Article **ECORFAN Journal-Ecuador**
June 2021, Vol.8 No.14 39-45

Innovative process of a food supplement made from oregano bagasse. "NUTRIOREG"

Proceso innovador de un suplemento alimenticio elaborado a base del bagazo del orégano. "NUTRIOREG"

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DOI: 10.35429/EJE.2021.14.8.39.45 Received January 25, 2021; Accepted June 30, 2021

Abstract

The South-Central Region of Chihuahua is a highly agricultural and livestock area. It has 41,900 hectares of non-timber forest resource (oregano) (Alarcón, 2005), which is processed and generates waste up to 1,470.17 tons per season cycle, which do not take advantage of its economic and nutritional benefit. The niche of opportunity was born here where it was found that the oregano residue contains 16.44% of protein per 100 g according to studies at the Center for Research in Food and Development of Delicias (CIAD), attached to CONACYT, and in the laboratory of the company Alimentos Concentrados de Delicias. The proportion that is generated from this waste is very rich, it is considered as an area of commercialization opportunity. In this region there are 257 potential clients according to SAGARPA (2017) dedicated to raising cattle. As quoted by Almeida G, (DIGAL 2018) specified that 8363 livestock production units participate directly in the dairy activity with a daily volume of 3,000,000 liters of milk. Of the five dairy basins in the state, Delicias is the most important, therefore, there is the opportunity to establish the NUTRIOREG company as a producer of concentrated feed supplement for livestock.

Innovation, Oregano residues, Nutrioreg

Resumen

La Región Centro Sur de Chihuahua es zona altamente agrícola y ganadera. Cuenta con 41900 Has de recurso forestal no maderable (orégano) (Alarcón, 2005), el cual se procesa y genera desperdicio hasta por 1470.17 toneladas por ciclo de temporada, mismas que no aprovechan su beneficio económico y nutricional. Nace aquí el nicho de oportunidad donde se encontró que el residuo del orégano contiene por cada 100 g un 16.44% de proteína según estudios en el Centro de Investigación en Alimentación y Desarrollo de Delicias (CIAD), adscrito al CONACYT, y en el laboratorio de la empresa Alimentos Concentrados de Delicias. La proporción que se genera de este desecho es muy rica, es considerada como un área de oportunidad de comercialización. En esta región se cuenta con 257 clientes potenciales según SAGARPA (2017) dedicados a la crianza de ganado vacuno. Como lo cita Almeida G, (DIGAL 2018) precisó que en la actividad lechera participan de manera directa 8363 unidades de producción pecuaria con un volumen de 3,000,000 litros diarios de leche. De las cinco cuencas lecheras del estado, Delicias es la más importante, por consiguiente, se tiene la oportunidad de establecer la empresa NUTRIOREG como productora de suplemento alimenticio concentrado para ganado.

Innovación, Residuos del orégano, Nutrioreg

Citation: DELGADO-MARTÍNEZ, Martha Lilia, AGUIRRE-OROZCO, Mario Abelardo, MÁRQUEZ-MONÁRREZ, Olivia and CONTRERAS-MARTÍNEZ, Jesús José. Innovative process of a food supplement made from oregano bagasse. "NUTRIOREG". ECORFAN Journal-Ecuador. 2021. 8-14:39-45.

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Introduction

The State of Chihuahua has an area of 247,460 km^2, divided in 67 municipalities, with 908 agrarian nuclei and 72 rural communities, accounting 10,116,936 hectares of social property in the area according to SEDATU (2014). In the State, there is a surface of 41,900 hectares of non-timber forest resource (oregano) (Alarcón, 2005), which is processed and, like any company, it generates waste up to 1,470.17 tons by time cycle, these wastes are not taken economically and nutritionally advantage of (INEGI, 2015). With the oregano bagasse a total of 36,754 bags of 40 kg of NUTRIOREF will be obtained. Technical scientifical test were performed in the Centro de Investigación en Alimentación y Desarrollo A.C. of Delicias and Hermosillo, Sonora (CIAD), attached to CONACYT. The physicochemical studios obtained in the Alimentos Concretados de Delicias, S.A. de C.V. (ALCODESA, 2019) lab show that the bagasse has a 6.69% of raw fat, 11.19% of fiber and 16.44% of protein; likewise, it has 308.77 kilocalories of caloric intake and a total of 45.7% carbs, in other words, this is established as optimal necessary nutrition to feed the livestock. In the region of Delicias, there is a presence of 257 potential clients according to SAGARPA (2017), which are dedicated to the cattle raising and will be the main clients.

