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EFFECT OF LEVAMISOLE AND INMUNAIR17.5[®] ON PERFORMANCE OF GROWING RABBITS

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ABSTRACT: The aimed of this study was to investigate the impact Levamisole and Immunair17.5[®] on the growth performance, feed utilization and carcass traits of growing rabbits. A total of 24 weaned male growing New Zealand White rabbits (average initial weight, 682-693 g; 6 weeks of age) were randomly allotted three treatment groups the first group without any treatment as control group, the second group was injected with Levamisole[®] subcutaneously (S/C) at a dose of 2.5mg/rabbit (half of recommended therapeutic dose), weekly for four weeks. The three group was injected with Immunair17.5[®] intramuscularly (I.M) at a dose 1ml/10 kg BW twice per week for four weeks. Results obtained body weight (BW) and Daily body weight gain (DBWG) at 13 weeks of age and feed intake and feed conversion through 5-13 week of age were significantly improved in rabbit treated with and Immunair17.5[®] compared with those of the control. Most carcass traits studied (carcass weight, fore part, hind part, liver, head, heart and lung, kidney and dressing) except spleen and trunk were significantly ($p < 0.5$ or $p < 0.01$) higher in growing rabbit received levamisole and Immunair17.5[®], compared with control. Hematocrit, MCV, MCH, MCHC and WBC, count showed insignificant difference between treated groups and control. Hemoglobin, platelet parameters and RBC increased significantly ($P < 0.01$) in the three group compared with other groups and control. Total protein, globulin, urea, creatinine, SGPT, Ca, Ca⁺⁺, potassium, SGOT and SGPT in the serum samples showed insignificant difference in treated groups and control. Total cholesterol, SGPT in serum samples were increased significantly ($p < 0.01$) in rabbits treated with levamisole and Immunair17.5[®].

Key word: Tabbit, feed utilized, levamisole, Immunair.

INTRODUCTION

Feed management is a cornerstone in ensuring pet rabbits welfare, and this is supported by the fact that the main reason pet rabbit owners consult veterinarians is because of health problems caused by incorrect nutrition (Harrenstien, 1999).

Use of immune stimulants for the prevention of diseases in poultry is considered an effective and improving area. Immune stimulants are natural or synthetic substances able to enhance the non-specific and/or the specific immune responses (Anderson, 1992).

Immuno-stimulators are substances that stimulate the immune system by increasing the activity of any of its component as granulocyte macrophage colony stimulating factor (Soehnlein, 2008).

Levamisole (LMS) is a drug used in treatment of animals against stomach, intestinal and lungworms (Janssen, 1976) as well as it could be used as a nonspecific immunomodulatory agent for treating the diseases in which the immune system was thought to be impaired, such as chronic infections, connective tissue diseases and cancer (Stevenson *et al.*, 1991).

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A prebiotic substance has been defined as a non-digestible food ingredient that beneficially affects the host by selectively stimulating the growth and/or activity of limited number of bacteria in the colon (Choudhari, 2008). Several studies have shown that addition of prebiotic to the ration of broilers, layers and pigs improved performance through improving gut micro flora (XU *et al.*, 2003). Using of compounds that may have prebiotic effects is a possible way to improve intestinal health and animal performance in the absence of antibiotic growth promoters (Kim *et al.*, 2011).

MATERIALS AND METHODS

The present work was carried out at Department of Animal Production, Faculty of Agriculture, Zigzag University, Egypt. The practical part was carried out at Middle East for Veterinary Vaccines (ME-VAC) El-Salhiya El-Gadida city, Sharkia Governorate, Egypt.

A total number of Twenty-four growing New Zealand White male rabbits at five weeks of age with average body weight 682-693g were randomly distributed into three groups (8 rabbits in each). Then each group was subdivided into four replicates (two rabbits per replicate). The 1st group without any treatment as control group, the 2^{sc} group was injected with Levamisole[®] subcutaneously (S/C) at a dose of 2.5mg/rabbit (half of recommended therapeutic dose), weekly for four weeks. The 3th was injected with Inmunair17.5[®] intramuscularly (I.M) at a dose 1ml/10 kg BW twice per week for four weeks.

