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Research article

DIVERSITY AND BOTANIC COMPOSITION OF THE DIET OF THE WHITE TAILED DEER (*ODOCOILEUS VIRGINIANUS*), RÍO BALSAS DEPRESSION, PUEBLA, MEXICO

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ABSTRACT: The Río Balsas Depression is located in several States that drain to the Pacific Ocean, in Puebla State, Mexico. It is located in the southern part, in the region called Mixteca Region, which is an ethical zone with ecosystems with low agricultural and forest potential, in its rough summer pasture there are areas with different types of natural vegetation; where the white-tailed deer is distribute "in situ" from the "mexicanus" subspecies. The objective of the present work was to determine the diversity and botanical composition of the diet of the cervid in the region, by means of application of diverse field's and laboratory's techniques; due to one of the bases for the managing of the species is to know its feeding. For it, there were realized direct and indirect observations of deer's grazing in 49 transects of 500 m length by 6m width, in seven Units for the Management and Wildlife Conservation or UMAs, from five Municipalities, where the browsed and excreted plants were collected for microhistology. By direct and indirect observation method of browsed plants, there were registered 139 species belonging to 51 families; leguminous represent 20.1% (N =28), followed by cactaceae 13.7% (N =19), gramineous with 7.2% (N =10), agavaceae with 6.5% (N =9) and asteraceae with 5.8% (N =8). In addition; they were detected by microhistology in feces to 60.1% (N =8%). In agreement to the contribution in MS's composition, 17 species stand out. These results repeat the important contribution of leguminous to the diet, and the great diversity of plants used as forage for this cervid.
Key words: Cervid, excreted, microhistology, leguminous.

INTRODUCTION

The Rio Balsas Depression is located in several States in Mexico that drain to the Pacific Ocean, in the Puebla State. It is located to the south of the entity in the region called "Mixteca", which is an ethnic, poor and isolated region with 47 Municipalities in a surface of 1,056.54 km^2; with rough topography that goes from 625 to 2750 meters above sea level, with hot semiarid and moderate semiarid climates, its main vegetative types are: tropical dry forest (TDF), several types of xerophilous desert scrub (DS) and forest of oak forest (OF) among other vegetative types. Its economy is sustained in agricultural activities, with low development in economy's secondarily and tertiary sectors. In the region the white tail deer (*Odocoileus virginianus*: Zimmermann 1780) is distributed "*in situ*" from the "*mexicanus*" subspecies, in a superficie of 547,550 has. [1]. Due to it, Units of Managing have established Units for the Management and Wildlife Conservation or UMAs UMAs to preserve, to handle and to take advantage in sustainable form of this specie and its habitat [2, 3]. At present in the region exists 92 UMAs, with a surface of managing of more than 100,000 has., they are handled in majority with the technology called: Diversified Ranching; that is a agro-ecological model, that combines the extensive production of beef cattle, with the sustainable use of the white-tail deer, other species of wild fauna and the habitat, in the ecological and hunting tourism [4, 5].

To determine the diversity of the diet, and to estimate the botanical composition of the vegetable species that deer intakes advantage in its feeding, it is indispensable to establish the practices of conservation and managing of the species and its habitat, for the UMAs that are operating in the region [6].

MATERIALS AND METHODS

To evaluate the diversity and botanical composition of the diet of the white tail deer in the region, the following methodologies were used: To the botanical diversity, there was used the direct and indirect observation of the consumed plants by the specie. For it 17 field samplings were realized, nine in epoch of rains and eight during the low water, from March, 2004 to February, 2007, in 49 transects, in seven UMAs, of five Municipalities, with a total surface of 10,328 has. All transects of 500 meters length for 6 width (3000 m^2): in all transect, the vegetative parts (stems and leaves) and reproductive (flowers and fruits) from the consumed vegetables by deer were observed. At the same time, there was realized a collection of the same plants, to obtain their scientific name. In this observation technique from the consumption, two procedures were considered, the direct and the indirect ones: the first one consisted to the observation "in situ" of the animal feeding plants [7]. The second or indirect, it is based on the observation of the left tracks by the animal on having fed, such as: the consumed parts of the plants and the animal's footprints in the surrounding soil [8, 9]; based on the indications for tracks of deer [10]. In addition, the rumen content was checked in nine adult males received during the seasons for sport-hunting (big game) from 2004 to 2007 years.

