Plant Diversity of Pastures on the Family Farms in the Southern Part of Istria (Croatia)

Ivana VITASOVIĆ KOSIĆ
Mihaela BRITVEC (✉)

Summary

Autochthonous vascular pasture flora was researched at the localities of three family owned farms which breed sheep, situated on the south part of Istria (Croatia). During research conducted in 2003 and 2004, a total of 330 plant taxa (302 species, 27 subspecies and one variety) were found. The taxa belonged to 197 genera and 44 families. The most dominant families are: *Asteraceae* with 57 species and three subspecies, followed by *Fabaceae* with 38 species, six subspecies and one variety, and *Poaceae* with 41 species and one subspecies. According to analysis of life forms, the most numerous are hemicryptophytes (48.48%). Relatively high presence of therophytes (34.24%) suggesting the great influence of the eumediterranean zone. Phytogeographical analysis has shown that the most pasture plants belong to the Mediterranean floral element (33.64%), followed by Euro-Asiatic floral element (23.94%) and widespread plants (16.67%).

Key words

autochthonous vascular pasture flora, family farm, Istria, Croatia

University of Zagreb , Faculty of Agriculture, Department of Agricultural Botany
Svetošimunska 25, 10000 Zagreb, Croatia
✉ e-mail: mbritvec@agr.hr

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Introduction

It is necessary to study the pasture flora as an important factor upon which livestock production depends. In spite of many researches of flora in Croatia recent reference data there are few studies of pasture flora in Istria (Šegulja 1969, Šugar 1984, Kaligarič 1997, Starmühler 1998, 1999, 2000, 2001, 2002, 2003a, 2003b, 2005, Topić & Šegulja 2000, Pericin 2001, Alegro 2003, Bernhardt & Britvec 2005). It is also important to note that systematic research of pasture flora on family farms in the Adriatic region has been insufficiently studied to date (Britvec et al. 2005, Šugar et al. 2005, Vitasović Kosić & Britvec 2005, 2006, Vitasović Kosić 2006, Vitasović Kosić et al. 2006).

The objective of this study is to establish the composition and to analyse the autochthonous vascular flora of pastures on family-owned agricultural farms on the south part of Istria.

Area of investigation

The research localities are situated at the south of the Istrian Peninsula. The vascular pasture flora was researched at the locality of three familis owned sheep-raising farms: family farm near St. Grgur (Macan family) - 45° 00' 46" N, 13° 50' 51" E, family farm near Krnica (Percan family) - 44° 58' 32" N, 14° 01' 26" E, and family farm near Jadreški (Damjanić family) - 44° 52' 16" N, 13° 55' 13" E (Fig. 1.). The researched family farms varied in altitude from 58-78 m above sea level (Jadreški) to 172–199 m above sea level (St. Grgur and Krnica).

The localities Krnica and Jadreški have a Cs climate type – typical Mediterranean climate, while the area of St. Grgur is on the boundary of a Cfa climate - moderately humid with hot summers (Filipčić 1992). The soil type is flat, typical anthropologic red soil on the localities Krnica and Jadreški, and St. Grgur typical flat, gravelly brown soil, besides the swallow where the soil is deeper. The bedrock consists of limestone. The researched pastures in Krnica and Jadreški are table. Pastures in St. Grgur are slightly hilly with 3-8% inclination, and have a few larger swallows.

The researched family farms varied in size from 10 to 13 ha. Each family farm had about 100 sheep, which are used for milk and cheese production.

Material and methods

Our research of the autochthonous vascular pasture flora in Istria included field work as well as the analysis of herbarium specimens. Field research was carried out from April to October 2003 and 2004. The taxa of families, genera, species and subspecies are presented in alphabetical order in the list of flora. The plants were determined using standard flora keys (Tutin et al. 1968-1993, Pignatti 2002). The nomenclature was adjusted according to Tutin et al. (1968-1993), Nikolić et al. (1994, 1997, 2000), Hršak (2001) and Bogdanović & Nikolić (2004). The analysis of life forms was made according to Pignatti (2002). The flora list uses abbreviations of the life forms that precede the names of taxa: Ch - Chamaephyta, G - Geophyta, H - Hemicryptophyta, P - Phanerophyta, and T - Therophyta.

