

Effect of Supplementary Urea on the Performance of Desert Lambs (Tribal Subtype Hammri) Under Dry Land Conditions , North Kordofan State, Sudan

B. A. Fadul*, M- K. A. Ahmed** Fadel Elseed, A. M. A** and I. A. Nour**

* Faculty of Natural Resources and Environmental Studies, Alsalam University, P.O. Box 20, El Fulla, Sudan.

**University of Khartoum Faculty of Animal Production

Corresponding author. Tel.: +249121008529

E-mail address: Fadollbashir@gmail.com (Dr. Bashir Adam Fadul Ibrahim).

Abstract: This study was conducted in El-Nuhoud locality, North Kordofan State (2010 / 2011) with the objective of studying the effect of supplementary urea on reproductive performance of desert sheep. The study used 48 Hammari desert ewes and two rams at the rate of one ram/24 ewes. The ewes were randomly divided into four equal groups. All groups were left to graze naturally throughout the day. The first group drank water daily with urea (T1), the second group drank water daily without urea (T2), the third group had access to water every other day with urea (T3) and the fourth group was watered every other day without urea (T4). The new born lambs of these groups weighed weekly and the body measurements included (height at withers, heart girth, body length, head length, ear length, neck length and tail length). The litter sizes of newborns were weighed and recorded. The results showed that the performance of lambs significantly ($P \leq 0.05$) affected by the different treatments. The average weight of new born lambs in the initial week was 3.6 kg and it was increased to reach 24.46 kg in the final week. The results revealed that the urea supplementation of dams gave the highest mean values in the body measurements especially height at wither, heart girth and body length recorded the highest values in treatment supplementary urea with daily

water access. Hence, daily watering access and supplementary urea was important for flushing to improve the productive and reproductive performance of lambs.

Keywords: Supplementary urea; Performance measurement; Lambs

ملخص الدراسة

أجريت هذه الدراسة بمحلية النهود, ولاية شمال كردفان (2010-2011) بهدف دراسة أثر إضافة اليوريا في الماء على وزن وقياسات جسم المواليد حتى عمر الفطام و التي تعتمد امهاتها على المراعي الطبيعية في التغذية. استخدمت في التجربة (48) نعجة من الضأن الحمري و كبشان بمعدل كبش لكل 24 نعجة ؛ حيث قسمت النعاج لاربع مجموعات عشوائيا ،متساوية في العدد (12 نعجة لكل مجموعة) ودون فروق معنوية في الوزن بين المجموعات عند بداية التجربة. ترعى كل المجموعات على المرعى الطبيعي. تشرب المجموعة الاولى الماء يوميا مع اضافة اليوريا ، المجموعة الثانية تشرب الماء يوميا بدون اليوريا، المجموعة الثالثة تشرب الماء يوم بعد يوم مع اضافة اليوريا واما المجموعة الرابعة تشرب يوم بعد يوم بدون اليوريا. تم تسجيل وزن الجسم وقياساته اسبوعيا، وزن الجسم و (ارتفاع الجسم؛ محيط الصدر؛ طول الجسم؛ طول الراس؛ طول الاذن؛ طول الرقبة وطول الذيل) حتى عمر الفطام. و ايضا تم تسجيل عدد المواليد الافراد والتوائم . أيضا تم تحديد المكونات الغذائية وهاضمية (Invitro digestibility coefficients) المراعي الطبيعية. تم تحليل البيانات باستخدام تحليل التباين إستعانة بالحاسوب (Used factorial arrangement statistix) (8 كانت هاضميه حشائش المراعي الطبيعية 62.48% (48 h) . إستنتجت الدراسة أن اضافة اليوريا يزيد من فرص التوأم. وزن (3.6 كجم وزن ابتدائي الي 24.46 كجم وزن نهائي) وقياسات جسم المواليد زيادة معنوية , وعالية في كل من اضافة اليوريا , شرب الماء يوميا, اخر اسبوع وتداخل اليوريا مع الماء. ايضا أوضحت الدراسة ان شرب الماء يوميا بالاضافة الى إعطائها اليوريا هو كدفع غذائي ضروري لزيادة الكفاءة الانتاجية والتناسلية.

