

The forest-edge vegetation of the alliance *Trifolion medii* Müller 1962 in the Northern Apennines (Italy)

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Riassunto

La vegetazione di orlo forestale dell'alleanza *Trifolion medii* Müller 1962 nell'Appennino settentrionale (Italia). La vegetazione dell'alleanza *Trifolion medii* Müller 1962 nell'Appennino settentrionale. Viene presentato uno studio effettuato sugli orli di vegetazione forestale dell'Appennino settentrionale riferibili all'alleanza *Trifolion medii*, della classe *Trifolio medii-Geranietea sanguinei*. Vengono descritte tre nuove associazioni: *Phyteumo scorzonerifoliae-Teucrietum scorodoniae*, *Gentiano asclepiadeae-Geranium nodosi* e *Digitalidi luteae-Geranium nodosi*.

La prima associazione si rinviene sul versante tirrenico dell'Appennino Ligure e Tosco-Emiliano, interessato dal bioclimate temperato. L'aspetto tipico dell'associazione è rappresentato dalla nuova subassociazione *phyteumatosum scorzonerifoliae*, che si presenta a quote altitudinali inferiori ai 700m, al margine di boschi di castagno e rovere dell'associazione *Physopermo-Quercetum petraeae* mentre la subassociazione *violetosum riviniana* si sviluppa al margine di boschi di faggio acidofili dell'associazione *Luzulo pedemontanae-Fagetum* e di castagneti nell'Appennino toscano.

L'associazione *Gentiano asclepiadeae-Geranium nodosi* si rinviene sul versante padano dell'Appennino Ligure e Tosco-Emiliano, intorno ai 1000 m di quota, su substrati argilloso-arenacei e flyschoidi, esposti prevalentemente a Nord, al margine di boschi di faggio dell'associazione *Cardamino heptaphyllae-Fagetum*.

L'associazione *Digitalidi luteae-Geranium nodosi* si rinviene sul versante padano dell'Appennino ligure, a quote inferiori rispetto alla precedente, e sul versante tirrenico dell'Appennino toscano, su substrati arenacei e marnoso-arenacei. L'associazione si sviluppa a contatto con cerrete, castagneti ed ostrieti, meno acidofili, più eliofili e termofili rispetto a quelli che entrano in contatto con la vegetazione di orlo dell'associazione precedente.

Parole chiave: Appennino settentrionale, Fitosociologia, Italia, orli di vegetazione, *Trifolion medii*, *Trifolio-Geranietea sanguinei*.

Summary

We present here a study carried out on the forest-edge vegetation of the Northern Apennines that form a part of the alliance *Trifolion medii*, of the class *Trifolio medii-Geranietea sanguinei*. Three new associations are described: *Phyteumo scorzonerifoliae-Teucrietum scorodoniae*, *Gentiano asclepiadeae-Geranium nodosi* and *Digitalidi luteae-Geranium nodosi*.

The first association is found on the Tyrrhenian slopes of the Liguria and Tuscany-Emilia Apennines, which are characterised by a temperate bioclimate. The typical example of the association is represented by the new subassociation *phyteumatosum scorzonerifoliae*, which is found at altitudes below 700 m at the edges of chestnut and bay oak woods of the *Physopermo-Quercetum petraeae* association, while the subassociation *violetosum riviniana* develops at the edges of acidophilous beech woods of the *Luzulo pedemontanae-Fagetum* association, and of chestnut woods of the Tuscany Apennines. The association *Gentiano asclepiadeae-Geranium nodosi* is found on the Padana slopes of the Liguria and Tuscany-Emilia Apennines at around 1000 m in altitude on arenaceous clay and flysch-like substrata mainly exposed to the north, at the edges of beech woods of the *Cardamino heptaphyllae-Fagetum* (= *Trochiscantho-Fagetum*) association.

The association *Digitalidi luteae-Geranium nodosi* is found on the Padana slopes of the Liguria Apennines at altitudes less than 1000 m, and on the Tyrrhenian slopes of the Tuscany Apennines, on arenaceous and marl-arenaceous substrata. The association develops in contact with turkey oak, chestnut and hornbeam woods that are less acidophilous and more heliophilous and thermophilous with respect to those that come into contact with the edge vegetation of the preceding association.

Key words: Italy, Northern Apennines, phytosociology, *Trifolion medii*, *Trifolio-Geranietea sanguinei*, vegetation edges.

Introduction

Phytosociological studies on the vegetation of the herbaceous edges of the class *Trifolio medii-Geranietea sanguinei* that surround the deciduous forests in Italy have developed fairly recently. In particular, with the exception of some localised studies (Allegrezza, 2003; Taffetani, 2000), the first monographic study of this type of vegetation relative to the Central Apennines (Biondi *et al.*, 2001) revealed some associations attributed to

the two alliances *Geranion sanguinei* and *Trifolion medii*. The present study considers the territories of the Northern Apennines, with respect to the second of these alliances.

