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Ageobotanical survey on acidophilous grasslands in the Abruzzo, Lazio and Molise National Park (Central Italy)

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Abstract: Di Pietro, R., De Santis, A. & Fortini, P. A*geobotanical survey on acidophilous grasslands in the Abruzzo, Lazio and Molise National Park (Central Italy). Lazaroa 26: 115-137 (2005).*

The acidophilous grasslands of the south-eastern part of the Abruzzo, Lazio and Molise National Park was studied by the phytosociological method and analyzed from a synecological viewpoint with the help of soil analysis. Four clusters of relevés resulted from the numerical classification. Syntaxonomically they were ascribed to the following associations: *Poo violaceae-Nardetum strictae, Potentillo rigoanae-Festucetum paniculatae, Nardo strictae-Brachypodietum genuensis* and *Potentillo rigoanae-Brachypodietum genuensis*. Since the original proposal of all the syntaxa identified in the present study were affected by nomenclatural mistakes, they were corrected in accordance with the rules of ICPN. The occurrence of *Anthoxanto-Brachypodietum* in central Apennines, is excluded since this association falls in syntaxonomical synonymy with *Potentillo-Brachypodietum*. The synecological analysis proved that the distribution of the different communities identified within the study area to be correlated with topographic, geomorphological and soil factors. Among these latter, the ratio H+/basic cations, pH behave as the most influencing parameters in the distribution of the communities identified.

Resumen: Di Pietro, R., De Santis, A. & Fortini, P. *Estudio geobotánico de los pastizales acidófilos de las provincias de Abruzzo, Lazio y el Parque Nacional del Molise. Lazaroa 26: 115-137 (2005).*

Los pastizales que se desarrollan sobre sustratos ácidos del sector suroriental del Parque Nacional del Lazio, Abruzzo y Molise han sido estudiados utilizando el metodo fitosociológico y sinecológico. La clasificación de los inventarios muestra cuatro grupos principales encuadrados en las siguientes asociaciones: *Poo violaceae-Nardetum strictae, Potentillo rigoanae-Festucetum paniculatae, Nardo strictae-Brachypodietum genuensis* e *Potentillo rigoanae-Brachypodietum genuensis*. Estos sintaxones presentan problemas de tipo nomenclatural, por este motivo se propone la nomenclatura correcta en base al ICPN. Se excluyen las referencias al *Anthoxantho-Brachypodietum,* considerado como sinónimo sintaxonómico del *Potentillo-Brachypodietum.* El estudio sinecológico demuestra que la distribución territorial de las comunidades estudiadas está relacionada con factores topograficos, geomorfológicos y, en mayor medida, edáficos. Entre estos últimos, el pH y la relación hidrogeniones (H^{+})/cationes básicos parecen ser los mas discriminantes.

INTRODUCTION

Among phytosociological studies on the Apennines, several concern the vegetation of the National Park of Abruzzo, Lazio and Molise (BAZZICHELLI & FURNARI, 1961, 1970; BRUNO & FURNARI, 1966; BRUNO & BAZZICHELLI, 1966). Still, there are some sectors of this area which have received minor attention, with only a small number of phytosociological studies often confined to very restricted areas (PIGNATTI, 1977; PETRICCIONE, 1985; PIRONE, 1997; DI PIETRO & *al*., 2004).

The present paper aims at providing a phytosociological and syntaxonomical classification of the acidophilous pastures of Mount Greco (2285 m a.s.l.), which are pertinent to beech woodlands series of vegetation, pointing out the main physical criteria influencing the spatial distribution of the various communities identified. Of particular interest are the grasslands dominated by *Festuca paniculata* subsp. *paniculata* a species considered very rare in the Apennines up to 20 years ago and which is now rapidly re-colonizing large areas as a consequence of extensive-grazing abandonment.

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Figura 1.—Study area.

The distributional and coenological features of *Festuca paniculata* are quite interesting. This species exhibits various disconnected centers of distribution ranging between Portugal to Bulgaria and up to North Africa, and in western Himalaya through. *Festuca paniculata* is divided into three subspecies: *Festuca paniculata* subsp. *paniculata* is spread from the Pyrenees to the French Central Massif, the Alps, the Apennines, the Balkans and western Himalaya; *F. paniculata* subsp. *spadicea* (L.) Litard grows from western Portugal to the Pyrenees and the French Central Massif; *F. paniculata* subsp. *baetica* (Hackel) Markgr.-Dannenb. is to be found in southern Spain and also in Algeria and in Tunisia (FIORI, 1923-29; TUTIN, 1964-80; HARTL, 1983; MEUSEL & *al*., 1965). In Italy *Festuca paniculata* subsp. *paniculata* communities -always rather localized- are to be found both on the Alps (MONDINO, 1965; BARBERO, 1970; BRAUN-BLANQUET, 1972; LACOSTE, 1975; BERBERIS & *al*., 1987; LASEN, 1995; POLDINI & ORIOLO, 1997; SBURLINO & *al*., 1996, 1999) and the Apennines, where populations of limited extension are reported in the Tuscan-Emilian sector (BARBERO & BONIN, 1980; ROSSI, 1994; TOMASELLI & *al*., 1996, 1997, 1999), on the Central Apennines and on Vulturino, Sila and Aspromonte in the Southern Apennines (CORBETTA & *al*., 1984; GIACOMINI & GENTILE, 1961; BRULLO & *al*., 2001). In central Apennines *Festuca paniculata* exhibits a scattered distribution although it is locally abundant in mountainous areas such as Laga Mountains, Reatini Mountains and Mount Greco where it may cover relatively large zones (BONIN, 1978; PEDROTTI, 1981; GIGLI & *al*., 1991; PIRONE & TAMMARO, 1995; PIRONE, 1997).

STUDY AREA

The object of this study are two limestone ranges running in a north-south orientation (Serra Sparvera-M.te Curio-Serra Santa Maria; Serra del Feudo-Pratello) and the valley that runs between them (Valle Chiarano), located in the external protection area in the eastern sector of the Abruzzo, Lazio and Molise National Park (Fig.1). Geologically, this area belongs to the «facies marsicana di transizione» due to the alternation of coarse deposits - which can be traced back to a situation of cliff - and micritic-pelagic deposits of «Maiolica» and «Scaglia» (COLACICCHI, 1964, 1967). From a geomorphological point of view the study area appears to have been subject to glacial processes evident - especially in the Valle Chiarano- from lateral and frontal moraines, glacial erosion escarpments, drumlins etc. (DAMIANI & PANNUZI, 1991; GIRAUDI, 1998).

The vegetation relevés were carried out between 1500 and 1900 m a.s.l., a bioclimatic area which is to be included in the cold axeric region and temperate subregion (BLASI, 1994), with montane thermotype and humid ombrotype. The average annual temperature ranges between 6 and 7,5°C while rainfalls are between 1100 and 1200 mm/yr.

DATA AND METHODS

The phytosociological relevés were collected in the summers of 2000 and 2001 using the phytosociological method of the Zurich-Montpellier school (BRAUN-BLANQUET, 1928). The matrix of 44 relevés for 140 species was transformed in accordance with

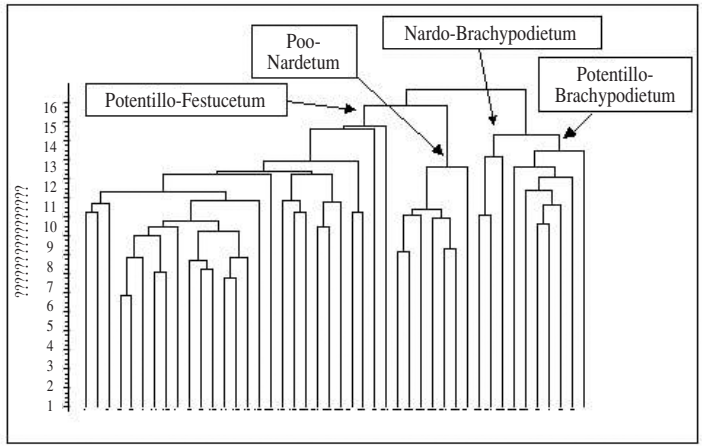

Figura 2.—Cluster analysis.

Table 1.— Chorotypes and life forms spectra calculated from simple presence, frequency and cover values of the species in the phyto-sociological tables.

	Poo-Nardetum	Potentillo-Festucetum	Nardo-Brachypodietum	Potentillo-Brachypodietum	Poo-Nardetum	Potentillo-Festucetum	Nardo-Brachypodietum	Potentillo-Brachypodietum	Poo-Nardetum	Potentillo-Festucetum	Nardo-Brachypodietum	Potentillo-Brachypodietum
Chorotypes	Presence %				Frequency %				Cover %			
Amphiadriatic	0,7	3,9	5,1	4,3	2,1	2,7	3,8	4,5	0,3	0,6	1,4	0,8
Subatlantic	0,7	1,2	4,1	3,6	2,1	2,7	3,8	2,2	0,1	0,1	0,6	1,4
Boreal	27,3	18,3	18,6	8,6	20,8	15,5	17,3	10,1	50,4	6,4	11,7	3,1
Central-Europ.	0,7	3,7	2,1	6,1	2,1	3,6	1,9	3,4	0,1	2,4	0,3	2,4
Endemic	12,2	14,6	11,3	16,8	12,5	13,6	9,6	13,5	6,4	13,7	60,2	59,2
Eurasiatic	13,7	16,7	19,6	13,2	8,3	13,6	15,4	14,6	3,4	5,7	11,9	8,7
Euri-Medit.	3,6	4,2	5,1	10,7	6,2	4,5	5,8	6,7	0,5	0,8	1,4	6,9
Europ-Caucas.	5,8	6,3	5,1	7,9	6,2	6,4	3,8	6,7	0,7	1,2	2,6	7,6
Medit.-Mont.	7,9	8,4	8,2	7,9	10,4	9,1	11,5	11,2	0,7	64,1	1,8	2,7
SE-Europ. oroph.	21,6	16,9	15,5	15,4	22,9	16,4	19,2	18	35,5	3,7	6	5,9
SE-European	5,8	5,4	5,2	3,6	6,2	10	7,6	6,7	1,9	1,1	2	0,7
Subcosmop.	0	0,5	0	2,1	0	1,8	0	2,2	0	0,1	0	0,6
Life forms	Presence %				Frequency %				Cover %			
Chamaephytes	1,4	4	1	8,2	4,2	8,2	1,9	11,2	0,1	5	0,1	7,2
Geophytes	1,4	2,6	4,1	5	4,2	5,5	3,8	5,6	0,1	0,4	0,6	2,2
H bienn	0,7	0,9	2,1	0,4	2,1	0,9	1,9	1,1	0,1	0,1	0,9	0,1
H caesp.	43,2	34,7	32	30,7	29,2	20	28,8	24,7	84,7	75,9	77,5	70,9
H rep.	0,7	0,2	0	0	2,1	0,9	0	0	0,3	0	0	0
H ros.	7,9	11,5	15,5	13,2	12,5	14,5	17,3	10,1	1,2	1,7	3,5	4,9
H scap.	43,2	44,3	43,3	38,9	43,7	46,4	44,2	41,6	13,4	15,9	17	14,1
Phanerophytes	0	0,2	0	0	0	0,9	0	0	0	0,1	0	0
Therophytes	1,4	1,7	2,1	3,6	2,1	2,7	1,9	5,6	0,1	0,9	0,3	0,6