Introduction

Sheep of the Sudan are about 50.39 million heads representing about 32.51% of the total livestock population which is approximately 155 million heads, (MARF, 2011). There is a special role for sheep advantages over cattle and camels when compared for meat production. Sheep reproduce quickly and annually provide both the national and foreign markets with good quality meat, (McIeroy, 1961). Thus improving their production can economically improve the nomadic life and relief poverty and hence stop people migration and support Sudanese animal export. The share of livestock in the national income is about 22.3%, constituting about 18.2% of total exports and about 38% of agricultural exports. In spite of the importance of sheep they are still raised under nomadic conditions using traditional methods of management and natural grazing. Sheep flocks in North Kordofan are raised on rangelands under traditional agro-pastoral systems. Weight and growth are important aspects of overall productivity, especially when meat is the main product. Heavier birth weights provide lambs with a good start in life and rapid growth during pre-and post-weaning periods, ensuring resistance to diseases as well as early maturity (Sulieman *et al.*, 1990). One of the major constraints under rangelands conditions in the tropics is the unavailability of nutritious grazing resources on a year-round basis, where animals face a prolonged dry season (February-June). This is reflected in the seasonality of production, high mortality rates in both young and mature animals and low reproductive performance (El-Hag *et al.*, 2001). Protein is the most affected nutrient (Van Soest, 1982) and reaches low levels (below 6%) that cannot sustain normal rumen microbial function (McDonald *et al.*, 2006). This is reflected in that ruminant animals raised on such rangelands do not ingest sufficient nutrients necessary for good performance. Normally farmers provide their animals

with different supplements during critical times of feed shortage. Supplements used are mainly oilseed cakes and cereal grains. However, Kordofan, where most of the sheep wealth is located has a high density of grasses, trees and shrubs from which pods and foliage could be used as feeds (Fadul, 2007). The poor grasses, pods and foliage can be improved with water mixed with urea which improves the protein that is consumed by sheep. However, very few studies have been carried out to evaluate the effects of this approach on sheep performance. There for this study was conducted to evaluate the effects of supplementing urea mixed with water to ewes during the dry season on their overall reproductive potential.

The Study Area

The study was conducted in Helat Babiker-vicinity about 10 km east of El-Nuhoud town in North Kordofan State, Sudan. El-Nuhoud locality lies within latitudes 11.5-13.75 N° and longitudes 27-29.5 E° about 900 km West of Khartoum. Due to sand cover in the study area, the surface run off is very poor, since most of the precipitating water infiltrates directly to the subsurface while the remainder evaporates. Rains often fall on warm or hot sand surface. Average annual rainfall is about 300 mm in the north and about 400 mm in the southern parts. Average maximum temperature is 24-39°C during most of the year, with peaks above 36°C during April, May and June, (El-Nuhoud Metrological Station, 2009). The dominant vegetation is a variable mixture of mainly annual grasses. The acacia trees are dominant in the area, where *Acacia senegal* (Hashab) are the most important type from an economical point of view. Other trees found in this area include *Acacia nilotica* (Sunot), *Acacia nubica* (Laot) and *Bascia senegalensis* (Mokhait). There are large numbers of the latter type of trees in the vicinity of the villages. *Sclerocary abirrea* (Hummit), *Guiaraaeng egalensis*(khubaish), *Albizzaamara* (Arad),

Terminalia brownie (Daroot) and *Combretum cordofanum* (Habel). Grasses include *Dactyloctenium aegyptium* (Abu-Asabi), *Cenchrus biflorus* (Haskaneet), *Echinochloa colonum* (Difra), *Eragrostis tremula* (Banu), *Andropogon gayanus* (Abu Rakhies), *Zornia glockidata* (Shiline), and *Ipomea cordiosepala* (Tabar), as described by Yehia (2002).

New born lambs experiment:

Eighty four ewes of Hammari desert sheep were used in this trial. Average initial body weight was 31.0 kg (19.0-43.0 kg) with ages varying from 1-3 year at the beginning of the experiment. The ewes were vaccinated against sheep pox, anthrax hemorrhagic septicemia, and were treated against internal and external parasites using Ivomectin^R (0.5 ml/head). Albendazole drenches for de worming were given orally. The ewes were split into four groups of twelve animals each, with more or less equal initial body weight. All ewes groups were left on natural grazing (NG). The experimental treatments were as follows: Group 1: Daily access to water + urea in water, group 2: Daily access to water, group 3: Every once day access to water+ urea in water and group 4: Every once day access to water. A half of a gram of urea was added to one liter of water. Urea was thoroughly mixed with water in a separate container before being added to drinking water. The water consumed by each animal ranged between 4-6 liters. The water was offered daily at 10:00, after the ewes were sent to grazing. The animals were given the experimental treatment for an adaptation period of two weeks. The ewes were allowed to run with rams throughout the year. Twenty seven new born lambs of these groups with ages from birth day at the beginning of the experiment to weaning ages.

