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IMPACT OF INFECTION WITH *FASCIOLA* Spp. ON PRODUCTIVE PERFORMANCE AND CARCASS CHARACTERISTICS IN RABBITS

[80]

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ABSTRACT

Liver fluke are common parasites of herbivores in most of Middle East countries as Egypt. The chronic and acute infections with 10 & 20 metacercaria of this parasite cause biliary liver cirrhosis in rabbits that lead to huge economic losses. This cross-sectional study was carried out to determine the prevalence of fascioliosis in slaughtered rabbits in Giza governorate. In Egypt *Fasciola gigantica* was responsible for V-Line and Black Baladi rabbits total liver condemnations in infected groups. The infection impacts on female rabbits were more than males (p<.0001) in most groups for both strains.

Liver condemnations due to fascioliasis were more affected in body weight and feed consumption, feed conversion, heart, kidney and carcass characterestic, so it`s low economic efficiency. Blood parametars showed high significant (p<.0001) between treated groups of strains.

Keywords: *Fasciola* infection, productive performance, carcass, rabbits.

INTRODUCTION

Fascioliasis is a hepatic parasitic infection in many mammalian species. The pathogenic effect on the definitive host begins with the ingestion of metacercariae, which become excysted and released the juvenile fluke in the intestinal lumen. The juvenile flukes then migrate through the intestinal wall into the peritoneal cavity and penetrate into the liver through the liver capsule. In some parasitic diseases, liver is an important organ that is infected with parasites **(Malone et al 1998 and Ansari-Lari & Moazzeni, 2006).**

Rabbits fed with parasites can cause reduction on number of progeny production and many disorders such as diarrhea, loss of weight gain, abdominal pain and anemia. Fascioliasis considered the top of all the domestic rabbit's parasitic zoonotic worldwide infection that is endemic in a tropical area and Egypt **(Haridy et al 2002 and Amer et al 2016).** Fascioliasis reduces animal productivity, weight gain and production of meat and milk**.** In addition, it causes metabolic disorders, and secondary infections due to decrease immunity by chronic fascioliasis and liver condemnation during postmortem of carcass while the acute fascioliasis may lead to mortalities **(Mason, 2009 and Eman et al 2016).**

MATERIALS AND METHODS

This study was carried out at Poultry Production Department, Faculty of Agriculture, Ain Shams University. A total number of 36 rabbits (18 white V- Line rabbit and 18 Black local breed) aging (2) months, weighted about 2 kg when used in present work (Obtained from Faculty of Agriculture Farm,

Alex University). Each strain was divided into 3 groups (Control group, treated group with 10MC and treated group with 20MC) each group contains 6 rabbits. They fed on standard pellet diet, the pelleted experimental diets were formulated to be approximately which incorporated at 0,200 mg/kg. The animals kept in suitable temperature and clean cages, housing size 45cm * 55cm.

The rabbits were housed in galvanized metal wire cages and kept under the same managerial and hygienic conditions. Diets and fresh water were available all times.

Live body weight of rabbits and feed consumption were weekly recorded. Feed conversion ratio was calculated as (g feed/g gain) **(Hala Gamal El-Dein and Azza Mostafa, 2012).**

At the end of experimental period, three representative rabbits from each group were randomly chosen and fasted for 12 hour before slaughtering according to (**Blasco et al 1993)**, and also carcass traits and plasma parameters were determined. After complete bleeding of rabbits, pelt, viscera and tail were removed. Carcass and the following tissues (liver, heart, and kidney) were weighed.

Blood samples were collected at slaughtering into heparinized tubes. Blood samples were centrifuged at 4000 r.p.m. for 20 minutes for preparation of blood plasma. The collected plasma was stored at -20°C until assay.

