

A Phytosociological Study of *Hydrocotyle mannii* and *Centella asiatica* Weed Community in Kampala (Uganda, Eastern Africa)

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Abstract: A phytosociological study of a weed community dominated by *Hydrocotyle mannii* and *Centella asiatica* was carried out in Kampala, the capital city of Uganda from 2000 to 2002. The Zurich-Montpellier School of Phytosociology method was used with special emphasis on floristic and synecological structure as well as on dynamic aspects. This community was found to grow on shady moist roadsides and is about 15 cm high. In total, 54 species were recorded; most of them are annual, anemochorous and widespread. The *Hydrocotyle mannii* and *Centella asiatica* community is described as a new weed association: *Hydrocotylo-Centelletum asiaticae* Mosango ass. nova.. *Hydrocotyle mannii*, *Centella asiatica*, *Dichondra repens* and *Sida veronicifolia* have been recognized as the character species of this association. The *Hydrocotylo-Centelletum* is a pioneer association. It has been ascribed to the alliance *Eleusinion indicae* Leonard 1950 which includes plant communities growing on shady roadsides. In terms of ecological succession, it appears to be evolving to the *Asystasia gangetica* herbaceous fallow association which belongs to the alliance *Panicion maximi*. It belongs to the order *Ruderali-Euphorbietalia* Schmitz 1971 and the class *Ruderali-Manihotetea* Leonard in Taton 1949.

Key words: *Hydrocotyle mannii* and *Centella asiatica* community, phytosociology, ecology, life forms, dispersal, chorology, Kampala, Uganda.

1. Introduction

The urban ecosystem of Kampala includes several man-made habitats such as roads, lawns, fields and settlements, where a new type of vegetation has emerged. This type of vegetation is known as anthropic because of human activities. It is classified as arable field or ruderal vegetation. The arable fields' vegetation grows in cultivated land while ruderal vegetation grows in waves or abandoned land.

A phytosociological study of Kampala weed communities was initiated in Kampala in 1996. Several phytosociological surveys were then performed throughout Kampala. As a result, a checklist of weed species of Kampala [1] and a new synanthropic association named *Talinetum paniculati* Mosango, Maganyi and Namaganda 2001 [2] were

published.

In this article, the *Hydrocotyle mannii* and *Centella asiatica* community, a weed community growing on moist shady roadsides, is described. A special emphasis is placed on plant species composition, life forms, dispersal means and geographical distribution as well as on dynamics and phytosociological position of this association.

2. Material and Methods

2.1 Study Area

The study was conducted in Kampala, the capital city of Uganda which is located at 0°19' N latitude and 33°35' E longitude and at an altitude of ca 1,200 m above sea level [2, 3]. Rainfall varies throughout the year with a mean annual total of ca 1,000-1,250 mm. Kampala city experiences two rainy seasons (March-June and September-November) and two dry

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seasons (July-August and December-February). The average temperature is about 23 °C. The population is relatively high with about 1,000,000 inhabitants.

2.2 Methods

The *Hydrocotyle mannii* and *Centella asiatica* community was studied following the Zurich-Montpellier School of Phytosociology method [4, 5]. Special emphasis was placed on floristic and synecological structure as well as on dynamic aspects. Phytosociological relevés were made at ten different sites in Kampala, where the *Hydrocotyle mannii* and *Centella asiatica* community was found to grow.

The biological spectrum was analyzed following the plant LF (Life Form) classification [6], also used by several authors [1, 2, 7-10]. The following life forms were recognized:

- Ch (Chamaephytes): small shrubs and herbs that grow close to the ground;
- G (Geophytes): perennial plants that regenerate from rhizomes, bulbs, corms and tubers that are completely buried in the soil;
- Hc (Hemicryptophytes): herbaceous perennial plants dying back at the end of the growing season with the buds protected by the withered leaves and soil;
- Th (Therophytes): annual plants that regenerate from seeds buried in the soil each year.

The DIS (Dispersal Spectrum) was analyzed following Dansereau, P. and Lems, K.'s classification [11], as also used in many previous studies [1, 10, 12, 13]. The dispersal types below were identified:

- Scl (Sclerochores): unfleshy and slight diaspores that can be dispersed by wind;
- Des (Desmochores): adhesive and clinging diaspores that are sticky or barbed to facilitate dispersal by attachment to animals;
- Ball (Ballochores): diaspores that are forcibly ejected and dispersed by the parent plant itself;
- Sar (Sarcochores): fleshy plant diaspores that are dispersed by being ingested by animals or birds and thereafter defecated away from the parent plant.

