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Conference Paper

Fodder Mixture Evaluation for the Feeding of Growing-fattening Guinea Pigs in the Quijos Canton of the Province of Napo

Evaluación De Una Mezcla Forrajera Para La Alimentación De Cuyes En Crecimiento-Engorde, En El Cantón Quijos De La Provincia Del Napo

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Abstract

It is known that increasing the productivity of any animal species involved in human nutrition is a permanent challenge to overcome. Consequently, the objective addressed was to evaluate the productive behavior of guinea pigs in the stage of growth-fattening, when forage mixture is used in their daily diet. It was carried out in Bellavista Farm, Santa Lucia de Bermejo, Cosanga Parish located in Quijos in Napo Province. The treatments were: T1(honey grass 25%, blue grass 25%, and concentrated 50%), T2(honey grass 25%, ryegrass 25%, and concentrated 50%), T3 (blue grass 25%, ryegrass 25%, and concentrated 50%) versus control T0 (local weeds). We used 64 guinea pigs, 32 females and 32 males improved line aged 15 days and an average weight of 339.17, using a completely random design in a combinatorial arrangement of two factors: where factor A corresponds to the forage mixture and factor B to the sex of the animals. The results were tabulated for better statistical understanding, and the separation of means was performed using the Tukey's test with a significance level of 0.05. The results indicate that the use of the forage mixture made up of honey grass and concentrated blue grass, presents higher responses of forage consumption (2371,13 g/MS) and total food consumption (3 669,81g/MS), exceeding the results of the control treatment. In the economic evaluation, it was established that the T2 obtains the highest cost-benefit, with a nominal value of $1.13. It is concluded that no significant differences were observed when evaluating the productive parameters; in the meantime in the variables: weight gain, forage consumption, total food consumption, and food conversion, present highly significant differences. It is recommended to use fodder mixture of blue grass plus honeygrass, as part of a diet, in the stages of gestation and lactation.

Keywords: *zootechnics, blue grass, honey grass, ryegrass, final weight, feed conversion, total feed consumption.*

Resumen

Se conoce que elevar la productividad de cualquier especie animal que interviene en la alimentación humana es un reto permanente para superar; en consecuencia, el objetivo aboradado fue evaluar el comportamiento productivo de los cuyes en la etapa de crecimiento engorde cuando en su alimentación diaria se utiliza una mezcla forrajera. Este estudio se llevó a cabo en la finca Bellavista, sector Santa Lucia de Bermejo, parroquia Cosanga, ubicado cantón Quijos de la provincia de Napo. Los tratamientos fueron: T1 (pasto miel 25 % + pasto azul 25 % + concentrado 50 %), T2 (pasto miel 25 % + ryegrass 25 % + concentrado 50 %), T3 (pasto azul 25 % ryegrass 25 % + concentrado 50 %) frente al control T0 (malezas de la zona); se utilizaron 64 cuyes,

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32 hembra y 32 machos de la línea mejorada de 15 días de edad y un peso promedio de 339,17 g; utilizando un diseño completamente al azar en un arreglo combinatorio de dos factores: donde el factor A corresponde a la mezcla forrajera y B al sexo de los animales. Los resultados fueron tabulados para su mejor comprensión estadística, y para la separación de medias se realizó mediante la prueba de Tukey con un nivel de significancia del 0,05. Los resultados indican que la utilización de la mezcla forrajera conformada por pasto miel + pasto azul + concentrado, presenta respuestas más altas, de consumo de forraje (2 371,13 g/MS); y consumo total de alimento (3 669,81 g/MS), superando a los resultados del tratamiento testigo. En la evaluación económica se estableció que el T2 obtiene mayor beneficio costo, con un valor nominal de $ 1,13. Se concluye que al evaluar los parámetros productivos no existe diferencias significativas, mientras tanto en las variables: ganancia de peso, consumo de forraje; consumo de alimento total y la conversión alimenticia, presentan diferencias altamente significativas. Se recomienda utilizar mezcla forrajera de pasto azul más pasto miel, como parte de una dieta, en las etapas de gestación y lactancia.

