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BIOSYSTEMATIC STUDIES OF THE RUMEX ACETOSELLA-COMPLEX III. A NOTE ON THE SYNSYSTEMATIC POSITION OF "R. TENUIFOLIUS (WALLR.) LÖVE"

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SUMMARY

A survey is given of some taxonomic aspects of *Rumex acetosella* L. s.s. and the critical *R. tenuifolius* (Wallr.) Löve (both in the sense of Löve), and of the status of *R. tenuifolius* in the syntaxonomic literature pertaining to Northern Germany, The Netherlands, and a part of Central Europe. In several publications this latter taxon is recorded as characteristic of the Class *Koelerio-Corynephoretea* (or of some of its subordinate syntaxa). A number of relevés of stands of vegetation belonging to this syntaxonomic Class from the Netherlands and a few from the German Federal Republic are presented in which only hexaploid *acetosella* occurred. Such specimens may be narrow-leaved, and although corresponding with the morphological description of *R. tenuifolius* cannot belong to this tetraploid species. The ecological amplitude of *R. acetosella* s.s. (with 2n = 42) overlaps that of the tetraploid *R. tenuifolius* (Wallr.) Löve. Within the *R. acetosella* aggregate *R. tenuifolius* is a critical taxon whose morphological and ecological characteristics do not have an adequate diagnostic significance. The conclusion can be drawn, in anticipation of a forthcoming revision, that it is at least in The Netherlands and in Germany not recommendable to credit "*R. tenuifolius*" with any meaningful status in syntaxonomy.

1. INTRODUCTION

Rumex acetosella s.l. is known to be a polymorphous and variable, polyploid complex (with x = 7) comprising 2x, 4x, 6x, and 8x components. LÖVE (1941a, b, 1944) split up the aggregate into four species on the basis of the ploidy level and of some characters supposed to be correlated with the latter. This proposal has met with a good deal of criticism (HARRIS 1968, DEN NIJS 1974, 1976).

In the present paper only two of Löve's species will be discussed, *viz.*, *R. acetosella* L. s.s. (2n = 42) and *R. tenuifolius* (Wallr.) Löve (2n = 28); the other two do not occur in the vegetation types under discussion and do not play any role in the relevant synsystematic literature.

WESTHOFF & DEN HELD (1969) state that in the Netherlands the ecology of particularly *R. tenuifolius* had too insufficiently been studied to permit its recognition as was done by, *e.g.*, PASSARGE (1960) and KRAUSCH (1962), as characteristic species of the *Koelerio-Corynephoretea*; in 1975 these Dutch authors remark in this connection that *R. tenuifolius* cannot be maintained as a distinct taxon.

In the present paper it will be attempted to clear up this point, starting from a discussion of the systematics of the *R. acetosella* aggregate augmented by a

survey of the pertaining syntaxonomic literature and a series of relevés and analyses of representative population samples of *R. acetosella* s.l. from representative stands of vegetation.

2. SYSTEMATICS OF R. ACETOSELLA L. s.l.

After its first description by Linnaeus a number of workers studied the complex in view of the great (plastic) variability and polymorphism. For the moment the above-mentioned publications of Löve will be used as the starting point of a critical evaluation; a more exhaustive monographic treatment of the complex within the general frame-work of a biosystematic study is in preparation.

The classification of Löve in four species (*R. angiocarpus* Murb. 2n = 14, *R. tenuifolius* (Wallr.) Löve 2n = 28, *R. acetosella* L. s.s. 2n = 42, and *R. graminifolius* Lamb. 2n = 56) is usually accepted for the Netherlands and Germany (and neighbouring countries), see RECHINGER (1957, 1964), ROTHMALER (1963), SCHMEIL & FITSCHEN (1967), OBERDORFER (1970), GARCKE (1972), but not in HEUKELS & VAN OOSTSTROOM (1977).

