

A Comparison of the Nutritional Value of *Opuntia* and *Agave* Plants for Ruminants

Jesus Fuentes-Rodriguez, Ph. D.

Department of Animal Production
Universidad Autonoma Agraria "Antonio Narro"
Saltillo, Coahuila, Mexico

INTRODUCTION

A large area of northern Mexico and southern United States are located in arid and semiarid areas. In these areas, long drought periods are common, with high summer temperatures and low winter temperatures. These factors cause both low forage production and availability. Fortunately, under these conditions, forage is available from plants that have adapted to these ecological conditions, such as *Agave* and *Opuntia* plants (Borrego, 1986). Although, these plants are generally felt to have low nutritional value, they are used in these areas as an emergency maintenance feed and as part of the regular rations. These plants have good palatability and high humidity content (Suñigiga, 1980).

Agave and *Opuntia* plants have been used as forage for ruminants since the first settlers (Granados, 1993; Gentry, 1976), as suggested by an Aztec legend, "Animals taught man the use of these plants as feed, it was common to observe livestock eating the flowers, fruits, and pads of these plants" (Goncalves, 1956). The objective of this study was to compare the nutritional value and production characteristics of *Agave* and *Opuntia* plants.

CHEMICAL COMPOSITION

Sanchez (1986) indicated that plants from the Agavaceae and Cactaceae families were the most abundant succulent plants in Mexico, which agrees with observations of Walter (1977) and Daubenmire (1979). These authors stated that important ecological adaptations of plants of arid lands included water retention, forming a succulent plant that could utilize its water during the dry season. Due to the importance of these plants for use by people, several studies were conducted to determine the chemical composition of both *Agave* and *Opuntia* plants (Table 1 and Table 2).

Table 1. Chemical Composition of Different *Agave* Species

Specie	Reference	Dry Matter	Crude Protein	Nitrogen Free Extract	Ether Extract	Crude Fiber	Ash
<i>A. asperima</i>	Espinoza (1964)	8.6	5.8	---	2.4	18.9	---
<i>A. atrovirens</i>	Martinez (1994)	10.4	4.5	57.9	1.4	19.7	16.1
<i>A. salmiana</i>	Martinez	11.1	4.6	57.1	1.3	17.2	20.5
MEAN <i>Agave</i>		10.0	5.0	57.5	1.6	18.6	18.3

Table 2. Chemical Composition of Different *Opuntia* Species

Specie	Reference	Dry Matter	Crude Protein	Nitrogen Free Extract	Ether Extract	Crude Fiber	Ash
<i>O. robusta</i>	Ensminger	10.4	4.4	57.6	1.7	17.6	18.6
<i>O. lindheimeri</i>	Ensminger	11.6	4.1	66.3	1.0	16.2	25.5
<i>O. ficus-indica</i>	Ensminger	11.3	3.8	77.1	1.4	17.6	13.1
Mean <i>Opuntia</i>		11.1	4.1	67.0	1.3	17.1	19.1

Tables 1 and 2 show that *Agave* plants have slightly higher crude protein, ether extract, and crude-fiber content, while *Opuntia* plants have slightly higher dry-matter, nitrogen-free-extract, and ash contents. Considering the small differences in chemical composition of both *Agave* and *Opuntia* plants, they have similar nutrient advantages when used as feed for ruminants. Research conducted at Antonio Narro University indicated that many dairy and beef cattle producers in some areas of Mexico provide these plants either alone, together, or in combination with rations depending on the area and market availability. *Agave* and *Opuntia* are used not only during critical periods of the year, but on a regular basis throughout the year.

The utilization of these plants involves some manual labor before they can be fully administered to animals. *Agave* leaves are chopped after the spines are removed while *Opuntia* leaves have to be burned with direct fire and cut into small pieces before they are offered to the animals. Some of the most extensively distributed species of *Agave* and *Opuntia* in Mexico are shown in Table 3.

