

Synflorescences of species related to *Schizachyrium condensatum* (Poaceae)

M.C. Peichoto^{a,*}, A.C. Vegetti^b

^a*Instituto de Botánica del Nordeste, Corrientes, Argentina*

^b*Facultad de Agronomía y Veterinaria, Esperanza, Santa Fe, Argentina*

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Abstract

The synflorescences of species related to *Schizachyrium condensatum* are typologically characterized. This species presents floriferous shoots with complex systems of ramification. In all species the inflorescence is polytelic and truncate. The typological pattern has been described and presents differences in the following parameters: length and shape of the synflorescence, paracladia of the trophotagma subzone and short paracladia subzone. A comparative analysis of the variations observed in the structure of the synflorescence is included.

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Introduction

The typical Poaceae inflorescence is a terminal inflorescence appearing as a panicle, raceme or spike (Allred, 1982; Gould and Shaw, 1983). In the Andropogoneae tribe some genera are characterized by having a reduced terminal inflorescence and a proliferation of axillar branches, that is why the system of ramification in some cases approaches a panicle of spikelets named false panicle (Clayton, 1969, 1972). The main characteristic of these shoots is that they present complex systems of ramification, at the level of the distal leaves, subtending leaves and developed prophylls. The typological analysis turns out to be very useful in the correct interpretation of these systems (Vegetti, 1994, 1997a, b, 1998, 1999).

The typology-based system developed by Troll (1964, 1969) and Weberling (1989) has proved to be useful for describing inflorescences (Rua, 1999) as well as for providing characters with phylogenetic value (Aagesen, 1999; Liu et al., 2005; Nickol, 1995; Rua, 2003; Rua and Aliscioni, 2002; Tortosa et al., 2004).

Schizachyrium Nees is a genus with approximately 50–60 species in the world; distributed in tropical and subtropical regions of America and Africa (Clayton and Renvoize, 1986; Nicora and Rúgolo de Agrasar, 1987). *Schizachyrium* is represented in America by 30 species, 16 of which are cited for South America (Peichoto, 2006; Zuloaga et al., 2003), however, the identity and identification of many of them is questionable.

This genus has an important range of variation in the degree of ramification of the floriferous shoots (Vegetti, 1992; Vegetti and Tivano, 1991), some of them have many racemes of spikelets, whereas others just have one developed raceme which lacks axillar racemes (Clayton and Renvoize, 1986).

*Corresponding author.

E-mail addresses: mpeichoto@agr.unne.edu.ar (M.C. Peichoto), avegetti@fca.unl.edu.ar (A.C. Vegetti).

The first author is performing a morpho-systematic research of the South American species of this genus as a consequence of discrepancies in the interpretation of some entities, such as the identity of *Schizachyrium condensatum* (Kunth) Nees and related species. In Rossengurt et al. (1968), the following entities are recognized: *S. bimucronatum* Roseng., B.R. Arrill. & Izag., *S. condensatum*, *S. lactiflorum* (Hack.) Herter, *S. microstachyum* (Desv. ex Ham.) Roseng., B.R. Arrill. & Izag. subsp. *microstachyum*, *S. microstachyum* subsp. *elongatum* (Hack.) Roseng., B.R. Arrill. & Izag., and *S. plumigerum* (Ekman) Parodi. However, in the last revision of the genus for South America, Türpe (1984) merged sub *S. condensatum* all the entities mentioned above. Nevertheless, in Zuloaga et al. (2003) *S. condensatum* and *S. microstachyum* are recognized as different species. In order to solve these discrepancies we performed a typological interpretation of the variations which occur in the complex synflorescences. Although Vegetti and Tivano (1991) and Vegetti (1993) have worked with the inflorescence of a few species of *Schizachyrium*, typologically the genus has not been studied in detail yet.

The typologic study is made with three objectives: (1) to re-evaluate the inflorescence morphology using the terminology proposed by Troll (1964) and Weberling (1989), (2) to look for new morphological features to test in future cladistic analysis and (3) to identify some evolutionary trends that may be responsible for the inflorescence diversity in *Schizachyrium*.

Materials and methods

Live samples, alcohol preserved material and herbarium specimens were studied under stereoscopic microscope. The typology-based system developed by Troll (1964) and Weberling (1989) was used for the interpretation of the synflorescence of the following species: *S. bimucronatum*, *S. condensatum*, *S. lactiflorum*, *S. microstachyum* subsp. *microstachyum*, *S. microstachyum* subsp. *elongatum*, *S. plumigerum*, and *Schizachyrium spicatum*.

