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SIMILARITY AND VARIATION IN PLANT NAMES IN FIVE TUPI-GUARANI LANGUAGES (EASTERN AMAZONIA)

William Balée and Denny Moore

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SIMILARITY AND VARIATION IN PLANT NAMES IN FIVE TUPI-GUARANI LANGUAGES (EASTERN AMAZONIA)

William Balée and Denny Moore*

ABSTRACT

This paper examines similarity and variation in plant words in five Tupi-Guarani languages of eastern Amazonia. These languages are Araweté, Asurini, Ka'apor, Tembé, and Wayãpi. The paper attempts to explain why words denoting certain plants are nearly the same in most of these languages whereas words for other plants are highly variable from one language to another. A total of 625 plant names from these languages were elicited for 167 botanical species, divided among non-domesticates, semi-domesticates, and domesticates. Plant names are of two basic types, metaphorical/descriptive and literal. The results show clearly that (1) the more intensively managed plants have higher rates of similarity in their names from one language to another; (2) a nomenclatural system appears to intervene between degree of plant management and similarity of names--the types of names which the nomenclatural system assigns to domesticates strongly tend to be literal, the types assigned to semi-domesticates show an increasing proportion of metaphorical terms, and the majority of those assigned to non-domesticates are metaphorical; (3) the literal plant terms strongly tend to be much more similar from language to language than are metaphorical terms, regardless of degree of domestication of the referents; and (4) the ratio of literal to metaphorical plant words, combining names from all plant management types, is not significantly different between the five languages. It is suggested that cultural factors of plant management and the plant naming system combine with the linguistic properties of names and diachronic linguistic processses to produce similarity and variation in plant vocabulary.

RESUMO

O presente trabalho investiga similaridades e variações de nomes para plantas em cinco línguas Tupi-Guarani da Amazônia oriental. Estas línguas são Araweté, Asurini, Ka'apor, Tembé e Wayãpi. Faz-se uma tentativa de explicar por que palavras que se referem a certas plantas são muito similares enquanto que palavras para outras plantas variam muito de uma língua para outra. Foram registrados um total de 625 nomes de plantas destas línguas para 167 especies

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botânicas, divididos entre plantas não-domesticadas, semi-domesticadas e domesticadas. Nomes para plantas são de dois tipos básicos, metafóricos/descritivos e literais. Os resultados mostram que (1) nomes para as plantas mais intensamente manejadas têm taxas mais altas de similaridade de uma língua para outra; (2) um sistema de nomenclatura parece intervir entre o grau de manejo das plantas e a similaridade dos nomes - os tipos de nomes que o sistema de nomenclatura compartilha entre plantas domesticadas apresentam uma tendência a serem literais; os tipos compartilhados entre semi-domesticadas mostram uma proporção crescente de termos metafóricos e a maioria daqueles compartilhados entre não-domesticadas são metafóricos; (3) os nomes literais para plantas demonstram forte tendência a serem muito mais similares de uma língua para outra em comparação com os nomes metafóricos, independente do grau de domesticação dos referentes; e (4) as proporções de nomes literais e metafóricos para todos os tipos de manejo não variam significantemente entre as cinco línguas. Propõe-se que fatores culturais de manejo de plantas e o sistema de nomenclatura das plantas em combinação com as propriedades lingüísticas de nomes e processos de lingüística diacrônica produzem similaridades e variação no vocabulário das plantas.

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INTRODUCTION

We may note, in passing, that the double or compound names are the most doubtful. They may consist of two mistakes; one in the root or principal name, destined almost always to indicate the geographical origin, some visible quality, or some comparison with other species. The shorter a name is, the better it merits consideration in question of origin or antiquity; for it is by the succession of years, of the migrations of peoples, and of the transport of plants, that the addition of often erroneous epithets takes place. (from ALPHONSE DE CANDOLLE, Origin of Cultivated plants [orig. Fr. 1886]).

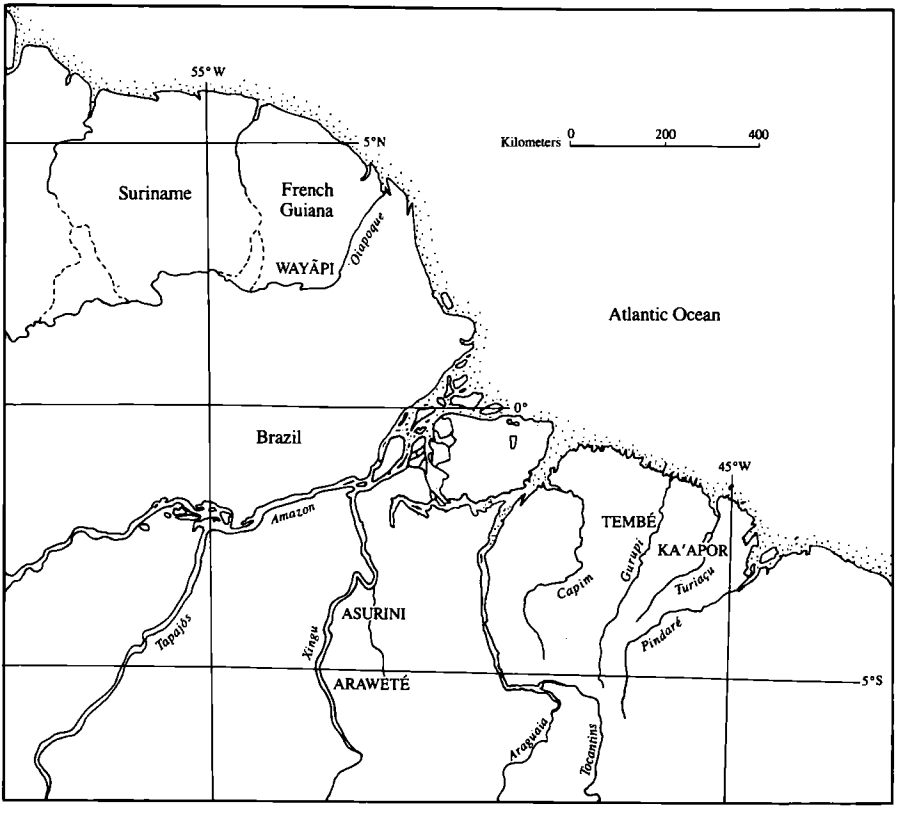
Why is it that within a family of genetically related languages (i.e. descended from a common mother language) words denoting certain referents or concepts are nearly the same in most of the languages whereas words for other referents or concepts are highly variable from one language to another? For example, in the Tupi-Guarani family, the words for 'bacaba' are similar in

five languages: Araweté (Ar) **pinuwa-ʾi**, Asurini (As) **pinuwa-ʾiwa**, Ka'apor (K) **pinuwa-ʾi**, Tembé (T) **pinuwa-ʾiw**, Wayãpi (W) **pino**. By contrast, the words for 'moela de mutum' are bewilderingly different: Ar **iwa-pedi**, As **iwa-kaw-ʾiwa**, K **kupapa-ʾiran-ʾi**, T **iwa-zu-ʾiw-ran**, W **mitũ-ʾay**.

This paper attempts to answer this question, at least partially, for the semantic domain of ethnobotany, by investigating similarity and variation among words for a given corpus of plant species in five different languages of Tupi-Guarani. These five languages are spoken in a broad arc in lower Amazonia. The possible factors that may *a priori* help explain why words for some plant species are similar while words for others vary across languages of the same family include (1) cultural ones, such as plant utility and/or management; (2) geographical ones, such as proximity and similarity of environments; (3) diachronic linguistic ones, such as borrowing and degree of genetic relatedness, as well as (4) the linguistic properties of the words used to designate plants, including their morphological or semantic structure. An investigation of such factors, to our knowledge, has never before been carried out with regard to South American languages. We have collected data on similarity and variation of words for 167 botanical species native to the neotropics in the Araweté, Asurini do Xingu, Ka'apor, Tembé, and Wayãpi languages of eastern Amazonia (Tables 1, 2, and 3). Although these data were collected initially for non-linguistic purposes, they are highly appropriate for the investigation of factors involved in similarity and variation in plant words among different languages of the same family.

First, the five languages are dispersed in four linguistic sub-groupings of Tupi-Guarani (A.R. Rodrigues 1984/85; A.R. Rodrigues, pers. comm. 1988), with only Wayãpi and Ka'apor being classified in the same sub-grouping. Second, these five languages are spoken in three ecologically diverse regions: the Xingu River basin of north-central Brazil for Araweté amd Asurini, the Gurupi/Turiaçu River basins of extreme eastern Amazonia for Ka'apor and Tembé, and the Oiapoque River basin of northern Amazonia for Wayãpi. Third, although all five groups are horticultural, they exhibit notable differences in crop staples and patterns of utilization of non-domesticated species. For example, the Araweté rely heavily on maize, in contrast to the other groups who are more dependent on tubers; the Asurini traditionally eschewed hog plum (*Spondias mombin* L.), which is an esteemed edible fruit of the other groups. Fourth, collections and determinations of voucher specimens for most of the 167 species in our sample have been obtained for the five languages. Finally, the corpus of data is large enough to test statistically propositions regarding similarity and variation in plant words across the five languages.

Some years ago, Brent Berlin and his colleagues (Berlin et al. 1973) published a pioneering paper on the retention of plant words in two Mayan languages. They proposed that such retention reflected the cultural



Map showing approximate locations of Araweté, Asurini, Ka'apor, Tembé, and Wayāpi Indians of eastern Amazonia.

importance of the plants designated by those words. The present study differs from that of Berlin et al. (1973) in several ways. First, we introduce comparable data on five languages of the same language family as opposed to two, yielding comparison of 10 pairs of languages instead of one. Second, the present study is organized according to botanical referents instead of indigenous plant words themselves. Whereas Berlin et al. (1973) generally compared folk generic names for botanical species held in common between the two Mayan groups and then counted pairs of similar words, we compare similar and dissimilar words in terms of the botanical species themselves. Third, the present study shows dissimilar as well as similar names for botanical species and all these names are glossed morphemically. As such, our data permit insights into patterns of nomenclature of plants and the relationship of these patterns to culture. Despite the differences, the findings of this study independently support the contention of Berlin et al. (1973) that some cultural process is involved in the similarity of plant words. We suggest, however, that the analysis of Berlin et al. (1973) may be further refined in terms of identifying the exact cultural and linguistic processes at work.

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DATA AND METHODS

Data Sources

A total of 625 names for the 167 botanical species were obtained from the five languages. These data are presented in Tables 1, 2, and 3. Indigenous plant names are divided among the five languages as follows: 114 (Ar), 90 (As), 160 (K), 125 (T), and 136 (W). All 136 names in W are derived from Grenand's published study (1980), and these are supported by his voucher numbers and determinations. Of the remaining 489 names in the other four languages, 399 are represented by voucher numbers on the series Balée (voucher specimens are deposited at the New York Botanical Garden with duplicates at the Museu Paraense Emílio Goeldi). In other words, 535 (87%) of the plant names in our data are supported by voucher numbers, either by Balée or Grenand (1980). Many names that were not documented by voucher numbers refer to species whose identities were unmistakable in the field, especially domesticates. Of the 45 Tembé names not supported by a voucher number, 42 were obtained from Boudin's published dictionary (1978). Other names for some of the 19 species in Araweté and 17 in Asurini which were not documented by voucher numbers were obtained from Eduardo Viveiros de Castro (pers. comm. 1988), Aryon D. Rodrigues (pers. comm. 1988), and Velda Nicholson (1982). These names tend to refer to extremely well-known domesticated species. The nine Ka'apor names not documented by voucher numbers were supplied by Balée based on reliable field determinations of species.

Each plant name associated with a voucher number in the series Balée (for Ar, As, K, and T only) was elicited from several informants by Balée at the moment of its collection. Each name was later checked for accuracy in the village. Data were recorded in phonetic transcription. Balée is a native speaker of English, fluent in Portuguese, with reasonable speaking fluency in Ka'apor; he has some linguistic training.

Data Format

Tupi-Guarani is not phonologically difficult. The accuracy of the transcription of plant words in these five languages is reasonably high. For example, the c/č allophony and the schwa phoneme in Tembé appeared in Balée's transcription as predicted by Bendor-Samuel (1966). There are probably some minor errors in transcription, for example, in i vs. ɨ, ə vs. ɨ,

full vs. partial nasalization, exact quality of labial vs. bilabial fricatives, and vowel/glide distinctions.

One standardized orthography is used for the five languages. Stress falls on the last syllable in As, K, T, and W unless otherwise indicated; stress in Ar and As is irregular and has been indicated for each word (1).

Morpheme-by-morpheme glosses are given for maximum opportunity to confirm or counteranalyze our results and to use the data for other purposes. Glosses for the most part are supplied by Balée, except for W words, the glosses for which come from Grenand (1980). Many suggestions on glossing and advice on transcription were supplied by A.D. Rodrigues, based on sources unavailable to us. Word boundaries are undetermined.

Method of Comparison

Measuring similarity and variation of vocabulary between related languages is different from the procedures of historical linguistics--reconstruction using the comparative method. This paper asks the question, given a botanical species, what are the words for it in various languages of the same family and are these words similar or different? This reflects well the common sense notion of what is meant by similarity and can be quantified in a straightforward way. In diachronic linguistics, on the other hand, one searches for cognate terms showing systematic sound correspondences, allowing, if necessary, a considerable degree of semantic 'shift' of the referent. There is no concern with determining non-cognacy, which is difficult with incomplete collections and without knowledge of the full range of meaning of each word.

In order to determine whether words in two languages are similar or different it is necessary to specify a comparable range of meaning for them (such as the biological species) to prevent problems of overlapping (see Alcorn 1984:270). Consider, for example, the Ka'apor and Tembé names for 'jarana' and 'caçador,' which are two species in the Brazil nut family:

	K	T
Lecythis cf. *chartacea* Berg	**iwiri-ʾi**	**iwiri-ʾiw**
Lecythis idatimon Aubl.	**yaši-amir**	**iwiri-ʾiw-pitã**

If the range of meaning were not restricted and "looking up and down the list" were permitted, then from the point of view of Tembé, both words would have a similar Ka'apor counterpart, on the basis of the head terms, **iwiri**. But paradoxically, from the point of view of Ka'apor, only one of the words has a similar counterpart in Tembé. The situation would become yet more confusing when considering five instead of two languages. Further, a skewing would result in that a pair of languages both having relatively complete collections would offer a greater possibility of finding similar words than would a pair of languages both having relatively incomplete collections.

So it is necessary to restrict the range of meaning of the referent, then examine whether the words for it are similar or different. We opted to restrict referents to the taxonomic rank of botanical species. This is because one may argue that the botanical species is the most objective level of abstraction for distinguishing between individual plants. The species is more objective than higher order units, such as tribes, genera, and families, since "rank is not inherent in supraspecific groups" (Cronquist 1968:31) [2]. Species are natural units, not products of mind (see Gould 1980:204-213).