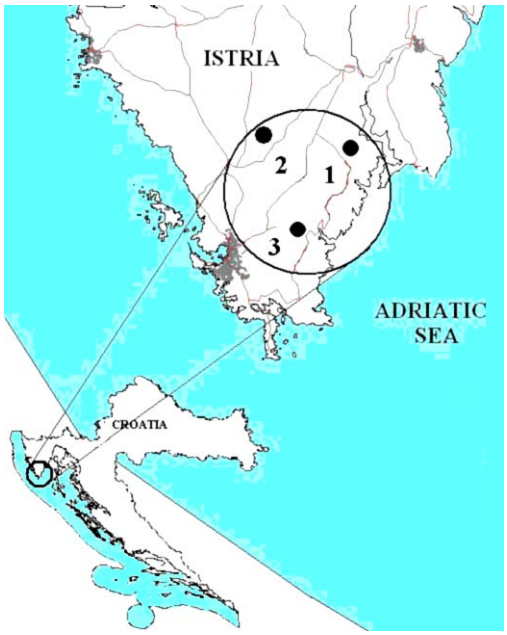

Figure 1.
Area of investigation: Istrian Peninsula with localities of the family farms (Krnica - 1, St. Grgur - 2, and Jadreški - 3)

The following abbreviations are used to designate the species, subspecies and varieties to a specific floral element (in the flora list after the names of taxa): Mediterranean floral element (m), South European floral element (se), East European-Pontic floral element (eaep), European floral element (e), Central European floral element (ce), Euro-Asiatic floral element (ea), Circum-Holartic spread plants (cirh), Widespread plants (wp), and Adventive and cultivated plants (adv).

The localities of the family farms (marked with number) are given after the floral element (1 - Krnica, 2 - St. Grgur, 3 - Jadreški).

Threatened plants of pasture flora in the south part of Istria were analysed according to Nikolić & Topić (2005).

Results

A total of 330 plant taxa (species, subspecies and varieties) of autochthonous vascular pasture flora were found on Istrian Krnica, St. Grgur and Jadreški family farms (Tab. 1). The results of the taxonomical and ecological analysis are presented in Table 1, 2 and Figure 2.

Table 1. Floristic list of vascular pasture flora of the family farms in the south part of Istria (Krnica - 1, St. Grgur – 2, and Jadreški - 3)

