

Evaluation of the VIUSID Vet (Powder and Solution) Nutritional Supplement in Growing-Finishing Pigs

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Abstract: The objective of this research was to evaluate the impact of the VIUSID Vet (powder and solution) nutritional supplement on the productive performance of growing-finishing pigs. Two experiments were conducted, each using 210 pigs at an average age of 40 d—70 per treatment—which were distributed into 15 pens (five per group). The experiments lasted 170 d. The treatments consisted in: Experiment 1, Group I control group; Group II received from the start 1.5 g of VIUSID Vet powder per kilogram of feed daily for 90 d; Group III same as the former, but instead given 2.0 g. Experiment 2, Group I control; Group II received from the start 1.5 g of VIUSID Vet powder per kilogram of feed daily for 90 d; Group III same as the former, but instead given 1.5 mL of VIUSID Vet solution per kilogram of feed. VIUSID Vet (powder or solution) significantly improved weight gain and feed conversion as well as reduced deaths when given doses of 2.0 g and 1.5 g or 1.5 mL per kilogram of feed during the first 90 d of the growing-finishing phase, giving rise to financial benefits.

Key words: VIUSID, pig, glycyrrhizic acid, antioxidants, molecular activation.

1. Introduction

The goal of pig farming is to produce high-quality meat at the lowest possible cost and with the least impact on the environment. The factors that influence the achievement of this goal are many, with nutrition as a key factor, especially during the fattening phase as it is an important stage in the total cost of production. Specifically, feeding growing-finishing pigs is one of the most difficult challenges that a nutritionist can face, whether due to advances in the use of new and different additives and ingredients, the existence of new production methods and technologies, as well as the demands of a market that is increasingly informed and interested in consuming quality animal products at affordable prices [1].

These demands have made the use of many

chemical compounds and antibiotics as prophylactics or growth promoters in feeds common practice for a long time. Antibiotics used as therapy or additives are considered essential tools to protect animal health and welfare and therefore contribute to meeting the growing global demand for food. But for many, a problem correlated with the use of antimicrobials is the development of resistance to them, which is an ancient phenomenon in biological evolution and which may associate with the excessive use of antibacterial products in animals and humans. Resistance is a situation that is considered a major problem today, both in public health and in the treatment of farm animals [1, 2].

In view of the foregoing, their use as feed additives has been limited practically all over the world. For example, the European Union decided to ban antibiotics as feed additives on January 1, 2006. Consequently, many alternatives were studied to find other substances

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with similar beneficial effects, such as probiotics [3], prebiotics [4], acidifiers [5], etc. One of these compounds is the VIUSID Vet nutritional supplement.

VIUSID Vet has been designed to improve health, prevent disease and increase yield. It is a natural product without chemically synthesized components, which does not lead to resistance or cause side effects, and is registered in the European Union with a withdrawal period of zero days. It contains plant extracts, vitamins and amino acids—components with proven biological activity and enhanced by the molecular activation technology of Catalysis S.L. [6].

The supplement has been shown to have beneficial effects on key performance indicators in several pig categories such as farrowing rate and piglets [7], newly weaned pigs [8], replacement gilts [9] and fattening pigs [10, 11]. All these studies used VIUSID Vet powder, and there are no published references to research using VIUSID Vet solution mixed with feed. The liquid form has been mainly designed for drinking water, so it calls for dispensers in the commercial units, which is not feasible on all farms.

Under natural conditions, the pig—being an omnivorous animal—has always been fed with products with varying moisture content. On intensive pig farms, the technique of feeding animals with liquid feed has been widely used for many years. One of the main characteristics of liquid feeding is the possibility to include a wide range of ingredients, some with high moisture content [12]. In Cuba, it is common to use wet feeding mainly in the fattening of pigs in the non-specialized sector, so it is possible to use liquid nutritional supplements such as VIUSID Vet.