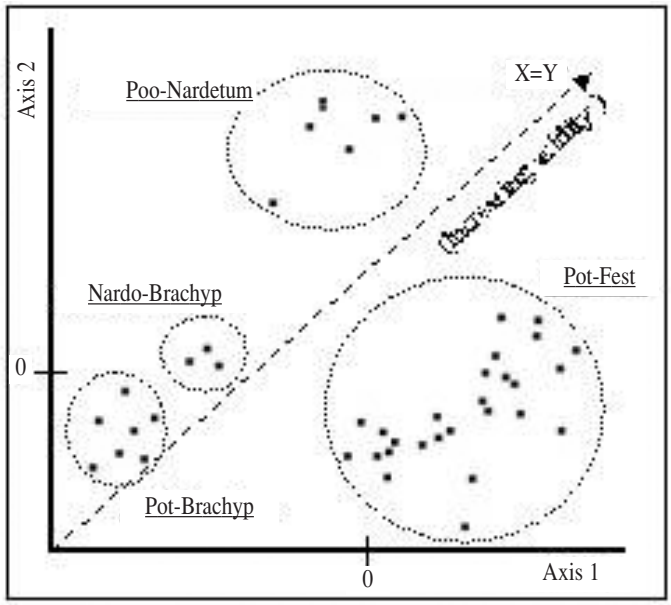

Figura 3.—Ordination diagram (PCoA).

VAN DER MAAREL (1979), and subjected to multivariate analysis procedures (cluster analysis and ordination) using the Syntax 2000 package (PODANI, 2001). The species nomenclature follows CONTI (1998) while for life forms and chorotypes reference was made to PIGNATTI (1982 see Table 1). Each plant community identified was moreover subjected to soil survey according to SANESI (1977). Each soil sample was air-dried, powdered in a mortar and sieved with a 2 mm sieve. According to OSSERVATORIO NAZIONALE PEDOLOGICO methods (1994), the samples were then subjected to pH in H_2O; total carbonates; percentage of organic carbon; percentage of organic matter; total nitrogen; aivalable phosphorus; exchange acidity; analysis of exchangeable bases; particle-size analysis; assessment of soil water availability to plant communities (AWC) according to SALTER & WILLIAMS (1967-69). The soil samples were then identified to subgroup level with SOIL TAXONOMY (1998).

RESULTS

The dendrogram, obtained through chord distance and average linkage clustering, shows a relatively clear divisions between the communities dominated by *Festuca paniculata*, *Nardus stricta* and *Brachypodium genuense,* respectively (Fig. 2). The PCoA confirms the autonomy of the clusters emerged through classification, and ranges them along the first axis according to decreasing pH values (Fig. 3).

Poo violaceae-Nardetum strictae Pedrotti 1981 **festucetosum circummediterraneae** Biondi & al. 1999 (Table 4).

This grassland community does not occur frequently in the survey area, and is characteristic of flattish morphotypes, the bottom of dolines and slightly sloping drainage lines. The physiognomy is that of the typical central Apennines *Nardus* communities, which are characterized by marked floristic poorness and whose dominant species are *Nardus stricta* and, in the second place, *Bellardiochloa variegata* (*Poa violacea*). In the surveyed area are always present *Agrostis capillaris*, *Dianthus deltoides* and *Festuca rubra* subsp. *commutata*. On a strictly territorial scale this community lacks exclusive species, with the exception of *Erodium alpinum* which is occasionally to be found also in some aspects of *Festuca paniculata* grasslands. From a chorological point of view, the species with Boreal and Oroph. S-European chorotypes reach the highest percentages among the all the grassland types identified, while structurally the tufty Hemycryptophytes are -as expected- clearly dominant (Table 1).

Table 2.— Soil features spectrum of the grassland community types identified.

	cm	hor.	pH	CaCO3	org. mat. %	org. C %	N %	C/N	P avail.	Exch. Ac.	Exch. Cations meq/100g				C.E.C.	Base satur%	Texture					A.W.C.	Colour
									p.p.m. of P	meq/ 100g.	Ca	Mg	K	Na	Meq/ 100g.		Sand%			Sit %	Clay %	mm	
																	coarse	med.	fine				
profile 1																							
Poo - Nardetum	25	A	5,2	0	13	7,6	1,7	10,8	50	36,8	10,4	1,6	0,5	0,1	49,5	25,5	5	2,8	4,5	55,5	32,2		7,5 YR 4/4 brown
(Dystrudept humic;acid	35	B1	5,4	0	6,9	4	0,4	9,4	42,6	33,4	6	0,9	0,3	0,1	40,7	17,9	6,2	2,9	5,5	61,8	23,6		7,5 YR 4/4 brown
	70	B2	5,5	0	7,4	4,3	0,5	5,6	26	34,5	6,5	1,2	0,2	0,1	42	18,3	5,9	2,5	5,7	61,7	24,6		7,5 YR 4/3 brown
	50	B3	5,7	0	3,8	2,2	0,3	8,5	11	31,2	4,6	0,7	0,2	0,1	36,8	15,3	14,2	6,6	6,9	56,4	16	470	10 YR 6/4 d. y.orang.
profile 2																							
Poo - Nardetum	30	A	5,4	0	11,3	6,5	0,8	8,5	10,6	36,6	10,8	1,4	0,3	0,2	49,3	25,7	2,2	0,8	1,7	66,1	29,3		7,5 YR 4/4 brown
(Dystrudept humic;calcic	30	B1	6,1	0	6,3	3,7	0,6	6,6	14,8	25,8	23,2	1	0,2	0,1	50,3	48,6	1,7	0,9	2,1	67,5	27,7		7,5 YR 4/4 brown
brown soil)	25	B2	7,1	0	6,2	3,6	0,4	8,6	17,8	16,5	45,5	2,3	0,2	0,2	64,7	74,4	0,7	0,7	1,9	64,8	32	240	7,5 YR 4/3 brown
profile 3																							
Potentillo - Festucetum	20	A1	5,3	0	12	7	0,8	9,2	14,8	36,3	14,3	1,7	0,5	0,2	53,1	31,6	1,8	1	1,6	61,5	34,1		7,5 YR 4/4 brown
Euphorbia samnitica variant	40	B1	5,8	0	7,8	4,5	0,5	9,2	7	30,6	15,5	1	0,2	0,2	47,5	35,6	2,7	1,3	2,3	69,8	23,9		7,5 YR 4/4 brown
(humic Dystrudept ;calcic	15	B2	6	0	7,8	4,5	0,5	9,2	10	29,3	17,9	0,9	0,2	0,4	48,7	39,9	5	2,3	3,5	61	28,2	216	7,5 YR 4/3 brown
brown soil)																							
profile 4																							
Potentillo - Festucetum	25	A	5,6	0	14,4	8,38	0,7	12,7	5,2	31	21	3,8	0,4	0,2	56,4	45	8,7	3,3	4,7	48,1	35,1		7,5 YR 4/3 brown
Armeria canescens variant	35	B1	5,6	0	11,4	6,6	0,5	12,1	2	32	17,8	2,4	0,2	0,1	52,5	39,1	7,7	3,2	5	57	27		7,5 YR 4/3 brown
(humic Dystrudept;calcic	20	B2	5,6	0	10,8	6,3	0,5	11,8	5,2	35	17,1	2,3	0,2	0,2	55,1	36	7,1	2,8	5,8	62,1	22,2		7,5 YR 3/3 darkbrown
brown soil)	20	B/C	5,6	0	4,2	2,46	0,2	11,2	10	20,9	27,5	1,7	0,3	0,2	50,7	58,7	13,3	4,1	5,1	37,5	40	280	7,5 YR 4/2 grayish b.
profile 5																							
Potentillo - Festucetum	15	A	5,6	0	11,7	6,8	0,6	10,9	18,2	26,3	17,8	2,6	0,9	0,1	47,7	45	5,1	2,7	4,4	56,1	31,7		7,5 YR 4/4 brown
Satureja vulgaris variant	30	B1	5,7	0	6	3,5	0,4	9,1	3,4	27,6	8,6	1,3	0,3	0,1	37,9	27,2	4,7	2,1	5,2	71	17		7,5 YR 4/4 brown
(humic Dystrudept;calcic	20	B2	5,8	0	1,8	1	0,2	5,8	5	19,7	9,2	1,7	0,1	0,1	30,9	36,1	5,5	3,1	5,2	62,2	24	170	7,5 YR 4/4 brown
brown soil)																							
profile 6																							
Nardo - Brachypodietum	20	A	5,6	0	8	4,6	0,4	10,2	25,2	23,1	16,9	2,3	0,3	0,2	42,8	46,2	5,8	3,9	6,7	51	32,6		7,5 YR 4/4 brown
(humic Dystrudept;calcic	30	B1	5,7	0	2,9	1,7	0,3	5,9	24,2	20,8	16	2,3	0,1	0,1	39,3	47,2	9,1	6,4	7,5	59	18		7,5 YR 4/4 brown
brown soil)	30	B2	5,9	0	2	1,1	0,2	6,3	17	16,7	15,9	1,8	0,2	0,1	34,7	51,9	7,4	4,8	7,1	51,6	29	184	7,5 YR 4/4 brown
profile 7																							
Potentillo - Brachypodietum	30	A1	6,7	0	10,9	6,3	0,8	8	8,8	21,8	37,9	1,84	0,3	0,2	62,1	64,8	8	3	4,3	73,5	11,2		7,5 YR 3/4 darkbrown
(entic Hapludoll; brown rendzina)	25	A2	7	0	8,8	5,1	0,6	8,3	3,2	20	43,4	2,3	0,1	0,2	66	69,7	8	3,1	4,2	67,1	17,5	163	7,5 YR 3/3 darkbrown

Table 3
Synoptic table of all the Festuca paniculata communities described for the central Apennines.