Palabras Clave: *zootecnia, pasto azul, pasto miel, ryegrass, peso final, conversión alimenticia, consumo total de alimento.*

1. Introduction

Guinea pig breeding is commonly done according to the traditional method, family raising inside or in the backyard of the house. It is a precocious species, quick to reproduce, with a short reproductive cycle, easy to manage and easy to adapt to biological systems. However, traditional breeding has gradually become more technical, now becoming a type of large-scale exploitation that is different from traditional breeding [1].

Feed rations for guinea pigs should be well proportioned and contain all the necessary nutrients as much as possible so that their development is within an estimated time, in addition to minimizing costs and economic losses. The advantages of raising guinea pigs are their short reproduction cycle and their adaptability to different forms of feeding. Therefore, a non-competitive diet can be used, in addition to using wild forage that exists in different areas [2].

This is a pertinent area since it seeks to resolve the behavior of livestock when consuming pastures from the eastern area. Consequently, it encourages producers to raise guinea pigs with nutritional requirements in the fattening stage, improving their productivity and reducing mortality (since a lower weight over a longer time means more economic losses), thus translating into profitability for producers [3]. For this reason, it is unpredictable to provide an adequate diet for the guinea pig, agreeing in advance on the nutritional requirements according to its growth stage. Given that protein needs must be greater, and in the same way, the main minerals that must be included in diets are calcium, phosphorus, magnesium, and potassium [4].

It is important to know how to properly feed guinea pigs, especially during the growth and fattening stages, because inadequate feeding can have serious consequences depending on the degree of malnutrition. For this reason, this research seeks to measure the adequate supply of existing forage in the area for its use. A ration that is more nutritionally concentrated in carbohydrates, fats, and proteins leads to lower consumption and better profitability [5].

Based on the above, the objective was to evaluate the productive behavior of guinea pigs in the growth and fattening stages when a fodder mixture is used in their daily diet.

2. Materials and methods

The development of this research was carried out on the Bellavista farm, Santa Lucia de Bermejo sector, Cosanga parish, located in the Quijos canton of the Napo province, which lasted 75 days and was distributed in different activities such as; sowing grasses in different plots, adaptation of the research site (ponds), supply of daily forage, recording of all daily data (75 days), and finally the bromatological analysis of the weeds in the area and the three pastures.

In this study, 64 improved-line guinea pigs, 15 days old and with an average weight of 339.17 grams, were used, of which 32 were male guinea pigs and 32 were female guinea pigs, grouped with two animals per pool and of the same sex.

2.1. Treatments and experimental design

Three treatments based on the forage mixture were used, (honeygrass 25% plus bluegrass 25% plus concentrated 50%; bluegrass 25% plus ryegrass 25% plus concentrated 50%; bluegrass 25% plus ryegrass 25% plus concentrated 50%) compared to a control treatment. Additionally, a Completely Random Design was applied in a combinatorial arrangement of two factors: where Factor A corresponded to the mixture of fodders and B to the sex of the animals. Four repetitions were carried out per treatment and the size of the Experimental Unit was two animals; That is, we worked with eight animals of each sex and sixteen animals of each treatment.

2.2. Statistical analyzes and significance tests

- Variance analysis (ADEVA), $p < 0,05$
- Treatments' separation of means according to the Tukey test at a 5% significance level.

• Correlation and regression analysis of the variables that present significance ($p < 0.01$).

3. Results and Discussion

3.1. Evaluation of the productive behavior variables of growing-fattening guinea pigs in the Quijos canton of the Napo province due to the effect of the fodder mix

3.1.1. Starting weight (g)

The average initial weight of the guinea pigs for the development of this research was 339.17 g, presenting homogeneity in them as indicated in Table 1.

Tabla 1

Evaluation of the productive behavior of guinea pigs in the growth – fattening stages.