Species, for our purposes, are also more suitable referents for comparing indigenous plant names than taxa of infraspecific ranks. The classification of many neotropical cultivars (i.e., varieties) of a single botanical species is far from possessing taxonomic exactitude. In their taxonomic revision of the genus *Manihot* (which includes cultivated manioc, *Manihot esculenta* Crantz), for example, Rogers and Appan (1973:34) observed that "It is impossible to apply formal subspecific taxon epithets to fleeting variants which are not related to some precise geography or ecological region." In an exhaustive study, Albuquerque and Cardoso (1980) discussed several possible means of classifying manioc cultivars. One classification was based on color of the tuber, yielding only three basic types: white, yellow, and cream. Each of these types had sweet, bitter, and sweet/watery sub-types. Each sub-type was further subdivided into cultivars that had erect stem habits vs. ones that showed branching stem habits. The total number of phenotypically distinct cultivars based on this classification, then, would be only 18 (cf. Albuquerque and Cardoso 1980:138-139). Another proposed classification scheme, based on floral parts, yielded only 6 possible cultivars. The number of phenotypically distinct manioc cultivars named and recognized by the Ka'apor, however, is at least 19 (Balée and Gély 1989:138); the Wayãpi name as many as 29 (Grenand 1980:310). The lack of correspondence between folk species and botanical infraspecific taxa is not limited to manioc. With respect to neotropical cotton (*Gossypium barbadense* L.), Fryxell (n.d.) wrote: "There are many difficulties in determining the identity of individual plants among the tetraploids from the Greater and Lesser Antilles (and elsewhere), where spontaneous and artifical hybridizations among different taxa have blurred the distinctions between them and made a rational classification difficult at best." No "correct" taxonomic

criteria exist for distinguishing between categories more or less encompassing than the species (see Gould 1980:206) with the obvious exception of the individual plant. For logistical reasons, it was not feasible to obtain responses in the five languages for individual plant specimens.

One of the criteria for including species in our list was that they be of neotropical origin. This is because names for non-neotropical species, clearly, would be most likely introduced and hence of non-Tupi-Guarani origin as well. There is some doubt, nevertheless, about the origins of a few species included in our analysis, all of which are domesticates. These include papaya (*Carica papaya* L.), bananas and plantains (*Musa* spp.), and bottle gourds (*Lagenaria siceraria* Mol.). As for papaya, it has been most recently argued on botanical grounds that it is a New World cultigen (Storey 1976:23); moreover, Sousa (1974: 99) refers to its introduction in 16th century Bahia, indicating that it came from Pernambuco to the north. Although the genetic evidence indicates a Southeast Asian origin for bananas, Smole (1980) argued that *Musa* spp. existed in the neotropics in pre-Columbian times. Early 16th century explorers noted that the Tupinambá cultivated bananas and called these **pakoßa** (Léry 1960:157; Lisboa 1967:122; Sousa 1974:98; Vasconcellos 1865:136), a reconstructable term in Proto-Tupi-Guarani (A.D. Rodrigues, pers. comm. 1988). Bottle gourds were also cultivated by the aboriginal Tupinambá (Sousa 1974:95). The bottle-gourd probably probably arrived in South America via Africa in remote pre-Columbian times (Heiser 1979:114-116). Although it is probably not, therefore, a true native to the neotropics, it seems unlikely that it was introduced by human beings (but see Lathrap 1977). This means that there is no *a priori* reason to assume that the name for it in modern Tupi-Guarani languages was introduced. Our exclusion of "borrowed" plants is, first, an attempt to exclude borrowed words. All domesticates here included are of sufficient antiquity in the neotropics (i.e., probably older than the five languages in our analysis) that they can be considered for historical linguistic purposes to be neotropical.

One other requirement for species inclusion in our comparison concerns the number of responses. Only species for which names in three or more of the five languages were obtained are included. This is to guarantee that each species occurs in at least two of the three ecological regions. If species were included where there were only two or more responses, then the ecological region occupied by proximate groups (the K/T and the As/Ar) perhaps would be overrepresented in the lists of species. It is plausible, moreover, that linguistic borrowings are more likely to exist between neighbors. The three-or-more rule, then, is one more means of controlling the possible occurrence of borrowed words between the five languages in the sample. As will be seen, we are able to draw statistically significant conclusions about similarity and variation in plant words between these languages on the basis of the data.

Before either of us had read the Berlin et al. (1973) article, and while field collections were being made, it seemed that a pattern of similarity and variation in plant names between these Tupi-Guarani languages was at least partly a function of degree of human management of plants (Balée 1987, 1989a). Patterns of plant nomenclature appear to segregate traditionally cultivated and non-cultivated plants. These patterns may be summarized as follows: (1) life-form heads (for example, K **mira, ka'a, sipo**) are not incorporated into names for traditional cultigens; (2) animal morphemes are incorporated into names for traditional cultigens only when the animals are not ecologically associated with the plants themselves; (3) "obscure" plant names (i.e., names that do not incorporate plant morphemes, such as K **akuši-nami** 'agouti-ear,' which refers to a rubiaceous forest herb) do not denote traditional domesticates; (4) morphemes referring to divinities (such as K **kurupir**) and to the state of being 'false' (or 'similar') (K **-ran,** Ar **-rĩ,** As **-rana,** T **-ran,** W **rã**) are only incorporated into words that do not refer to traditionally cultivated plants (Balée 1989b).

Three basic kinds of plant species can be identified in terms of management. These are non-domesticates, semi-domesticates, and domesticates. Non-domesticates typically occur in primary well-drained forest, archaic vine forests, or swamp forests. These are zones where contemporary human interference in species composition and dominance is, or recently has been, negligible. Well-known non-domesticates from Table 1 include wild cashew (*Anacardium giganteum* Hancock ex Engl.), *Conceveiba guianensis* Aubl., and *Capparis*. Although some non-domesticates may sporadically occur in zones of recent human inteference, such as swidden fallows, they do not appear to gain dominance other than in fairly undisturbed forests.

Semi-domesticates, in contrast, do not generally appear to become ecologically dominant without human interference, usually by horticultural fires and/or the seemingly random tossing away of viable seeds. A few of these species (such as *Annona montana* Macf. var. *marcgravii* 'araticum' and *Theobroma grandiflorum* Schum. 'cupuaçu'--see Table 2) are deliberately planted and carefully protected, by one or more of the five groups, but without cross-cultural regularity and only sporadically. As such, the category of semi-domesticates corresponds very well with that of "protected plants" in Berlin et al. (1973:146). Most of the semi-domesticates in Table 2 are disturbance indicators as well. By their presence and/or dominance, they tend to indicate former sites of human habitation and horticultural fields. These species are also extremely efficient in dispersing themselves and are thus widely encountered throughout the Amazon basin. Disturbance indicators include *Spondias mombin* L. 'hog plum', *Jacaratia spinosa* A.DC., 'wild papaya' (Lisboa et al. 1987:55), *Didymopanax morototoni* (Aubl.) Decne. & Planch 'morototó' (Huber 1909:161), *Maximiliana maripa* (Corr. Serr.) Drude 'inajá' (Pesce 1985:66; Schulz 1960:222), several species of *Inga*, specifically, *Inga alba*

TABLE 1: NAMES OF NON-DOMESTICATED PLANT SPECIES IN FIVE TUPI-GUARANI LANGUAGES[1]

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÃPI
ANACARDIACEAE (Cashew family)					
001. *Anacardium giganteum* Hancock ex Engl. cajueiro do mato	-	-	akayu-ɨ (L) L-tree (B2282)	akazu-ɨw-ete (L) L-tree-true (B1122)	akayu-u (L) *Anacardium occidentale*-big (G220)
002. *Astronium lecointei* Engl. muiracatiara	-	ka'a-tai-'ɨwa (M) forest-spicy-tree (B2449)	ara-kanei-'ɨ (M) macaw-resin-tree (B2209)	zarákaci-'aran-'ɨw (M) *Jaracatia*-similar-tree (B1512)	-
003. *Thrysodium* cf. *spruceanum* Benth. castanha do porco	-	waruwa-'irána (M) reflector-similar (B2364)	tatu-mɨra (M) armadillo-tree (B437)	manume-ran-'ɨw (M) *Ageneiosus* sp. (a fish)-similar-tree (B1493)	anɨle-wisi (M) bat-feces (G224)
004. *Tapirira guianensis* Aubl. tatapiririca	tàkàré-me'e-'a-'ĩ (?) ?-some-fruit-tree (B1669)	-	tayahu-mɨra (M) white lipped peccary-tree (B1069)	tata-piririk-'ɨw (M) fire-crackling-tree (B1203)	tata-plilil (M) fire-crackling (G253)
ANNONACEAE (Custard apple family)					
005. *Anaxagorea dolichocarpa* Sprague et Sandw.	-	-	teremu-mɨra (M) ?-tree (B937)	pira-iwa-pihun (M) fish-fruit-black (B1560)	sa'i-melu-ka'a (M) grandmother-housetiy-herb (G249)
006. *Duguetia* sp. envira pindaiba	iwirã̃-amute (M) tree-other (B2063)	-	pina-'ɨ (M) fish hook-tree (B2664)	-	pina-'ɨ-tay (M) fish hook-tree-spicy (G248)
007. *Fusaea longifolia* (Aubl.) Sall. envira preta	-	-	karãtu'ã-'ɨ (L) L-tree (B2885)	pina-'ɨw-hu (M) fish-hook-tree-big (B1349)	yãwĩ-kala (M) tortoise-yam (G267)
008. *Guatteria chrysopetala* (Steud.) Miq. envira	tãiwi-'i (L) ?-tree (B1752)	-	tata-iran-'ɨ (M) fire-similar-tree (B231)	-	ɨwi (M) lashing material (G231)
009. *Xylopia nitida* Dun. bitterwood, envira cana	yáwi-'i (L) L-tree (B2062)	yawi-ɨwa (L) L-tree (B2549)	yawi-'ɨ (L) L-tree (B344)	tupã-wɨra (M) thunder-tree (B1103)	yãwĩ-'ɨ (M) tortoise-tree (G267)
APOCYNACEAE (Dogbane family)					
010. *Aspidosperma* sp. araracanga	iwirára-'i (L) L-tree (B165)	pepemɨra (?) ? (B2491)	-	arar-ãkã-'ɨw (M) macaw-head-tree (B1083)	peiakuta-piñũ (L) L-black (G244)

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÃPI
011. *Lacmellea aculiata* (Ducke) March. pau de colher	-	-	**kuyeri-ɨ** (M) spoon-tree (B26)	**wɨra-kuzer** (M) tree-spoon (B1091)	**tapele-yuwa** (?) old village-? (G252)
012. *Parahancornia amapa* (Huber) Ducke milk tree, amapa	-	-	**apa-'ɨ-tuwɨr** (L) L-tree-white (B2895)	**amapa-cĩ-ɨw** (L) L-white-tree (B1193)	**amapa** (L) L (G223)
013. *Tabernaemontana angulata* Mart.	**amenó wai-'i** (?) ?-tree (B1759)	-	**kaw̃aruhu-mɨra** (M) paca-tree (B1015)	**pɔkɔ-'a-tɨpɨ** (M) paca-fruit-? (B1555)	**yapukuliwa** (L) L (G266)
ARECACEAE (PALMAE) (Palm family)					
014. *Astrocaryum munbaca* Mart. mumbaca	**yára-'i** (L) L-tree (B1764)	-	**yu-'ɨ** (M) spine-tree (B1021)	**marai-zɨwa-'ɨw** (L) L-fruit-tree (B1406)	**patali** (L) ? (G301)
015. *Bactris maraja* Mart. marajá	**maráya-'i** (L) L-tree (B1955)	-	**maraya-'ɨ** (L) L-tree (B824)	**maraza-'a** (L) L-fruit (MB131)	**alawale** (L) ? (G297)
016. *Geonoma baculifera* (Poit.) Kunth. ubim	-	-	**owi** (L) L (B922)	**uwi** (L) L (B1549)	**owi** (L) L (G300)
017. *Geonoma* sp.	-	-	**owi-ran** (L) L-similar (B2965)	**uwi-ran** (L) L-similar (B1591)	**owi-tã** (L) L-similar (G300)
018. *Iriartea exorrhiza* (Mart.) Wendl. paxiuba	**páci-'i** (L) L-tree (B2068)	-	**paši-'ɨ** (L) L-tree (B3541)	**paci-'ɨw** (L) L-tree (B4026)	**pasi-'ɨ** (L) L-tree (G301)
019. *Mauritia flexuosa* Mart. moriche palm, buriti	**murucí** (L) L - -	-	**mɨrĩšɨ** (L) L - -	**muricí** (L) L (MB166)	**mɨɨɨsi** (L) L (G300)
020. *Syagrus* sp. pati	**ɨrɨrí** (L) L (B960)	-	**marari-'ɨ** (L) L (B2303)	-	**malaɨiapu** (L) L (G299)
BIGNONIACEAE (Bignonia family)					
021. *Arrabidaea* sp. cipó cruz	**yuwarã-hipa** (?) ?-vine (B1956)	**kurɨma** (?) ? (B2442)	**musu-sɨpo** (M) eel-vine (B2225)	-	-