The GD (Geographical Distribution) of the recorded plant species was determined based on the geographical area of each species as described in many different publications [1, 2, 7, 8, 10, 12-16]. The following phytogeographical elements were identified:

- Pan (Pantropical): plant species growing throughout the tropics;
- Pal (Paleotropical): plants species growing in tropical Africa, Madagascar, Asia and Australia;
- AM (Afro-Malagasy): plant species with geographical distribution in Africa and Madagascar;
- GSZ (Omni-Guinean-Sudano-Zambesian): plant growing in the Guinean and Sudano-Zambesian Regions;
- GCSZ (Central Guinean-Congolo-Sudano-Zambesian): plant species found in the central part of the Guinean region and in the Sudanian and Zambesian regions;
- Cos (Cosmopolitan): plant species spread worldwide.

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

Finally, the International Code of Phytosociological Nomenclature [16] was referred to describe the phytosociological status of the studied plant association.

3. Results

3.1 *Hydrocotyle mannii* and *Centella asiatica* Community Description

The *Hydrocotyle mannii* and *Centella asiatica* community is described here as a new association, *Hydrocotylo-Centelletum asiaticae* Mosango ass. nova.. This association is ascribed to the alliance *Eleusinion indicae* Leonard 1950 [17], the order *Ruderali-Euphorbietalia* Schmitz 1971 [18] and the class *Ruderali-Manihotetia* Leonard in Taton 1949 [19].

The new association is named *Hydrocotylo-centelletum asiaticae* Mosango ass. nova.. The type-vegetation relevé (Typus) of the new

**A Phytosociological Study of *Hydrocotyle mannii* and *Centella asiatica*
Weed Community in Kampala (Uganda, Eastern Africa)**

association is relevé 2 in Table 1. And the character species (Diagnostic species combination) are *Hydrocotyle mannii*, *Centella asiatica*, *Dichondra repens* and *Sida veronicifolia*.

3.2 Community Ecology and Structure

Hydrocotylo-Centelletum asiaticae is a weed community that thrives on roadsides, especially under shade and on moist soil relatively rich in organic matter. Physiognomically, this plant community is

characterized by one layer of 10-15 cm high and covers 80 to 100% of the sampled area. Both *Hydrocotyle mannii* and *Centella asiatica* appear readily as the dominant species of the community.

3.3 Plant Composition

Within the analyzed relevés, a total number of 54 plant species were recorded in the *Hydrocotylo-Centelletum asiaticae* association (Table 1). The number of species per relevé is between 7 and 26,

Table 1 *Hydrocotylo-Centelletum asiaticae* association in Kampala (Uganda).