The abbreviations used for the references of the figures are the same of Vegetti and Müller-Doblies (2004).

The following examined specimens are kept in CTES, the herbarium of Instituto de Botánica del Nordeste: *S. bimucronatum* Roseng., B.R. Arrill. & Izag. (Peichoto 52, 58, 71, 76, 103, 115, Peichoto et al. 123), *S. condensatum* (Kunth) Nees (Peichoto 54, 57, 84, 94, 96, 106), *S. lactiflorum* (Hack.) Herter (Dombrowski 5991; Hatschbach et al. 58707; Múlgura de Romero et al. 3690; Peichoto 62, 80, 85, Peichoto et al. 118, 125), *S. microstachyum* subsp. *microstachyum* (Desv. ex

Ham.) Roseng., B.R. Arrill. & Izag. (Peichoto 24, 55, 82, 88, 93, 117; Peichoto et al. 35, 124), *S. microstachyum* subsp. *elongatum* (Hack.) Roseng., B.R. Arrill. & Izag. (Peichoto 64, 74, 86, 97, 112; Peichoto et al. 34, 119), *S. plumigerum* (Ekman) Parodi (Peichoto 68, 72, 77, 109, 113; Peichoto et al. 51), *S. spicatum* (Spreng.) Herter (Parodi 9411; Peichoto 73, 99, 110, 111; Peichoto et al. 32, 36, 39, 48; Rambo 44467).

Results

Synflorescence zones

All the species studied present the following zones (Fig. 1):

Innovation zone (IZ): basal area of short internodes, leaves with sheath and developed blade, their axillary buds giving rise to new lateral shoots (innovations) which later become floriferous. These species are caespitose grasses, they have rhizomes of short internodes and erect floriferous shoots; the innovations are intravaginal.

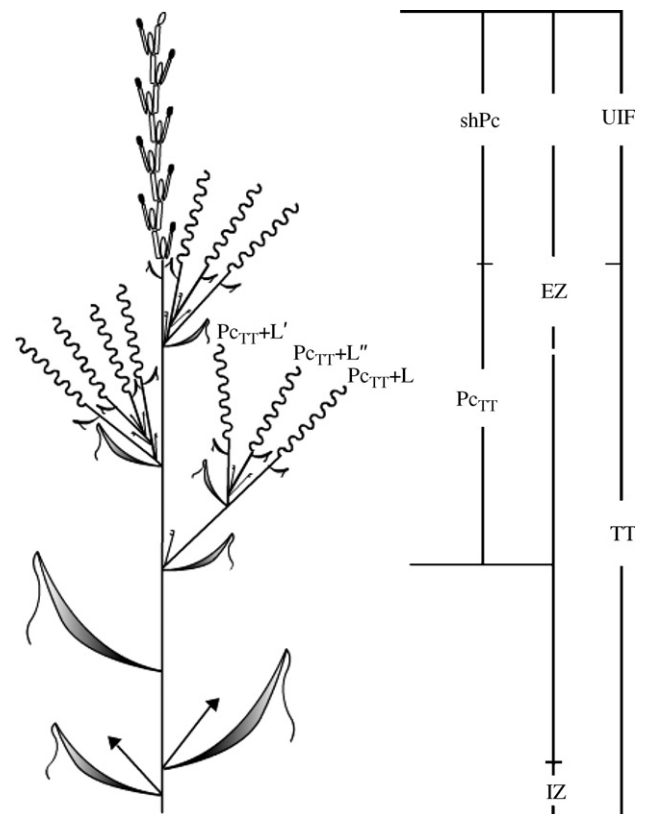


Fig. 1. Diagram of the synflorescence of *Schizachyrium spicatum* (Spreng.) Herter. Abbreviations: UIF, unit of inflorescence; TT, trophotagma; IZ, innovation zone; EZ, enrichment zone (= paracladial zone); Pc_{TT} , paracladia of the trophotagma region; shPc, short paracladium of the inflorescence unit; $Pc_{TT} + L$, $Pc_{TT} + L'$, $Pc_{TT} + L''$, paracladium of the trophotagma with foliage leaf/leaves of consecutive order.

In *S. condensatum* and *S. lactiflorum* the basal portion of this region is shortly decumbent.

It is important to mention that *S. bimucronatum* presents in this zone remarkably wide leaves, 7–20 mm wide. However, the rest of the species studied present leaves 3–7 mm wide.

