

## TALINETUM PANICULATI, A NEW SYNANTHROPIC ASSOCIATION OF TROPICAL AFRICA

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**Abstract:** A phytosociological study of a community dominated by *Talinum paniculatum* in Kampala, Uganda, was carried out in 1998. This plant community grows in cultivated and ruderal areas, especially under shade, during the rainy season. A total of 78 species was recorded, most of them annual, anemochorous and widespread. This community is characterized by two different strata: the upper one, about 10–30 cm high, composed mainly of *Talinum paniculatum*; and the lower one, about 0–10 cm high, comprised of many different plant species. The *Talinum paniculatum* community has been described as a new association, *Talinetum paniculati* ass. nov., belonging to the *Bidention pilosae* Lebrun alliance in Mullenders 1949 which comprises plant communities occurring in cultivation, postcultivation and ruderal habitats.

**Key words:** *Talinum paniculatum* community, phytosociology, ecology, Kampala, Uganda

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### INTRODUCTION

A phytosociological study of weed communities growing in Kampala, the capital city of Uganda, was carried out in 1998. Kampala is located at 0°19'N latitude and 33°35'E longitude, at an altitude of ca 1200 m above sea level. Rainfall varies throughout the year, with a mean annual total of ca 1000–1250 mm. Kampala experiences two rainy seasons (March–June and September–November) and two dry seasons (July–August and December–February). The average temperature is about 23°C. The population is relatively high, with ca 800,000 inhabitants.

Due to human impacts (settlement, agriculture, infrastructure, etc.), the natural ecosystem has been modified and replaced by several manmade habitats. These are covered by anthropogenic vegetation, mostly species commonly called weeds because of their interference with man's activities, health and pleasures (Fryer 1982). These species are troublesome not only because of their competition with cultivated plant species but also because they grow where they are not wanted, for example around settlements, along waysides and sometimes on roofs (Holzner & Numata 1982; Mosango 1983a). Although they have negative

impacts, they may protect the soil against erosion, indicate soil and climate conditions, or be used as food and medicine (Hoff 1991). It is therefore important to study these plant communities in order to understand their ecology.

So far there has not been any phytosociological study on this kind of vegetation in Kampala, although Ivens (1967, 1971) has described the ecology and means of control for 220 weeds of East Africa, including Uganda.

In this paper the *Talinum paniculatum* community is described. A phytosociological table is given and discussed in terms of plant species composition, life forms, geographical distributions and means of dispersal.

### MATERIAL AND METHODS

The *Talinum paniculatum* community was studied following the Zürich-Montpellier School of Phytosociology method (Braun-Blanquet 1932; Mueller-Dombois & Ellenberg 1974). This method has been used successfully in tropical Africa by several researchers: Lebrun (1947), Léonard (1950, 1952), Schnell (1952), Mullenders (1954), Lubini (1982, 1986), Mandango (1982),

Mosango and Lejoly (1988) and Mosango (1991). Special emphasis is placed on floristic and synecological structure as well as on dynamic aspects. Phytosociological relevés were made at fifteen sites in Kampala where the *Talinum paniculatum* community was found to grow.

The biological spectrum was analyzed following the plant life form (LF) classification described by Raunkiaer (1934): phanerophytes (Ph) – woody plants, essentially trees, tall shrubs and climbers > 50 cm high carrying their perennating buds on the tips of their branches where they are exposed to climatic extremes;

chamaephytes (Ch) and climbing chamaephytes (Chcl) – small shrubs and herbs that grow close to the ground;

hemicryptophytes (Hc) – herbaceous perennial plants dying back at the end of the growing season, with the buds protected by the withered leaves and soil;

geophytes (G) – perennial plants that regenerate from rhizomes, bulbs, corms and tubers that are completely buried in the soil;

therophytes (T) and climbing therophytes (Tcl) – annual plants that regenerate from seeds each year.

The dispersal spectrum (DIS) was analyzed following Dansereau and Lems' (1957) classification:

sclerochores (Scler) – unfleshy and slight diaspores; desmochores (Desm) – adhesive and clinging diaspores;

ballochores (Ball) – diaspores dispersed by any plant itself;

sarcochores (Sarco) – totally or partly fleshy diaspores.

