

Effect of linseed (flax) ingestion and oil skin-application on hair growth in rabbits

K.B. Beroual¹, Z.M. Maameri¹, B.B. Benleksira¹, A.A. Agabou², Y.H.P. Hamdi Pacha¹

¹Laboratory pharmacologytoxicology, Institute of Veterinary, El khroub, Constantine Algeria,

²Laboratory PADESCA, University Constantine 1, Algeria

beroualk@yahoo.fr

Abstract

This study aims to assess the effects of linseed or flaxseed (*Linum usitatissimum*) on hair growth in rabbits and also to verify its safety.

Two trials were conducted on adult New-Zealand rabbits according to two routes of administration: ingestion of ground linseed and topical application of its oil.

Weekly, rabbits were weighed and each month hair was taken from a same delimited area on their backs and blood samples were also analyzed.

Results showed a slight increase in mean body weight (+3%) and a significant decrease in glycemia (-9%) and cholesterolemia (-22%) in the group fed daily with ground linseed. These findings are similar to those reported in the literature. However, results related to the trichogen effects are original, since a better hair growth was recorded during the second and the third months.

An increase in hair length (+26%) was observed in the third month (2.04 cm) with a slight positive effect (+7%) on hair diameter (40.25 μm).

The weight of locks harvested from the oil topical application group, has increased (+53%) compared to the control one.

The exact mechanism of action or the component(s) of linseed that promote the hair growth could not be established in this study. However, it was shown that flaxseed chutney diet doesn't affect γ -glutamyl transpeptidase load. This enzyme is an indicator of hair growth (associated to alkaline phosphatase).

More investigations are needed to determine the right doses and the frequency of use while taking into account the seasonal variations in hair growth.

Keywords: Linseed, Linseed oil, hair, rabbit.

Resumen

El presente estudio tiene como objetivo evaluar los efectos de la linaza (semilla de lino) (*Linum usitatissimum*) en el crecimiento del pelo de los conejos (cuantitativa y cualitativamente) y también para estudiar su inocuidad.

Dos experimentos se han realizado en conejos adultos de la raza Nueva Zelanda según la vía de administración: la ingestión de semillas de linaza trituradas (primer ensayo) y la aplicación tópica de su aceite (segundo ensayo).

Semanalmente, los conejos se pesaron y cada mes, pelo fue tomado de una misma área delimitada en las espaldas de los animales. también se analizaron muestras de sangre.

Los resultados mostraron un ligero aumento en el peso vivo promedio (3%) y una disminución significativa de la glucemia (-9%) y la colesteroemia (-22%) en el grupo alimentado diariamente con semillas de lino, en comparación con el grupo de control.

Estos resultados son similares a los reportados en la literatura.

Sin embargo, nuestros resultados relacionados con los efectos tricógenos son originales.

El crecimiento del pelo no mostró diferencias significativas durante el primer mes, pero un mejor crecimiento se registró después (segundo y tercer mes).

Se observó un aumento en la longitud del pelo (26%) en el tercer mes (2,04 cm) con un efecto positivo pequeño (7%) en el diámetro del pelo (40,25 μm).

El peso del pelo recogido en el grupo de la aplicación tópica de aceite, se ha incrementado (+53%) en comparación con el grupo de control.

Los Mecanismos de los efectos beneficiosos de la linaza en el crecimiento del pelo, aún no se han determinado, a sabiendas de que un estudio en ratas mostraron que la dieta de linaza chutney no afecta a la carga γ -glutamyl transpeptidasa. Esta enzima microsomal es un indicador del crecimiento del pelo (asociada a la fosfatasa alcalina).

Junto con el estudio de los mecanismos de acción, se necesitan más investigaciones para determinar las dosis adecuadas y la frecuencia de uso, teniendo en cuenta las variaciones estacionales en el crecimiento del pelo.

Palabras clave: Semilla de lino, aceite de linaza, pelo, conejo.

Introduction

Flax (*Linum usitatissimum*) is an annual plant of the linaceae family. It is an oilseed produced in more than 50 countries mainly in the northern hemisphere. It contains about 40% Lipids (most of them Omega-3 fatty acids), 30% dietary fibres and 20 % protein. After oil extraction from seeds, the linseed meal is used as a supplement in animal feeds (Chesneaut et al., 2004); Cattle, sheep (Rondia et al., 2003), horses (O'Neill et al., 2002), (Delobel & Cuvelier., 2008), rabbits (Benatmane et al., 2010), poultry, turkey (Guillevic et al., 2010) and pigs (Noblet et al., 2008).

On the other hand, the biological and mainly the pharmacological values of this plant have not been well studied especially in our country.

The principal objectives of this research are to contribute to a better understanding of the effects of linseeds ingestion and linseed oil skin-application on hair growth in rabbits.

Materials and methods

Animals and husbandry

The experiments have been carried out on 16 New Zealand rabbits, weighing approximately (2.5 \pm 0,05Kg) and aged between 24-32 weeks.

They were kept in individual standard cages in the same room and under the same environmental conditions (temperature, relative humidity and hygiene practices). Each morning they received the same feed during an acclimatization period of 07 days.