VARIABLES	TREATMENTS						
	T0	**T1**	**T2**	**T3**	S.E	Prob	Sign
Starting weight (g).	324,06	346,94	347,63	338,06	-	-	-
Final weight (g).	809,44 a	753,75 a	776,06 a	757,13 a	19,97	0,2078	ns
Weight gain (g).	485,38 a	406,81 b	428,44 ab	419,06 ab	19,37	0,0404	*
Fodder Consumption (g/MS).	1 904,01 d	2 371,13 a	2 005,81 c	2 250,85 b	9,05	<0,0001	**
Concentrate consumption (g/MS).	1 299,23 a	1 298,69 a	1 299,21 a	1 300,70 a	0,90	0,4393	ns
Total feed consumption (g/DM)	3 203,24 c	3 669,81 a	3 305,01c	3 551,55 b	9,32	<0,0001	**
Feed conversion	6,68 b	9,18 a	7,85 ab	8,54 a	0,38	<0,0007	**
Carcass weight (g).	533,09 a	489,24 a	502,83 a	499,35 a	15,81	0,2599	ns
Carcass yield (%)	65,86 a	64,93 a	64,84 a	65,92 a	2,03	0,9693	ns
Mortality (N°)	0	1	1	0	-	-	-

S.E. = Standard error; **Prob.** = Probability; **Sig.** = Significance. Prob. ≤ 0,05: there are significant differences.
Prob. ≥ 0,05: there are no statistical differences. Prob. ≤ 0,01: there are highly significant differences.
Source: authors

3.1.2. Final weight (g)

In the statistical evaluation of the final weight of guinea pigs in the growth stage, there are no statistical differences ($p > 0.05$). This is due to the inclusion of diets of different forage mixtures, showing that T0 obtained the best results, with 809.44 g. While the lowest result was recorded with guinea pigs fed honey grass plus blue grass, at 753.75 g, see Figure **1**.

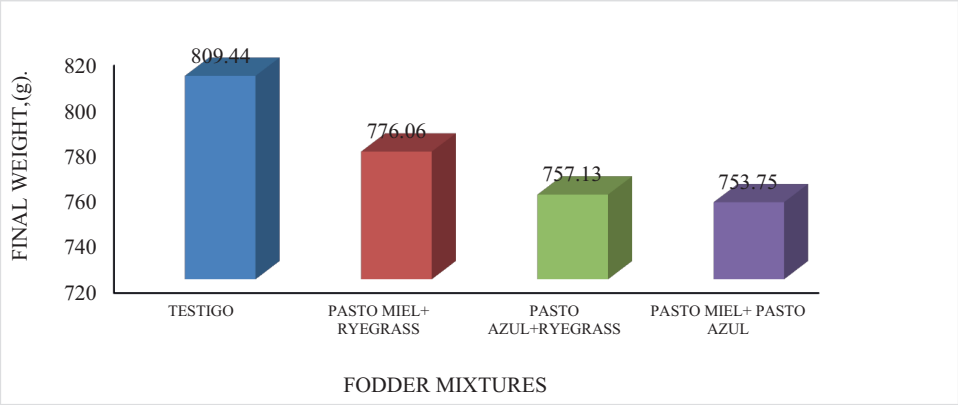

Figura 1

Final weight of growing guinea pigs - fattening, due to the effect of forage mixing. **Source:** authors.

These results are similar to those presented by [6], who, when analyzing the final weight, showed that in the treatment with the inclusion of 30% of forage peanut flour, 1,250.44 g. Similarly, [7], who studied the feeding of growing guinea pigs based on tropical grasses adapted to the Amazon region.

Reported by [8], when evaluating different grasses from the Amazon (*Axonopus scoparius, Pennisetum purpureum, Echinochioa polystachia, Axonopus micay),* more concentrated in the feeding of guinea pigs in the growth - fattening stage, obtained final weights of 760 g.

According to the results obtained by [9], in the evaluation of ryegrass and forage oats in the mixed feeding of guinea pigs in the growth phase, the guinea pigs that presented the highest weight values were those fed ryegrass supplemented with a commercial ration restricted to an average of 903.44 g.

It is necessary to mention what [10] indicates, that a guinea pig can be fed with any type of fodder, however, it is considered that alfalfa is the best fodder for feeding them; but since this forage is not available, others can be used, such as: vetch, maralfalfa, garrotilla, forage corn, oats, barley, raygrass, elephant grass, crop stubble (bean leaves,

cabbage, oat straw, barley straw, corn husk); kitchen waste: vegetable and vegetable peelings.