Materials and Methods

Forty-eight phytosociological relevés were carried out in the Liguria Apennines, both on the Tyrrhenian

and the Padana slopes, and in the Tuscany-Emilia Apennines, including the Monti Pisani massif (Fig. 1).

The relevées were brought together into a phytosociological table, and after the conversion of the phytosociological codes into quantitative values (Van der Maarel, 1979), they were classified according to the mean linkage algorithm (Anderberg, 1973) on the basis of the similarity matrix between the relevées, calculated through the similarity ratio option with respect to the coverage (Westoff & Van der Maarel, 1978), which has allowed the construction of the dendrogram (Fig. 2).

Vegetation

On the basis of this dendrogram (Fig. 2) that clearly reveals three relevée groups, the three new associations presented below were identified.

PHYTEUMO SCORZONERIFOLIAE-TEUCRIETUM SCORODONIAE ass. nova

PHYTEUMATOSUM SCORZONERIFOLIAE subass. nova typical (rel. n. 24-21 in Tab. 1, holosintypus n. 46)

VIOLETOSUM RIVINIANAE subass. nova (rel. n. 27 – 30 in Tab. 1, holosintypus n. 28)

This association is found mainly on the Tyrrhenian slopes of the Liguria and Tuscany-Emilia Apennines, which are characterised by a temperate bioclimate (principally of the Submediterranean variant), from humid to hyper-humid, and also sporadically on the Piedemonte slopes of the Liguria Apennines. These are acidophilous edges that are found on mainly arenaceous substrata that have as characteristic species: *Teucrium scorodonia* and *Phyteuma scorzonerifolium* – a species present on the Central-Western Alps and on the Apennines as far as Val Tiberina. The following are considered as the differential species of the association: *Hypericum montanum*, *Avenella flexuosa* and *Genista pilosa*.

The typical aspect of the association is seen in the subassociation *phyteumatosum scorzonerifoliae* that, as well as the characteristic species of the association, has the differential species: *Luzula albida*, *Erica carnea*, *Physospermum cornubiense* and *Digitalis lutea*. In this typical aspect, the association is found at altitudes of less than 700 m at the edges of chestnut and bay oak woods of the *Physospermo-Quercetum petraeae* association, with a vegetation mantle of *Cytisus scoparius*, of the *Calluno-Sarothamnetum scoparii* association (Vagge, 2002), and at the higher altitudes in contact with beech woods of the *Cardamino heptaphyllae-Fagetum sylvaticae* association. Within this vegetation, a *Dactylorhiza maculata* variant



Fig. 1 – Localisation of the areas studied

can be distinguished, with *Knautia purpurea*, *Geranium nodosum*, *Campanula trachelium*, *Anemone trifolia* and *Potentilla erecta* in the more humid and rich-in-humus areas.

At the edge of the more acidophilous beech woods of the *Luzulo pedemontanae-Fagetum* association (Oberdorfer & Hofmann, 1967), and of chestnut woods of the Tuscany Apennines (in particular of Monti Pisani) the subassociation *violetosum riviniana* is found, which is differentiated by: *Viola riviniana*, *Luzula nivea*, *Epilobium montanum* and *Digitalis micrantha*.

GENTIANO ASCLEPIADEAE-GERANIETUM NODOSI ass. nova

(holosintypus: rel. n. 5 in Tab. 2)

This association is found on the Padana slopes of the Liguria and Tuscany-Emilia Apennines at higher altitudes (around 1000 m on average) on clay-arenaceous (and flysch-like) substrata at the edge of beech woods (*Cardamino heptaphyllae-Fagetum*) on mainly north-facing slopes.

The dominant and characteristic species are *Gentiana asclepiadea* (European orophile with an Alpine and Apennine distribution in Italy – as far as the Pistoia area), *Geranium nodosum*, *Luzula nivea*, *Digitalis lutea* and *Epilobium montanum*. This association can be ecologically differentiated from the previous, *Phyteumo scorzonerifoliae-Teucrietum scorodoniae*, association as it is subacidophilous and as it develops in low light and higher humidity conditions.

Senecio fuchsii and *Geum urbanum* differentiate a nitrophilous variant of this association.

HELLEBORO ODORI-GERANIETUM NODOSI ass. nova

(holosintypus: rel. n. 17 in Tab. 3)

This association is found on the Padana slopes of the Liguria Apennines (at lower altitudes with respect to the previous, *Gentiano asclepiadeae-Geranietum nodosi*, association), and on the Tyrrhenian slopes of the Tuscany Apennines, on arenaceous and marl-arenaceous substrata. The following species characterise and differentiate the association: *Digitalis lutea*, *Helleborus odorus*, *Geranium nodosum*, *Helleborus foetidus* and *Brachypodium sylvaticum*. The edge vegetation corresponding to this association is found at the edges of turkey oak, chestnut and hornbeam woods that show a less acidophilous and more heliophilous and thermophilous character with respect to the *Phyteumo scorzonerifoliae-Teucrietum scorodoniae* association. It is thought that the *Helleboro odori-Geranietum nodosi* association substitutes for the *Digitalidi micranthae-Helleboretum bocconeii* association in the Northern Apennines, the latter of which includes the vegetation edges linked to the hornbeam woods that are widespread on the calcareous and marl-arenaceous substrata of the Central Apennines (Biondi *et al.*, 2001).

