Relato de caso

Effect of sweet potato vine on rabbits’ fur

Efeito do baraço de batata-doce sobre o pelo de coelhos

Efecto de hojas de batata-dulce sobre el pelo de conejos

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ABSTRACT

Rabbits’ skin is often used to produce delicate and thermal insulating fabric. The purpose of this study was to evaluate the effects of sweet potato vines (SPV) on length and quality of rabbits’ fur, which were fed different levels of that ingredient. A total of 25 rabbits, New Zealand, from both sexes, weaned at 35 days old was used, and they were distributed randomly in individual cages, in randomized allocation design with 5 treatments, with 5 replicates each. The animals were fed one of the following diets: 0SPV – Control diet without SPV; 25SPV, 50 SPV, 75SPV, 100SPV – Diets with 25%, 50%, 75% and 100%, respectively, of sweet potato vines in replacement of alfalfa hay.The biological essay was carried out for 49 days. At the end, a portion of fur was removed from the region of the nape and submitted to length analysis. Collected data was tabulated and analyzed through Analysis of Variance ($p<0.05$), correlation and regression curve. The length of rabbits’ fur was not affected by experimental diets. Correlation test value (ρ) was negative. Therefore, results evidence the possibility of using local and low-cost ingredients, as SPV, to produce fur with the same quality, for fashion and handicraft industries, as in fur produced from conventional ingredients.

Keywords: Fur length; Animal nutrition; Pelage.

RESUMO

A pele dos coelhos é tradicionalmente usada para confeccionar tecidos delicados e com grande potencial de isolamento térmico. O objetivo desta pesquisa foi avaliar os efeitos alimentados com diferentes níveis desse ingrediente. Foram utilizados 25 coelhos da raça

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Nova Zelândia, de ambos os sexos, desmamados aos 35 dias de idade, que foram distribuídos aleatoriamente em gaiolas individuais, em delineamento inteiramente casualizado com 5 tratamentos, com 5 repetições cada. Os animais receberam uma das seguintes dietas: 0BBD – Dieta controle sem BBD; 25BBD, 50 BBD, 75BBD, 100BBD – Dietas com 25%, 50%, 75% e 100%, respectivamente, de batata-doce em substituição ao feno de alfafa. O ensaio biológico durou 49 dias. Ao final do ensaio biológico, uma porção de pelos foi retirada da região da nuca e submetida à análise de comprimento. Os dados coletados foram tabulados e analisados por meio de Análise de Variância ($p < 0,05$), correlação e curva de regressão. O comprimento do pelo não foi afetado pelas dietas experimentais. Mesmo com o teste de correlação, seu valor (ρ) foi negativo. Portanto, os resultados evidenciam a possibilidade de utilizar ingredientes locais e de baixo custo, como o BBD, para gerar peles com qualidade igualmente satisfatória, para a indústria de moda e artesanato, em comparação às geradas a partir de ingredientes convencionais.

Palavras-chave: Comprimento do pelo; Nutrição animal; Pelagem

RESUMEN

Los pelos de conejo se utilizan para la confección de tejidos finos e aislante térmico. El objetivo de este estudio fue evaluar los efectos de las hojas de patata dulce (HBD) sobre la longitud y la calidad del pelo de conejos alimentados con diferentes niveles de dicho ingrediente. Se utilizaron 25 conejos, de ambos sexos, de la raza Nueva Zelanda, destetados a los 35 días de edad, alojados aleatoriamente en jaulas individuales en arreglo completamente casualizado con 5 tratamientos y 5 repeticiones cada una. Los animales fueron sometidos a una de las siguientes dietas: 0HBD – Dieta control sin inclusión de HBD; - 50HBD, 50HBD, 75HBD, 100HBD- Dietas con inclusión del 25%, 50%, 75% y 100% de SPV en sustitución del heno de alfalfa. El ensayo tuvo una duración de 49 días. Al final del ensayo, una porcion de pelos de la región de la nuca fue seccionado y sometido a análisis de longitud. Los datos obtenidos fueron tabulados y analizados a través del análisis de varianza ($p < 0,05$), correlación y curvas de regresión. La longitud del pelo de los conejos no fue afectada por las dietas experimentales. Incluso realizando una prueba de correlación, el valor de la misma (ρ) se mostró negativo. Los resultados demuestran por tanto que es posible la utilización de ingredientes locales y de bajo costo para la generación de pelos de calidad como es el caso de los conejos.

Palabras clave: Longitud del pelo, Nutrición animal; Escudo.

Introduction

The use of alternative ingredients instigates researchers’ interest all around the world (Gurman et al., 2016). In this context, residues of agricultural industry may be used as a low-cost source to animal nutrition. Sweet potato vines (SPV) are the residue of sweet potato production, which is used for culinary and for biofuel production. Rabbits have a good tolerance about SPV as a fiber source, thus, this ingredient may be used to

compound their diet (Klinger et al., 2018).