The geographical distribution (GD) of the recorded plant species was determined based on the geographical area of each species as described in many different publications (Germain 1952; Mullenders 1954; Schmitz 1971; Mandango 1982; Mosango & Lejoly 1988; Mosango *et al.* 1999; *Flora of East Tropical Africa; Flore d'Afrique Centrale*; White 1986). The following phytogeographical elements were identified:

pantropical (Pan) – plant species growing throughout the tropics;

paleotropical (Pal) – plants growing in tropical Africa, Madagascar, Asia and Australia;

Afro-tropical (At) – plants found exclusively in tropical Africa;

Afro-Malagasy (AM) – plants found in Africa and Madagascar;

cosmopolitan (Cos) – plants spread worldwide.

The interpretation of different ecological spectra is based essentially on native, spontaneous and spontaneous plant species.

## RESULTS

In the *Talinum paniculatum* community in Kampala, 78 plant species were recorded (Table 1). These species were categorized into socio-ecological groups.

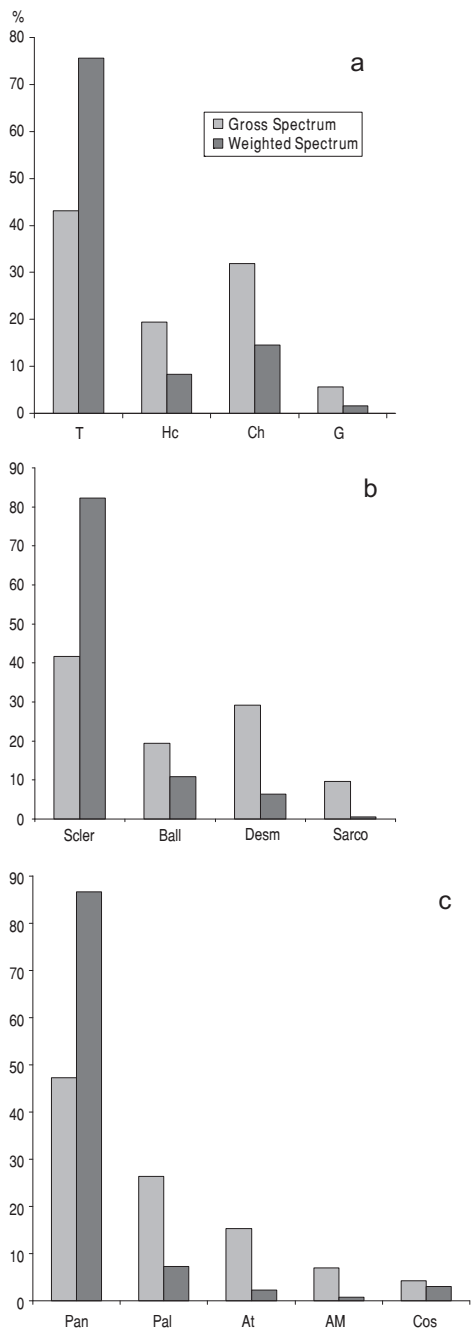
The first group consists of 5 characteristic species of the plant community. These include *Talinum paniculatum*, *Dichondra repens*, *Hillieria latifolia*, *Oxalis latifolia* and *Drymaria cordata*. Among these species, *Talinum paniculatum* is the most abundant and dominant, with 50.8% average cover. It grows mainly in cultivated and ruderal areas, especially under shade where the soil is rich in organic matter.

The other species are globally less abundant: 18 agrestials or segetals which normally grow in crop areas (*Bidention pilosae* Lebrun in Mullenders 1949); 21 ruderals which normally grow along roadsides, in trash dumps and dunghills (*Eleusinion indicae* Léonard 1950); 6 species of shady areas (*Paspalion conjugati* Léonard 1950); 21 species of herbaceous fallows (*Panicion maximi* Léonard 1950); and finally 6 cultivated plant species.