	M. Greco	**M. Terminillo**	**Reatini mountains**	**Laga mountains**
Altitude (range)	1600-1850	1600-2000	1850-1950	2000-2250
Order N.	1	2	3	4
Characteristics:				
Festuca paniculata	V	IV	V	V
Trifolium pratense subsp. *semipurpureum*	III	IV	IV	II
Bellardiochloa variegata	III	I	IV	IV
Festuca rubra subsp. *commutata*	V	IV	V	IV
Hieracium pilosella (s.l.)	III	II	I	III
Luzula multiflora	I	IV	II	IV
Nardus stricta	V	II	V	V
Plantago atrata subsp. *fuscescens*	I	II	IV	I
Ranunculus sartorianus	II	IV	IV	III
Viola eugeniae subsp. *eugeniae*	I	IV	IV	IV
Dianthus deltoides	IV	II	III	.
Gentiana lutea	I	IV	V	.
Rumex nebroides	I	IV	II	.
Potentilla rigoana	V	V	.	V
Botrychium lunaria	I	.	I	II
Vaccinium myrtillus	.	II	IV	IV
Luzula italica	.	II	II	II
Agrostis capillaris	III	.	II	.
Luzula campestris	III	.	III	.
Rumex acetosella	I	.	II	.
Taraxacum apenninum	I	.	I	.
Veronica orsiniana	I	II	.	.
Phleum alpinum subsp. *rhaeticum*	.	I	II	.
Pedicularis tuberosa	.	.	I	V
Trifolium thalii	.	.	I	III
Coeloglossum viride	.	.	II	III
Ajuga tenorei	II	.	.	.
Hypericum richeri	.	.	.	V
Transgressive species from *Molino-Arrhenatheretea*:				
Lotus corniculatus	IV	IV	IV	V
Anthoxanthum odoratum	II	V	V	V
Trifolium repens	I	III	I	.
Achillea setacea	IV	II	.	.
Galium verum	V	II	.	.
Cruciata laevipes	II	III	.	.
Poa pratensis	I	I	.	.
Briza media	I	.	.	III
Rumex acetosa	IV	.	.	II
Bellis perennis	.	II	.	II
Plantago lanceolata	.	III	.	.
Transgressive species from *Festuco-Brometea:*				
Cerastium arvense	IV	IV	V	V
Asperula cynanchica	II	II	I	.
Carlina acaulis subsp. *caulescens*	II	.	II	V
Euphrasia stricta	I	.	IV	II
Thymus longicaulis	I	.	I	V
Trifolium montanum subsp. *rupestre*	I	.	II	II
Carex caryophyllea	.	I	I	III
Bromus erectus	I	I	.	.
Campanula glomerata	I	II	.	.
Dianthus sylvestris (s.l.)	I	I	.	.

Table 3 (Cont.)

	M. Greco	**M. Terminillo**	**Reatini mountains**	**Laga mountains**
Altitude (range)	1600-1850	1600-2000	1850-1950	2000-2250
Order N.	1	2	3	4
Festuca circummediterranea	III	III	.	.
Knautia purpurea	I	IV	.	.
Teucrium chamaedrys	I	I	.	.
Thymus praecox subsp. *polytrichus*	I	II	.	.
Trifolium ochroleucon	I	II	.	.
Carex macrolepis	I	.	I	.
Helianthemum nummularium (s.l.)	I	.	I	.
Leontodon hispidus	I	.	.	II
Narcissus poeticus	I	.	.	I
Achillea tenorii	II	.	.	.
Transgressive species from *Elyno-Seslerietea:*				
Polygala alpestris	I	IV	IV	II
Cynoglossum magellense	I	I	I	.
Satureja alpina	I	I	.	I
Helictotrichon praetutianum	II	I	.	I
Phyteuma orbiculare	I	.	V	V
Armeria canescens	II	.	I	I
Biscutella laevigata	I	.	I	II
Senecio scopolii	III	II	.	.
Carduus carlinifolius	II	.	II	.
Galium anisophyllon	II	.	.	V
Silene roemeri subsp. *staminea*	I	.	.	II
Potentilla crantzii	.	II	II	.
Pulsatilla alpina	.	I	I	.
Gentiana verna	.	II	.	III
Hieracium lactucella	.	II	.	II
Myosotis alpestris	.	II	.	III
Minuartia verna	.	.	II	I
Leucanthemum heterophyllum	.	.	V	.
Pedicularis verticillata	.	.	.	III
Carex kitaibeliana	.	.	.	III
other species:				
Brachypodium genuense	V	II	V	V
Poa alpina	I	IV	II	V
Campanula scheuchzeri	II	I	V	III
Cruciata laevipes	II	III	.	.
Campanula micrantha	I	I	.	.
Silene multicaulis	I	.	I	.
Persicaria bistorta	.	II	III	.
Ajuga reptans	.	II	.	III
Verbascum longifolium	III	.	.	.
Asphodelus macrocarpus	.	IV	.	.
Cruciata glabra	.	.	IV	.
Crocus vernus	.	.	.	III

The reference soils belong to the Inceptisols order, suborder Udepts, great group Dystrudepts, sub-group humic Dystrudepts (calcic and acid brown soils). These soils have a depth of over one meter and a low base content (base saturation= 25,7%) plus high acidity (pH=5,2-5,4) consequent to their extensive leaching. Available water content (AWC) is high: 200-400 mm (Table 2).

Potentillo rigoanae-Festucetum paniculatae Bonin 1978 *corr. hoc loco* (Table 5).

Festuca paniculata communities appear in the study area as widespread populations whose features are easily distinguishable from those of the surrounding grasslands. The dominant species is constantly accompanied by *Potentilla rigoana*, *Brachypodium*

genuense, *Galium verum*, *Festuca rubra* subsp. *commutata*, and often also by *Nardus stricta*. From a syntaxonomical point of view, these communities should be included in *Potentillo-Festucetum*. This association is developed in form of three variants, related to different micro-morphotypes. The variant with *Euphorbia gasparrini* subsp. *samnitica* (Table 5, Rel. 8-13) includes those stands located at the footslopes or in the depressions embedded in ancient morainal material. The variant with *Satureja vulgaris* subsp. *vulgaris* (Table 5; Rel. 1-7) is relative to pioneer stands of limited extension, located at the border of beech woods. The variant with *Armeria canescens* (Table 5; Rel. 14-23) is developed in form of xerophilous stands rich in species of dry grasslands (*Phleo-Bromion*) and it is found mainly on south-facing slopes or where the layer of topsoil is particularly thin. This last variant shows the exclusive presence of *Genista sagittalis*, a plant rarely found in the Central Apennines (CONTI, 1998). A fourth group of relevés (Table 5; Rel. 24-27) which is related to *F. paniculata* stands developed on natural terraces is recognizable for the absence of all those species indicated as differentials in the above variants. From a chorological point of view (Table 1) *F. paniculata* communities are mainly characterized by Boreal (18%), Oroph. S-European (17%), Eurasiatic (16%) and Endemic (14%) chorotypes. Structurally, Hemycryptophytes are absolutely dominant, and the occurrence of both Chamaephytes and Nanophanerophytes (the last ones represented only by a few scattered specimens of *Juniperus communis* subsp. *nana*) is extremely poor (Table 1).

The reference soils (Table 2) belong to the Inceptisols order, suborder Udepts, great group Dystrudepts, subgroup humic Dystrudepts (calcic brown soils). These soils are deep and well-developed, showing a high water availability (AWC= 170-280 mm), and acid pH (5,3-5,6) because many of the calcium ions have already been removed (Ca++ = 14-20 meq / 100 g; base saturation= 31-45%).

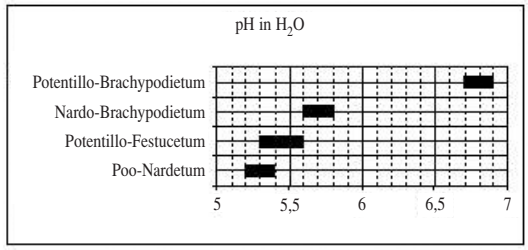

Figura 4.—pH values related to grassland types.

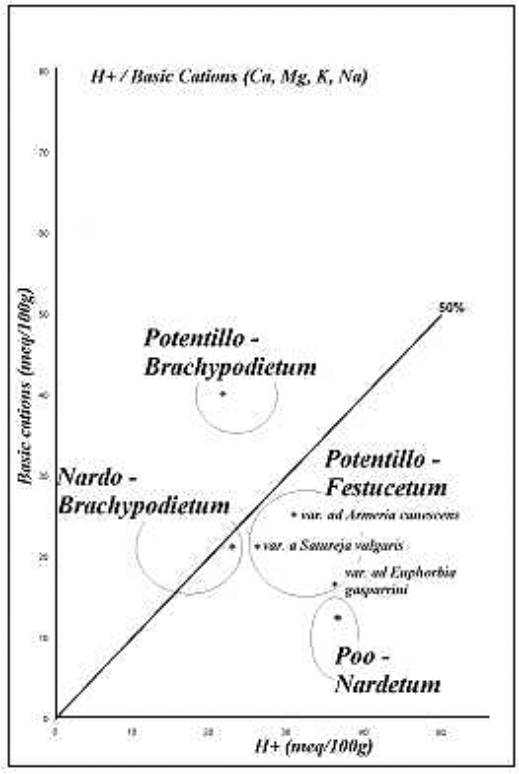

Figura 5.—Exchangeable acidity diagram related to the grassland types identified.

***Brachypodium genuense* grasslands:**

The grasslands dominated by *Brachypodium genuense* cover a large part of the study area, especially in the north-facing slopes, while they are less widespread on the south-facing slopes (where *Festuca paniculata* is prevalent) and in flattish areas. The two communities identified are syntaxonomycally belonging to different associations.

Nardo strictae-Brachypodietum genuensis Pignatti 1977 corr. hoc loco (Table 6).

