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Response of a growth promoter in growing pigs in the growth phase

Respuesta de un promotor de crecimiento en cerdos criollos en la fase de crecimiento

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Abstract
This research was carried out at the experimental farm "La María" belonging to the State Technical University of Quevedo (UTEQ), located at km 7 of the Quevedo - El Empalme road. The effect of the growth promoter Flavomycin was evaluated at three levels, with the following treatments: (T1) without the use of the growth promoter; (T1) with the addition of 300 g/ton of feed; (T2) with 500 g/Ton and (T3) with 700 g/Ton. A Completely Randomized Design (CRD) was applied with four replicates and four replicates. The variables evaluated were: weight gain, feed intake (kg/day) and feed conversion. Sixteen CRIOLLOS pigs, weaned at 28 days of age and weighing 6.83 ± 1.08 kg, were used. For weight gain, significant statistical differences were found between treatments according to Tukey's test (P≤0.05), with the best control treatment without promoter T0 with (13.33) total weekly gain, followed by treatment T2 500g/Ton with (13.29) total weekly gain. With respect to feed consumption, significant differences were found among the treatments under study according to Tukey's test (P≤0.05), having a higher consumption the treatment T2 500/Ton with (42.81) total weekly, followed by the control treatment without promoter T0 with (42.35) total weekly. Regarding feed conversion, significant differences were found between treatments according to the Tukey test (P≤0.05), the best CA values were given by the control treatment without promoter T0 and T1 300g/Ton with 3.18 weekly total.
Keywords: Flavomiciyn, piglets, feed intake, weight gain, effect.

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Received July 11, 2021
Approved: September 09, 2021

Resumen

La presente investigación se llevó a cabo en la finca experimental "La María" perteneciente a la Universidad Técnica Estatal de Quevedo (UTEQ), situado en el km 7 de la vía Quevedo – El Empalme. Se evaluó el efecto del promotor de crecimiento Flavomycin en tres niveles, con los siguientes tratamientos: (T1) sin la utilización del promotor de crecimiento; (T1) con la adición de 300 g/tonelada de alimento; (T2) con 500 g/Ton y (T3) con 700 g/Ton. Se aplicó un Diseño Completamente al Azar (DCA) con cuatro repeticiones y cuatro repeticiones. Las variables evaluadas fueron: ganancia de peso, consumo de alimento (Kg/día) y conversión alimenticia. Se utilizó 16 cerdos CRIOLLOS, destetados a los 28 días de edad con 6.83 ± 1.08 kg de peso. Para la ganancia de peso se encontraron diferencias estadísticas significativas entre los tratamientos según la prueba de Tukey (P≤0,05), siento el mejor tratamiento testigo sin promotor T0 con (13.33) total semanal, seguido del tratamiento T2 500g/Ton con (13.29) total semanal. Con respecto al consumo de alimento se encontraron diferencias significativas entre los tratamientos en estudio según la prueba de Tukey (P≤0,05) teniendo un mayor consumo el tratamiento T2 500/Ton con (42.81) total semanal, continuo del tratamiento testigo sin promotor T0 con (42.35) total semanal. En cuanto a la conversión alimenticia se encontraron diferencias significativas entre los tratamientos según la prueba de Tukey (P≤0,05) los mejores valores de CA fueron otorgados por el tratamiento testigo sin promotor T0 y T1 300g/Ton con 3.18 total semanal.
Palabras clave : Flavomiciyn, lechones, consumo de alimento, ganancia de peso, efecto.

Introduction

In current times, the management of livestock farms, such as swine, constitutes a means of livelihood for economic and social growth, based on human nutrition. Pig production is a complex process, where physiological, nutritional and management factors interact and give, as a result, the efficiency or inefficiency of the productive and reproductive process, to this action is added the valuation by measuring the productivity in numerical form, where the costs of the implementation of raw material and complements are analyzed to initiate an investigation differentiating with the results obtained and establish if it is profitable.