Inhibition zone (HZ): located immediately above the innovation zone. The internodes get longer as well as the leaves. Their axillary buds do not develop any shoot. The internodes of the floriferous shoots are shorter in the proximal zone, they get longer towards the medium zone and they get reduced a bit below the enrichment zone. The leaves, formed by sheath and blade, are larger towards the middle of the culm and they get reduced towards the apex portion. In *S. spicatum* this zone is very small, represented generally by two or three internodes (Fig. 1). There is almost no variation in the size of the leaves, they just get reduced in the distal portion of this zone.

Enrichment zone or paracladial zone (EZ): above the inhibition zone there are leaves with developed sheath, but the blades are gradually reduced. In the ramifications of lower order, an aristulate-blade is observed; which may not be present in the ramifications of higher order. In this extreme case of reduction, the sheath has an acute apex. The axillary buds generate floriferous shoots, which repeat the structure observed on the main axis. These shoots are paracladia of the trophotagma (P_{CTT} , enrichment axes); they get reduced acropetally towards a foliar structure without axillary production. From this structure, the paracladia of the unit of inflorescence (P_{CUIF}) are started. These are made up by pairs of spikelets directly placed on the main axis, the most distal paracladium being reduced to one spikelet. Consequently, the paracladial zone can be divided in two subzones: paracladia subzone of the unit of inflorescence and the paracladia of trophotagma subzone. The P_{CUIF} are homogenized and are all short paracladia (shPc). The unit of inflorescence does not present developed long paracladia.

Each short paracladium is made up by a pair of spikelets, with the exception of the distal paracladium which has only one sessile and vestigial spikelet. A terminal spikelet is not observed, thus the synflorescence lacks the main florescence.

The paracladia of the trophotagma have a short hypopodium and an adaxial prophyll, a long epipodium and a variable number of bracts (see Table 1). They end in a unit of the inflorescence made up only by the subzone of short paracladia resembling the one described for the main axis. From the axillary bud of the prophyll and the bracts, with the exception of the distal bract, (which is sterile) long paracladia with trophotagma of the next order can originate. The variations observed in the structure of the synflorescence are displayed in Tables 1–3.

Within the typological pattern described here the analyzed species present variations regarding the following parameters: length and shape of the synflorescence, subzone of P_{CTT} : number and length of internodes, maximum degree of ramification, number and length of the internodes of the basal P_{CTT} , number of bracts of P_{CTT} basal, P_{CTT} II and P_{CTT} III (see Tables 1 and 2).

There are also variations in the length of the UIF (shPc subzone), in the number of short paracladia, in the length of the peduncle and the spatheole and consequently in the position of the UIF as regards the spatheole (exerted or included) (Fig. 2). There are characteristics of each shPc (sessile spikelet: length and apex, length of the awn) and rachis internodes which support it (see Table 3).

The ramification of the subzone of P_{CTT} is generated from axillary buds of the bracts, with the exception of the distal bract which remains sterile. From Table 1, we can recognize that such degree of ramification is closely related to the number of bracts. Thus *S. bimucronatum*, *S. condensatum*, *S. lactiflorum*, *S. microstachyum* subsp. *microstachyum* and *S. microstachyum* subsp. *elongatum* present a higher number of bracts and consequently their synflorescences are highly branched. On the other hand, *S. spicatum* shows a lower number of bracts on each axis and as a result, it presents floriferous shoots which are scarcely branched. *S. plumigerum* shows an intermediate situation.

However, if we analyze the degree of ramification in the P_{CTT} subzone (Table 2), we can observe that there are not great variations among the species, with the exception of *S. lactiflorum* that, in some samples, shows ramifications up to the eighth degree (Fig. 3). The intensity of the ramification which is manifested in the synflorescence of the species is associated, as we said earlier, to the number of bracts placed in the P_{CTT} subzone of the main axis and on each P_{CTT} .

Little variation is observed in the number of short paracladia (pairs of spikelets), with the lowest number for *S. condensatum* and the highest one for *S. spicatum*. The latter species shows a synflorescence less branched, and also presents a longer basal internode (peduncle), which at maturity determinates the position of the peduncle as regards to the spatheole of that unit (Table 3). This higher number of short paracladia is probably related to the scarce branching which this species shows in its synflorescence.

The sessile spikelet is very small in *S. condensatum*, *S. microstachyum* subsp. *microstachyum*, *S. microstachyum* subsp. *elongatum* and *S. lactiflorum* (Table 3).