Blood plasma contents of glucose, total protein, albumin, activities of aspartate amino transferase (AST) alanine aminotransferase (ALT), Creatinine and Urea were measured using commercial kits **(Biodiagnostics Company).** Blood plasma was analysed for total protein according to **(Peters, 1968)**, albumin **(Doumas et al 1917)**, glucose **(Trinder, 1969)**, activities of AST and ALT **(Harold, 1975)**, urea **(Pisani et al 1995)** and creatinine **(Greiling and Gressner, 1995)**.

Statistical analysis

Data were subjected to a two-way analysis of variance using the General Linear Model (GLM) procedure of **(SAS, 2004)** using the following model:

$$Yij = \mu + Si + Ti + (Si*Ti) + eij$$

Where;
Yij = Trait measured, μ = Overall means, Si = Strain effect, Ti = Treatment effect, (Si*Ti) = Interaction effect and eij = Experimental error

When significant differences among means were found, means were separated using Duncan's multiple range tests **(Duncan, 1955).**

RESULTS AND DISCUSSION

1. Productive performance

1.1. Body weight and body weight gain

The body weight in **(Table 1)** showed a significant increase affected by strain factor, control group of V-Line and Black Baladi recorded a higher significant increase compared to treated groups at (4,8 and 12 wk) after infection. At the end period of infection, there were a highly significant decrease in body weight (p<.0001) for group when infected with (20 MC). this group shown an acute symptoms and the lowest body weight compared to all groups as follow (3.27 Kg Cont. , 2.07 Kg for 10 MC & 1.192 Kg for 20 MC) for "BB strain". And (3.7 Kg Cont. , 2.02 Kg for 10 MC & 1.86 Kg for 20 MC) for "VL strain" at 12 week of age.

Table 1. Means and (SE) of live body weight for two rabbit strains affected by fascioliases.

Trait	Strain	Treatment			Overall (strain)	Prob.		
		Control	10 MC	20 MC		tr	st	tr*st
Initial Body wt.	Baladi	2.02±0.03	1.99±0.02	2.00±0.04	2.005	NS	NS	NS
	VL	1.95±0.04	2.01±0.03	1.99±0.04	1.98			
	Overall (trait)	1.98	2.005	1.99				
4 weeks (kg)	Baladi	2.66±0.007	2.58±0.007	2.45±0.009	2.57 [b]	<.0001	<.0001	0.0004
	VL	2.85±0.02	2.61±0.04	2.46 ±0.02	2.64 [a]			
	Overall (trait)	2.75 [a]	2.60 [b]	2.46 [c]				
8 weeks (kg)	Baladi	3.17±0.01	2.29 ±0.006	2.19 ±0.01	2.55 [b]	<.0001	<.0001	<.0001
	VL	3.57±0.01	2.27±0.03	2.12 ±0.03	2.66 [a]			
	Overall (trait)	3.37 [a]	2.28 [b]	2.15 [c]				
12 weeks (kg)	Baladi	3.27±0.009	2.07 ±0.01	1.92 ±0.01	2.42 [b]	<.0001	<.0001	<.0001
	VL	3.7±0.002	2.06 ±0.02	1.86 ±0.02	2.54 [a]			
	Overall (trait)	3.49 [a]	2.06 [b]	1.89 [c]				

Results of body weight gain that showed in **(Table 2)** referred to a significant decrease at the age period between (4-12 wk) to the group infected with (20 MC) for both Baladi (-0.044 kg at 12 week) and V-Line (-0.08 kg at 12 week) strains, compared to control and the group infected with (10 MC).

In this study, we have two strains of rabbit to proved which strain has a highly immune against infections with a recognized negative impact on rabbits herds production in Egypt that have a temperate climate zone. **Tasawar et al (2007)** reported that the body weight that decreases because the animal increases the parasitic infection, this could be due to acquired immunity in the host. It was concluded that the prevalence of *Fasciola hepatica* in rabbit was significantly affected by the breed, age and body weight of the animal.