On the other hand, in 28 transects from the 49 initials, of two contiguous UMAs with 4,995.85 has., from "Santa Cruz Nuevo" community, "Totoltepec de Guerrero" Municipality; place where the TDF, DS and OF from the region of the region converge [6]: It was applied the micro-histological analyses to the faeces, to determine the botanical composition of the diet. Where they were collected, both groups of pellets of faeces as plants for the preparation of the reference prints by means of modified microhistological analyses [11], based on the original technology [12]. The samples were ground and processed by reagents that destroy the parenchyma and phloem, persisting only epidermis and xylem; to do that, the samples were dehydrated in an herbalist's tumble dryer to 70 °C for four days; later they were crushed in a Willey mill with mesh of the number 20. Then they were undergone to boiling, in water in 30 minutes, later in sodium hydroxide (NaOH) to 10% by 20 minutes, then in sodium hypochlorite (NaHClO) during 10 minutes; in order to whiten the epidermal cells; at the end, they sifted and washed the samples till the foam was eliminated. After that, they were placed into a beaker during 20 minutes in gradual alcohols of 30, 50, 70 and 100%, for their dehydration, using as way of assembly jelly-glycerin. Then the samples from plants were analyzed by microscope to 100 increases, to their next identification in the vegetable fragments of feces. To determine the botanical composition of the diet, were done mixed preparations were done from the fecal collected groups, where 100 fields or microplots were analyzed, converting the frequency to density by means of the specific table for this intention [13], then to calculate the input percentage of dry matter (DM) by means of the formula (FI / TF * 100), where: FI are identified fragments by species; and TF is the total of fragments [7]. The advantages of working with feces, is the fact that it is not necessary to sacrifice to animals or to affect them with surgeries, in addition it is adapted for the case of wild fauna "*in situ*", it therefore seems very difficult and costly their capture [14]. Additionally the ruminal content was checked in thirteen adult males of five UMAs, collected during the 2007-2008 season of sports hunt, to do this, the direct observation to plants´ fragments and the microhistological technology mentioned previously. The obtained information was analyzed by means of species similarity analysis [22] among diversity and botanical composition of the deer's diet, also an analysis of canonical correlation was carried out considering to be independent variables to the habitat (UMA, municipality and year of collection) and the dependent variables the consumed species (species and consumed part) by means of the PROC CANCORR [23].

RESULTS AND DISCUSSION

The botanical diversity of the diet of the white tail deer in the region, is constituted by 139 species belonging to 51 families (Table 1); the leguminous ones represent 20.1% (N =28), followed by cactaceae 13.8% (N = 19), gramineous with 7.2% (N =10) and agavaceae with 6.5% (N =9) among others (Fig. 1). The diversity of the species and families was major in the humid epoch, since 82 plants are consumed preferably on this station (May-October) representing 59%: in the dry epoch (November-April) there were registered a total of 44 species that constitute 32.7%; the emaciated species all the year round represent 9.3% (N =13). The most exploited vegetative strata were: herbaceous 33.1% (N =46), shrub vegetation 32.4% (N =45) and arboreal 27.3% (N =38), pastures only 7.2% (N =10). Where, four species are agricultural crops: maize (*Zea mays*), bean (*Phaseolus vulgaris*), grass (*Andropogon gayanus* Kunth) and Bufell forage (*Cenchrus ciliaris*).

Table 1. Species of wild flora consumed by the Mexican white tail deer, in the Rio Balsas Depression, Puebla, Mexico