The pigs of Ecuador have their origin in the Iberian breeds imported during the period of the conquest. Some remnants of these specimens are found in remote areas of the country, with their own characteristics and diminished genetic capabilities. Quiroz-Guadarrama et al.(2013), Benitez (2001)

The growth promoters that exist are: Androgens: which are characterized by being myotrophic (act directly on muscle cells). The hormone penetrates the cell, attaches to a receptor in the cytoplasm; it goes to the nucleus. It stimulates the production of an RNA menagerie, which elaborates an enzyme that acts in the process of protein synthesis Toscano et al.(2020) and Bavera (2002)**.**

For Jure et al., (2015) indicates that there is a muscular hypertrophy with a decrease in plasma amino acids and plasma urea with a positive nitrogen balance, with a decrease in urine excretion and an increase in STH somatotrophin. Androgens are much more potent as growth promoters than estrogens: they have a more indirect action. They act at the pituitary level, stimulating the production of somatotrophin (STH), thyrotrophin and adrenocorticotrophin, hormones responsible for growth and development (ACTH). A considerable increase in the concentration of growth hormone in plasma after cattle or sheep were treated with estrogens. Antibiotics are intended to increase weight gain and feed conversion efficiency by adding them to the feed to minimize secondary bacterial infections and control liver abscesses, common in feedlot fattening. Those available are: chlortetracycline, oxytetracycline, bacitracin and tylosin. (Quiroz-Guadarrama et al., 2013, p. 65)

For Montoya et al., (2015) in their study indicates that it is characterized by predominance in the agricultural part since the environment endows to perform these activities due to the privileged location. However, it is particularly established that the livestock part of the sector needs to reinforce technician its reproductive methods since this activity generates income to the Country, being called national economy. Feeding is a predominant factor to carry out this reproductive process, since pigs need food supplementation since the mothers are in gestation and pro following the birth to weaning, which is a vulnerable stage where piglets decrease their body weight and musculature, therefore this critical point must be improved by optimizing the general condition of the animal (Seger, 2020). (Benítes & Sánchez, 2001) .

Materials and methods

Experiment Location

The research was conducted at the experimental farm "La María", belonging to the State Technical University of Quevedo (UTEQ), located at km 7 of the Quevedo - El Empalme road, Rcto San Felipe, Canton Mocache, Province of Los Ríos. It is located between the geographic coordinates of 01º 06' South latitude and 79º 29' West longitude. At an altitude of 73 meters above sea level.

Experimental Design

A completely randomized design with four treatments and four replications was used for the study. Each treatment consisted of one experimental unit with a total of 16 experimental units.

Data analysis was performed by ADEVA and means were separated by Tukey's test ($P \leq 0.05$), using the Infostaf statistical package.

Table 1. *ADEVA analysis of variance of the experimental design*

Source of Variation	Degrees of freedom	
Treatments	*t-1*	3
Error	*t(r-1)*	12
Total	*tr-1*	15

Experiment management

For this research we proceeded to the elaboration of pens of one square meter per experimental unit with their respective installations of feeders and drinkers, then we proceeded to the cleaning and disinfection of the area under study, we used Creole breed piglets of 16 days of age for the control treatment, growth promoter (Flavomycin) was not includedFor treatment one 300g/Ton, treatment two 500g/Ton and treatment three 700g/Ton of growth promoter (Flavomycin), records were kept of the applications of growth promoter, feed consumption and feed conversion of each experiment and then proceeded to perform the corresponding statistical analysis.

Table 2. *Description of treatments.*

Treatments	Description
T0	No promoter
T1	300 g/Ton of Flavomycin
T2	500 g/Ton of Flavomycin
T3	700 g/Ton of Flavomycin