The infection start to appear at rabbits at the fourth week from date of infection with *Fasciola*, simultaneity with decrease in body weight, dispite of the normal consumed of feed **(Table 1).** In this study, the results proved that the live body weight and the quality fur of infected rabbit groups is poor and loss of hair coat compared control. Rabbit showing emaciation, loss of hair coat **(Mahmoud et al 2010).**

Table 2. Means and (SE) of live body weight gain for two rabbit strains affected by fascioliases.

Trait	Strain	Treatment			Overall (strain)	Prob.		
		Control	10 MC	20 MC		tr	st	tr*st
0-4 weeks	Baladi	0.165±0.02	0.152±0.02	-0.018±0.01	0.099 [b]	<.0001	<.0001	<.05
	VL	0.226±0.01	0.179±0.03	0.116±0.01	0.174 [a]			
	Overall (trait)	0.19 [a]	0.16 [b]	0.049 [b]				
4-8 weeks	Baladi	0.125±0.01	-0.072±0.01	-0.044±0.01	0.002 [a]	<.0001	NS	<.05
	VL	0.132±0.01	-0.022±0.02	-0.084±0.02	0.008 a			
	Overall (trait)	0.12 [a]	-0.047 [b]	-0.064 [b]				
8-12 weeks	Baladi	-0.002±0.007	-0.065±0.01	-0.061±0.004	-0.042	<.0001	NS	NS
	VL	0.0125±0.01	-0.056±0.007	-0.065±0.01	-0.036			
	Overall (trait)	0.005 [a]	-0.06 [b]	-0.063 [b]				
Cum. BWG	Baladi	1.258±0.03	0.0775±0.03	-0.072±0.05	0.421 [b]	<.0001	<.0001	<.0001
	VL	1.75±0.04	0.0501±0.05	-0.121±0.04	0.559 [a]			
	Overall (trait)	1.504 [a]	0.063 [b]	-0.097 [c]				

Hawkins and Morris (1978) demonstrated that weekly growth rates of weight gain and live weight decreased with increasing fluke burdens in the infected animals.

Weight gain is an observable phenomenon and reduced weight gain can prompt nematode control in herd of breeding (**Hoglund *et al* 2009).**

The effects of *F. hepatica* infections on weight gain and wool growth were in agreement with results of **(Dargie, 1987).**

1.2. Feed Consumption and Feed Conversion Ratio

In the current study, **(Table 3)** showed that feed consumption recorded a significantly (p<.0001) decreased levels in the end of experiment period at 12 wk for both infected group to Baladi and V-Line strain compared to control as follow ($16.193^{Cont.}$, 11.685^{10MC}, 10.203^{20MC} for "BB & VL").

The feed conversion ratio recorded a significant (p<.0001) differences between Baladi and V-Line strains, traits effect showed in the end of experiment period at 12 wk increase for 10 & 20 MC compared control ($6.15^{Cont.}$, 13.25^{10MC}, 17.4^{20MC}) for FCR], respectively **(Table 4).**

Appetite was low and the prevalence of fascioliasis was significantly affected by the breed, feed consumption of the herd **(Tasawar *et al* 2007)**. Furthermore, fascioliasis also led to a loss of appetite and poor utilization of food, which results in a loss of body weight **(Ahmed et al 2007).**

Table 3. Means and (SE) of feed conversion ratio for two rabbit strains affected by fascioliases.

