucose, total lipids, total cholesterol, urea-N, ammonia and creatinine concentration were estimated by using commercial Kits (Stambio, San Antoni, Texas, USA). The globulin values were obtained by subtracting the values of albumin from the corresponding values of total proteins. Transaminase enzyme activities (AST and ALT) were determined by using kits purchased from Bio Merieux, France. The volatile fatty acids were determined according to Conway (1958). After blood samples were taken, the carcass traits were estimated. Dressing percentage included relative weights of carcass, giblets and head. While, non-carcass fat included relative weights of heart, kidney, caul and mesenteric fat. Values of pH for stomach and caecum contents were measured immediately by using a digital pH meter

Chemical analysis:

The chemical composition of the diets and faeces were analyzed according to A.O.A.C. (1990). The total digestible nutrients (TDN) were calculated according to the classic formula (Cheeke et al., 1982).

Economic efficiency (EE) :-

The EE was calculated according to the following equation:

EE = A-B/B X 100

where A is selling cost of obtained gain (LE per kg) and B is the feeding cost of this gain.

The performance index (PI) was calculated according to the equation described by North (1981) as follows:

PI = Live body weight (Kg)/ Feed conversion x 100

The production efficiency factor (PEF) was calculated according to the equation described by Emmert (2000) as follows:

PEF= [(Livability x mass)/ (FCR x Age in days)] *100

Livability= 100- mortality rate (%), Mass= Final live body weight, in kilograms.

Statistical analysis:-

Data were analyzed on replicate basis each having 3 animals by using a factorial design (3x3) according to Snedecor and Cochran (1982). The following model was used.

Yijk = u + Di + Cj + DCij + Eijk

where Yijk = Observed trait, u = The overall mean, Di = The effect of i th diet composition (i = 1, 2, 3), Cj = The effect of j th Yea Sacc levels (j = 1, 2, 3), DCij = Interactions between the j th diet composition and j th Yea Sacc levels and Eijk = Random error. Mean differences between experimental groups were tested by Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

I. Growth performance:-

As shown in Table (2) neither live body weight nor daily weight gain were affected by diet composition.However, a significant increase ($P<0.01$) in live body weight at 53 days of age as well as final live body weights (81 days of age) were obtained in rabbits fed diet supplemented by yea Sacc. So did daily weight gain and the highest live body weight and/or daily weight gain were recorded for the group fed diet supplemented with 0.20% yea sacc. These results are in harmony with those of Hammad and Gomaa (2001), Aziza and Gomaa (2002) and Gomaa *et al.* (2003), but contradicted with those obtained by Kermuner and Struklec (1998) and Tag EL-Din *et al.* (1999). They reported that the improvement in final body weight and/or daily weight gain by feeding diet containing yea sacc was not significant.

In terms of daily feed consumption, data in Table (3) showed that the effect of diet composition on feed consumption did not pronounce till 53 days of age. Rabbits fed diet contained high starch (D2) consumed significantly less feed during the period from 53-81 days of age than those fed the recommended diet (D1).

Over the course of the study, rabbits fed diet supplemented with high level of yea sacc (0.30%) recorded significantly the lowest daily feed consumption compared to the other groups. Feed conversion was not affected by the different diet composition. Conversely, the feed conversion ratio was significantly improved by adding yes sacc to the growing rabbit diets and the best was recorded by the highest level of yea sacc.

Data for mortality rate from 25-81 days are illustrated in Table (3). As might be expected, the postmortem examination showed that the death was attributed to enteritis indices in the group fed diet contained high starch. However, rabbits fed high starch diet with yea sacc recorded the better survival rate as compared to the group fed the same diet without yea sacc addition. It could be concluded that yea sacc administration to growing rabbit diet containing high level of starch could moderate the lethal effect of this diet.

These results are in accordance with the results of Ghaudhary *et al.* (1995), Gidenne (1995) and Abdel-Azeem *et al.* (2000) who postulated that body weight and daily weight gain was not affected by starch and /or fiber levels. They also found that rabbits fed diet contained high starch recorded lower feed consumption, better-feed conversion and higher mortality rate. Lebas and Maitre (1989) described a significant increase of mortality rate when rabbits were fed high starch diets (25%) in the fisrt period of growth (from 21 to 45 days of age), during which the digestive enzymatic systems are still incomplete. Also,

Table (2): Effect of diet composition,Yea-sacc levels and their interaction on live body weight and daily weight gain.

Items	Yea-sacc level	0.00%	0.20%	0.30%	Overall	Sig. D	Sig. T	Sig. D*T
Live body weight: -	D1	405±11	405±6	404±21	**404.3**	NS	NS	NS
25 days	D2	404±14	404±16	405±4	**404.4**			
	D3	405±4	404±8	405±4	**404.5**			
	Overall	**404.3**	**404.2**	**404.7**				
	D1	1212±9	1334±34	1260±22	**1268.9**	NS	**	NS
53 days	D2	1228±36	1311±32	1284±14	**1274.6**			
	D3	1188±11	1335±29	1270±30	**1264.3**			
	Overall	**1209.3^{c}**	**1326.8^{a}**	**1271.6^{b}**				
	D1	1926±28	2074±23	2068±11	**2022.9**	NS	**	NS
81 days	D2	1930±35	2068±38	2069±38	**2022.3**			
	D3	1893±20	2161±36	2021±37	**2025.1**			
	Overall	**1916.7^{b}**	**2101.0^{a}**	**2052.7^{a}**				
Daily weight gain	D1	28.9±0.7	33.2±1.1	30.6±1.2	**30.9**	NS	**	NS
25-53 days	D2	29.4±0.8	32.4±0.6	31.4±0.5	**31.1**			
	D3	28.0±0.3	33.3±0.9	30.9±1.0	**30.7**			
	Overall	**28.8^{c}**	**33.0^{a}**	**31.0^{b}**				
53-81 days	D1	25.5±1.3	26.4±1.3	28.8±1.2	**26.9**	NS	**	NS
	D2	25.1±0.6	27.0±0.4	28.0±1.0	**26.7**			
	D3	25.2±1.1	29.5±1.5	26.8±1.2	**27.2**			
	Overall	**25.3^{b}**	**27.7^{a}**	**27.9^{a}**				
25-81 days	D1	27.2±0.3	29.8±0.5	29.7±0.4	**28.9**	NS	**	NS
	D2	27.3±0.7	29.7±0.4	29.7±0.6	**28.9**			
	D3	26.6±0.4	31.4±0.5	28.9±0.6	**28.9**			
	Overall	**27.0^{b}**	**30.3^{a}**	**29.4^{a}**				