LF	GD	DIS	Relevé number.	1	2	3	4	5	6	7	8	9	10	P	AC
			Area (m ²)	9	12	10	27	6	8	10	18	16	10		
			Height (cm)	15	12	15	10	15	10	10	20	10	15		
			Cover (%)	90	80	100	100	85	90	95	95	90	100		
			Number of species	25	15	10	20	6	25	12	17	14	7		
			Characteristic species of the association												
Hc	CGSZ	Scl	<i>Hydrocotyle mannii</i> Hook. f.	3	4	4	4	3	3	4	4	3	4	V	52.5
Ch	Pal	Ball	<i>Centella asiatica</i> (L.) Urb.	2	1	2	1	2	3	1	2	1	2	V	12.3
Ch	Pan	Sar	<i>Dichondra repens</i> J. R. Forst. & G. Forst.	+	-	1	2	1	1	-	-	2	1	IV	4.1
Ch	Pan	Ball	<i>Sida veronicifolia</i> Lam.	+	-	-	1	-	2	1	1	2	-	III	3.8
			Characteristic species of the alliance <i>Eleusinion indicae</i>												
Th	Pan	Scl	<i>Eleusine indica</i> (L.) Gaertn.	+	+	-	-	-	+	-	1	+	-	III	0.45
Ch	Pal	Des	<i>Achyranthes aspera</i> L.	-	-	+	-	-	1	+	-	-	-	II	0.35
Gr	Pan	Scl	<i>Kyllinga erecta</i> Schumach.	+	-	-	-	-	+	-	-	+	-	II	0.15
Ch	Cos	Scl	<i>Cynodon dactylon</i> (L.) Pers.	+	-	1	-	-	-	-	-	-	-	I	0.3
Ch	Pan	Ball	<i>Sida acuta</i> Burm. f.	+	-	-	-	-	-	+	-	-	-	I	0.1
Th	Pan	Scl	<i>Euphorbia hirta</i> L.	+	-	-	-	-	-	-	+	-	-	I	0.1
Gr	Pal	Scl	<i>Stenotaphrum dimidiatum</i> (L.) Brongn.	-	+	-	-	-	-	-	-	-	+	I	0.1
Ch	Pan	Des	<i>Indigofera spicata</i> Forssk.	-	-	+	-	-	-	-	-	+	-	I	0.1
Ch	Pan	Des	<i>Desmodium canum</i> (J. F. Gmel.) Schinz & Thell.	-	-	+	-	-	+	-	-	-	-	I	0.1
Th	Pal	Scl	<i>Digitaria ternata</i> (A. Rich.) Stapf	-	-	+	-	-	-	-	-	+	-	I	0.1
Th	Pal	Ball	<i>Justicia exigua</i> S. Moore	-	-	-	+	-	+	-	-	-	-	I	0.1
Hc	Pan	Scl	<i>Kyllinga alba</i> Nees	-	-	-	-	-	+	-	-	-	+	I	0.1
			Characteristic species of the order <i>Ruderali-Euphorbietalia</i>												
			Characteristic species of the alliance <i>Paspalion conjugati</i>												
Hc	Pan	Scl	<i>Paspalum conjugatum</i> Bergius	+	-	-	-	+	1	-	-	1	+	III	0.65
Th	Pal	Scl	<i>Cardamine trichocarpa</i> Hochst. ex A. Rich.	+	+	-	1	-	1	+	+	-	-	III	0.7
Hc	Pan	Scl	<i>Axonopus flexuosus</i> (Peter) C. E. Hubb. ex Troupin	-	+	-	1	-	-	-	+	-	-	II	0.35
Ch	Pal	Scl	<i>Commelina benghalensis</i> L.	-	+	-	-	-	+	+	-	-	+	II	0.2
Th	Pan	Scl	<i>Montia fontana</i> L.	-	-	-	1	-	-	-	+	-	-	I	0.3
Hc	Pal	Scl	<i>Setaria homonyma</i> (Steud.) Chiov.	-	+	-	+	-	+	-	-	-	-	I	0.15
Th	Pan	Des	<i>Gutenbergia cordifolia</i> (Benth. ex Oliv.) S. Moore	-	-	-	+	-	-	+	-	-	-	I	0.1

(Table 1 continued)