Discussion

In Poaceae, the main axis and each innovation shoot represent a synflorescence (Cámara Hernández and

Table 1. Comparison of some aspects of the synflorescence and variations in the paracladia of the trophotagma subzone

Species	Length of the synflorescence	Length UIF + Pc _{TT}	Total number of the UIF	Shape UIF + Pc _{TT}	Variations in the paracladia of the trophotagma region			
					Number the leaves in the main axis	Number the bracts in the basal Pc _{TT}	Number the bracts in the Pc _{TT} II	Number the bracts in the Pc _{TT} III
<i>S. bimucronatum</i>	55–75	12–25	50–135	“Corymb-like form”, very ramificated, subcongeste	5–9	4–7	4–6	3–5
<i>S. condensatum</i>	60–100	5–20	80–120	“Corymb-like form”, very ramificated, remarkably congeste at subcongeste	(6–) 7–12	5–11	4–7	3–6
<i>S. lactiflorum</i>	60–80	6–23	75–130	“Corymb-like form”, very ramificated, congeste at subcongeste	(6–) 7–12	(5–) 7–12	3–12	2–11
<i>S. microstachyum</i> subsp. <i>microstachyum</i>	50–100	20–40	60–120	“Panicle-like form”, very ramificated, open	8–12	(4–) 6–10	(3–) 4–8	3–7
<i>S. microstachyum</i> subsp. <i>elongatum</i>	45–120	25–55	50–150	“Panicle-like form”, very ramificated, narrowly elongate	(6–) 7–12	(4–) 5–7	3–5 (–7)	2–4 (–6)
<i>S. plumigerum</i>	25–55	20–35	35–70	“Panicle-like form”, intermediate ramification, lax	5–7	4–5	3–4	2
<i>S. spicatum</i>	15–35 (–50)	15–30 (–40)	< 20	“Panicle-like form”, scarcely ramificated, lax	4–5	3–1	2–1	1

UIF, unit of inflorescence; Pc_{TT}, paracladia of the trophotagma region; Pc_{TT} II, Pc_{TT} III, paracladia of the trophotagma placed in the nodes II and III, respectively.

Table 2. Comparison of paracladia of the trophotagma subzone in species of *Schizachyrium*

Species	Pc _{TT} subzone				
	Number of the internodes	Length of the internodes: in acropetal direction (cm)	Ramification degree	Basal Pc _{TT}	Number of the internodes
<i>S. bimucronatum</i>	6–10	3.8, 2.5, 1.8, 1.5, 1, 0.8 5.3, 2.5, 1.9, 1.4, 1.1, 0.65 0.5, 0.35, 0.25, 0.15	3rd–5th	4–8	8, 1.7, 1.5, 1 7.3, 2.6, 1.7, 1.3, 1.1, 1.2, 0.9, 0.7
<i>S. condensatum</i>	6–12	4, 1.4, 0.55, 0.4, 0.3, 0.2 7.2, 3.8, 3, 1.4, 0.6, 0.5, 0.4, 0.3, 0.35, 0.2, 0.15, 0.15	3rd–5th	5–10	1.2, 1, 0.6, 0.5, 0.45 6.8, 5.2, 2.3, 1.4, 0.65, 0.45, 0.35, 0.3, 0.25, 0.15
<i>S. lactiflorum</i>	(5–) 9–11	(2.4, 1, 0.6, 0.4, 0.3) 5.1, 3.1, 1.75, 0.6, 0.35, 0.3, 0.3, 0.4, 0.4 5, 4, 2.7, 2, 1.3, 1, 0.8, 0.7, 0.5, 0.4, 0.25	3rd–8th	4–8 (–11)	3.8, 1.2, 1, 0.4 4.2, 3.9, 1.7, 0.6, 0.35, 0.25, 0.25, 0.3 (5.1, 4.8, 2.7, 1.2, 0.95, 0.7, 0.6, 0.4, 0.25, 0.25, 0.2)
<i>S. microstachyum</i> subsp. <i>microstachyum</i>	6–11	7, 4.7, 3.3, 2.5, 1.9, 1.5 6, 5, 3.9, 3, 2.7, 1.9, 1.3, 1, 1.2, 1, 1.4	3rd–4th	(3–) 5–9	(7.5, 2.7, 2.2) 5, 4.5, 1.9, 1.3, 1.2 7.7, 5, 4.1, 3.5, 2.4, 2.2, 1.6
<i>S. microstachyum</i> subsp. <i>elongatum</i>	(5–) 6–12	7.5, 5.8, 3.5, 3.2, 2.4, 2.2 8.1, 7.8, 7.3, 6, 4.3, 3.6, 3, 2.7, 2.5, 2.3, 1.8, 1.3	4th–5th	(3–) 4–10	8, 4.7, 3.4, 1.2 8.2, 7.1, 6.5, 6, 4.5, 3.5, 3.3, 2.6, 1.8, 1.8
<i>S. plumigerum</i>	4–6	4.8, 5.6, 3.5, 2.5 8.8, 8.4, 4, 2.5, 2.2, 2	3rd–6th	3–4	5.3, 2.5, 1.8 5, 3.7, 3, 2.5
<i>S. spicatum</i>	3–4	4.5, 3.5, 2.7 4.7, 5.2, 4.2, 2.1	3rd–6th	2–3	5, 4.4 9.5, 5.7, 4.5