$^{a,b\ c}$: Means in the same row or column with the same letters are not significantly different.
Sig. = Significance NS: Non-significant **: ($P \leq 0.01$)
D1 = Recommended diet, D2 = High starch diet, D3 = High fiber diet D= diet, T = Yea Sacc, D*T = Interaction

Table (3): Effect of diet composition, Yea Sacc levels and their interaction on daily feed consumption, feed conversion ratio and mortality rate.

Items	Yea-sacc level	0.00%	0.20%	0.30%	Overall	Sig. D	Sig. T	Sig. D*T
Daily feed consumption	D1	71.9±2.4	67.7±2.2	67.7±1.9	**69.1**	NS	**	NS
25-53days	D2	78.8±2.0	71.4±0.4	68.1±3.7	**72.8**			
	D3	74±3.4	77.4±3.1	65.9±1.1	**72.4**			
	Overall	**74.9^{a}**	**72.2^{a}**	**67.2^{b}**				
53-81 days	D1	106.4±1.3	107.1±2.1	98.2±1.0	**103.9^{a}**	**	**	NS
	D2	106.2±1.3	98.1±1.2	88.1±4.6	**97.5^{b}**			
	D3	106.1±4.2	108.0±1.9	90.6±0.7	**101.6^{ab}**			
	Overall	**106.2^{a}**	**104.4^{a}**	**92.3^{b}**				
25-81 days	D1	89.2±1.8	87.4±1.1	82.9±0.5	**86.5**	NS	**	NS
	D2	92.5±1.3	84.8±0.6	78.1±2.2	**85.1**			
	D3	90.1±3.4	92.7±1.4	78.2±0.8	**87.0**			
	Overall	**90.6^{a}**	**88.3^{a}**	**79.8^{b}**				
Feed conversion ratio	D1	2.5±0.1	2.0±0.1	2.2±0.1	**2.3**	NS	**	NS
25-53 days	D2	2.7±0.0	2.2±0.0	2.2±0.1	**2.4**			
	D3	2.7±0.2	2.3±0.1	2.1±0.1	**2.4**			
	Overall	**2.6^{a}**	**2.2^{b}**	**2.2^{b}**				
53-81 days	D1	4.2±0.2	4.1±0.2	3.4±0.1	**3.9**	NS	**	NS
	D2	4.2±0.1	3.6±0.1	3.1±0.1	**3.7**			
	D3	4.2±0.0	3.7±0.2	3.4±0.1	**3.8**			
	Overall	**4.2^{a}**	**3.8^{b}**	**3.3^{c}**				
25-81 days	D1	3.3±0.1	2.9±0.1	2.8±0.0	**3.0**	NS	**	NS
	D2	3.4±0.0	2.9±0.1	2.6±0.0	**3.0**			
	D3	3.4±0.1	3.0±0.1	2.7±0.0	**3.02**			
	Overall	**3.4^{a}**	**2.9^{b}**	**2.7^{c}**				
Mortality rate %	D1	0.0	0.0	0.0	**0.0**			
25-81 days	D2	25.0	8.3	8.3	**13.9**			
	D3	8.3	0.0	0.0	**2.8**			
	Overall	**11.1**	**2.8**	**2.8**				

a,b c: Means in the same row or column with the same letters are not significantly different.
Sig. = Significance NS: Non-significant **: ($P \leq 0.01$)
D1 = Recommended diet, D2 = High starch diet, D3 = High fiber diet
D= diet, T =Yea Sacc, D*T = Interaction

Debray *et al.*, (2002) obersved higher mortality rate in rabbits fed a high-starch/low-fiber diet in the weaning period, but morbidity was higher for the rabbits fed the low- starch/ high- fiber diet from 32 to 44 day of age. When high-starch diets were fed to rabbits older than 35 day of age under more balanced nutritional conditions and respecting minimum fiber levels, no significant difference was recorded on health status (Parigi Bini *et al.*, 1990 and Xicccato *et al.*, 2002). According to De Blas et al. (1986) which investigated a wide range of starch to fiber ratio, minimum values of ADF 15.3%, crude fiber 11.7% and ADL 4.1% DM were necessary to reduce mortality due to diarrhoea. The occurrence of diarrhoea was attributed to a low digestive transit rate due to insufficient dietary fiber, while no direct effect of starch concentration was revealed.