LF	GD	DIS	Relevé number.	1	2	3	4	5	6	7	8	9	10	P	AC
Hc	Pan	Scl	<i>Tripsacum andersonii</i> J. R. Gray	-	-	+	-	-	-	-	+	-	-	I	0.1
Hc	AM	Scl	<i>Panicum trichocladum</i> Hack. ex K. Schum.	-	-	-	-	-	+	-	+	-	-	I	0.1
Th	Pan	Des	<i>Laportea aestuans</i> (L.) Chew	-	-	-	-	-	+	-	-	+	-	I	0.1
Ch	Pal	Ball	<i>Sida ovata</i> Forssk.	-	-	-	+	-	-					I	0.05
Th	Pal	Ball	<i>Justicia betonica</i> L.	-	-	-	+	-	-					I	0.05
Th	Pan	Des	<i>Cyathula prostrata</i> (L.) Blume	-	-	-	-	-	+					I	0.05
			<i>Characteristic species of the alliance Panicion maximi</i>												
Ch	Pal	Ball	<i>Asystasia mysorensis</i> (Roth) T. Anderson	+	-	-	-	-	-	+	-	-	-	I	0.1
Ch	Pan	Ball	<i>Sida rhombifolia</i> L.	-	+	-	-	-	-					I	0.1
Hc	GSZ	Scl	<i>Brachiaria brizantha</i> (A. Rich.) Stapf	+	-	-	-	-	-	+	-	-	-	I	0.1
Ch	Pan	Ball	<i>Centrosema pubescens</i> Benth.	+	-	-	-	-	-	-	+	-	-	I	0.05
Hc	Pan	Scl	<i>Sporobolus pyramidalis</i> P. Beauv.	+	-	-	-	-	-	-	-	-	-	I	0.05
Ch	Pan	Ball	<i>Asystasia gangetica</i> (L.) T. Anderson	-	-	-	-	-	+	-	+	-	-	I	0.05
Chcl	GSZ	Sar	<i>Cyphostemma adenocaula</i> (Steud. ex A. Rich.) Wild & R. B. Drumm.	-	-	-	-	-	+	-	-	-	-	I	0.05
			<i>Characteristic species of the class Ruderali-Manihotetea</i>												
Th	Pan	Des	<i>Spilanthes mauritiana</i> (Rich. ex Pers.) DC.	+	-	-	-	+	-	-	-	-	-	IV	0.1
Gr	Cos	Scl	<i>Oxalis corniculata</i> L.	1	+	2	+	1	+	-	+	+	-	III	17.2
Th	Pan	Des	<i>Synedrella nodiflora</i> (L.) Gaertn.	2	-	+	2	-	+	-	+	+	-	III	0.32
Gr	Pal	Scl	<i>Oxalis latifolia</i> Kunth	+	+	-	1	-	1	-	+	-	-	II	0.65
Th	Pan	Scl	<i>Drymaria cordata</i> (L.) Willd. ex Schult.	-	1	-	1	-	1	-	+	-	-	I	0.8
Th	Pal	Des	<i>Amaranthus dubius</i> Mart. ex Thell.	+	+	-	+	-	-	-	-	-	+	I	0.2
Th	Cos	Des	<i>Galinsoga parviflora</i> Cav.	+	-	-	+	-	+	-	-	-	-	I	0.15
Th	Pal	Des	<i>Dicrocephala integrifolia</i> (L.f.) O. Kuntze	+	-	-	-	+	-	-	-	-	-	I	0.1
Th	Pan	Des	<i>Ageratum conyzoides</i> L.	+	-	-	-	-	-	+	-	-	-	I	0.1
Th	Pan	Des	<i>Bidens pilosa</i> L.	+	-	-	-	-	-	-	+	-	-	I	0.1
Th	Pal	Des	<i>Celosia trigyna</i> L.	-	+	-	-	-	-	-	-	+	-	I	0.1
Gb	Pan	Scl	<i>Talinum paniculatum</i> (Jacq.) Gaertn.	-	+	-	-	-	-	-	+	-	-	I	0.1
Th	Pal	Scl	<i>Phyllanthus nummulariifolius</i> Poir.	-	-	-	+	-	-	+	-	-	-	I	0.1
Th	Pal	Sar	<i>Erucastrum arabicum</i> Fisch. & C. A. Mey.	-	-	-	-	-	+	-	-	+	-	I	0.1
Th	Pan	Scl	<i>Acalypha crenata</i> Hochst. ex A. Rich.	+	-	-	-	-	-	-	-	-	-	I	0.05
Th	CGSZ	Des	<i>Crassocephalum vittellinum</i> (Benth.) S. Moore	+	-	-	-	-	-	-	-	-	-	I	0.05
Ch	Pal	Scl	<i>Phyllanthus ovalifolius</i> Forssk.	-	-	-	+	-	-	-	-	-	-	I	0.05
Th	Pan	Des	<i>Amaranthus hybridus</i> L.	-	-	-	-	-	+	-	-	-	-	I	0.05

*LF—life form; GD—geographical distribution; DIS—dispersal; P—species constancy; AC—average cover (%).

The locations of relevés (Table 1) are:

1. Makerere University Campus, shady roadside near the Herbarium: 07.05.2000;
2. Nakasero, Kampala Central, Lumumba Roadside, under shade: 09.05.2000;
3. Wandegeya, around Mulago Hospital, shady roadside: 16.05.2000;
4. Makerere University Campus, shady roadside, behind Zoology Department: 26.12.2000;
5. Nakawa, shady roadside: 23.05.2001;
6. Makerere University, Garden Hill roadside: 11.12.2001;
7. Nakawa, shady roadside: 14.03.2002;
8. Nakuru, shady roadside: 15.03.2002;
9. Kololo, Acacia Avenue, roadside, under shade: 12.04.2002;
10. Nakawa, Jinja roadside, shady area: 18.05.2002.

with a mean of 16 (\pm 6.7). Among these, *Hydrocotyle mannii*, *Centella asiatica*, *Dichondra repens* and *Sida veronicifolia* are recognized as the character species of the association.