These are typically close grasslands which are located in flattish areas generally occurring at the footslopes of mountain sides. Apart from *Brachypodium*, these communities consist of *Nardus stricta*, *Luzula campestris*, *Dianthus deltoides*, *Galium*

Table 4
Poo violaceae-Nardetum strictae festucetosum circummediterraneae Biondi & al. 1999
(Ranunculo pollinensis-Nardion strictae, Nardetalia strictae, Nardetea strictae)

Altitude (dm a.s.l.).	165	181	164	160	163	166	162
Cover (%)	90	90	100	100	100	80	90
Area (m^2)	20	10	80	40	40	50	20
Relevé N.	1	2	3	4	5	6	7
Characteristics:							
Nardus stricta	3	4	3	3	3	3	3
Bellardiochloa variegata	3	3	4	3	4	3	+
Agrostis capillaris	+	1	+	1	+	+	3
Luzula campestris	+	.	.	+	.	.	+
festucetosum circummediterraneae:							
Galium verum	1	.	1	1	1	1	+
Festuca rubra commutata	1	1	2	2	2	.	1
Hieracium pilosella (s.l.)	+	.	.	+	.	+	1
Festuca circummediterranea	.	.	+	+	.	.	1
Achillea collina	+	1	.	.	.	.	.
Carlina acaulis subsp. caulescens	.	.	+	.	.	.	.
Thymus longicaulis	.	.	.	.	.	.	+
All. & upper units:							
Dianthus deltoides	+	1	+	1	+	+	1
Potentilla rigoana	1	.	2	1	1	1	2
Festuca paniculata	.	+	+	.	+	.	.
Ranunculus oreophilus	.	.	+	+	+	.	.
Festuca rubra subsp. *microphylla*	.	.	+	.	.	+	.
Erodium alpinum	.	.	+	.	.	+	.
Ajuga tenores	.	.	.	.	.	+	1
Taraxacum apenninum	.	.	.	+	.	.	.
Phleum alpinum subsp. *rhaeticum*	.	.	.	.	+	.	.
Rumex nebroides	.	.	.	.	.	+	.
Ranunculus sartorianus	.	.	.	.	.	.	1
transgressive species from *Molino-Arrhenatheretea*:							
Rumex acetosa	+	+	+	+	1	.	.
Achillea setacea	.	.	1	1	1	1	1
Trifolium pratense subsp. semipurpureum	.	.	+	1	+	+	+
Anthoxanthum odoratum	+	+	+	.	.	.	.
other species:							
Brachypodium genuense	+	+	+	+	.	.	+
Cerastium arvense subsp. suffruticosum	.	+	.	+	+	+	+
Verbascum longifolium	+	.	+	+	+	.	.
Koeleria lobata	+	.	.	+	.	+	+
Cruciata laevipes	+	.	.	+	1	.	.
Digitalis ferruginea	.	.	.	1	+	.	1
Stachys heraclea	.	+	+	.	.	.	.
Armeria canescens	.	.	+	.	.	.	+
Campanula scheuchzeri	.	.	.	+	+	.	.
Poa alpina	.	.	.	+	.	1	.
Satureja vulgaris	.	.	.	.	1	.	+

Other species: *Stachys cretica* subsp. *salviifolia* + in 1; *Veronica serpyllifolia* 1 in 2; *Cirsium tenoreanum*, *Bunium bulbocastanum*, *Rumex sanguineus* and *Potentilla detommasii* + in 3; *Allium cirrhosum* +, *Veronica chamaedrys* 1 in 4; *Satureja alpina* + in 5; *Geum molle* + in 6; *Asperula cynanchica* + in 7.

Localities: 1: Valle di Chiarano, 20/06/2001; 2: Serra Santa Maria, 11/07/2001; 3-6: Posta Chiarano, 01-03/07/2001; 7: Valle di Chiarano: il Casone, 06/07/2001.

Table 5

Potentillo rigoanae-Festucetum paniculatae Bonin 1978

(Ranunculo pollinensis-Nardion strictae, Nardetalia strictae, Nardetea strictae)

Altitude (dm. a.s.l.)	162	158	160	169	167	162	170	164	168	165	168	169	168	176	178	180	172	185	175	172	184	173	186	171	181	175	172
Aspect	S	S	E	S	N	E	N	-	S	N	-	S	-	E	E	S	S	E	S	N	W	S	N	-	-	-	-
Slope	15	15	25	5	5	5	30	-	5	5	-	5	-	10	10	5	15	5	10	15	10	10	10	-	-	-	-
Cover (%)	80	80	90	90	90	90	100	90	80	90	95	95	100	95	90	90	100	90	95	100	80	95	90	100	95	100	100
Area (m^2)	30	10	20	30	30	15	30	50	60	60	60	50	50	99	60	60	99	50	60	80	70	40	30	60	20	40	40
Relevé N.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Charachteristics:																											
*Festuca paniculata*subsp. *paniculata*	4	3	4	5	4	5	4	4	4	4	5	4	5	4	4	5	4	4	4	3	3	4	4	5	5	4	5
Potentilla rigoana	2	1	1	2	1	1	2	1	+	1	.	+	.	+	1	+	1	1	+	+	1	2	+	1	.	+	+
Brachypodium genuense	1	1	1	1	.	+	2	+	+	.	+	.	+	2	3	1	2	2	2	2	1	1	1	+	+	1	1
Senecio scopolii	.	.	.	+	.	.	+	.	.	.	+	1	.	+	+	.	+	1	.	1	+	.	.	+	.	+	+
typicum (subass. nova)																											
Galium verum	2	+	+	1	+	1	+	+	1	+	1	+	+	1	1	1	1	1	1	1	1	1	.	1	1	1	+
Dianthus deltoides	1	+	+	+	.	.	.	+	+	+	+	+	+	+	1	+	+	.	+	+	+	.	.	+	+	+	+
Achillea setacea	.	+	.	+	1	.	.	+	+	+	.	+	.	+	1	1	.	+	+	+	+	.	.	+	+	+	+
Festuca circummediterranea	.	.	.	+	+	.	1	.	+	.	1	1	.	.	1	+	+	.	+	.	.	1	.	.	.	.	.
Gentiana lutea	+	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Satureja vulgaris variant:																											
Satureja vulgaris	+	1	+	+	+	+	1	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Digitalis ferruginea	1	1	1	1	+	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Cruciata laevipes	1	+	+	.	+	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+
Euphorbia gasparrini subsp. samnitica variant:																											
Euphorbia gasparrini subsp. samnitica	.	.	.	.	.	.	.	1	2	2	2	2	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Erodium alpinum	.	.	.	.	.	.	.	.	.	+	+	2	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Armeria canescens *variant:*																											
Armeria canescens	.	.	.	.	.	.	+	.	.	.	.	.	.	+	1	+	+	+	+	+	+	+	.	.	.	.	.
Asperula cynanchica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	+	+	+	+	.	.	.	.	.
Galium anisophyllon	.	.	.	.	.	+	.	+	.	.	.	.	.	+	+	.	.	.	.	1	+	.	+	.	.	.	+
Silene roemeri subsp. staminea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+	.	+	+	.	.	.	.	.
Genista sagittalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2	2	.	.	.	1	.	.	.	.
All. Characteristics:																											
Ranunculus sartorianus	+	.	.	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	+	+	+	.	.	+	.	.
Ajuga tenorei	.	.	.	.	.	+	.	+	+	+	.	.	.	+	.	+	.	.	.	.	.	.	.	+	.	.	.
Viola eugeniae	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.	.	.
Plantago atrata subsp.fuscescens	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.

Table 5 (Cont.)

Rumex nebroides	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.
Taraxacum apenninum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Ord. & Class characteristics:																											
Festuca rubra subsp. commutata	+	+	+	.	+	+	1	+	+	1	+	1	1	1	1	1	1	1	+	1	1	1	.	1	1	1	1
Nardus stricta	+	+	1	.	+	+	1	+	+	1	1	1	1	.	1	1	1	+	+	+	+	1	.	1	2	+	1
Luzula campestris	1	.	+	+	+	.	+	+	.	+	.	.	.	+	+	+	.	+	+	+	+	+	.	+	.	.	.
Agrostis capillaris	.	.	.	.	.	.	1	+	.	+	.	1	.	+	1	+	+	+	1	+	.	.	.	+	.	1	1
Trifolium pratense subsp. semipurpureum	.	.	+	.	+	.	+	+	+	+	.	+	.	+	.	.	.	.	+	+	+	.	.	+	.	.	.
Hieracium pilosella (s.l.)	.	+	+	.	.	.	+	+	+	+	.	+	.	+	+	1	.	.	+	.	.	1	.	+	.	.	.
Bellardiochloa variegata	.	.	.	.	.	.	.	+	+	+	+	1	1	.	+	.	.	+	.	.	.	.	.	+	+	.	+
Luzula multiflora	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Botrychium lunaria	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.
Alchemilla flabellata	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Veronica officinalis	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Alchemilla colorata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Gnaphalium sylvaticum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
transgressive species from Molino-Arrhenatheretea:																											
Lotus corniculatus	2	1	+	1	+	.	2	+	+	.	.	+	.	1	1	+	+	+	1	1	1	+	+	.	.	1	1
Rumex acetosa	+	1	.	+	2	.	+	1	+	+	+	+	+	1	1	+	.	+	.	+	1	.	.	.	1	+	1
Anthoxanthum odoratum	.	.	.	.	.	.	+	.	.	.	.	.	.	+	+	.	.	+	.	+	.	.	.	+	+	.	+
Festuca rubra	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Geum molle	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.
trasnsgressive species from Festuco-Brometea:																											
Cerastium arvense subsp. suffruticosum	2	1	+	.	1	.	.	+	+	+	.	+	.	+	+	+	+	+	+	+	+	1	+	+	.	+	+
Hippocrepis comosa	+	.	.	+	.	.	1	.	.	.	.	.	.	+	1	.	.	+	.	+	+	+	+	.	.	.	.
Carlina acaulis subsp. caulescens	+	.	.	+	.	.	.	+	.	.	.	+	.	.	+	.	.	+	.	.	.	+	+	.	.	.	+
Koeleria lobata	.	.	.	+	+	.	.	+	+	.	.	+	.	.	.	+	.	.	+	.	.	+	.	.	.	.	.
Campanula rapunculus	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	+	.	+	+	+	.	.	.	.	.	.
Achillea tenorii	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	1	.	.	.	.	.	1	.	+	1	.	.
Leontodon cichoraceus	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.
Narcissus poeticus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	+	.	.	.	.	.	.
Knautia purpurea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	2	.	.	.	.	.
Trifolium ochroleucon	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.	.	.	.	.
Helianthemum nummularium	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1	.	1	.	+	.	.	.	.	.
Thymus longicaulis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	+	+	.	.	.	.	.
Eryngium amethystinum	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Campanula glomerata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	+	.	.	.	.	.	.