Pc_{TT}, paracladia of the trophotagma.

Rua, 1991; Vegetti, 1991). When considering the synflorescence of *Schizachyrium*, a complex system of ramification is observed, which may be ordered in the following way:

1. The group of short paracladia on the main axis that constitutes the unit of inflorescence.
2. The pair of spikelets that constitute the simplest system of ramification developed in each node, which is equivalent to a short paracladium; this system is even more reduced in the distal node that consists of one spikelet only.
3. The paracladia of the trophotagma that are generated by the axillary buds of the distal leaves of the long internodes region of each synflorescence. At the same time, the axillary buds of their prophylls and bracts may originate branches generating complex systems of ramification at each node of this distal portion of the trophotagma.

The UIF in the species studied has been characterized as a spiciform raceme (Clayton and Renvoize, 1986). It is made up by pairs of spikelets, each pair made up of a sessile spikelet and a pedicellate spikelet, with the exception of the distal paracladium, which is reduced to a single spikelet. This spikelet has been interpreted as homologue of the sessile spikelet (Vegetti and Anton, 1991). This sessile spikelet is sterile (Cámara Hernández and Gambino, 1990; Vegetti, 1992). The distal spikelet of the unit of inflorescence is axillary and those axes end up sterile. This also applies to each paracladium of the trophotagma. Thus, the unit of inflorescence in the Andropogoneae is polytelic truncate (Vegetti, 1994, 1999). As a consequence of the truncation, the UIF presents a homothetic structure. In the Andropogoneae, the inflorescence is also homogenized. This is a process that generally accompanies the truncation (Vegetti and Anton, 1995, 2000) and which lets us recognize short and long paracladia in the area of the unit of inflorescence.

Table 3. Comparison of the some aspects of the short paracladia subzone in species of *Schizachyrium*

Species	shPc subzone									
	Length (cm)	Number of shPc	Peduncle length (cm)	Peduncle location (at maturity)	Spatheole		Sessile spikelet			Rachis internodes length (cm)
					Length (cm)	Shape	Length (cm)	Apex	Awn length (cm)	
<i>S. bimucronatum</i>	0.20–0.35	6–8	0.5–0.8	Included	1.5–2	Upper portion subconvolute, convolute base	0.55–0.7	Bimucronate	1–1.7	0.45–0.55 (–0.6)
<i>S. condensatum</i>	0.12–0.20	4–5	0.3–0.5	Included	1	Upper portion subconvolute, convolute base	0.35–0.45	Subacute with irregularities	0.6–0.9 (1)	0.25–0.35 (0.40)
<i>S. lactiflorum</i>	0.15–0.25	4–6	1.4–1.8	10–25% exerted	1.2–1.5	Narrowly convolute	0.4–0.45	Subacute with irregularities	0.8–1	0.30–0.35 (0.40)
<i>S. microstachyum</i> subsp. <i>microstachyum</i>	2.5–3.5	6–8	1.5–2.5	15–20% exerted	2	Narrowly convolute	0.35–0.4	Acute	1–1.2	0.35–0.4
<i>S. microstachyum</i> subsp. <i>elongatum</i>	3.5–4.5	5–8	0.5 (–0.7)	Included	2.3–2.7	Subconvolute at open	0.4–0.45	Acute, hyaline fissile medial part	1–1.5	0.45–0.5
<i>S. plumigerum</i>	4.5–5.5	5–8	2.5–4.5	20–35% exerted	2–3	Convolute	0.55–0.65	Acute, hyaline fissile medial part	(1.3–) 1.5–1.7	0.55–0.65
<i>S. spicatum</i>	3–7	6–11	4–7.5	30–45% exerted	2.5–5.5	Convolute	0.6–0.8 (0.9)	Acute or with two unequal aristules	1.3–2	(0.55) 0.6–0.85

shPc, short paracladia.