Trait	Strain	Treatment			Overall (strain)	Prob.		
		Control	10 MC	20 MC		tr	st	tr*st
0-4 weeks	Baladi	6.739 ±1.51	10.099 ±1.36	17.99 ±6.01	11.61 a	0.042	0.001	0.04
	VL	5.335 ±0.61	7.565 ±1.36	7.57 ±1.19	6.82 b			
	Overall (trait)	6.037 c	8.83 b	12.78 a				
4-8 weeks	Baladi	7.377 ±1.11	10.936 ±5.3	21.140 ±5.40	13.15 a	<.0001	0.0001	NS
	VL	5.150 ±1.19	16.240 ±8.002	8.04 ±1.34	9.81 b			
	Overall (trait)	6.264 c	13.588 b	14.59 a				
8-12 weeks	Baladi	7.55 ±0.28	16.60 ±5.94	19.369 ±4.14	14.50	<.0005	NS	NS
	VL	6.535 ±0.26	15.89 ±8.77	20.33 ±9.71	14.25			
	Overall (trait)	7.04 c	16.25 b	19.84 a				
Cumulative FCR	Baladi	7.83 ±0.64	12.106 ±2.001	15.35 ±4.43	11.76	<.0001	NS	NS
	VL	4.484 ±4.07	14.403 ±7.05	19.45 ±8.25	12.77			
	Overall (trait)	6.15 c	13.25 b	17.4 a				

Effect of treatments on body organs weight

1.2.1. Liver

Hepatic damage was evaluated in this study, it assessed by visual inspection. Evaluation showed that bile duct had a worms, so liver a statistically significant increase in weight in both strains infected with *F. gigantica* compared to the control (p<.0001).

Liver section of rabbit infected with *F. gigantica* showed the worm resided in the bile ducts **(Sherif et al 2005). Charlier et al (2008).** A previous study found that worms of the major bile ducts only detected 29% of the infected livers.

1.2.2. Kidney

Kidney weight recorded highly significant difference between traits (P<.0001), data showed dissimilarity for control group and 10, 20 MC. Renal changes in response to fascioliasis in rabbits varied among the studied animals. These results for kidney were in agreement with results of **(Mesele et al 2012)**.

1.2.3. Lungs

Our results showed that lungs have venous congestion hemorrhagic spots and high significance overall for acute and chronic cases (p<.0001)**.** The changes in the lung from different experimental groups showing diffused interstitial inflammatory reaction and giant alveoli and showing chronic venous congestion in the lung tissue and some infected groups showing vasculitis and mild interstitial inflammatory reaction **(Mesele et al 2012 and Mendes et al 2012).**

1.2.4. Heart

Heart is an important organ and any change abnormal cause rapidly crisis in vitality and production performance, the data showed hemorrhage a highly significant traits (p<.0001) for infected groups with 10 & 20 MC compared to control. Fascioliasis affects on the heart leading to heart condemnation in carcass of rabbits according to **(Bala et al 2011).**

Table 4. Means and (SE) of carcass characteristics for two rabbit strains affected by fascioliases.

Trait	Strain	Treatment			Overall	Prob.		
		Control	10 MC	20 MC	(strain)	tr	st	tr*st
Live body weight (g)	Baladi	1708.67 ±36.88	942.33 ±40.01	786.67 ±45.31	1128.39b	<.0001	<.0001	NS
	VL	2097.67 ±40.65	1050.67 ±19.94	909.33 ±59.65	1538.78a			
	Overall (trait)	1894.25a	991.00b	845.50c				
Carcass %	Baladi	51.01 ±0.85	43.80 ±1.63	37.80 ±2.07	44.21 b	<.0001	<.0001	NS
	VL	57.20 ±1.03	53.06 ±2.20	39.78 ±1.49	50.01 a			
	Overall (trait)	54.10 a	48.43 b	38.79 c				
Head wt. (g)	Baladi	107.4 ±4.04	104.69 ±2.91	102.58 ±3.52	105.55b	0.05	0.032	NS
	VL	115.1 ±6.00	107.5 ±2.85	105.32 ±2.90	110.2a			
	Overall (trait)	112.3a	106.77b	104.74b				
Liver wt. (g)	Baladi	23.21 ±1.47	39.66 ±2.23	60.66 ±3.34	41.18	<.0001	0.05	0.05
	VL	22.21 ±1.38	39.81 ±1.94	51.36 ±0.91	37.8			
	Overall (trait)	22.71 c	39.74 b	56.01 a				
Kidney wt. (g)	Baladi	5.38 ±0.10	6.25 ±0.18	7.05 ±0.19	6.22	<.0001	NS	NS
	VL	5.40 ±0.07	5.98 ±0.10	6.53 ±0.22	5.97			
	Overall (trait)	5.39 c	6.11 b	6.79 a				
Lungs wt. (g)	Baladi	5.70 ±0.12	8.20 ±0.21	8.11 ±0.32	7.33	<.0001	NS	NS
	VL	5.56 ±0.08	8.25 ±0.36	8.61 ±0.33	7.47			
	Overall (trait)	5.63 b	8.22 a	8.36 a				
Heart wt. (g)	Baladi	2.18 ±0.04	2.76 ±0.09	2.84 ±0.10	2.59 a	<.0001	0.007	NS
	VL	2.19 ±0.06	2.55 ±0.04	2.61 ±0.03	2.43 b			
	Overall (trait)	2.18 b	2.66 a	2.70 a				