The *Talinum paniculatum* community presents two different strata. The upper one, 10–30 cm high, is formed essentially by *Talinum paniculatum*, and the lower one, about 0–10 cm high, is composed mainly of creeping or prostrate plant species like *Dichondra repens*, *Hydrocotyle manii* and some shorter plants such as *Oxalis corniculata* and *O. latifolia*.

Because of the high species diversity in this plant community, the diversity of life forms is also high. As shown in Fig. 1a, annuals or therophytes largely dominate, not only in terms of number of species (43.1%) but also in terms of average cover (75.6%). Then follow the chamaephytes, hemicryptophytes and geophytes respectively.

Most of the plant species recorded are sclerochorous (Fig. 1b). They represent 41.7% of the total, with the highest average cover, 82.2%. Their light diaspores allow them to be dispersed by wind. Other species are either desmochorous, ballochorous or sarcochorous. These are generally less abundant but show an ability to be dispersed



**Fig. 1a:** Life form (a), dispersal (b) and geographical (c) spectra of *Talinetum paniculati*. T – therophytes, Hc – hemicryptophytes, Ch – chamaephytes, G – geophytes; Scler – sclerochlores, Ball – ballochores, Desm – Desmochlores, Sarco – sarcobolus; Pan – pantropical, Pal – paleotropical, At – Afro-tropical, AM – Afro-Malagasy, Cos – cosmopolitan.

either by themselves (ballochorous species) or by animals (desmochorous and sarcochorous species).

The phytogeographical spectrum is dominated by widespread species (Fig. 1c). Most of them are pantropical and constitute 47.2% of the total, and their average cover is very high (86.7%). They are followed by paleotropical species representing 26.4% of the total, and Afro-tropical ones (15.3%). Afro-Malagasy and cosmopolitan plant species are also present but scarce.

DISCUSSION AND CONCLUSION

The *Talinetum paniculatum* community appears in the first stage of plant succession. It grows in cultivated and ruderal areas where the soil appears to be rich in organic matter and nitrogen. It is characterized mainly by the dominance of annual and widespread species which are dispersed mostly by wind (= anemochorous, sensu Molinier & Muller 1938).

The occurrence of this community is related to the rainy season and the absence of weeding. As is known, buried seeds and underground parts of weeds remain viable in the soil for a long time and germinate or regenerate under favorable conditions (Mosango 1983b).

Normally the community evolves towards a herbaceous fallow community of *Panicum maximum*. This occurs generally when the habitat is open and nutrient-rich. However, in the case of regular weeding the soil becomes more and more nutrient-poor. Consequently, the community evolves towards the herbaceous community of *Imperata cylindrica* which grows mainly in nutrient-poor soils around Kampala. The occurrence of this community therefore indicates regressive evolution of the local vegetation of Kampala, ultimately resulting in the savannization of the area.

Léonard (in Taton 1949) described a phytosociological class of plant communities growing in ruderal, cultivation and postcultivation habitats called *Ruderali Manihotetea pantropicalia*. This class is comprised of two orders: *Digitarietalia abyssinicae* Lebrun (in Taton 1949) consisting of

**Table 1.** *Talinum paniculati* association in Kampala (Uganda). LF – life form, GD – geographical distribution, DIS – dispersal spectrum, P – species constancy, AV – average cover, AV\* – species average cover values of *Talinum iriangularis* in Kisangani, Democratic Republic of Congo (Nyakabwa 1982).