Result

Initial, weekly and total weight gain

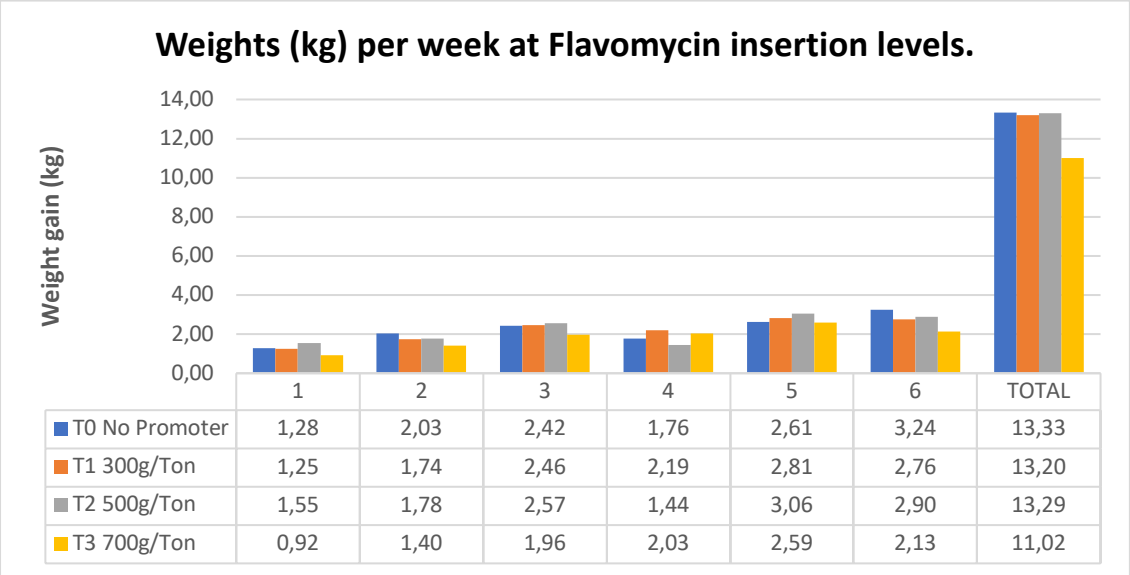
Table 3 shows the weekly and total weight gain, significant statistical differences were found (P≤0.05), the treatment with the highest weight gain was the treatment (T0) with 13.33 kg, while the lowest performance was the treatment (T3) with 11.02 kg. Garcés, (2008) in his studies evaluated the effect of the use of different levels of Natural Zeolite (0, 2, 4 and 6%) in the feeding of York - Landrace sows, in the growth and fattening stages, determined productive parameters in terms of weight gain with 33.50 kg with the use of 6% Zeolite, the data expressed by this author are higher and do not agree with those currently obtained. While Cunuhay, (2013) investigated, Levels of hydroponic green corn forage in the feed diet in fattening of crossbred pigs obtained averages of 10.46 kg, these data are consistent with those obtained in the current research.

Table 3. *Statistical averages of the productive factor weight gain (kg) of growing stage Criollo pigs. FCP. UTEQ.*

Week	Weights (kg) per week at Flavomycin insertion levels				CV
	T0 without Promoter	T1 300g/Ton	T2 500/Ton	T3 700g/Ton	
1	1.28b*	1.25b	1.55c	0.92a	3.42
2	2.03c	1.74b	1.78b	1.40a	2.07
3	2.42b	2.46b	2.57c	1.96a	1.34
4	1.76b	2.19d	1.44a	2.03c	1.70
5	2.61a	2.81b	3.06c	2.59a	1.74
6	3.24d	2.76b	2.90c	2.13a	1.76
TOTAL	**13.33b**	**13.20b**	**13.29b**	**11.02a**	**0.94**

*Averages with equal letters do not show statistical differences according to Tukey's test (P≤0.05). **Prepared by:** Authors.

In Graph 1, in the first week, the T2 treatment showed superiority in weight gain, in week two the T0 treatment or commercial control showed superiority over the other treatments under study, in the third week the T2 treatment showed superiority in weight gain, but in the fourth week the same decreases, with the T1 treatment showing the highest rate of weight gain, in the fifth week the T2 treatment showed superiority, in the sixth week the T0 treatment or commercial control showed the highest parameter of weight gain, respectively. The treatment that did not show effectiveness being the least relevant was treatment T3 with the lowest levels of weight gain, being the one that uses the highest amount of promoter "flavomycin".