It has repeatedly been shown that especially in western and central Europe these species are "critical": the supposed correlation of diagnostic characters and ploidy level is by no means consistent, and there is an overlapping of morphological features (sizes of flowers and fruits, leaf shape), see HYLANDER (in LÖVE 1960), STERK et al. (1969), DEN NIJS (1970, 1974), HARRIS (1973), and WILLIAMS (1975). It has been established, among other things, that angiocarpy of the fruit (*i.e.*, the cementing of the inner perigone segments to the pericarp) does not occur in the diploids only but also in tetra- and hexaploid populations. On the other hand not all diploids are angiocarpous but sometimes gymnocarpous population-groups occur (*i.e.*, the inner perigone segments are not firmly attached to the fruit); see DEN NIJS 1976. Similarly, very narrow leaf-blades ("*tenuifolius* type") are found in tetraploid populations but also in di- and hexaploid ones, whereas in many tetraploid populations all plants have broad leaf-blades (HARRIS 1973). The senior author (DEN NIJS 1974, 1976, and in press) established the presence in Central and S. Europe of a fairly intricate distribution pattern of the ploidy levels. It appears that in certain areas (which are often geographical units) as a rule only one cytodeme is present which in most cases, dependent on the area, exhibits a correlative occurrence of certain morphological features (gymno- of angiocarpy, leaf-shape, etc.). An example is provided by the region of the Pyrenees, where a population-complex of angiocarpous and broad-leaved tetraploids is found.

For a better understanding of the synsystematic position of "*R. tenuifolius*", as proposed in the literature, it is necessary to study the identities of the morphologically very similar *R. acetosella* s.s. and *R. tenuifolius*. *Table 1* shows the supposedly most important diagnostic characters of the two taxa mentioned in some widely used floral works. It is at once evident that as regards the leaf-shape and growth habit there is no conformity. It has also been demonstrated (see, *e.g.*,

Table 1. Concise survey of some allegedly diagnostic features of *Rumex acetosella* L. s.s. and *R. tenuifolius* (Wallr.) Löve, taken from: 1 = LÖVE 1941a, b, 1944: 2 = RECHINGER 1964; 3 = ROTHMALER 1963; and 4 = GARCKE (1972).

Character	Rumex acetosella	Rumex tenuifolius
Somatic chromosome number	1, 2, 3, 4: 2n = 42	1, 2, 3, 4: 2n = 28
Fruit dimensions	1: (1.3 × 0.9 mm, from a photograph) 2, 4: length 1.3–1.5 mm (l. > b.) 3: 1.5 × 0.8 mm	1: 0.9–1.3 × 0.6–0.8 mm 2, 4: length 0.9–1.3 mm (l. > b) 3: 1.0 × 0.7 mm
Leaf shape	1: variable; blade relatively broad, l.: b. = 3–4 2: variable, principal lobe 3: narrowly lanceolate 4: hastate, main lobe lanceolate	1: narrow with involute margin; l.:b. = 10 to 15 2: narrowly linear, up to 10 times longer than broad, often with involute margin 3: narrowly linear to filiform 4: hastate, main lobe narrowly linear, 10 to 20 times longer than broad
Growth habit	1: erect 2: erect, ramifying from the middle onwards 3: – 4: usually erect, otherwise as 2	1: usually prostrate (to ascending) 2: ascending or prostrate with ascending branches, ramifying below the middle 3: – 4: ascending, usually already branching below the middle
habitat	1: gravelly soils in lowlands, cultivated ground 2: – 3: on neutral to slightly alkaline soils 4: acid, lime-free and rather poor, usually sandy soils	1: infertile, sandy or rocky soils, calcifugous 2: – 3: calcifugous, distribution insufficiently known 4: usually found on sandy soils poor in lime

VAN DER LEEUW 1969, HARRIS 1968 and unpublished investigations of the senior author) that in both "species" (or ploidy levels) the fruit dimensions, leaf-shape, and growth habit show such a considerable overlap that their distinction on the basis of these largely qualitative characteristics becomes extremely difficult. The following data are from a more extensive survey, to be published in a broader context elsewhere:

Author	Region	Fruit dimensions at two ploidy levels	
		2n = 28	2n = 42
VAN DER LEEUW (1969)	Southern part of the Netherlands	1.0–1.1 × 0.7–0.8 mm	1.1–1.2 × 0.9 mm
DEN NIJS (1970)	Belgium	1.0–1.2 × 0.8 mm	1.1–1.2 × 0.8–0.9 mm
DEN NIJS (present paper)	Austria	1.0–1.2 × 0.8–0.9 mm	—
do.	France	(1.3–1.5 × 0.9–1.1 mm)	(1.3–1.8 × 0.9 × 1.2 mm)

N.B. The figures between brackets relate to angiocarpous fruits (the other ones were gymnocarpous); they are not essential but illustrate the wide range in both tetra- and hexaploids.