Therefore, the objective of this research was to evaluate the impact of the VIUSID Vet (powder and solution) nutritional supplement on the productive performance of growing-finishing pigs.

2. Materials and Methods

2.1 General Aspects

Two experiments were conducted at the La Vega

farm, in the municipality of Jatibonico in the province of Sancti Spíritus in Cuba. Its coordinates are 21°56'52.89" N, 79°08'50.49" W. Experiment 1 took place in 2018 while Experiment 2 took place in 2019.

The product evaluated has been developed by Catalysis, S.L., in the European Union by the parent company in Spain using the most modern and advanced technology and in accordance with international good manufacturing practice (GMP) standards. The components are subjected to a biocatalytic process of molecular activation. Its composition is shown in Table 1.

The feed used in the experiments had approximately 88%-90% dry matter, 17.5% crude protein and 2.90 Mcal/kg of digestible energy. When fed to the pigs it was mixed with water (20%).

2.2 Approach and Research Methods for Experiments 1 and 2

In each of the experiments, 210 pigs at an average age of 40 d were used—70 per treatment—homogeneously distributed into 15 pens (five per group under study). The experimental unit consists of the pig and the pen.

Table 1 Composition of VIUSID vet.

Composition	Powder g/100 g	Solution g/100 mL
DL-malic acid	9.20	9.20
Glucosamine	9.20	9.20
L-arginine	8.30	8.30
Glycine	4.70	4.70
Ascorbic acid	2.30	2.30
Monoammonium glycyrrhizinate	0.46	0.46
Pyridoxine hydrochloride	0.45	0.45
Zinc sulfate	0.23	0.23
Calcium pantothenate	0.23	0.23
Folic acid	0.10	0.10
Cyanocobalamin	0.001	0.001
Distilled water sufficient quantity for:	-	100 mL
Excipients		
Sodium benzoate	0.20	-
Potassium sorbate	0.20	-
Maltodextrin	18.02	-
Calcium carbonate	36.40	-
Silicon dioxide	10.00	-

Table 2 Treatments in the experiments.

Experiment 1	
Group I	Control, under normal fattening conditions
Group II	Received from the start of the phase 1.5 g of VIUSID Vet powder per kilogram of feed daily for 90 d
Group III	Same as above, but instead 2.0 g
Experiment 2	
Group I	Control, under normal fattening conditions
Group II	Received from the start of the phase 1.5 g of VIUSID Vet powder per kilogram of feed daily for the first 90 d of the trial
Group III	Same as above, but instead 1.5 mL of VIUSID Vet solution per kilogram of feed

The experiments lasted 170 d. The details about the treatments are present in Table 2.

The following independent variables were selected in the analyses: administration of VIUSID Vet, and initial weights per pig and per pen. The dependent variables were: final weight per pig (kg), final weight per pen (kg), weight gain per pen (kg), average daily gain (kg, calculated from weight gain per pen), feed efficiency (kg/kg, calculated from weight gain per pen and feed offered), deaths (u, %) and presence of diarrhea (u, %).

2.3 Statistical Analyses

In the statistical analyses of the variables related to weight, average daily gain and feed conversion, the one-way analysis of variance (ANOVA) and Tukey's range test were used. Previously, the normal distribution of data was assessed using the Kolmogorov-Smirnov test as a goodness of fit test, and Levene's test was used to check for the homogeneity of variance. Deaths and the presence of diarrhea were analyzed using Hypothesis Testing for a proportion. The SPSS 15.0.1 for Windows [13] and MINITAB release 14.12.0 [14] statistical software packages were used.

2.4 Financial Analysis

For the financial analysis, the parameters affected by the treatments were taken into account: cost of VIUSID and income due to the difference in weight

gain between the treatment groups and the control group. Other expenses were not included as they were the same for the different groups under study and were not influenced by the treatment with VIUSID. The analysis was done per pen based on the average values obtained from productive performance.