Data Collection;

Body weight and body measurements:

The animals were weighed and body measurements were taken at the beginning. Measurements were taken for sixteen weeks (weaning weight) on lambs. Live lambs body weights were recorded every week and body measurements were taken using a measuring tape (according to Owen *et al.*, 1977). A proximate analysis was done for feed Sample according to (AOAC, 1990). *In vitro* digestibility method (the gas test, Close and Menke, 1986).

Statistical analysis:

Data from new born lambs were analyzed using (CRD). The treatments were arranged factorially (statistix 8) and LSD test was used for mean separation.

Results and Discussion

The chemical composition of the natural range grasses (NG) contained dry matter (DM = 95.3%). crude protein (CP) (6.3%). Natural grazing had the crude fiber (CF = 45.9%). and ether extract (0.79%) also metabolizable energy (ME) was (9.76 MJ/kg DM). The situation is particularly critical during the long dry season that extends from February to June. Rangelands grasses quality drops sharply during this time of the year. Protein is the most affected nutrient (Van Soest, 1982) and reaches low levels (below 6%) that cannot sustain normal rumen microbial function (McDonald *et al.*, 2006). One of the major causes for low levels of protein in natural rangelands under tropical conditions is the dominance of annual grasses and absence of perennials (El- Wakeel and Abu Sabah, 1993).

Table 1. Chemical composition of natural grasses and calculated energy content.

Ingredients	Forage
Nutrient (g/kg DM)	
Dry matter	95.3
Crude protein	6.4
Crude fibre	45.9
Crude fat	0.79
Ash	7.3
Energy density (ME, MJ/kg DM)	9.76
In vitro OM digestibility (%)	62.48 at 48 h

metabolizable energy calculated from literature values.

Litter size:

There was positive and significant effects of urea supplementation combined with less frequent every other day watering on litter size. These results are in line with the findings of Suither *et al.*, (1971) who found that a 10 pounds increase in live weight of ewes resulted in 2.9% increase in lambs and 3.2% increase in twins born. They further concluded that there was a positive correlation between pre-mating live weight and lambing performance. In our experiment ewes supplemented with urea and watered every other day achieved the highest body weights and as a result the best litter size. Niare , (1995) found that the low twinning rate and low fertility rate were due to improper nutrition use by farmers at mating. The increases in litter weight at birth, with increasing ewe weight at mating was suggested by Cameroon *et al.*, (1983). Also Curll *et al.*, (1975) indicated that ewes which weighed 58 kg at mating produced 152 lambs per 100 ewes compared with a lambing percentage of 70 by ewes that

weighed 44 kg. They concluded that there was a positive relationship between ewe body weight at joining and the lambing rate and the increased number of lambs born was attributed to increased rate of twinning.

Effects of supplementary urea in water to dams on lambs body weight:

The live weights of lambs born to ewes offered water daily and every other day were significantly affected by the watering regime. Final body weights were 14.26 kg in lambs born to dams offered water daily and 12.15 kg for those on water every other day. The effects of all two way interactions between urea supplementation, watering regime and age on live weights of lambs were significant. The highest live weight was found in the subclass of lambs from dams supplemented with urea and watered daily (26.43 kg). These results were in line with the results of Ali (2002) who studied the weaning weight of Hammari and Kabashi subtypes and found that their weaning weights were 24.33 and 24.25 kg, respectively. Similar findings were reported by Suleiman (1976) who studied the weaning weight of Sudanese Desert sheep and found that the weaning weight of male lambs was 24.75 and that of female lambs was 21.9 kg. Heavier lambs at birth have a better chance to survive and to grow faster to puberty as reported by Alama, (1987). Birth weight can vary from 1.5 to 6.0 kg, a variation that can be due to genetic differences, feeding practices, sex or litter size (Villette *et al.*, 1981). Abou, (1980) studied the reproductive and production traits of Sudan Desert sheep. Heavier birth weights provide lambs with a good start in life and rapid growth pre- and post-weaning period, ensuring resistance to diseases as well as early maturity (Suleiman *et al.*, 1990). The effects of water restriction on body weight of small ruminants were reported by several authors (Ali *et al*, 1984; Fowl and Church, 1973; Silanikove, 1987; Bott *et al*, 1965; Anderson *et al*, 1958; Houpt, 1970).