In Belgium the following leaf-blade indices were found (DEN NIJS 1970):
Leaf-blade ratio (length/width): in 9 tetraploid population samples the mean varies from 6.8 to 18.4;
Leaf-blade ratio (length/width): in 11 hexaploid ones the mean varies from 5.8 to 14.5.
Also GARDOU & BIGOT (1976) recorded the incidence of very narrow-leaved individuals in hexaploid populations (in the vicinity of Paris). WILLIAMS (1975), who studied populations in Warwickshire (Gr. Brit.), convincingly showed that such characteristics as leaf width, involute leaf margins, and mode of branching overlap in populations at both ploidy levels, and he adduced several cogent arguments for the assumption that the variation is to a great extent attributable to a plastic response to local environmental factors. It follows that the characteristics enumerated in *table 1* have no diagnostic value for the distinction between *R. acetosella* s.s. and "*R. tenuifolius*". In other words, by using the current set of morphological diagnostic characters it is not possible, even when counting chromosomes, to distinguish *R. tenuifolius* (Wallr.) Löve 2n = 28 from the hexaploid *R. acetosella* L. s.s. The set of characters refers to more than tetraploid, narrow-leaved individuals as defined by Löve. As can be concluded from the cytogeographical pattern, found by DEN NIJS (1974, 1976, in the press and in preparation) one should reckon with the possibility that in a forthcoming biotaxonomic revision one or more tetraploid topo-cytodemes could get any taxonomic status, since it has become evident from these studies that within the tetraploid level there is morphological diversity. It will be a matter of nomenclatural study whether or not the epithet *tenuifolius* is applicable to one of these taxa.

Because of convergent evolution, ecological overlapping and introgression in the area now studied, a sharp distinction between the tetra- and hexaploid levels is not possible.

3. SURVEY OF RELEVANT SYNTAXONOMIC PUBLICATIONS

The following concise and inexhaustive survey is centred around the supposed status of "*R. tenuifolius*" as a characteristic taxon in certain syntaxonomic units reported from northern Germany and (partly) central Europe. It also includes publications in which on theoretical grounds no character species but only characterising ("frequent") species or species groups are recognised (*e.g.*, PASSARGE 1964). Since the differences of opinion regarding the recognition of character species *versus* characterising species (*sensu* PASSARGE 1964) are irrelevant in the present context, all records are included without comment.

R. acetosella s.s., with its very wide ecological amplitude, is generally considered to be "Gesellschaftsvag" (OBERDORFER 1970), *i.e.*, not clearly belonging to certain syntaxonomic communities.

R. tenuifolius, to the contrary, is generally supposed to be much more stenoecious (see also *table 1*) and is often considered to be a character species (or frequent species) of certain syntaxa. *Table 2* gives a selection of pertaining syntaxonomic publications and requires some supplementary explanation (for the author's names of the syntaxa, see this *table*):

— KRAUSCH (1968) mentions *R. acetosella* as characteristic species of the *Sedo-Scleranthetea* (synonym.: *Koelerio-Corynephoretea*) in his description of the syntaxon, but in the accompanying table only *R. tenuifolius* is listed;

— PASSARGE (1964) does not indicate any character species. His tables give information about the faithfulness and abundance of the species. The faithfulness of *R. tenuifolius* is upon the whole low;

— MORAVEČ (1967) discusses two associations, *viz.*, the *Agrosteto-Rumicetum tenuifolii* Tx. 1951, and the *Armeria elongata – Rumex tenuifolius* association Tx. 1951, without mentioning *R. tenuifolius* in his comparative "Stetigkeitstafel" (= table of relative constancy of representation, faithfulness) of the communities. Only *R.acetosella* is present.