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÁPI
022. *Pachyptera standleyi* (Steyerm.) Gentry	hipə-karã (M) (vine-yam) (B2021)	ipa-rimũ (M) vine-creeper (B2471)	-	-	yãwĩ-tem (M) tortoise-penis (G295)
023. *Tabebuia serratifolia* (Vahl.) Nichol. greenheart, pau d'arco amarelo	tayipá (L) L - -	ĵĩ-'á (L) L-fruit (B2347)	tayɨ-po (L) L-other (B2189)	tazɨw (L) L (MB249)	tayɨ (L) L (G253)
BOMBACACEAE (Bombax family)					
024. *Ceiba pentandra* Gaertn. kapok tree, sumaumeira	-	tarawiri-rána (M) lizard-similar (B2425)	waʒĩgĩ (L) L (B2260)	iwi'um-'ɨw (L) L-tree (B4022)	kumaka (L) L (G236)
BORAGINACEAE (Borage family)					
025. *Cordia scabrifolia* A. DC. aloewood, freijó	táiwi-'i (L) L-tree (B799)	apiterew-ɾwa (M) bald-tree (B2567)	apə-'ɨ-tuwɨr (L) L-tree-white (B2655)	-	-
BURSERACEAE (Bursera family)					
026. *Protium aracouchini* (Aubl.) March. acouchi tree, breu	piñi-i-cə̃ (L) L-tree-black (B1660)	-	yawa-mɨra (M) jaguar-tree (B969)	waruwa-iran-'ɨw (M) reflector-similar-tree (B1530)	-
027. *Protium giganteum* Engl. incense tree, breu branco	-	waruwa-'ɨwa (M) reflector-tree (B2572)	kanel-'ɨ-tuwɨr (M) resin-tree-white (B1061)	hɨkətə-'ɨw-cĩ (M) resin-tree-white (B1111)	-
028. *Tetragastris altissima* (Aubl.) Swart. cedar of Guiana, breu-manga	piñi-'i-əhó (L) L-tree-big (B1769)		waruwa-'ɨ (M) reflector-tree (B8)	iwa-pe-piraʒ̃-'ɨw (M) fruit-flat-red-tree (B1376)	yaya-'ɨ (L) L-tree (G267)
029. *Trattinickia burserifolia* Mart. incense tree, breu sucuruba	iciri-'i (L) L-tree (B1779)	ihɨk-ɪrɨwa (M) resin-tree (B2369)	kɨrɨ-hu-'ɨ (L) L-big-tree (B876)	kɨrɨ-wa-'ɨw (L) L-fruit-tree (B1408)	waluwa-'ɨ-sĩ (M) reflector-tree-white (G258)
CAPPARIDACEAE (Caper family)					
030. *Capparis* sp. caper tree	yapə-tãi-'i (M) crested oropendola- spicy-tree (B1828)	ɨwɨra-tái (M) tree-spicy (B2534)	sawɨya-mɨra (M) rat-tree (B998)	-	-

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÃPI
CARYOCARACEAE (Butternut family)					
031. *Caryocar glabrum* (Aubl.) Pers. bat's souari, piquiarana	-	-	p+k+'a-ranI-'+ (L) L-similar-tree (B113)	p+k+'a-ran-'+w (L) L-similar-tree - -	peke'a-lã̀ (L) L-similar (G246)
032. *Caryocar villosum* (Aubl.) Pers. butternut tree, piquiá	-	-	p+k+'a-'+-te (L) L-tree-true (B1038)	p+k+'a-ete (L) L-true (MB197)	peke'a (L) L (G246)
CECROPIACEAE (Mulberry family)					
033. *Pourouma guianensis* Tréc. sucuba	-	-	ka'a-me-'+ (L) forest-?-tree (B2690)	ama-'+w-cĩ (L) L-tree-white (B1331)	kale-te (M) rugged-very (G233)
CHRYSOBALANACEAE (Tropical rose family)					
034. *Hirtella racemosa* Lam. var. *racemosa* caraiperana	yãnə-'i (M) spider-tree (B1656)	-	mukuku-'+-wi (L) L-tree-little (B1058)	weri-ruwai-ran (M) howler monkey-tail-similar (B1550)	yanu-'+ (M) spider-tree (G264)
035. *Licania apetala* (E. Mez.) Fritsch pottery tree, caraipé	tacipe-'i (L) L-tree (B1861)	takipe-ci-'+wa (L) L-white-tree (B2499)	-	takipe-'+w (L) L-tree (B1107)	-
036. *Licania canescens* R. Ben. macucu	-	-	we-pini-'+-tuwi+r (M) fruit-striped-tree-white (B245)	iwa-pin-'+w (M) fruit-striped-tree (B1439)	pa-yula (M) paca-stairs (G246)
037. *Licania heteromorpha* Benth. var. *heteromorpha* macucu de sangue	tatə-papénan-I (M) armadillo-claw-similar-tree (B1804)	-	mukuku-'+ (L) L-tree (B175)	-	wi+la-+mi+-'+ (M) tree-dark sap-tree (G259)
CLUSIACEAE (Garcinia family)					
038. *Clusia* sp. strangler vine, apuí	añĩ-adapéke-'i (M) divinity-?-tree (B1899)	-	apo-'+ (L) L-tree (B964)	apu-'+w-pihun (L) L-tree-black (B1231)	añã-pãpã (M) divinity-claw (G270)
039. *Rheedia* sp. bacurizinho	kərə-petimi-'i (M) divinity-tobacco-tree (B1647)	kurúpi-ti-'+wa (M) divinity-place-tree (B2319)	pakuri-sõsõ-'+ (L) L-?-tree (B2997)	-	kulu-pitã (M) divinity-red (G235)

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÁPI
040. *Symphonia globulifera* L. doctor's gum, anani	-	-	ɨratɨ-'ɨ (M) wax-tree (B2973)	ɨratɨ-'ɨw (M) wax-tree (MB78)	**wanani** (M) wax (G258)
041. *Tovomita* sp. sapateiro	-	-	**yapu-mɨra** (M) crested oropendola-tree (B938)	**magi-'ɨw-ran** (M) mango-tree-similar (B260)	**pasi'ɨ-wapo** (M) *Iriartea exorrhiza*-tree-root (G245)
COMBRETACEAE (Combretum family)					
042. *Buchenavia* sp. cuiarana	-	-	**yakuširi-'ɨ** (L) L-tree (B185)	**wakawa-'ɨw-ran** (M) laughing falcon-tree-similar (B1435)	**kwata-kaya** (M) *Ateles*-vulva (G237)
DILLENIACEAE (Dillenia family)					
043. *Doliocarpus* cf. *guianensis* (Aubl.) Gilg. water vine, cipó d'água	**murucɨ-ti-ipa** (M) *Maurilia flexuosa*-grove-vine (B1957)	-	**tɨrɨrɨ-rɨmo** (M) flow-vine (B321)	**zapekuramog** (M) L (B1247)	**tameyu-'ɨ** (L) L-tree (G289)
EUPHORBIACEAE (Spurge family)					
044. *Aparisthmium cordatum* (Juss.) Baill. mameleiro	-	-	**ara-kɨ'ɨ** (M) macaw-chili pepper (B2696)	**uruku-ran** (M) *Bixa orellana*-similar (B1159)	**a'ɨ-meyu** (M) sloth-manioc, bread (G219)
045. *Conceveiba guianensis* Aubl.	-	**ɨga-ɨ-úna** (M) *Inga*-tree-black (B2570)	**arapuha-mɨra** (M) brocket deer-tree (B280)	**wɨra-kɨ'ɨw-ran** (M) tree-chili pepper-similar (B1221)	**a'ɨ-mɨnɨyu** (M) sloth-cotton (G220)
046. *Mabea caudata* P. et H. pau de cachimbo	-	-	**kašima-'ɨ** (M) pipe-tree (B2152)	**kacimi-'ɨw** (M) pipe-tree (B1326)	**awaɨapuna** (L) L (G225)
047. *Sapium marmieri* Huber tallow tree, murupita	**ɨka-'l** (M) latex-tree (B2061)	**yuwa-'ɨwa** (M) bird lime-tree (B2355)	**wakura-mɨra-hu** (M) nighthawk-tree-big (B2227)	-	-

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÃPI
FLACOURTIACEAE (Flacourtia family)					
048. *Casearia javitensis* H.B.K. Brazilian snakeroot, piabinha	yánə-'i (M) spider-tree (B1778)	pepemiwi-'ɬwa (?) ?-tree (B2460)	arãkwã-mi'u-'ɬ (M) little chachalacha-food-tree (B2659)	-	-
HELICONIACEAE (Heliconia family)					
049. *Heliconia* sp. bastard plantain, bananeira do mato	páriri (L) L (B1987)	pariri (L) L (B2430)	tayahu-pako-ro (M) white lipped peccary-banana-bitter (B845)	-	pelili (L) (G284)
LAURACEAE (Laurel family)					
050. *Ocotea caudata* Mez. louro	éyu-'i (L) L-tree (B1662)	ayu-'ɬwa (L) L-tree (B2383)	ayu-'ɬ-pihun (L) L-tree-black (B2958)	azu-'ɬw-pihun (L) L-tree-black (B1579)	ãñũ-ɬ-witowa (M) [kind of] tanager-tree-open nut (G226)
LECYTHIDACEAE (Brazil nut family)					
051. *Couratari* sp. tauari	pétimi-'i (M) tobacco-tree (B1855)	-	pɬtɬm-inem-'ɬ (M) tobacco-fetid-tree (B187)	-	yemi-'ɬ (M) masked-tree (G267)
052. *Eschweilera coriacea* (A.P. de Candolle) Mart. ex Berg matamatá branco	iwɬ-tɬr-ɬwa (M) lashing material-?-tree (B1701)	iwɬ-tɬr-ɬwa (M) lashing material-?-tree (B2332)	parawa-'ɬ (M) mealy parrot-tree (B10)	ɬwa-wiha-'ɬw (M) fruit-?-tree (B1588)	-
053. *Lecythis* cf. *chartacea* Berg jarana	-	yá'ɬ-rána (L) L-tree-similar (B2406)	ɬwiri-'ɬ (M) lashing material-tree (B19)	iwɬri-'ɬw (M) lashing material-tree (B1380)	-
054. *Lecythis idatimon* Aubl. caçador	-	-	yaši-amɬr (M) tortoise-deceased (B66)	iwɬri-'ɬw-pitã (M) lashing material-tree-red (B1280)	tata-ɬwi (M) *Connarus* sp.-lashing material (G251)
LEGUMINOSAE-CAESALPINIACEAE (Pea family)					
055. *Bauhinia acreana* Harms	yapépa-tĩ (?) ?-white (B1778)	yapupaci-néma (?) ?-fetid (B2498)	akuši-yu-'ɬ (M) agouti-spine-tree (B2887)	-	-

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÃPI
056. *Bauhinia guianensis* Aubl. escada de jaboti	**hipa-pé-pe** (M) vine-trail-flat (B1808)	**waperer-upáp** (M) ?-river bed (B2608)	**yaš̆i-s̆ɨpo-pe** (M) tortoise-vine-flat (B2750)	**ɨwɨpo-pew** (M) vine-flat (B1611)	**ãñã-yulu** (M) divinity-stairs (G271)
057. *Cassia fastuosa* Willd. mari-mari	**acicɨ-rapã** (M) howler monkey-bow (B1748)	-	**aman-putɨr-'ɨ** (M) rain-flower-tree (B2150)	-	**malimali** (L) ? (G238)
058. *Copaifera* sp. purple heart, copaíba	-	-	**kupa-'ɨ** (L) L-tree (B1022)	**kupa-'ɨw** (L) L-tree (MB109)	**kupaɨwa** (L) L (G236)
059. *Derris amazonica* Killq. timborana	**acɨ̃-ipa** (M) head-vine (B2010)	-	**s̆imo-ran** (L) L-similar (B1003)	**cimo-ran** (L) L-similar (B1078)	-
060. *Zollernia paraensis* Huber pau santo	**yapémi** (M) war club-tree (B1791)	**iyapem-'ɨwa** (M) war club-tree (B2350)	**tamaran-'ɨ** (M) war club-tree (B2672)	-	-
LEGUMINOSAE-FABACEAE					
061. *Alexa* sp. melancieira	**iwirá-'i** (M) tree-little (B1634)	**añɨg̃a-ránа** (M) divinity-similar (B2391)	-	-	**ani** (L) L (G224)
062. *Dipteryx odorata* (Aubl.) Willd. tonka bean, cumaru	-	-	**kumaru-'ɨ** (L) L-tree (B972)	**kumaru-'ɨw** (L) L-tree (B1113)	**munu-'ɨ** (M) peanut-tree (G241)
063. *Machaerium floribundum* Benth.	**u'ɨ-ruwapa-hã** (M) arrow-?-generator (B2011)	**marima-ránа** (L) ?-similar (B2648)	-	-	**inãmũ-yɨwã** (M) tinamou-sachet (G272)
064. *Taralea oppositifolia* Aubl. cumarurana	-	-	**kururu-'ɨ** (M) toad-tree (B1036)	**kumaru-'iran-'ɨw** (L) L-similar-tree (B1100)	**pala-ɨ-wãtã** (M) *Jacaranda*-tree-hard (G244)
LEGUMINOSAE-MIMOSACEAE					
065. *Newtonia suaveolens* Miq. faveira folha lina	-	-	**kɨkɨ-'ɨ** (L) L-tree (B2701)	**cimo-'ɨw** (M) *Derris utilis*-tree (B1237)	**wɨla-lã** (M) tree-felid (G259)
066. *Parkia pendula* (Willd.) Benth. nitta tree, visgueiro	**yópa-'i** (L) L-tree (B1850)	-	**yupi-'ɨ** (L) L-tree (B3547)	-	**yolulu** (L) L (G268)

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÃPI
067. *Pithecellobium cauliflorum* Mart. ingarana	**arapá-yi-'i-hete** (M) eel-?-tree-true (B2012)	**pire-ɨg̃a-'ɨwa** (M) fish-*Inga*-tree (B2575)	**taír-ɨg̃a-'ɨ** (L) blue headed parrot- *Inga*-tree (B2825)	-	-
068. *Tachigali myrmecophila* Ducke taxi preto	**tácí-i** (M) *Azteca*-ant-tree (B1795)	**tací-'íwa** (M) *Pseudomyrmax*-ant-tree (B2481)	**taš̃i-'ɨ** (M) *Pseudomyrmax*-ant-tree (B39)	**tací-'ɨw** (M) *Pseudomyrmax*-ant-tree (B1508)	-
MARANTACEAE (Arrow root family)					
069. *Ischnosiphon arouma* (Aubl.) Koern. aruma, guarumã	**urú-i** (M) basket-tree (B2066)	-	**warumã** (L) L (B825)	**uruwiw** (L) L (B4019)	**ulu** (L) L (G290)
MARCGRAVIACEAE (Marcgravia family)					
070. *Souroubea guianensis* Aubl. rabo de arara	-	-	**araruhu-wai-rɨmo** (M) red and green macaw- tail-creeper (B839)	**trakwa-wɨpo-piraɡ̃** (M *Camponatus* ant-vine- red (B1300)	**moyu-alala-luwãy** (M) anaconda-macaw-tail (G281)
MELIACEAE (Mahogany family)					
071. *Carapa guianensis* Aubl. crab wood, andirobeira	-	-	**yanɨ-ro-'ɨ** (M) oil-bitter-tree (B2821)	**zanɨ-ro-ɨw** (M) oil-bitter-tree (B1244)	**yanɨ** (M) oil (G263)
072. *Cedrela fissilis* Vell. Brazilian cedar, cedro da mata	-	**tata-kaci-'ɨwa** (M) fire-vapor-tree (B2574)	**ɨrarɨ** (L) L (B965)	-	**kaisu** (L) ? (G233)
073. *Trichilia* cf. *lecointei* Ducke jitó mirim	**pía-'i** (L) L-tree (B1698)	**ɨwɨra-pɨtɨk-'ɨwa** (M) tree-?-tree (B2546)	**yakuš̃iri-'ɨ** (L) L-tree (B2257)	**waruwa-'iran-'ɨw** (M) reflector-similar-tree (B1096)	-
MENISPERMACEAE (Moonseed family)					
074. *Abuta grandifolia* (Mart.) Sandw. abuta	**ihipá-ra-tĩ** (M) vine-?-white (B2009)	-	**aputa** (L) L (B728)	-	**yanɨ-ɨpo** (M) *Carapa guianensis*-vine (G294)