Order; Family; *Scientific Name*	**Common name**	**Vegetative parts**	**Reproductive parts**	**Epoch of year**
Pteridophyta; *Selaginellaceae*				
*Selaginella lepidophylla**	Doradilla	Leaves		May-Oct.
Acanthaceae				
*Dyschoriste micophylla**	Hierba	Leaves		May-Oct.
Agavaceae	Magueyes e izotes (Rosetófilas)			
*Agave angustifolia**	Mezcal		Inflorescence	Mar.-April
*Agave kerchovei*R*	Maguey de Ixtle	Leaves	Inflorescence	Anual
*Agave lechuguilla**	Lechuguilla	Leaves		Sep.-Oct.
*Agave macroacantha**	Espadín o esfacelante		Inflorescence	Sep.-Oct.
*Agave marmorata**	Maguey pulquero, pizorra o pitzome	Leaves	Inflorescence	Mar. Abril
*Agave potatorum**	Maguey papalota o papalometl		Inflorescence	March-April
Agave salmiana	Maguey manso		Inflorescence	March-April
Agave stricta	Espadín o gallinita		Inflorescence	Ago.-Sep.
*Yuca periculosa**	Izote, ixiote, palmito o platanillo		Inflorescence	March April
Amaryllidaceae				
Nothoscordum sp.	Cebolleja	Leaves	Flowers	May-Oct.
Asteraceae				
*Ageratum sp.**	Hierba	Leaves		Mayo-Nov.
*Montanoa sp.**	Acahual blanco	Leaves		Mayo-Nov.
*Montanoa sp.**	Acahual morado	Leaves	Flowers	Mayo-Oct.
Porophyillum punctatum	Comida de venado	Leaves		Mayo-Oct.
Porophyllum tagetoides	Pipicha	Stems and leaves		June-Sep.
*Sanuntalia procambens**	Desconocido	Leaves		June-Sep.
*Sclerocarpus sp.**	Acahual amarillo	Leaves		Mayo-Oct.
Unbesina sp.	Desconocido	Leaves		Mayo-Oct.
Bignoniaceae				
*Tecama stans**	Tronadora, campana amarilla, ixtantil	Leaves		Mayo-Oct.
Boraginaceae				
*Cordia curassavica**	Varita prieta, San Pablito		Fruits	
Erhetia tinifolia	Palo prieto	Leaves		Mayo-Oct.
Heliotropium afficolcicole	Hierba maestra	Stems and leaves		Mayo-Oct.
Bromeliaceae	Bromelias			
Hecthia roseana	Lechuguilla	Leaves		
Leguminosae: *Mimosoideae*				
*Acacia acatlanensis*R*	Chondata	Leaves	Flowers and fruits	June-July
*Acacia cochliacantha**	Cubata negra, cucharito	Leaves	Fruits	Oct.-Nov.
*Acacia pennatula**	Cubata blanca	Leaves	Fruits	Mach Nov.
*Acacia bilimekii**	Tehuixtle	Leaves	Flowers and fruits	Feb.-April
*Acacia coultieri**	Mimbre o guajillo	Leaves		Mayo-Nov.
*Acacia subangulata*R*	Cierrillo, cierrecillo o cierrecilla	Leaves	Fruits	Nov.-January
*Acacia farnesiana**	Huizache	Leaves	Fruits	Annual
Acacia picachensis	Desconocido	Leaves	Flores	May-Oct.
*Harpalyce loeseneriana**	Tamarindo	Leaves		May-Oct.

Table-1 cont……

*Leucaena leucocephala*R*	Guaje	Leaves	Fruits	May-Oct.
Leucaena esculenta	Guaje rojo o de monte	Leaves	Fruits	June-Oct.
*Mimosa goldmanni**	Cierrillo o garavatillo	Stems and Leaves		Dic.-Enero
*Mimosa luisana**	Uña de gato, cumito, madre de los tetechos	Leaves	Fruits	May-Sep.
Lysiloma divaricata	Tlahuitole	Leaves	Flowers and fruits	June-Sep.
*Pithecellobium acatlense**	Barba de chivo	Leaves	Flowers and fruits	Mayo-Sep.
*Pithecellobium dulce**	Guamúchil	Leaves	Flowers and fruits	Ene.-Mayo
*Prosopis laevigata**	Mezquite	Leaves	Fruits	Feb.-Junio
Leguminosae: *Caesalpinioidea*				
*Caesalpinia pulcherrima**	Camarón, pericón, surungana	Leaves	Flowers and fruits	May-June
*Cercidium praecox*R*	Palo verde o mantecoso	Leaves	Flowers and fruits	Anual.
*Haematoxylum brasiletto**	Brasil	Leaves	Flowers and fruits	April-Nov.
Senna holwayana	Canelillo	Leaves	Flowers and fruits	April-Sep.
Senna wizliezenii var. pringeli	Rompebotas	Leaves	Flowers and fruits	April-Sep.
Leguminosae: *Fabaoideae*				
*Chamaecrista zygophylloides**	Desconocido	Leaves	Flowers	May-Oct
*Dalea leptorina**	Escobilla	Leaves		May-Oct.
Erythrina americana	Zompantle o colorín		Flowers	March-Abril
*Eysenhardtia polystachya**	Palo dulce, coatillo, varaduz	Leaves		Mayo-Oct.
*Pachyrrisus sp.*R*	Frijolillo	Leaves	Flowers and fruits	Oct.-Feb.
Phaseolus vulgaris	Frijol	Stems and leaves	Flowers and fruits	April-Oct.
Anacardiaceae				
Cyrtocarpa procera	Coco de cerro o chupandía		Flowers	May-Nov.
Spondias purpurea	Ciruelo o ciruela de cerro		Flowers	May-Nov.
Bombacaceae				
Ceiba aesculifolia	Pochote de aguas o tepesponcho		Flowers	May-June
Ceiba parvifolia R*	Pochote o ceiba	Leaves	Flowers	Nov.-Dic.
Burseraceae				
Bursera arida	Aceitillo	Leaves		March-April
Cactaceae	Cardones, biznagas y nopales			
*Escontria chiotilla**	Quiotilla o chiotilla		Flowers and fruits	Feb.-Sep.
*Hylocereus undatus**	Pitahaya		Flowers and fruits	August-Sep.
Mitrocereus fulviceps	Cardón pachón o huevos de león		Flowers	March-May
*Myrtillocactus geometrizans**	Garambullo		Flowers and fruits	March-May
*Neobuxbaumia mezcalaensis**	Gigante		Flowers and fruits	April-May
Neobuxbaumia macrocephala	Cardón de zopilote		Flowers and fruits	March-April
*Pilosocereus chrysacanhtus**	Cardón viejito o viejita	Stems	Flowers and fruits	Dic.-May
*Pachisereus webery**	Órgano o candelabro		Flowers and fruits	Feb.-May
Stenocereus pruinosus	Pitayo de Mayo		Flowers and fruits	April-May
*Stenocereus stellatus**	Xoconostle		Flowers and fruits	August-Sep.
Ferocactus flavovirens	Biznaga		Flowers and fruits	April-May
*Ferocactus platyacanthus**	Biznaga gigante, asiento de suegra o borreguito		Flowers	April-May
Ferocactus robustus	Biznaga piñita, chichi de conejo		Flowers	April-May
Mammillaria carnea	Biznaga lechuda		Flowers	Nov.-Feb.