A glance at *table 2* and the commentary show quite clearly that there is no consensus of opinion as regards the position of *R. tenuifolius*. This is partly attributable to differences of syntaxonomic opinion, but especially the publications of MORAVEČ (1967), KRAUSCH (1968) and JECKEL (1975) are indicative of additional, taxonomic problems, especially regarding the separation of *R. tenuifolius* from *R. acetosella*. Compare also KRAUSCH 1962 and 1968. PASSARGE (1964) lists in his table relating to the *Arabidopsidetum thalianae* Siss. '42 (*Sedo-Scleranthetea*) "*R. acetosella*-coll.", which means that at any rate *R. tenuifolius* (and perhaps also *R. angiocarpus?*) is implicitly included. The same author reports the (infrequent) occurrence of *R. tenuifolius* in the *Stipetum capillatae* Hueck '31 in N.E. Germany, whereas KRAUSCH (1961) recorded *R. acetosella* in this same association in the province of Brandenburg.

WALTHER (1977) mentions the occurrence of *R. tenuifolius*, sometimes as character species, in several associations in the Meetschow (Kreis Lüchow-Dannenberg, BRD) area, but he recently (pers. comm.) expressed his doubt as to the possibility, let alone reliability, of the identifications.

Table 2. Evaluation of "*R. tenuifolius*" in a number of syntaxonomic publications.* Italics indicate the syntaxa to which the species has been referred as a characteristic species.

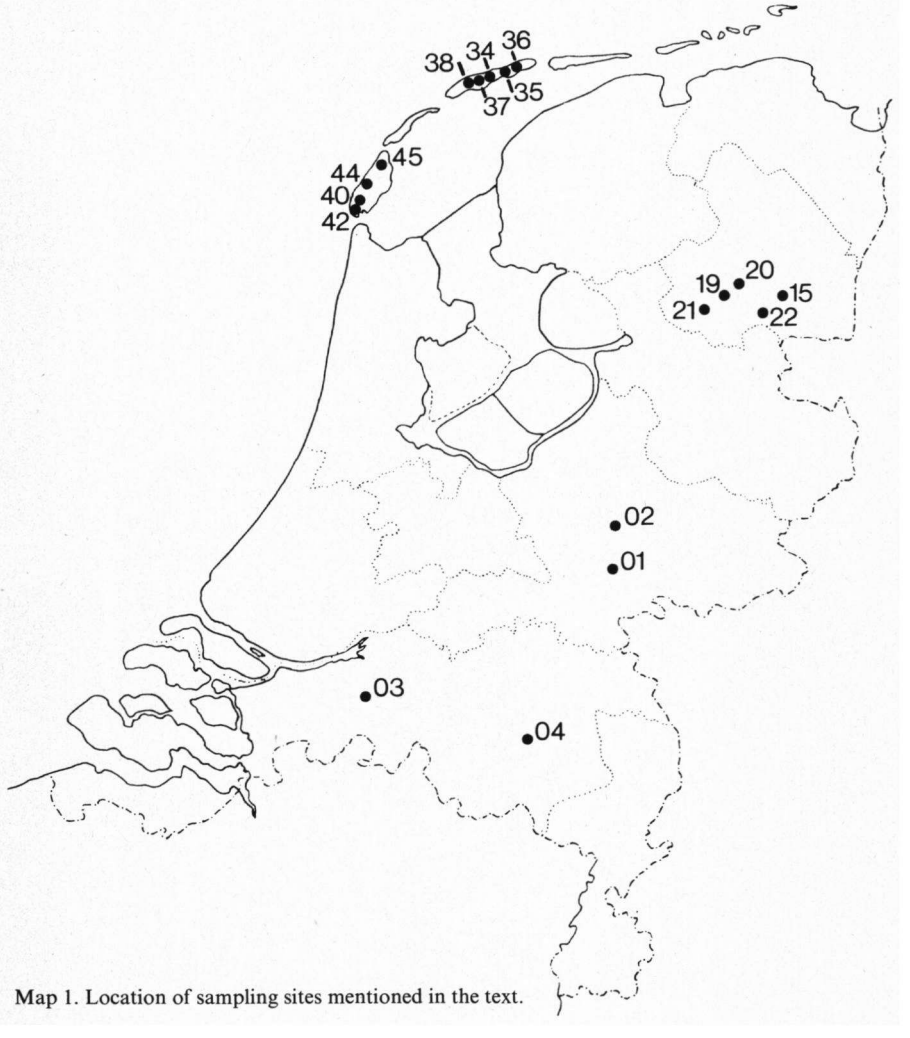
Author	Taxon	Evaluation	Syntaxon
Passarge (1960)	R. tenuifolius	character species	*Koelerio-Corynephoretea* Klika apud Klika et Novak '41
Krausch (1962)	R. tenuifolius	character species	*Koelerio-Corynephoretea* Klika apud Klika et Novak '41
Passarge (1964)	R. tenuifolius	frequent species	Koelerio-Corynephoretea Klika '41 : *Corynephoretalia* (Klika '31) Tx. '33 em. Pass. '60
			: Sedo-Festucetalia Tx. '51 em.
			: *Koelerion glaucae* (Volk '30) Klika '35
			Festuco-Brometea : Brometalia erect: Br.-Bl. '36
			: *Bromion* Br.-Bl. '38
Moraveč (1967)	R. acetosella	frequent species	*Koelerio-Corynephoretea* Klika apud Klika et Novak '41
	R. tenuifolius	frequent species	Sedo-Scleranthetea Br.-Bl. '55 em. Moraveč '67: *In a few associations*
Krausch (1968)	R. acetosella/ R. tenuifolius	character species	*Sedo-Scleranthetea* Br.-Bl. '55 em. Müller '61 (Syn. Koel.-Coryn. aut. cit.)
Oberdorfer (1970)	R. tenuifolius	character species present in	Sedo-Scleranthetea Br.-Bl. '55 em. Müller '61: *Festuco-Sedetalia* Tx. '50 em. Krausch '61
			: Corynephoretalia canescentis Tx. '37 em. Krausch '62
			: *Corynephorion canescentis* Klika '31
Jeckel (1975)	R. acetosella	frequent species	Sedo-Scleranthetea Br.-Bl. '55 : Festuco-Sedetalia Tx. '51: *various associations*