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÃPI
MORACEAE (Mulberry family)					
075. *Brosimum acutifolium* Huber cow tree, mururé	-	**mururе-eté** (L) L-true (B2523)	**mururе-'ɨ** (L) L-tree (B3006)	-	**takeni** (L) ? (G251)
076. *Helicostylis tomentosa* (P. & E.) Rusby inharé	**mitãci-'i** (?) ?-tree (B1738)	-	**akaú-ɨ** (L) L-tree (B333)	**mururе-ran-'ɨw** (L) L-similar-tree (B1085)	**ɨwa-pe** (M) tree-flat (G230)
077. *Perebea guianensis* Aubl. caxingubarana	-	**yapatawi-rána** (L) L-similar (B2468)	**akaú-'ɨ** (L) L-tree (B2277)	-	**yuwa-pi-so** (M) *Couma* sp.-soft-like (G268)
MYRISTICACEAE (Nutmeg family)					
078. *Virola michelli* Heckel ucuúba da terra firme	**iwikə-'i** (?) ?-tree (B1754)	-	**tukwan-mi'u-'ɨ** (M) toucan-food-tree (B255)	**hoku-'ɨw-ran** (?) ?-tree-similar (B1345)	**wololo** (L) ? (G262)
NYCTAGINACEAE (Four-o'clock family)					
079. *Neea* sp. joão mole	**ðepeci-ri-'i** (M) rabbit-?-tree (B2111)	**tepeci-kuruw-ɨ** (M) rabbit-?-tree (B2443)	**tapiʃi-kɨrɨ-'ɨ** (M) rabbit-?-tree (B2274)	**wəkəwə-'ɨw** (M) laughing falcon-tree (B1300)	**inimo-po'i-ipi** (M) thread-thin-gliding (G272)
OLACACEAE (Olax family)					
080. *Minquartia guianensis* Aubl. acariquara	-	-	**yɨwoy-ɨ** (M) boa constrictor-tree (B1028)	**wakari-'ɨw** (M) kind of fish-tree (B1437)	**wakati-'ɨ** (M) kind of fish-tree (G256)
PIPERACEAE (Pepper family)					
081. *Piper* cf. *ottonoides* Jun. jambira	**yami-əhə** (L) L-big (B2087)	**yamɨra** (L) L (B2651)	**yamir** (L) L (B2678)	**zamɨra** (L) L (B1592)	**yemi-lã** (L) L-similar (G296)
POACEAE (GRAMINAE) (Grass family)					
082. *Olyra* sp. taboca	**te'éka-cĩ** (L) L-white (B2083)	**takuwar-ɨ-pinim-ú** (L) L-water-striped-big (B2567)	**takwar-ɨ** (L) L-water (B789)	-	**sowo** (L) L (G287)

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÂPI
QUIINACEAE					
083. *Lacunaria jenmani* (Oliv.) Ducke moela de mutum	**iwá-pedi** (M) fruit-? (B1814)	**ɨwa-kaw-ɨwa** (M) fruit-vessel-tree (B2340)	**kupapa-'iran-'ɨ** (L) L-similar-tree (B2880)	**ɨwa-zu-'ɨw-ran** (M) fruit-yellow-tree-similar (B1463)	**mɨtũ-'ay** (M) curassow-crop (G240)
RUBIACEAE (Madder family)					
084. *Psychotria* cf. *poeppigiana* M. Arg. erva de rato	**akuci-wɪrã** (M) agouti-tree (B2039)	**yawci-ɨg̃a** (M) tortoise-*Inga* (B2593)	**tapi'i-ka'a** (M) tapir-herb (B3100)	**ka'a-raɨ** (M) herb-poison (B1545)	-
SAPINDACEAE (Soapberry family)					
085. *Cupania scrobiculata* L.C. Rich.	**pɔ̃rɔ̃rɔ̃'ne-'i** (?) ?-tree (B1678)	**awe-te-'ɨ-rãna** (M) person-true-tree-similar (B2501)	**tupiyarɨma-mɨra** (M) long tailed tyrant-tree (B223)	-	**kalima-'ɨ-'sĩ** (L) L-tree-white (G234)
086. *Pseudima frutescens* Radlk.	-	**arapua-rena-ɨwa** (M) brocket deer-sitting place-tree (B2477)	**ag̃-waiya-mɨra** (M) soul-enemy-tree (B1017)	-	**yɨkɨsĩ'ĩ'o** (L) ? (G267)
087. *Serjania* sp. timbó	**cimã** (L) L (B1984)	**cimé** (L) L (B2613)	**kururu-sɨmo** (M) toad-*Derris utilis* (B889)	**kururu-cimo** (M) toad-*Derris utilis* (B1590)	-
SAPOTACEAE (Sapote family)					
088. *Manilkara huberi* (Ducke) Standl. cow tree of Pará, maçaranduba	-	-	**ɨrɨkɨwa-'ɨ** (L) L-tree (B2926)	**masaranu-'ɨw-ete** (L) L-tree-true (B1157)	**ɨwɨ-lã** (L) L-similar (G232)
089. *Prieurella* cf. *cuneifolia* Pierre abiurana vermelha	-	-	**kupapa-'iran-'ɨ** (L) L-similar-tree (B2243)	**ɨwa-zu-'ɨw-ran** (M) fruit-yellow-tree-similar (B1346)	**wɨla-pele** (L) tree-? (G260)
SIMAROUBACEAE (Quassia family)					
090. *Simaba cedron* Planch. rattlesnake's bean, serve pra tudo	-	**ari-kara-'ɨwa** (M) ?-yam-tree (B2345)	**pere-pusã-'ɨ** (M) skin eruption-remedy-tree (B2219)	**akuci-wɨra** (M) agouti-tree (B1094)	-

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÃPI
091. *Simaruba amara* Aubl. bitter damson tree, marupá	-	**tukuɾi-'ɨwa** (M) grasshopper-tree (B2566)	**ɨwese-'ɨ** (M) manioc grater-tree (B262)	**maɾupa-'ɨw** (L) L-tree (B1152)	**iwẽ-'ɨ** (M) manioc grater-tree (G231)
STERCULIACEAE (Sterculia family)					
092. *Sterculia pruriens* (Aubl.) Schum. tacacazeiro	**tapi'i-ðopáimi-'i** (M) tapir-?-tree (B1740)	-	**tapi'i-pamɨr** (M) tapir-? (B2)	**tapi'iɾa-pawmi-'ɨw** (M) tapir-?-tree (B1260)	**ɨwi-sĩ** (M) lashing material-white (G232)
THEOPHRASTACEAE (Joewood family)					
093. *Clavija lancifolia* Benth.	**yani-ðópiã** (M) ?-egg (B1941)	**yawci-rupi'a-renã** (M) tortoise-egg-place (B2423)	**kaɾume-pɨtaɡ̃-'ɨ** (M) tortoise-red-tree (B991)	-	-
TILIACEAE (Linden family)					
094. *Apeiba tibourbou* Aubl. pente-de-macaco	**ape-'i** (L) L-tree (B1820)	-	**ape-'i** (L) L-tree (B2681)	**azaɡ̃-kɨwa-ɨw** (M) divinity-comb-tree (MB47)	**ape-'i** (L) L-tree (G225)
ULMACEAE (Elm family)					
095. *Ampelocera edentula* Kuhlm.	**yaci-pépe-'i** (M) tortoise-claw-tree (B1816)	**iwi-payé** (M) earth-shaman (B2454)	**tapi'iãkwãpe-'ɨ** (M) white bearded manakin-tree (B2707)	-	-
VIOLACEAE (Violet family)					
096. *Rinorea* cf. *passoura* (DC.) Kuntze branquinha	**yánə-'i** (M) spider-tree (B1887)	**wayaw-a'ĩy** (M) guava-seed (B2654)	**pɨwa-'ɨ** (M) [kind of] arrow point-tree (B2686)	**pɨwa-'ɨw** (M) [kind of] arrow point-tree (B1172)	-
ZINGIBERACEAE (Ginger family)					
097. *Renealmia floribunda* K. Sch. wild ginger, cana brava	**kaní-əhə** (?) ?-big (B2071)	-	**kurupi-kã** (M) divinity-sugar cane (B1011)	-	**kulimako-u** (L) ?-big (G277)

WORD TYPE	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÃPI	LINE TOTALS
L	22	12	42	27	35	138
M	29	29	50	39	38	185
?	8	4	0	1	1	14
COLUMN TOTALS	59	45	92	67	74	337 (Total no. indigenous names in Table 1)

NOTES TO TABLE 1

1. Symbols in parentheses to the right of each indigenous name indicate word type: M = metaphorical word; L = literal word; ? = indeterminate word type. Entries immediately below each indigenous name are morpheme-by-morpheme glosses (morpheme boundaries being indicated by hyphens): L indicates a literal plant morpheme; ? indicates either a non-literal plant morpheme for which a gloss is unknown or a word for which morpheme boundaries, if any, are unknown. Although there are syntactic and minor semantic differences between free and bound forms for "tree" [e.g., **mira** vs. **i** (K) (Balée, 1989b)], for considerations of space, these differences are not distinguished in glossing. Entries in parantheses below glosses indicate voucher numbers on the series Balée if preceded by "B"; volume and page numbers in Boudin (1978), where the gloss is given, if preceded by "MB," (T only); and page numbers in Grenand (1980), where the gloss is given, if preceded by "G" (W only).

2. Plant species are listed in alphabetical order by family, genus, and species. Words below each species name are English and/or Portuguese equivalents.

(Sandw.) Willd., *Inga auristellae* Harms, and *Inga thibaudiana* DC. (Ducke 1949:29), *Astrocaryum vulgare* Mart. 'tucumã' (Balée 1988:47; Wessels Boer 1965:132), *Orbignya phalerata* 'babassu' (Anderson 1983), *Theobroma speciosum* Willd. ex Spreng. 'cacauí' (Ducke 1953: 14), *Dialium guianense* Benth. 'jutaípororoca' (Ducke 1949: 112), *Solanum* spp. (Lisboa et al. 1987:55), and *Trema micrantha* (L.) Blume 'trema' (Lisboa et al. 1987:55). Neotropical plant domesticates (Table 3) are completely dependent on human management for their long-term propagation; most, if not wholly incapable of setting seed, are producers of minuscule quantities of viable seed. These species are often parthenocarpic as a result of human interference--that is, their genotypes have been altered through domestication.

To measure the degree of similarity between two languages, we look at pairs of words such that the word in A and the word in B refer to the same species. The number of such pairs which are "similar" and the number which are "different" are then tabulated, the ratio between them being the degree of similarity.

In order to define "similarity" adequately, it is necessary to distinguish "literal" plant words from "metaphorical/descriptive" (henceforth called simply metaphorical) plant words, a distinction which proves to be of crucial analytical importance. In our usage, "literal" plant words are those which contain a literal plant morpheme; they may contain other morphemes as well. Literal plant morphemes are here defined as those which have as their sole referent a specific plant, excluding thereby general life form morphemes such as 'tree' or 'herb.' The word 'oak' in English, for example, refers only to this kind of tree and to nothing else--the association between the word and its referent is purely arbitrary. The terms 'live oak', 'post oak', and 'oak tree' are also literal since they contain the literal morpheme 'oak'. Likewise, in the Tupi-Guarani languages under study, the words for *Inga nobilis* Willd. (Table 2) are literal in the three languages for which terms were collected: Ar **iña-pəkə-'i** '*Inga*-long-tree', As **yurupi-rana-ĩga** 'throat-similar-*Inga*' and K **ĩga-howi-'i** '*Inga*-blue-tree', since they all incorporate the literal morpheme **iña/ĩga** 'ingá'.

Two literal plant words are considered to be similar if their literal plant morphemes are similar, regardless of the other morphemes occurring in the word. Thus, the three words for 'ingá' above constitute three pairs (Ar-As, Ar-K, As-K) of similar words.

In our usage, "metaphorical" names are those which do not contain a literal plant morpheme, or if they do contain a literal plant morpheme, it is being used metaphorically (i.e., the class of plants designated by the whole metaphorical term is not a subset of the class designated by the literal morpheme.) In English, 'dogwood' is an example of a metaphorical plant term, since neither 'dog' nor 'wood' refer to a specific plant, as does 'oak.' The term 'poison oak' is also metaphorical, since it is not botanically a kind of oak at all. Similarly, in the Tupi-Guarani data, the Ka'apor word for *Tapirira guianensis*

TABLE 2: NAMES OF SEMI-DOMESTICATED PLANT SPECIES IN FIVE TUPI-GUARANI LANGUAGES[1]

PLANTS[2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÃPI
ANACARDIACEAE (Cashew family)					
098. *Spondias mombin* L. hog plum, cajá	ekə̃ya-'ɨ (L) L-tree (B1897)	kayuwa-'ɨwa (L) L-tree (B2569)	taper-ɨwa-'ɨ (M) old village-fruit-tree (B2212)	tawe-wa-'ɨw (M) old village-fruit-tree (B4032)	akaya (L) L (G220)
ANNONACEAE (Custard apple family)					
099. *Annona montana* Macf. var. *marcgravii* sour sop, araticum	tayəhə́-'ə̃-'ɨ (M) white lipped peccary-fruit-tree (B1884)	-	erəsiku-'ɨ (L) L-tree (B997)	araciku-'ɨw (L) L-tree (MB37)	-
APOCYNACEAE (Dogbane family)					
100. *Himatanthus* cf. *articulatus* Woods. janaguba	-	ɨwɨra-tapi-cɨ́ (M) tree-?-white (B2578)	kuyerl-'iran-'ɨ (M) spoon-similar-tree (B832)	-	melekene (L) L (G239)
ARALIACEAE (Ginseng family)					
101. *Didymopanax morototoni* (Aubl.) Decne & Planch. match wood, morototó	murete-tə́wi-'ɨ (L) L-?-tree (B1709)	-	moroto-'ɨ (L) L-tree (B528)	-	molototo (L) L (G240)
ARECACEAE (Palm family)					
102. *Astrocaryum vulgare* Mart. tucuma, tucumã comum	-	-	tukumə̃-'ɨ (L) L-tree (B2173)	tukumə (L) L (MB273)	awala (L) L (G298)
103. *Euterpe oleracea* Mart. assai, açaí	acá-'ɨ (L) L-tree (B1872)	yuɨ-ɨwa (L) ?-tree (B2568)	wasai-'ɨ (L) L-tree (B531)	waca-'ɨw (L) L-tree (MB288)	wasey (L) L (G303)
104. *Maximiliana maripa* (Corr. Serr.) Drude inajá	náya-'ɨ (L) L-tree (B1637)	inayá (L) L - -	inaya-'ɨ (L) L-tree - -	naza-'ɨw (L) L-tree (MB176)	ɨnaya (L) L (G298)
105. *Oenocarpus distichus* Mart. bacaba	pinuwá-'ɨ (L) L-tree - -	pinuwa-'ɨwa (L) L-tree (B2500)	pinuwa-'ɨ (L) L-tree (B2824)	pinuwa-'ɨw (L) L-tree (B1101)	pino (L) L (G301)
106. *Orbignya phalerata* Mart. babassu, babaçu	náta-'i (L) L-tree (B1776a)	marɨte-'ɨwa (L) L-tree - -	yetahu-'ɨ (L) L-tree - -	iwa-hu-'ɨw (M) fruit-big-tree (B4030)	-