Table-1 cont……

*Mammillaria haageana**	Biznaga blanca o cacá de burro		Flowers	Nov.-Feb.
Mammillaria sphacelata	Caca de burro		Flowers	Nov.-Feb.
*Opuntia depressa*R*	Nopal rastrero	Leaves	Flowers and fruits	Annual
*Opuntia imbricata**	Tencholote o tincholote		Flowers and fruits	Annual
*Opuntia pilifera*R*	Nopal de crines	Leaves	Flowers and fruits	Annual
Celastraceae				
Wimmeria microphylla	Estoraque	Leaves		May-Oct.
Commelinaceae				
Commelina erecta	Hierba de pollo	Leaves		May-Oct.
Compositae				
Porophyllum ruderale	Pápalo	Stems and leaves		May-Oct.
Convolvulaceae				
Ipomoea sp.	Bejuco	Leaves		May-Oct.
Ipomoea wolcottiana	Cazahuate blanco		Flowers	January.-Mach
Ipomoea leptotoma R	Temecate		Flowers	Nov.-Feb.
Cucurbitaceae				
Melothria guadalupensis	Sandillita de ratón		Flowers	August.-Nov.
Euphorbiaceae				
Cnidoscolus multilobus	Chichicaxtle de árbol	Leaves		May-Oct.
Euphorbia antisiphylitica	Candelilla	Stems		Annual
*Jatropha dioica**	Zapotillo	Leaves	Flowers and fruits	May-Oct.
Fouquieriaceae				
*Fouquieria formosa Kunth**	Guachapo, tlapacone o tlapacón u ocotillo	Leaves		April-January
Fagaceae				
*Quercus glaucoides*R*	Encino negro	Leaves	Fruits	Oct.-January
*Quercus castanea*R*	Encino roble		Fruits	Oct.-Enero
*Quercus microphylla*R*	Encino enano		Fruits	Oct.-January
Gramineae: *Panicoidaceae*	Pastos o zacates			
Andropogon gayanus Kunth	Pasto llanero	Stems and leaves	Granis	May-Oct.
Cenchrus ciliaris	Zacate Bufell	Stems and leaves		May-Oct.
*Setaria macrostachya**	Zacate	Stems and leaves		May-Oct.
Gramineae: *Poaceae*				
*Bouteloa curtipendula**	Zacate de camino	Stems and leaves		May-Oct.
*Calamgrostis orisabae**	Pasto pajón	Stems and leaves		May-Oct.
*Rynchelytrum repens**	Zacate flor morada	Stems and leaves		May-Oct.
*Setaria geniculate**	Pasto gusano	Stems and leaves		May-Oct.
Zea mays	Maíz	Stems and leaves	Grains	April-Oct.
Gramineae: *Sporobolaceae*				
*Muhlenbergia rigida**	Cola de zorra	Stems and leaves		May-Oct.