SPV presents a propitious nutritional composition to diets for rabbits: approximately 16% of crude protein, 40% of crude fiber and 3% of ether extract in dry matter. In this regard, alfalfa hay, a common fibrous ingredient in rabbit nutrition, has similar aspects of SPV. However, the price for alfalfa hay may reach R$2.00, while SPV may be obtained for free in plantations where it is discarded.

Since from the creation of Draize test (Draize, 1944), many scientific studies have used rabbits as experimental model for pharmaceutical tests. In this context, the literature is extensive to demonstrate the effects of chemicals on rabbits' skin (Ocampo-Suarez et al., 2017). Even though, studies about the relation between nutrition and fur/skin quality of this species are scarce.

However, it is important to study the influence of the nutrition over the animals' pelage due to the use of rabbits' fur traditionally for heating purposes. In this context, the purpose to this research was to observe the effects of SPV over the length and the quality of rabbits' fur that were fed different levels of SPV as a replacement of alfafa hay in diets for growing rabbits.

Material and methods

Animals and experimental arrangement

To develop this study, the biological essay took place at the Laboratory of Rabbits breeding in Federal University of Santa Maria, with 25 rabbits, New Zealand, from both sexes, weaned at 35 days old.

The animals were allocated randomly, in individual cages with dimensions of 50cmx50cmx40cm, which were made of galvanized wire and equipped with ceramics bowls – one for food, another for water. The experimental arrangement was randomized allocation design, with five treatments, with five replicates, and each animal was considered an experimental unit.

Experimental diets

Five experimental diets were formulated, with similar nutritional levels to provide the requirements of growing rabbits, according AEC (1987) as demonstrated in Table 1: 0SPV – Control diet without SPV; 25SPV, 50SPV, 75SPV, 100SPV – Diets with 25%, 50%, 75% and 100%, respectively, of SPV in replacement of alfalfa hay.

SPV was obtained for free at Santa Maria and its composition was analyzed at the Animal Nutrition Laboratory of Federal University of Santa Maria by the methods from AOAC (1995).

Each rabbit received randomly one of the five diets during 49 days (84 days old). During the essay, water and food were supplied *ad libitum*. The age of 84 days was chosen to collect fur because, in the region of this study, that is the average age for slaughter in a family farming system.

Table 1 – Ingredients and chemical composition of rations with sweet potato vines in replacement of alfalfa hay for rabbits

Ingredients (g/kg)	Experimental diets				
	0SPV	25SPV	50SPV	75SPV	100SPV
Maize	172.5	172.5	170	170	167.5
Wheat meal	250	250	247.5	247.5	245
Soy-bean meal	175	175	180	180	185
Soy-bean oil	25	25	25	25	25
Rice hull	60	60	60	60	60
Alfalfa hay	300	225	150	75	0
Sweet potato vines	0	75	150	225	300
Dicalcium phosphate	8	08	8	8	8
Calcitic limestone	2.5	02.5	2.5	2.5	2.5
Salt	5	5	5	5	5
Premix*	2	2	2	2	2
Nutritional levels (%)					
Dry Matter (%)	81.6875	81.7625	81.8325	81.9075	81.9775
Crude Protein (%)	17.8405	17.653	17.636	17.4485	17.4315
Mineral Matter (%)	5.91985	6.1561	6.415025	6.651275	6.9102
Crude Fiber	15.20	14.50	13.82	13.15	12.46

Note. 0SPV: Diet without sweet potato vines; 25SPV, 50SPV, 75SPV, 100SPV: Diets with 25%, 50%, 75%, 100% of replacement of alfalfa hay for sweet potato vines, respectively.
* Premix Composition (per diet kilogram): Vitamin A 600,000 IU; Vitamina 100,000 IU; Vitamin E 8,000; Vitamin K3 200 mg; Vitamin B1 400 mg; Vitamin B2 600 mg; Vitamin B6 200,00 mg; Vitamin B12 2,000 mg; Panthotenic Acid 2,000 mg; Choline 70,000 mg; Fe 8,000 mg; Cu 1,200 mg; Co 200 mg; Mn 8,600 mg; Zn 12,000 mg; I 65 mg; Se 16 mg.

Fur collection

At the end of the essay, a little portion of fur was taken from the nape and submitted to length analysis. The sample of fur was sectioned off with a blade in order to obtain a length from the bottom of fur. Length measurement was executed with a digital pachymeter. The fur length is defined as the distance between the extreme superior tip and the point of insertion in the epidermis (Maia et al., 2008).

Statistical analysis

Data were tabulated and analyzed through Analysis of Variance ($p<0.05$), correlation and regression curve.