The experimental design shown in Table 1. All groups fed the basal diet and was given fresh tap water hrought 8 weeks.

Feed and water were offered *ad libitum*. The experimental period was extended for 8 weeks (5-13 weeks of age). The rabbits were housed individually in galvanized wire cages (35×60×35 cm) provided with feeders and automatic drinkers. All groups were kept under the same managerial and hygienic conditions. Live body weight (LBW) of rabbits was recorded weekly in grams; the average daily weight gain (DWG) was individually calculated. Average daily feed intake (DFI) was recorded weekly and feed conversion ratio (g feed/g gain), FCR, was

calculated. Mortality rate was recorded weekly. The rabbits were fed on basal diet that formulated to the level of the nutrient requirements of growing rabbits from 5 to 13 weeks of age according to NRC (1977).

At the end of the feeding period, blood samples of three rabbits were collected at slaughter time to estimate blood metabolites. The erythrocyte (RBCs), total leukocyte (WBCs) and hemoglobin (Hb) concentration, hematocrit and lymphocytes were determined according to the method of Grindem (2011). Also serum albumin from total protein (Schalm *et al.*, 1975). (Glutamate Pyruvate Transaminase (GPT), Glutamic Oxaloacetic Transaminase (Got) Cholesterol were measuring by using commercial kits (SPINREACT). The elements [(Ca⁺⁺) Magnesium (Mg⁺) and potassium (K⁺)] were measuring by using commercial kits (SPINREACT). Also, The carcasses TRAITS were weighted and the weights of liver, spleen, kidney, heart and lung were recorded and expressed as g/kg of slaughter. Dressing percentage was calculated according to Marica *et al.* (2014).

The differences among treatment groups and control group were statistically analyzed with a one-way ANOVA test in a completely randomized design according to Snedecor and Cochran (1982) as the following model:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where μ = the overall mean, T_i = the fixed effect of treatment, e_{ij} = residual error. Y_{ij} = the its observation on the j individual. The significant differences among means were compared using Duncan's new Multiple Range procedure was performed to separate means (Duncan, 1995).

RESULTS AND DISCUSSION

Live Body Weight and Weight Gain

Concerning to body weight (BW), the results obtained in Table 2 showed no significant effect on the live body weight at 5th week or 9th week of age in rabbit injected with RHDV Levamisole and Inmunair 17.5[®] compared with those of the control group. However, results obtained revealed significant ($p < 0.05$) promoting effect on body weight, at 13th week and DBWG through 5-13 weeks of age on rabbit injected with RHDV

Table 1. Formulation and calculated chemical composition of the basal diet in Table1

Ingredient*	(%)	Calculated chemical composition **	
Clover hay	16.00	DE (Kcal/kg)	2562.46
Soybean meal (44% CP)	19.40	CF (%)	13.37
Yellow corn	16.00	CP (%)	17.29
Wheat bran	33.62	Lysine %	0.90
Wheat straw	12.00	Methionine + cysteine (%)	0.56
Vitam. and Min. mixture*	0.20		
Bone meal	1.30		
Limestone	1.10		
Salt	0.30		
DL-Methionine	0.08		
Total	100.00		

* Each 3 Kg of Vitamamins and minerals mixture contains: Vitam. A 10000 IU; Vitam.D3 2000 IU; Vitam.E 50 mg; Vitam. K3 1000 mg; Vitam.B1 1000 mg; Vitam.B2 5000 mg; Vitam.B6 1500 mg; Vitam. B12 10 mg; Pantothenic acid 60 mg; Niacin 150 mg; Folic acid 1000 mg; Biotin 50 mg; Choline 12000 mg; Iodine 20 mg; Manganese 90 mg; Zinc 210 mg; Copper 10 mg; Iron 30 mg; Iodine 1000 mg; Selenium 100 mg; Cobalt 100 mg and Magnesium 40 mg. **Calculated composition according to NRC (1977).