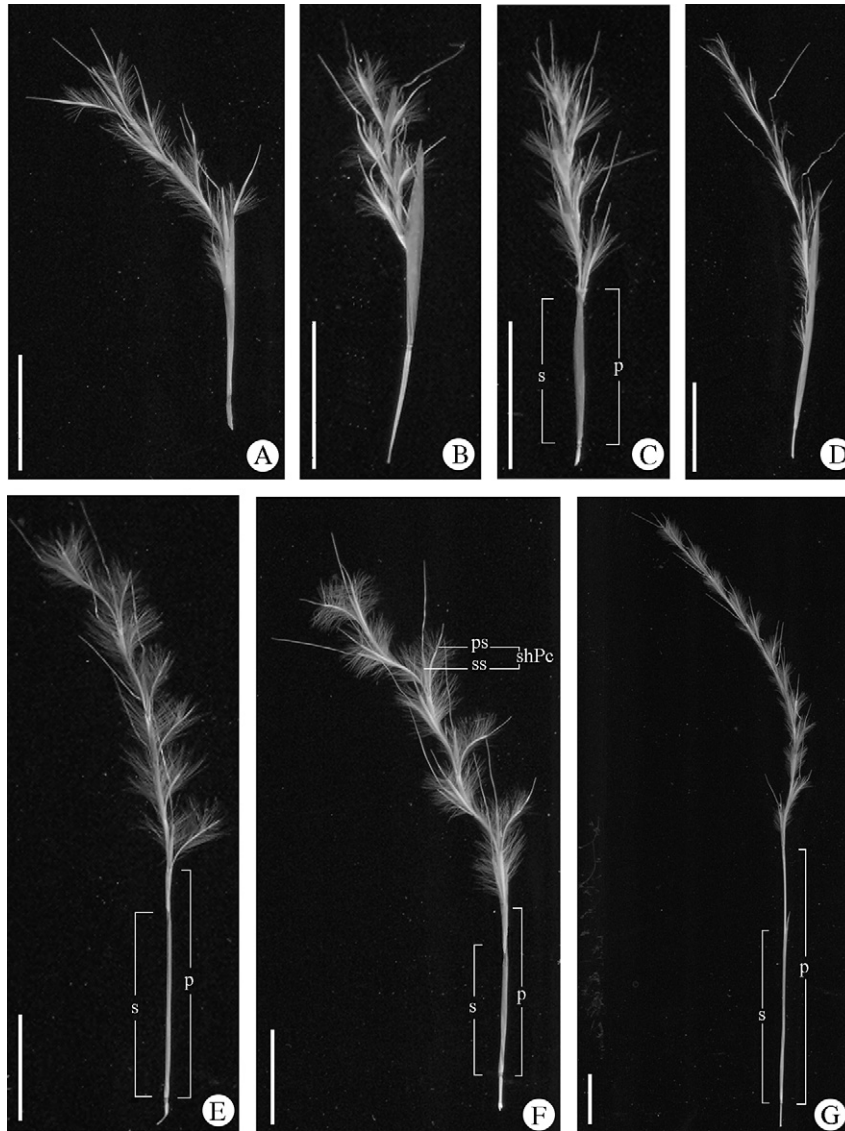


Fig. 2. The unit of inflorescence (UIF) in (A) *Schizachyrium bimucronatum* Roseng., B.R. Arrill. & Izag.; (B) *S. condensatum* (Kunth) Nees; (C) *S. lactiflorum* (Hack.) Herter; (D) *S. microstachyum* subsp. *elongatum* (Hack.) Roseng., B.R. Arrill. & Izag.; (E) *S. microstachyum* (Desv. ex Ham.) Roseng., B.R. Arrill. & Izag. subsp. *microstachyum*; (F) *S. plumigerum* (Ekman) Parodi; (G) *S. spicatum* (Spreng.) Herter. Abbreviations: s, spatheole; p, peduncle; shPc, short paracladium; ps, pedicellate spikelet; ss, sessile spikelet. Scale bar: A–E, G = 1 cm; F = 2 cm.