Justification

In the present project are exposed the reasons why it is important to develop this type of research. In the making of the nutritional supplement, it is observed that, after carrying out the oregano oil extraction process, the waste is not used and is thrown away. This is where the fundamental idea of the project is born, the oregano bagasse is the main element of the cattle feed. The physicochemical studies obtained in the Alimentos Concretados de Delicias, S.A. de C.V. (ALCODESA, 2019) lab show that the bagasse has a 6.69% of raw fat, 11.19% of fiber and 16.44% of protein; likewise, it has 308.77 kilocalories of caloric intake and a total of 45.7% carbs. This nutritional supplement will be of great benefit to the livestock of the area.

Attributes: NUTRIOREF has a high nutritional power, for each 100 g it has 16.44% of protein according to the nutritional table of the Centro de Investigación en Alimentos y Desarrollo (CIAD), obtained through the measurement of its properties in technical scientific equipment. The nutritional supplement is a high nutritional quality substitute for the appropriate cattle raising.

Differentiation: The nutritional supplement NUTRIOREG is differentiated in the market from the competing processing companies by offering a lower price of $104.63 pesos for a 40 kg bag, which represents up to 5 times less the price from the companies dedicated to the commercialization of cattle feed.

Problem Statement

There are 257 potential clients in Delicias according to SAGARPA (2017), dedicated to the cattle raising willing to substitute the nutritional supplement they use for NUTRIOREG, due to the high nutritional value provided for the livestock, besides its low cost. NUTRIOREG has a high nutritional power, for each 100 g it has 16.44% of protein according to the nutritional table of the Centro de Investigación en Alimentos y Desarrollo (CIAD), by absorbing the properties it contains. The nutritional supplement NUTRIOREG has as a competitive advantage which allows it to differentiate from the competing companies by offering a lower price of $104.63 pesos for a 40 kg bag, which represents up to 5 times less the price from the companies dedicated to the commercialization of cattle feed, in addition, it provides more energy and nutrients to the livestock, this benefits mainly its feeding.

Theoretical Framework

The State of Chihuahua has an area of 247,460 km^2, divided in 67 municipalities, with 908 agrarian nuclei and 72 rural communities, accounting 10,116,936 hectares of social property in the area according to SEDATU (2014).

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Innovation description

The amount of waste coming from the extraction of the essence of oregano oil is great and it is used to be thrown away without knowing that these wastes have nutrients that are not manipulated and can be taken advantage of in an effective way. There are 257 potential clients in Delicias according to SAGARPA (2017), dedicated to the cattle raising willing to substitute the nutritional supplement they use for NUTRIOREG, due to the high nutritional value provided for the livestock, besides its low cost. NUTRIOREG has a high nutritional power, for each 100 g it has 16.44% of protein according to the nutritional table of the Centro de Investigación en Alimentos y Desarrollo (CIAD), by absorbing the properties it contains. The nutritional supplement NUTRIOREG has as a competitive advantage which allows it to differentiate from the competing companies by offering a lower price of $104.63 pesos for a 40 kg bag, which represents up to 5 times less the price from the companies dedicated to the commercialization of cattle feed, in addition, it provides more energy and nutrients to the livestock, this benefits mainly its feeding. By processing and marketing it, it will generate an economic apportion to the region, creating more income and employment sources.

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ID
90188
DATE
26/04/2019

Customer: 2004 General Public
Sample: 0002 8 Others ingredients — 26/04/2019
Package: PAQ 10 — 26/abr./19 01:10
Report : Full

OBS: **Oregano Saucillo Stove. 11/April/2019 Alejandro Palacios.**

Dry Base Results		
Dry Matter	88.7	%
Ashes	8.7	%
Dcs		%
BMD		%
Energy		
ENL INRA		Mcal/Kg M.S
ENL NRC		Mcal/Kg M.S
In Manto		Mcal/Kg M.S
In Gan		Mcal/Kg M.S
Crude Fat	6.69	%
Starch		%
Starch Dig Rumen		%
% Grains		%
Fast Energy		
CNF		%
Total Sugars		%
Fibers		
ADF		%
NDF		%
NDF Indigestible		% M.S.
NDF digestible		% M.S.
NDF Indigestible		% NDF.
NDF digestible		% NDF.
Crude Fiber	11.19	%
Lignin		%
Proteins		
Crude Fiber	16.44	%
Degradable Protein		%PC
Non-Degrad Protein		%PC
PDIN		%
PDIE		%
PDIA		%