Table 2. Growth performance of New Zealand White rabbits as affected by levamisole and immunair17.5[®]

Treatment	Control	Levamisole (2.5mg/rabbit)	Immunair17.5[®] (1ml/10 kg BW)	Sig
Average live body weight, g, (week)				
5	695.7±68.8	682.8±37.0	688.2±37.4	NS
9	1409.0±91.2	1510.0±62.8	1472.7±58.2	NS
13	1809.0±112.6 ^b	1963.0±39.9 ^a	1954.0±32.6 ^a	*
Daily body gain, g, (week)				
5-9	25.5±.99 ^a	29.9±1.3 ^b	28.0±1.0 ^b	*
9-13	14.3±1.2 ^a	16.2±1.6 ^{ab}	17.2±1.1 ^{abc}	*
5-13	19.0±0.9 ^a	22.9±20.5 ^a	22.6±18.9 ^a	**
Feed intake (g/day)				
5-13week	75.72±6.3 ^b	77.3±5.2 ^a	77.4±5.3 ^a	*
Fee conversation Ratio				
5-13week	3.98±0.02 ^a	3.33±0.03 ^b	3.42±0.01 ^b	*

Means in the same row within each classification bearing different letters are significantly different. N.S. = Not significant and ** (P ≤ 0.01) * (P ≤ 0.05)

vaccine, Levamisole and Inmunair 17.5[®] compared with those of the control group. The average BW of rabbits injected with RHDV, Levamisole and Inmunair17.5[®] was heavier by about (8.40, 8.51 and 8.01%) respectively at 13th week when compared with control group.

Regarding to the effect of Levamisole, **El Saïdy *et al.* (2016)** found that heat stressed NZW growing rabbits received a single dose of subcutaneous Levamisole injection (2mg/kg BW) significantly ($p < 0.05$) improved BWG. Regarding to the effect of innumaire17.5, **Abd El-Azeam *et al.* (2009)** found that live body weight and body weight gain of rabbits significantly ($p < 0.01$) improved by probiotics (400 mg bioplus 2B/Kg feed) supplementation. on the other hand, **Matusevicus *et al.* (2006)** found that addition of Bioplus 2B at level of 400mg/kg did not affect significantly the body weight and daily weight gain of rabbits, during the period between 35 and 66 days of age. **El-Habback *et al.* (2015)** showed that, dietary treatment of broilers chickens by Inmunair17.5[®] at inclusion rate of 1 m/litter showed significantly higher body weight in the treated birds than control group.

Feed Intake and Feed Conversion Ratio

The effect of Levamisole and Inmunair17.5[®] injection on the average feed intake and feed conversion ratio are illustrated in Table 2. It is clear that feed intake and feed conversion ratio were significantly ($p < 0.05$ or $p < 0.01$) improved as a result of improved daily body weight gain and subsequently was reflected as improved body weight gain in the treated groups compare to the control group. Average feed intake of rabbits injected with levamisole and Inmunair 17.5[®] were improved by about (3.96, 2.08 and 2.21% respectively), the corresponding values of FCR were (13.06, 16.33 and 14.07% respectively), when compared with control group. Our results agreed with **El-Saïdy *et al.* (2016)** they found that, heat stressed NZW growing rabbits received a single dose of subcutaneous Levamisole injection (2mg/kg BW) significantly ($p < 0.05$) improved feed intake and feed conversion ratio. **Abd El-Azeam *et al.* (2009)** who found that average feed intake and feed conversion ratio in the growing rabbits were improved in group fed 200 mg Lincofeed/diet.

Carcass Traits

The average value of some carcass traits of growing rabbits as affected by Levamisole and Inmunair17.5[®] are shown in Table 3. From data in Table 3 it could be noticed that, most carcass traits studied (carcass weight, fore part, hind part, liver, head, heart and lung, kidney and dressing) except spleen and trunk were significantly ($P < 0.05$ or $P < 0.01$) higher in growing rabbit received levamisole and Inmunair17.5[®], compared with control group. In which spleen and trunk weight were not significantly affected. Regarding to the effect of innumair17.5[®], agreed with **El-Adawy *et al.* (2002)** reported that carcass traits and internal organs as percentages of live body weight were in significantly affected by dietary supplementation with biogenic (as a prebiotic), except the dressing percentage which increased significantly with the supplementation.