Comparisons between the associations

From the comparisons between the structures of the associations described through the evaluation of the

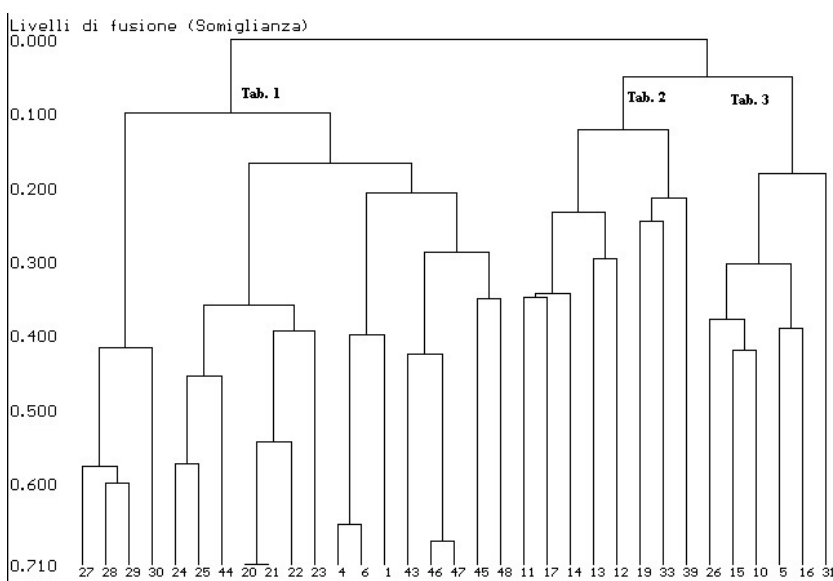


Fig. 2 – Dendrogram of the relevés

Tab. 2 - *Gentiano asclepiadeae-Geranium nodosi* ass. nova (rel. typus n. 5)