*All notations of authors of syntaxa as given in the cited literature.

As regards the Netherlands, WESTHOFF & DEN HELD (1975) expressed the opinion that *R. tenuifolius* cannot be maintained as a separate taxon and as a consequence they do not give it any syntaxonomic status any longer.

4. POPULATION SAMPLES AND METHODS

From the large collection of population samples from the N.E. Netherlands and from the Dutch North Sea Islands those which on the ground of the relevés of the local vegetation types had been growing in *Koelerio-Corynephoretea* stands were more closely investigated for the purpose of the present publication. In addition,



Map 1. Location of sampling sites mentioned in the text.

Table 3. Survey of the Koelerio-Corynephoretea-relevés, ploidy level, and some mean leaf ratios of the *R. acetosella* population samples. Characteristic and differentiating species qualifications according to WESTHOFF & DEN HELD (1969) and HEUKELS-VAN OOSTSTROOM (1977), x = present in relevé.

	Population number	01	15	19	20	21	22	02	03	04	34	37	35	36	38	40	44	42	45
	Mean leaf ratio (1:w)		6.9	6.5	5.5	6.8	8.6												
	Ploidy level	6x	6x	6x	6x	6x	6x	6x	6x	6x	6x	6x	6x	6x	6x	6x	6x	6x	6x
	Rumex acetosella	x	2m	2a	2m	2m	1p	x	x	x	1p	2m	1p	2m	2m	1p	1p	2m	1p
Character spec. of Class	Corynephorus canescens	x	2m	2a	2m	2m	2m	x	x	x	1p	2m	2m	2m	2m	1p	1p		1p
	Agrostis canina ssp. montana			2b	2m	2m	2m	x	x	x									
	Carex arenaria								x		1p	1p	1p	1p	1p	1p	1p	+p	+p
Character spec. of Order	Hieracium umbellatum						+r				1a	+p	+p	+r	1a	+p			+r
	Jasione montana							x	x		1p	1p	1a	+p	2m	+r			
	Aira praecox					1p					1p		1p	+p	1p	+r	+p		1p
	Teesdalia nudicaulis															+r	r		r
	Sedum acre																+p		1p
Character spec. of Alliance	Anthyllis vulneraria														+p				
	Cerastium diffusum																+p		
Character spec. of Association	Spergula morisonii		1p	1p	1p	1p	1p												
	Viola canina										+r								
Diff. spec. of Class	Festuca ovina	x	2m		2m	2m	2m			x						1p	2m	2m	3b
	Koeleria cristata															1p	1p		2m
	Hieracium pilosella																+p	+p	1a
	Galium verum												1a			1p	1p	+p	2m
Diff. spec. of Association	Agrostis tenuis												+p						
Comp. spec.	Viola curtisii														r	+p	+p	r	+p
	Luzula campestris											+p		1p		1p	2m	1p	1p
	Rosa pimpinellifolia															2b	2a	2b	
	Empetrum nigrum											+r	+a	2a					
	Polypodium vulgare												+r	1a	+b				+p
	Lotus corniculatus												1a	1p	2a				1p
	Hypochaeris radicata							x			1p	1p	1p	+p	1a		r		
	Festuca rubra										+p	+p	1p						
	Veronica officinalis													1p			+p		+p