3. Results and Discussion

3.1 Results and Discussion for Experiments 1 and 2

Table 3 shows the evolution of weight per pig in both experiments. In all cases, the groups treated with VIUSID Vet (powder or solution) reached a final average weight statistically significantly higher ($p < 0.05$) than the control groups of between 4 kg and 7 kg more. The differences between the treatment groups were not statistically significant ($p > 0.05$).

The results related to the final weight per pen are shown in Table 4. These evolved in a similar manner as those obtained per pig; that is, the treatment groups showed a statistically significantly higher weight at slaughter ($p < 0.05$) than the control group. It was the same for weight gain per pen. In Experiment 1, the highest final weight and weight gain were obtained by the group treated with 1.5 g of VIUSID Vet powder.

In Experiment 2, it was the group treated with VIUSID Vet solution, although the difference with the powder was not statistically significant ($p > 0.05$). This was mainly due to the fact that in these two treatment groups, one less pig died than in the other treatment groups.

The relative improvement (%) obtained in the treatment groups compared with the control group is shown in Fig. 1. The higher percentages compared with the controls were mainly due to the better individual evolution of the pigs (Table 4) and fewer deaths in the treatment groups. The weight gain per pen was higher by 9.98% and 9.06% for the groups treated with 1.5 g and 2 g of VIUSID, respectively, in Experiment 1, and 10.50% and 11.53% for the groups treated with VIUSID Vet powder and solution, respectively, in Experiment 2.

Table 3 Evolution of the indicators related to weight gain per pig (mean ± standard deviation).

Experiment 1					
Variables	U/M	Control	Powder 1.5 g	Powder 2.0 g	<i>p</i>
Initial No.	u	70	70	70	-
Final No.	u	67	69	68	-
Initial weight	kg	9.87 ± 0.19	9.97 ± 0.16	9.99 ± 0.14	0.853
Final weight	kg	108.03 ± 1.04 b	114.48 ± 1.11 a	115.23 ± 1.19 a	0.000
Experiment 2					
	U/M	Control	Powder 1.5 g	Solution 1.5 mL	<i>p</i>
Final No.	u	65	68	69	-
Initial weight	kg	8.66 ± 0.16	8.61 ± 0.16	8.65 ± 0.15	0.964
Final weight	kg	94.05 ± 0.87 b	98.15 ± 1.02 a	97.98 ± 0.94 a	0.026

Average values with different letters (a, b) in the same line show a difference that is statistically significant ($p < 0.05$).

Table 4 Evolution of the indicators related to weight gain per pen (mean ± standard deviation).

Experiment 1					
Variables	U/M	Control	Powder 1.5 g	Powder 2.0 g	<i>p</i>
Initial weight		138.2 ± 1.88	139.6 ± 1.14	139.9 ± 0.95	0.646
Final weight	kg	1,447.6 ± 44.8 b	1,579.8 ± 26.8 a	1,568.0 ± 27.8 a	0.033
Weight gain		1,309.4 ± 43.2 b	1,440.1 ± 26.4 a	1,428.1 ± 28.4 a	0.032
Experiment 2					
	U/M	Control	Powder 1.5 g	Solution 1.5 mL	<i>p</i>
Initial weight		121.20 ± 0.99	120.58 ± 0.37	121.10 ± 1.04	0.862
Final weight	kg	1,222.60 ± 45.6 b	1,337.60 ± 28.2 a	1,349.50 ± 19.7 a	0.035
Weight gain		1,101.4 ± 5.9 b	1,217.0 ± 28.1 a	1,228.4 ± 20.1 a	0.035

Average values with different letters (a, b) in the same line show a difference that is statistically significant ($p < 0.05$).