Rel. N.	26	15	10	5*	16	31		
Alt. (m a.s.l.)	420	1280	1000	1200	1070	920		
Exp.	NW	N	NNW	N	NNE	WNW	Pres.	Freq. class
Incl. (°)	15	20	10	15	20	40		
Cov. %	80	100	95	90	100	100		
Rel. Area (smq)	40	40	30	40	50	40		
Dif. and char. sp. <i>Gentiano asclepiadeae-Geranium nodosi</i>								
<i>Gentiana asclepiadea</i> L.	2.2	+	1.1	2.3	+	3.3	6	V
<i>Geranium nodosum</i> L.	4.4	3.3	4.5	4.4	3.4	+2	6	V
<i>Luzula nivea</i> (L.) Lam. et DC.	-	1.2	+	2.3	2.2	2.2	5	V
<i>Epilobium montanum</i> L.	1.2	1.2	-	+2	1.1	+	5	V
<i>Digitalis lutea</i> L.	2.3	2.3	+	-	2.2	-	4	IV
Dif. sp. <i>Senecio fuchsii</i> var.								
<i>Senecio fuchsii</i> Gmelin	1.2	1.2	2.2	-	-	-	3	III
<i>Geum urbanum</i> L.	+2	1.1	-	-	+	-	3	III
Dif. and char. sp. <i>Trifolium medii</i>								
<i>Viola reichenbachiana</i> Jordan ex Boreau	+	1.2	+	1.2	1.2	-	5	V
<i>Festuca heterophylla</i> Lam.	2.2	1.2	2.2	-	-	1.2	4	IV
<i>Hieracium sylvaticum</i> (L.) L.	-	-	+	+	2.2	-	3	III
<i>Ajuga reptans</i> L.	-	+	-	+	+2	-	3	III
<i>Astragalus glycyphyllos</i> L.	+	+2	-	-	-	-	2	II
<i>Trifolium medium</i> L.	-	2.3	-	-	1.2	-	2	II
<i>Cruciata glabra</i> (L.) Ehrend.	-	1.1	-	-	+2	-	2	III
<i>Scrophularia nodosa</i> L.	-	+	-	-	-	+	2	II
<i>Agrostis tenuis</i> Sibith.	-	-	+	-	-	1.2	2	II
<i>Knautia drymeia</i> Heuffel	-	-	-	+	-	-	1	I
<i>Asarum europaeum</i> L.	-	+2	-	-	-	-	1	II
<i>Hieracium racemosum</i> W. et K.	-	1.1	-	-	-	-	1	I
<i>Lathyrus montanus</i> Bernh.	-	-	-	-	2.2	-	1	I
Dif. and char. sp. <i>Origanetalia</i> and <i>Trifolio-Geranietaea</i>								
<i>Rubus idaeus</i> L.	-	2.2	1.2	+	-	1.2	4	IV
<i>Clinopodium vulgare</i> L.	-	+2	-	-	1.2	-	2	II
<i>Helleborus foetidus</i> L.	+	-	-	-	1.2	-	2	II
<i>Galium album</i> Miller	-	2.2	+2	-	-	-	2	II
<i>Prenanthes purpurea</i> L.	-	-	-	1.1	-	+	2	II
<i>Veronica urticifolia</i> Jacq.	-	-	-	2.3	-	+	2	II
<i>Sesleria autumnalis</i> (Scop.) Schultz	+	-	-	-	-	-	1	I
<i>Vincetoxicum hirsutinaria</i> Medicus	+2	-	-	-	-	-	1	I
<i>Teucrium scorodonia</i> L.	+	-	-	-	-	-	1	I
<i>Hypericum montanum</i> L.	+	-	-	-	-	-	1	I
<i>Silene italica</i> (L.) Pers.	-	+	-	-	-	-	1	I
<i>Viola alba</i> Besser subsp. <i>dehnhardtii</i> (Ten.) W. Becker	-	-	-	-	+2	-	1	I
<i>Phyteuma scorzonifolium</i> Vill.	-	-	-	-	-	+	1	I
Other sp.								
<i>Fragaria vesca</i> L.	2.2	2.3	+	2.3	2.3	+2	6	V
<i>Euphorbia dulcis</i> L.	1.1	1.1	1.1	1.1	-	+2	5	V
<i>Campanula trachelium</i> L.	+	+	+	-	1.1	-	4	IV
<i>Geranium robertianum</i> L.	1.2	+	+	+	-	-	4	IV
<i>Primula vulgaris</i> Hudson	-	+	+	+	1.2	-	4	IV
<i>Dactylis glomerata</i> L.	-	1.1	1.1	-	+	2.2	4	IV
<i>Fagus sylvatica</i> L. pl.	-	1.1	-	+	1.2	-	3	III
<i>Mycelis muralis</i> (L.) Dumort.	1.1	-	-	+	+	-	3	III
<i>Avenella flexuosa</i> (L.) Parl.	+2	2.2	-	-	-	-	2	II
<i>Dryopteris filix-mas</i> (L.) Schott	+	-	-	1.2	-	-	2	II
<i>Salvia glutinosa</i> L.	+	-	-	-	-	+2	2	II
<i>Erica carnea</i> L.	+2	-	-	-	-	1.2	2	II
<i>Daphne mezereum</i> L.	-	+	+2	-	-	-	2	II
<i>Aegopodium podagraria</i> L.	-	+	+	-	-	-	2	II
<i>Laburnum alpinum</i> (Miller) Berchtold et Presl pl.	-	+	-	+	-	-	2	II
<i>Sorbus aucuparia</i> L. pl.	-	+	-	1.1	-	-	2	II
<i>Crataegus monogyna</i> Jacq.	-	-	+	-	+	-	2	II
<i>Vaccinium myrtillus</i> L.	-	-	-	+	-	1.2	2	II
<i>Poa nemoralis</i> L.	-	-	-	-	1.2	1.2	2	II
Occasional sp.	11	2	8	6	6	6		

Tab. 3 - *Helleboro odori-Geranium nodosi* ass. nova (rel. typus n. 17)