In the Andropogoneae the development of the long paracladial subzone is variable; there are some genera which lack them (Vegetti, 1997). In the *Schizachyrium* species analyzed the UIF consists of only short paracladia. The development of the region of long paracladia with trophotagma is greater in those inflorescences in which the region of long paracladia of the UIF is reduced or absent (Vegetti, 1999).

Each short paracladium has a pair of spikelets, with the exception of the distal paracladium. Consequently, they constitute short paracladia of second degree (Weberling et al., 1993). The length of the short paracladial subzone in the Andropogoneae is also

variable (Vegetti, 1999). In *Schizachyrium*, that subzone, which constitutes the whole UIF, also varies (Table 3). The UIF does not shed as a whole; each disseminule consists of an internode of the rachis and the pair of spikelets that was developed in its proximal node.

The paracladia of the trophotagma develop from the axillary buds of the distal leaves of the long internodes zone. These paracladia have trophotagma ($Pc_{TT}+L$, Vegetti and Müller-Doblies, 2004). The axis of this trophotagma bears up a prophyll and a variable number of bracts. The axillar buds of the prophyll and the following bracts of each of the Pc_{TT} can develop new paracladia of the trophotagma. An exception is the

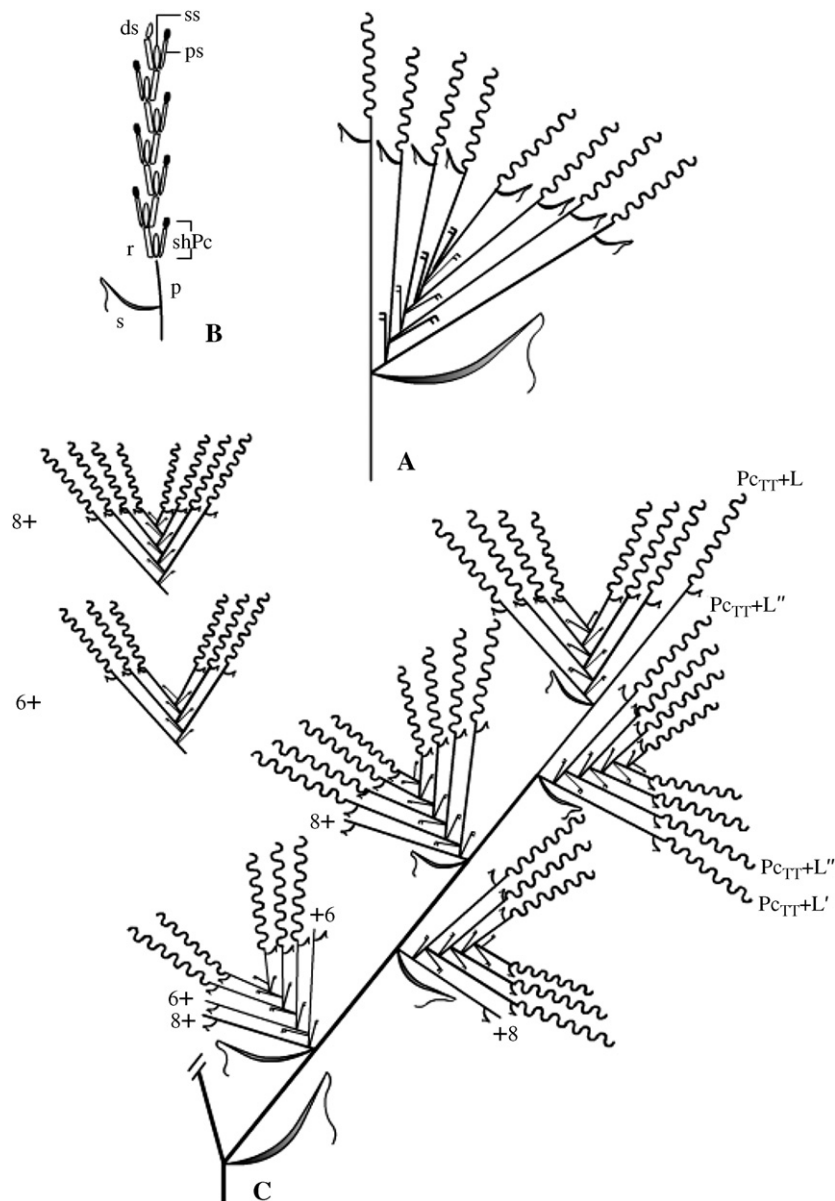


Fig. 3. *Schizachyrium lactiflorum* (Hack.) Herter. (A) diagram of the distal paracladia; (B) diagram of the short paracladia subzone; (C) diagram of the basal paracladia with different branching degree. Abbreviations: ds, distal spikelet; ss, sessile spikelet; ps, pedicellate spikelet; shPc, short paracladium; r, rachis internodes; s, distal “bract” (= spatheole); p, exerted portion of basal internode of the UIF (= peduncle); PC_{TT+L} , $PC_{TT+L'}$, $PC_{TT+L''}$, paracladium of the trophotagma with foliage leaf/leaves of consecutive order.