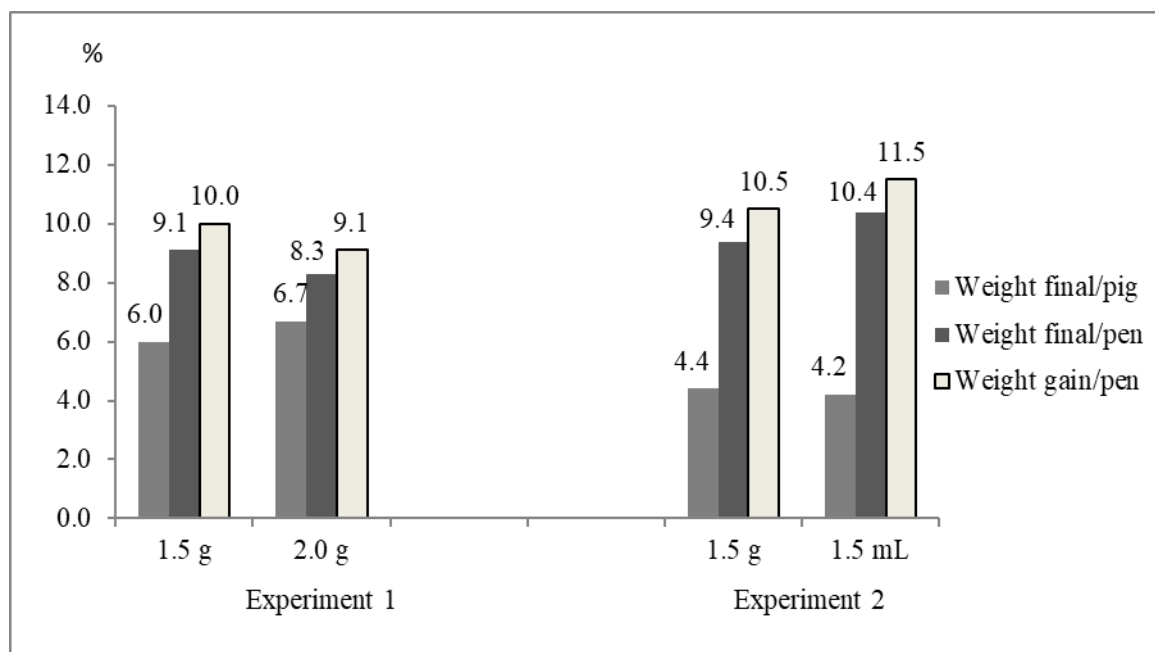


Fig. 1 Improvements observed in the final weight and weight gain in both experiments (the control group was considered to be 0%).

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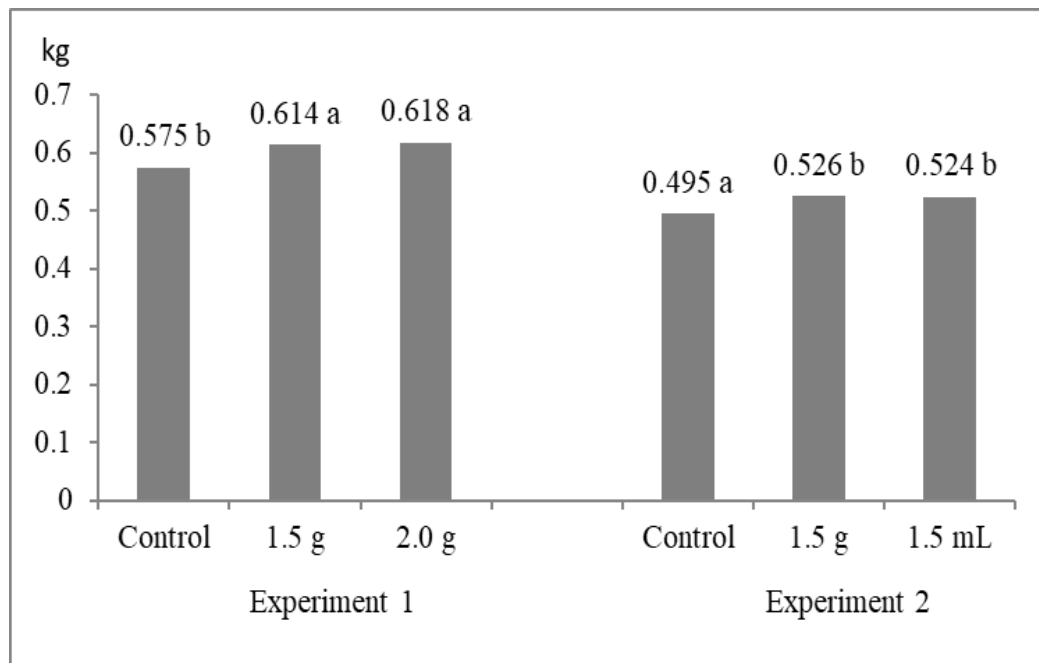