Milk Production	
Milk Production	lt/cow/day
Forage Cons M Dry	kg/cow/day
VRF	kg of M.S.
Degradab Enzymatic	%
Urea Kg/Ton	

Micotoxins		Optimal
Aflatoxin	ppb	Max 20 ppb
Zearalenone	ppb	Max 300 ppb
Vomitoxin	ppm	Max 5 ppm

Minerals	
Calcium	%
Phosphorus	%
Magnesium	%
Potassium	%
Manganese	ppm
Copper	ppm
Zinc	ppm
Arsenic	ppm

Fermentative Quality		Optimal	Quality
PH			
Ammoniacal Nitrogen	%	3.75	Middle
Soluble nitrogen	%	5.00	Good
		60.00	Good

Q.B.P. Mario René Sodi Pérez

Figure 1 Physicochemical analysis
kSource: *ALCODESA, 2019*

Interview with experts

It has been achieved to nail down a commercial alliance with one of the more important companies in the dry oregano processing, to provide with raw material to the NUTRIOREG production, obtaining as a result a major support to the project, the plant is located in the south-central region of the State of Chihuahua.

Manufacturing method

The procedure carried out to explain the process of obtaining the oregano bagasse is, according to W. Niebel Benjamin, (1998), a flow process diagram is a graphic representation of the sequence of all operations, transportations, inspections, delays and storages that happen during all the process.

ISSN-On line: 1390-9959

The flow process diagram includes the information that is considered to be necessary for the analysis, in the figure 2, for example, the required time for the operation and the distance traveled are especially useful to bring out the hidden costs, as well as the distance traveled, temporal storages, delays, etc.

In the flow process diagram attention must be put into:

1. The material handling or transfer.
2. The plant and equipment distribution.
3. The production time and the delays.
4. The storage time.

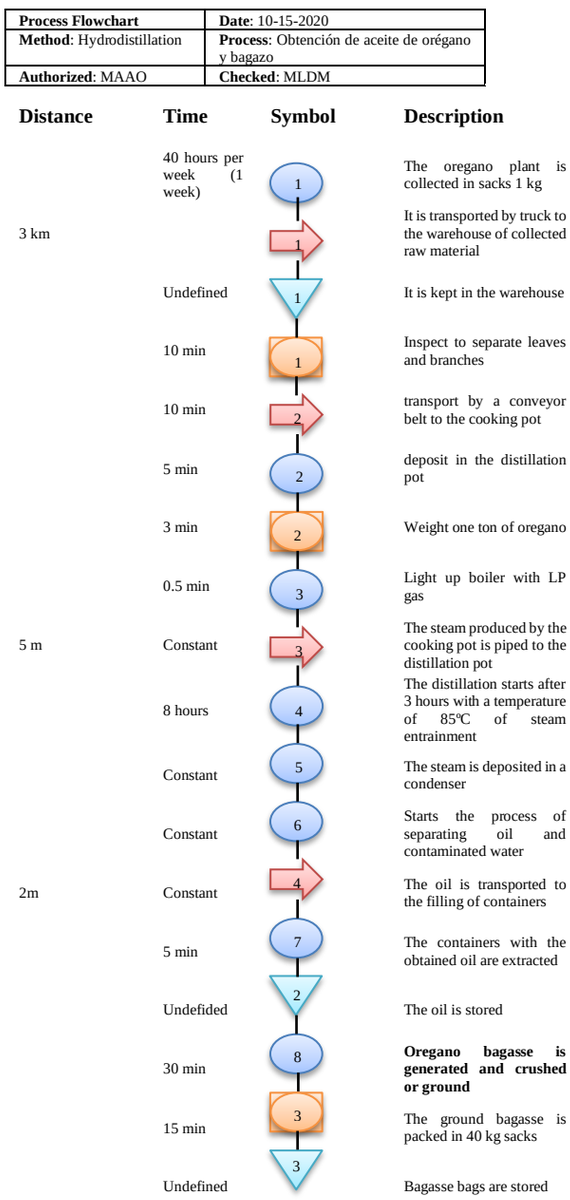

Figure 2 Flow process diagram
Source: Own source

Activity	Symbol	Quantity	Time (min)	Distance (m)
Operation		8	2920.5	
Combined Act.		3	28	
Transport		4	0	3007
Store		3	Undefined	
TOTAL		4	18	2958.5	3007

Table 1 Summary table
Source: Own source

Generalizing, in the table 1 above, it is identified that to produce 40 kg of nutritional supplement were required eight operations, with a time of 2,920.5 minutes, three combined activities with a total time of 28 minutes, four transports traveling a 3,007 meters distance, three storages where the storage time is undefined, in other words, the total time was of 2,958.5 minutes of process and a traveled distance of 3,007 meters, taking into consideration that storages are undefined, this will depend on the sales and advertising made to the NUTRIOREG product.