The experimentation was conducted in two trials for 16 weeks.

- The first trial: Effect of linseed ingestion on hair growth (during 12 weeks): animals were divided into 02 groups. The first group did not receive any feed supplement and served as control (CRL_i group), the other one served as test group and received the same feed as the previous group but supplemented with 2.5% of crashed linseed (LSI).

Weekly, rabbits were weighed at the same day and the same hour before feed distribution.

Blood samples were also taken each month, on heparinized tubes from the marginal ear vein of rabbits (using vacutainer system). Plasma was obtained by blood centrifugation at 3000 rpm for 5 min and then kept at -20° C until used for analysis to dose the following blood parameters:

Glycemia (GLU), Cretinemia (CREA), Uremia (URE), Albuminemia (ALB), Bilirubinaemia (BIL), Total protein (TP), glutamic pyruvic transaminase (GPT), glutamic oxaloacetic transaminase (GOT), cholesterolemia (CHOL) and triglycerides (TRI).

- One week after the end of the first trial, the second trial was undertaken (during 04 weeks), where animals of the control group of the first trial were divided into two groups to evaluate the effect of the linseed virgin oil skin-application (LSOA) on hair growth. The first group of animals served as control group (CRL₀) without any skin-applications while animals of the second group served as test group (LSOA) with 01 ml of linseed oil applied on their skins.

For all groups, monthly, hair was shaved on a limited zone (of 10cmx10cm) on each rabbit's back. Prior to shaving a lock was sampled with a clamp to measure the length and the width of 10 hairs using respectively a ruler and a scaled micrometer (with 10 objective magnifications).

Hair from the shaved zone was weighed with a high precision balance then conditioned in labeled plastic bags.

To compare the results of the different groups the Student *t* test was computed after testing their normal distribution (*K2* test) and equality of variances (Fisher's test): (data not shown).

Results

Effect of linseed ingestion on hair growth

Lock length

The results reveal an effect of linseed ingestion only at the 2nd month with length instability in the two groups (Table 1). An increase of 34% against 26% has been recorded respectively at the end of the experiment compared to J₃₀ and 3.5% against 7.3%, compared to the original dimensions (J₀)

Table 1: Mean hair length (cm)

	J0	J30	J60	J90
CTLi	2.240±0.940	1.737±0.689	2.692±0.606	2.325±1.026
LSI	1.900±0.8815	1.655±0.735	2.080±0.618	2.043±1.233

Lock width (diameter)

The lock mean width has linearly decreased in the group control and a little less in the LSI group with a diet effect from the second month attesting a positive effect of the linseed ingestion on hair width at the end of the experimentation (07% increase).

Table 2: Mean hair width (µm) sampled before each shaving

	J0	J30	J60	J90
CTLi	50.00±24.36	48.00±32.61	45.50±17.60	32.58±19.67
LSI	54.88±27.74	50.88±28.02	37.61±25.69	40.25±22.10

Hair length and width variability in this first trail demonstrate that the ingestion of the linseed doesn't block body hair physiological cycle and stimulate it slightly, since there is a positive effect on hair width and a reinforcement of its length from the second month.

Hair weight

There was an important variance in hair weight between the two groups but the effect of linseed ingestion on hair weight was very marked.

Table 3: Mean weight (g) of shaved hair

	J0	J30	J60	J90
CRLi	3.89±1.43	1.24±0.87	2.04±1.89	0.46±0.47
LSI	3.92±0.80	0.53±0.53	1.47±0.77	0.88±0.92

Effect of linseed ingestion on weight and blood parameters

As it is shown in table 4, a relative weight increase has been recorded in rabbits receiving a diet supplemented with crashed linseed.

Table 4: Mean rabbits weight (kg) at the beginning and the end of the trails

	J0	J90	Yield %
CRLi	2.50	3.10	+24
LSI	2.53	3.11	+22

Mean concentration of the blood parameters seem to be less important in the LSI group than the control one (Figure 1).

A decrease of 9% and 22% was recorded in glycemia and chloeterolemia respectively.