Fig. 2 Evolution of average daily gain in both experiments.

Different letters (a, b) in the same experiment show a difference that is statistically significant ($p < 0.05$).

Weight gain is correlated with average daily gain, whose evolution is shown in Fig. 2. Pigs in the treatment groups gained, on average, 31 g and 29 g more per day than the control group in Experiment 1, and 39 g and 43 g more in Experiment 2. The highest gain, as pointed out earlier, occurred in the groups treated with VIUSID Vet powder or solution. The difference between the treatment groups was not statistically significant ($p > 0.05$).

In evaluating VIUSID Vet powder in fattening pigs in Mexico, Ocampo and Sánchez [15] found that using a dose of 2 kg per ton of feed improved production parameters, average daily gain by 89 g and feed conversion by 90 g. In Cuba, trials using VIUSID Vet powder on fattening pigs also reported significant increases in weight gain [10, 11].

Although VIUSID was initially designed to be used in humans to boost the immune system in all processes that caused immunodeficiency or altered immune responses, the responses observed in pigs indicate that the product has a positive impact on the productive performance of fattening pigs. The compounds comprising the product are naturally

present in the animals and the molecular activation to which they are subjected gives it properties that allow its use in different species and zootechnical categories, which has been demonstrated in research on mainly pigs and birds [9, 16, 17].

One of the goals of using feed additives is to increase feed efficiency, that is, to improve weight gain at the expense of greater efficiency of feed use and to a lesser extent through increased feed intake, due to the high cost of feeds. In this case, the efficiency of feed use in the treatment groups shows a statistically significant improvement ($p < 0.05$). Fig. 3 shows its evolution in both experiments.

In Experiment 1, there were six deaths: three of them in the control group, and one and two in the groups treated with 1.5 g and 2.0 g of VIUSID Vet, respectively. The difference was not statistically significant ($p > 0.05$). In Experiment 2, the mortality rate in the control group was 7.14%, compared with 2.86% and 1.43% in the groups treated with VIUSID Vet powder and solution, respectively. The difference between the treatment groups and the control group was statistically significant ($p < 0.05$).