	1	2	3	4	5	6	TOTAL
T0 No Promoter	1,28	2,03	2,42	1,76	2,61	3,24	13,33
T1 300g/Ton	1,25	1,74	2,46	2,19	2,81	2,76	13,20
T2 500g/Ton	1,55	1,78	2,57	1,44	3,06	2,90	13,29
T3 700g/Ton	0,92	1,40	1,96	2,03	2,59	2,13	11,02

Figure 1 Weekly weight gain (kg) of Creole pigs at different doses of Flavomycin insertion, expressed in bars. FCP. UTEQ. Prepared by: Authors.

Graph 2 shows the superiority in the trend curve of treatment T0 with 13.33 kg, being the commercial control without promoter, followed by treatment T1 with 13.20 kg, being these the best results respectively, treatment T2 with 13.29 kg and treatment T3 with 14.02 kg, showed the lowest rate of weight gain.

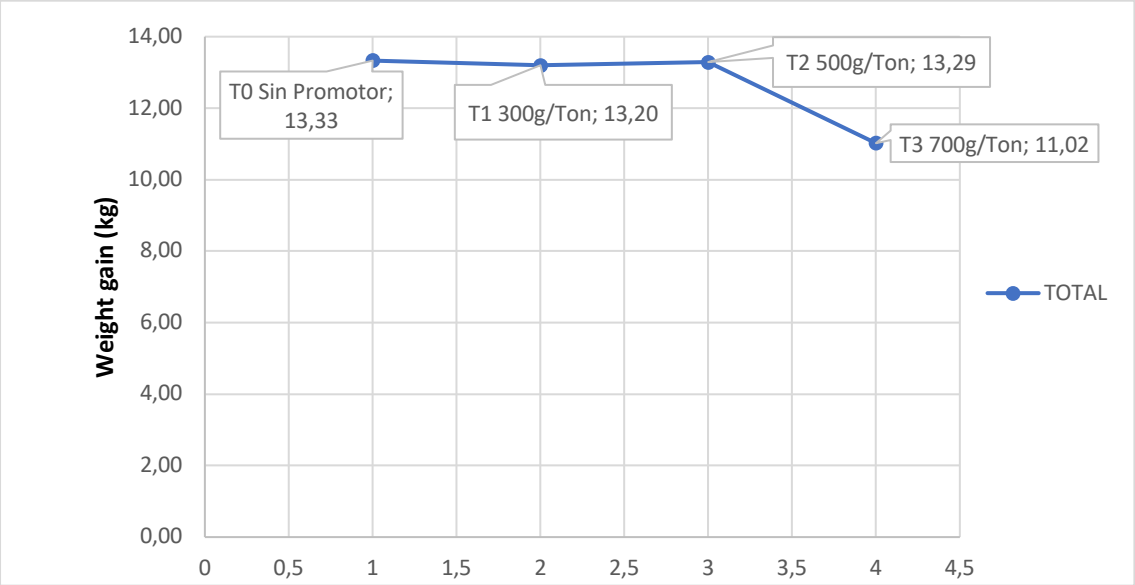


Figure 2. Total weight gain (kg) at different doses of Flavomycin insertion, expressed as a trend curve. FCP. UTEQ. Prepared by: Authors.

Weekly and total food consumption.

Regarding the variable total and weekly feed consumption, a statistical difference was found (P≤0.05), the treatment with the lowest index was T3 with 2.55 kg, at the first week, the same treatment obtained 10.03 kg, at the sixth week, being the highest index. Ambi, (2011) who evaluated the application of flavoring in the diet of Landrace-York pigs during the stages of growth and fattening obtained total averages in the growth stage of 74.30 kg, Consequently Caballero, (2010) who conducted studies on the Effect of the use of palletized balanced feed from the beginning to fattening in the pig farm, El Hobo, Santa Cruz de Yojoa, Honduras obtained weekly average values of 14.83 kg, being higher than those currently obtained. (Table 4)

