

Development Of An Intranet Browse Identification Reference

Leslie D. Zeigler^{1*}, Mark S. Edwards² and Robert E. Bray¹

¹*Animal and Veterinary Sciences, California State Polytechnic University Pomona, Pomona, California USA*

²*Department of Veterinary Services, Zoological Society of San Diego, San Diego, California USA*

The general term "browse" refers to harvest plant materials that are including as a component of a captive animal's diet. These materials may satisfy a nutritional, behavioral or combination of components desired in the feeding program. The Zoological Society of San Diego (ZSSD) maintains a comprehensive list of plant species (browse) which may be used with the animal collections, however there was no associated resource available to identify those same species. Using criteria established by the International Society of Arboriculture (ISA), approximately fifty browse species were identified and described in a ZSSD intranet-based document, as well as a paper-based document. In identifying all browse species that are fed to zoo animals, the possibility maximizing the positive aspects of such food items can be maintained, while minimizing potential negative aspects (e.g., toxicosis).

Key words: **captive diets; forage; plant identification; arboriculture**

INTRODUCTION

Browse, including leaves, twigs, shoots, flowers and fruits, can provide an important component of the zoo animal diet [Oftedal et al., 1996]. It not only influences behavior, but also provides nutritional value that often can not be replicate in manufactured feeds. As the availability of these plants increases for this application, it is of utmost importance to know exactly what species is being fed to the animal. At the Zoological Society of San Diego, the responsibility of harvesting approved plants is divided across both animal care and horticulture personnel. The purpose of a browse identification reference source is to provide zookeepers, volunteers, and other zoo staff a guide to correctly identify the plants that they are harvesting, processing, or feeding. This reference will provide specific species of browse that are suitable for feeding and will ultimately be grouped into those plants suitable for taxonomic groups of animals (i.e. hoofstock).

The protective mechanisms of plants can not be overlooked when incorporating browse plants into captive animal diets. It has been documented that toxicosis from feeding browse has occurred in the zoo setting [Weber and Miller, 1997]. It may not even be appropriate to generalize a level of safety

across a given genus, such as with the genus *Acer*. Red maple (*Acer rubrum*) is known to be toxic and could be confused with a non-toxic maple.

Arborists use three specific regions of a tree for correct identification; bark, leaves, and fruit/flower. Differing species even within families will have unique bark color and pattern, as seen with paper bark acacia (*Acacia woodii*) and karroo thorn (*Acacia karroo*). Additionally, based on the phenology of the plant, not all three components may be present at any given time so special attention to individual details should be practiced.

MATERIALS AND METHODS

A current browse plant list was generated from the plant safety database maintained by the Nutrition Division of the ZSSD Department of Veterinary Services. Criteria used by the International Society of Arboriculture (ISA) were established as the standard format of recording the required information. A member of the Horticulture Department confirmed the identification of each species documented. Structures were photographed using a digital camera with a centimeter rule in the image for reference of scale. Descriptive text accompanied each photograph and was placed into a word processing document. Images recorded included the full tree, bark, leaves, and presence of fruit/flower in accordance with ISA format. Data was then organized on an intranet server accessible to zoo personnel by plant species and browse group with a single image for rapid identification under field conditions. A paper-based edition of the data was made accessible to zoo personnel.

RESULTS

Approximately 50 browse species were identified and accompanied by descriptive text (Table 1). The finished document could be viewed via the ZSSD intranet or printed out in a paper-based format (Fig. 1).

DISCUSSION

The browse identification reference is essential since browse is used in such a large number of diets fed to ZSSD collections. With the increasing use of fresh plant materials, either as an occasional supplement or a significant (>50%) source of daily caloric intake, there is an importance of properly identifying those materials for the safety of the animals [Edwards, 1999]. In some cases, browse may constitute 100% of the animal's consumed diet.

Some plant species have secondary plant compounds associated with them that could be harmful to the animal. These toxins include cyanide, alkaloids, and glycosides. Free-ranging wild animals cope with toxic plants and secondary plant compounds by one of the following strategies: avoidance, dilution, gastrointestinal degradation or detoxification [Fowler, 1981]. Captive animals are at risk of toxicity if given any type of access to poisonous plants. Often exposure to toxicity is accidental. Fowler [1981] cited an incident in which a zoo gardener was supposedly collecting acacia branches (*Acacia sp.*) and inadvertently

snipped a branch of yellow oleander (*Thevetia peruviana*) that contains cardioactive glycosides. In this case, the error was detected before consumption occurred. Attention to detail is fundamental when including browse in the diet. Animals that ingest poison plants could experience gastroenteritis of some degree that could result in death depending on the species and quantity consumed. Zoo animals are dependent on the knowledge and experience of keepers, veterinarians and nutritionists to execute food selection decisions on their behalf.