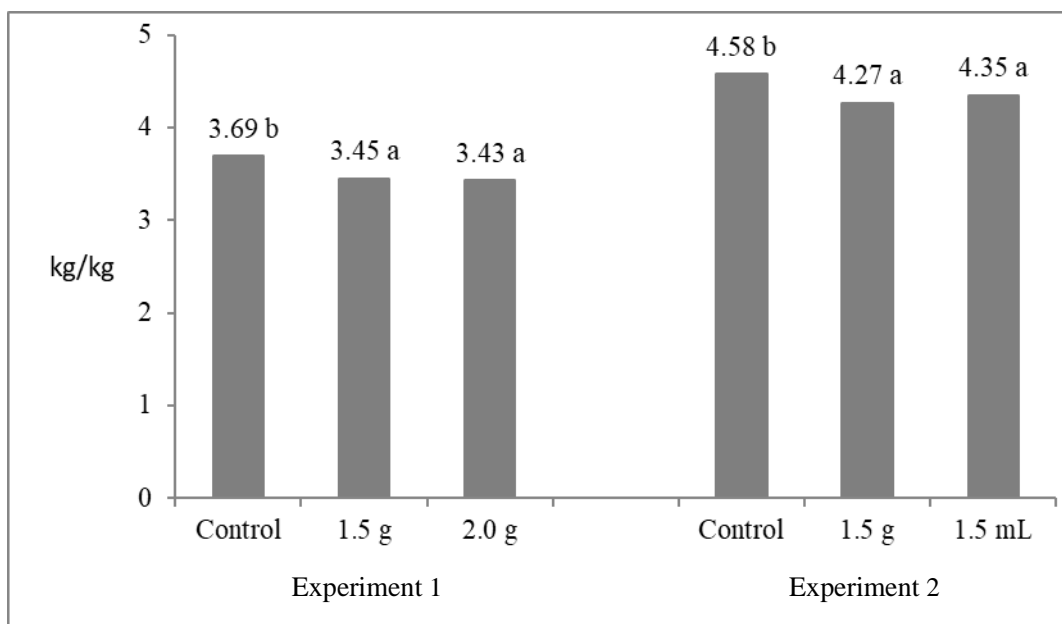


Fig. 3 Evolution of feed efficiency in both experiments.

Different letters (a, b) in the same experiment show a difference that is statistically significant ($p < 0.05$).

Digestive disorders (diarrhea) were observed in both experiments. In Experiment 1, these occurred in three pens of the control group, compared with none in the pens of the treatment groups ($p < 0.05$), which entailed additional expenses for treatments. In Experiment 2, aside from diarrhea, edema disease—which was the primary cause of death in the control pigs—occurred. In this trial, the difference in diarrhea among the three groups was not statistically significant ($p > 0.05$).

In Cuba, in an experiment with fattening pigs treated with VIUSID Vet powder, changes in feeding led to digestive disorders occurring in only the control group (36 cases), with three deaths in the control group and two in the treatment groups [11].

VIUSID Vet, due to its composition and the molecular activation process used in its manufacture, has antioxidant, immunomodulatory, antianemic, antiviral and biocatalytic properties, which improve the health and welfare of the animals taking it. The antioxidant power of VIUSID is 11,587.95 $\mu\text{mol TE/mL}$, which means that the antioxidant properties of the product are high [6].

One of the components of VIUSID Vet is

glycyrrhizic acid (GA), which has antiviral and antibacterial properties, thus serving as an excellent alternative to the use of antimicrobials to improve production without the disadvantage of withdrawal periods or the presence of pharmacochimical residue [18]. GA, a triterpene isolated from the roots and rhizomes of licorice, named *Glycyrrhiza glabra*, is the main bioactive ingredient with antiviral, anti-inflammatory and hepatoprotective effects. GA has been used in the clinical treatment of hepatitis, bronchitis, gastric ulcer, acquired immunodeficiency syndrome (AIDS), certain cancers and skin diseases. It has a direct anti-hepatitis B virus (HBV) action by suppressing extracellular secretion of hepatitis B surface antigen (HBsAg), improving liver function in patients with chronic hepatitis B, and ultimately improving the immune response in HBV. GA can significantly inhibit the proliferation of HIV, showing immune activation. The clinical application of GA on the prevention and treatment of various diseases arises from its numerous pharmacological properties. This review provides a summary of the research progress in the antiviral effects and mechanisms of GA in recent years [19].

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Table 5 Financial assessment per pen^a, of the use of VIUSID Vet in growing-finishing pigs (USD).