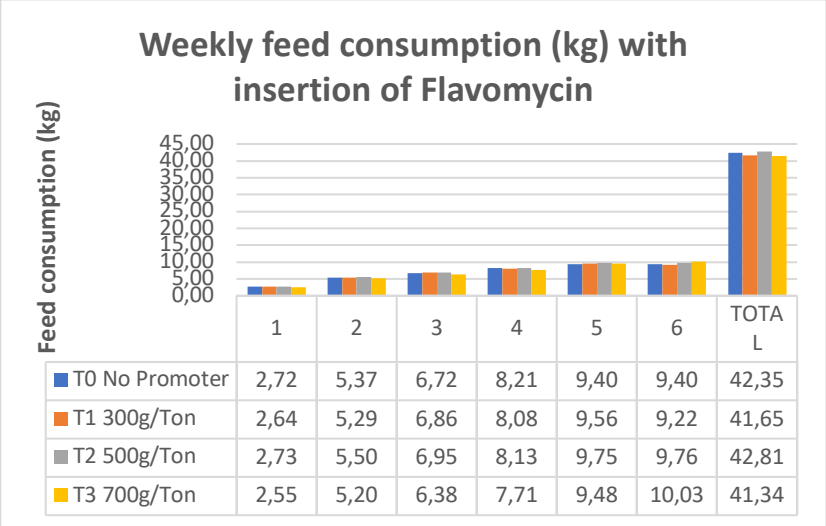
Table 4. *Statistical averages of the feed intake factor. FCP. UTEQ.*

Week	Weekly feed consumption (kg) with insertion of Flavomycin				CV
	T0 without Promoter	T1 300g/Ton	T2 500/Ton	T3 700g/Ton	
1	2.72c*	2.64b	2.73c	2.55a	1.18
2	5.37b	5.29b	5.50c	5.20a	0.85
3	6.72b	6.86c	6.95d	6.38a	0.52
4	8.21b	8.08b	8.13b	7.71a	0.84

5	9.40a	9.56b	9.75c	9.48ab	0.66
6	9.94c	9.22a	9.76b	10.03d	0.44
TOTAL	**42.35c**	**41.65b**	**42.81d**	**41.34a**	**0.29**

Means with equal letters do not show statistical differences according to Tukey's test (P≤0.05). Prepared by: Authors.

In Graph 3, treatments T0 with 2.72 kg, commercial control and T2 with 2.73 kg, showed a similar consumption in week one, but in the second and third week, treatment T2 with 5.50 kg; 6.95 kg, respectively, was superior to the other treatments under study, in week five showed similarity between treatments, being slightly higher in treatment T2 with 9.75 kg, in the sixth week, treatments T0 with 9.94 kg, commercial control and T3 with 10.03 kg were higher.



	1	2	3	4	5	6	TOTAL
T0 No Promoter	2,72	5,37	6,72	8,21	9,40	9,40	42,35
T1 300g/Ton	2,64	5,29	6,86	8,08	9,56	9,22	41,65
T2 500g/Ton	2,73	5,50	6,95	8,13	9,75	9,76	42,81
T3 700g/Ton	2,55	5,20	6,38	7,71	9,48	10,03	41,34

Figure 3. Weekly feed consumption (kg) of Creole pigs at different doses of Flavomycin insertion, expressed in bars. FCP. UTEQ. Prepared by: Authors.