Leontodon nudicaulis									+p	+p		1p		1p
Cerastium fontanum									+r					
Ammophila arenaria						1a	1p	1p	1p	1p	+p			+p
Sagina nodosa														+r
Senecio jacobaea var. nudus														+a
Erodium cicutarium				x										
Holcus lanatus				x										
Molinina coerulea					x									
Calamagrostis epigejos													1p	
Calluna vulgaris	x	+r	+r											

some samples from corresponding stands of vegetation were obtained from a few localities in the province of Noord-Brabant and on the Veluwe. The 18 samples enumerated below were included in the analysis; the number corresponds with those indicated on *map 1* and used in *table 3*.

List of sampling localities:

01: Otterlo, Veluwe; 02: Stroe, vicinity of Voorthuizen, Veluwe; 03: Alphen, Noord-Brabant; 04: Heeze, Strabechtse heide, Noord-Brabant; 15: Mantingerzand, near Mantinge, Drenthe; 19: Kraloër veld, vicinity of Eursinge, Drenthe; 20: Ter Horsterzand, near Wijster, Drenthe; 21: Eursinge-Ruinen, Drenthe; 22: Hullerzand, surroundings of Nieuw Balinge, Drenthe; 34: Oosterend, dunes near beach beacon 16, Isle of Terschelling; 35: Oosterend, dunes near Biological Station, Isle of Terschelling; 36: Oosterend, Jan Thijssendune, Isle of Terschelling; 37; Lies, dunes near beach beacon 10, Isle of Terschelling; 38: Hee, near the "Waterplak", Isle of Terschelling; 40: Den Hoorn, dunes near Bollekamer, Isle of Texel; 42: Den Hoorn, dunes near De Geul, Isle of Texel; 44: Bleekersvalley, dunes near beach beacon 16, Isle of Texel; 45: De Cocksdorp Eyerland dunes near Beach beacon 29, isle of Texel.

The identification of the species (only higher plants were recorded) was carried out with HEUKELS & VAN OOSTSTROOM (1977), for the synsystematics WESTHOFF & DEN HELD (1969) was consulted. The relevés were made according to the Braun-Blanquet-method with the scales of BARKMAN et al. (1964). The chromosome numbers were established by using the method of DEN NIJS (1974), the leaf characteristics and leaf-blade ratios according to a method developed by PANHORST née SANGSTER (1977).

5. RESULTS

The location of the sampling sites is indicated on *map 1*. *Table 3* shows the specific composition of the sampled stands of vegetation and also the ploidy level of the local population of *R. acetosella* s.l.; in addition, of some *Rumex* samples also the leaf ratio (blade length: blade width) of plants collected in the field was calculated (of each plant 5 to 15 leaves were measured, so as to include the intra-individual variation.

The relevés are all referable to the *Koeleria-Corynephoretea* on account of the specific composition of the associations encountered. All specimens of the *Rumex acetosella* aggr. without exception appeared to be hexaploid ($2n = 42$). The mean leaf ratios are fairly high: the leaf-blades are upon the whole narrow. Table 4 gives the frequency distribution of the ratios over a number of arbitrarily chosen classes. It is clear that this characteristic is extremely variable even under the relatively similar ecological conditions prevailing at the sampling sites. In all populations studied both broad-leaved to very narrow-leaved individuals were found to occur. In identification keys a leaf ratio exceeding about 10 is indicated as characteristic of "*R. tenuifolius*".

Table 4. Frequency distribution of the leaf ratios in some population samples.