3.1.3. Weight gain (g)

The weight gain variable presented significant differences ($p < 0.05$). Due to the effect of the different forage mixtures, the average of the highest weight gain was obtained in the batch of guinea pigs from the control treatment where the averages were 485.38 g; Followed by the T2 treatment responses, with means of 428.44 g; Below are the responses recorded in the batch of guinea pigs from treatment T3, since the averages were 419.06 g; Finally, the lowest results were recorded by the guinea pigs from treatment T1, with average values of 406.81 g. The greatest weight gain was established both in the control treatment and when using honey grass plus blue grass. In this regard [11] states that when feeding guinea pigs is based on forage grass, as the sole source of food, it ensures the correct intake of vitamin C, but it cannot cover the animal's nutritional needs completely, therefore, an improvement in weight cannot be achieved.

The weight gains reported in this research could be due to the genetics of the animals used and are not necessarily related to the feed's quality since in the different types of guinea pig rearing, various feeds are used, and it is not known how they affect weight gain. The results of the present research are superior when compared to the study by [7], who evaluated the feeding of growing and fattening guinea pigs based on tropical grasses adapted to the Amazon region. By feeding them with micay grass and feed, he reported weight gains of 380 g.

Similar was the result of [8] when evaluating different grasses from the Amazon (Axonopus scoparius, Pennisetum purpureum, Echinochioa polystachia, Axonopus micay) plus concentrated in feeding guinea pigs in the growth and fattening stages. A weight gain of 360 g was reported. However, these results are superior to those recorded by the author [12] who determined the yield in fattening guinea pigs with three feeding systems (maralfalfa, tanzania and elephant) plus a concentrate in the Gualaquiza canton, obtaining average weight gains of 490.33 g.

3.1.4. Fodder consumption, (g/MS)

In the assessment of fodder consumption of guinea pigs in the growth stage, highly significant differences are observed ($p <0.01$). This is due to the feeding with different forage mixtures, with higher values being determined in the group of guinea pigs from the T1 treatment, with results of 2,371.13 g, as well as the guinea pigs of treatment T3,

with values of 2,250.85 g; Below are the results achieved in the batch of guinea pigs from treatment T2, with average values of 2,005.81 g. While the lowest results were reported in the T0 treatment, with records of 1,904.01 g, (Figure **2**).

The highest results are achieved when using a mixture of blue grass plus honey grass in the guinea pig's diet. In this regard, [13] states that bluegrass can be used as forage along with molasses, since it contains vitamins, proteins, and minerals in stabilized form, comparable in nutritional value to alfalfa flour.

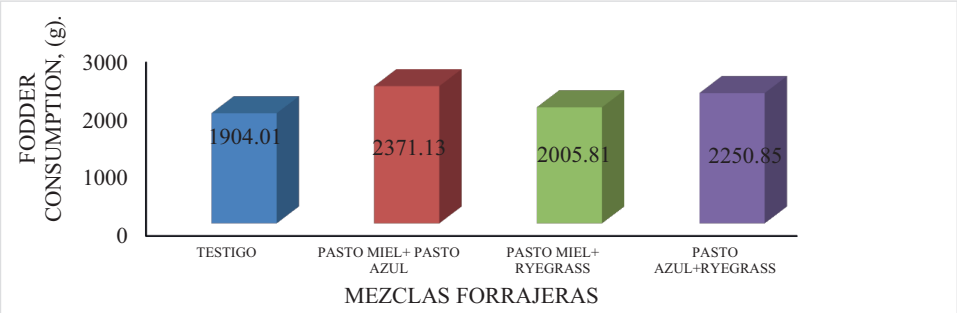

Figura 2

Forage consumption of growing and fattening guinea pigs, due to the forage mixture type effect. **Source:** authors.

The results of the present investigation are superior when compared to the records by [14]. When evaluating the bio-economic response of guinea pigs (*Cavia porcellus*) fed with diets based on non-traditional and traditional inputs in palletized and ground form, in the growth and finishing phases. In fodder consumption, no significant differences were found ($p > 0.05$) between these components, only numerical differences were found, observing that the highest consumption was 2,773 g/day.

3.1.5. Concentrate consumption, (g/MS)

In the evaluation of the concentrate consumption in the feeding of the guinea pigs of the Quijos canton, in the growth stage, no significant differences were recorded ($p > 0.05$). Due to the effect of feeding with different forage mixtures, determining the highest values in the group of guinea pigs from treatment T3 with values of 1,300.70 g/DM.