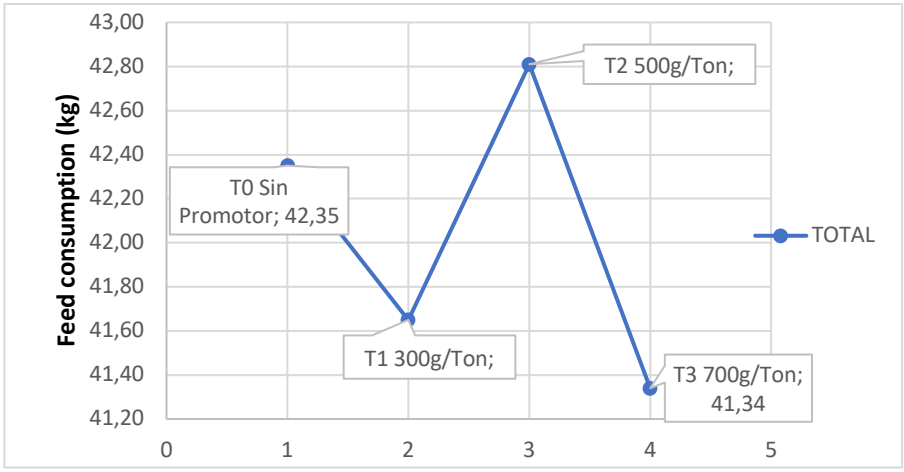


Figure 4. Total feed consumption (kg) at different doses of Flavomycin insertion, expressed as a trend curve. FCP. UTEQ. Prepared by: Authors.

Weekly and total feed conversion.

The feed conversion showed a significant statistical difference, with the highest value corresponding to treatment T3 with 3.78 and the lowest conversion corresponding to treatment T0 and T1 with 3.18. On the other hand, the studies of Garcés (2008) show a feed conversion of 2.92. During the fattening stage, the sows treated with 6% inclusion of Natural Zeolite. Research conducted by Castro, Santana, & Santana, (2010) who tested the effect of the use of different levels of prebiotic in the diet of pigs during the growth and finishing phase obtained variations of 2.89 and 3.22, these data are similar to the current data obtained by the authors cited above.

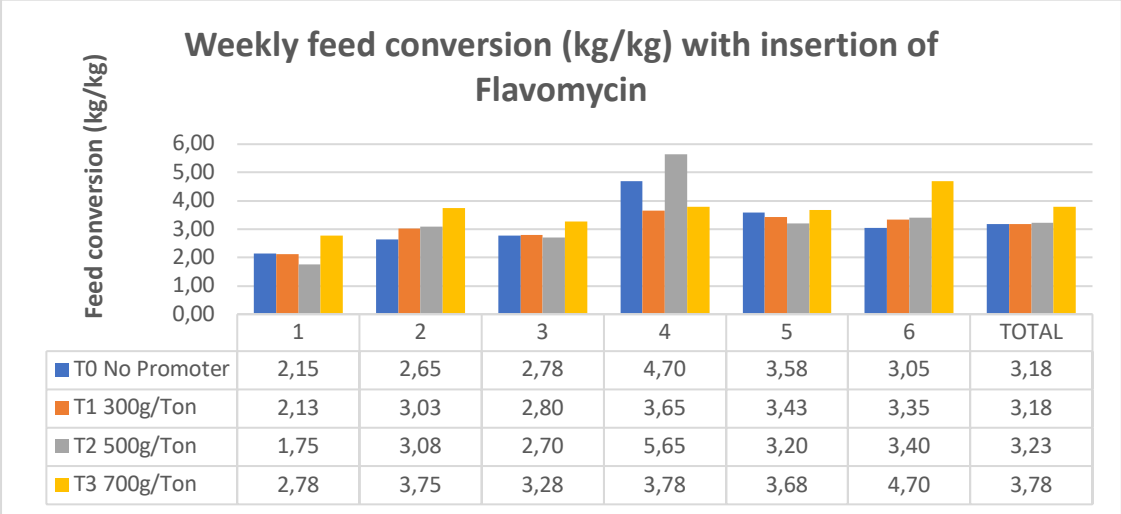
Table 5. *Statistical averages of Feed Conversion. FCP. UTEQ.*

Week	Weekly feed conversion (kg/kg) with insertion of Flavomycin				CV
	T0 without Promoter	T1 300g/Ton	T2 500/Ton	T3 700g/Ton	
1	2.15b*	2.13b	1.75a	2.78c	5.17
2	2.65a	3.03b	3.08b	3.75c	2.53
3	2.78b	2.80b	2.70a	3.28c	1.22
4	4.70b	3.65a	5.65c	3.78a	2.49
5	3.58bc	3.43b	3.20a	3.68c	2.39

6	3.05a	3.35b	3.40b	4.70c	1.95
TOTAL	**3.18a**	**3.18a**	**3.23a**	**3.78b**	**1.50**

*Averages with equal letters do not show statistical differences according to Tukey's test (P≤0.05). Prepared by: Authors.