Table 5 (Cont.)

Silene otites	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Euphrasia stricta	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.
Bupleurum falcatum subsp. cernuum	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Bromus erectus	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Trifolium montanum subsp. rupestre	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.
Plantago argentea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.
Companions:																														
Verbascum longifolium	+	+	+	+	+	.	1	+	.	+	+	+	.	.	+	+	+	.	.	.	.	.	.	+	.	+	+	.		
Campanula scheuchzeri	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	+	.	+	+	.	.	+	.	.	.	.		
Carduus carlinifolius	.	.	.	.	.	.	1	.	.	.	.	.	.	+	1	.	.	.	.	+	.	+	+	.	.	+	+	.		
Helictotrichon praetutianum	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	.	.	+	.	+	.	+	.	.	.	.	.	.		
Bunium bulbocastanum	.	.	.	.	.	.	+	.	.	.	.	+	.	+	.	.	+	+	.	.	.	+	.	.	.	.	.	.		
Myosotis arvensis	+	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.		
Orchis mascula	+	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		
Cynoglossum magellense	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.		
Stachys heraclea	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.		
Campanula micrantha	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.		
Poa alpina	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.		
Biscutella laevigata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.	.	.	.		
Stachys tymphae	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	1		
Silene multicaulis	.	.	.	.	.	.	.	.	.	+	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.		
Polygala alpestris	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.		
Arabis sagittata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1	.	.	.	.	.		

Other species: Briza media + in 23 and 24; Phyteuma orbiculare + in 24 and 25; Veronica chamaedrys + in 1; Silene dioica + in 4; Satureja alpina +, Achillea collina 1 in 7; Polygala major + in 9; Cerastium arvense + in 11; Senecio integrifolius (s.l.) + in 12; Rumex acetosella +, Festuca alfrediana 1 in 18; Veronica orsiniana + in 19; Viola reichenbachiana + in 20; Galium lucidum and Allium cirrhosum + in 22; Dianthus carthusianorum (s.l.), Campanula foliosa and Leucanthemum ceratophylloides subsp. tenuifolium +, Ranunculus polyanthemos subsp. polyanthemoides 1 in 24; Juniperus communis subsp. nana, Saxifraga granulata, Pimpinella tragium, Dianthus sylvestris (s.l.) and Helianthemum oelandicum subsp. incanum +, Phleum ambiguum 1 in 26; Leontodon hispidus +, Linum austriacum subsp. tommasinii 1 in 27.

Localities: 1, 3, 5: Posta Chiarano, 7-9-11/06/2001; 4, 7, 26: Serra Sparvera, 02/07/2001; 6: Valle di Chiarano, 20-2/06/2001; 8-13: Valle di Chiarano, 19-04/06-07/2001; 14, 20, 27: Valle Chiarano: Il Feudo, 10-12/07/2001; ril. 15: Serra Santa Maria, 11/07/2001; 16, 17, 24, 25: Bocche Chiarano, 08/07/2001; 18, 19, 22: Serra Santa Maria, 10-11/07/2001; 21, 23: Serra del Feudo, 07/07/2001.

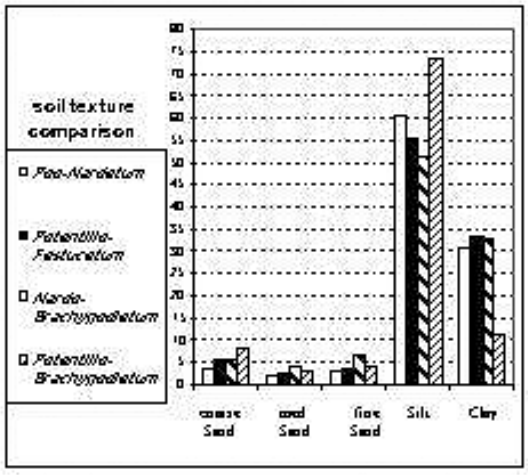

Figura 6.—Soil texture spectrum related to the grassland types identified.

verum, *Potentilla rigoana, Cruciata laevipes* and *Digitalis ferruginea*. The chorological diagram (Table 1) shows a roughly equal percentages of Boreal, Orophytes S.-European and Eurasiatic species. Structurally there is here — compared to the other communities identified — an evident increase of rosulate Hemycryptophyte probably due to the presence of both rich soils and a fair quantity of light at ground level (Table 1).

Nardo-Brachypodietum soils belong to the Inceptisols order, suborder Udepts, great group Dystrudepts, subgroup humic Dystrudepts (calcic brown soils). The soils are about one meter deep; the texture is mainly silty but shows also a significant presence of both coarse sands and clay. Calcium ions have for the most part been removed (Ca++ = 17 meq / 100 g; base saturation= 46%), pH is acid (5,6) and the water content is high (AWC= 184 mm) (Table 2).

Potentillo rigoanae-Brachypodietum genuensis Lucchese, Persia & Pignatti 1995 (Table 7).

Located on medium-steep slopes, this kind of *Brachypodium genuense* communities are relatively open. Apart from *Brachypodium genuense*, they consists of *Helictotrichon praetutianum*, *Bunium bulbocastanum*, *Potentilla rigoana*, *Armeria canescens* and *Achillea tenorii* (this latter being almost exclusively in these communities). In chorological terms there is the prevalence of the Endemic chorotype, both in the normal spectrum and in the cover one. Orophytes S.-European and Eurasiatic components are nonetheless quite high. Structurally, there is a significant presence of both Chamaephytes and Therophytes, but the Hemycryptophytes are still prevailing (Table 1). The first three relevés of Table 7 (Rel. 39, 41, 43) were collected on slopes of moderate slant and include still some species which testimony an intermediate character between the acidophilous (*Nardo strictae-Brachypodietum genuensis*) and the neutral-subacidophilous (*Potentillo rigoanae-Brachypodietum genuensis*). The last relevé (Rel. 44, Tab. 7) marks the shift towards a micro-chemaephitic vegetation with dominance of *Helianthemum oleandicum* subsp. *incanum* typical of humps and convex slopes.

Potentillo rigoanae-Brachypodietum genuensis soils are to be included in the Mollisols order, suborder Udolls, great group Hapludolls, subgroup entic Hapludolls (brown rendzina). The profile is relatively deep (55 cm) and the clay content is low. Calcium ions are high (Ca++ = 38 meq / 100 g; base saturation= 64%), resulting in a subacid reaction (pH=6,7). Water content is high (AWC= 163 mm) (Table 2).

SOIL-VEGETATION RELATIONSHIP

The soils investigated show some characters which testify the earlier occurrence of a woodland vegetation. In fact, the decay of the micro-thermic beechwoods and of the secondary dwarf-shrublands began about 8000 years ago, as shown by some coal layers found in the deposits of this zone (GIRAUDI, 1999). These soils originate from calcareous materials, either *in situ* or organized in morainal, fluvioglacial or layer drift deposits, which in the late glacial period and the early Holocene mixed with pyroclastic materials —related to «Tufo giallo napoletano»— and aeolian deposits (loess) (FREZZOTTI & GIRAUDI, 1989, 1990). Mineralogical analysis of the deposits found that quartz prevails among the minerals in aeolian deposits and k-feldspar, glass, plagioclases, pyroxenes and amphiboles predominate in deposits of volcanic origin (FREZZOTTI & GIRAUDI, 1989). This results in a moderate shift toward acidity in the pH values of these soils. The present survey, which was restricted to secondary acidophilous grasslands, pointed out the soils belong to two orders, Mollisols and Inceptisols, which usually are related to woodland potential vegetation types (the first on slopes

Table 6
Nardo strictae-Brachypodietum genuensis Pignatti 77 corr. Di Pietro, De Santis & Fortini hoc loco
(Ranunculo pollinensis-Nardion strictae, Nardetalia strictae, Nardetea strictae)

Altitude dm a.s.l.	157	170	169
Aspect	SE	NE	S
Slope (º)	5	7	5
Cover (%)	80	100	90
Area (m2)	30	70	50
Relevé N.	1	2	3
Characteristics:			
Brachypodium genuense	3	5	4
Digitalis ferruginea	1	1	1
Agrostis capillaris	+	1	+
Plantago atrata subsp. *fuscescens*	+	.	.
Silene roemeri subsp. *staminea*	+	+	+
All. Charcteristics:			
Potentilla rigoana	+	1	1
Ranunculus sartorianus	1	+	+
Ranunculus oreophilus	.	.	+
Taraxacum apenninum	.	.	+
Ord. & Class characteristics:			
Nardus stricta	1	1	1
Luzula campestris	+	+	+
Rumex nebroides	.	.	+
Hieracium pilosella (s.l.)	+	+	.
Dianthus deltoides	+	+	+
Festuca rubra subsp. *commutata*	+	2	.
Bellardiochloa variegata	.	.	+
Festuca paniculata	.	.	+
transgressive species from *Molino-Arrhenatheretea:*			
Lotus corniculatus	+	1	1
Achillea setacea	1	+	.
Galium verum	1	1	1
Anthoxanthum odoratum	.	+	.
Trifolium pratense subsp. *semipurpureum*	+	+	1
Dactylis glomerata	.	+	2
Rumex acetosa	+	1	.
transgressive species from *Festuco-Brometea:*			
Carlina acaulis subsp. caulescens	+	.	+
Cerastium arvense subsp. *suffruticosum*	1	+	.
Festuca circummediterranea	+	.	1
Trifolium ochroleucon	.	+	+
Leontodon cichoraceus	1	.	+
Koeleria lobata	+	+	.
other species:			
Verbascum longifolium	.	+	1
Cruciata laevipes	+	+	+
Armeria canescens	.	+	1
Bunium bulbocastanum	+	+	+
Satureja vulgaris	+	+	+
Helictotrichon praetutianum	+	+	+
Poa alpina	+	.	.
Campanula scheuchzeri	.	+	.
Myosotis arvensis	.	+	+
Campanula micrantha	+	.	1

Other species: *Geum molle, Ranunculus millefoliatus* and *Thlaspi caerulescens* subsp. *brachypetalum* + in 1; *Veronica chamaedrys, Arabis collina, Saxifraga granulata, Thymus longicaulis, Trifolium montanum* subsp. *rupestre, Geum urbanum* and *Stachys heraclea* +, *Achillea collina* 1 in 2; *Leontodon crispus* subsp. *asper* + in 3.