Table-1 cont……

Gramineae: *Bambusaceae*				
*Otatea acuminata**	Otate	Stems and leaves		May-Oct.
Lamiaceae				
Salvia sp. R	Salve real de cerro	Leaves		Nov.-Feb.
Loranthaceae				
Cladocolea gracilis	Bejuco de cierrillo	Leaves		May-Dic.
*Psittacanthus ariculatus*R*	Injerto de Tehuixtle	Leaves		Dic.-January
*Psittacanthus sp.*R*	Injerto de encino negro	Leaves		Annual
Malphigaceae				
*Bunchosia lanceolada**	Nanche de zorra o coyotomate		Fruits	June-Sep.
*Byrsonima crassifolia*R*	Nanche		Frutos	June-Nov.
*Gaudichaudia karwinskiana**	Flor de gallito		Flowers	Mayo-Oct.
*Malpighia mexicana**	Nanche rojo		Frutos	June-Sep.
*Maseagnia seleriana loes**	Hoja ceniza	Leaves		Sep.-Nov.
Malvaceae				
Anoda cristata	Alaches	Stems and leaves		May-Oct.
*Herissantia crispa**	Desconocido	Leaves		May-Oct.
Montaneae				
*Mollisina sp.**	Desconocido	Leaves		May-Oct.
Moraceae				
Ficus contifolia	Texcalamate o higo		Fruits	April-Oct.
Ficus goldmani	Mora o amate		Fruits	Mayo-Oct.
Nolinaceae				
Beaucarnea gracilis	Sotolín o pata de elefante	Leaves		Annual
*Dasylirion acrotriche**	Cucharilla	Leaves	Inflorescence	Annual
Onagraceae				
Hauya elegans	Guayabo cimarrón o guayabillo		Fruits	January-Feb.
Orchidaceae				
*Cyrtopodium macrobulbon** *R*	Cañaveral, caña de jabalí, cuernos de vaca	Leaves	Flowers	May-Nov.
Palmacae				
*Brahea dulcis**	Palma de sombrero o soyatl	Leaves		Annual
Brahea nitida	Palmón	Leaves		Anual
Portulacaceae				
Portulaca oleracea	Verdolaga	Leaves		June-Sep.
Rhamnaceae				
*Ziziphus amole**	Manzanita, capulincito, nanche cimarrón o cholulo	Leaves	Fruits	Nov.-January
Rubiaceae				
Hintonia standleyana	Quina	Leaves		Sep.-Nov.
Rutaceae				
Casimiroa calderoniae	Palo de zorro	Cortex and leaves		Annual
Zantothoxylum fagara	Palo hediondo	Leaves		Dic.-Enero
Salicaceae				
Salix chilensis	Sauce		Flowers	Dic.-January
Sapindaceae				
Cardiospermum grandiflorum R	Tres costillas	Leaves		Dic.-January

Table-1 cont……

Sapotaceae				
*Bumellia laete**	Tempesquistle	Leaves	Fruits	April-June
Seraphulariaceae				
*Castilleja sp.**	Hierba	Leaves		May-Oct.
Simaroubaceae	Arbustivas			
*Castela tortuosa*R*	Coronilla, chaparrón, guajillo, venenillo o chaparro amargo	Stems and leaves		June-Dic.
Sterculiaceae				
Ayenia jaliscana	Hierba	Stems and leaves		May-Oct.
Guazuma ulmifolia	Cuajilote o masacote		Grains	
*Waltheria americana**R	Tapacola, cahualillo, cuahuilotillo, jehuite o manrrubio	Stems and leaves	Flowers	May-Oct.
Theophrastaceae				
Jaquinia macrocarpa R*	Palo santo o quelite santo	Leaves	Capulines	May-Nov.
Turneraceae				
*Turnera diffusa*R*	Damiana o itamorreal	Stems and leaves	Flowers	May-Nov.
Ulmeaceae				
*Celtis iguanaca**	Huiscolote o coronilla	Leaves	Fruits	Oct.-Nov.
Verbenaceae				
*Lantana velutina*R*	Manzanita	Leaves		June-Dic.
*Lippia graveolens*R*	Orégano	Leaves	Flowers	June-Oct.

* Observation in microhistological of feces. R = Found in ruminal contents of males of hunting utilization.