When Nubian goats were subjected to feed restriction for 96 and 168 hours, with water available all the time, there was an 11.6% and 19.8 reduction in body weight, respectively, with a significant increase in blood ketone and serum total protein (Ali *et al.*, 1984). Sheep lose from 7-10% of their bodyweight when deprived of water for 48 hours. This loss was replaced within 10 minutes when the animal was offered water to drink (Bott *et al.*, 1965). Season and year of birth greatly influenced mortality at all ages from 30 days (Suleiman *et al.*, 1990). Similarly, El Amin and Rizgalla, (1976) studied the effect of season on birth weight using a flock of Watish sheep at Umbenin livestock Research station. They found that in the season of March – April lamb birth weights were heavier (2.63 kg for males and 2.54 kg for females), than the season of June – October (2.13 kg for males and 1.8 kg for females), and November – February (2.3 kg for males and 2.2 kg for females). They found that lambs born in December had a significantly higher birth weight than those born in November.

Effects of dams supplementary urea in water on lambs body measurements:

The results showed that water access (daily and every other day), age (initial and final) and their interactions (age x watering regime and urea x watering regime x age) affected height at withers; heart girth, body length and head length of lambs significantly. Ear length level of new born lambs when their dams supplemented with urea were significantly. Lambs born to ewes supplemented with urea recorded the lowest level in ear length, whereas those on without urea had the highest level. Tail length of lambs was significantly affected by the urea supplementation treatment (43.91, 44.13 cm for the supplemented and control, respectively) and the water regime (45.07 and 42.98 cm for daily and every other day, respectively). (Table 9). Highly significant ($P < 0.01$) differences were found between subclasses of urea x age, age x

watering regime, urea x watering regime x age in final tail length. These results were comparable to those reported by Bukhari, (2011) who studied the lambs' measurements from birth till the age of 180 days as affected by the system of grazing of their dams, watering frequency and supplementation during autumn through the year. Height at withers (HW) at birth of lambs was 39.200cm. These were born to dams on natural grazing at night and watered once every three days. The lowest values were found for dams on natural grazing without being rested at day and watered once every five days. At the age 30, 60 and 90 days of lambs in the three groups recorded the same and higher (HW) compared with other groups when were supplemented had the highest values. At the ages of 120, 150 and 180 days the supplemented group had the highest HW values compared with the other three un supplemented groups. The heart girth (HG) of lambs was observed at birth, at the age 120 and 150 days had the same values, but at the age 30, 60 and 90 days had different values. The measurements of body length (BL) of lambs from birth to 180 days of age were highest in lambs born to dams on natural grazing supplemented with concentrates (25.3 cm) and the lowest values were recorded in lambs from ewes on natural grazing, not allowed to rest under shade during the day and watered once every five days (22.7cm). Values of chest depth (CD) of lambs were similar in all groups at birth. At the age of 30day all the groups had similar of deeper chest depth values. At 60 and 90 days of age lambs had a higher value of chest depth than the control group. Lamb born for ewes that were on the natural grazing and supplemented with concentrates had higher values of head length than the other groups not supplemented. At the age 30 days lambs were also superior in (LH) followed by similar values and lastly when lambs reached 60 and 90 days of age recorded similar values. The length of ear (LE) of lambs from birth to180 values is similar.

At the age 30 had lowest values compare with the other three groups that had similar values and at the age of 90. Measurements for length of necks (LN) in lambs from birth to 180 days of age are recorded highest and as same values. Values for the length of tail (LT) of lambs from birth to 180 days of age were observed as same among the four groups of lambs in (LT).The control group had the lowest values of (LT) compared with the other groups.