Below are the results achieved by the batch of guinea pigs from the control group, with results of 1,299.23 g, as well as in the guinea pigs from treatment T2, with values of 1,299.21g. Finally, the lowest responses were those recorded by the guinea pigs from treatment T1, with averages of 1,298.69 g.

Regarding the consumption of concentrate, [15] reported an average of 2,873.3 g; value that is higher than the data found in the present research. This result may be due to the better use of concentrated feed. However, when using concentrate as the only feed, it is necessary to prepare a good ration in such a way that it satisfies the nutritional requirements of the guinea pigs. Furthermore, under these conditions, consumption per animal/day is on average between 40 to 60 g/animal/day, depending on the ration quality.

3.1.6. Total feed consumption, (g/MS)

In the evaluation of the total feed consumption variable, highly significant differences were reported, with a value of ($p < 0.01$). Due to the effect of feeding the guinea pigs in the growth stage with different fodder mixtures, the highest values were established in the guinea pigs of the T1 treatment, with results of 3,669.81g/DM. Below, the values reported in the batch of guinea pigs from treatment T3 can be seen, with responses of 3,551.55 g/DM as illustrated in Figure **3**.

In the same way, the mean values of treatment T2 (honeygrass + ryegrass) are considered, with means of 3,305.01 g/DM, and finally the results reported by the control treatment are recorded, with responses of 3,203.24 g.

The results obtained by this research are lower compared to those reported by [16] who in the evaluation of three types of microsilos based on barley, alfalfa, corn with sweet agave, in guinea pigs in the growth and fattening stages, observed that the control treatment ingests the greatest amount of food, with a total of 1,6376.32 g.

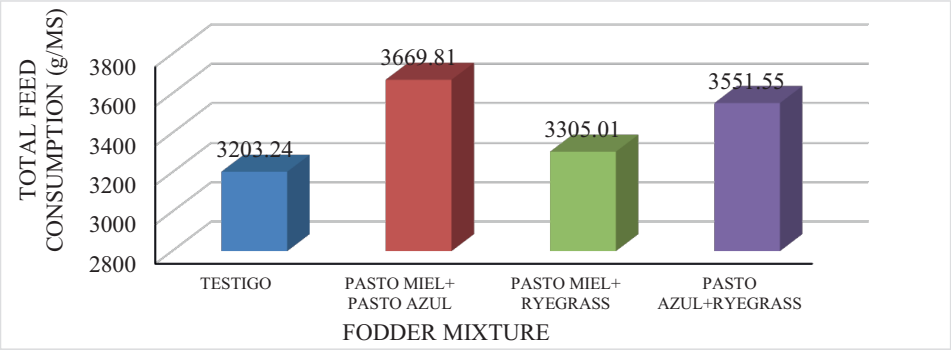

Figura 3

Total food consumption of growing and fattening guinea pigs, due to the fodder mixture type effect. **Source:** authors.

According to [9], in the food consumption (g/animal) of guinea pigs fed with natural grass, ryegrass or forage oats according to treatment and a ration in the growth and

fattening phase, the highest consumption was obtained by T2: ryegrass with averages of 9367 g; This is because ryegrass is highly preferred by guinea pigs.

3.1.7. Feed conversion

In the assessment of the feed conversion variable, highly significant differences were reported ($p < 0.01$). Due to the effect of feeding guinea pigs in the growth stage with different fodder mixtures, the highest results were reported in the batch of guinea pigs from the T0 control treatment, with results of 6.68. Next are the responses of the batch of guinea pigs from treatment T2, with average values of 7.85. In the same way, the responses of the batch of guinea pigs from treatment T3 are appreciated, with records of 8.54. Finally, the results achieved in the batch of guinea pigs from treatment T1 are reported with averages of 9.18.

According to [11], the best feed conversion index was for treatment T2, (guinea pigs that consumed balanced feed), with means of 9.0. This could be due to this treatment not being affected by the fodder's excess fiber, thus interfering with feed consumption. On the other hand, [17] reports similar values in feed conversion of 8.84 for guinea pigs fed with ryegrass, expressing that the feed conversion in guinea pigs will depend on the energy and protein level of the feed. If the level is high, it promotes greater weight gain, which reflects on the feed conversion values.