ACKNOWLEDGEMENTS

Special thanks to the Zoological Society of San Diego's Horticulture Departments, especially Dan Simpson, James Everly, and Robert Thurston.

REFERENCES

- Edwards MS. 1999. Nutritional management of acute and chronic bloat in eastern giant eland (*Taurotragus derbianus gigas*). In: Maslanka MT, Clemens E, editors. Proceedings of the Third AZA Nutrition Advisory Group Conference on Zoo and Wildlife Nutrition. Columbus, OH.
- Fowler ME. 1981. Plant poisoning in captive nondomestic animals. *J Zoo Anim Med* 12:134-7.
- Oftedal OT, Baer DJ, Allen ME. 1996. The Feeding and Nutrition of Herbivores In: Kleiman DG, Allen ME, Thompson KV, Lumpkin S. Wild mammals in captivity: principles and techniques. Chicago, Illinois: University of Chicago Press.
- Weber, M. and Miller, R.E. 1997. Presumptive red maple (*Acer rubrum*) toxicosis in Grevy's zebra (*Equus grevyi*). *J Zoo Wildl Med* 28:105-8.

TABLE 1. Selected list of plants used in animal feeding programs at the Zoological Society of San Diego

Scientific Name	Common Name ¹
<i>Acacia karroo</i>	Karroo thorn
<i>Acacia longifolia</i>	Sydney golden wattle
<i>Acacia saligna</i>	Weeping wattle
<i>Acacia woodii</i>	Paperbark acacia
<i>Acacia xanthophloea</i>	African fever tree
<i>Albizia julibrissin</i>	Silk tree, mimosa
<i>Bambusa beechiana</i>	Beechy bamboo
<i>Bambusa glaucescens</i>	golden goddess bamboo
<i>Bambusa oldhamii</i>	giant timber bamboo
<i>Bambusa textillis</i>	Weaver's bamboo
<i>Bambusa tuldaoides</i>	Punting pole bamboo
<i>Bambusa ventricosa</i>	Budda's belly bamboo
<i>Bauhinia blakeana</i>	Hong Kong Orchid tree
<i>Bischofia trifoliata javanica</i>	Toog tree
<i>Brassaia actynophylla</i>	Umbrella tree, rubber tree
<i>Coprosma ripens</i>	Mirror plant
<i>Eucalyptus sideroxylon</i>	Red ironbark
<i>Fargesia fungosa</i>	NCN*
<i>Fargesia nitida</i>	NCN
<i>Ficus benjamina</i>	weeping ficus, java ficus, laurel
<i>Ficus elastica decorum</i>	Indian rubber plant
<i>Ficus florida</i>	NCN
<i>Ficus microcarpa nitida</i>	NCN
<i>Ficus mysorensis</i>	NCN
<i>Ficus nekбуду</i>	Zulu fig tree
<i>Ficus religiosa</i>	Bo tree, peepul, sacred ficus
<i>Ficus rubiginosa</i>	Rusty fig mulberry
<i>Ficus rumphii</i>	NCN
<i>Ficus thonningii</i>	NCN
<i>Ficus watkinsiana</i>	NCN
<i>Harpephyllum caffrum</i>	Kaffir plum
<i>Hibiscus rosa-sinensis L</i>	Chinese hibiscus, Rose-of-China
<i>Inga vera</i>	NCN
<i>Jacaranda mimosifolia</i>	Jacaranda tree
<i>Morus alba</i>	White mulberry
<i>Opuntia spp.</i>	Prickly pear cactus
<i>Phyllostachys aurea</i>	Golden bamboo
<i>Phyllostachys aureosulcata</i>	Yellow groove bamboo
<i>Phyllostachys nigra</i>	Black bamboo
<i>Phyllostachys vivax</i>	NCN
<i>Populus spp.</i>	Poplar, aspen, cottonwood

TABLE 1 (cont'd). Selected list of plants used in animal feeding programs at the Zoological Society of San Diego

Scientific Name	Common Name¹
<i>Saccharum officinarum</i>	Sugar cane
<i>Salix babylonica</i>	Weeping willow
<i>Strelitzia spp.</i>	Giant bird of paradise
<i>Syzgium paniculatum</i>	Brush cherry
<i>Tecomaria capensis</i>	Cape honeysuckle
<i>Tipuana tipu</i>	Tipu tree, rosewood
<i>Tropaeolum majus</i>	Nasturtium, Indian cress

¹NCN= no common name.