On the other hand, the present results are in agreement with those of Hammad and Gomaa (2001), Aziza and Gomaa (2002) and Gomaa *et al.* (2003) who reported that the improvement in feed conversion was most pronounced by yea sacc administration to the growing rabbit diets.

The present improvement in feed conversion might be due to the significant lower feed intake relative to the highest body weight recorded by the rabbits fed diet supplemented with Yea-sacc. Fairly *et al.* (1985) attributed the improvement in feed efficiency by lacto-sacc (probiotics) to an increase in the efficiency of nutrient absorption and nutrient utilization.

II-Digestibility coefficients, nutritive values and nitrogen utilization:

Effects of diet composition on digestibility coefficients, nutritive values and nitrogen utilization are presented in Tables (4 and 5). Rabbits fed diet contained high starch recorded significantly the greatest values of DM, OM, CP and NFE digestibility coefficients, DCP, TDN and N-retained % of intake, however they recorded the lowest values of CF digestibility and Fecal-N as compared to the group of rabbits fed high fiber. The rabbits fed the recommended diet showed intermediate values. However, diet composition did not reveal any significant effect on EE, N-intake, urinary-N and N-balance.

These results are in agreement with those of Aderibigbe *et al.* (1992) who reported that DM and OM were higher in the rabbits fed high starch diet indicating that rabbits are good digesters of starch. Also, the results are similar to those reported by De-Blas *et al.*, 1986, Starika and Raharjo (1992) and Shalash *et al.* (1991). All of these studies indicated that the increase in the level of fiber in rabbit diet resulted in a decrease in nutrient digestibility coefficients except, CF digestibility.

As shown in Table (4), Yea-Sacc administration (0.20 or 0.30%) to the growing rabbit diets significantly improved the digestibility coefficients of DM, OM, CP and CF as well as the nutritive values of DCP and TDN as compared to the rabbits fed the same diets without Yea-Sacc supplementation. This evidence agrees with the previous results of Kermaurner *et al.* (1997) who found that Yea-sacc administration to rabbit diets improved digestibility coefficients of DM,OM,CP and CF.

Digestibility coefficients of EE, NFE and nitrogen utilization were affected insignificantly by Yea-Sacc supplementation, the big differences between their levels in rabbits fed the experimental diet with or without yea-Sacc could be masked the significant effects of Yea-sacc supplementation. Tag El-Din *et al.* (1999) reported that yeast culture had no obvious effects on

Table (4): Effect of diet composition, Yea sacc levels and their interaction on nutrients digestibility coefficients.

Items	Yea Sacc level	0.00%	0.20%	0.30%	Overall	Sig. D	Sig. T	Sig. D*T
Digestibility coefficients (%)								
DM	D1	61.8±0.8	68.5±1.8	72.2±1.7	**67.5 [b]**	**	**	**
	D2	66.3±1.0	75.0±0.8	73.4±1.6	**71.6 [a]**			
	D3	64.7±0.4	64.5±1.6	61.8±0.7	**63.7 [c]**			
	Overall	**64.2 [b]**	**69.3 [a]**	**69.2 [a]**				
OM	D1	64.2±0.7	70.7±1.6	73.9±1.7	**69.6 [b]**	**	**	**
	D2	67.9±1.2	75.7±0.9	74.5±1.5	**72.7 [a]**			
	D3	65.4±0.4	65.3±1.5	62.4±0.7	**64.4 [c]**			
	Overall	**65.8 [b]**	**70.6 [a]**	**70.3 [a]**				
CP	D1	70.9±1.2	79.1±2.2	79.7±0.7	**76.6 [ab]**	*	**	NS
	D2	73.9±1.9	82.4±1.9	80.6±2.1	**79.0 [a]**			
	D3	74.3±0.7	75.1±1.1	74.5±2.8	**74.6 [b]**			
	Overall	**73.0 [b]**	**78.9 [a]**	**78.3 [a]**				
CF	D1	32.6±1.9	40.9±3.2	51.1±0.9	**43.5 [a]**	**	**	**
	D2	17.6±0.4	44.8±0.5	43.2±2.5	**35.2 [b]**			
	D3	38.3±1.6	42.0±1.1	43.1±1.6	**41.1 [a]**			
	Overall	**29.5 [b]**	**44.6 [a]**	**45.8 [a]**				
EE	D1	71.3±6.9	88.9±2.6	89.8±2.4	**83.3**	NS	NS	**
	D2	84.4±3.3	87.1±1.8	86.3±0.5	**85.9**			
	D3	90.7±0.6	80.0±1.4	77.6±0.7	**82.7**			
	Overall	**82.2**	**85.3**	**84.6**				
NFE	D1	68.8±1.7	73.6±0.9	77.9±1.8	**73.4 [b]**	**	NS	**
	D2	74.2±1.4	78.3±1.5	77.0±1.2	**76.5 [a]**			
	D3	73.8±2.4	70.5±0.9	62.8±1.8	**69.0 [c]**			
	Overall	**72.3**	**74.1**	**72.6**				

a,b c: Means in the same row or column with the same letters are not significantly different.
Sig. = Significance. NS: Non-significant: ($P \leq 0.01$) *: ($P \leq 0.05$)**
D1 = Recommended diet, D2 = High starch diet, D3 = High fiber diet
D= diet, T = Yea Sacc, D*T = Interaction

Table (5): Effect of diet composition, Yea Sacc levels and their interaction on nutritive values and nitrogen utilization.