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Number of relevé		30	40	20	4	40	3	30	40	6	21	5	10	3	5	20
Area (m <sup>2</sup> )		100	100	65	80	100	95	100	95	100	85	100	60	80	90	80
LF	GD	DIS														P
																AV
																AV*
Height (cm)		35	30	30	30	30	45	30	50	20	25	18	30	30	30	45
Number of species		18	17	21	19	35	9	18	35	15	18	16	29	14	17	22
1. Characteristic species of the association																
T	Pan	Scler		4	4	3	3	4	4	4	4	3	4	3	3	3
																V
Ch	Pan	Scler		1	-	1	+	1	+	1	+	+	+	+	+	V
																V
Hc	Pal	Ball		1	+	-	-	+	-	3	1	2	+	+	+	IV
																IV
Ch	AM	Scler		1	+	1	+	+	+	+	+	-	-	-	+	IV
																IV
Ch	Pan	Ball		-	-	+	+	-	2	-	+	1	+	-	-	III
																III
2. Characteristic species of the <i>Bidention pilosae</i>																
Ch	Cos	Scler		1	+	+	+	+	2	1	1	+	+	+	1	1
																V
T	Pan	Desm		+	+	+	+	-	-	+	+	-	1	-	1	IV
																IV
T	Pal	Scler		-	+	+	+	+	-	+	+	-	+	-	+	III
																III
Hc	Pal	Scler		+	+	+	+	+	+	+	+	-	-	-	+	III
																III
T	Pan	Desm		+	-	-	-	+	+	+	+	+	+	+	1	II
																II
T	Pan	Scler		-	-	+	-	-	-	-	-	+	-	-	+	II
																II
T	Cos	Desm		-	1	-	-	-	+	-	+	+	+	+	-	II
																II
T	Pal	Scler		-	-	-	+	+	-	+	-	+	+	+	-	II
																II
T	Pan	Desm		-	+	-	-	+	+	+	-	-	-	-	+	II
																II
T	Pan	Desm		-	-	-	-	+	+	+	-	-	-	-	-	II
																II
Hc	AM	Scler		-	-	-	-	+	+	+	-	+	-	-	-	II
																II
T	Pan	Desm		+	-	-	-	-	+	-	-	+	-	-	+	II
																II
T	Pan	Desm		-	-	-	-	+	+	-	-	-	-	-	-	II
																II
T	Pan	Desm		-	-	-	-	+	+	-	-	-	-	-	-	II
																II
T	At	Ballo		-	-	-	-	-	-	-	-	+	-	-	-	I
																I
T	Pan	Ball		-	-	-	-	-	-	-	-	-	-	-	-	I
																I
T	Pan	Scler		-	-	-	-	-	-	-	-	-	-	-	-	I
																I
T	Pal	Scler		-	-	-	-	-	-	-	-	-	-	-	-	I
																I

*Digitaria ternata* (Hochst. ex Steud.) Stapf



Table 1. Continued.

LF	GD	DIS	Number of relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	P	AV	AV*	
T	Pan	Desm	<i>Desmodium canum</i> (J. F. Gmel) Schinz & Thell.	-	+	+	-	-	-	-	+	+	-	+	-	-	-	+	II	0.08	-	
Gb	Pal	Scler	<i>Cyperus cyperoides</i> L.	-	-	+	+	+	-	-	-	-	-	-	+	-	+	-	II	0.07	-	
Ch	Pan	Desm	<i>Indigofera spicata</i> Forsk.	-	-	+	+	+	-	-	-	-	-	-	-	-	+	-	II	0.05	-	
T	Pan	Scler	<i>Eleusine indica</i> (L.) Gaertner	-	-	+	-	-	-	-	-	+	-	-	+	-	-	+	II	0.05	-	
Hc	At	Scler	<i>Digitaria abyssinica</i> (A. Rich.) Stapf	-	-	+	-	-	-	+	-	-	+	-	+	-	-	-	II	0.05	-	
Ch	Pal	Ball	<i>Sida veronicifolia</i> Lam.	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-	I	0.04	-	
Ch	Pal	Ball	<i>Sida ovata</i> Forsk.	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-	I	0.04	-	
Hc	At	Scler	<i>Sporobolus pyramidalis</i> P. Beauv.	-	-	-	-	-	-	-	+	+	-	-	-	-	-	+	I	0.04	-	
Gr	Cos	Scler	<i>Cynodon dactylon</i> (L.) Pers.	-	-	-	-	-	-	-	-	+	-	-	+	-	+	-	I	0.04	-	
T	Pan	Desm	<i>Desmodium triflorum</i> (L.) DC.	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	I	0.03	-	
Ch	Pal	Ball	<i>Sida cuneifolia</i> Roxb.	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	I	0.03	-	
Hc	Pan	Scler	<i>Kyllinga alba</i> Nees	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	I	0.03	-	
T	Pan	Desm	<i>Desmodium ramosissimum</i> G. Don	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	I	0.01	-	
Gr	Pal	Scler	<i>Stenotaphrum dimidiatum</i> (L.) Brongn.	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	I	0.01	-	
T	Pal	Desm	<i>Desmodium repandum</i> (Vahl.) DC.	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	I	0.01	-	
4.2. Characteristic species of <i>Paspalium conjugati</i>																						
Hc	At	Scler	<i>Hydrocotyle mannii</i> Hook. f.	2	-	-	-	-	-	+	-	-	-	-	-	-	-	-	I	1.00	-	
T	Pal	Ball	<i>Dyschoriste radicans</i> (Hochst. ex A. Rich.) Nees	-	-	-	-	-	-	-	+	-	-	-	-	-	+	-	I	0.03	-	
T	Pal	Ball	<i>Justicia betonica</i> L.	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	I	0.01	-	
Hc	Pan	Scler	<i>Axonopus compressus</i> (Sw.) P. Beauv.	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	I	0.01	0.08	
Hc	Pan	Scler	<i>Paspalum conjugatum</i> Berg.	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	I	0.01	0.83	
T	Pan	Desm	<i>Gynura scandens</i> O. Hoffm.	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	I	0.01	-	
5. Cultivated and spontaneous species																						
Gt	Pan	Ball	<i>Manihot esculenta</i> Crantz	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	I	0.03	-	
Gt	Pan	Sarco	<i>Colocasia esculenta</i> (L.) Beauv.	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	I	0.01	-	
Gr	Pan	Scler	<i>Canna indica</i> L.	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	I	0.01	-	
Ch	Cos	Sarco	<i>Solanum nigrum</i> L.	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	I	0.03	0.08	
Ch	Cos	Sarco	<i>Lycopersicon esculentum</i> Miller	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I	0.01	-	
Ch	Pan	Sarco	<i>Capsicum frutescens</i> L.	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	I	0.01	-	

