

USE OF HARD DATE STONES (*Phoenix dactylifera* L.) IN SILAGE PROCESSING

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ABSTRACT

The aim of the present study was to investigate a low cost treatment able to remedy the hardness of the raw date seeds (stones) to allow using it efficiently in feeding animals. Such treatment could represent economic tool to utilize the secondary product of date palm trees and reducing wasted materials of this industry.

Two thousands kg Sewi cultivar date stones added to fodder before making silage. Physical characteristics (length, diameter, volume and weight) recorded for individual seeds before and after treatment. Proximate feed analysis (dry matter, ash, crude protein, fat and crude fiber) were performed on date stones before and after treatment.

Treated date stone was heavier (2.079 vs. 1.396 g) and taller (2.7 vs. 2.0 cm) than before treatments, which mean that the seeds gained moisture from the silo. There was no significant difference in the chemical composition, on dry matter base, of seeds before and after treatment. Sheep were able to consume whole silage content including the seeds and digest it easily. When we sacrifice animals after feeding treated date stones there was no seeds in the rumen or in feces. In contrast, animals fed hard seeds, without treatment, showed indigested seeds in the rumen and were found in feces.

Key wards: *date stone, sewi, chemical composition, silage, feeding.*

INTRODUCTION

Date palm (*Phoenix dactylifera* L.) is a major agricultural crop in the Near East and North Africa, it historically has been connected with sustaining human life in many of the hot and barren parts of the old world thus has become an integral part of the culture and tradition of people in these regions (El-Juhany, 2010).

Date production in Egypt has been steadily increasing over the last 30 years. In 2005, numbers of palm trees found to be more than 11 million, producing almost 1,170,000 tons date crop per year (El-Sharabasy (2009). According to FAO data, Egypt tops the list of date production in the world; the crop of date palm in Egypt is 1470000 tons (FAO STATE 2013). Date palm is one of the most economically important fruit tree grown in Egypt and plays an important role in the Egyptian agriculture representing a significant part in reclamation program. Adaptation of date palm to water stress made it one of the first fruit trees dispersed and taken into cultivation in arid and semi-arid regions of Egypt. Date palm trees are grown all-over Egyptian lands from Alexandria-

north up to Aswan-South and from Red Sea-East up to the New Valley and Oases in the West. In addition, date palm trees considered the most successful fruit tree that cultivated in the new reclaimed lands in Toshki, El-Ewinates, and Sinai areas (Bekheet, 2013).

All parts and byproduct of date can added to the feed mixtures of ruminants (Bukhhaev *et al.*, 1985 and Zaza *et al.*, 2008). Date seeds represent 10-15 % of date fruits, which mean that the total seed product of 147000 to 220500 tons/year is usable. At present time there are 16 factories, for date processing in Egypt and some will be build in the close future (GOI, 1999). All these factories have a mass production of date seeds, which comes as waste product during date processing. If these seeds exploited well, it could play a good role in the national income.

The use of the whole date seeds as animal feed is still likely the most common practice. However, the hard, enclosed structure of the seed is a real obstacle to optimize its feed value ((Barreveld, 1993; Sumianah *et al.*, (1984) and Zaza *et al.*, 2008).

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Submerging date seeds in water for 72 hours could gain 25% in weight, and gain increase to 50% after a week or so. However, they not readily ingested by the animals, as seeds need more than 40 days to become soft and suitable for feeding sheep (Barreveld, 1993). Sumianah *et al.*, (1984) studied the effect of germination of date seeds at 35-36 °C for 22 or 52 days and found that crude protein, fats, total carbohydrates and starch decreased but crude fiber, ash, total soluble carbohydrate and reduced sugars were increased.

A second method of improvement is grinding which modify the hard structure of the seed, but it is energy cost and cause wear and tear of machinery. Experimentally, it was established that in a 40 HP swinging hammer mill fitted with a 2 mm sieve, the grinding of date seeds consumed over 100 Kwh/ton whilst for barley or maize these figures are 19 and 15 Kwh, respectively with the same mill. The energy consumption can reduced by crushing the pits firstly prior grinding, but this requires more investment (Barreveld, 1993).

The purpose of this study was to investigate a low cost treatment able to remedy the hardness of the fresh date stones, by ensiling the hard date seeds that may allow using seeds efficiently in feeding animals, thus better utilize the secondary product of date palm which reduce wasted materials of this industry.

MATERIAL AND METHODS

The experimental work (silage processing) done in a private farm in El-Saf district, Giza Governorate, Egypt. Physical characteristics and chemical composition of date seeds carried out at the Regional Laboratory for Food and Feed, Agriculture Research Center, Egypt.

Two tons of raw date seeds of Sewi cultivar were used in the study, representing 5% of total silage mass of 40 tons corn leaves and stalks after harvesting the ears (after 120 days of cultivation). The seeds had collected from one farm of Sewi cultivar at Wadi Elnatroan, since all trees were in the same age and under the same management system.

Corn stalks were hand cut then chopped mechanically to 2-3.5 cm length. The date seeds added to the ensiled corn stalks. After ensiling

for a period of 2 months, samples of date seeds taken for testing physical characteristic and chemical analysis.