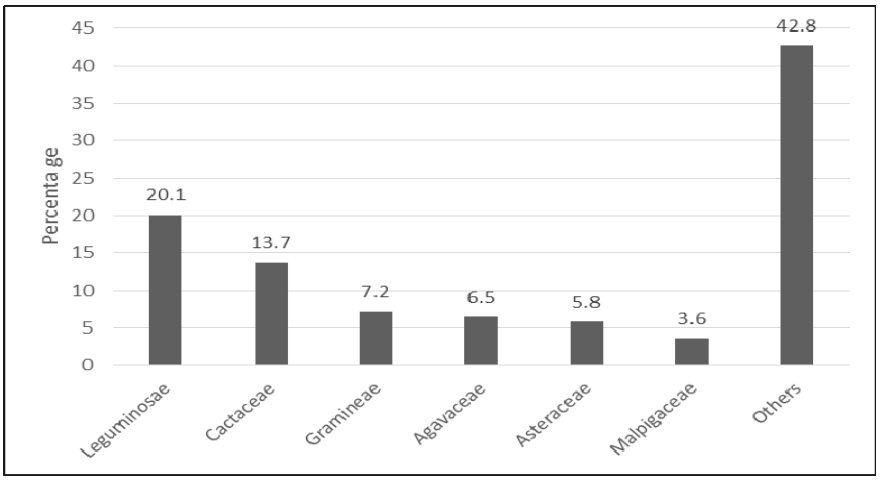

Fig. 1 Percentage of principal groups of consumed plants by the white tail deer in the Rio Balsas Depression, Puebla, Mexico

Of the total of the diversity of available plants by the animal in the region, it was identified for microhistological of plants and feces, in two UMAs from the representative community, 59.7% (N =83). The analysis of the percentage composition in dry matter (DM), registered 46 species of 22 families (Table 2), where seven families represent 71.13% of the DM of the diet these are: Agavaceae 5.9%, Asteraceae 6.9%, Fagaceae 8%, Mimosoideae 34.7%, Faboideae 5.7%, Caesalpinioidea 8.5% and Malphigaceae 1.5 %. Leguminous ones contribute 48.87 % of the DM of the diet. Neither species contributed more than 6 % of the diet; the plants that stand out for their contribution of dry matter (DM) are 17 that contribute 60.44 %; in this case also leguminous stand out with 36.87% (Table 3). Of the above mentioned, 58.8% (N =10) is exploited preferably on the rainy station, 29.4% (N =5) in the low water, and only 11.8% (N =2): Deer feeds so much from their vegetative parts (stems and leaves) as of the reproductive ones (flowers and fruits). On the other hand, it was corroborated in the ruminal contents of nine males of hunting utilization to 26 species (18.7%), standing out in this case: *Agave kerchovei, Quercus glaucoides, Acacia subangulata, Ceiba parvifolia, Pachyrrisus sp., Quercus castanea, Quercus microphylla, Opuntia sp., Castela tortuosa, Lippia graveolens* and *Turnera diffusa*; what confirmed the work of the microhistological technology in terms of its precision [15, 16, 17].

Table 2. Percantages of dry matter (DM) in the Mexican white tail deer´s diet, In the Rio Balsas Depression, Puebla, México

N°	Species	% DM	N°	Species	% DM
1	*Selaginella sp.*	0.98	24	*Pithecellobium dulce*	3.55
2	*Agave kerchovei*	4.68	25	*Prosopis laevigata*	0.98
3	*Agave potatorum*	0.40	26	*Caesalpinia pulcherrima*	0.61
4	*Montanoa sp.*	2.74	27	*Cercidium praecox*	2.74
5	*Montanoa sp.*	4.13	28	*Haematoxylum brasiletto*	4.13
6	*Ceiba parvifolia*	2.34	29	*Senna wizliezenii*	0.98
7	*Ferocactus platyacanthus*	0.83	30	*Eysenhardtia polystachya*	3.27
8	*Ipomoea sp.*	2.09	31	*Pachyrrisus sp.*	2.47
9	*Quercus microphylla*	1.97	32	*Psittacanthus ariculatus*	0.40
10	*Quercus glaucoides*	3.55	33	*Bunchosia lanceolata*	0.98
11	*Quercus castanea*	2.47	34	*Gaudichaudia karwinskiana*	0.51
12	*Rynchelytrum repens*	1.50	35	*Dasylirion acrotriche*	0.98
13	*Otatea acuminata*	0.30	36	*Waltheria americana*	3.14
14	*Acacia acatlanensis*	2.09	37	*Jaquinia macrocarpa*	0.72
15	*Acacia bilimekii*	1.85	38	*Turnera diffusa*	2.22
16	*Acacia coultieri*	2.29	39	*Lippia graveolens*	2.44
17	*Acacia farnesiana*	2.22	40	*Heliotropium afficolcicole*	0.40
18	*Acacia pennatula*	3.13	41	*Casimiroa calderoniae*	2.34
19	*Acacia subangulata*	5.25	42	*Celtis iguanaca*	0.98
20	*Harpalyce loeseneriana*	4.26	43	*Castela tortuosa*	2.09
21	*Leucaena leucocephala*	5.08	44	*Cyrtopodium macrobulbon*	0.30
22	*Mimosa luisana*	2.99	45	*Opuntia pilifera*	2.86
23	*Pithecellobium acatlense*	0.98	46	*Erhetia tinifolia*	2.34