While [18] achieved the best feed conversion using 40% alfalfa with 60% concentrate with averages of 7.21. Considering honey grass as an excellent dietary supplement with bio-stimulating action; likewise, by using essential fatty acids such as linoleic and linolenic acids, which could be an alternative in feeding guinea pigs since it activates fattening.

3.1.8. Carcass weight (g)

The statistical evaluation of the productive variable, carcass weight, of the guinea pigs in the growth stage, did not report significant differences ($p > 0.05$). Due to the effect of including different forage mixtures in the diet. Therefore, the best response was established in the guinea pigs of the T0 treatment (Control), with averages of 5 33.09 g.

Subsequently, a decrease occurred when the guinea pigs were provided with the forage mixture consisting of honey grass + blue grass with values of 489.24 g. Subsequently, the responses achieved in the group of guinea pigs fed with honey grass +

ryegrass were 502.83 g. Finally, the lowest responses were reported in the guinea pigs supplied with bluegrass + ryegrass, with mean reports of 499.35 g.

According to [16], guinea pigs from T1 that consumed only alfalfa achieved the best carcass weight, higher than those achieved by this research at 793.5 grams. Similarly [19] in the carcass weight variable, presented a higher weight in the treatment with the mixed feeding system (forage + feed) with an average of 867.0 g.

3.1.9. Carcass yield (%)

In the assessment of the carcass yield of guinea pigs in the growth stage, no statistical differences were observed ($p > 0.05$) due to the effect of feeding with different forage mixtures. The highest values were determined in the group of guinea pigs from treatment T3, with responses of 65.92%. Subsequently, the responses of T0 treatment are seen, with results of 65.86%. Then the results achieved in the guinea pigs of T1 treatment are recorded, with values of 64.93%. Finally, the mean values of T2 treatment are reported, with records of 64.84%, as indicated in Figure **4**.

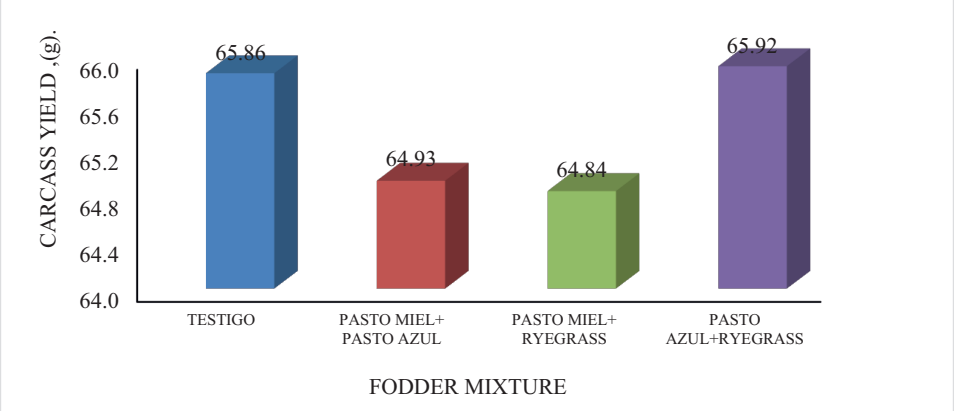

Figura 4

Weight of the growing and fattening guinea pig carcass, due to the type of forage mixture effect. **Source:** authors.

Based on the results obtained, it can be stated that bluegrass + ryegrass has a higher yield compared to [20] who, when feeding native guinea pigs with concentrated diets based on chilca and dill, the carcass yields expressed percentages of 52.53% and 54.27%n which is a lower percentage than the one found in this research.

On the contrary, [16], when evaluating the carcass yield of guinea pigs, obtained a superior result. With an average of 67.4% using alfalfa microsilo; Also [19] using a Mixed diet (Fodder– Feed); presented a higher carcass yield with an average of 69.9%, a

difference that can be attributed to the inequality in the final live weight between the treatments.

3.2. Mortality (N°)

In the mortality assessment, it is noted that there were two dead animals and that it was exclusively due to the handling of the livestock at the time of providing their food. This area was very rainy, so this particularity was taken into consideration later.