In Graph 5 we observe that in the first week the T2 treatment with 1.75 of A.C. showed predominance, in the second week the T0 treatment, commercial control reaches the lowest feed conversion, which is favorable, since we need less feed for meat conversion, in the third week the T0, commercial control, T1 and T2 treatments remained lower and favorable in feed conversion, in the fourth week the T1 treatment showed superiority, in the sixth and last week the T0, commercial control obtained the best CA index.



	1	2	3	4	5	6	TOTAL
T0 No Promoter	2,15	2,65	2,78	4,70	3,58	3,05	3,18
T1 300g/Ton	2,13	3,03	2,80	3,65	3,43	3,35	3,18
T2 500g/Ton	1,75	3,08	2,70	5,65	3,20	3,40	3,23
T3 700g/Ton	2,78	3,75	3,28	3,78	3,68	4,70	3,78

Figure 5. Weekly feed conversion (kg/kg) of Creole pigs at different doses of Flavomycin insertion, expressed in bars. FCP. UTEQ.

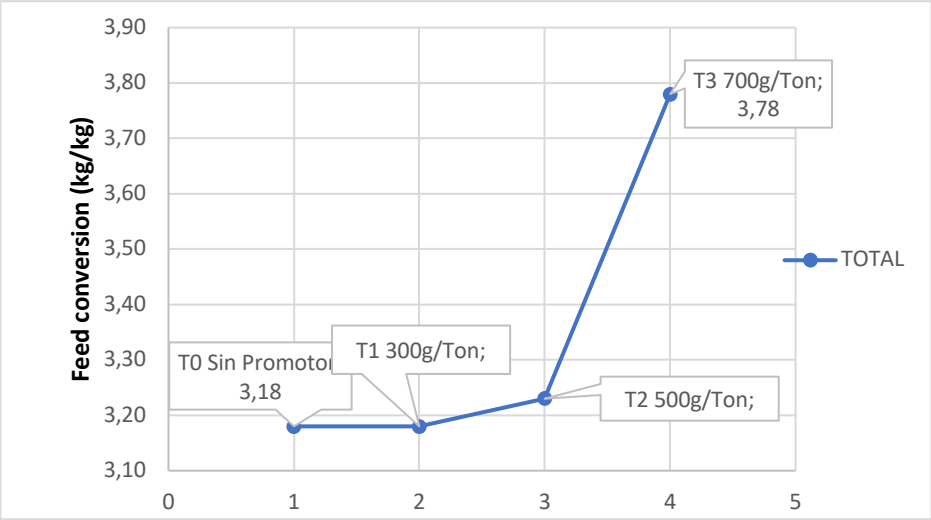


Figure 6. Total feed conversion (kg/kg) at different Flavomycin insertion doses, expressed as a trend curve. FCP. UTEQ. 2015

In Graph 6, it is evident in the trend curve that the T0 and T1 treatments show superiority as they are lower, the T2 treatment with low and favorable feed conversion rates, the highest and least favorable rate was evidenced in the T3 treatment.

Conclusions

According to the results obtained in the present investigation, the following conclusions were reached: with respect to weight gain, significant statistical differences were found among the treatments according to the Tukey test (P≤0.05), with the best control treatment without promoter T0 with (13.33) weekly total, followed by treatment T2 500g/Ton with (13.29) weekly total. With respect to feed consumption, significant differences were found among the treatments under study according to Tukey's test (P≤0.05), having a higher consumption the treatment T2 500/Ton with (42.81) total weekly, followed by the control treatment without promoter T0 with (42.35) total weekly. Regarding feed conversion, significant differences were found between treatments according to the Tukey test (P≤0.05), the best CA values were given by the control treatment without promoter T0 and T1 300g/Ton with 3.18 weekly total.

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