Rel. N.	11	17*	14	13	12	19		
Alt. (m a.s.l.)	470	710	820	730	500	180		
Exp.	NNE	W	S	W	W	NNE		
Incl. (°)	20	20	20	30	40	15	Pres.	Freq. class
Cov. %	100	100	100	98	100	90		
Rel. Area (smq)	40	40	40	45	40	40		
Dif. and char. sp. <i>Helleboro odori-Geranium nodosi</i>								
<i>Digitalis lutea</i> L.	1.1	1.2	2.2	1.2	2.2	+	6	V
<i>Geranium nodosum</i> L.	+2	2.2	1.2	2.3	+	3.3	6	V
<i>Viola alba</i> Besser subsp. <i>dehnhardtii</i> (Ten.) W. Becker	+	+	1.2	+	2.2	-	5	V
<i>Helleborus foetidus</i> L.	+2	+2	1.2	+	1.1	-	5	V
<i>Helleborus odorus</i> W. et K.	1.1	+	-	+	+2	2.2	5	V
<i>Vicia incana</i> Gouan	+	1.2	1.2	+	+	-	5	V
Dif. and char. sp. <i>Trifolium medii</i>								
<i>Cruciata glabra</i> (L.) Ehrend.	1.2	-	+	+	-	+	4	IV
<i>Festuca heterophylla</i> Lam.	2.2	2.2	-	1.2	-	3.3	4	IV
<i>Viola reichenbachiana</i> Jordan ex Boreau	2.2	-	-	1.2	1.2	1.2	4	IV
<i>Astragalus glycyphyllos</i> L.	-	+	-	-	+2	-	2	II
<i>Trifolium medium</i> L.	-	-	1.2	+2	-	-	2	II
<i>Prunella vulgaris</i> L.	1.2	-	-	-	-	-	1	I
<i>Hieracium sylvaticum</i> (L.) L.	-	2.2	-	-	-	-	1	I
<i>Ajuga reptans</i> L.	-	+2	-	-	-	-	1	I
<i>Hieracium racemosum</i> W. et K.	-	-	-	2.2	-	-	1	I
<i>Lathyrus montanus</i> Bernh.	-	-	-	+2	-	-	1	I
<i>Potentilla erecta</i> (L.) Rauschel	-	-	-	+	-	-	1	I
<i>Salvia glutinosa</i> L.	-	-	-	+	-	-	1	I
Dif. and char. sp. <i>Origanetalia</i> and <i>Trifolio-Geranieta</i>								
<i>Galium album</i> Miller	1.2	1.2	+	+	1.2	-	5	V
<i>Clinopodium vulgare</i> L.	3.3	2.2	3.3	1.2	-	-	4	IV
<i>Hypericum montanum</i> L.	2.2	2.2	2.2	+	-	-	4	IV
<i>Inula conyza</i> DC.	-	+	1.2	-	+	-	3	III
<i>Centaurea nigrescens</i> Willd.	+	+	+	-	-	-	3	III
<i>Silene italica</i> (L.) Pers.	1.1	-	-	+	1.1	-	3	III
<i>Sesleria autumnalis</i> (Scop.) Schultz	-	-	1.2	1.2	3.3	-	3	III
<i>Brachypodium sylvaticum</i> (Hudson) Beauv.	1.2	+2	-	1.2	-	-	3	III
<i>Thalictrum aquilegifolium</i> L.	-	+	-	-	+	-	2	II
<i>Euphorbia cyparissias</i> L.	+2	-	-	-	-	-	1	I
<i>Campanula rapunculus</i> L.	+	-	-	-	-	-	1	I
<i>Coronilla varia</i> L.	2.2	-	-	-	-	-	1	I
<i>Digitalis ferruginea</i> L.	2.2	-	-	-	-	-	1	I
<i>Stachys recta</i> L.	+	-	-	-	-	-	1	I
<i>Lathyrus pratensis</i> L.	+	-	-	-	-	-	1	I
<i>Helianthemum nummularium</i> (L.) Miller	-	-	1.2	-	-	-	1	I
<i>Luzula albida</i> (Hoffm.) Lam. et DC.	-	-	-	2.2	-	-	1	I
<i>Epilobium montanum</i> L.	-	-	-	+	-	-	1	I
<i>Stachys officinalis</i> (L.) Trevisan	-	-	-	+2	-	-	1	I
<i>Lilium bulbiferum</i> L. subsp. <i>croceum</i> (Chaix) Baker	-	-	-	-	+	-	1	I
<i>Peucedanum oreoselinum</i> (L.) Moench	-	-	-	-	+	-	1	I
Other sp.								
<i>Fragaria vesca</i> L.	2.3	2.2	1.2	1.2	2.2	1.2	6	V
<i>Campanula trachelium</i> L.	-	1.1	1.2	+	1.2	+	5	V
<i>Dactylis glomerata</i> L.	+	-	1.1	1.1	1.2	+	5	V
<i>Primula vulgaris</i> Hudson	2.2	1.1	-	+	+	+	5	V
<i>Clematis vitalba</i> L.	1.2	-	1.2	+2	+2	-	4	IV
<i>Euphorbia dulcis</i> L.	+	-	+2	+	-	1.2	4	IV
<i>Brachypodium rupestre</i> (Host) R. et S.	-	+	+2	+2	+	-	4	IV
<i>Tussilago farfara</i> L.	-	+2	+2	+	+	-	4	IV
<i>Mycelis muralis</i> (L.) Dumort.	-	+	-	-	+	+	3	III
<i>Geranium robertianum</i> L.	+	-	-	+	+	-	3	III
<i>Silene vulgaris</i> (Moench) Garcke	+2	+	+	-	-	-	3	III
<i>Fraxinus ornus</i> L. pl.	+	+	-	-	1.2	-	3	III
<i>Geum urbanum</i> L.	+	+	-	-	-	+	3	III
<i>Hedera helix</i> L.	1.2	-	-	+	-	1.2	3	III
<i>Coronilla emerus</i> L.	-	1.2	+	-	1.2	-	3	II
Occasional sp.	13	14	9	6	12	10		

Tab. 4 – Comparison between the real (BS) and weighed (RBS) biological diagrams of the described associations indicated with the number of the corresponding phytosociological table

BS %	Tab 1	Tab 2	Tab 3
Ch	7	6	4
G	12	12	13
H	71	71	76
P	11	12	7

RBS %	Tab 1	Tab 2	Tab 3
Ch	6	0	0
G	3	40	15
H	89	55	81
P	2	4	3

biological spectra (Tab. 4), a clear predominance of hemicryptophytic species (mainly scapose and cespitose) can be seen, as would be expected for forest-edge vegetation in a temperate bioclimate. Of interest, there is a reasonable percentage of geophytes (clear from the actual biological spectrum) of the *Gentiano asclepiadeae-Geranium nodosi* association, which develops at greater altitudes with respect to the others and in fresh and humid environments of the Padana slopes of the Liguria Apennines.