Hydrocotyle mannii is the dominant species of this association with the highest abundance-dominance coefficient (3-4) and average cover (52.5%). It is a creeping perennial and semi-heliophilous species growing under shade and widely distributed in tropical Africa, especially in Guineo-Congolian and Sudano-Zambesian phytogeographical regions.

Centella asiatica is an annual creeping herbaceous and pantropical plant species widely distributed in tropical Africa and Asia. In Kampala, it is found to grow in ruderal areas (e.g. roadsides, ditches) and abandoned cultivation areas, especially under shade and on moist soils. It is also a semi-heliophilous species closely associated with *Hydrocotyle mannii* and has an average cover of 12.3%.

Dichondra repens is a small, prostrate, creeping chamaephyte and pantropical species. It is also found to grow in more or less shady areas. It is also closely associated with *Hydrocotyle mannii* and *Centella asiatica*.

Sida veronicifolia is also a prostrate creeping chamaephyte and pantropical species. It also grows in association with the above-mentioned species.

3.4 Ecosociological Groups

Hydrocotylo-Centelletum asiaticae forms almost one homogenous layer dominated by both *Hydrocotyle mannii* and *Centella asiatica* species. This plant community has a high recovery rate varying from 80 to 100%.

The following ecosociological groups were identified in this plant association. The first group comprises 16 plant species of the alliance *Eleusinion indicae* Leonard 1950 [17], four of which were recognized as the characteristic species of the association (e.g., *Hydrocotyle mannii*, *Centella asiatica*). The second group includes 20 species

belonging to the order *ruderali-euphorbietalia* Schmitz 1971 [18]; these are species growing in ruderal or abandoned areas (e.g. *Eleusine indica*, *Achyranthes aspera*). The third group consists of 18 species belonging to the class *Ruderali-Manihotetea* Leonard in Taton 1949 [19] which includes all plant species growing on ruderal areas, cultivation and post-cultivation areas (*Paspalum conjugatum*, *Cyathula prostrata*, *Asystasia gangetica*).

3.5 Ecological Spectra

Ecological spectra include species life forms, dispersal means and geographical distribution elements which are illustrated and described below.

3.5.1 Life Form Spectrum

Fig. 1 reveals high diversity of life forms in the *Hydrocotylo-Centelletum asiaticae* association.

Among these, therophytes or annual species are obviously the most numerous (44.4% of total), followed by chamaephytes (29.6%) and hemicryptophytes (16.7%). Geophytes, also present, are the least abundant (9.3%). However, in terms of average cover, therophytes do not weigh much when compared to the other types of life forms, consisting mainly of perennial species. Of these, hemicryptophytes have the highest average cover (54.9% of total, whose 52.5% for *Hydrocotyle mannii*). These are followed by chamaephytes (22.1%) and geophytes (18.6%), while the therophytes account for only 4.4% of total.

3.5.2 Dispersal Spectrum

The analysis of dispersal means also shows great diversity of dispersal means amongst the plant species recorded in the *Hydrocotylo-Centelletum asiaticae* association (Fig. 2).

Most of these plant species are sclerochorous (46.3% of total) and have the highest average cover (76.6%). These are followed by desmochorous and ballochorous with respectively 29.6 and 18.5%. Sarcochorous species represent only 5.6% of total. This shows that there are different ways by which the plant

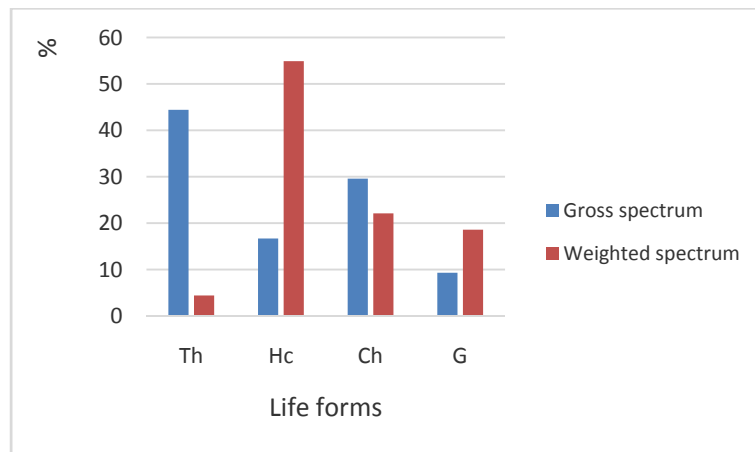


Fig. 1 Life form spectrum of *Hydrocotylo-Centelletum asiaticae*.