Table 5. Means and (SE) of blood parameters for two rabbit strains affected by fascioliases.

Trait	Strain	Treatment			Overall (strain)	Prob.		
		Control	10 MC	20 MC		tr	st	tr*st
Total Protein (mg/dl)	Baladi	5.22 ±0.14	6.89 ±0.21	8.72 ±0.17	6.94	<.0001	NS	NS
	VL	5.53 ±0.03	6.97 ±0.06	8.53 ±0.17	7.01			
	Overall (trait)	5.37 c	6.93 b	8.62 a				
Plasma Albumin (mg/dl)	Baladi	2.33 ±0.06	3.46 ±0.13	3.60 ±0.03	3.13	<.0001	NS	NS
	VL	2.16 ±0.04	3.34 ±0.09	3.53 ±0.08	3.01			
	Overall (trait)	2.24 b	3.40 a	3.56 a				
AST (U/L)	Baladi	32.46 ±0.47	55.56 ±1.83	73.92 ±0.72	53.98	<.0001	NS	0.02
	VL	34.61 ±0.21	50.16 ±2.11	72.50 ±0.93	52.42			
	Overall (trait)	33.53 c	52.86 b	73.21 a				
ALT (U/L)	Baladi	16.24 ±0.32	17.88 ±0.31	25.61 ±0.71	19.91	<.0001	NS	0.0105
	VL	15.99 ±0.30	19.02 ±0.44	23.59 ±0.63	19.53			
	Overall (trait)	16.11 c	18.45 b	24.60 a				
Plasma Glucose (mg/dl)	Baladi	109.36 ±0.66	95.19 ±1.24	83.65 ±1.43	96.07	<.0001	NS	NS
	VL	105.89 ±1.45	95.99 ±1.22	84.48 ±0.94	95.45			
	Overall (trait)	107.63 a	95.59 b	84.06 c				
Urea (mg/dL)	Baladi	39.12 ±0.35	46.47 ±0.83	70.91 ±0.91	52.17 a	<.0001	<.0002	<.0003
	VL	39.75 ±0.31	44.15 ±0.54	63.89 ±1.48	49.26 b			
	Overall (trait)	39.44 c	45.31 b	67.40 a				
Creatinine (µmol/L)	Baladi	0.78 ±0.02	1.29 ±0.04	1.75 ±0.08	1.35	<.0001	NS	NS
	VL	0.81 ±0.02	1.32 ±0.02	1.68 ±0.07	1.27			
	Overall (trait)	0.79 c	1.31 b	1.72 a				