Population number	Percentages of plants with different leaf ratios (lamina length: l. width)						Total number of leaves measured
	in "R. acetosella" type:	in "R. tenuifolius" type:					
	1–4	5–8	9–12	13–16	17–20	21–24	
15	31	46	17	5	1	–	290
19	34	52	11	3	–	–	290
20	45	44	10	1	–	–	114
21	33	47	12	6	1	1	141
22	21	40	25	11	2	1	293
45	36	38	11	7	5	2	53

On the basis of their chromosome number the plants collected in the stands of the *Koelerio-Corynephoretea* cannot be included in "*R. tenuifolius*" *sensu* Löve. However, in every population a smaller or greater part of the leaves have such narrow blades that this morphological feature suggests the presence of "*R. tenuifolius*". Seeds of plants supposed to represent *R. tenuifolius*, kindly supplied by Professor K. Walther (Hamburg), from *Corynephoretum*-vegetations from three localities in the Lüchow-Dannenberg-region (BRD) also proved to be hexaploids: Brünkendorf, Vasenthin-Trebel (Sandpit in *Pinus* forest) and Vietze-Meetschow (edge of *Pinus* forest). As no herbarium material was available, no leaf ratios could be calculated.

6. DISCUSSION

Although published records of *R. tenuifolius* (in various qualifications) as occurring in vegetation types of the Class *Koelerio-Corynephoretea* are fairly numerous (see *e.g.*, PASSARGE 1964, MORAVEC 1967, OBERDORFER 1970), this taxon (as defined by LÖVE 1941a, b, 1944) has not been found in corresponding sampled stands of vegetation. The fact that all plants enumerated in *table 3* were hexaploids indicates that on the basis of the current classification (as cited in chapter 2) they are referable to *R. acetosella* L. s.s. The "true", *i.e.*, tetraploid *R. tenuifolius* seems to be far less common than was hitherto assumed.

Tables 3 and *4* once more show that plants with very narrow leaf-blades (leaf ratios at least about 10) may occur on a large scale in hexaploid populations, as was already pointed out in the chapter on the systematics of the aggregate species. It is clear that this characteristic cannot be used to distinguish *R. acetosella* s.s. from *R. tenuifolius*.

The data reported above again demonstrate the very wide ecological amplitude of the hexaploid cytotype, which apparently can also thrive under the extreme conditions of the sites supporting *Corynephoretea*-associations. Its great

variability and plasticity may, moreover, result in the appearance of a "*tenuifolius*-like" habit form although more "typical" *acetosella* specimens may also occur in such habitats.

The senior author found that in Belgium the incidence of the very narrow leaf type is not restricted to *Koelerio-Corynephoretea* vegetation, and that whenever open, dry, and sandy sites are present one may expect to find individuals with very narrow leaf-blades.

The obvious corollary is that in The Netherlands exclusively hexaploid (2n = 42) *R. acetosella* populations occur in *Koelerio-Corynephoretea* vegetation and no tetraploid (2n = 28) ones. *R. tenuifolius* cannot be qualified as a character-species of any syntaxonomic unit, because (1) it is impossible to distinguish this species from *R. acetosella* L. s.s. (present in the same vegetation-types) using the present set of morphological and ecological characters, (2) the concerning tetraploid taxon, on the basis of these and previously published data, will receive another description, and perhaps also another name in a forthcoming revision.

One can state that *R. acetosella* s.l. has upon the whole very narrow leaves in open, dry sandy sites (thus including *Koelerio-Corynephoretea*) but it is incorrect to refer such individuals to *R. tenuifolius* (Wallr.) Löve 2n = 28 (compare WESTHOFF & DEN HELD 1975).

Since a study of material from Germany (Lüchow-Dannenberg) is corroborative, the conclusion must also hold for at least northern Germany. It must be emphasised that one should not draw the conclusion that the tetraploid cytotype of the *R. acetosella* aggregate does not occur in the Netherlands or in Germany. STERK et al. (1969), DEN NIJS (1976) and SPRENGER (1977) report the scattered occurrence of tetraploid populations, but neither of them draw any definite conclusions as regards the systematics or syntaxonomy of such population groups.

A revision of the complex based on taxonomic, ecological, and biosystematic analyses by the senior author is in preparation.

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