

## Feeding Value of Carob (*Ceratonia siliqua L.*) Beans

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### Introduction

Carob (Harnup, algarobba) is the bean-like pods of trees belonging to “*Ceratonia siliqua L.*” species of “*Leguminosae*” family. It is a characteristic plant of districts indicating typical Mediterranean climate.

Turkey is one of the homelands of the plant. It is widely found in the natural flora, particularly in Mediterranean and Aegean regions of the country (Figure 1). The total carob production is around 15.000 tons and 9-10 thousand tons is exported.

It is also distributed widely in the USA, Australia and South Africa as well as Mediterranean and Aegean countries such as Cyprus, Greece, Italy, Israel, Spain, Portugal, Morocco, Tunisia, Algeria, Libya.

Different products obtained from Carob are utilized by textile, paper, drug, cosmetics, paint, petroleum and alcohol industries as well as food industry. There are some literatures released indicating that carob, carob products and some residues or by-product obtained from processing plants are used as feed or feed additive in some places of the world. However there is no efficient scientific information about such materials.

There are carob processing plants in Turkey and it is possible for the animal producers to provide a certain amount of pods and molasses as residue or by-products very cheaply and even freely.

This study is conducted in order to determine nutritional composition, nutrient digestibility, total digestible nutrients (TDN), starch value (SV), digestible energy (DE), metabolizable energy (ME), net energy (NE), and silage quality of seedless carob pods, carob molasses and carob molasses silage.

### Methods

Seedless pods obtained from a processing plant analyzed in the laboratory for dry matter (DM), organic matters (OM), crude protein (CP), ether extract (EE), crude fiber (CF), ash, nitrogen free material (NFM).

In the second period carob molasses obtained from the same plant and the silage material made from this molasses were analyzed for nutrient composition and evaluated through a classical digestion trials conducted on 3 Chios rams for nutrient digestibility, TDN and SV.

Energy contents of the three materials are calculated depending on the following equations:

$$1 \text{ g TDN} = 4.4 \text{ kcal/kg DE} = 3.616 \text{ kcal/ ME}$$

$$1 \text{ SV (g/kg)} = 2.356 \text{ kcal/kg NE}$$

In the last period of the study carob molasses silage was evaluated according to sensory evaluation, organic acid composition, acidity and dry matter content.

## Results

Data related to nutrient composition, % digestibility and energy contents of seedles carob pods, carob molasses and carob molasses silage evaluated through chemical analysis and classical in vivo digestion trials indicated fairly good results comorable to many of the conventional feeds (Tables 1 and 2).

Table 1. Nutritional Composition, Nutritional Digestibility, Feed and Energy Value Data (DM basis)

Nutrients	Seedless carob, pods <sup>1</sup>	Carob Molasses <sup>1</sup>	Carob molasses silage <sup>1</sup>
DM, %	88.35 (63.89 %)	34.43 (55.32 %)	37.63 (53.43 %)
OM, %	93.06 (62.70 %)	96.95 (54.65 %)	92.47 (51.76 %)
CP, %	7.74 (64.49 %)	7.20 (59.89 %)	5.50 (63.04 %)
CF, %	10.34 (52.53 %)	9.24 (63.69 %)	12.58 (62.14 %)
EE, %	1.30 (60.76 %)	0.66 (66.54 %)	0.16 (65.56 %)
Ash, %	6.94 (37.30 %)	3.05 (47.35 %)	7.53 (48.24 %)
NFM, %	73.68 (76.75 %)	76.80 (52.27 %)	74.23 (49.13 %)
TDN, %	68.73	51.32	47.96
SV, g/kg	637	474	417
DE, kcal/kg	3024	2258	2110
ME, kcal/kg	2485	1856	1734
NE, kcal/kg	1501	1117	982

<sup>1</sup> Figures in paranthesis show % digestibility of each nutrient.

Table 2. Comparative Evaluation of Carob Products and Some Conventional Feeds in Their TDN Values (DM basis)

Feeds	TDN, %
Seedless carob bean pods	68.73
Carob molasses	51.32
Carob molasses silage	47.96
Alfaalfa hay, mid bloom	54.00
Grass hay, mid bloom	56.00
Corn silage	52.00
Sugar beet molasses silage	51.00
Sorghum silage	58.00
Wheat straw	38.00
Oat grain	72.00
Wheat bran	70.00

According to qualitative evaluation, carob molasses silage were found “very good” in both sensational and Fleig scoring while it was found “good” when graded depending on organic acid contents (Table 3).

Table 3. Quality of Carob Molasses Silage

Criteria	Evaluation	Score	Quality
<i>Sensetional</i>			
Odor	Slightly butiric acid-sour, fruty-aromatic odor	10	
Structure	No destruction in the structure	4	
Color	Naturel color	2	
<b>Total</b>		<b>16</b>	<b>Very good</b>
<i>Organic acids, %</i>			
Lactic	2.74	0	
Acetic	1.18	20	
Butiric	0.84	50	
<b>Total</b>		<b>70</b>	<b>Good</b>
<i>Fleig scoring</i>			
pH	4.25		
DM, %	37.63	<b>100</b>	<b>Very good</b>

## Conclusions

All data obtained from this study indicated that seedless carob bean pods, carob molasses provided from carob processing plants as a residue or by product and the silage made of carob bean molasses can be utilized as fairly good quality alternative cheap feed sources and are comparable to some conventional feeds.

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