Table 3. *Agave* and *Opuntia* Species in Mexico

<i>Agave</i>	<i>Opuntia</i>
<i>A. salmiana</i>	<i>O. rastrera</i>
<i>A. scabra</i>	<i>O. robusta</i>
<i>A. parrasana</i>	<i>O. engelmannii</i>
<i>A. americana</i>	<i>O. lindheimeri</i>
<i>A. masipaga</i>	<i>O. ficus-indica</i>
<i>A. atrovirens</i>	<i>O. cantabrigiensis</i>

PRODUCTION CHARACTERISTICS

Agave and *Opuntia* plants are relatively easy to establish in arid and semiarid lands. Propagation is done by seeding and by placing new sprouts on the ground. These means of reproduction makes the process of multiplication very fast. In addition, up to 750 *Agave* plants can be produced in one hectare, which yields about 55 metric tons of fresh forage (6.1 tons dry-matter basis) (Martinez, 1994). On the other hand, about 1,250 *Opuntia* plants can be produced in one

hectare, which yields about 32 metric tons of fresh forage (3.5 tons dry-matter basis) (Hamilton, 1992).

CONCLUSIONS

The high productivity and the large amount of forage produced by these plants increase the importance of these plants for livestock in the arid and semiarid areas of northern Mexico and the southern United States, especially during dry periods of the year.

There are no differences between *Agave* and *Opuntia* plants in their chemical composition, but *Agave* plants produce larger amounts of forage per hectare.

There is a need to conduct research to compare the performance of animals fed both *Agave* and *Opuntia* plants.

REFERENCES

- Borrego, E. F and N. Burgos. 1986. El Nopal. UAAAN. Saltillo, Coahuila, Mexico.
- Daubenmire, R. F. 1979. Ecología Vegetal. Tratado de Autoecología de Plantas. Ed. Limusa. Mexico.
- Ensminger, M. E., J. E. Oldfield, and W. W. Heinemann. 1990. Feeds and Nutrition. Ensminger Publishing Co. USA.
- Espinoza, G. J. 1964. Digestibilidad del Maguey Cenizo (*Agave asperrima* Jacobi). Tesis. ITESM. Monterrey, NL, Mexico
- Gentry, H. S. 1976. La Simbiosis Hombre-Agave. Cactaceas y Suculentas Mexicanas. 21:16.
- Goncalves, O. L. 1956. El Maguey y el Pulque en los Codices Mexicanos. Fondo de Cultura Economica. Mexico.
- Gonzalez, G. S. 1994. Valor Nutricional de Maguey (*Agave salmiana* y *Agave atrovirens* Karw) Forrajero Utilizado en las Zonas Aridas del Norte de Mexico en Relacion a sus Caracteristicas Fenologicas. Tesis. Universidad Autonoma Agraria Antonio Narro. Saltillo, Coahuila, Mexico.
- Granados, S. D. 1993. Los Agaves en Mexico. Universidad Autonoma de Chapingo. Chapingo, Mexico.
- Hamilton, J. R. 1992. Planting and Cultivating Native Cactus for Cattle Feed and Wildlife Utilization in South Texas. Proc. Third Annual Prickly Pear Council Convention. Kingsville, TX. USA.
- Martinez, C. J. 1994. Valor Nutricional de Dos Especies de Maguey (*Agave atrovirens* Karw) y (*Agave salmiana*) en el Sur del Estado de Coahuila. Tesis. Universidad Autonoma Agraria Antonio Narro. Saltillo, Coahuila, Mexico.
- Sanchez, S. O. 1966. La Flora del Valle de Mexico. Ed. Herrero. Mexico.

Sunigiga, C. H. 1980. Utilizacion del Maguey como Suplemento en el Crecimiento de Becerras Holstein. ITESM. Monterrey, NL. Mexico.

Walter, H. 1977. Zonas de Vegetacion y Clima. Ed. Omega. Espana.