Item	Experiment 1			Experiment 2		
	Control	Powder 1.5 g	Powder 2.0 g	Control	Powder 1.5 g	Solution 1.5 mL
Weight gain per pen (kg)	1,309.4	1,440.1	1,428.1	1,101.4	1,217.0	1,228.4
Costs for VIUSID (C) ^b	0.00	61.48	80.78	0.00	93.57	63.30
Income due to difference in weight gain (I) ^c	0.00	156.84	142.44	0.00	138.72	152.40
I—C	-	95.36	61.66	-	45.15	89.10
Income per peso invested in VIUSID (I/C)	-	2.55	1.76	-	1.48	2.41

^a Each pen had 14 pigs at the start of the experiment; ^b Price of VIUSID: powder = 33.48 USD/kg; solution = 22.32 USD/L; ^c The calculation was based on the weight gain of the control group, which is why the value for this is 0.00. The values were obtained by multiplying the price of live pigs (1.20 USD/kg) by the difference in weight gain compared with the control group.

VIUSID contains the amino acids L-arginine and glycine. Several studies confirm that using synthetic amino acids as a nutritional supplement lowers fecal excretion by 33% and nitrogen by 20% in fattening pigs due to greater efficiency of nutrient use [20]. Other studies show that dietary supplementation with arginine stimulates protein synthesis in the skeletal muscle of young pigs [21, 22], and there is evidence that arginine plays an important role in the regulation of energy metabolism [23].

It also contains zinc sulfate, which is a trace element found in the structure of more than 2,700 enzymes, primarily functioning as a catalyst in 70% of the cases. It is also a structural part and acts as a substrate or as a regulator of enzymatic activity [24]. It has antioxidant properties [25, 26], protecting sperm as well as other cells against oxidative stress and lipid peroxidation, inhibiting phospholipase [27].

From a physiological point of view, Zn is considered an essential micronutrient, which has multifunctional properties in the body. For example, it is an important trace mineral that, together with copper, is needed by pigs for numerous metabolic functions, and the inclusion of these minerals in the diet improves growth rates, especially in young pigs [28].

Most pig enzymes require zinc in their structure for normal growth and development. Pigs deficient in zinc show poor growth, poor appetite and parakeratosis [29].

It can be said that the improvements observed in performance are due to the combined action on animal

physiology of the different molecularly activated components of the product, which enhances its effect, especially its antioxidant capacity (11,587.95 $\mu\text{mol TE/mL}$). In the particular case of Cuba and other tropical countries, where every day, there is a period of time when the ambient temperature is higher than the pigs' comfort zone, the protective effect of antioxidants is much more relevant. This is because high temperatures cause peripheral vasodilation, and by extension, internal vasoconstriction, decreasing the supply of oxygen to internal organs with the consequent hypoxia, which causes an increase in oxidative stress and therefore greater cellular damage.

3.2 Financial Analysis

The results of the financial analysis are shown in Table 5. The comparison is more important between the treatment groups and the control group because no statistically significant differences in weight gain were observed between the treatment groups (Tables 3 and 4).

The purpose of the analysis was to check whether the cost increase due to the use of VIUSID was lower than the income obtained from the increase in production. The results showed that the use of VIUSID Vet does not lead to losses in finishing, but that, on the contrary, each peso invested in VIUSID led to increased earnings of anywhere between 1.48 and 2.55 pesos depending on the treatment used.

Financial benefits are not the only positive effects on the producer's bottom line. Using VIUSID Vet also

makes it possible to reduce finishing time; by improving weight gain, the desired slaughter weight is reached earlier. This leads to significant savings in resources due to shorter production times and enables the best use of available facilities. At the same time, it helps to reduce the pollutant load, and accordingly, waste treatment by improving feed efficiency.

4. Conclusions

VIUSID Vet, whether as a powder or solution, significantly improved weight gain and feed conversion as well as reduced deaths when given in doses of 2.0 g and 1.5 g or 1.5 mL per kilogram of feed during the first 90 d of the growing-finishing phase of pigs, giving rise to attractive financial benefits when compared with pigs that were not given such treatment. A dose of 1.5 mL per kilogram of feed in wet feeding or 1.5 g in dry feeding is recommended.

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