Localities: 1, 2: Posta Chiarano 11/06/2001, 03/07/2001; 3: Serra Sparvera 02/07/2001.

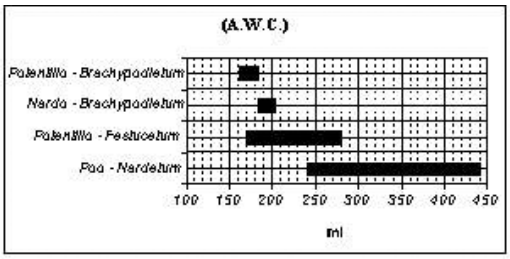

Figura 7.—Available water capacity related to the grassland types identified.

and the second on flat areas) of the pedological-evolutionary series on limestone (SBURLINO & *al*., 1999). The soils surveyed here are characterized by a Frigid thermotype, which in the adjacent Gran Sasso mountains is found between 1580 and 1750 m (CALANDRA, 1999) and a Udic moisture regime.

Acidophilous communities of *Poo violaceae-Nardetum strictae*, *Potentillo rigoanae-Festucetum paniculatae* and *Nardo strictae-Brachypodietum genuensis* were all found on Inceptisols. Because *Poo-Nardetum* occupies the most stable areas (level ground and depressions), its edaphic condition is the most evolved (brown acidic soil and brown calcic soil). *Potentillo-Festucetum* and *Nardo-Brachypodietum* are found only on brown calcic soil.

A moderate, subacidic soil comparable to a brunified rendzina is found for *Potentillo-Brachypodietm*, and it marks the transition towards the basic-neutrophilous communities of *Koelerio splendentis-Brometum erecti* (BIONDI & *al*., 1992).

Among edaphic parameters, those which follow most closely the distribution of the various communities identified are pH, the ratio between acid (H+) and basic (Ca, Mg, K, Na) cations, available water content (A. W. C.) and granulometric values.

The table of pH (Fig. 4) shows a decrease in acidity when passing from *Poo-Nardetum* to *Potentillo-Festucetum* and then to *Nardo-Brachypodietum*, and a clear distinction between these three and *Potentillo-Brachypodietum*. The same kind of distinction can be observed in the ratio H+/basic cations (Fig. 5) where the values for *Nardus* communities are the highest, as expected, while *Potentillo-Festucetum* and *Nardo-Brachypodietum* are placed slightly below the 50% line and *Potentillo-Brachypodietum* shows a dominance of basic cations. Granulometric analysis (Fig. 6) points out an increase in the percentage of coarse sands when passing from *Nardus* to *Festuca paniculata* and then to *Brachypodium* communities. The clay content is higher for those communities with an acidophilous character (*Nardus* and *Festuca paniculata*), and shows a clear decrease in *Potentillo-Brachypodietum*. Available water content of the soils (Fig. 7) marks above all a distinction between the communities of *Nardus* and *Brachypodium*.

SINDYNAMICAL FEATURES

A syndynamical link between *Potentillo-Festucetum, Potentillo-Brachypodietum* and *Poo-Nardetum* can be poorly hypothesized because of the highly competitive behaviour of *Festuca paniculata, Nardus stricta* and *Brachypodium genuense* in their respective optimal environments. However, the abundance of *Brachypodium genuense* in some relevés which have been included in the variant with *Armeria* of *Potentillo-Festucetum* could suggest a more or less recent stage of colonization of *F. paniculata* that could have replaced a pre-existent *Brachypodietum* due to a land-use change (e.g. the mowing interruption followed by a progressively decreasing livestock pressure). Even if this hypothesis should be confirmed, the dynamical passage *Potentillo-Brachypodietum*/ *Potentillo-Festucetum* would be limited to the south-facing slopes being *Festuca paniculata* stands almost completely missing in the north-facing ones. A more or less similar process could be considered valid as regards the possible colonization of flatland by *Festuca paniculata (Potentillo-Festucetum* variant with *Euphorbia gasparrini)*, which would happen mainly at the expense of *Nardo-Brachypodietum*.

In general, all the grassland communities identified have to be included in the beech woodlands climatophilous belt. In this case the potential vegetation type is *Cardamino kitaibelii-Fagetum*. On the mountain sides, gradual deforestation resulted in the eluviation of parts of the area and favoured the growth of more or less dry grassland communities such as *Koelerio-Brometum* (on steep slopes) or *Potentillo-Brachypodietum* (on less steep slopes). On the flatland and in the depressions it is likely that the heavy grazing progressively led to the passage from limited-acidity *Brachypodium* communities to *Nardo-Brachypodietum*, and from *Cynosurion* rich mesophilous grasslands to *Poo violaceae-Nardetum* (in

Table 7
Potentillo rigoanae-Brachypodietum genuensis Lucchese, Persia & Pignatti 1995
(Phleo ambigui-Bromion erecti, *Brometalia erecti, Festuco-Brometea)*

Altitude dm a.s.l.	175	165	178	162	172	164	173
Aspect	W	N	NE	NE	E	NE	E
Slope (º)	5	10	10	5	15	15	15
Cover (%)	90	90	90	90	80	80	70
Area (m^2)	30	60	40	30	40	40	30
Relevé N.	1	2	3	4	5	6	7
Characteristics:							
Brachypodium genuense	4	4	3	4	4	3	3
Potentilla rigoana	+	+	+	1	+	+	+
Armeria canescens	+	+	+	+	1	1	+
Achillea tenorii	1	1	1	+	+	1	+
Verbascum longifolium	.	+	.	.	.	.	+
Trifolium montanum subsp. *rupestre*	.	.	.	.	+	.	.
Nardus stricta variant*:*							
Nardus stricta	+	+	1	.	.	.	.
Bellardiochloa variegata	+	+	+	.	+	.	.
Dianthus deltoides	+	+	+	.	.	.	.
Festuca paniculata	+	.	+	.	.	.	.
All. characteristics:							
Galium lucidum	+	1	+	.	1	+	1
Festuca circummediterranea	1	.	1	+	2	+	1
Koeleria lobata	1	.	.	+	1	+	+
Arabis collina	+	.	.	+	+	.	.
Phleum ambiguum	.	.	.	.	+	.	+
Astragalus sempervirens subsp. *gussonei*	.	.	.	.	.	.	+
Pimpinella tragium	.	.	.	.	.	+	.
Leontodon cichoraceus	.	.	.	.	+	.	.
Ord and class characteristics:							
Thymus longicaulis	+	+	+	+	+	+	+
Asperula cynanchica	1	+	+	+	1	1	.
Cerastium arvense subsp. *suffruticosum*	+	+	+	+	+	.	1
Hippocrepis comosa	+	.	+	+	+	+	+
Carlina acaulis subsp. *caulescens*	+	1	1	+	+	1	.
Bromus erectus	.	+	2	.	+	+	+
Medicago lupulina	.	+	+	.	+	.	+
Dianthus sylvestris (s.l.)	.	.	+	.	1	+	+
Helianthemum nummularium	.	.	1	+	.	1	.
Bupleurum falcatum subsp. *cernuum*	.	+	.	.	.	+	.
Festuca laevigata	.	.	+	.	.	.	1
Arenaria serpyllifolia	.	.	.	.	+	.	+
Asperula aristata subsp. *scabra*	.	.	.	.	.	.	1
Anthyllis vulneraria subsp. *polyphylla*	.	.	.	.	.	+	.
Cerastium arvense	.	.	.	.	.	+	.
Linum catharticum (s.l.)	.	.	.	.	.	+	.
Seseli montanum	.	.	.	.	+	.	.
Campanula rapunculus	.	.	+	.	.	.	.
Satureja alpina	.	.	+	.	.	.	.
Satureja vulgaris	.	+	.	.	.	.	.
transgressive species from *Molino-Arrhenatheretea:*							
Lotus corniculatus	1	+	1	1	1	1	+
Trifolium pratense subsp. *semipurpureum*	+	+	+	1	1	+	.
Galium verum	1	.	+	1	+	.	.
Achillea setacea	.	.	+	+	+	.	.

Table 7 (Cont.)

Anthoxanthum odoratum	+	+	+	.	.	.	.
Geum molle	+	.	.	+	.	.	.
Dactylorhiza sambucina	.	.	.	+	.	.	.
transgressive species from *Nardetea:*							
Luzula campestris	+	+	+	+	+	+	.
Hieracium pilosella (s.l.)	1	+	+	1	.	1	+
Plantago atrata subsp. *fuscescens*	+	1	+	+	1	.	.
Ranunculus sartorianus	+	+	+	+	+	.	.
Rumex acetosella	+	1	+	.	+	.	.
Agrostis capillaris	+	.	.	+	+	.	.
Festuca rubra subsp. *commutata*	.	1	.	1	1	.	.
Festuca rubra subsp. *microphylla*	+	.	.	.	.	+	.
other species:							
Bunium bulbocastanum	+	+	+	+	1	1	1
Helictotrichon praetutianum	1	1	2	+	1	+	+
Silene roemeri subsp. *staminea*	+	+	+	+	+	.	.
Poa alpina	.	.	+	+	+	1	.
Silene multicaulis	.	+	.	+	.	.	+
Arabis hirsuta	.	.	1	.	.	+	+
Sedum acre	.	.	.	.	.	+	+
Leucanthemum ceratophylloides subsp. *tenuifolium*	.	.	.	+	.	+	.
Polygala alpestris	.	+	.	.	+	.	.
Campanula scheuchzeri	.	+	.	+	.	.	.
Carduus carlinifolius	+	.	+	.	.	.	.

Other species: *Cynoglossum magellense* + in 1; *Arabis sagittata* and *Campanula glomerata* + in 2; *Myosotis arvensis, Silene vulgaris, Campanula micrantha* and *Stachys tymphae* + in 3; *Rumex acetosa* and *Ajuga tenorei* + in 4; *Globularia meridionalis* and *Trifolium ochroleucon* + in 5; *Thlaspi praecox* subsp. *polytrichus* and *Sedum rupestre* + in 6; *Erophila verna, Poa bulbosa, Erysimum majellense* and *Allium cirrhosum* +, *Heliantemum incanum* 1 in 7.