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÁPI
BIGNONIACEAE (Bignonia family)					
107. *Jacaranda copaia* (Aubl.) D. Don. paraparaúba	-	apara-'ɨwa (L) L-tree (B2565)	para-'ɨ (L) L-tree (B1060)	para-'ɨw (L) L-tree - -	pala-'ɨ (L) L-tree (G244)
CARICACEAE (Carica family)					
108. *Jacaratia spinosa* A. DC. mamão do mato	erakáci-'i (L) L-tree (B1691)	yarakaci'é (L) L - -	mãmã-ran-ɨ (L) L-similar-tree (B2158)	zarakaci-'a-'ɨw (L) L-tree (B1569)	yalakasi (L) L (G263)
CECROPIACEAE					
109. *Cecropia* sp. cecropia, imbaúba	éma-'i (L) L-tree (B1830)	ama-'ɨwa (L) L-tree (B2373)	ama-'ɨ (L) L-tree (B1809)	ama-'ɨw (L) L-tree (MB24)	ama-'ɨ (L) L-tree (G223)
CONVOLVULACEAE (Morning glory family)					
110. *Ipomoea* sp. morning glory, batatarana	yiti-rĩ (L) Sweet potato-similar - -	yɨti-rána (L) Sweet potato-similar (B2599)	yɨtɨk-ran (L) Sweet potato-similar (B879)	zɨtɨk-ran (L) Sweet potato-similar (B1512)	yetɨ-lã (L) Sweet potato-similar (G297)
111. *Merremia macrocalyx* (Ruiz & Paiva) D. Dunn batatarana	hípa-yi (M) vine-durable (B2000)	-	-	zɨtɨk-ran (L) Sweet potato-similar (B1557)	musukupi (L) ? (G282)
EUPHORBIACEAE (Spurge family)					
112. *Manihot quinquepartita* Huber wild manioc, mandioca do veado	máyi-'irĩ (L) manioc-stem-similar (B1995)	-	erapuha-mani-'ɨ (L) brockel deer-manioc-stem (B811)	-	mani-'ɨ (L) manioc-stem (G279)
FLACOURTIACEAE (Flacourtia family)					
113. *Lindackeria latifolia* Benth.	ehawái-'irĩ (L) ?-similar (B1875)	aɲɨga-kɨwawa-'ɨwa (M) divinity-comb-tree (B2433)	kupa-'arani-ɨ (L) L-similar-tree (B2214)	-	-
HAEMODORACEAE (Bloodwort family)					
114. *Xyphidium caeruleum* Aubl.	tucĩ-na'ĩ-hã (M) toucan-seed-generator (B2002)	-	irakahu-ka'a (M) weasel-herb (B2967)	-	tupãɨpɨ (L) ? (B290)

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÃPI
LECYTHIDACEAE (Brazil nut family)					
115. *Bertholletia excelsa* Humboldt & Bonpland Brazil nut tree, castanheira-do-Pará	ya-'ĩ (L) ?-tree (B1770)	ya-'ɨwa (L) ?-tree (B2579)	kãtãi-'ɨ (L) L-tree - -	zapukaza-'ɨ (L) L-tree (MB301)	ñã (L) ? (G242)
116. *Gustavia augusta* L. geniparana	yanɨpa-ráni-'i (M) genipapo-similar-tree (B1841)	yanipa-ran-ɨwa (M) genipapo-similar-tree (B2410)	mɨtũ-pusu-'ɨ (M) curassow-crop-tree (B193)	zanɨpa-ran-'ɨw (M) genipapo-similar-tree (B3939)	a'ɨ-walɨpɨ (M) sloth-manioc beer pot (G220)
117. *Lecythis pisonis* Cambess monkey pot tree, sapucaia	ya-púkai-'i (L) L-scream-tree (B1802)	-	ya-pukai-'ɨ (L) L-scream-tree (B2248)	za-pukai-'ɨw (L) L-scream-tree (MB303)	ya-pukay (L) L-scream (G265)
LEGUMINOSAE-CAESALPINIACEAE (Pea family)					
118. *Dialium guianense* Benth. wild tamarind, jutaipororoca	yanĩta-'i (L) L-tree (B1702)	ayuru-mupa-'ɨwa (M) mealy parrot-?-tree (B2469)	yurupepe-'ɨ (L) L-tree (B1040)	iwa-popok-'ɨw (M) fruit-dehiscent-tree (B1146)	wɨla-takulu (M) tree-stone (G261)
119. *Hymenaea parvifolia* Huber copal tree, jutaí	yúta-'i (L) L-tree (B2093)	yeta-'ɨwa (L) L-tree - -	yeta-'ɨ (L) L-tree (B880)	zuta-'i-'ɨw (L) L-little-tree (B3998)	yɨta-'ɨ (L) L-tree (G268)
LEGUMINOSAE-MIMOSACEAE					
120. *Acacia multipinnata* Ducke juquiri	yú-me'e (M) spine-it has (B1960)	yu-'ema-'ɨwa (M) spine-?-tree (B2530)	yɨkɨrɨ-sɨpo (L) L-vine (B2738)	-	yemo-'i (M) penis-small (G296)
121. *Inga alba* (Sandw.) Willd. Inga-xixica	cici-'i (L) ?-tree (B1744)	ɨg̃a-ɨ-úna (L) L-tree-black (B2510)	ɨg̃a-s̃ĩsik (L) L-smooth (B2281)	ɨg̃a-pi-'ɨw (L) L-thin-tree (B1307)	-
122. *Inga auristellae* Harms	iñá-pɔkɔ-'i (L) L-long-tree (B1730)	yurupi-rana-ɨg̃á (L) throat-similar-L (B2584)	ɨg̃a-howɨ-'ɨ (L) L-blue-tree (B2213)	ɨg̃a-pi'ɨw-hĩmə (L) L-thin-tree-slippery (B1080)	ɨg̃a-sili (L) L-thin (G229)
123. *Inga capitata* Desv. ingá-açu	iñá-pɔkɔ-'i (L) L-long-tree (B1725)	kururu-ɨg̃á (L) toad-L (B2352)	ɨg̃a-hu-'ɨ (L) L-big-tree (B297)	tapi'i-rɨg̃a-'ɨw (L) tapir-L-tree (B1102)	ɨg̃a-mulua-ya (L) L-pregnant-owner (G229)
124. *Inga nobilis* Willd. ingá	iñá-pɔkɔ-'i (L) L-long-tree (B1782)	yurupi-rana-ɨg̃á (L) throat-similar-L (B2527)	ɨg̃a-howɨ-'ɨ (L) L-blue-tree (B2226)	-	-

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÃPI
125. *Inga rubiginosa* (Rich.) DC. ingá	iñá-pɔkɔ-'ĩ (L) L-long-tree (B1665)	ɨg̃a-pe-'ɬwɨ (L) L-flat-tree-little (B2427)	-	-	akɬkɨ-ɨg̃a (L) howler monkey-L (G221)
126. *Inga thibaudiana* DC. ingá	iñá-pɔkɔ-'ĩ (L) L-long-tree (B1663)	muruwi-yawa-ɨg̃á (L) ?-jaguar-L (B2487)	ɨg̃a-'ɨ-pɨtag̃ (L) L-tree-red (B977)	ɨg̃a-wizu-'ɬw (L) L-?-tree (B1513)	alãkwã-ɨg̃a (L) little chachalacha-L (G223)
MELASTOMATACEAE (Melastoma family)					
127. *Bellucia grossularioides* (L.) Triana Guiana missel tree, goiabinha de anta	-	-	mu-'ɨ (L) ?-tree (B1073)	tapater (L) ? (B1622)	pɨsulu (L) ? (G248)
MORACEAE (Mulberry family)					
128. *Bagassa guianensis* Aubl. tatajuba	tɔráikɔ-'ĩ (L) L-tree (B1771)	tarawirɔ-'ɬwa (L) L-tree (B2370)	tareka-'ɨ (L) L-tree (B2298)	tɔrɔkɔ-'ɬw (L) L-tree - -	pakasa (L) L (G243)
MYRTACEAE (Myrtle family)					
129. *Eugenia patrisii* Vahl. pitanga, jinja	me'e-'e-'ĩ (M) some-fruit-tree (B1902)	-	arãkwã-mɨra (M) little chachalacha-tree (B2208)	iwa-ũ-'ɬw (M) fruit-black-tree (B1539)	ɨwa-pɨtã (M) fruit-red (G231)
PHYTOLACCACEAE (Pokeweed family)					
130. *Phytolacca rivinoides* Kunth. & Bouche caruru bravo	-	-	ka'a-rɨru (M) herb-carrier (B896)	ke'a-piw (M) herb-thin (B1562)	ka'a-lulu (M) harb-tumescent (G274)
RUBIACEAE (Madder family)					
131. *Genipa americana* L. genipapo	yanɨpa-'ĩ (L) L-tree - -	yanɨpa-ɬwa (L) L-tree - -	yenɨpa-'ɨ (L) L-tree (B800)	zanɨpaw-'ɬw (L) L-tree (MB300)	yanɨpa (L) L (G264)
132. *Uncaria guianensis* (Aubl.) Gimel.	iwirã̃-'a-ɨ ĩ (M) tree-fruit-white (B2097)	-	parawa-sɨpo (M) mealy parrot-vine (B3423)	-	alainapa (L) ? (G269)

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÃPI
SAPOTACEAE (Sapote family)					
133. *Richardella rivicoa* Pierre cutitiribá	-	akuci-tɨr-iwa-'ɨwa (M) agouti-food-fruit-tree (B2327)	akuši-tɨr-iwa-'ɨ (M) agouti-food-fruit-tree (B2682)	akuci-tɨr-iwa-'ɨw (M) agouti-food-fruit-tree (MB23)	-
SOLANACEAE (Nightshade family)					
134. *Physalis capsicifolia* Dunal ground cherry, camapu	kanapũ (L) ? (B1994)	-	kamamu (L) L (B3050)	kamamu-hu (L) ?-big (B1562)	ulu-kɨ'ɨ̃y (M) marbled wood quail-chili pepper (G290)
135. *Solanum rugosum* Dunal jurubeba	me'e-rá-tĩ-'ĩ (M) some-fruit-white-tree (B1927)	-	ka'a-yuwar (M) herb-itchy (B923)	zu-ruwe (M) spine-? (B1565)	-
136. *Solanum stramonifolium* Jacq. jurubeba	-	-	yu-ruwe (M) spine-? (B1031)	zu-ruwe-cĩ (M) spine-?-white (B1559)	yũ-piñũ (M) spine-black (G269)
STERCULIACEAE (Sterculia family)					
137. *Theobroma grandiflorum* Schum. cupuaçu	kupĩ-'ĩ (L) L-tree	-	kupɨ-hu-'ɨ (L) L-big-tree (B478)	kupĩ-'e-'ɨw (L) L-fruit-tree (B1117)	kapɨai (L) L (G234)
138. *Theobroma speciosum* Willd. ex Spreng. cacaul	aka-'áwi-'ĩ (L) L-?-tree (B1670)	aka-wɨwa (L) L-tree (B2338)	kaka-'iran-'ɨ (L) L-tree (B1025))	aka'u-'ɨw (L) L-tree (B3968)	aka-'ɨ (L) L-tree (B228)
ULMACEAE (Elm family)					
139. *Trema micrantha* (L.) Blume trema, periquitinho	kurúmi-'ĩ (M) inlani-tree (B2045)	-	kuru-mi'u-'ɨ (M) boy-food-tree (B788)	-	kulani-'ɨ (L) ?-tree (G234)
URTICACEAE (Nettle family)					
140. *Fleurya aestuans* (L.) Gouv. nettle, urtiga	pĩnũ (L) L (B2055)	pɨnũ (L) L (B2625)	purake-ka'a (M) electric eel-herb (B815)	-	-

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÃPI
VERBENACEAE (Verbena family) 141. *Lantana camara* L. lantana, chumbinho	ñéma-'i (M) nothing-tree (B1929)		kanami-ran (M) *Clibadium sylvestre*-similar (B3030)	ərəkwə -wɨra (M) little chachalacha-tree (B1624)	yakale-pill (M) caiman-aromatic plant (G294)

WORD TYPE	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÃPI	LINE TOTALS
L	26	22	29	23	28	128
M	10	6	13	10	8	47
COLUMN TOTALS	36	28	42	33	36	175 (Total no. indigenous names in Table 2)

NOTES TO TABLE 2

1. See note 1, Table 1

2. See note 2, Table 1.

Aubl., **tayahu-mira** 'white lipped peccary-tree,' is metaphorical since its constituent morphemes do not refer to a specific plant, and the Wayãpi word for *Conceveiba guianensis*, **a'i-miniyu** 'sloth-cotton,' is metaphorical because this tree of the spurge family is not a kind of 'cotton.' The relation between a metaphorical plant term and its referent is, in a sense, less arbitrary than that of a literal term to its referent, because some culturally given interpretation of the plant intervenes between the metaphorical term and its referent.

It is more complicated to judge the similarity of metaphorical plant terms since these may incorporate several morphemes, and some degree of arbitrariness is unavoidable. Two metaphorical terms are deemed similar (1) if they share two morphemes which are similar in sound and in meaning (e.g.,K **yaši-sipo-pe** 'tortoise-vine-flat' and T **iwipo-pew** 'vine-flat') or (2) if one of the principal nominal components is similar in sound and in meaning, excluding life-form morphemes or common plant part morphemes (e.g., T **zani-ro-'iw** 'oil-bitter-tree', W **yani** 'oil', referring to the tree of the mahogany family, *Carapa guianensis* Aubl.).