## Location of relevés:

1. Makerere University Campus, Garden Street, roadside, under shade, 13 February 1998.
2. Makerere University Campus, near Swimming Pool, shady roadside, 13 February 1998.
3. Nakasero, Kampala Central, roadside, under *Aleurites moluccana* tree, 20 March 1998.
4. Nakasero, Kampala Central, Lumumba Avenue, cassava field, 20 March 1998.
5. Nakasero, Kampala Central, between Lumumba Avenue and Wandegaya Road, cassava field, under shade, 18 April 1998.
6. Nakasero, Kampala Central, Kintame Road, shady roadside, postcultivated area, 24 April 1998.
7. Nakasero, Lumumba Road, under *Milletia* tree, 24 April 1998.
8. Nakuru, banana garden, 9 May 1998.
9. Kololo, Acacia avenue, roadside, 16 May 1998.
10. Kololo, near Jinja Road, cassava field, 20 May 1998.
11. Nakawa, banana field, under shade, 26 May 1998.
12. Makerere University Campus, ruderal area, behind the Department of Botany, 29 May 1998.
13. Rubaga Division, cassava field, 30 May 1998.
14. Kawempe Division, abandoned field, 5 September 1998.
15. Kawempe Division, banana field, 5 September 1998.

ruderal and postcultivation plants in highlands, and *Bidentetalia pilosae* Lebrun (in Taton 1949) consisting of ruderal and postcultivation plants growing in lowlands. This classification was revised later by Schmitz (1971), who described three phytosociological orders: (1) *Bidentetalia africana*, combining the former two orders of *Bidentetalia pilosae* and *Digitalietalia abyssinicae*; (2) *Rudereto-Euphorbietalia*, ruderal plants growing along roadsides, around settlements and trampled areas; and (3) *Amarantho-Ecliptetalia*, nitrophilous plants growing in trash dumps, dunghills and sewage sites. Later on, Hoff (1991) described a new pantropical class called *Soncho-Bidentetia pilosae* and grouping all cultivation and postcultivation vegetation. The order *Bidentetalia pilosae* A. Schmitz was put into this new class.