Localities: 1: Valle Chiarano: Il Feudo, 12/07/2001; 2, 6: Bocche Chiarano, 01-04/07/2001; 3: Serra Santa Maria, 10/07/2001; 4: Valle Chiarano: Il Casone, 06/07/2001; 5, 7: Valle Chiarano, 9-10/07/2001.

both cases through the gradual felting and acidification of the soil). The recent wide diffusion of *Festuca paniculata* is probably ascribable to the decrease of the livestock pressure during the last century, which resulted in an increase in the nitrifying power due to the reduced compression of soil surface (QUANTIN & NENTIEN, 1940; GEROLA & GEROLA, 1956-57).

The syndynamical progressive evolution towards the woody communities appears to be very slow, and in fact specimens of *Juniperus communis* subsp. *nana*, *Amelanchier ovalis*, *Cotoneaster integerrimus*, *Ribes uva-crispa*, *Sorbus aria*, *Rosa canina*, *Rubus idaeus* and *Sorbus aucuparia* were found only sporadically in the grassland communities. Among these species only *Juniperus communis* subsp. *nana* appears to be able to penetrate the *Brachypodium* and *Festucetum* communities on the slopes (*Potentillo rigoanae-Festucetum paniculatae* var. with *Armeria canescens*) and develop into downright thickets in form of the association *Helianthemo-Juniperetum nanae* (BLASI, 1989). On the contrary no shrubs were found in *Festuca paniculata* or *Nardus stricta* communities developed on flatlands and in the slope depressions. In fact also *Juniperus nana* would therefore appear to be unable to successfully colonize these more acidic grasslands (in BLASI & *al*., 1990 *Helianthemo grandiflori-Juniperetum alpinae* was found to be developed on soils with pH=5,5-6,5). On the other hand, *Fagus* individuals seems unable to take root directly on these grasslands, probably due to the thick layer of dead leaves and roots measuring up to 10-15 cm. At present, therefore, both *Poo-Nardetum* and *Potentillo-Festucetum* (especially the variant with *Euphorbia gasparrini*) appear dynamically stable. It is likely, however, that the occurrence of a certain degree of extensive grazing in this area could play an important role in keeping the dynamical evolution blocked. In fact, the similar *Nardus* and

Festuca paniculata communities found on the neighbouring Laga Mountains and on Mount Terminillo (PEDROTTI, 1982; GIGLI & *al*., 1991; ABBATE & *al*., 1994) exhibit clear seral relationship with the subalpine *Vaccinium myrtillus* dwarf-shrublands, while the *Luzulo sieberi-Festucetum paniculatae* of southern Italy, is successfully colonized by *Sorbus aucuparia* stands.

SYNTAXONOMICAL DISCUSSION

Due to the dominance of *Nardus stricta* and *Bellardiochloa variegata*, all *Nardus* communities surveyed in this study can be included in *Poo violaceae-Nardetum strictae* which was described in PEDROTTI (1981) for Laga Mountains. The presence of several ingressive species of *Festuco-Brometea* justifies its inclusion in the subassociation *festucetosum circummediterraneae* (BIONDI & *al*., 1999), which substitutes the *typicum* aspect on calcareous substrates. Relevé 34 on Table 4 exhibits the dominance of *Agrostis capillaris* and *Nardus stricta* and a limited presence of *Bellardiochloa variegata*. This aspect is to be considered just a transitory phase which is due to a early stage of the soil evolution (morainal soil), therefore it has not been included in the association *Agrostio tenuis-Nardetum strictae* (GIGLI & *al*., 1991).

Festuca paniculata communities are to be included in *Potentillo-Festucetum paniculatae*. BONIN (1978) proposed the name *Potentillo-Festucetum spadiceae* for the *Festuca paniculata* communities of the upper montane and subalpine belt of Mount Terminillo, extending the presumed range of this association to most of the Central Apennines. Still on Mount Terminillo, GIGLI & *al*. (1991) doubt the possibility of *Festuca paniculata* communities could be included in *Potentillo-Festucetum*, because the ecological amplitude of such a syntaxon would in their opinion be too wide to be restricted to the association rank only. In a paper dated 1981 but effectively published only in 1983, PEDROTTI gives a description of *Brachypodio-Festucetum spadiceae* on the Laga Mountains relying on a single relevé with a floristic list of only ten species. In 1982 though the same author had published a phytosociological table consisting of 4 relevés and referred to *Brachypodio-Festucetum* PEDROTTI 1981, with an average of 35 species per relevé. Even though growing on substrata of different nature (marly calcareous for *Potentillo-Festucetum* and flysch arenaceous pelitic for *Brachypodio-Festucetum*), the differences in floristic composition between the two communities do not appear to be such as to require a separation at association level (Tab. 3). Leaching and acidification phenomena affecting high mountain soils, even on limestones (especially where calcareous skeleton is lacking), might be responsible of a certain convergence in the edaphic anc consequently floristic and coenological traits of these two areas. It is not by accident that *Potentillo-Festucetum* on Mount Terminillo and *Brachypodio-Festucetum* on the Laga Montains have both dynamical contacts with the subalpine *Vaccinium myrtillus* heathlands.

Concerning nomenclatural issues, the association *Potentillo-Festucetum spadiceae* BONIN 1978 is validly published (Art. 1). According to GIGLI & *al*. (1991), however, it is likely that the taxonomical attribution of some diagnostic species recorded in the original phytosociological table (BONIN, 1978) is to be considered as wrong. In fact, on the basis of further field observations and according to recent Floras and checklists (ANZALONE, 1996; TONDI & PLINI, 1995; CONTI, 1998) the records of *Potentilla aurea* and *Potentilla tabernaemontani* should be reported to *Potentilla rigoana* and those of *Brachypodium pinnatum* to *Brachypodium genuense*. Furthermore, the principle of nomenclatural priority requires that the binomial *Festuca spadicea* be substituted by *Festuca paniculata* (the wrong identification of the same species occurred also in the original table of *Brachypodio-Festucetum* proposed by PEDROTTI). The names of both associations, modified in accordance with ICPN (Art. 43), are therefore *Potentillo rigoanae-Festucetum paniculatae* BONIN 1978 corr. DI PIETRO, DE SANTIS & FORTINI 2005 and *Brachypodio genuensis-Festucetum paniculatae* PEDROTTI 1981, corr. DI PIETRO, DE SANTIS & FORTINI 2005. On the basis of the floristic and coenological similarities mentioned above, however, is our opinion that these two associations (*Potentillo-Festucetum* and *Brachypodio-Festucetum*) behave as syntaxonomical synonyms, and, as a consequence, *Potentillo rigoanae-Festucetum paniculatae* would therefore obtain nomenclatural priority (Art. 22). Since the original paper in which was published lacks the nomenclatural type, it is necessary to provide a lectotype which is choosen hoc loco. (lectotypus of *Potentillo-Festucetum*: rel. 861 table 9 in BONIN, 1978).

The relevés of *Brachypodio-Festucetum* on Laga Mountains, though referable to *Potentillo-Festucetum*, identify a new subassociation with the name of *Potentillo rigoanae-Festucetum paniculatae hypericetosum richerii* (Holotype: Ril. 1, Tab 4, PEDROTTI, 1982) which is characteristic of sandy-pelitic substrates with high levels of acidity and water retention. The differential species of this subassociation are *Hypericum richeri*, *Trifolium thalii*, *Pedicularis verticillata* and *Pedicularis tuberosa*[1].

Concerning higher syntaxonomical levels, BONIN (1978) placed *Potentillo-Festucetum* in *Ranunculo-Nardion* an alliance having a prevailing central and southern Apennine distribution (BONIN, 1972). PEDROTTI (1982), on the other hand, highlighted a certain similarity between *Brachypodio-Festucetum* and *Potentillo-Festucetum*, but made no mention of the higher syntaxonomical level.

In the present paper we agree with the inclusion of *Potentillo-Festucetum paniculatae* to the alliance *Ranunculo-Nardion*. In fact *Potentillo-Festucetum* shows definite floristic peculiarities, due to the presence of endemic and amphiadriatic species such as *Achillea tenorii*, *Euphorbia gasparrini* subsp. *samnitica*, *Erodium alpinum*, *Potentilla rigoana*, *Brachypodium genuense*, *Ajuga tenorei, Viola eugeniae* subsp. *eugeniae, Helictotrichon praetutianum, Campanula micrantha, Senecio scopolii*, *Silene roemeri*, *Ranunculus sartorianus*…. which confirm the floristic and coenological autonomy of the Apennine biogeographical area. At the rank of order and class we agree with a preliminary inclusion in *Nardetalia* and *Nardetea*, at least for the time being, because of the lack even at European level of an organic classification of mountainous acidophilous grasslands (compare OBERDORFER, 1978; MOLINA ABRIL, 1993; DE FOUCAULT, 1993; MUCINA, 1993, 1997; THEURILLAT & *al*., 1995; POLDINI & ORIOLO, 1997).

Brachypodium genuense stands are referred to: *Potentillo rigoanae-Brachypodietum* and *Brachypodio-Nardetum strictae* two associations whose traits for the Central Apennines have already been defined. *Potentillo rigoanae-Brachypodietum genuensis*, whose type-relevé (Rel. 10, Tab. 2, LUCCHESE, PERSIA & PIGNATTI, 1995) was collected precisely in the Valle di Chiarano (which is included in our study area), is typical of the medium-steep limestone slopes of the montane bioclimatic belt. This association was previously identified as *Anthoxantho odorati-Brachypodietum genuensis brometosum* (LUCCHESE, 1987) whereas the subassociation «*nardetosum*» was referred to more mesophilous and acidic environments. *Brachypodio-Nardetum* was described in the same geographical area (PIGNATTI, 1997) and it is typical of flattish areas with acidic soil formerly covered by beech woods. In our opinion, the subassociation *Anthoxantho odorati-Brachypodietum genuensis nardetosum* (LUCCHESE, 1987) is entirely to be ascribed to *Brachypodio-Nardetum strictae*. Nevertheless the shift between *Potentillo rigoanae-Brachypodietum* and *Brachypodio-Nardetum* is gradual, giving rise to a pattern of coenological types whose position is intermediate between the standard ones (Relevés 41, 39 and 43 of Table 7 show all the characteristic species of *Potentillo rigoanae-Brachypodietum*, together with many species of *Nardetea strictae*). According to GÉHU & RIVAS-MARTÍNEZ (1981), these relevés should be theoretically considered as a *Nardus strictae* variant of *Potentillo rigoanae-Brachypodietum genuensis* (confirming the proposal of BLASI & *al*., 1998 for Simbruini mountains).