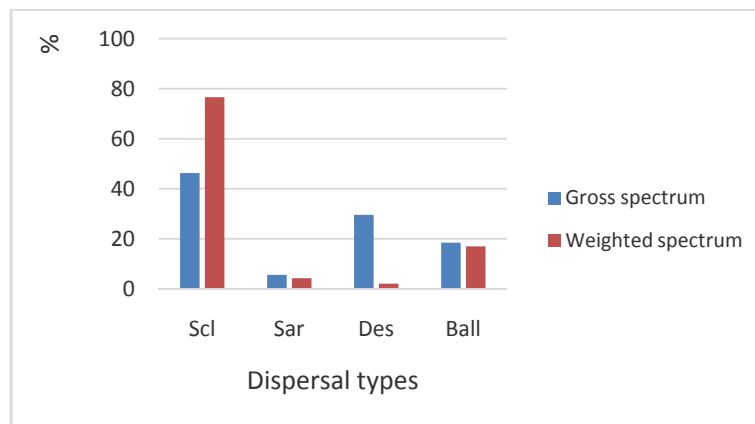


Fig. 2 Dispersal spectrum of *Hydrocotylo-Centelletum asiaticae*.

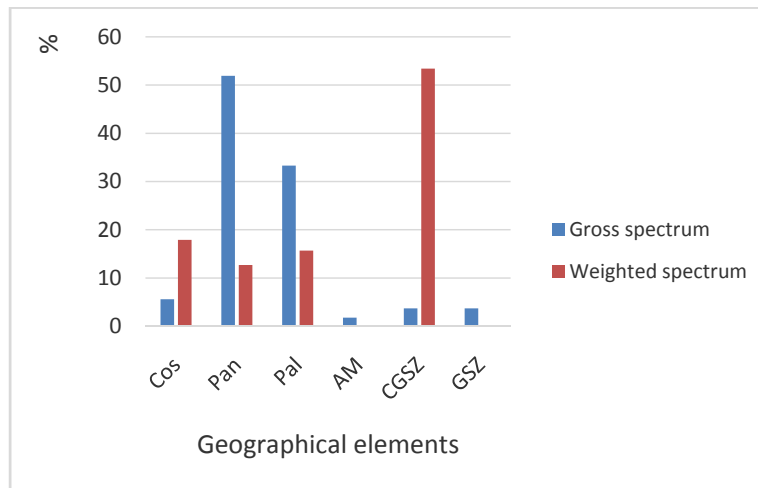


Fig. 3 Chorological spectrum of *Hydrocotylo-Centelletum asiaticae*.

species of this association can be dispersed: by wind (sclerochorous species), by animals or man (desmochorous and sarcochorous species) or by themselves (ballochorous species).

3.5.3 Chorological Spectrum

A chorological analysis in Fig. 3 shows that the *Hydrocotylo-Centelletum asiaticae* association is characterized by widespread species.

Species of African origin (Centro-Guinean-Sudano-Zambesian, Omni-Guinean-Sudano-Zambesian and Afro-Malagasy) together account for only 7.4% of total, while species widely distributed throughout tropical Africa and beyond represent 92.6% of total. Of these, species distributed throughout the tropics or pantropical species constitute the most important group (51.9% of total), followed by paleotropical (33.3%) and cosmopolitan species (5.6%). However, in terms of average cover, the species of African origin have globally the highest average cover (53.6%). The occurrence of these different phytogeographical elements in the *Hydrocotylo-Centelletum asiaticae* in Kampala indicates that this association has received major contribution of species from outside.

4. Discussion and Conclusions

The *Hydrocotyle mannii* and *Centella asiatica* weed community was found to grow on shady ruderal areas in Kampala city, mainly on roadsides during the rainy season, where the soil is moist and relatively rich in organic matter. It is a pioneer community which is regularly weeded. It reaches its ecological optimum of development in the absence of weeding. In such conditions, the *Hydrocotyle mannii* and *Centella asiatica* community is supposed to evolve towards the herbaceous fallow community of *Asystasia gangetica* (*Asystasietum gangeticae* Nyakabwa 1988) [20]. This normally evolves towards the *Panicum maximum* association (*Panicetum maximi* Leonard 1950) [17] which belongs to the alliance *Panicion maximi* Lebrun in Mullenders 1949 [21] (Table 1).

