Economical and Immunological Evaluation of Probiotic (*L. acidophilus*) In Male Castrated Goats within Egypt

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Abstract: This study was aimed to economic and immunological evaluation of Probiotic (*L. acidophilus*) in male castrated Goats. A total number of 24 male castrated goats were used in this study. The Goats were classified into 3 equal groups, each of eight and having nearly the same body weight. The first group was left as a normal control (non-treated and non-vaccinated). The second group was vaccinated by clostridia polyvalent vaccine by injecting 3 ml of the vaccine once under the skin of neck region. The third group was vaccinated in the same manner and given also the probiotic daily for successive 90 days in a dose of 3 gm /head. Immunological parameters (Total leucocytic count, lysozyme activity and serum nitric oxide) and Economical measures (total cost, total returns and net profit) were evaluated in differernt groups. The obtained results revealed that the total leukocytic count, lysozyme activity and serum nitric oxide were significantly increase in the third groups as compared with the vaccinated and control groups. And the economic measures revealed that the most economic profit (LE/Animal) was present in the third group that vaccinated and given the probiotic (*L. acidophilus*). Finally, from our obtained results, we can conclude that the probiotic *Lactobacillus acidophilus* possesses an immunostimulating properties evidenced by an increase in total leucocytic count, lysozyme activity and serum nitric oxide. This was reflected on the feed conversion ratio and feed efficiency on castrated male goats. So we recommended from our economic results that using *Lactobacillus acidophilus* in fattening goats daily for successive 90 days in a dose of 3 gm /head will increase economic profit**.**
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1. Introduction

The long term exploitation of probiotics would depend on scientifically proven clinical evidence of health benefit, of consumer expectation and of effective marketing strategies [1]. Probiotics are living microorganisms or microbial mixtures that affect the host in a beneficial manner and improving its microbial balance, particularly the environment of the gastrointestinal tract [2-4]. An expert panel commissioned by FAO (Food and Agriculture Organization) defined probiotic as "live microorganisms" which when administered in adequate amounts confers a health benefit on the host and improvement of growth weights and hence improve economic efficiency [5]

An ideal probiotic should have the following, a) the ability to adhere to cells. b) exclude or reduce pathogenic adherence. C) persist and multiply, d) produce acids, hydrogen peroxide and bacteriocins antagonistic to pathogen growth, e) be safe, noninvasive; noncarcinogenic and f) coaggregate to form a normal balanced flora [6]. The beneficial effect of probiotics could be produced in two ways. They could operate by: (1) Suppressing harmful bacteria, this could manifest itself in reduced numbers of bacteria or in a decreased concentration of harmful metabolites such as enterotoxin. (2) Stimulation of bacteria which are engaged in beneficial activities such as production of essential nutrients like vitamins or in digestion of food components. [7].

The objectives of this research is to study the immunomodulating effect of *Lactobacillus acidophilus* (Probax®) in goats vaccinated with clostridia vaccine (Ultrabac®) and economical evaluation of using Probax® in male castrated goats.

2. Material and Mehods

1. Data collection

This work was carried out during the period from September 2012 till January 2013.

a. Drugs:

Probiotic (Probax®), manufactured by Microbax (India)

It is water soluble powder, a probiotic for poultry and animal health. Each one Kg. contains *Lactobacillus acidophilus* not less than $1x10^{11}$ CFU.

b.Vaccine:

Ultrabac® 8. A polyvalent clostridia vaccine, produced by Pfizer Animal Health Technical

Services, Exton, PA, USA a Division of Pfizer Inc., Ny, 10017. castrated goats average weighing 18-22 kg body weight. Their ages ranged between 5-6 months

c. Animals:

The present study was conducted on twenty four males. They were purchased from local markets. They were freely housed in sheds and fed on concentrated ration and tiben according to **National reaserch council** [8]. Pre-experiment period extended for one week where animals were subjected to thorough clinical as well as laboratory examination to ensure sound physiological activities.

2. Experimental Desingn:

T**he Goats** (24) were classified into 3 equal groups, each of eight and having nearly the same body weight.

The first group was left as a normal control (non-treated and non-vaccinated).

The second group was vaccinated by clostridia polyvalent vaccine by injecting 3 ml of the vaccine once under the skin of neck region.

The third group was vaccinated in the same manner and given also the probiotic daily for successive 90 days in a dose of 3 gm /head.

Blood samples :

Two blood samples were obtained from each animal, at zero time,3,7,28, 60,90 days post vaccination.

A) Whole blood samples:

3 mls. of blood were allowed to flow freely and gently into a clean and dry sterile vials containing ethylene diamine tetra acetic acid (EDTA) as anticoagulant. These samples were used for counting total leukocytic counts.

B) Serum samples :

An equal number of blood samples were collected in the same manner in centrifuge tubes without anticoagulant, then allowed to be clotted at room temperature and centrifuged at 3000 r.p.m. for 15 minutes. A clear non-haemolysed sera were obtained and transferred into clean dry and sterile vials and kept at -4 oC until used for estimating nitric oxide (NO) production and lyzosomal activity.