Phonetic resemblance between forms must be apparent for them to be considered similar (such as **iña** and **iga** 'ingá' above). Given the number of languages involved in this study, the lack of descriptive work on two of the languages, the uncertainty of phonetic details, and the limited size of the corpus, it is not in general possible to reconstruct the Proto-Tupi-Guarani forms with certainty and then identify borrowings by the fact that they do not show the same systematic sound correspondences as do the reconstructable words.

Borrowing, however, appears to have been very minimal. Berlin et al. (1973:152) also observed that borrowing of words between Tzeltal-Tzotzil was a "relatively rare occurrence." First of all, names for domesticates would be the most likely of the three categories of names to be borrowed, yet these names strongly tend to reconstruct in Proto-Tupi-Guarani (Aryon Rodrigues, personal communication). It is very doubtful that much borrowing occurred, since a society would have had to lose the domesticate and the word for it and then regain the plant plus a new word. It seems unlikely this would have happened often. Second, if borrowings were extensive from language A to language B, then these two languages should be conspicuously more similar to each other than to languages C, D, and E, but among these Tupi-Guarani languages, no such significant pairings were found. There has been minor Portuguese influence (K **kuyer-'i** and T **wira-kuzer** 'spoon-tree' from *colher* [#11, Table 1], K **kanei-'i-tuwir** 'resin-tree-white' from *candeia* [#27, Table 1], and the words for 'wild cacao' and 'cacao' [#138, Table 2 and #167, Table 3). It should be noted that the referents of these words are of neotropical origin. The similarities between the languages for these words probably reflect independent borrowing from Portuguese in the remote past.

TABLE 3: NAMES OF DOMESTICATED PLANT SPECIES IN FIVE TUPI-GUARANI LANGUAGES[1]

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÃPI
ANACARDIACEAE (Cashew family)					
142. *Anacardium occidentale* L. cashew, cajú	akaɣú (L) L - -	-	akayu (L) L (B866)	akazu (L) L (MB23)	akayu (L) L (G304)
ARACEAE (Arum family)					
143. *Xanthosoma* sp. coccoyam, taja	-	-	taya (L) L (B3554)	taza (L) L (MB249)	tã-sĩ (L) L-thorny (G314)
ASTERACEAE (Sunflower family)					
144. *Clibadium sylvestre* Aubl. fish poison plant, cunumi	-	-	kanami (L) L (B3045)	kunami (L) L (MB108)	kunãmi (L) L (G308)
BIGNONIACEAE (Bignonia family)					
145. *Crescentia cujete* L. calabach, cuia	kəi (L) L - -	kuyá (L) L - -	kwi (L) L (B814)	kwi (L) - (MB118)	kwi (L) - (G309)
BIXACEAE (Annatto family)					
146. *Bixa orellana* L. annatto, urucu	itikə (L) L (B2054)	urukú (L) L - -	uruku (L) L (B801)	uruku (L) L (MB283)	ululu (L) L (G315)
BROMELIACEAE (Pineapple family)					
147. *Ananas comosus* (L.) Merril pineapple, abacaxi	náni (L) L - -	pararawɨ'á (L) L - -	nana (L) L (B1020)	nənə (L) L (B1568)	nãnã (L) L (G312)
148. *Neoglaziovia variegata* L. curratow, caroá	kurawã (L) L (B2046)	-	kɨrawa (L) L (B953)	kurawa (L) L (MB110)	kulawa (L) L (G308)

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÃPI
CARICACEAE (Papaya family)					
149. *Carica papaya* L. papaya, mamão	mɵ̃mɵ̃ (L) L - -	yerakaci'a-ú (L) L-big - -	mãmã (L) L (B954)	zerakaci'a-hu (L) L-big (MB299)	mãũ (L) L (G311)
CONVOLVULACEAE (Morning glory family)					
150. *Ipomoea batatas* Lam. sweet potato, batata doce	yitĺ-hete (L) L-tree (B2085)	yɨtíke (L) L (B2633)	yɨtɨk (L) L (B805)	zetɨk (L) L (MB342)	yetɨ (L) L (G316)
CUCURBITACEAE (Gourd family)					
151. *Cucurbita moschata* (Lam.) Poir. musk melon, jerimum	yurumũ (L) L - -	yerimũ (L) L (B2631)	yurumũ (L) L (B3046)	zurumu (L) L (MB338)	asikala (L) L (G305)
152. *Lagenaria siceraria* Mol. bottle gourd, cabaça	-	-	kawasu (M) container-big (B906)	ɨ'ekwa (L) L (MB59)	mulutuku (L) L (G312)
DIOSCOREACEAE (Yam family)					
153. *Dioscorea* cf. *trifida* L. yam, inhame	karã (L) L (B2086)	kara (L) L (B2629)	kara (L) L (B1012)	kara (L) L (B1551)	kala (L) L (G306)
154. *Manihot esculenta* Crantz manioc, mandioca	manĺ (L) L - -	mani-'ɨwa (L) L-stem - -	mani-'ɨ (L) L (B848)	mani-'ɨw (L) L-stem (B1573)	mani-'ɨ (L) L-stem (G309)
LEGUMINOSAE-FABACEAE (Pea family)					
155. *Arachis hypogaea* L. peanut, amendoim	-	-	manuwi (L) L (B894)	munuwi (L) L (MB163)	munuwi (L) L (G312)
156. *Phaseolus lunatas* L. lima bean, feijão comum	kamána-'i (L) L-little - -	-	kamana (L) L - -	kumana (L) L (MB108)	kumãna (L) L (G308)
157. *Vigna* sp. black eyed pea, feijão da colônia	-	komaná (L) - (B2628)	kamana-'i-tuwɨr (L) L-little-white (B3099)	-	kumãna-'i (L) L-little (G308)

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÂPI
MALVACEAE (Mallow family)					
158. *Gossypium barbadense* L. cotton	míniyu (L) L (B1931)	aminiyú (L) L (B2640)	maneyu (L) L (B849)	manizu (L) L (B1544)	mɨnɨyu (L) L (G311)
MUSACEAE (Banana family)					
159. *Musa paradisiaca* L. plantain, banana	pátsitsi (L) L - -	pakú (L) L - -	pako (L) L - -	pako (L) L (MB183)	pako (L) L (G313)
160. *Musa sapientum* L. banana, banana	pátsitsi (L) L - -	pakú (L) L - -	pako (L) L - -	pako (L) L (MB183)	pako (L) L (G313)
MYRTACEAE (Myrtle family)					
161. *Psidium guajava* L. guava, goiaba	kuyawá (L) L - -	-	waiya (L) L (B903)	wazap (L) L (MB288)	kuya (L) L (G308)
PASSIFLORACEAE (Passion flower family)					
162. *Passiflora* cf. *edulis* Sims passion fruit, maracujá	-	marikuyá (L) L - -	murukuya (L) L (B810)	murukuza (L) L (B1553)	mulukuya (L) L (G282)
POACEAE (GRAMINAE) (Grass family)					
163. *Gynerium sagittatum* Beauv. arrow cane, flecha	-	-	u'ɨ-wa (M) arrow-? (B917)	u'iwa-a (M) arrow-? (MB281)	wɨwa (L) ? (G316)
164. *Zea mays* L. maize, milho	awatsi (L) L (B2144)	awaci (L) L (B2644)	awa̰si (L) L - -	awaci (L) L (MB43)	awasi (L) L (G305)
SOLANACEAE (Nightshade family)					
165. *Capsicum frutescens* L. chili pepper, malagueta	kĩ'ĩ (L) L - -	ɨkɨ'ɨ̃ya (L) L - -	kɨ̃'ɨ̃-awi (L) L-needle (B910)	kɨ'ɨy (L) L (MB103)	kɨ'ɨy (L) L (G307)

PLANTS [2]	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÂPI
SOLANACEAE					
166. *Nicotiana tabacum* L. tobacco, tabaco	**pétĩ** (L) L - -	**petɨm** (L) L (B2627)	**pɨtɨm** (L) L (B935)	**petɨm** (L) L (MB191)	**makule** (L) L (G309)
STERCULIACEAE (Sterculia family)					
167. *Theobroma cacao* L. cacao, cacau	**áka-'i** (L) L-tree - -	**aka-'ɨwa** (L) L-tree - -	**kaka-'ɨ** (L) L-tree - -	**aka-'ɨw-ete** (L) L-tree-true (MB22)	**walapulu** (L) L (G315)

WORD TYPE	ARAWETÉ	ASURINI	KA'APOR	TEMBÉ	WAYÂPI	LINE TOTALS
L	19	17	24	24	26	110
M	0	0	2	1	0	3
COLUMN TOTALS	19	17	26	25	26	113 (Total no. indigenous names in Table 3)

NOTES TO TABLE 3

1. See note 1, Table 1.

2. See note 2, Table 1.

Similarity between literal plant terms must, in general, be due to their retention in the languages since splits in the proto-language. This is probably also the general cause of resemblances between metaphorical terms, though in some cases resemblance may be due to independently similar cultural interpretations of the plant. No effort is made here to exclude these, because there are no clear means of identifying such cases and their contribution to the overall proportion of similarity is certainly extremely limited (3).

RESULTS

The results show clearly that the more intensively managed plants have higher rates of similarity in their names from one language to the other. Combining data from all 10 pairs of languages:

Management Type	All Word Pairs	Similar	Dissimilar	Source
Non-domesticates	441	136 (30.8%)	305 (69.2%)	(Table 4)
Semi-domesticates	278	164 (59%)	114 (41%)	(Table 5)
Domesticates	198	159 (80.3%)	39 (19.7%)	(Table 6)

The differences between the three categories of plants--non-domesticates, semi-domesticates, and domesticates--in terms of degree of similarity (30.8%, 59%, and 80.3%, respectively) are very significant (X^2 = 146.483, 2 df, p < .0001). In other words, lexical similarity between the 10 pairs of languages very significantly increase along a scale of increasing human management of plants (see Fig. 1).

The results also show that the type of plant name, literal or metaphorical, is also strongly influenced by the degree of domestication:

TABLE 4: Pairs of word types for Non-domesticated plant species among the five languages. Similar pairs indicated by asterisk. M = metaphorical and/or descriptive word; L = literal word; ? = indeterminable word type; -- = no data.[1]
AR = Araweté; AS = Asurini; KA = Ka'apor; TE = Tembé; WA = Wayãpi. Data from Table 1.

SPECIES NO. (From Table 1)	AR / AS	AR / KA	AR / TE	AR / WA	AS / KA	AS / TE	AS / WA	KA / TE	KA / WA	TE / WA
001	- -	-L	-L	-L	-L	-L	-L	LL*	LL*	LL*
002	-M	MM	-M	- -	MM	MM	M-	MM	M-	M-
003	-M	-M	-M	-M	MM	MM	MM	MM	MM	MM
004	?-	?M	?M	?M	-M	-M	-M	MM	MM	MM*
005	- -	-M	-M	-M	-M	-M	-M	LM	MM	MM
006	M-	MM	M-	MM	-M	- -	-M	M-	MM*	-M
007	- -	-L	-M	-M	-L	-M	-M	LM	LM	MM
008	L-	LM	L-	LM*	-M	- -	-M	M-	MM	-M
009	LL*	LL*	LM	LM	LL*	LM	LM*	LM	LM*	MM
010	L?	L-	LM	LL	?-	?M	?L	-M	-L	ML
011	- -	-M	-M	-?	-M	-M	-?	MM*	M?	M?
012	- -	-L	-L	-L	-L	-L	-L	LL	LL	LL*
013	?-	?M	?M	?L	-M	-M	-L	MM	ML	ML
014	L-	LM	LL	LL	-M	-L	-L	ML	ML	LL
015	L-	LL*	LL*	LL	-M	-L	-L	LL*	LL	LL
016	- -	-L	-L	-L	-L	-L	-L	LL*	LL*	LL*
017	- -	-L	-L	-L	-L	-L	-L	LL*	LL*	LL*
018	L-	LL*	LL*	LL*	-L	-L	-L	LL*	LL*	LL*
019	L-	LL*	LL*	LL*	-L	-L	-L	LL*	LL*	LL*
020	L-	LL	L-	LL	-L	- -	-L	L-	LL*	-L
021	??	?M	?-	?-	?M	?-	?-	M-	M-	- -
022	MM	M-	M-	MM	M-	M-	MM	- -	-M	-M
023	LL	LL*	LL*	LL*	LL	LL	LL	LL*	LL*	LL*

SPECIES NO. (From Table 1)	AR / AS	AR / KA	AR / TE	AR / WA	AS / KA	AS / TE	AS / WA	KA / TE	KA / WA	TE / WA
024	-M	-L	-L	-L	ML	ML	ML	LL	LL	LL
025	LM	LL	L-	L-	ML	M-	M-	L-	L-	- -
026	L-	LM	LM	L-	-M	-M	- -	MM	M-	M-
027	-M	-M	-M	- -	MM	MM	M-	MM	M-	M-
028	L-	LM	LM	LL	-M	-M	-L	MM	ML	ML
029	LM	LL*	LL*	LM	ML	ML	MM	LL*	LM	LM
030	MM	MM	M-	M-	MM	M-	M-	M-	M-	- -
031	- -	-L	-L	-L	-L	-L	-L	LL*	LL*	LL*
032	- -	-L	-L	-L	-L	-L	-L	LL*	LL*	LL*
033	- -	-L	-L	-M	-L	-L	-M	LL	LM	LM
034	M-	ML	MM	MM*	-L	-M	-M	LM	LM	MM
035	LL*	L-	LL*	L-	L-	LL*	L-	-L	- -	L-
036	- -	-M	-M	-M	-M	-M	-M	MM*	MM	MM
037	M-	ML	M-	MM	-L	- -	-M	L-	LM	-M
038	M-	ML	ML	MM*	-L	-L	-M	LL*	LM	LM
039	MM*	ML	L-	MM*	ML	M-	MM*	L-	LM	-M
040	- -	-M	-M	-M	-L	-M	-M	MM*	MM	MM
041	- -	-M	-M	-M	-M	-M	-M	MM	MM	MM
042	- -	-L	-M	-M	-M	-M	-M	LM	LM	MM
043	M-	MM	ML	ML	-M	-L	-L	LL	ML	LL
044	- -	-M	-M	-M	-M	-M	-M	MM	MM	MM
045	-M	-M	-M	-M	MM	MM	MM	MM	MM	MM
046	- -	-M	-M	-L	-M	-M	-L	MM*	ML	ML
047	MM	MM	M-	M-	MM	M-	M-	M-	M-	- -
048	M?	MM	M-	M-	MM	M-	?-	M-	M-	- -