Yea Sacc level / Items		0.00%	0.20%	0.30%	Overall	Sig. D	Sig. T	Sig. D*T
Nutritive values %:-								
DCP	D1	10.8±0.2	13.6±0.4	13.7±0.1	**12.7^{b}**	**	**	**
	D2	12.7±0.3	14.1±0.3	13.8±0.3	**13.5^{a}**			
	D3	12.9±0.1	12.9±0.2	12.8±0.5	**12.9^{b}**			
	Overall	**12.1^{b}**	**13.5^{a}**	**13.5^{a}**				
TDN	D1	57.9±0.5	64.8±1.6	67.5±1.5	**63.4^{b}**	**	**	**
	D2	61.5±1.0	68.4±0.9	67.9±0.7	**65.9^{a}**			
	D3	60.9±1.4	59.4±0.6	56.5±0.5	**59.0^{c}**			
	Overall	**60.1^{b}**	**64.2^{a}**	**64.0^{a}**				
Nitrogen utilization:-								
N-intake	D1	2.6±0.2	2.7±0.1	2.5±0.1	**2.58**	NS	NS	NS
(g/day)	D2	3.3±0.4	2.3±0.1	2.6±0.1	**2.75**			
	D3	2.6±0.5	3.3±0.3	2.8±0.3	**2.92**			
	Overall	**2.9**	**2.8**	**2.7**				
Fecal N	D1	0.5±0.1	0.6±0.1	0.5±0.0	**0.54^{b}**	*	NS	NS
(g/day)	D2	0.8±0.1	0.4±0.0	0.5±0.1	**0.55^{b}**			
	D3	0.7±0.1	0.8±0.1	0.8±0.1	**0.78^{a}**			
	Overall	**0.6**	**0.6**	**0.6**				
Urinary N	D1	0.4±0.1	0.8±0.2	0.4±0.1	**0.53**	NS	NS	NS
(g/day)	D2	0.6±0.1	0.5±0.1	0.5±0.2	**0.52**			
	D3	0.5±0.0	0.8±0.2	0.7±0.1	**0.67**			
	Overall	**0.5**	**0.7**	**0.5**				
N-balance	D1	1.5±0.1	1.3±0.1	1.6±0.1	**1.45**	NS	NS	NS
(g/day)	D2	1.9±0.2	1.4±0.2	1.6±0.2	**1.64**			
	D3	1.3±0.2	1.7±0.2	1.4±0.2	**1.44**			
	Overall	**1.6**	**1.5**	**1.5**				
N-retained	D1	59.4±1.4	47.6±7.4	63.3±3.0	**56.78^{ab}**	*	NS	NS
% of intake	D2	55.8±1.6	60.7±6.4	62.0±7.7	**59.52^{a}**			
	D3	48.9±0.7	51.9±5.8	47.9±0.5	**49.57^{b}**			
	Overall	**54.7**	**53.4**	**57.7**				

a,b c: Means in the same row or column with the same letters are not significantly different.
Sig. = Significance. NS: Non-significant **: (P≤ 0.01) *: (P≤ 0.05)
D1 = Recommended diet, D2 = High starch diet, D3 = High fiber diet
D= diet, T = Yea Sacc, D*T = Interaction

digestibility coefficients of all nutrients except ether extract in rabbits.

The improvement effects of yea-sacc may be attributed to its ability to induce the microbial equilibrium of the gut in order to prevent the digestive disorders and/or by enhancing the growth of desirable gastrointestinal microbes of the host animal (Fuller, 1988, Marionnet and Lebas, 1990).

The interaction between diet composition and yea-sacc levels was significant ($P<0.01$ of 0.05) for all digestibility coefficient items (except CP%) and nutritive values, while was insignificant for nitrogen utilization.

The results indicated that better improvement in digestibility coefficients and nutritive values was most pronounced in rabbit fed high starch diet supplemented with low level (0.20%) of yea-sacc.

III. Carcass traits and digestive tract measurements:-

With respect to the effect of experimental diets either with or without yea sacc addition on carcass traits and digestive tract measurements (Table 6) the results show that neither diet composition nor yea sacc administration had any effect on either carcass traits or digestive tract measurements with two exception:

The total non-carcass fat weight percentage was significantly lower in rabbits fed diet supplemented with high level of yea sacc as compared to those fed the same diet without yea sacc. Caecum pH also significantly decreased with yea sacc addition. These results were in agreement with those obtained by Radwan *et al.* (1996), Ali (1999) and El-Adawy *et al.* (2000) who reported that probiotics addition to the growing rabbit diets had no significant effect on carcass, giblets and dressing percentages. However, this result is in contrast with the results obtained by Aziza and Gomaa (2002) and Gomaa *et al.* (2003) who concluded that feeding diet contained yeast culture increased significantly the dressed weight, dressing percentage and edible parts.

On the oher hand, Dehalle (1981) found that the weights of the stomach tissue and stomach contents were higher with the high fiber diets, whereas the caecal weight was greater with the high starch diets. Similarly, Champe and Maurice (1983) and De-Blas et al. (1986) reported that, the high weight of the stomach in rabbits fed the high fiber diets may reflect the greater feed intake on the low energy diets, and the physical effect of fiber in stimulating and increasing thickness of the stomach wall.

IV. Physiological and biochemical parameters of blood serum:

Data in Table (7) illustrated that, neither diet composition nor yea-sacc levels exerted a significant effect on serum total protein, albumin, globulin or albumin/globulin ratio and hematocrit values. Also, the interactions between diet composition and yea-sacc levels were not significant.