distal bract of the main axis and of each paracladium of the trophotagma whose axillary buds do not generate any shoot. Thus that area can be considered as an intercalary area of inhibition represented by the node of the distal sterile foliose hypsophyll (Vegetti and Müller-Doblies, 2004). This area of inhibition is situated at the point of greatest discontinuity on the main axis and each paracladium of the trophotagma between the UIF and the PC_{TT} .

In the studied species of *Schizachyrium* the region of the paracladia of the trophotagma presents

different degrees of development. That variation occurs in the number of primary paracladia of the trophotagma, in the number of bracts they bear and in the degree of ramification that could evolve by the development of the axillary buds of their prophylls and bracts.

There is an important variation among the species as regarding the development of the paracladia of the trophotagma. This region can be well developed in *S. lactiflorum* or it can be reduced to a few nodes and a few paracladia, as in *S. spicatum*.

The number of those primary paracladia is reduced in *Schizachyrium tenerum* (1–5 P_{CTT}) and *Schizachyrium salzmannii* (1–3 P_{CTT}) (Vegetti, 1992), whereas the species studied here show a higher number (Table 2): 3–4 in *S. spicatum*, (4–) 6–10 (–12) in most of the species. The degree of ramification of the paracladia of the trophotagma is also variable (Table 2): up to the eighth order in *S. lactiflorum*; up to the sixth order in *S. plumigerum*, *S. spicatum*, and forth and fifth order in the remaining taxa.

The inflorescence of *S. tenerum* presents paracladia up to the third order; whereas in *S. salzmannii* there are only primary paracladia which lack bracts with axillary buds that could generate secondary paracladia (Vegetti, 1992). Consequently, the secondary and tertiary paracladia of the trophotagma of *S. salzmannii* are just prophyllary paracladia. In the species related to *S. condensatum* the number of bracts of the P_{CTT} varies. There is a high number in *S. condensatum*, *S. lactiflorum*, *S. microstachyum* subsp. *microstachyum* and subsp. *elongatum*; whereas *S. bimucronatum* presents a lower number. *S. plumigerum* and *S. spicatum* are the species with the lowest number of bracts in the P_{CTT} . The prophyllary paracladia are not located in the typical prophyllar sequence, but in the position described by Vegetti (1992) for *S. tenerum* and *S. salzmannii* which is characteristic for Andropogoneae (Vegetti, 1994, 1999).

The cymose branch system generated has a clear acropetal development. The branch system generated in the axils of the bracts sometimes corresponds to an acropetal development, but very frequently it is less developed at the proximal node of the synflorescence. In *S. lactiflorum* the proximal paracladium is the most developed.

The following features are of taxonomic importance: length, shape, and intensity of the synflorescence ramification; total number of the UIF; length of the paracladia in the trophotagma, length of the UIF and its rachis internodes; number of short paracladia, length of the peduncle in relation to the length of the spatheole; length and shape of the spatheole; location of the UIF in relation to the spatheole; length of the sessile spikelet and apex; characteristics of the lower glume of the sessile spikelet.

The synflorescence of the species studied is the result of different processes: (1) truncation and homogenization which determine the typical structure of short paracladia made up by pairs of spikelets (Vegetti, 1994, 1999; Vegetti and Anton, 2000); (2) reduction of the unit of inflorescence due to the lack of formation of long paracladia at this level; (3) development of the paracladia of the trophotagma. The variations among the species studied are the result of the following processes: reduction/enlargement of the main axis internodes and paracladia; reduction/development of the short paracladia subzone; reduction/development of the

paracladia of the trophotagma region, affecting the number of leaves that develop P_{CTT} , the number of the bracts on each P_{CTT} , and the corresponding branching degree.

It should be noted that the typological analysis not only provides the instruments for an easy interpretation of the complex Andropogoneae systems of ramification (Vegetti, 1999), but also presents a comparative morphological approach for discovering homology, what in turn is considered central for assessing phylogenetic relationships (Tortosa et al., 2004).

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