Potential market

The project of producing and commercializing the nutritional supplement made from oregano bagasse has a potential market in Delicias City, in the State of Chihuahua, where there is a presence of 257 potential clients according to SAGARPA (2017), mainly male people dedicated to the cattle raising and commercialization of its derivates, however, the number of potential clients expands as the project obtains more broadcasting and commercialization taking it to a national and international market; currently, the target market is: small, medium and big livestock producers dedicated to the cattle raising and handling in the south-central region of the State of Chihuahua, and subsequently to any person who owns livestock and is willing to change its current livestock food product for the nutritional supplement NUTRIOREG.

Target market

Mexico is the second world-wide producer of oregano, this brings certain security that the natural resource will not be considered one of the limitations to its production, minimizing the possibility for it to run out.

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Annually, near 4 thousand tons of dry oregano are produced in the States of Baja California, Sonora, Chihuahua, Durango, Tamaulipas, San Luis Potosí, Coahuila, Nuevo León y Zacatecas which gives certain security and sustainability to the NUTRIOREG processing plant, allowing it to have sources to obtain the bagasse and keep producing the nutritional supplement.

Method assessment and applicable normativy

Bromatology technical-scientific studies performed in the Centro de Investigación en Alimentación y Desarrollo A.C. (CIAD) and physicochemical studios obtained in the Alimentos Concretados de Delicias, S.A. de C.V. (ALCODESA, 2019) quality control lab, figure 1 and table 2 show that the oregano bagasse has the necessary protein nutrients to the good development in the livestock food. Besides, tests where performed to the bagasse in order to determine the percentage of energy, fiber and dry protein, these calculations were based on The Official Methos of Analysis (AOAC, 2000), through which the amount of calorific energy and carbs was obtained. The statistic evidence resulting from the bagasse analysis stand out the nutritional input for an adequate and balanced nutrition for the development of the livestock, complementing the nutrient intake in the food supplied daily.
Following are shown the norms that must be complied for the NUTRIOREG production:

NormaOficialMexicanaNOM-051-SCFI/SSA1-2010, General specifications for labelled of prepackaged food and non-alcohol drinks. Commercial and health information. Its object is to establish the commercial and health information that the labelled must have for prepackaged food and non-alcohol drinks of national or foreign production, as well as determine the characteristics of that information Norma Oficial Mexicana NOM-182-SSA1-2010, Etiquetado de nutrientes vegetales. In this norm are established the vegetable nutrients that are object of vigilance by the authorities, in order to guarantee to the user its quality and to prevent the potential risk for public, animal and vegetable health, as well as the adverse effects to the environment.

Norma Oficial Mexicana NOM-251-SSA1-2009, Prácticas de higiene para el proceso de alimentos, bebidas o suplementos alimenticios. This norm establishes the minimum requirement of good hygiene practices that must be observed in the production of food, drinks or nutritional supplement and its raw materials, in order to avoid its contamination through all the process.

Norma Oficial Mexicana PROY-NOM-005-SEMARNAT-2012. The norm establishes the requirements to the sustainable exploit of the non-timber forest resources in the forestall ecosystems, cold temperate forests, jungles and arid and semiarid zones – Technical specifications.

Norma Oficial Mexicana NOM-086-SSAL-1994. Goods and services, food and non-alcohol drinks with modifications in its composition, nutritional specifications.

Norma Oficial Mexicana NOM-130-SSA1-1995. Goods and services, food package in hermetically sealed containers and subjected to heat treatment. Sanitary dispositions and specifications.