1.2.5. Carcass

Edible parts of carcass is the important parts to show quality meat of the animal, so, the infected groups were gave abnormal measures. In this study the control group for both strains recorded a highly significant decrease (P<.0001) to carcass percentage value compared to infected groups with 10 and 20 MC. Strain effect didn`t show a difference between V-Line & Baladi intra the 10 and 20 MC treated groups. The results show how the carcase performance characteristics, assessed according to international standards agreed within the European Union, deteriorate when liver fluke is present which is detrimental to the value of carcass **(Sanchez-Vazquez and Lewis, 2013)**. These results are agreed with findings of **(Mesele et al 2012).**

2. Blood parameters

Table (5) Showed the mean values of total serum Protein in control groups and groups infected with 10MC were significant, while the infected groups treated with 20 MC (P<.0001) were highly significant than other groups**. Ali (2012)** stated that percent changes of serum protein concentration from rabbits infected is very high**.**

Table (5) has shown Albumin levels is high significant (P<.0001) for normal control groups because the difference individuality blood levels for each rabbit**.**

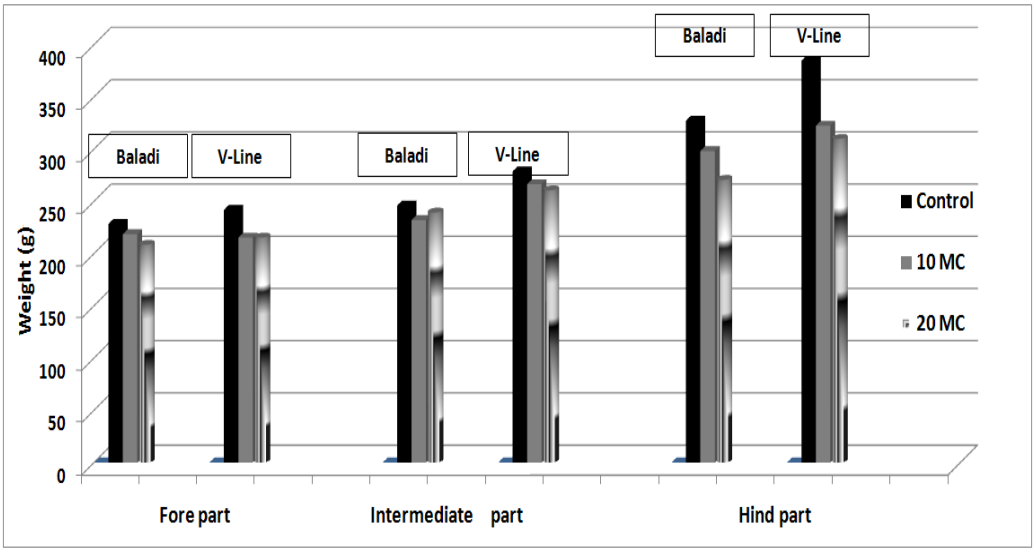

Fig. 1. Means of edible parts for carcass weight of two rabbit strains affected by fascioliases.

Our findings of abnormal albumin in this study are characteristic features of chronic and acute fascioliasis as in agreement with **(Matanovic´ et al 2007).**

Regarding to activities of enzymes AST, ALT in blood of rabbits infected with *F. gigantica*, the results showed in **(Table 5)** referred to significant difference between male and female infected with 10 MC groups and the other groups treated 20 MC had highly significant (P<.0001) compared control. The same result recorded by (**Ferre et al 1995)** reported significant elevation in AST level 14 weeks post- infection. However, **Teleb et al (2007)** reported significant elevation in AST after 6 weeks post- infection; moreover serum ALT levels were elevated after 4 weeks post- infection.

Glucose level in blood of rabbit groups exposed to 10 metacercariae of *F. gigantica* were significant, but the groups exposed to 20 metacercariae were lower than control as follow ($107.63^{aCont.}$ mg, 95.59^{b10MC} mg, 84.07^{c20MC} mg). The difference between both strain was non-significant because the infected groups had been hardly impact (96.07 mg for "BB" and 95.46 mg for "VL"). It was observed that a reduction in serum glucose levels was significantly lower ($p < 0.05$) in infected rabbits than control ones starting from 5 weeks post-infection even the end of the experiment **(Phiri et al 2007).**

Serum urea levels of treated groups for 20 metacercariae had been highly significant (p<.0001) than the treated groups for 10 metacercariae compared to control due to *Fasciola* parasitism these results agreed with **(Teleb et al 2007 and Rashed, 2008)**.