A reference to *Anthoxantho-Brachypodietum*[2] as a new syntaxon, has recently been proposed for a

[1] The decision not to use for the name of this subassociation the relevé in PEDROTTI (1981) already mentioned for the association *Brachypodio-Festucetum* is due to the fact that this relevé is clearly not representative of the floristic and ecological traits of this community, since the floristic list of species appears excessively limited (about 1/3 of the actual species) in comparison with relevés published by other authors (compare PEDROTTI, 1982) or those in the present paper, and referred to the same association.

[2] The association *Anthoxantho-Brachypodietum* LUCCHESE ex ATTORRE & BRUNO 2003 shows in our opinion some incongruities in the original diagnosis. While the name *Anthoxantho-Brachypodietum* LUCCHESE 1987 is invalid according to Art. 1of ICPN (WEBER & *al*., 2000) and has been invalidly used again by LUCCHESE & *al*. 1995, it is not clear whether the new diagnosis made in ATTORRE & BRUNO (2003) is to be referred to subassociation *brometosum erecti* or to subassociation *nardetosum strictae*. Because of the absence of *Nardus stricta* in the relevés of *Anthoxantho-Brachypodietum* by ATTORRE & BRUNO, and due to the presence of *Bromus erectus* we tend to consider this diagnosis as closer to subassociation *brometosum erecti*, which is precisely the one used by LUCCHESE & *al*. (1995) for valid description of *Potentillo rigoanae-Brachypodietum*. But what really fits almost perfectly with the diagnosis of *Potentillo rigoanae-Brachypodietum* by LUCCHESE & *al*. 1995 is the original phytosociological table of *Anthoxantho-Brachypodietum* found in

grassland type occurring on the Simbruini Mountains, in Central Apennines (ATTORRE & BRUNO, 2003). This reference, however, has been avoided in the present paper since this association does not appear to have a real and authonomous coenological space outside *Potentillo-Brachypodietum* and *Brachypodio-Nardetum*.

In nomenclatural terms the association *Brachypodio-Nardetum* Pignatti 1977 has never been typified. The lectotypification is consequently made in this paper (lectotype: relevé 33, table 57 in PIGNATTI, 1977). The name itself of the association needs to be modified. We propose to the ICPN Nomenclature Commission that the name *Brachypodio-Nardetum* PIGNATTI 1977 be changed into *Nardo strictae-Brachypodietum genuensis* PIGNATTI 1977, corr. DI PIETRO, DE SANTIS & FORTINI 2005. This because the relevés of the original table of *Brachypodio-Nardetum* show *Nardus stricta* as always subordinate to *Brachypodium genuense* (which was wrongly recorded as *B. pinnatum*). Since the three relevés which in the present paper are included to *Nardo strictae-Brachypodietum genuensis* were performed in the nearby the «locus classicus» of this association, they have therefore been listed here together with those published in PIGNATTI, 1977 (Rel. 1 Table 52, PIGNATTI, 1977, was left out because relative to a different kind of vegetation) in the attempt to produce a more reliable synoptic table for this association (Table 6).

As for the higher rank syntaxa, *Potentillo-Brachypodietum* and *Nardo-Brachypodietum* show different references. In fact *Potentillo rigoanae-Brachypodietum* belongs to class *Festuco-Brometea*, order *Brometalia erecti*, alliance *Phleo-Bromion*. Within this alliance, *Potentillo-Brachypodietum* refers to suballiance *Brachypodenion genuensis*, which includes all those grassland types developed within the upper montane belt, On the contrary, *Nardo-Brachypodietum* belongs to class *Nardetea strictae*, order *Nardetalia strictae*, alliance *Ranunculo-Nardion*. The choice of including in different classes grassland types sharing the same dominant species and adjoining each other spatially should not come as a surprise, being a consequence of the considerable ecological amplitude of *Brachypodium genuense* which is able to form communities also in *Thlaspietea rotundifolii* (FEOLI & FEOLI-CHIAPELLA, 1983) and *Elyno-Seslerietea* (DI PIETRO & *al*., 2004).

SYNTAXONOMICAL SCHEME

NARDETEA STRICTAE Oberd. 1949
- *Nardetalia strictae* Oberd. 1949 em. Preising 1949
  - *Ranunculo pollinensis-Nardion strictae* Bonin 1972
    - *Potentillo rigoanae-Festucetum paniculatae* Bonin 1978 *corr.* Di Pietro, De Santis & Fortini hoc loco
      (Lectotypus hoc loco design. rel. 861, Table 9, in Bonin, 1978).
      [= *Brachypodio genuensis-Festucetum paniculatae* Pedrotti 1983 corr. Di Pietro, De Santis & Fortini hoc loco: synt. synon.]
      Potentillo rigoanae-Festucetum paniculatae typicum .
      Potentillo rigoanae-Festucetum paniculatae hypericetosum richeri Di Pietro, De Santis & Fortini subass. nov.
      (holotypus hoc loco design. rel. 1, Table 4, in Pedrotti, 1982).
      Nardo strictae-Brachypodietum genuensis Pignatti 1977, *corr.* Di Pietro, De Santis & Fortini hoc loco, nom. inver. prop. hoc loco
      (Lectotypus hoc loco design. rel. 33, Table 57, in Pignatti, 1977).
      [= *Nardo-Brachypodietum* Pignatti 1977: Basion.; = *Anthoxantho odorati-Brachypodietum genuensis nardetosum* Lucchese, Persia & Pignatti 1995: nom. inval. art. 5;]
      Poo violaceae-Nardetum strictae Pedrotti 1983
      Poo violaceae-Nardetum strictae festucetosum circummediterraneae Biondi, Ballelli, Allegrezza, Taffetani, Frattaroli, Guitian, Zuccarello 1999

FESTUCO-BROMETEA Br.-Bl. et Tx. 1943 ex Klika et Hadac 1944
- *Brometalia erecti* Br.-Bl. 1936
  - *Phleo ambigui-Bromion erecti* Biondi et Blasi ex Biondi, Ballelli, Allegrezza, Zuccarello 1995
    - *Brachypodenion genuensis* Biondi, Ballelli, Allegrezza, Zuccarello 1995
      - *Potentillo rigoanae-Brachypodietum genuensis* Lucchese, Persia, Pignatti 1995
        [= *Anthoxantho odorati-Brachypodietum genuensis brometosum erecti* Lucchese, Persia & Pignatti 1995: nom. inval. art. 5; *Anthoxantho odorati-Brachypodietum genuensis* Lucchese, Persia & Pignatti *ex* Attorre & Bruno 2003: synt. syn.]

ATTORRE & BRUNO (2003), and especially its relevé-type (Rel. 4, Tab. 4 on page 64). In fact both table and typre-relevé describe a mesophilous mountain grassland dominated by *Brachypodium genuense* and characterized by a relevant presence of ingressive species from *Phleo-Bromion erecti*. Moreover, the original table of *Anthoxantho-Brachypodietum* sensu ATTORRE & BRUNO 2003 contains almost all those species which where considered as characteristic of *Potentillo-Brachypodietum* in LUCCHESE & *al*. (1995). The choice of using two different syntaxa at the rank of association for describing grassland communities which are rather similar would therefore appear whether tenable nor justified.

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APPENDIX 1: COMPLETE LIST OF THE SINTAXA QUOTED IN THE TEXT

Agrostio tenuis-Nardetum strictae Gigli, Abbate, Blasi & Di Marzio 1991; *Anthoxantho odorati-Brachypodietum genuensis brometosum* Lucchese 1987; *Anthoxantho odorati-Brachypodietum genuensis nardetosum* Lucchese 1987; *Anthoxantho-Brachypodietum* Attorre & Bruno 2003; *Brachypodenion genuensis* Biondi, Ballelli, Allegrezza & Zuccarello 1995; *Brachypodio-Festucetum spadiceae* Pedrotti 1983; *Brachypodio-Nardetum strictae* Pignatti 1977; *Brometalia erecti* Br.-Bl. 1936; *Cardamino kitaibelii-Fagetum* Ubaldi *& al*. ex Ubaldi 1995; *Cynosurion* Tüxen 1947; *Elyno-Seslerietea* Br.-Bl. 1948; *Festuco-Brometea* Br.-Bl. & Tüxen ex Br.-Bl. 1949; *Helianthemo grandiflori-Juniperetum alpinae* Blasi, Gigli, Abbate & Stanisci 1989; *Koelerio splendentis—Brometum erecti* Biondi, Allegrezza, Ballelli, Calandra, Crescente, Frattaroli, Gratani, Rossi & Taffetani 1992; *Luzulo sieberi-Festucetum paniculatae* Corbetta, Ubaldi & Puppi 1984, corr. in Biondi, Ballelli, Allegrezza & Zuccarello 1995; *Nardetalia* Oberd. 1949 em. Preising 1949; *Nardetea* Oberd. 1949; *Nardo strictae-Brachypodietum genuensis* Pignatti 1977 corr. in Di Pietro, De Santis, Fortini & Blasi hoc loco; *Phleo ambigui-Bromion erecti* Biondi & Blasi *ex* Biondi, Ballelli Allegrezza et Zuccarello 1995; *Poo violaceae-Nardetum strictae festucetosum circummediterraneae* Biondi, Ballelli, Allegrezza, Taffetani, Frattaroli, Guitian & Zuccarello 1999; *Poo violaceae-Nardetum strictae* Pedrotti 1983; *Potentillo rigoanae—Brachypodietum genuensis* Lucchese, Persia & Pignatti 1995; *Potentillo rigoanae-Festucetum paniculatae* Bonin 1978 corr. In Di Pietro, De Santis, Fortini & Blasi hoc loco; *Potentillo-Festucetum hypericetosum richerii* Di Pietro, De Santis, Fortini & Blasi subass. nov.; *Potentillo-Festucetum* subass. «*typicum*» Bonin 1978; *Ranunculo-Nardion* Bonin 1972; *Thlaspietea rotundifolii* Br.-Bl. 1948.

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