Blood glucose was not affected by the different experimental diets, however, rabbits fed diet supplemented with yea-sacc recorded significantly ($P<0.01$) the lower serum glucose levels as compared to those fed diet without yea-sacc. Another study in this respect using broiler chicks reported that yea-sacc supplementation increased significantly plasma glucose level (Omar, 1996). The variation between the results may be due to the different experimental animal. The interaction ($P<0.01$) between diet compositions and yea-sacc levels was due almost entirely to the group fed diet contained high starch (D2) without yea-sacc as compared to the group fed the

Table (6): Effect of diet composition, Yea Sacc levels and their interaction on carcass traits and digestive tract measurements.

Items	Yea Sacc level	0.00%	0.20%	0.30%	Overall	Sig. D	Sig. T	Sig. D*T
Dressing percentage	D1	61.9±1.1	61.9±1.0	59.9±1.1	**61.25**	NS	NS	NS
	D2	62.7±0.5	59.6±2.2	60.1±1.7	**60.95**			
	D3	62.4±1.9	64.8±2.8	59.4±1.2	**61.99**			
	Overall	**62.3**	**62.1**	**59.8**				
Hot carcass wt %	D1	51.4±0.9	52.2±1.1	51.5±1.3	**51.70**	NS	NS	NS
	D2	51.2±0.4	49.9±1.6	49.7±1.6	**50.32**			
	D3	51.1±1.7	54.1±3.1	48.0±1.2	**50.83**			
	Overall	**51.2**	**52.1**	**49.8**				
Giblets wt %	D1	3.9±0.2	3.9±0.4	3.1±0.3	**3.64**	NS	NS	NS
	D2	4.7±0.1	3.7±0.1	4.3±0.2	**4.25**			
	D3	4.5±0.4	4.5±0.2	5.0±0.3	**4.68**			
	Overall	**4.3**	**4.0**	**4.1**				
Total non-carcass fat wt %	D1	1.8±0.1	1.3±0. 1	1.12±0.15	**1.40**	NS	*	NS
	D2	1.5±0.2	1.6±0.1	1.30±0.07	**1.44**			
	D3	1.2±0.2	1.4±0.1	1.17±0.20	**1.23**			
	Overall	**1.5[a]**	**1.4[ab]**	**1.18[b]**				
Empty stomach wt %	D1	0.9±0.1	0.9±0.1	0.9±0.1	**0.97**	NS	NS	NS
	D2	1.0±0.1	1.0±0.0	1.0±0.1	**1.02**			
	D3	1.0±0.0	1.0±0.0	1.1±0.1	**1.07**			
	Overall	**1.0**	**1.0**	**1.0**				
Stomach contents wt %	D1	3.9±0.3	4.3±0.8	4.00±0.82	**4.52**	NS	NS	NS
	D2	5.1±0.4	4.8±0.6	4.61±0.35	**4.93**			
	D3	4.7±0.5	4.6±0.2	5.52±0.50	**4.91**			
	Overall	**4.7**	**4.7**	**4.9**				
Stomach pH	D1	2.3±0.3	2.3±0.3	2.9±0.4	**2.49**	NS	NS	NS
	D2	2.8±0.3	2.4±0.2	2.3±0.2	**2.50**			
	D3	2.6±0.4	2.3±0.1	2.4±0.2	**2.42**			
	Overall	**2.5**	**2.3**	**2.5**				
Empty small intestine wt %	D1	2.5±0.3	2.3±0.4	2.1±0.2	**2.38**	NS	NS	NS
	D2	1.8±0.2	2.9±0.1	2.5±0.3	**2.47**			
	D3	2.5±0.3	2.6±0.2	2.5±0.2	**2.43**			
	Overall	**2.3**	**2.7**	**2.4**				

[a,b]: Means in the same row or column with the same letters are not significantly different.
Sig. = Significance NS: Non-significant *: ($P \leq 0.05$)
D1 = Recommended diet, D2 = High starch diet, D3 = High fiber diet
D= diet, T =Yea Sacc, D*T = Interaction

To be continued on the next pae

Table (6): Continued

Yea Sacc level		0.00%	0.20%	0.30%	Overall	Sig.		
Items						D	T	D*T
Small intestine contents wt %	D1	0.4±0.1	0.6±0.3	0.7±0.2	**0.58**	NS	NS	NS
	D2	1.2±0.5	0.5±0.1	0.3±0.1	**0.56**			
	D3	0.6±0.2	0.6±0.1	0.9±0.3	**0.68**			
	Overall	**0.9**	**0.6**	**0.6**				
Empty caecum wt %	D1	1.4±0.2	1.1±0.1	1.1±0.1	**1.22**	NS	NS	NS
	D2	1.2±0.1	1.5±0.2	1.3±0.2	**1.33**			
	D3	1.5±0.2	1.4±0.2	1.5±0.1	**1.47**			
	Overall	**1.3**	**1.3**	**1.3**				
Caecum contents wt%	D1	4.7±0.7	3.7±0.5	3.7±0.6	**4.35**	NS	NS	NS
	D2	3.8±0.4	5.0±1.1	3.9±0.3	**4.35**			
	D3	5.3±1.5	5.0±0.9	5.5±0.8	**4.39**			
	Overall	**4.6**	**4.6**	**4.4**				
Caecum pH	D1	6.5±0.1	6.1±0.1	5.9±0.2	**6.18**	NS	**	NS
	D2	6.7±0.1	5.8±0.3	5.9±0.1	**6.16**			
	D3	6.8±0.1	6.2±0.2	6.1±0.2	**6.35**			
	Overall	**6.7**[a]	**6.0**[b]	**6.0**[b]				
Empty large intestine wt %	D1	2.8±0.5	2.8±0.3	2.5±0.3	**2.72**	NS	NS	NS
	D2	2.6±0.2	3.4±0.4	3.2±0.4	**3.10**			
	D3	3.6±0.2	3.6±0.5	3.4±0.2	**3.59**			
	Overall	**3.0**	**3.3**	**3.0**				
Large intestine wt %	D1	6.2±1.0	4.5±0.5	4.2±0.5	**5.19**	NS	NS	NS
	D2	4.6±0.5	6.3±1.3	4.1±0.2	**5.05**			
	D3	6.2±1.6	5.4±1.0	6.1±1.0	**5.89**			
	Overall	**5.7**	**5.4**	**4.8**				
Caecum length (cm)	D1	32.3±0.8	33.5±1.0	34.3±0.9	**33.35**	NS	NS	NS
	D2	31.0±0.6	32.5±1.0	36.0±1.6	**33.17**			
	D3	39.3±2.8	34.9±1.0	34.4±2.5	**36.08**			
	Overall	**34.2**	**33.6**	**34.9**				