3.3. Productive evaluation of guinea pigs in the growth and fattening stages fed with different forage mixtures due to the sex effect

The results obtained, after having carried out the different statistical analyzes when evaluating a forage mixture for feeding growing and fattening guinea pigs, due to the sex effect, are presented in table 2.

When evaluating the productive behavior of guinea pigs in the growth and fattening stage fed with different forage mixtures due to the sex effect, they did not present significant differences ($p < 0.05$) in any of the variables studied. However, numerically there is a better performance of female guinea pigs compared to males, in terms of the variables: final weight, weight gain and feed conversion.

3.4. Bromatological analysis of the weeds in the area (East)

The result obtained in the AGROLAB laboratory (agricultural chemical analysis laboratory) of the bromatological analysis of the weeds in the area (East), provided the following results Humidity 86.70%; dry matter 13.3%; protein 27.68%; fat 2.38%; ash 9.59%, fiber 17.40% and E.L.N.N. 42.95%.

It is worth mentioning that this weed is from the Santa Lucia de Bermejo area, sector in the parish of Cosanga, province of Napo, which is very desirable for minor species. This weed grows in areas that have a slope and does not require management. Although the nutritional profile of weeds reveals the potential they have for feeding herbivores, it is necessary to clarify their nutritional value, especially in the proper use of their nutrients. It has a protein content of 27.68%, which is high, hence nutritional analysis tests should be an appropriate option to decide which of these forages deserve to be incorporated as basic feeds for guinea pigs. Always with the premise of using raw materials that are abundant in the area and that do not represent an additional cost.

Tabla 2

Productive evaluation of growing and fattening guinea pigs, in the Quijos canton.

PRODUCTIVE VARIABLE	SEX				S.E	PROB	SIGN
	FEMALE		MALE				
Initial weight (g).	338,03		340,31		-	-	-
Final weight (g).	777,34	a	770,84	a	14,12	0,7476	ns
Weight gain (g).	439,31	a	430,53	a	13,7	0,6544	ns
Fodder Consumption, (g/MS).	2 136,79	a	2 129,11	a	6,4	0,4044	ns
Concentrate consumption, (g/MS).	1 299,35	a	1 299,56	a	0,63	0,8175	ns
Total feed consumption, (g/MS).	3 436,14	a	3 428,67	a	6,59	0,4304	ns
Feed conversion	7,99	a	8,13	a	0,27	0,7106	ns
Carcass weight, (g)	502,44	a	509,82	a	11,18	0,6449	ns
Carcass yield (%)	64,62	a	66,16	a	1,43	0,4548	ns
Mortality	2		0		-	-	-

S.E. = Standard error; **Prob.** = Probability; **Sig.** = Significance. Prob. ≤ 0,005: There are significant differences. Prob. ≥ 0,05: There are NO statistical differences Prob. ≤ 0,01: There are highly significant differences.
Source: authors

3.4.1. Bromatological analysis of Honey Grass

The result obtained in the AGROLAB laboratory from the bromatological analysis reflects the following: humidity 86.03%; dry matter 13.97%; protein 15.69%; fat 3.12%; ash 10.68%; fiber 29.17% and E.L.N.N. 41.34%.

Knowledge of the nutritional value of feeds is essential for animal nutrition; honey grass belongs to grasses, and therefore its nutritional value is delimited by its protein content and its energy value. This statement is very inconsistent since both the protein and energy content can vary depending on the vegetative state of the plant. However, reports indicate a protein content of 15.69%, which is necessary since proteins constitute the main component of most tissues. The formation of each of them requires their contribution, depending more on the quality than the quantity that is ingested.

3.4.2. Bromatological analysis of Blue Grass

The bromatological analysis of bluegrass in the AGROLAB laboratory reported a moisture content of 82.54%; dry matter of 17.46%; 18.07% protein; 3.85% fat; ash 11.72%; fiber 26.20%; and E.L.N.N of 40.16%.

Honey grass has an average protein content of 18.07%, which is beneficial for the nutrition of guinea pigs in the growth and fattening stage. In this regard [5], mentions

that it is a subtropical grass with a wide variation in form and species, giving rise to many descriptions of related species. It also shows a wide tolerance for growing in various environments relatively far from the ideal conditions for its species. Digestibility values found in the literature range from 50 to 70%, but most are between 55 and 65%, crude protein varies between 5 and 19%.