The chorological spectra (Fig. 3) corresponding to the three phytosociological tables reveal the predominance of the Eurasiatic element, and of particular interest, show the presence of the Atlantic and Western European species, which clearly reveal the

influence of the elements with a western distribution in these associations, and mainly of the *Phyteumo scorzonerifoliae-Teucrietum scorodoniae* association. This association is spread over the Tyrrhenian slopes of the Apennines and for this reason there is a greater presence of the Euromediterranean element in its chorological spectrum, with respect to the other two associations (which are situated at higher altitudes or found on the Padana slopes), where, in contrast, there is a greater percentage of Boreal species. Finally, the chorological spectrum relative to the *Gentiano asclepiadeae-Geranium nodosi* association shows a reasonable percentage of European orophyte species, as it is a high-mountain association.

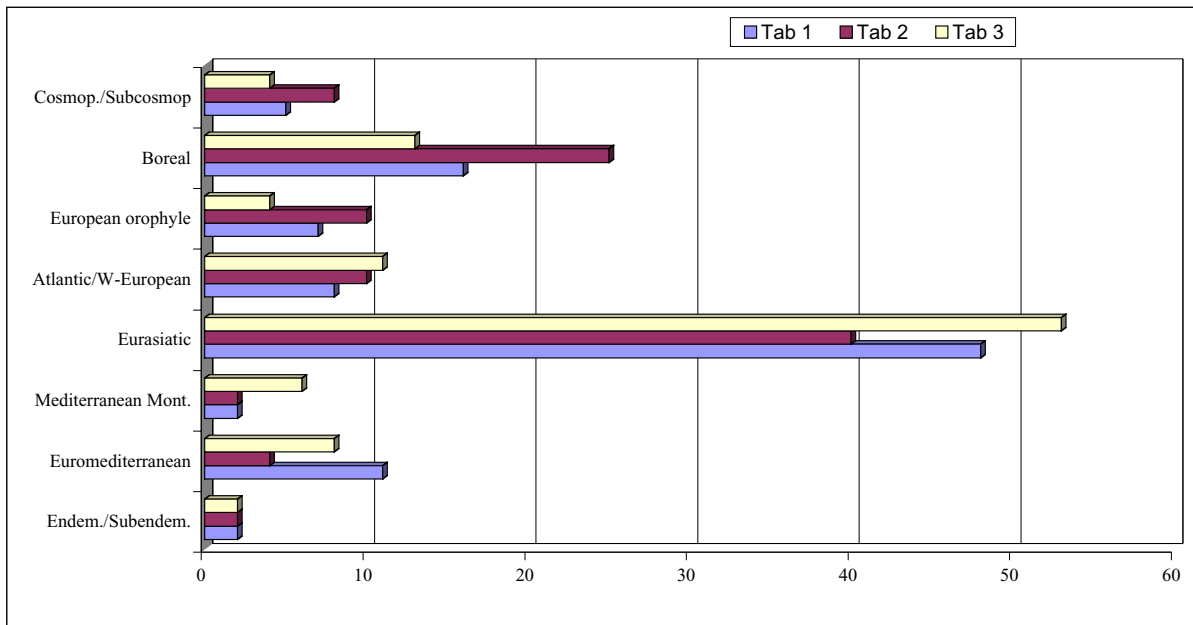


Fig. 3 - Comparison among the chorological diagrams of the described associations indicated with the number of the corresponding phytosociological table

Syntaxonomical list

- TRIFOLIO MEDII-GERANIETEA SANGUINEI Müller 1962
 +. *ORIGANETALIA VULGARIS* Müller 1962
 * *Trifolium medii* Müller 1962
Phyteumo scorzonerifoliae-Teucrietum scorodoniae ass. nova
luzuletosum albidae subass. nova
violetosum riviniana subass. nova
Gentiano asclepiadeae-Geranium nodosi ass. nova
Helleboro odori-Geranium nodosi ass. nova

Sintaxa quoted in the text and not present in the syntaxonomical list

- Calluno-Sarothamnetum scoparii* Malc. 1929 em. Oberd. 1957
Cardamino heptaphyllae-Fagetum Oberd. 1967 = *Trochiscantho-Fagetum* Gentile (1973) 1974
Digitalidi micranthae-Helleboretum bocconei Biondi, Carni, Vagge, Taffetani & Ballelli 2001
Erico-Genistetum pilosae Oberd. & Hofmann 1967
Luzulo pedemontanae-Fagetum Oberd. & Hofmann 1967
Physpermo-Quercetum petraeae Oberd. & Hofmann 1967