a,b: Means in the same row with the same letters are not significantly different.
Sig. = Significance NS: Non-significant **: (P≤0.01)
D1 = Recommended diet, D2 = High starch diet, D3 = High fiber diet
D= diet, T = Yea Sacc, D*T = Interaction

Table (7): Levels of total protein and its fractions, hematocrit value (PCV) and blood glucose as affected by interaction due to diet composition and Yea Sacc levels.

Yea-sacc level		0.00%	0.20%	0.30%	Overall	Sig.		
Items						D	T	D*T
Total protein	D1	6.6±0.4	7.0±0.4	6.7±0.5	6.77	NS	NS	NS
(g/100ml)	D2	7.7±0.3	6.4±0.5	6.6±0.5	6.88			
	D3	7.1±0.3	7.0±0.5	6.0±0.3	6.77			
Overall		**7.1**	**6.8**	**6.4**				
Albumin	D1	4.6±0.4	4.7±0.3	4.8±0.6	4.72	NS	NS	NS
(g/100ml)	D2	5.7±0.3	4.3±0.4	4.6±0.4	4.87			
	D3	5.1±0.1	4.7±0.2	4.4±0.3	4.75			
Overall		**5.2**	**4.6**	**4.6**				
Globulin	D1	2.0±0.3	2.3±0.3	1.9±0.2	2.06	NS	NS	NS
(g/100ml)	D2	2.0±0.6	2.1±0.2	2.0±0.3	2.02			
	D3	2.0±0.4	2.3±0.5	1.6±0.2	2.00			
Overall		**2.0**	**2.2**	**1.8**				
AL:GL ratio	D1	2.4±0.4	2.1±0.2	2.7±0.5	2.42	NS	NS	NS
	D2	3.7±0.9	2.1±0.2	2.4±0.4	2.75			
	D3	2.9±0.6	2.3±0.5	2.8±0.5	2.65			
Overall		**3.0**	**2.2**	**2.6**				
PCV%	D1	43.3±1.4	40.5±2.6	40.9±1.8	41.57	NS	NS	NS
	D2	42.3±2.5	46.3±4.0	41.3±5.6	43.31			
	D3	43.8±1.1	42.4±2.1	40.0±3.1	42.06			
Overall		**43.7**	**43.1**	**40.7**				
N : L ratio	D1	0.7±0.0	0.76±0.08	0.75±0.16	0.73^a	**	NS	NS
	D2	0.7±0.1	0.49±0.03	0.53±0.11	0.57^b			
	D3	0.6±0.0	0.37±0.06	0.40±0.02	0.47^b			
Overall		**0.7**	**0.5**	**0.6**				
Glucose (g/l)	D1	2.5±0.1	2.6±0.2	2.3±0.0	2.45	NS	**	**
	D2	3.6±0.3	2.2±0.3	2.3±0.1	2.69			
	D3	2.3±0.2	2.6±0.3	2.4±0.2	2.42			
Overall		**2.8^a**	**2.5^b**	**2.3^b**				

^{a,b}: Means in the same row or column with the same letters are not significantly different.
Sig. =Significance. NS: Non-significant **: (P≤0.01)
D1 = Recommended diet, D2 = High starch diet, D3 = High fiber diet
D= diet, T = Yea Sacc, D*T = Interaction
N:L ratio: Neutrophils/Lymphocytes ratio

same diet supplemented with each yea-sacc level.

With respect to N/L ratio, there was significant effect due to diet compoision however, rabbits fed diets supplemented with yea-sacc levels recorded the lowest N/L ratio as compared to those fed diet without yea-sacc administration. The big difference (P<0.01) in N/L levels between the different experimental diets could be masked the significant effects of yea-sacc supplementation.

The physiological changes accompanied with enteritis included an increase in total lipids, cholesterol, urea, ammonia and impaired liver function (Vetesi and Kutas, 1973, 1974, Ekpenyong 1986, Gascon and Verde, 1985 and Licois *et al.,* 1978). As shown in Table (8), rabbits fed diet contained high starch recorded the highest levels of total lipids, cholesterol, AST, ALT, urea and creatinine, the parameters used as an indicator of impaired liver function and enteritis as compared to the other experimental diet groups. In some parameters, the big difference between their levels in rabbits fed the experimental diet with or without yea-sacc could be masked the significant effects of diet composition on those parameters. Rabbits fed diet contained high starch, recorded the highest (P<0.01) levels of TVFAs to keep the caecum acidic and preventing changes in microflora however, it had also the highest (P<0.01) level of ammonia. Morisse *et al.* (1985) indicated that high level of ammonia allows greater dissociation of VFAs with a drop in their effectiveness in inhibiting growth of E-coli and Clostridium.