Following Schmitz (1971, 1988) and Hoff (1991), the *Talinum paniculatum* community belongs to the order *Bidentetalia pilosae* formed of two alliances: *Bidention pilosae* Lebrun (in Mullenders 1949), consisting of plant communities growing in cultivation and postcultivation areas; and *Panicion maximi* Lebrun (in Mullenders 1949), consisting of herbaceous plants occurring in abandoned areas where the soil is relatively nutrient-rich.

The *Talinum paniculatum* community therefore can be classed in the alliance of *Bidention pilosae* Lebrun (in Mullenders 1949). This alliance includes many plant associations described from the Democratic Republic of Congo:

1. *Talinum triangularis* (Léonard 1950) Nyakabwa (in Schmitz (1988), growing in shady cultivated areas where the soil is nitrogen-rich; it also encroaches on ruderal habitats;

2. *Galinsoga parviflora* (Hendricks in Mullenders 1954), described as a plant community growing in a Coffea plantation in Kivu;

3. *Siegesbeckia orientalis-Cynoglossetum geometrici* Mullenders 1954, colonizing lava plains and steep slopes around Kisenyi and Goma;

4. *Agerato-Cleometum ciliatae* Nyakabwa (in Schmitz 1988), growing in cultivated areas, regularly weeded, where the soil is sandy-clayey with low nitrogen content around Kisangani;

5. *Chloris pycnothrix* and *Bidens pilosa* (*Chlorio-Bidentetum pilosae* Schmitz 1971), growing in crop areas where the soil is rich in nitrogen and organic matter (in Lubumbashi);

6. *Spermacocetum latifoliae* Lubini 1980: annual and herbaceous vegetation which colonizes crop areas that have not been weeded for a long time.

From its ecology, the *Talinum paniculatum* community shows some affinities with the *Talinum triangularis* community described in the Democratic Republic of Congo by Nyakabwa (1982, and in Schmitz 1988) and Lubini (1982). Both of them grow in shady cultivated or ruderal areas where the soils are rich in organic matter and nitrogen. They are therefore all nitrophilous communities. However, they differ from each other in terms of characteristic plant species. Nyakabwa (1982) described *Talinum triangulare* and *Talinum paniculatum* as characteristic species of the *Talinum triangularis* association in Kisangani. Lubini (1982) lists the following species as characteristic of the same association in the Kisangani region: *Talinum triangulare*, *Synedrella nodiflora*, *Sida acuta*, *Pouzolzia denudata* and *Justicia matamensis*. In terms of characteristic species the difference between *Talinum paniculatum* described in this study and *Talinum triangularis* described in Kisangani is obvious. *Talinum paniculatum* is rare in Kisangani and less abundant. It was recorded in only one relevé by Nyakabwa (1982) and had very low cover (0.50%). Lubini (1982) did not even mention it among the characteristic species. In Kampala, however, ecologically it is the dominant species, with 50.8% average cover, and forms a well-individualized community. *Talinum triangulare* is the dominant species in Kisangani, with average cover of 66.67% (Nyakabwa 1982). Surprisingly, it was not recorded in Kampala. Some other species described as characteristic of the *Talinum paniculatum* community in Kampala do not exist in Kisangani: *Oxalis latifolia* and *Dichondra repens*. Moreover, the total number of species recorded in the *Talinum paniculatum* community in Kampala is higher (78 species) than that recorded by Nyakabwa (1982) in the *Talinum triangulare* community in Kisangani (50 species).

Lubini (1982) also noted the poverty of *Talinum triangularis* in Kisangani. The average number of species per relevé is also higher in the *Talinum paniculatum* community (20 species) than in the *Talinum triangulare* community (17 species). The number of species in common between the two communities is very low: 17 species only. Consequently, the *Talinum paniculatum* community studied in Kampala is a different association. It is described here as a new association (*Talinum paniculati* Mosango, Maganyi & Namaganda ass. nov.). Relevé no. 5 of Table 1 is the type-vegetation relevé. This association belongs to the alliance *Bidentetalia pilosae* Lebrun in Mullenders 1949, the order *Bidentetalia pilosae* Schmitz 1971 and the class *Ruderali-Manihotetea* Léonard in Taton 1949.

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