3. Methods

a. Determination of Total leukocytic count (WBCs count).

Leukocytic count was done by using the improved Neubauer chamber according to the method of Wintrobe[9].

b. Nitric oxide production assay:

Was evaluated according to Green et al. [10].

c. Lysosomal activity assay:

Was performed according to Richard et al. [11].

I.Productive measures.

a. Live body weight (LBW):-

Gaots were weighted in each groups during experimental period. Total individual live weights in each groups were divided by the number of goats in the group to obtain the average live body weight per goat (LBW).

b. Feed intake:-

goats in each group were provided with a weighed amount of feed day, the residual were obtained at the end of the day and the amount consumed was calculated by the difference.

c. Feed conversion rate (FCR) :-The average amount of feed consumed per goat = amount of feed consumed per goats / number of duck consuming feed. Feed conversion (FCR) was calculated according to Wanger et al [12]**.** and the following equation was applied. Feed conversion rate = (feed intake per kilograms in 90 days / body weight gain per kilograms in 90 days).

d. Feed efficiency (FE) :

The feed efficiency during the total experimental period was calculated as follow: Feed efficiency = (Gain in live body weight in this period / Feed intake in certain period cited by [13, 14].

d. Economic measures:

A. Costs of male goats production (LE/Animal).

1. Variable costs include:

Feed costs, labour costs, total veterinary management costs (service, treatment, disinfectant and veterinary supervision cost), and other variable costs as costs related to production cited by *[15]*

2- Fixed costs include:

Building and equipment depreciations *[16]*.

The depreciation rate calculated on the basis of 25 years for buildings and on 5 years for equipment [17].

3.Constituents of total costs:

That inculdes the sum of the variable and fixed costs *[18]*.

B. Income parameters of male goats production (LE/ animal**)**

1.Variable factors of return *[19]*.

That includes return from sale animals and litter.

1. **Net income** = Total return – Total costs [20].

4. Statistical analysis:

All the data were analyzed using SPSS/PCT, 2001 [21]. The statistical method was ANOVA test (two way analysis of variance) to test the differences in productive and economic efficiency parameters. The Duncan multiple range test are also used[22].

3. Results and Discussion

1. Effect on total leukocytic count

The present study was conducted to study the immunological profile of the probiotic lactobacillus acidophilus in goats. The obtained results revealed that the total leukocytic count was slightly increased allover the entire period of the study when compared with both

control and vaccinated group. The results in table one of this study revealed that the total WBCs count was non-significantly changed in the zero and three days post vaccination. Meanwhile there were significantly changed in seven, 28, 60 and90 days post vaccination. These results coincides with Shoeib *et al.*[23].

Table (1): Effect of vaccination alone and/or in combination with probiotic (lactabacillus acidophilus) on total leukocytic count of Goats (Mean + S.E). n = 8

Group	Total Leukocytic count (x10^3 /mL) post-treatment					
	Zero time	Three days	Seven days	28 days	60 days	90 Days
Control	9.95± 0.272^a	9.82± 0.71^a	9.69± 0.66^c	9.68±0.33^b	10.4 ± 0.5^b	10.25 ± 0.1^b
Vaccinated	9.95+ 0.272^a	9.86+ 0.15^a	9.76+ 0.27^b	11.69 + 0.3^b	11.8+ 0.76^b	10.5±0.25^b
Vaccinated + probiotic	9.95+ 0.272^a	9.96+ 0.76^a	12.11+ 0.37^a	17.20+ 0.52^a	18.7+ 0.36^a	19.17+ 0.42^a

2. Effect on Lysozymes activity:

It was apparent from Table (2) that control group showed non significant changed all over the period of the experiment.

Meanwhile the vaccinated group of Goats with clostridia polyvalent marked increase when compared with normal control group at 60 and 90 days post vaccination. Whereas, the vaccinated and treated group with probiotic showed a significant increase in serum lysozyme activity after 60 and 90 days post-vaccination when compared to vaccinated group. These results agree with Das etal. [24], they recorded a significant increase in lysozyme activity in Catla catla vaccine afforded a significant decrease (P<0.05) in serum lysozymes activity after third day post vaccination. As well as a significant increase (P<0.05) in serum lysozyme contents after seven and twenty eight days.

Table (2): Effect of vaccination alone and/or in combination with probiotic (*Lactabacillus acidophilus*) on serum lysozymes of Goats. (Mean + S.E). n = 8

Group	Serum lysozymes (µg/mL) post treatment					
	Zero time	Three days	Seven days	28 days	60 days	90 Days
Control	211± 6.35	211± 6.35^a	211± 6.35^b	211± 6.35^b	211± 6.35^a	211± 6.35^b
Vaccinated	205+ 10.5	194.5+ 10.53^c	222+ 15.5^a	222 + 15.5^a	167+ 6.35^c	211+ 6.20^b
Vaccinated + probiotic	205+ 10.53	200+ 8.96^b	211+ 14.2^b	216+ 18.8^b	189+ 14.2^b	244+ 8.23^b

Means within the same columns in each category carrying different litters are significant at ($P \leq 0.05$).