The effect of treatments on
Litter Size

Table 2: Effect of urea, watering regime and urea x watering regime on litter Size (mean± S.E) * .

Factors	Treatments and subclasses	means Litter size
Urea	Urea	1.34 ^a ±0.025
	Without urea	1.19 ^b ±0.032
Watering	Daily watering	1.19 ^b ±0.027
	Every other day watering	1.34 ^a ±0.029
Urea x Watering	Urea, daily watering	1.25 ±0.037
	Urea, every other day watering	1.44 ±0.035
	Without urea, daily watering	1.14 ±0.040
	Without urea, every other day watering	1.24 ±0.053

*Means with different superscript within the same column and same factor are significant different (P<0.05)

Factors	Treatments and subclasses	Body weight	Height at wither	Heart girth	Body length
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Urea	Urea	13.21 ^a ±0.19	54.89 ^a ±0.24	53.54 ^a ±0.24	44.21 ^a ±0.22
	Without urea	13.20 ^a ±0.24	54.79 ^a ±0.30	53.09 ^a ±0.30	44.07 ^a ±0.28
Watering	Daily water	14.26 ^a ±0.20	55.76 ^a ±0.26	54.48 ^a ±0.26	44.99 ^a ±0.24
	Water every other day	12.15 ^b ±0.22	53.92 ^b ±0.28	52.15 ^b ±0.28	43.28 ^b ±0.26
Age	W0	3.64 ±0.62	39.94 ±0.79	34.88 ±0.78	27.46 ±0.73
	W16	24.46 ±0.63	66.61 ±0.79	67.75 ±0.78	56.36 ±0.73
Urea x Watering	Urea water daily	13.54 ^a ±0.28	54.89 ^a ±0.35	53.39 ^a ±0.35	44.23 ^a ±0.33
	Urea water every other day	12.89 ^a ±0.26	54.69 ^a ±0.33	52.79 ^a ±0.33	43.90 ^a ±0.31
	Without urea water daily	14.99 ^a ±0.30	56.64 ^a ±0.38	55.58 ^a ±0.38	45.74 ^a ±0.35
	Without urea water every other day	11.42 ^a ±0.40	53.14 ^a ±0.50	51.51 ^a ±0.50	42.66 ^a ±0.47

Table 3: Effect of urea, water, age and urea x watering regime on new born lambs body weight and body measurements (mean± S.E) *.

Table 4: Effect of urea, water, age and urea x watering on lambs body measurements (mean± S.E) *.

Factors	Treatments and subclasses	Head length	Ear length	Neck length	Tail length
Urea	Urea	22.98	14.14 ^b	15.43 ^b	43.91 ^b

		±0.09	±0.05	±0.08	±0.30
	Without urea	22.78 ±0.11	14.43 ^a ±0.06	15.95 ^b ±0.11	44.13 ^a ±0.38
Watering regime	Daily watering	23.29 ^a ±0.09	14.33 ±0.05	15.62 ±0.09	45.07 ^a ±0.32
	Watering every other day	22.47 ^b ±0.10	14.24 ±0.06	15.76 ±0.10	42.98 ^b ±0.35
Age	W0	16.74 ±0.28	10.53 ±0.17	11.81 ±0.28	28.69 ±0.98
	W16	26.99 ±0.28	15.95 ±0.17	19.37 ±0.28	55.34 ±1.00
Urea x Watering	Urea, daily watering	23.04 ±0.13	14.17 ±0.07	15.39 ±0.13	43.58 ±0.44
	Urea, every other day watering	22.92 ±0.12	14.11 ±0.07	15.47 ±0.12	42.69 ±0.42
	Without urea, daily watering	23.54 ±0.14	14.49 ±0.08	15.85 ±0.13	46.56 ±0.47
	Without urea, every other day watering	22.02 ±0.18	14.38 ±0.11	16.05 ±0.18	43.27 ±0.63

Means with different superscript within the same column and same factor are significant different (P<0.05)

Table 5: Effect of interactions among urea, age and watering regime new born lambs body weight and body measurements (mean± S.E) *.