The high starch diet may provide the suitable substrate to pathogenic kinds of bacteria in the caecum allowing them to proliferation and produce toxins.

With respect to yea-Sacc administration, the present data illustrated that, rabbits fed diets supplemented with yea-sacc levels recorded significantly (P<0.01) the lowest levels of total lipids, total cholesterol, AST, urea, creatinine and total ammonia when compared with rabbits fed the experimental diets without yea-sacc supplementation. Braum *et al.* (1983) suggested that, ALT concentration in rabbit plasma is not very useful for detecting pathology in this species. Perhaps for this reason, neither diet composition, nor yea-sacc administration revealed any significant effect on serum ALT. The previous data showed that yea-sacc administration decreased significantly the plasma levels of those blood components associated with the symptoms of enteritis

As shown in Table (8), there was significantly interaction between diet composition and yea-sacc administration due primarily to group fed high starch diet without yea-sac. Rabbits in this group recorded the highest levels of total lipids, urea, creatinine, TFVAs and total ammonia as compared to the groups fed the same diet supplemented with yea-sacc levels.

In regard to serum cholesterol, the interaction between diet composition and yea-sacc administration may be due to the increase in the serum cholesterol by the group fed the recommended diet without yea-sacc compared to the group fed the same diet with yea-sacc administration.

V-Economical evaluation:

In terms of economical evaluation, data in Table (9) showed that rabbits fed the recommended diet (D1) scored the highest (P<0.01) economical efficiency and production efficiency factor (PEF) percentages compared to those fed either the high starch (D2) or high fiber (D3) diets. On the other hand, economical efficiency, performance index as well as

Table (8): Effect of diet composition, Yea Sacc levels and their interection on blood constituents.

Yea-sacc level	0.00%	0.20%	0.30%	Overall	Sig.		
Items					D	T	D*T
Total lipids D1	639±53	440.5±42.8	465.0±19.6	514.67^{b}	**	**	*
(mg/100 ml) D2	1037±112	419.3±5.1	526.8±9.4	661.08^{a}			
D3	583±82	358.0±37.9	484.3±53.6	474.92^{b}			
Overall	752.8^{a}	405.9^{b}	492.0^{b}				
Total cholesterol D1	253.5±20.8	148.0±7.2	161.0±6.3	187.50^{a}	*	**	**
(mg/100 ml) D2	203.0±8.5	162.8±5.0	187.0±6.1	184.27^{a}			
D3	185.3±6.0	164.0±3.6	142.0±14.1	163.80^{b}			
Overall	213.9^{a}	158.3^{b}	163.3^{b}				
AST (μ/L) D1	37.0±4.9	20.3±1.1	22.0±1.9	**26.42**	NS	**	NS
D2	33.5±5.7	23.0±2.1	28.0±7.8	**28.70**			
D3	28.8±4.8	22.8±0.5	12.3±0.9	**21.25**			
Overall	33.1^{a}	21.9^{b}	20.1^{b}				
ALT (μ/L) D1	30.3±2.5	37.5±7.2	20.3±1.7	**29.67**	NS	NS	NS
D2	36.8±1.3	33.5±2.8	38.8±5.0	**36.37**			
D3	26.0±1.6	22.7±1.5	22.3±4.5	**23.67**			
Overall	**31.0**	**32.0**	**27.6**				
Urea (mg/dl) D1	40.0±3.8	37.4±5.0	30.2±3.8	**35.83**	NS	*	**
D2	55.5±7.8	38.7±0.8	43.8±2.9	**46.01**			
D3	36.8±3.3	32.7±3.3	32.5±1.3	**33.95**			
Overall	44.1^{a}	36.2^{b}	35.5^{b}				
Creatinine D1	1.7±0.0	1.4±0.2	1.00±0.1	**1.37**	NS	**	**
(mg/100ml) D2	2.6±0.4	0.9±0.1	1.12±0.1	**1.56**			
D3	1.3±0.1	1.0±0.1	1.44±0.1	**1.24**			
Overall	1.9^{a}	1.1^{b}	1.2^{b}				
T.VFAs D1	10.7±0.2	6.3±0.6	6.2±0.6	7.73^{b}	**	**	**
(ml. eq/dl) D2	7.5±0.5	7.3±0.6	13.5±1.5	9.42^{a}			
D3	2.5±0.3	5.6±1.1	10.7±1.3	6.24^{c}			
Overall	6.9^{b}	6.4^{b}	10.1^{a}				
T. Ammonia D1	26.5±0.4	24.4±1.5	22.9±1.2	24.57^{c}	**	**	**
(mg/100 ml) D2	64.0±4.3	31.0±2.2	26.8±2.3	41.59^{a}			
D3	44.3±1.7	29.8±2.8	28.0±2.0	35.00^{b}			
Overall	44.9^{a}	28.4^{b}	25.9^{b}				

^{a,b}: Means in the same row or column with the same letters are not significantly different.
Sig. = Significance. NS: Non-significant *: ($P \leq 0.05$) ** ($P \leq 0.01$)
D1 = Recommended diet, D2 = High starch diet, D3 = High fiber diet
D= diet, T = Yea Sacc, D*T = Interaction

Table (9): Effect of diet composition, Yea Sacc levels and their interaction on Economical efficiency %, Performance index % and Production efficiency factor (PEF).