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Appendix

Localities, date and sporadic species

Tab. 1

Rel. 27, 28, 29, 30: Serra Mount (Monti Pisani PI) 02/09/1999; rel. 24: Bargone (GE) 29/06/2001, rel. 25: road from passo del Bocco di Tregin to Vara Valley 29/06/2001, rel. 44: Campo Ligure (AL) 23/05/2003, rel. 4: Berceto (near Santo Lake) 26/07/2000, rel. 6: road for Pontremoli from Passo della Cisa (Pracchiale) 26/07/2000, rel. 1: Berceto (BoscoLagadei) 25/07/2000 rel. 43: Casale di Ricco' del Golfo (SP) 29/06/2003, rel. 46, 47: Neirone (Chiavari - GE) 25/06/2004, rel. 45: Praglia (GE) 07/07/2003, rel. 48: Parco Capanne Marcarolo (Martiri Benedicte - AL) 17/07/2004 rel. 22: Passo Camilla near Carmone Mount, 28/06/2001, rel. 23: Né (GE) 28/06/2001, rel. 20: Botasi (Né GE) 28/06/2001, rel. 21: before Botasi near Rocchette (GE) 28/06/2001.

Rel. 29: *Cytisus scoparius* (L.) Link +; rel. 25: *Sedum rupestre* L. +, *Crepis leontodontoides* All. +; rel. 47: *Eupatorium cannabinum* L. 1.2; rel. 27: *Cephalanthera damasonium* (Miller) Druce +, *Potentilla micrantha* Ramond +; rel. 30: *Erica scoparia* L. +, *Ulex europaeus* L. +, *Helichrysum italicum* (Roth) Don +; rel. 44: *Polygonatum multiflorum* (L.) All. +.2, *Melica uniflora* Retz. 1.2, *Dryopteris filix-mas* (L.) Schott +, *Rheicardia picroides* +, *Campanula persicifolia* +; rel. 4: *Lotus corniculatus* L. *sensu stricto* +, *Daucus carota* L. +, *Sanguisorba minor* Scop. +, *Rosa canina* L. *sensu* Bouleng. +, *Crataegus monogyna* Jacq. +, *Abies alba* Miller pl. +, *Tussilago farfara* L. +; rel. 6: *Dianthus balbisii* Ser. +.2, *Lotus corniculatus* L. *sensu stricto* 1.1, *Daucus carota* L. +, *Betula pendula* Roth pl. +, *Quercus cerris* L. pl. +, *Arabis collina* Ten. +, *Salix caprea* L. pl. +, *Sedum rupestre* L. +, *Crepis leontodontoides* All. 1.1, *Dianthus balbisii* Ser. +.2; rel. 1: *Rubus idaeus* L. 2.2, *Pyrus pyraeaster* Burgsd. +, *Rumex acetosella* L. +, *Saxifraga rotundifolia* L. +, *Daphne mezereum* L. +, *Melica uniflora* Retz. 2.2; rel. 43: *Circaea lutetiana* L. +, *Silene alba* (Miller) Krause +, *Galium rotundifolium* L. 1.2, *Euphorbia amygdaloides* L. 2.2; rel. 46: *Galeopsis tetrahit* L. +, rel. 45: *Cytisus scoparius* (L.) Link +; *Senecio fuchsii* Gmelin +, *Dianthus balbisii* Ser. +.2, *Polygonatum multiflorum* (L.) All. 1.2, *Brachypodium genuense* 2.2; rel. 48: *Mycelis muralis* (L.) Dumort. 1.1, *Holcus mollis* L. 1.2,

Acer pseudoplatanus L. (pl.) +, *Anthoxanthum odoratum* L. +, *Potentilla reptans* L. +, *Sorbus torminalis* (L.) Crantz +, *Dianthus balbisii* Ser. +, *Tussilago farfara* L. +, *Eupatorium cannabinum* L. 1.2; rel. 22: *Senecio fuchsii* Gmelin +, rel. 23: *Plantago lanceolata* L. (+), rel. 20: *Epipactis atropurpurea* Rafin. +, *Saxifraga cuneifolia* L. +.2; rel. 21: *Neottia nidus-avis* (L.) L. C. Rich. +.

Tab. 2

Rel. 26: road from Maissana to Tavarone (Vara Valley SP) 29/06/2001, rel. 15: passo del Chiodo (near. Penna Mount) 27/07/2000, rel. 10: passo della Cisa 26/07/2000, rel. 5: Berceto (Cancelli – Santo Lake) 26/07/2000, rel. 16: near Passo del Tomarolo 27/07/2000, rel. 31: Melanotte (Borzonasca - GE) 24/08/1993.