3.4.3. Bromatological analysis of Ryegrass

The bromatological composition of the ryegrass that was used to feed guinea pigs in the growth and fattening stage indicates a moisture content of 87.73% Dry matter of 12.27%; 19.82% protein; 2.27% fat; ash 12.65%; fiber of 24.32% and E L.N. N of 40.94%.

Alvarado [20] mentions that the guinea pig digests proteins from fibrous foods less efficiently than those from energy and protein foods. These are the two most used, compared to ruminants, due to their digestive physiology, having first an enzymatic digestion in the stomach and then another microbial digestion in the cecum and colon. In growth and fattening, with diets that ranged between 14% and 17%, good weight gain is obtained using perennial ryegrass, weighing up to 800g at three months of age. It is necessary to avoid excess or lack of protein in the diet since an imbalance occurs in the protein-energy relationship, which reduces the normal growth of the animal and increases the cost of the diet [21].

3.5. Economic analysis

Table 3 shows the results of the economic evaluation for the different fodder mixtures used in feeding the guinea pigs in the growth and fattening stage used in the study, considering the expenses and income obtained. In general terms, the greatest cost benefit is obtained in treatment T2 (honey grass 25% plus ryegrass 25% plus concentrate 50%); therefore, a cost benefit of 1.13 is achieved, which means that for every dollar invested, a profit of 0.13 cents is obtained.

4. Conclusions

• The use of the fodder mixture consisting of honey grass, plus blue grass, plus concentrated fodder for daily feeding of guinea pigs in stages of growth and fattening presented the highest results of fodder consumption (2,371.13 g/MS); and total feed consumption (3,669.81 g/DM), surpassing the results of the control treatment.

Tabla 3

Economic analysis of the fodder mixture supplied to guinea pigs.

VARIABLES	TREATMENTS			
	T0	**T1**	**T2**	**T3**
1. Cost of animals ($)	56,00	56,00	56,00	56,00
2. Fodder cost ($)	7,65	8,10	7,05	8,05
3. Concentrate Cost ($)	27,36	25,65	25,65	27,36
4. Health ($)	4,32	4,05	4,05	4,32
5. Basic Services ($)	1,92	1,80	1,80	1,92
6. Labor ($)	32,00	32,00	32,00	32,00
TOTAL EXPENSES	129,25	127,60	126,55	129,65
7. Carcass sales ($)	128,00	128,00	128,00	128,00
8. Compost sales ($)	15,00	15,00	15,00	15,00
TOTAL INCOME	143,00	143,00	143,00	143,00
BENEFIT/COST ($)	**1,11**	**1,12**	**1,13**	**1,10**

1. Animal cost $ 3
2. Fodder cost; T0: $0,47; T1: $0,50; T2: $0,44; T3: $0,50
3. Concentrate cost $0,66
4. Cost of deworming and disinfection$ 4.32/Treatment
5. Light and transportation: $1.92/Treatment.
6. Labor: $128 All research
7. Carcass sales: $ 8C/U
8. Compost sales: $15/ Treatment

Source: authors

• When evaluating the productive parameters of the final weight (g), concentrate consumption (g/MS), carcass weight (g), and carcass yield (%), no significant differences were reported ($p > 0.05$). Meanwhile, the variables weight gain, fodder consumption, total feed consumption, and feed conversion presented highly significant differences ($p < 0.01$) due to the fodder mixture effect.

• Regarding the sex factor, no significant differences were experienced ($p > 0.05$) in any of the variables under study. However, numerically, better behavior of female guinea pigs was observed compared to males.

• In the economic evaluation it was established that the most profitable treatment is the mixture of 25% honey grass plus 25% ryegrass plus 50% concentrate. This is because the highest cost benefit is obtained with a nominal value of $1.13, that is, for every dollar invested, a profit of 13 cents or 13% profit is obtained.

• Finally, when carrying out the proximal analysis, it is seen that blue grass has the highest dry matter content (17.46%). Weeds show the highest protein content (27.68%), while the highest fiber is recorded in the analysis of honey grass (29.17%).

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