The number of consumed species by this animal in the region of study ratify the great diversity of usable species by the cervid: the woody plants (shrub vegetation and arboreal) and herbaceous, are the most consumed vegetative strata. On the other hand, the botanical composition in DM of the diet confirm the expositions of several authors brings over of the nutritional value of leguminous , as group of highly usable plants for deer, which ratifies its role as selective browsers, As the diversity of species which consumes of this extensive vegetable group [18, 19, 20, 6, 21]. Therefore, we can deduce that in the botanical composition of the diet of the white tail deer in the Rio Balsas Depression, the fundamental species are: *Acacia subangulata, Acacia pennatula, Leucaena leucocephala, Harpalyce loeceneriana, Haematoxylum brasiletto, Pithecellobium dulce, Eysenhardtia polystachya, Agave kerchovei, Quercus glaucoides, Waitheria americana*, and *Montanoa spp.* (Table 3). By smaller amount we can mention to: *Mimosa luisiana, Cercidium praecox, Pachyrrisus sp., Quercus castanea, Opuntia sp., Castela tortuosa, Ceiba parvifolia, Lippia graveolens* and *Turnera diffusa*.

The Similarity Index of the botanical diversity from the species regarding to the microhistological of rumen was 41.3%. Which suggests that the microhistological of feces was better to obtain the botanical diversity of the diet of the deer. On the other hand the index of similarity to the microhistological of feces in relation to the ruminal was alone of 47.1%, this information suggests that it is necessary to analyze major quantity of ruminal contents in deer to have major certainty of the diversity of species consumed by the species. Just there has been reported in red brokcet deer (*Mazama temama*), there exist several reasons (Villarreal *et al*., 2008) that explain the difference of the botanical registered diversity like consumed by *Odocoileus virginianus* with relation to the botanical composition of the detected vegetables by microhistological of feces or ruminal. It is possible that some vegetable species were consumed in a very low proportion of diet or with little frequency, or that the consumed parts of the plant were of great digestibility, reason by which its indigestible fractions are not detected in feces, besides that a condition of balance does not exist in these conditions of food consumption.
There exists positive correlation (0.73) among the UMAs and the years (Table 4), which indicates that in every year, the quantity and food's availability are modified possibly by the environmental conditions. There was no correlation (0.19) between the consumed species and the consumption of vegetative or reproductive parts, which suggests that the food consumption is depending on the food's availability across the year.

Table 3. More important consumed plants for the white-tail deer, in the Rio Balsas Depression, Puebla, Mexico

Species	Contribution % Dry Matter	Vegetative stratum	Epoch
Leguminous			
Acacia pennatula	3.13	Shrub	May-Nov.
Acacia subangulata	5.25	Shrub	Nov.-January
Leucaena leucocephala	5.08	Shrub	May-Oct.
Eysenhardtia polystachya	3.27	Tree	May-Oct.
Pithecellobium dulce	3.55	Tree	January-Mayo
Haematoxylum brasiletto	4.13	Shrub	March-Oct.
Harpalyce loeseneriana	4.26	Herby	May-Oct.
Mimosa luisiana	2.99	Shrub	May-Sep.
Cercidium praecox	2.74	Shrub	March-Oct.
Pachyrrisus sp.	2.47	Herby	Oct.- February
Subtotal leguminous	**36.87**		
Agave kerchovei	4.68	Shrub	Annual
Quercus glaucoides	3.55	Tree	Oct.- January
Quercus castanea	2.47	Tree	Oct.- January
Waltheria americana	3.14	Herby	May-Oct.
Montanoa sp.	2.74	Herby	May-Nov.
Montanoa sp.	4.13	Herby	May-Oct.
Opuntia pilifera	2.86	Shrub	Anual
Total	**60.44**		

The canonical habitat sees influenced negatively for the municipalities (-0.83) and in positive form (0.95) by years (Table 1), which suggests that in every municipality and in every year the food's availability was different for the deer. In relation with the canonical variable of the consumed species, is influenced (0.95) by the type of consumed part, which explains by the epoch of the year in which the deer was hunted for the study. The crossed correlations among the original variables of the habitat and the canonical habitat (Table 4) show that the year of sampling has the highest correlation (0.72); whereas the crossed correlations among the original variables of the vegetables and the vegetable canonical show that the consumed vegetable part has the highest correlation (0.99).