Different types of oregano used							
Element	Saucillo 1	Saucillo 2	Saucillo stove	Original	Saláices	Without smell	Average
Ni (ppm)	132.785	4.48	5.92	3.785	5.015	5.14	26.1875
Fe (ppm)	158.545	158.575	198.04	117.215	166.95	16.305	135.9383333
Zn (ppm)	20.17	21.12	13.9	13.795	17.855	1.53	14.72833333
Na (%)	0.0047	0.0049	0.00403	0.0025	0.0037	0.0038	0.0040
Cu (ppm)	6.74	7.77	8.2	6.825	7.645	3.51	6.781666667
Mn (ppm)	30.14	30.64	13.47	38.285	15.98	0.36	21.47916667
Ca (%)	1.32785	1.5285	1.3556	1.5073	1.4908	0.1869	1.232825
K (%)	0.9223	0.9999	0.7682	0.7133	0.85365	0.07215	0.721583333
Mg (%)	0.3564	0.3564	0.4232	0.2874	0.25	0.00975	0.280525
N (%)	2.5104	2.3312	2.6304	1.9136	2.1184	2.3008	2.3008

Table 2 Bromatology studies
Source: CIAD Delicias

Financial viability

NUTRIOREG expects to achieve a 16,725 annual tons production of nutritional supplement, it is estimated that to develop the project $ 1,625,178.00 pesos are needed, obtained from partners contribution in $ 731,330.10 pesos and from financed capital with debt in $ 893,847.90 pesos, the short term investment is of $ 349,752.00 pesos for the opening of the company for the first three months, the fixed investment is of $ 1,244,926.00 pesos which includes the employers salary, the local rent, as well as services, freights and a deferred investment of $30,500 pesos that covers the constitutive act and the anticipated paid rent.

ISSN-On line: 1390-9959

The assessment tools show that the business plan is clearly profitable, based on the Net Present Value of $ 1,003,623.17 pesos is possible to generate an Internal Rate of Return of 67.39% in contrast with a Weighted Average Cost of Capital of 20.36% and a Minimum Acceptable Rate of Return of 17.68%, the Internal Rate of Return is bigger than the Weighted Average Cost of Capital, therefore it is possible to cover the cost of the assessment rate and also generate utilities, it was established that the more convenient and reasonable price is of $ 104.63 pesos for a 40 kg bag.

Intelectual property

NUTRIOREG will adopt the patent registry in the IMPI, the legal concept it will adopt will be a patent according to the Diario Oficial de la Federación published on May 18, 2018 in articles 15 to 27. It was requested a patent unity for the State of Chihuahua in the CRODE (Centro Regional de Optimización y Desarrollo de Equipo), the identity patent procedure to back up the technical scientific innovation from the nutritional supplement. Besides, the copyright will be protected through the Sistema Nacional de Propiedad Industrial. The proof of the patent provided to NUTRIORED will allow to exploit the innovation during 20 years.

Results

The present research project develops a solution to the problem that generated the great quantity of oregano bagasse. The nutritional supplement for the livestock is made from the wastes generated in the oil oregano extraction process. Table 3, with nutrimental information, shows the results related to the studies performed in the Centro de Investigación en Alimentación y Desarrollo A.C. and Alimentos Concretados de Delicias, S.A. de C.V. (ALCODESA, 2019) lab, it is proved that the nutritional supplement contains the necessary nutrients to the cattle development. Each bag contains the following nutritional contribution per 100 grams.

Macronutrient element			Micronutrient element		
Na	0.00403%		Ni	5.92	ppm
Ca	1.36%		Fe	198.04	ppm
K	0.77%		Zn	13.9	ppm
Mg	0.42%		Cu	8.2	ppm
Na	2.63%		Mn	13.47	ppm
P	0.18%				
Protein	**16.44%**		**Fiber**	**11.19 %**	

Table 3 Nutritional information of the oregano bagasse
Source: CIAD Delicias

The nutritional supplement gives the livestock a basic nutritional contribution for a balanced diet, complementing the food intake daily, without neglecting the quality of the product. This contributed to the cattle growth and development, table 4 shows the nutrient estimates based on The Official Methos of Analysis (AOAC, 2000), it shows the amount of calorific energy and carbs contained in NUTRIOREG, it satisfices the economic needs of any other supplement existing in the market, offering it by a lower price.

CHO'S:	100%	Moisture	Ashes	Crude Fat	Fiber	Protein
CHO'S=	100	-11.3	-8.68	-6.69	-11.19	=-16.44 - 45.7 %
Calorific Energy (Kcal) = Carbohydrates (4) + Protein (4) + Crude Fat (9)						
KCAL=	45.7 (4)		+ 16.44 (4)	16.69 (9)	=308.77 Kcal	

Table 4 Estimation of calorific nutrients
Source: ALCODESA Delicias, AOAC, 2000

With the obtained results, it is sustained that NUTRIOREG is between the ranges of ideal calorific contribution for a good cattle nutrition.

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