SPECIES NO. (From Table 1)	AR / AS	AR / KA	AR / TE	AR / WA	AS / KA	AS / TE	AS / WA	KA / TE	KA / WA	TE / WA
049	LL*	LM	L-	LL*	LM	L-	LL*	M-	ML	-L
050	LL*	LL*	LL*	LM*	LL*	LL*	LM*	LL*	LM*	LM*
051	M-	MM*	M-	MM	-M	- -	-M	M-	MM	-M
052	LL*	MM	MM	M-	MM	MM	M-	MM	M-	M-
053	-L	-M	-M	- -	LM	LM	L-	MM*	M-	M-
054	- -	-M	-M	-M	-M	-M	-M	MM	MM	MM*
055	??	?M	?-	?-	?M	?-	?-	M-	M-	- -
056	MM	MM*	MM*	MM	MM	M-	MM	MM*	MM	MM
057	M-	MM	M-	ML	-M	- -	-L	M-	ML	-L
058	- -	-L	-L	-L	-L	-L	-L	LL*	LL*	LL*
059	M-	ML	ML	M-	-L	-L	- -	LL*	L-	L-
060	MM*	MM	M-	M-	MM	M-	M-	M-	M-	- -
061	MM	M-	M-	ML	M-	M-	ML	- -	-L	-L
062	- -	-L	-L	-M	-L	-L	-M	LL*	LM	LM
063	ML	M-	M-	MM	L-	L-	LM	- -	-M	-M
064	- -	-M	-L	-M	-M	-L	-M	ML	MM	LM
065	- -	-L	-M	-M	-L	-M	-M	LM	LM	MM
066	L-	LL*	L-	LL	-L	- -	-L	L-	LL	-L
067	MM	ML	M-	M-	MM*	M-	M-	L-	L-	- -
068	MM*	MM*	MM*	M-	MM*	MM*	M-	MM*	M-	M-
069	M-	ML	LL*	ML*	-L	-L	-L	LL	LL	LL*
070	- -	-M	-M	-M	-M	-M	-M	MM	MM*	MM
071	- -	-M	-M	-M	-M	-M	-M	MM*	MM*	MM*
072	-M	-L	- -	-L	ML	?-	ML	L-	LL	-L
073	LM	LL	LM	L-	ML	MM	M-	LM	L-	M-

SPECIES NO. (From Table 1)	AR / AS	AR / KA	AR / TE	AR / WA	AS / KA	AS / TE	AS / WA	KA / TE	KA / WA	TE / WA
074	M-	ML	M-	MM	-L	- -	-M	L-	LM	-M
075	-L	-L	- -	-L	LL*	L-	LL	L-	LL	-L
076	?-	?L	?L	?M	-L	-L	-M	LL	LM	LM
077	-L	-L	- -	-M	LL	L-	LM	L-	LM	-M
078	?-	?M	??	?L	-M	-?	-L	ML	ML	?L
079	MM*	MM*	MM	MM	MM*	MM	MM	MM	MM	MM
080	- -	-M	-M	-M	-M	-M	-M	MM	MM	MM*
081	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*
082	LL*	LL*	L-	LL	LL*	L-	LL	L-	LL	-L
083	MM	ML	MM	MM	ML	MM	MM	LM	LM	MM
084	MM	MM	MM	M-	MM	MM	M-	MM	M-	M-
085	?M	?M	?-	?L	MM	M-	ML	M-	ML	-L
086	-M	-M	- -	-L	MM	M-	ML	M-	ML	-L
087	LL*	LM*	LM*	L-	LM*	LM*	L-	MM*	M-	M-
088	- -	-L	-L	-L	-L	-L	-L	LL	LL	LL
089	- -	-L	-M	-L	-L	-M	-L	LM	LL	ML
090	-M	-M	-M	- -	MM	MM	M-	MM	M-	M-
091	-M	-M	-L	-M	MM	ML	MM	ML	MM*	LM
092	M-	MM*	MM*	MM	-M	-M	-M	MM*	MM	MM
093	MM	MM	M-	M-	MM	M-	M-	M-	M-	- -
094	L-	LL*	LM	LL*	-L	-M	-L	LM	LL*	ML
095	MM	MM	M-	M-	MM	M-	M-	M-	M-	- -
096	MM	MM	MM	?-	MM	MM	M-	MM*	M-	M-
097	?-	?M	?-	?L	-M	- -	-L	M-	ML	-L

PAIR TYPE	AR / AS	AR / KA	AR / TE	AR / WA	AS / KA	AS / TE	AS / WA	KA / TE	KA / WA	TE / WA	LINE TOTALS
LL	1	3	1	7	2	1	3	7	10	4	39
LL*	7	11	8	6	5	3	2	16	12	13	83
MM	11	12	6	10	18	11	7	17	16	18	126
MM*	5	5	3	3	3	1	1	11	4	3	39
ML & LM	4	14	9	5	9	5	7	14	25	13	105
ML* & LM*	0	1	2	3	1	1	2	0	2	1	13
?M & M?	2	7	2	2	6	2	1	0	1	1	24
?M* & M?*	0	0	0	0	0	0	0	0	0	0	0
?L & L?	1	1	1	4	0	0	1	0	0	1	9
?L* & L?*	0	0	0	0	0	0	0	0	0	0	0
??	1	0	1	0	0	0	0	0	0	0	2
??*	1	0	0	0	0	0	0	0	0	0	1
COLUMN TOTALS	33	54	33	40	44	24	24	65	70	54	441 (Total no. pairs)

- Total similar pairs: 136
- Total dissimilar pairs: 305

NOTE TO TABLE 4

1. Entries with no data symbol (--) excluded from calculated totals.

TABLE 5: Pairs of word types for Semi-domesticated plant species among the five languages. Similar pairs indicated by asterisk. M = metaphorical; L = literal word; -- = no data.[1] AR = Araweté; AS = Asurini; KA = Ka'apor; TE = Tembé; WA = Wayãpi. Data from Table 2.

SPECIES NO. (From Table 2)	AR / AS	AR / KA	AR / TE	AR / WA	AS / KA	AS / TE	AS / WA	KA / TE	KA / WA	TE / WA
098	LL*	LM	LM	LL*	LM	LM	LL*	MM*	ML	ML
099	M-	ML	ML	M-	-L	-L	- -	LL*	L-	L-
100	-M	-M	- -	-L	MM	M-	ML	M-	ML	-L
101	L-	LL*	L-	LL*	-L	- -	-L	L-	LL*	-L
102	- -	-L	-L	-L	-L	-L	-L	LL*	LL	LL
103	LL	LL*	LL*	LL*	LL	LL	LL	LL*	LL*	LL*
104	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*
105	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*
106	LL	LL	LM	L-	LL	LM	L-	LM	L-	M-
107	-L	-L	-L	-L	LL*	LL*	LL*	LL*	LL*	LL*
108	LL*	LL	LL*	LL*	LL	LL*	LL*	LL	LL	LL*
109	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*
110	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*
111	M-	M-	ML	ML	- -	-L	-L	-L	-L	LL
112	L-	LL*	L-	LL*	-L	- -	-L	L-	LL*	-L
113	LM	LL	L-	L-	ML	M-	M-	L-	L-	- -
114	M-	MM	M-	ML	-M	- -	-L	M-	ML	-L
115	LL*	LL	LL	LL*	LL	LL	LL*	LL	LL	LL
116	MM*	MM	MM*	MM	MM	MM*	MM	MM	MM	MM
117	L-	LL*	LL*	LL*	-L	-L	-L	LL*	LL*	LL*
118	LM	LL	LM	LM	ML*	MM	MM	LM	LM	MM
119	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*
120	MM*	ML	M-	MM	ML	M-	MM	L-	LM	-M
121	LL	LL	LL	L-	LL*	LL*	L-	LL*	L-	L-

SPECIES NO. (From Table 2)	AR / AS	AR / KA	AR / TE	AR / WA	AS / KA	AS / TE	AS / WA	KA / TE	KA / WA	TE / WA
122	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*
123	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*
124	LL*	LL*	L-	L-	LL*	L-	L-	L-	L-	- -
125	LL*	L-	L-	LL*	L-	L-	LL*	- -	-L	-L
126	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*
127	- -	-L	-L	-L	-L	-L	-L	LL	LL	LL
128	LL	LL*	LL*	LL	LL	LL	LL	LL*	LL	LL
129	M-	MM	MM	MM	-M	-M	-M	MM	MM	MM
130	- -	-M	-M	-M	-M	-M	-M	MM	MM*	MM
131	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*
132	M-	MM	M-	ML	-M	- -	-L	M-	ML	-L
133	-M	-M	-M	- -	MM*	MM*	M-	MM*	M-	M-
134	L-	LL	LL	LM	-L	-L	-M	LL*	LM	LM
135	M-	MM	MM	M-	-M	-M	- -	MM	M-	M-
136	- -	-M	-M	-M	-M	-M	-M	MM	MM	MM
137	L-	LL*	LL*	LL*	-L	-L	-L	LL*	LL*	LL*
138	LL*	LL	LL*	LL*	LL	LL*	LL*	LL	LL	LL*
139	M-	MM*	M-	ML	-M	- -	-L	M-	ML	-L
140	LL*	LM	L-	L-	LM	L-	L-	M-	M-	- -
141	M-	MM	MM	MM	-M	-M	-M	MM	MM	MM

PAIR TYPE	AR / AS	AR / KA	AR / TE	AR / WA	AS / KA	AS / TE	AS / WA	KA / TE	KA / WA	TE / WA	LINE TOTALS
LL	4	8	3	1	6	3	2	4	6	5	42
LL*	16	16	15	19	12	13	15	18	15	15	154
MM	0	6	3	4	2	1	3	7	4	6	36
MM*	2	1	1	0	1	2	0	1	1	0	9
ML & LM	2	4	5	6	4	2	1	2	8	2	36
ML*	0	0	0	0	1	0	0	0	0	0	1
COLUMN TOTALS	24	35	27	30	26	21	21	32	34	28	278 (Total no. pairs)

- Total similar pairs: 164

- Total dissimilar pairs: 114

NOTE TO TABLE 5

1. See note 1, Table 4.

TABLE 6: Pairs of word types for domesticated plant species among the five languages. Similar pairs indicated by asterisk. M = metaphorical word; L = literal word; -- = no data.[1] AR = Araweté; AS = Asurini; KA = Ka'apor; TE = Tembé; WA = Wayãpi. Data from Table 3.

SPECIES NO. (From Table 3)	AR / AS	AR / KA	AR / TE	AR / WA	AS / KA	AS / TE	AS / WA	KA / TE	KA / WA	TE / WA
142	L-	LL*	LL*	LL*	-L	-L	-L	LL*	LL*	LL*
143	- -	-L	-L	-L	-L	-L	-L	LL*	LL*	LL*
144	- -	-L	-L	-L	-L	-L	-L	LL*	LL*	LL*
145	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*
146	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*
147	LL	LL*	LL*	LL*	LL	LL	LL	LL*	LL*	LL*
148	L-	LL*	LL*	LL*	LL*	-L	-L	LL*	LL*	LL*
149	LL	LL*	LL	LL*	LL	LL*	LL	LL	LL*	LL
150	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*
151	LL*	LL*	LL*	LL	LL*	LL*	LL	LL*	LL	LL
152	- -	-M	-L	-L	-M	-L	-L	ML	ML	LL
153	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*
154	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*
155	- -	-L	-L	-L	-L	-L	-L	LL*	LL*	LL*
156	L-	LL*	LL*	LL*	-L	-L	-L	LL*	LL*	LL*
157	-L	-L	- -	-L	-L	L-	LL*	L-	LL*	-L
158	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*
159	LL	LL	LL	LL	LL*	LL*	LL*	LL*	LL*	LL*
160	LL	LL	LL	LL	LL*	LL*	LL*	LL*	LL*	LL*
161	L-	LL	LL	LL*	-L	-L	-L	LL*	LL	LL
162	-L	-L	-L	-L	LL*	LL*	LL*	LL*	LL*	LL*
163	- -	-M	-M	-L	-M	-M	-L	MM	ML*	ML*
164	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*	LL*

SPECIES NO. (From Table 3)	AR / AS	AR / KA	AR / TE	AR / WA	AS / KA	AS / TE	AS / WA	KA / TE	KA / WA	TE / WA
165	LL*	LL*	LL*	LL*	LL*	LL*	LL	LL*	LL*	LL*
166	LL*	LL*	LL*	LL	LL*	LL*	LL*	LL*	LL	LL
167	LL*	LL	LL*	LL	LL	LL*	LL	LL	LL	LL

PAIR TYPE	AR / AS	AR / KA	AR / TE	AR / WA	AS / KA	AS / TE	AS / WA	KA / TE	KA / WA	TE / WA	LINE TOTALS
LL	4	4	4	5	3	1	4	2	4	6	37
LL*	11	15	15	14	14	15	13	21	20	18	156
MM*	0	0	0	0	0	0	0	1	0	0	1
ML	0	0	0	0	0	0	0	1	1	0	2
ML*	0	0	0	0	0	0	0	0	1	1	2
COLUMN TOTALS	15	19	19	19	17	16	17	25	26	25	198 (Total no. pairs)

· Total similar pairs: 159

· Total dissimilar pairs: 39

NOTE TO TABLE 6

1. See note 1, Table 4.

Management Type	All Words*	Literal	Metaphorical
Non-domesticates	323	137 (42.4%)	186 (57.6%)
Semi-domesticates	175	128 (73.1%)	47 (26.9%)
Domesticates	113	110 (97.3%)	3 (02.7%)

* The 14 indeterminate words, indicated with ? (Tables 1, 2, and 3), are excluded.

The differences between the proportions of metaphorical words in the three categories of plants (57.6%, 26.9%, and 2.7%) are very significant and show that these words were taken from fundamentally different populations (G heterogeneity = 143.482, $p < .0001$). In other words, the proportion of metaphorical words declines considerably as a function of increasing plant management (see Fig. 2).

Another finding is that the literal plant terms are much more similar from language to language than are metaphorical terms. Overall, the similarity of pairs of literal words compared to metaphorical words is:

	Total	Similar	Dissimilar
Literal Word Pairs	511	393 (77%)	118 (23%)
Metaphorical Word Pairs	211	49 (23.2%)	162 (76.8%)

It is important to note that the overall proportions of similarity of literal plant name pairs for each of the three management types are not significantly different (68% for non-domesticates, 78.6% for semi-domesticates, and 80.8% for domesticates).

The ratio of literal to metaphorical plant words, combining words from all management types, is not significantly different between the five languages ($X^2 = 1.7$, df=4, $p > .05$).