Table 4. Species of wild flora found in ruminal contents of males of big game use in the Río Balsas Depression, Puebla, Mexico

Plant species recorded	Part intake	UMA and Municipality	Epoch (Nov-Feb)	Observations
Acacia subangulata	Leaves	Ejido Santa Cruz Nuevo, Totoltepec de Gro.	2004-2005	
Quercus microphylla	Leaves and fruits			
Castela tortuosa	Leaves			
Agave kerchovei	Inflorescence	Ejido Santa Cruz Nuevo, Totoltepec de Gro.	2004-2005	Ruminal contents of three deer
Quercus glaucoides	Leaves and fruits			
Acacia subangulata	Leaves and fruits			
Pachyrrisus sp.	Leaves and fruits			
Quercus castanea	Leaves and fruits			
Quercus microphylla	Fruits			
Castela tortuosa	Leaves and fruits			
Ceiba parvifolia	Stems and leaves			
Lippia graveolens.	Leaves and fruits			
Acacia acatlanensis	Leaves and fruits			
Ipomoea leptotoma	Leaves and fruits			
Salvia sp	Fruits			
Psittacanthus ariculatus	Leaves			
Byrsonima crassifolia	Leaves			
Cardiospermum grandiflorum	Fruits Leaves			
Waltheria americana	Leaves, fruits and flowers			
Jaquinia macrocarpa	Leaves and fruits			
Lantana velutina	Leaves			
Lippia graveolens	Leaves and fruits			

Table-4 cont……

Cardiospermum grandiflorum *Ipomoea leptotoma* *Salvia sp.* *Ceiba parvifolia* *Ziziphus amole*	Leaves Leaves Leaves Flowers Stems and leaves Leaves	Ejido San Miguel, Chiautla	2004-2005	
Quercus castanea *Bunchosia lanceolada* *Acacia acatlanensis* *Jaquinia macrocarpa* *Pachyrrisus sp.*	Leaves and fruits Cortex Flowers Leaves Leaves and fruits	Ejido San Miguel, Chiautla	2004-2005	
Cydista sp. *Pachyrrisus sp.* *Quercus glaucoides*	Leaves and fruits Leaves and fruits Leaves and fruits	Bienes Comunales Santa Cruz Nuevo. Totoltepec de Gro.	2005-2006	
Eysenhardtia polystachya *Waltheria americana* *Quercus glaucoides* *Agave kerchovei*	Leaves Leaves, flowers Leaves and fruits Leaves	Bienes Comunales Santa Cruz Nuevo. Totoltepec de Gro.	2005-2006	* Present in irrigated crops
*Rynchelytrum repens** *Pachyrrisus sp.* *Anoda cristata** *Quercus glaucoides*	Leaves Fruits Stems and leaves Fruits	Bienes Comunales Santa Cruz Nuevo, Totoltepec de Gro.	2005-2006	* Present in irrigated crops
Agave kerchovei *Cercidium praecox* *Opuntia sp.*	Leaves Flowers Leaves	Ejido Santa Cruz Nuevo, Totoltepec de Gro.	2005-2006	
Maseagnia seleriana *Quercus castanea* *Ipomoea leptotoma* *Mimosa goldmanni* *Hauya elegans*	Flowers Fruits Leaves and fruits Leaves and flowers Fruits	Ejido San Miguel, Chiautla	2006-2007	
Quercus castanea *Poropyillum punetatum* *Ipomoea wolcottiana*	Leaves and fruits Leaves Flowers	Las Salinetas, Axutla	2006-2007	
Melothria guadalupensis *Hauya elegans* *Cardiospermum grandiflorum*	Leaves and fruits Fruits Leaves and fruits	El Cajón, Chiautla	2006-2007	

Correlation: between UMAs and years (0.73), between consumed species and consumption of vegetative or reproductive parts (0.19). The canonical habitat is influenced by municipalities (-0.83) and years (0.95). The canonical variable of the consumed species is influenced by the type of consumed part (0.95). The crossed correlation crossed between the original variables of the habitat and the canonical habitat indicates correlation by year (0.72). The crossed correlations among the original variables of the vegetables and the vegetable canonical show correlation with the vegetable consumed part (0.99).

CONCLUSIONS AND RECOMMENDATION

The diet of "*mexicanus*" white tail deer is more diverse than the reported one for the "*texanus*" subspecies, in the xerophytic desert scrub (Tamaulipan thornscrub) of the northeastern plain of Mexico, animal that is fed on 81 species; constituted by 83% of shrubs, 17% of grasses and only 1% of pastures. On the other hand, it is less diverse than in the "*sinaloae*" subspecies, of the low deciduous forest of Chamela's biological research station, Jalisco; since this geographical race consumes 178 species of 30 families. This study is a fundamental contribution for the managing and administration, of the UMAs of the region of study. It is necessary for future to know the bromatological composition from plants that compose the diet of the deer in the Rio Balsas Depression.

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