Physical characteristics

The seeds dimension, volume and weight were measured using average one hundred seeds. The physical characteristics done before and after treatment. Seed length "L" (cm) and seed diameter "D" (cm) recorded. Seeds weight (g) obtained for average 100 seeds (weights measured for batches each of 10 seeds). Average seeds volume (ml) determined by immersion of samples (ten seeds) in a known quantity of water in a graduated jar.

Chemical analysis

Raw date seeds and treated seeds chemically analyzed for moisture, protein, ash and crude fiber according to the methods described in A.O.A.C (1990).

Determination of fiber fractions

Samples analyzed for fiber fractions using Tecator Fibretic system according to Van Soest (1982).

Date seeds residues in rumen

Three rams were fed on discard date fruit (rejected for human use) to test digestibility of the seeds. After 24 h, the rams sacrificed and the rumen content investigated. The date seeds found with negligible digestion. Other rams fed the silage including date stone for 24 h then they sacrificed and the rumen content investigated where there were no seeds in the rumen.

Statistical analysis

The data presented as LS mean \pm S.E. Collected data statistically analyzed according to T test using General Linear Model (GLM) procedure (SAS, 1999).

RESULTS AND DISCUSSION

Physical characteristics

Seeds' physical characteristics presented in table (1). These physical characteristics done before and after fermentation of the silage.

Ensiled date seeds were significantly taller ($P<0.01$) than raw date seeds (2.74 vs. 2.04 cm, respectively). The same trend was recorded on seeds diameter ($P<0.01$), (4.82 vs. 2.74 cm, respectively). Ensiled seeds were significantly heavier than raw seeds (2.079 vs. 1.396 g). In addition, seeds' volume was greater ($P<0.01$) in treated seeds (1.77 vs. 1.05 ml/seed, respectively).

This result indicate that seeds gained moisture during ensiling which resulted in the great change in their characteristics, meanwhile the seeds became soft and high palatable.

Sheep were able to consume whole silage offered including the seeds, and there were no seeds in the feces opposite to feces of animals fed raw hard seeds.

Chemical composition

Chemical composition of raw and ensiled date seeds presented in Table (2). There were no significant differences in the chemical composition, on dry matter base, of seeds

before and after treatment for crude protein (CP), fat, and crude fiber (CF). Dry mater was significantly higher ($P<0.01$) in the raw date seeds.

In the present, study the date seeds did not loss any portion content during ensiling (Table 2). However, it known that during the initial ensiling process, aerobic organisms predominate on the forage surface and important chemical change occurred during this early phase leading to the breakdown of plant proteins. Proteins first reduced to amino acids then to ammonia and amines, thus up to 50 percent of the total plant protein may be broken down during this process.

Fiber fractions

Fiber fractions of raw and ensiled date seeds presented in Table (3). There was no significant difference in fiber fractions

Table (1): Physical characteristic (Mean \pm SE) of individual date seeds of Sewi cultivar before and after fermentation in the silage.

Physical characteristics	Raw date seeds	After fermentation
Length (cm)	2.04 \pm 0.01 ^b	2.74 \pm 0.01 ^a
Diameter (cm)	2.93 \pm 0.01 ^b	4.82 \pm 0.02 ^a
Weight (g)	1.396 \pm 0.023 ^b	2.079 \pm 0.038 ^a
Volume (ml)	1.05 \pm 0.0166 ^b	1.77 \pm 0.063 ^a

Values with different superscript litters within the same row differ significantly ($P<0.01$).

Table (2): Chemical composition (%) of raw date seeds and seeds after fermentation in silage.

	DM	C.P	Fat (E.E)	C.F	Ash
Raw date seeds	94.5 ^a	5.6	7.54	21.4	10.9
Treated seeds	62.5 ^b	5.37	7.63	19.2	10.7

Values with different superscript litters within the same column differ significantly ($P<0.01$).

Table (3): Fiber fractions of raw and fermented date seeds.

	NDF	ADF	ADL	C	HC	L
Raw date seeds	75.30	56.65	25.42	41.23	18.74	14.84
Treated seeds	75.13	57.58	24.46	33.11	17.55	14.17

NDF: Neutral detergent fiber;
ADL: Acid Detergent Lignin;
HC: Hemi-Cellulose;

ADF: Acid Detergent Fiber.
C: Cellulose.
L: Lignin.

Date seeds residues in rumen

Rumen contents of sacrificed animals, fed on experimental rations for 24 h, showed that

animals fed raw hard seeds had negligible digested seeds, in the rumen, while rams fed the

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treated date stones, mixed in the silage, had no seeds in the rumen.

CONCLUSION

It could be recommended to make silage of raw date seeds mixed with fodder, at rate 5%, as it transferred into more accessible nutritive material physically more beneficial for the animal to ingest. Its materials become softer and more palatable. Meanwhile, it maintains chemical composition with minimal loss due to treatment. Yet, ensiling represents a low cost process, compared to other methods, applied to reduce seeds hardness. Thereafter, the positive results attained recommend future research for using date seeds in higher percentage than 5% for ensiling.

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