Blood Parameters

Hematocrit, MCV, MCH, MCHC and WBC, count showed insignificant difference between treated groups and control. Hemoglobin, platelet parameters and RBC increased significantly ($P < 0.01$) in the three group compared with other groups and control. Total protein, globulin, urea, creatinine, SGPT, ca, ca⁺⁺, potassium, SGOT and SGPT in the serum samples showed insignificant difference in treated groups and control. Total cholesterol, SGPT in serum samples were increased significantly ($p < 0.01$) in rabbits treated with levamisole and Inmunair17.5[®].

Regarding to the effect of Levamisole, **El-Boshy *et al.* (2013)**, found Levamisole treatment significantly reduced ALT and AST serum level in heat stressed rabbits. **Ulaiwi (2018)** showed that, the best protective effect on the liver enzymes (GOT and GPT) was in the vitamin E and selenium followed by the levamisole, these results agreed with the results obtained by **Saad (2016)** who found that, the effect of different levels of feed additives on liver enzymes and demonstrated the limited impact of levamisole when compared with different level of digestion. Regarding to the effect of Inmunair17.5[®]. **Zantaty (2002)** found that Biogen addition at level of 1g/kg diet decreased serum transaminase enzymes (GOT and GPT)

Table 3. Carcass traits of new zealand white rabbits as affected by levamisole and Immunair17.5®

Treatment	Control	Levamisole (2.5mg/rabbit)	Immunair17.5® (1ml/10 kg BW)	Sig
carcass traits				
Carcass weight(g)	911.0±46.6 ^a	1228.3±31.5A ^b	1198.0±30.0A ^b	*
Lion (g)	221.7±14.8	332.3±13.2	289.7±7.4	NS
Fore part(g)	240.0±10.0 ^b	235.0±10.3 ^{ab}	288.7±7.7 ^a	*
Hind part (g)	263.3±20.2 ^a	421.0±22.0 ^b	378.7±34.5 ^b	*
liver (g)	38.3±3.3 ^a	47.0±3.5 ^{ab}	46.0±2.1 ^{ab}	*
Head (g)	130.0±2.9 ^a	178.3±15.6 ^b	173.3±15.5 ^{ab}	*
heart &lung (g)	8.7±0.7 ^{ab}	13.7±0.6 ^a	10.3±0.7 ^a	*
kidney(g)	8.0±0.6 ^b	10.0±1.0 ^a	10.3±0.7 ^a	*
Spleen (g)	1.0±0.0	1.0± 0.1	1.3±0.3	NS
Dressing %	57.0	62.3	66.7	

Means in the same row within each classification bearing different letters are significantly different. N.S. = Not significant and ** (P ≤ 0.01) * (P ≤ 0.05)

Table 4. Blood biochemical parameters of New Zealand White rabbits as affected by levamisole and Immunair17.5

Treatment	Control	Immunair17.5® (1ml/1liter)	Spirulina 0.1% in the diet	Spirulina 0.2% in the diet	Sig
Liver function					
GPT(g/dl)	49.3±4.3 ^b	59.0±2.5 ^a	48.3±1.8 ^b	52.7±3.2 ^a	*
GOT(g/dl)	36.3±1.9	40.7±2.7	34.7±2.7	38.1±1.5	NS
Total protein (g/dl)	2.9±0.1	3.2±0.1	3.3±0.1	3.0±0.1	*
Globulin (g/dl)	102.3±18.6 ^b	107.7±26.9 ^b	120.3±30.0 ^a	115±21.5 ^a	*
Albumin (g/dl)	2.8±0.1	3.2±0.	3.2±0.1	2.9±0.1	*
Kidney function					
Urea (g/dl)	21.8±5.4	20.2±3.9	20±2.7	20.1±8.9	NS
Creatinine (g/dl)	2.9±1.9	1.1±0.6	2.3±0.4	2.3±0.4	NS
Elements					
Calcium (g/dl)	10.7±0.3	10±0.3	11.8±25.1	9.9±0.3	NS
ca⁺⁺ (g/dl)	5.1±0.2	5.0 ±0.4	4.9±0.3	5.0±0.5	NS
potassium (g/dl)	4.7±0.2	5.±0.4	5.3±0.5	5.3±0.2	NS
Magnesium(g/dl)	3.1±0.2	2.5±0.1	2.2±0.1	2.8±0.2	NS
Cholesterol (g/dl)	80.7±3.8 ^b	88.0±4.7 ^a	97.0±6.7 ^a	85.5±7.3 ^b	*