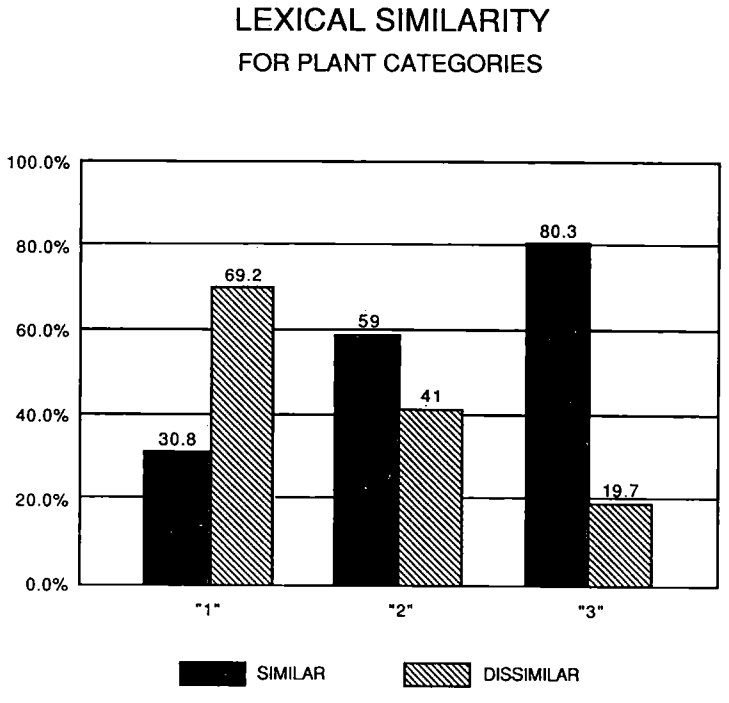
LEXICAL SIMILARITY
FOR PLANT CATEGORIES
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
30.8
69.2
59
41
80.3
19.7
"1"
"2"
"3"
SIMILAR
DISSIMILAR
1 = non-domesticates
2 = semi-domesticates
3 = domesticates

FIGURE 1

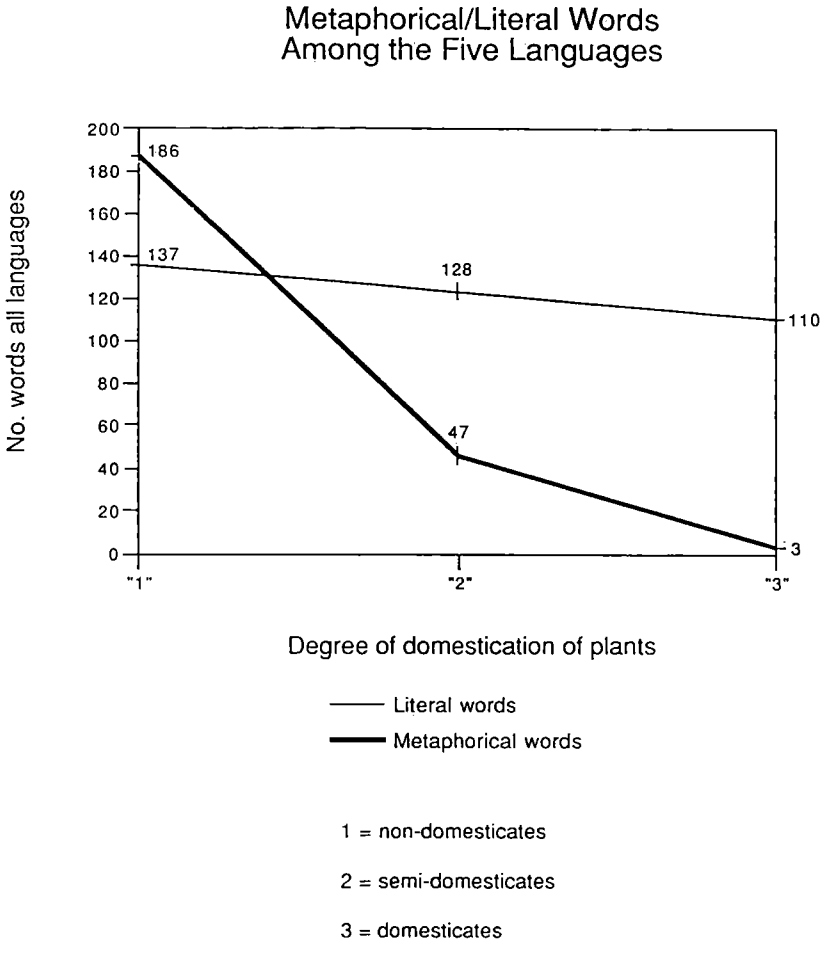
Metaphorical/Literal Words
Among the Five Languages
No. words all languages
200
180
160
140
120
100
80
60
40
20
0
186
137
128
110
47
3
"1"
"2"
"3"
Degree of domestication of plants
Literal words
Metaphorical words
1 = non-domesticates
2 = semi-domesticates
3 = domesticates

FIGURE 2

DISCUSSION

The above results are generally in accord with Berlin et al.'s (1973) pioneering hypothesis that cultural importance influences the retention of plant names in sister languages:

Degree of Cultural Importance ——→ Degree of Retention

But our results suggest that this process can be further elucidated by recognizing as analytical variables (1) the degree of plant management (domesticated, semi-domesticated, non-domesticated); (2) a widespread nomenclatural pattern among these languages, in which words for traditional domesticates tend to be literal, words for non-domesticates tend to be metaphorical, and words for semi-domesticates tend to lie between these extremes; and 3) the much higher stability of literal, as opposed to metaphorical, plant names. In this model, the types of names which the nomenclatural pattern assigns to domesticates strongly tend to be literal, the types assigned to semi-domesticates show an increasing proportion of metaphorical terms, and the majority of those assigned to non-domesticates are metaphorical. For some reason, literal terms are more stable over time and hence are more apt to be similar from language to language. That is, to answer the question posed in the beginning, cultural factors of plant management and the plant naming system combine with the linguistic properties of names and diachronic linguistic processes to produce similarity and variation in plant vocabulary:

(1) SYNCHRONIC FACTORS:

Degree of Plant Management + Nomenclatural System ——→ Proportion of Literal/Metaphorical Terms

(2) DIACHRONIC PROCESSES:

Differential Retention of Literal/Metaphorical Terms ——→ Similarity and Variation of Terms

In spite of the somewhat different methods, the results of Berlin et al. (1973) are consistent with ours. Although we cannot say whether metaphorical names are proportionally more represented in the "wild" vs. "protected" and "cultivated" categories of Berlin et al. (1973), since non-cognates and their glosses in these categories are not shown, it is possible to indicate what proportion of the cognates is literal and what proportion is metaphorical and in

which categories. The literal vs. metaphorical distinctions by our criteria can be obtained from the glosses of Tzeltal plant words given in Berlin et al. (1974). It is interesting that 79 Tzeltal plant names cognate with Tzotzil names are literal, while only 32 are metaphorical (Berlin et al. 1973, cf. 1974). This supports indirectly our contention that literal plant words tend to be cognate at a higher rate than metaphorical plant words. Second, although we cannot test significance of literal/metaphorical word proportions between the four different categories of plants given in Berlin et al. (1973) because of insufficient sample size, it is possible to test significance for the combined categories of cultivated and protected vs. wild-useful and wild-useless plants (see Tables 1-4 in Berlin et al. 1973). For the 111 cognate sample, 43 are cultivated and protected, while 68 are wild. Of the names for cultivated and protected plants, 37 are literal while only 6 are metaphorical. Of the 68 names for wild plants, 42 are literal while as many as 26 are metaphorical. In other words, the ratio of literal to metaphorical cognates (37 to 6 or 6.2 to 1) in the cultivated and protected categories combined is about four times higher than the corresponding ratio (42 to 26 or 1.6 to 1) for the combined "wild" categories. This difference is very significant at $p < .01, X^2 = 7.0$, df = 1). In other words, a nomenclatural pattern similar to that which we have observed for five Tupi-Guarani languages appears to exist as well with respect to Tzeltal/Tzotzil plant names. In addition, a nomenclatural pattern that lexically distinguishes between cultivated and non-cultivated plants has been explicitly noted for Mayan speakers of the Yucatan peninsula (Marin et al. 1976:472).

The factor of plant management correlates very highly with the retention of plant words in Tzeltal and Tzotzil. Although the sample proportion of cultivated to protected plants in Berlin et al. (1973) is too small to test significance of cognacy rates, it is possible to test overall significance of the proportion of cognacy for cultivated and protected vs. wild plants. Of the 52 word pairs obtained for cultivated and protected plants (see Table 5 in Berlin et al. 1973:161), 43 are cognates. Of the 205 word pairs for wild plants, only 68 are cognates. That is, managed plants have a cognacy ratio about two and a half times higher than non-managed plants.

The question remains whether plant utility, aside from plant management, as we have defined it, would more economically explain the proportion of similar plant words among the five Tupi-Guarani languages in our sample. We quantified the uses of non-domesticated species (see Prance et al. 1987) for the Ka'apor. The uses were (1) food, (2) construction material, (3) tool, weapon, utensil or container, (4) medicine, and (5) adornment. Fuel and game food were excluded as uses, since these are extremely widespread among forest species. Each use is of two types: major or minor. A major use has a value of 1.0, a minor use of 0.5, and no use, 0 (cf. Turner 1988). Given that literal plant words tend to be cognate in other languages, while metaphorical words tend not to be cognate in other languages, we asked

whether literal plant words in Ka'apor refer to highly useful plants in a higher proportion than Ka'apor metaphorical plant words. We limited this question to the non-domesticated plant category, where the factor of use can be isolated from that of plant management. A high use value for any species would be 1.0 or above; a low use value would be 0.5 or below. Of 92 names in the Ka'apor sample of non-domesticated plant names, 25 refer to plants with a high use value and 67 refer to plants with a low use value. Of the names denoting plants with a high use value, 13 are metaphorical, while 12 are literal. Of names for plants with a low use value, 37 are metaphorical while 30 are literal. The relative proportions of literal to metaphorical plant names in the two categories, high and low use value, do not significantly differ ($X^2 = .08$, $p > .05$, df = 1). This means that the usefulness of a plant is not a factor in why its name is literal or metaphorical and, by inference, in why its name is retained or not.

Why are literal plant terms more stable? One hypothesis is that of Alphonse de Candolle: they are shorter. While there may be some truth in this, there is probably more to it, since the shorter metaphorical words in our sample (one morpheme excluding any life-form or common plant part morpheme) do not seem to have a higher similarity rate than the longer words (two or three morphemes, excluding any life-form or common plant part morpheme). Another possibility is that the literal terms endure because of their arbitrariness--the metaphorical terms involve a cultural interpretation of the plant which is susceptible to change. In spite of the strong correlations observed in the section on results, there still remains some degree of unpredictability and possibly still unidentified factors at work in determining naming patterns. For example, some undomesticated species (in particular, several palms) show stable literal names. It is not yet clear what causes such exceptions.

The general patterns explained above, however, appear to be also present in the Mayan Tzeltal and Tzotzil as well as in the Tupi-Guarani languages studied. Perhaps this is the general case in Neolithic societies. It would be instructive to see whether similarity and variation in other semantic fields, such as birds, fish, or mammals, can be analyzed along the same general principles.

NOTES

1. The standardized symbols for consonants are as follows: **p, t, k, kw** (labialized velar stop), **'** (glottal stop), **b, d, g, c** (dental affricate), **č** (alveopalatal affricate), **s, š, z, đ** (voiced interdental fricative), **h, m, n, ñ, g̃** (velar nasal), **g̃w** (labialized velar nasal) **w, r, l,** and **y**. The vowel symbols are: **i, e** (mid or low-mid front

vowel), **ɨ̃**, (high central vowel), **ə** (mid central vowel) **a**, **u**, and **o** (mid or low-mid back vowel). In all of these languages, the nasals have homorganic prenasalized voiced stops as subphonemic variants, e.g. **m** is sometimes **[mb]**.

The Wayãpi phonemicization (Grenand 1980) is retained, although the symbols are standardized. The (surface) phonemes are: **p, t, k, ', s, m, n, ñ, g̃, w, l, y, i, e, a, u, o, ɨ̃,** and nasalization. The Ka'apor data are presented in the phonemicization by Kakumasu (1986:399-401): **p, t, k, kw, ', s, š, h, m, n, g̃, g̃w, w, r, y, i, e, ɨ̃, a, u,** and **o**. The phonemicization for Tembé is taken from Bendor-Samuel (1966) recognizing as phonemes the following: **p, t, k, kw, ', c** (alveolar or alveopalatal affricate), **z** (alveolar or alveopalatal affricate or palatal continuant), **h, m, n, g̃, g̃w, w, r, i, e, ɨ̃, ə ,a, u,** and **o.**

For the Asurini language, we have only a very tentative phonemicization (Irmazinha Edith 1987:5-7) and some unpublished transcriptions by Sidney Facundes of the Museu Goeldi. Although the sounds **ǰ, ñ,** and **y** are possibly allophones of the same phoneme, as are **g** and **g̃**, we employ a broad phonetic transcription rather than risk an undifferentiated preliminary analysis. The symbols, then, are: **p** (bilabial stop, fricative, or affricate), **t, č, k, ', j, g, m, n, ñ, g̃, w** (bilabial semivowel or fricative), **r, y, i, ɨ̃, e, a, u,** and nasalization.

There is no phonemicization available for Araweté, although some information appears in Viveiros de Castro (1986:145). The broad phonetic transcription for Araweté uses the following symbols: **p, t, k, ', b, d, c, č, h, đ, m, n, ñ, w, r, y, ĩ, ə , e, i, ɨ̃ , a, u, o,** and nasalization.

2. Cronquist (1988:18) later reaffirmed this, stating that:

> "It is perfectly clear that natural, recognizable groups of species, and groups of such groups, exist. The ranks at which these groups should be received are not inherent in the nature of the group, but depend on subjective individual judgment . . . any evaluation of the importance of the characters marking a [supraspecific] group is likely to be difficult and subject to unresolvable differences of opinion."

3. It is interesting to compare this with Berlin et al. (1973), whose methods differ somewhat from ours. They explicitly intended to exclude as possible cognates "compound names which appear to

be the result of identical responses to the same stimuli" (1973:153). Careful study of glosses of Tzeltal plant names in Berlin et al. (1974), however, shows this not to be entirely the case. Example #88 from Table 4 (Berlin et al. 1973:159), **ič̣il?ak** in Tzeltal, is glossed as 'itchy vine' in Berlin et al. (1974:374). They stated "The sap derived from the leaves is a well-known skin irritant, hence the plant's name" (Berlin et al 1974:374). As such, the similarity between Tzeltal and Tzotzil names for this species could be a result of "identical responses to the same stimuli" and, by this criterion, should have been excluded from comparison. Other examples include #29, **č'is te** (Berlin et al. 1973:156), a thorny plant elsewhere glossed as 'spine tree' (Berlin et al. 1974:191) and #41, **tus?'ak**, the word for wild onion, elsewhere glossed as 'stink grass' (Berlin et al. 1974:458). In fact, our analysis explicitly includes such names, as long as the referents are of neotropical origin.

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