Rel. 26: *Luzula albida* (Hoffm.) Lam. et DC. +.2, *Acer campestre* L. pl. +, *Cornus sanguinea* L. +, *Arabis turrata* L. +, *Anemone trifolia* L. +, *Holcus lanatus* L. +, *Peucedanum cervaria* (L.) Lepeyr. +, *Moehringia muscosa* L. 1.2, *Vicia incana* Gouan +, *Tamus communis* L. +, *Silene vulgaris* (Moench) Garcke +.2; rel. 15: *Saxifraga rotundifolia* L. 1.2, *Viola odorata* L. +, rel. 10: *Solidago virgaurea* L. +, *Brachypodium rupestre* (Host) R. et S. +.2, *Corylus avellana* L. pl. +, *Melica uniflora* Retz. 1.2, *Acer pseudoplatanus* L. pl. +, *Polygonatum multiflorum* (L.) All. +, *Pulmonaria vallisarsae* Kerner 1.2, *Cirsium erisithales* (Jacq.) Scop. +; rel. 5: *Polygonatum verticillatum* (L.) All. 1.2, *Anemone nemorosa* L. +, *Oxalis acetosella* L. 1.2, *Abies alba* Miller pl. 1.1, *Epipactis helleborine* (L.) Crantz +, *Dactylorhiza maculata* (L.) Soó +; rel. 16: *Salix caprea* L. pl. 1.1, *Veronica chamaedrys* L. +.2, *Ranunculus lanuginosus* L. +, *Genista germanica* L. +, *Rosa canina* L. sensu Bouleng. +, *Genista pilosa* L. +.2; rel. 31: *Athyrium filix-foemina* (L.) Roth 2.2, *Petasites albus* (L.) Gaertn. 2.2, *Festuca arundinacea* Schreber +.2, *Eupatorium cannabinum* L. +, *Sambucus racemosa* L. +, *Physospermum cornubiense* (L.) DC. +.

Tab. 3

Rel. 11: on the way to Borgo Val di Taro (Luzzolo) 27/07/2000; rel. 17: before Ponte Ceno, 27/07/2000; rel. 14: Alpe 27/07/2000; rel. 13: on the way to Penna Mount 27/07/2000; rel. 12: on the way to Borgo Val di Taro 27/07/2000; rel. 19: boschi di Carrega (Sala Baganza) 27/07/2000.

Rel. 11: *Ligustrum vulgare* L. +, *Arabis collina* Ten. +, *Plantago media* L. +, *Scabiosa maritima* L. +, *Chaerophyllum temulum* L. +, *Daucus carota* L. +, *Cornus sanguinea* L. 1.2, *Sanguisorba minor* Scop. +, *Achillea millefolium* L. s.s. +, *Teucrium chamaedrys* L. +, *Acer campestre* L. pl. 1.1, *Hepatica nobilis* Miller 1.2, *Prunus spinosa* L. +; rel. 17: *Laburnum anagyroides* Medicus pl. +, *Ostrya carpinifolia* Scop. pl. +, *Aegopodium podagraria* L. +, *Carpinus betulus* L. pl. +, *Euphorbia amygdaloides* L. +, *Vinca minor* L. +.2, *Epipactis helleborine* (L.) Crantz +, *Corylus avellana* L. pl. +, *Cornus sanguinea* L. +.2, *Arabis turrata* L. +, *Solidago virgaurea* L. 1.2, *Tamus communis* L. +, *Hepatica nobilis* Miller +, *Fagus sylvatica* L. pl. +; rel. 14: *Daphne laureola* L. +.2, *Bromus erectus* Hudson 1.2, *Prunus avium* L. +, *Rubus ulmifolius* Schott +.2, *Sanguisorba minor* Scop. +, *Achillea millefolium* L. s.s. +, *Teucrium chamaedrys* L. 2.2, *Acer campestre* L. pl. +, *Pteridium aquilinum* (L.) Kuhn +; rel. 13: *Genista germanica* L. 2.2, *Castanea sativa* Miller pl. 1.1, *Epipactis helleborine* (L.) Crantz +, *Corylus avellana* L. pl. +, *Salix caprea* L. pl. +; rel. 12: *Calamintha nepeta* (L.) Savi 2.3, *Poa trivialis* L. +, *Aremonia agrimonoides* (L.) DC. +, *Rhamnus catharticus* L. 1.2, *Scabiosa maritima* L. +, *Chaerophyllum temulum* L. +, *Daucus carota* L. +, *Melittis melissophyllum* L. +, *Arabis turrata* L. +.2, *Solidago virgaurea* L. +, *Melica uniflora* Retz. +, *Eupatorium cannabinum* L. +, rel. 19: *Lathyrus venetus* (Miller) Wohlf. 1.2, *Lathyrus niger* (L.) Bernh. +, *Polygonatum multiflorum* (L.) All. +.2, *Circaea lutetiana* L. +, *Eupatorium cannabinum* L. +, *Vinca minor* L. 1.2, *Castanea sativa* Miller pl. +, *Melittis melissophyllum* L. +, *Tamus communis* L. +, *Melica uniflora* Retz. 1.2, *Asarum europaeum* L. 1.2.