Means in the same row within each classification bearing different letters are significantly different. N.S. = not significant and ** (P ≤ 0.01) * (P ≤ 0.05)

Table 5. Haematological parameters of New Zealand White rabbits as affected by levamisole and Inmunair17.5®

Treatment	Control	RHDVvaccine (1m /rabbit)	Levamisole (2.5mg/rabbit)	Inmunair17.5® (1ml/10 kg BW)	Sig
Hemoglobin(g/dl)	11.9±1.2 ^b	13.5±0.7 ^a	12.9±0.4 ^a	13.5±0.3 ^a	*
RBCS *1012/L	3.8±0.4 ^b	4.2±0.1 ^a	4.1±0.2 ^a	4.2±0.0 ^a	*
Hematocrit%	36.0 ±4.0	37.2 ±0.9	37.1 ±0.7	35.6 ± 0.0	NS
MCV (FL)	94.7 ±0.3	92.0 ±1.5	93.3±1.3	92.0±0.0	NS
MCH (Pg.)	30.7±0.3	28.7±0.9	30.0±0.6	28.0±0.0	NS
MCHC(g/l)	32.0 ±0.6	31.0 ±0.7	32.0 ±0.6	31.0 ±0.0	NS
WBCS *103/mm	6.2±1.4	6.2±0.8	6.3±0.6	6.2± 0.0	NS
Platelets*109/l	167.3±0.7 ^b	167.3±0.7 ^b	139.0±12.7 ^c	188.0±0.0 ^a	*

Means in the same row within each classification bearing different letters are significantly different. N.S.= Not significant and ** (P ≤ 0.01) * (P ≤ 0.05)

Regarding to the effect of Inmunair17.5® **Abd El-Azeem *et al.* (2009)**, who found that, cholesterol content was reduced significantly (P < 0.01 or P < 0.05) for rabbits fed a diet containing 400MG Bioplus 2B/kg feed as compared with the other control. **Zanaty (2002)**, found that Biogen addition at level of 1g /kg diet decreased serum total cholesterol. And no significant difference among the different experimental groups and control on total protein, globulin and albumin plasma. Regarding to the effect of Levamisole **El-Saidy (2016)** found that, the total protein (g/dl), albumin (g/dl), globulin (g/dl) and globulin ratio were significant decrease in rabbits treated by Levamisole when compared with the control under heat stress. Regarding to the effect of innumaire17.5® **Abd El-Azeem *et al.* (2009)**, found that significant decrease in serum total protein, globulin values and a significant (p<0.01) increase in albumin and albumin/globulin ratio (A/G ratio) for rabbits received diet supplemented with 200mg lincofeed /kg when compared with control. **Shivastava and Jha (2010)** reported that feeding probiotic supplemented diets to growing rabbits led to higher serum levels of total protein compared with their control rabbits (**Khalil *et al.*, 2002**) indicate that, dietary supplementation with probiotic had no significant effect on total protein and its fractions of 12 week age New Zealand white rabbits while it found in Kidney functions did not show any significant effect due

to treated rabbits with injection by, Levamisole subcutaneous at a dose of (2.5 mg/rabbit) weekly until one month and Inmunair17.5® (based prebiotic) intramuscularly at a dose at (1ml/10 kg BW) twice a week until one month in urea and creatinine concentration. It could be noticed that, ca, ca⁺⁺ and potassium were not significantly affected due to different treatments. However, Levamisole, Inmunair17.5® (based prebiotic) significantly decreased magnesium concentration in rabbit's blood.