Additionally, the *Hydrocotylo-Centelletum asiaticae* association exhibits high diversity of life forms. These include both annual and perennial species. Annuals or therophytes are species that regenerate from buried seeds, whereas perennial species (chamaephytes, hemi-cryptophytes and geophytes) regenerate from buds or rhizomes under suitable ecological conditions [1, 2, 22]. The proportion of therophytes is

significantly higher than those of other life form types. This is probably due to unstable and disturbed conditions of roadside habitats. These are often open and weeded. Therophytes, short-lived plant species, are reported to be well adapted to such ecological conditions because of high production of small seeds [1, 23]. These help them survive and evade weeding operations and even dry-seasons, and regenerate again when climatic conditions are favourable due to high viable seed production buried into the soil [21, 24]. Although annual species are more numerous, perennial species weigh much in this plant association because of the highest value of their average cover. Together they represent 95% of the average cover, of which 52.5% for the sole *Hydrocotyle mannii*, one of the main characteristic species. Although species of African origin are numerically less abundant, they have globally the highest average cover (53.6%).

As above-mentioned, the *Hydrocotylo-Centelletum asiaticae* association also shows high diversity of dispersal means and phytogeographical elements. The most important means of plant dispersal in this association is anemochory sensu Mollinier, R. and Muller, P. [25], since the proportion of sclerochorous species is relatively high. Such species are mainly dispersed by wind. Moreover, the occurrence of different types of phytogeographical elements is probably due to the geographical situation of the study area, ecological conditions and species dispersal means. The majority of species are widespread in tropical Africa and beyond while the species whose geographical distribution is limited in tropical Africa are fewer. Species of African origin are essentially Omni-Guineo-Sudano-Zambesian and Centro-Guinean-Sudano-Zambesian. In contrast, the species whose geographical distribution extends beyond tropical Africa are pantropical, paleotropical or cosmopolitan.

Ecologically, the *Hydrocotylo-Centelletum asiaticae* develops mostly as a ruderal vegetation along shady and moist roadsides. This type of vegetation was

placed in the order *Ruderali-Euphobietalia* Schmitz 1971 [18]. This order belongs to the class *Ruderali Manihotetea* Leonard in Taton 1949 [19] which includes ruderal, cultivation and post cultivation plant communities. It consists of three alliances: 1. *Eleusinion indicae* Leonard 1950 [17], which includes weed plant associations growing on roadsides with fairly marked nitrophilous character; 2. *Paspalion conjugati* Leonard 1950 [17], which consists of plant associations growing along shady forest paths; 3. *Cynodontion dactyli* Schmitz 1971 [18], which encompasses weed vegetation of waste land, abandoned cropland, roadsides, on superficially bare soil which is poor in organic matter and exposed to harsh weather.

On the basis of its ecology and floristic composition, the *Hydrocotyle mannii* and *Centella asiatica* plant community is described here as a new weed association: *Hydrocotylo-Centelletum asiaticae* Mosango ass. nova. and placed in the alliance *Eleusinion indicae* Leonard 1950 [17]. This alliance consists of seven associations which are listed in Table 2 along with their characteristic species. As shown in this Table, all these associations were described from D. R. Congo, especially in lowland areas, in contrary to the *Hydrocotylo-Centelletum asiaticae* association which is a medium highland plant community.

The *Hydrocotylo-Centelletum asiaticae* association is distinguished from other associations of the alliance *Eleusinion indicae* Leonard 1950 [17] in terms of

Table 2 The associations belonging to the alliance *Eleusinion indicae* Leonard 1950.