Results and discussion

Rabbits' fur length was not affected by the experimental diets (Table 2). Even though with the correlation test, its value (ρ) was negative. In this sense, for each 1% of SPV, in replacement of alfalfa hay, fur length decreases 0.0027cm, which is not zootechnically expressive although mathematically smaller. This result is similar to Arruda et al. (2003) findings: among the diversity of fiber ingredients, the non-conventional ones, usable in diets for rabbits, may present positive effects on productive and reproductive yield mainly due to the characteristics of meat and pelage of that species.

Table 2 – Fur length of rabbits fed different levels of sweet potato vines in replacement of alfalfa hay

	Experimental diets					
	0SPV	25SPV	50SPV	75SPV	100SPV	P Value
Length (cm)	3.01±12.6	2.50±13.6	2.98±6.3	2.69±10.2	2.58±22.7	0.15

Note. 0SPV: Diet without sweet potato vines; 25SPV, 50SPV, 75SPV, 100SPV: Diets with 25%, 50%, 75%, 100% of replacement of alfalfa hay for sweet potato vines, respectively. Means followed by coefficient of variation.

These results are also attributed to the similar level of crude protein (17%) in all five treatments. Ke-liang et al. (2004) found positive results, for good fur growth, by testing a similar level of crude protein. In this context, amino acids, mainly sulfur ones, are the most important nutrients to fur growth. Development process of feather and fur is intrinsically related to availability of

those ingredients. Therefore, other diet components, as mineral matter, did not influence the variable in this study (fur length), although their percentage presented small differences in the treatments.

Even so, the coefficient of total determination was close to neutrality, with a value of 0.05. This result demonstrates that SPV influence in fur length is very low. Thus, some factors, that were not studied, as ambience and genetics, may influence more the variable of this research.

Therefore, these results evidence it is possible to use local and low-cost ingredients to produce high-quality fur as it happens in the rabbit. For this matter, researching alternative ingredients as SPV may represent a stricture point to the expansion of rabbits breeding as a profitable activity in Brazil (Arruda et al., 2003). These results also coincide the actual preference for sustainability in animal production in which the focus is over the optimization of resources from productive chains (FAO, 2014).

According to Veríssimo et al. (2009), length alterations in fur and pelage are responses to long-term adaptation and, thus, they need more exposition to environmental conditions. During this study, the rabbits were submitted to SPV for all their growth period (35 to 84 days old); due to that, if the ingredient had influenced badly on the variables that were studied, this alteration would be evident.

Zhao et al. (2017) mention that, recently, many studies are conducted to reveal the development mechanism of skin and fur in rabbits. However, these processes are not so clear. Recent studies, which mapped over 80% of rabbits genome, verified that formation and development of fur happen through the genes of additive action (Zhao et al., 2017). In this context, animal genetics presents plasticity about pelage characteristics. In this way, external factors, as nutrition and ambience, have decisive influence in skin and fur quality.

Conclusion

The conclusion, after this study, is sweet potato vines can replace up to 100% of alfalfa hay in diets for rabbits, without any negative alteration of fur characteristics.

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Figure 1 – Rabbit’s fur length (x) due to sweet potato vines level as a replacement of alfalfa hay (y) in the diets

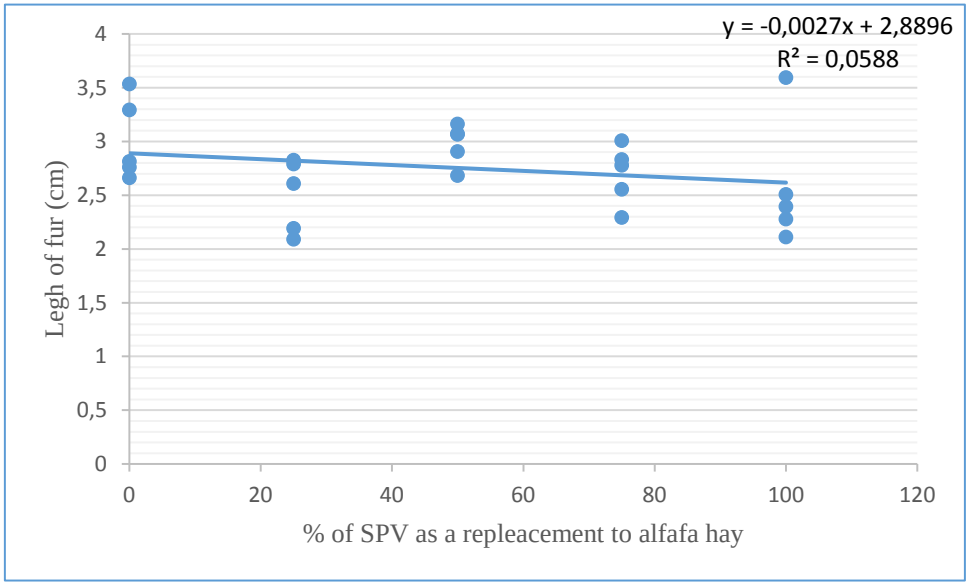

Figure 1