Conclusion

Levamisole: immune-stimulant, no effect on physiological state, improve the general health, improve the productive performance. Inmunair 17.5® (based prebiotic): immune-stimulant, improve the productive performance and improve the general health.

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تأثير أثر ليفاميزول والمعدن الحيوي انميونير على أداء الأرانب النيوزيلندية البيضاء النامية

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- 2- قسم الإنتاج الحيواني - كلية الزراعة - جامعة الزقازيق - مصر
- 3- المركز القومي للتغذية والأعلاف - وزارة الزراعة - مصر

تهدف هذه الدراسة إلى تقييم أثر ليفاميزول والمعدن الحيوي انميونير على أداء النمو في الأرانب النامية عند عمر 5-13 أسبوع استخدم في هذه التجربة عدد 24 أرنب نيوزيلندي أبيض في عمر 5 أسابيع ومتساويين تقريباً في وزن الجسم الإبتدائي. وزعت عشوائياً إلى 3 مجاميع (كل مجموعة 8 أرانب). ولقد أعطيت المجموعة الأولى عليه وماء بدون إضافات (المجموعة الضابطة) والمجموعة الثانية حققت ليفاميزول 2.5 جرام لكل أرنب حسب توصيات الشركة المنتجة تحت الجلد مرة أسبوعياً لمدة أربع أسابيع والمجموعة الثالثة حققت بالمعدن الحيوي انميونير 17.5 (1مل) لكل أرنب مرتين أسبوعياً لمدة أربعة أسابيع. وقد تم دراسة تأثير حقن هذه المواد على أداء النمو (وزن الجسم النهائي - الزيادة في وزن الجسم - معدل استهلاك الغذاء - ومعامل التحويل الغذائي)، أجزاء الذبيحة خلال الفترة العمرية وبعض القياسات البيوكيميائية في المصل (وظائف الكبد - وظائف الكلى - البروتينات - بعض المعادن) وصورة الدم. وقد أظهرت النتائج زيادة معنوية ($p < 0.05$) في وزن الجسم عند الأسبوع 13 ومتوسط الغذاء المأكل ومعدل الكفاءة التحويلية في كل من مجموعة الأرانب التي تم حقنها ليفاميزول والمعدن الحيوي انميونير وايضا زاد وزن معظم أجزاء الذبيحة في المجموعات تحت الدراسة (الجزء الأمامي - الجزء الأوسط - الكبد - الرأس - القلب - الرئة - الكليتين - ونسبة التصافي) ماعدا الجزء الخلفي والطحال تحسنا معنوياً في الأرانب مقارنتها بالمجموعة الضابطة. وجدت زيادة معنوية في كل من الهيموجلوبين والصفائح الدموية ($P < 0.01$) في المجموعة التي تم حقنها بالمعدن الحيوي انميونير 17.5 عند مقارنتها بالمجموعة الضابطة. لم يلاحظ فروق معنوية في قياسات كل من RBCS, Hematocrit, MCV, MCH, MC WBCS في المجموعات تحت الدراسة عند مقارنتها بالمجموعة الضابطة. وكذلك قياسات وظائف الكبد (ALT و AST) ووظائف الكلى (urea و creatinine). كذلك لم نلاحظ أي فروق معنوية أيضاً في قياسات كل من البروتينات الكلية والالوميين والجلوبين في المصل عند مقارنتها بالمجموعة الضابطة. وجدت زيادة معنوية في نسبة الكوليسترول في المجموعات التي حقنت بالليفاميزول والمعدن الحيوي الانميونير 17.5 مقارنة بالمجموعة الضابطة. لا يوجد أي فروق معنوية في معدلات كل من الكالسيوم والبوتاسيوم في جميع المجاميع تحت الدراسة عند مقارنتها بالمجموعة الضابطة.

الكلمات الإسترشادية: الأرانب، المعدن الحيوي، ليفاميزول.

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