Yea Sacc level / Items		0.00%	0.20%	0.30%	Overall	Sig. D	Sig. T	Sig. D*T
Economical efficiency %	D1	322.8± 9.9	351.6±13.0	353.9±2.7	**342.8[a]**	**	**	NS
	D2	291.3±9.4	329.2±11.2	348.7±6.0	**323.0[b]**			
	D3	258.9±0.6	309.9±7.8	328.8±4.0	**298.9[c]**			
	Overall	**290.8[b]**	**330.2[a]**	**343.7[a]**				
Performance index %	D1	58.9±1.9	70.8±2.9	74.0±0.7	**67.9**	NS	**	NS
	D2	56.0±0.7	73.2±2.9	74.6±2.3	**69.4**			
	D3	56.9±1.1	72.6±2.7	78.8±1.0	**67.1**			
	Overall	**57.2[c]**	**72.2[b]**	**75.8[a]**				
PEF %	D1	60.4	115.2	91.5	**89.0**			
	D2	52.6	89.6	89.9	**77.3**			
	D3	69.2	85.8	92.1	**82.3**			
	Overall	**60.7**	**96.9**	**91.2**				

a,b: Means in the same row with the same letters are not significantly different.
Sig. = Significance. NS: Non-significant0 **: (P≤ 0.01)
D1 = Recommended diet, D2 = High starch diet, D3 = High fiber diet
D= diet, T =Yea Sacc, D*T = Interaction

production efficiency factor percentages were significantly higher in the rabbits fed the experimental diets with yea sacc than those fed the same diets without yea sacc, this might be due to reducing the amount of feed intake required to produce one unit of meat associated with the addition of yea sacc, This observation confirmed those obtained by Tag El-Din *et al.* (1999), Soliman *et al.* (2000) and Gomaa *et al.* (2003) who reported that yeast culture improved economic efficiency.

Generally, it could be recommended to use the yea-sacc up to 0.30% in the growing rabbit diets to get the best live weight gain, liveability percent, nutrients digestibility and economical efficiency values without any harmful effects on growing rabbit performance.

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استجابة الأرانب النامية المغذاة علي مستويات مختلفة من النشا والألياف لاضافة المعضدات الحيوية كمحفز نمو

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استخدم في هذا البحث عدد (١٠٨) أرنب نيوزيلاندي أبيض مفطوم عمر ٢٥ يوم غير مجنس وتم تقسيمهم عشوائيا إلي ٩ مجاميع غذائية (٣x٣) كما يلي :- ٣ مجاميع رئيسية تبعا لنسبة النشا والألياف في العليقة (المجموعة الأولي ٢٠% نشا – ١٤% ألياف ، المجموعة الثانية ٢٨% نشا – ٩ % ألياف ، المجموعة الثالثة ١٤ % نشا – ١٧% ألياف). داخل كل مجموعة رئيسية تم تقسيم الأرانب إلى ٣ تحت مجموعة تبعا لنسبة مزارع الخميرة(Yea-Sacc) المضافة إلى العليقة (صفر % ، ٠,٢٠% ، ٠,٣٠%). استمرت التغذية على العلائق التجريبية من عمر ٢٥ يوم إلى ٨١ يوم أي لمدة ٨ أسابيع.

وكانت النتائج المتحصل عليها كالآتي:

- لوحظ تحسن معنوي فى وزن الجسم ومعدل النمو اليومى عند إضافة مزارع الخميرة مقارنة بالمجموعة المقارنة.
- سجلت الأرانب المغذاة على العليقة المحتوية (٢٨% نشا و ٩% ألياف خام) اقل معدل للاستهلاك اليومى من الغذاء مقارنة بالمجموعة المغذاة على العليقة المثلى (المجموعة المقارنة).
- لوحظ انخفاض معنوى فى الاستهلاك اليومى للغذاء بالإضافة إلى تحسن معنوى فى معدل التحويل الغذائى للأرانب المغذاة على العلائق التجريبية المختلفة والمضاف إليها مزارع الخميرة مقارنة بالأرانب التى غذيت على نفس العلائق التجريبية بدون إضافة مزارع الخميرة.
- إضافة مزارع الخميرة قلل من التأثيرات الضارة الناجمة عن تغذية الأرانب النامية على علائق مرتفعة فى مستوى النشا.
- أظهرت الأرانب المغذاة على العلائق التجريبية والمضاف إليها مزارع الخميرة انخفاض معنوى فى درجة الحموضة (pH الأعور) وكذلك فى النسبة المئوية للدهن الحشوى (Non carcass fat).
- سجلت المجموعة المغذاة على عليقة مرتفعة فى مستوى النشا والمضاف إليها ٠,٢٠% Yea Sacc افضل النتائج فى المعاملات الهضمية للعناصر المختلفة والقيمة الغذائية.
- إضافة مزارع الخميرة إلى علائق الأرانب النامية أدت إلى انخفاض معنوى فى مكونات سيرم الدم المرتبطة أو المصاحبة لحالات الالتهاب المعوى فى الأرانب وهي: الليبيدات الكلية والكوليستيرول وانزيمات نشاط خلايا الكبد (ALT, AST) واليوريا والكيرياتينين .
- سجلت الأرانب المغذاة على العليقة المثلى وكذلك المغذاة على علائق عالية فى النشا أو الألياف والمضاف إليها Yea Sacc أعلى معدل فى الكفاءة الاقتصادية وعامل الإنتاج الاقتصادي "PEF" ودليل الإنتاج.