Association	Location	Ecology	Characteristic species
1. <i>Portulaco-Euphorbietum prostratae</i> Lebrun 1947 (in Schmitz 1988)	D. R. Congo	Slightly trampled and weeded lands	<i>Euphorbia thymifolia</i> L., <i>E. hirta</i> L., <i>E. prostrata</i> Ait., <i>Chloris pycnotrix</i> Trin., <i>Portulaca oleracea</i> L., <i>Oldenlandia corymbosa</i> L., <i>Eragrostis tenella</i> (L.) Roem. et Schult., <i>Tribulus terrestris</i> L.
2. <i>Ruderali-Eleusinetum indicae</i> (Leonard 1950) Mullenders 1953	D. R. Congo	Usually weeded roadsides and Waste lands	<i>Paspalum conjugatum</i> Berg., <i>Axonopus compressus</i> (Sw.) P. Beauv., <i>Eleusine indica</i> (L.) Gaertn., <i>Panicum repens</i> L., <i>Digitaria polybotrya</i> Stapf
3. <i>Cyperetum rotundi</i> (Nyakabwa 1982) 1988 (in Schmitz 1988)	D. R. Congo	On bare soil along roadsides and around houses	<i>Cyperus rotundus</i> L., <i>C. tenuiculmis</i> Boeck., <i>Euphorbia hirta</i> L., <i>Panicum repens</i> L., <i>Eleusine indica</i> (L.) Gaertn.
4. <i>Paspalo-Desmodietum ramosissimum</i> Nyakabwa (1982) 1983	D. R. Congo	On more or less trampled soils and lawns around homes and public building	<i>Paspalum notatum</i> Flueffe, <i>Desmodium ramosissimum</i> G. Don, <i>Kyllinga erecta</i> Schumach. var. <i>erecta</i> , <i>Fimbristylis dichotoma</i> (L.) Vahl
5. <i>Axonopo-Paspaleum conjugati</i> Lejoly et Nyakabwa 1981	D. R. Congo	On ruderal lands partly shaded, regularly mowed and slightly trampled	<i>Axonopus compressus</i> (Sw.) P. Beauv., <i>Paspalum conjugatum</i> Berg., <i>Cyperus sphacelatus</i> Rottb., <i>Centella asiatica</i> (L.) Urb., <i>Mariscus flabelliformis</i> Kunth, <i>Kyllinga bulbosa</i> P. Beauv., <i>Borreria ocymoides</i> (Burm. F.) DC.
6. <i>Oplismenetum burmannii</i> Nyakabwa (1982) 1988 (in Schmitz 1988)	D. R. Congo	Shady ruderal land, regularly weeded	<i>Oplismenus burmannii</i> (Retz.) P. Beauv., <i>Synedrella nodiflora</i> (L.) Gaertn., <i>Drymaria cordata</i> (L.) Willd. Ex Roem. Et Schult., <i>Cyathula prostrata</i> (L.) Blume, <i>Talinum triangulare</i> (Jacq.) Willd., <i>Commelina diffusa</i> Burm. F., <i>Ageratum conyzoides</i> L., <i>Panicum brevifolium</i> L.
7. <i>Eragrostio-Anthephoretum cristatae</i> Mandango et Boemu 1988 (in Schmitz 1988)	D. R. Congo	Open waste lands, low weeding, exceptionally trampled, sandy soil	<i>Eragrostis ciliaris</i> (L.) R. Br., <i>E. tremula</i> Steud., <i>Anthephora cristata</i> (Doell.) Hack ex De Wild.
8. <i>Hydrocotylo-Centelletum asiaticae</i> Mosango ass. nova. Current study	Uganda (Kampala)	Shady roadsides, slightly trampled and mowed	<i>Hydrocotyle mannii</i> Hook. F., <i>Centella asiatica</i> (L.) Urb., <i>Dichondra repens</i> J. R. Forst. & G. Forst., <i>Sida veronicifolia</i> Lam.

characteristics species. Indeed, with the exception of *Centella asiatica* which is cited as one of the characteristics of the *Axonopo-Paspaletum conjugate* association Lejoly and Nyakabwa 1981 [26], all other characteristic species of this association are markedly different. Moreover, the *Hydrocotylo-Centelletum asiaticae* association in Kampala area is located in medium highland of east tropical Africa. This new association is, therefore, ascribed to the order *Ruderali-Euphobietalia* Schmitz 1978 [27] and the class *Ruderali-Manihotetea* Leonard in Taton 1949 [19].

Although this association is composed of species that invade and clog the roadsides, and may host some harmful insects such as mosquitoes, it helps to secure and protect the soil against erosion and contains species that may be used by human beings for their livelihood such as *Talinum paniculatum* (food) and *Centella asiatica* (medicine). Hence, proper management of this plant community is necessary in order to save this association and to protect the soil against erosion and provide human beings with useful natural resources.

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