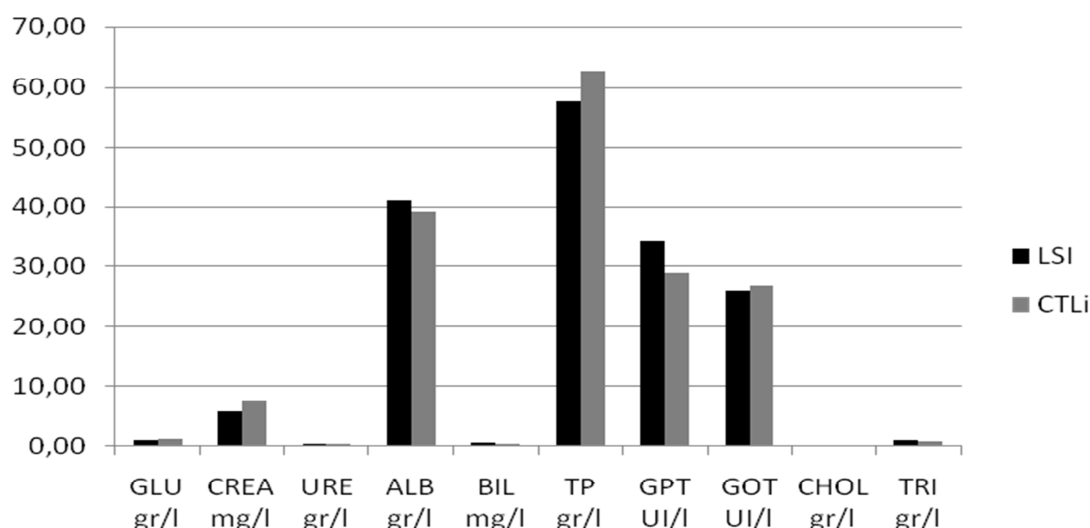


Figure 1: Variations of blood parameters in the LSI group and the control one.

Effect of linseed oil skin-application

A decrease in hair length (12%) was observed in LSOA group, while its width and density have significantly increased (43%, 53% respectively) compared to the CTL_o group.

Table 5: Mean Parameters of shaved hair

	Length (cm)	Width (µm)	Weight (gr)
CTL _o	2.72±0.76	27.17±15.52	0.76±0.17
LSOA	2.38±0.79	39.00±21.39	1.17±1.66

Discussion

According to Thebaut (1977), hair growth increases 6 to 7 weeks after depilation then it becomes specific to each hair kind after 9 to 13 weeks. 2 to 3% of hair lengths will be superior to the others and belong to a different tylotrich population.

Several authors reported that fur quality depends on some factors such as: gender, environmental conditions, season, photoperiodism, kind of harvest (shaving or depilation) (Charlet-Lery G et al., 1985; Rochambeau & Vrillon., 1985). This is why we have chosen the animals of the study (males belonging to the same breed, kept at the same environmental conditions and during the same season for the first trial).

Our results are in concordance with those reported by Bernard (2006), who confirms that hair follicle is the only stable cutaneous appendage with its asynchronous stochastic cyclicity.

The most important results of our study are mainly obtained with linseed oil skin-application and at a less degree with linseed ingestion. It has been shown that flaxseed chutney diet doesn't affect γ -glutamyl transpeptidase load (Faseehuddin & Basavaraj., 2007). This microsomal enzyme is an indicator of hair growth (associated to alkaline phosphatase) (Kang Bong et al., 2011), all these studies may explain the beneficial effect observed in our experiments.

Modifications of blood parameters (following linseed ingestion) founding are in concordance with those recorded by Hermier et al., (2004) and Weill & Mairesse., (2010).

CONCLUSION AND RECOMMENDATION

At the end of our study, some observations have been made, both on fundamental and practical aspects:

- Our results show that linseed ingestion is safe, however more investigations must be undertaken to study its chronic toxicity on organs (liver, kidney) using histological studies.
- Linseed ingestion has a positive effect on hair length plus diameter, and linseed oil skin-application seems to be a promising approach to improve the quality and quantity of animal fiber.
- More studies are necessary to assess its effects on hair structure, morphology and chemical composition.
- More trials must be initiated during several seasons to adjust the right dose of ingested linseed or skin-applied linseed oil.

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K. Beroual¹, Z. Maamer², B. Benleksira², A. Agabou², Y. Hamdi Pacha¹

¹Laboratory of pharmacology-toxicology, ²Laboratory PADESCA,
Institute of Veterinary Sciences, University Constantine 1, Algeria



beroualk@yahoo.fr



INTRODUCTION

Flax (*Linum usitatissimum*) is an annual plant of the linaceae family.

It is an oilseed produced in more than 50 countries mainly in the northern hemisphere.

It contains about 40% Lipids (most of them Omega-3 fatty acids), 30% dietary fibres and 20 % protein.

After oil extraction from seeds, the linseed meal is used as a supplement in animal feeds.

OBJECTIVE

Contributing to a better understanding of the effects of linseeds ingestion and linseed oil skin-application on hair growth in rabbits

RESULTS

Ours results showed a slight increase in mean body weight (+3%) and a significant decrease in glycemia (-9%) and cholesterolemia (-22%) in the group fed daily with ground linseed.

These findings are similar to those reported in the literature. However, results related to the trichogen effects are original, since a better hair growth was recorded during the second and the third months.

An increase in hair length (+26%) was observed in the third month (2.04 cm) with a slight positive effect (+7%) on hair diameter (40.25 μ m).

The weight of locks harvested from the oil topical application group, has increased (+53%) compared to the control one.

MATERIALS and METHODS

Two trials were conducted on adult

New-Zealand rabbits:

- Ingestion of ground linseed ;
- Topical application of its oil .

During each trial animals were divided into control and test groups.

Weekly, rabbits were weighed and each month hair was taken from a same delimited area on their backs and blood samples were also analyzed.



CONCLUSION

- Linseed ingestion has a positive effect on hair length plus diameter;
- Linseed oil skin-application seems to be a promising approach to improve the quality and quantity of animal fibers.
- More studies are necessary to assess its effects on hair structure, morphology and chemical composition.