Factors	stage	urea x age		watering x age		urea x watering x age			
		Urea	without urea	daily water	water every other day	urea water daily	urea water every other day	without urea daily water	without urea water every other

									day
Body weight	Initial	3.67 ±0.80	3.62 ±0.99	3.79 ±0.85	3.50 ±0.91	3.68 ±1.17	3.66 ±1.10	3.90 ±1.25	3.35 ±1.65
	Final	25.35 ^a ±0.80	23.56 ^b ±1.04	25.96 ^a ±0.85	22.95 ^b ±0.91	26.43 ^a ±1.17	24.27 ^c ±1.10	25.50 ^b ±1.35	21.62 ^d ±1.65
Height at withers	Initial	40.26 ±1.01	39.62 ±1.26	40.37 ±1.08	39.51 ±1.16	40.75 ±1.48	39.77 ±1.39	40.00 ±1.58	39.25 ±2.09
	Final	66.89 ±1.01	66.33 ±1.26	67.77 ^a ±1.08	65.45 ^b ±1.16	67.12 ^b ±1.48	66.66 ^c ±1.39	68.42 ^a ±1.58	64.25 ^d ±2.09
Heart girth	Initial	35.11 ±1.01	34.66 ±1.25	35.28 ±1.07	34.48 ±1.15	35.00 ±1.47	35.22 ±1.38	35.57 ±1.57	33.75 ±2.08
	Final	68.17 ^a ±1.01	67.73 ^b ±1.25	69.42 ^a ±1.07	66.48 ^b ±1.15	69.12 ^a ±1.47	67.22 ^b ±1.38	67.71 ^b ±1.57	65.75 ^c ±2.08
Body length	Initial	27.80 ±0.94	27.12 ±1.17	27.25 ±1.00	27.68 ±1.08	27.50 ±1.37	28.11 ±1.30	27.00 ±1.47	27.25 ±1.95
	Final	57.27 ^a ±0.94	55.46 ^b ±1.17	57.15 ^a ±1.00	55.58 ^b ±1.08	57.87 ±1.37	57.66 ±1.30	57.42 ±1.47	53.50 ±1.95

* Means followed by different superscripts within each row are significantly different.

Table 6: Effect of interaction s among urea, age and watering regime on new born lambs body measurements (mean± S.E) *.

Factors	stage	urea x age		watering x age		Urea x Watering x age			
		Urea	without urea	daily water	water every other day	urea water daily	urea water every other day	without urea daily water	without urea water every other day
Head length	Initial	17.28 ±0.37	16.19 ±0.46	16.63 ±0.39	16.84 ±0.42	17.12 ±0.54	17.44 ±0.50	16.14 ±0.57	16.25 ±0.76
	Final	27.07 ^a	26.91 ^b	27.47 ^a	26.51 ^b	27.37	26.77	26.57	26.25

		±0.37	±0.46	±0.39	±0.42	±0.54	±0.50	±0.57	±0.76
Ear length	Initial	10.70 ±0.22	10.37 ±0.27	10.81 ±0.23	10.26 ±0.25	10.62 ±0.32	10.77 ±0.30	11.00 ±0.34	9.75 ±0.45
	Final	15.70 ±0.22	15.19 ±0.27	15.94 ±0.23	15.95 ±0.25	15.75 ±0.32	15.66 ±0.30	15.14 ±0.34	15.25 ±0.45
Neck length	Initial	11.42 ±0.37	12.21 ±0.46	12.02 ±0.39	11.61 ±0.42	11.62 ±0.53	11.22 ±0.50	12.42 ±0.57	12.00 ±0.76
	Final	19.52 ±0.37	18.23 ±0.46	19.04 ±0.39	19.70 ±0.42	19.37 ±0.53	19.66 ±0.50	17.71 ±0.57	17.75 ±0.76
Tail length	Initial	28.66 ±1.26	28.71 ±1.57	28.71 ±1.34	28.66 ±1.44	28.00 ±1.84	29.33 ±1.73	29.42 ±1.97	28.00 ±2.60
	Final	54.30 ^b ±1.26	56.38 ^a ±1.57	55.96 ^a ±1.34	54.72 ^b ±1.50	56.50 ^b ±1.84	54.11 ^d ±1.73	57.42 ^a ±1.97	55.33 ^c ±2.60

*Means followed by different superscripts within each class are significantly different.

CONCLUSIONS

The final body weights and body measurements of lambs supplemented their dams with urea were greater than those on without urea. Short watering intervals gave better results on final body weight and body measurements of lambs compared to long watering intervals.

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