Serum creatinine recorded highly significant increase in infected group (BB) was (1.36 mg/dl & 1.67 mg/dl), respectively. While, (1.34 mg/dl &1.63 mg/dl) in (VL) respectively compared control groups, this due to the effect of parasite metabolism in the kidney enzyme. This result in agreement with (**Rashed, 2008),** who reported that serum creatinine in rabbits infected with *Fasciola gigantica* highly significant compared with control group.

CONCLUSION

These results indicate that the rabbits exposed to *F. gigantica* infection 10 MC or 20 MC concentration of *F. gigantica* affected negatively on productive performance of Baladi rabbit herds.

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تأثير العدوى بالفاشيولا على الأداء الانتاجى وصفات الذبيحة فى الأرانب

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الموجـــــز

الهدف من هذه الدراسة تقييم تأثير عدوى الفاشيولا الكبدية فى صورة (إصابة مزمنة و إصابة حادة) على المقاييس الإنتاجية على سلالتين من الأرانب البلدى المحسن والفى لاين الأسبانى ومقاييس الوزن وترسيب اللحم وبعض مقاييس الأعضاء الداخلية وعلى بعض مقاييس الدم خلال فترة التجربة (12 أسبوع).

إستخدمت فى هذه التجربة عدد 36 من الأرانب قسمت إلى 18 أرنب لكل سلالة فى مرحلة التربية وكان متوسط الوزن كجم وقسمت كل سلالة إلى ثلاثة مجاميع بعدد 6 أرانب للمجموعة الواحده ، وتم إعطاء العدوى بالطفيل عن طريق الفم المجموعة الأولى مقارنة والمجموعة الثانية مصابة بعدد 10 ميتاسركاريا إصابة غير مميتة والمجموعة الثالثة مصابة بعدد 20 ميتاسركاريا إصابة مميتة من نوع فاشيولا جيجانتيكا.

وأوضحت النتائج أن معاملات العدوى غير المميتة كانت أقل تأثرا بالطفيل ومرتفعة معنويا ($P<0.05$) وأكثر إرتفاعا للمعنوية ($P<0.05$) مقارنة بمجموعة المقارنة من كل سلالة. وبينت هذه الدراسة أن هناك فروق معنوية مرتفعة بين كل سلالة ($p<0.05$) وكذلك عند المقارنة بين معاملات السلالتين وكانت الفروق فى المعاملة على سلالة البلدى و الفى لاين مرتفعة المعنوية.

وكان متوسط الوزن عند مرحلة النضج الجنسى (كجم/أرنب) مرتفع معنويا ($p<0.05$) بمجموعة المقارنة فى سلالة البلدى وسلالة الفى لاين على التوالى ، بينما كانت متوسطات الآوزان فى المجموعة ذات الأصابة المزمنة فى سلالة البلدى وسلالة الفى لاين على التوالى، وكانت متوسطات أوزان المجموعة ذات الإصابة الحادة لكل سلالة على التوالى .وكان معدل الزيادة الوزنية للمتوسط العام لكلا السلالتين فى مجموعات المقارنة والإصابات المزمنة والإصابات الحادة على التوالى . وكان معدل الإستهلاك الغذائى اليومى (جم/أرنب) والتحويل الغذائى (كجم نمو / كجم غذاء) هو الذى تم تقديره لكل من سلالة البلدى وسلالة الفى لاين مقارنة بمجموعة المقارنة.

الكلمات الدالة: عدوى الفاشيولا، الأداء الإنتاجي، الذبيحة، الأرانب

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