3. Effect on Nitric oxide production:

Table (3) illustrates that vaccination of Goats with clostridia polyvalent vaccine elicited a significant increase in serum nitric oxide production along the entire period of the study. Meanwhile, the administration of the probiotic to vaccinated group afforded a significant increase (P<0.05) in serum nitric oxide production along the course of the study when compared with normal control and vaccinated group.

Undoubtedly, our data were in accordance with those reported by Manuel et la. [25] they recorded a significant increase in nitric oxide production in Catla catla dietary supplementation of 10^9 CFU/gm Bacillus amyloliquifaciens. suggested that the use of food containing lactobacillus may work as palliative to reinforced immune system and improve feed efficiency.

Table (3): Effect of vaccination alone and/or in combination with probiotic (*Lactabacillus acidophilus*) on Nitric oxide production of Goats. (Mean + S.E). n = 8

Group	Nitric oxide (µM) post treatment					
	Zero time	Three days	Seven days	28 days	60 days	90 Days
Control	14.6± 0.6	14.6± 0.6	14.6± 0.6	14.6± 0.6	14.6± 0.6	14.6± 0.6
Vaccinated	14.7+ 0.69	21.18± 0.45	21.7+ 1.65	21.3 + 1.2	20.4+ 1.8	17.3+ 1.3
Vaccinated + probiotic	14.4+ 0.8	21.1+ 0.9	23.9+ 1.3	26.6+ 0.9	27.1+ 1.85	25.7+ 1.2

Means within the same columns in each category carrying different litters are significant at ($P \leq 0.05$).

4. Productive traits for different groups

Table (4): illustrated the different productive traits for different groups of male castrated goats. The initial live body weight showed non significant.

Meanwhile there were significant difference ($P<$ 0.05) between different groups at total feed intake and final body weight.

The highest feed intake was present at third group126.7 kg/head and lowest feed intake was present at the first group 115.8kg/ head. Also from table (4) the final body weight was significant difference ($P<$ 0.05) between different groups. The highest final body weight was present at third group 36.9 kg/head and lowest was at the control groups was 34.6kg/head. The feed conversion rato and the feed efficiency were different among different groups but were non significant.

Table (4): Effect of productive traits on different groups.

group	Initial Live body weight (kg/ animal)	Total feed intake (kg/anima)	Final body weight (kg/ anial)	Feed conversion ratio (FCR)	Feed efficiency per anima (FE)
Control	**20.1± 2.6**	**115.8± 9.5^{b}**	**34.6± 3.5^{b}**	**8.57± 0.27**	**0.121 ± 0.02**
Vaccinated	**19.5± 15.2**	**120.2± 10.5^{b}**	**35.1± 4.2^{b}**	**7.70± 0.4**	**0.129 ± 0.02**
Vaccinated+ Probiotic	**18.9± 19.4**	**126.7± 11.5^{a}**	**36.9±4.9^{a}**	**7.03±0.3**	**0.14 ± 0.01**

Means within the same column in each category carrying different litters are significant at ($P \leq 0.05$).

5. Total costs, total returns and net profit (LE/ Animal) for different groups.

Table (5): illustrated the different economic parameters for different groups of male castrated goats. The total variable costs and the total fixed costs are different among different groups but the difference showed non significant.

Meanwhile there were significant difference ($P<$ 0.05) between different groups at total returns and net profits LE/head. The highest total returns and net profit at the third groups that had probiotic and these indicated that the using of probiotic had increased feed efficiency and in turn increase live body weight that leads to increase total returns and net profit.

Table (5):Total costs, total returns and net profit (LE/ Animal) for different groups.

Group	Total Variable costs (LE/Animal)	Total Fixed costs (LE/ Animal)	Total costs (LE/ Animal)	Total returns (LE/ Animal)	Net profit (LE/Animal)
Control	**1145.7± 12.6**	**90.8± 6.5**	**1235.7± 35.5**	**1380.1± 82.2^{b}**	**144.3 ± 19.2^{b}**
Vaccinated	**1150.5± 15.2**	**90.8± 6.5**	**1241.3± 46.2**	**1396± 87.4^{b}**	**155.7 ± 26.2^{b}**
Vaccinated + Probiotic	**1152.2± 19.4**	**90.8± 6.5**	**1243.1±41.2**	**1403± 99.3^{a}**	**160.2 ± 23.1^{a}**

Means within the same column in each category carrying different litters are significant at ($P \leq 0.05$).

Conclusion

Finally, from our obtained results, we can conclude that the probiotic *Lactobacillus acidophilus* possesses an immunostimulating properties evidenced by an increase in total leucocytic count, lysozyme activity and serum nitric oxide. This was reflected on the feed conversion ratio and feed efficiency on castrated male goats. So we recommended from our economic results that using Lactobacillus acidophilus in fattening goats daily for successive 90 days in a dose of 3 gm /head will increase economic profit**.**

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