Life form	Taxa	Floral element	Locality of family farm
	ANGIOSPERMAE		
	DICOTYLEDONES		
	AMARANTHACEAE		
T	*Amaranthus albus* L.	adv	3
	APIACEAE		
T	*Bupleurum baldense* Turra	m	1
H	*Daucus carota* L.	ea	1, 3
H	*Eryngium amethystinum* L.	m	1
H	*E. campestre* L.	m	2
H	*Foeniculum vulgare* Mill.	m	1
T	*Orlaya grandiflora* (L.) Hoffm.	ce	1, 2
H	*Seseli tortuosum* L.	m	3
T	*Tordylium apulum* L.	m	1, 2, 3
T	*Turgenia latifolia* (L.) Hoffm.	m	1, 3
	ASTERACEAE		
H	*Achillea millefolium* L.	ea	1, 2, 3
H	*A. virescens* (Fenzl) Heimerl	m	1
T	*Anthemis arvensis* L.	m	1, 2
H	*Arctium lappa* L.	ea	1, 2, 3
Ch	*Artemisia campestris* L.	cirh	1
H	*A. vulgaris* L.	wp	1, 3
H	*Bellis perennis* L.	ce	1, 2, 3
T	*Bombycilaena erecta* (L.) Smoljan.	ea	2
H	*Buphthalmum salicifolium* L.	se	2, 3
H	*Carduus nutans* L.	ea	3
H	*C. pycnocephalus* L.	m	1, 2, 3
H	*Carlina corymbosa* L.	m	1, 2
T	*Carthamus lanatus* L.	m	1
T	*Centaurea cyanus* L.	m	1, 2
H	*C. jacea* L.	ea	1, 3
T	*C. solstitialis* L.	se	2, 3
H	*C. spinosociliata* Seenus subsp. *tommasinii* (A. Kern.) Dostál	m	1
H	*C. triumfetti* All.	e	2
T	*Chamomilla recutita* (L.) Rauschert	wp	1, 3
H	*Chondrilla juncea* L.	ea	1
H	*Cichorium intybus* L.	wp	1, 3
G	*Cirsium arvense* (L.) Scop.	ea	1, 2
G	*C. vulgare* (Savi) Ten.	ea	2
T	*Conyza canadensis* (L.) Cronquist	adv	3
H	*Crepis biennis* L.	ce	1, 3
T	*C. capillaris* (L.) Wallr.	ce	1, 3
T	*C. neglecta* L.	m	1, 2, 3
H	*C. sancta* (L.) Babc.	m	1, 2, 3
T	*Crupina vulgaris* Cass.	ea	2, 3
H	*Echinops ritro* L.	se	1
T	*Erigeron annuus* (L.) Pers.	adv	1
T	*Filaginella uliginosa* (L.) Opiz	ea	1, 2
T	*Filago pyramidata* L.	m	1, 2
T	*F. vulgaris* Lam.	wp	1, 3
Ch	*Helichrysum italicum* (Roth) G.Don	m	1, 3
H	*Hieracium pilosella* L.	ea	2, 3
H	*Hyoseris radiata* L.	m	2
H	*Hypochoeris radicata* L.	ce	1, 3
H	*Inula hirta* L.	ea	2
H	*I. spiraeifolia* L.	m	1
H	*Jurinea mollis* (L.) Rchb.	se	2, 3
T	*Lactuca serriola* L.	wp	3
T	*Lapsana communis* L.	ea	3
H	*Leontodon crispus* Vill.	m	2, 3
H	*L. tuberosus* L.	m	2
H	*Leucanthemum vulgare* Lam.	ea	1, 2, 3
T	*Matricaria perforata* Mérat	wp	1
T	*Picris echioides* L.	m	1, 2, 3
Ch	*Reichardia picroides* (L.) Roth	m	1, 2
H	*Scolymus hispanicus* L.	m	1, 2, 3
H	*Scorzonera laciniata* L.	m	2, 3
H	*S. villosa* Scop.	m	1, 2, 3
T	*Senecio vulgaris* L.	wp	3
H	*Sonchus arvensis* L.	ea	1, 3
H	*Taraxacum* Sect. *Erythrosperma* Dahlst. *fulvum* group	se	1, 2, 3
H	*T. officinale* Weber	cirh	1, 2, 3
H	*Tragopogon porrifolius* L.	m	1
H	*T. porrifolius* L. subsp. *porrifolius*	m	1
H	*T. pratensis* L. subsp. *orientalis* (L.) Čelak.	ea	1, 2
T	*Urospermum picroides* (L.) Scop. ex F.W.Schmidt	m	1
	BORAGINACEAE		
T	*Myosotis ramosissima* Rochel	ea	1, 2, 3
	BRASSICACEAE		
T	*Arabidopsis thaliana* (L.) Heynh.	wp	1
T	*Arabis hirsuta* (L.) Scop.	wp	2
H	*Biscutella laevigata* L.	m	1
T	*Brassica napus* L. subsp. *oleifera* (DC.) Janch.	adv	3
Ch	*B. oleracea* L.	adv	1
T	*Calepina irregularis* (Asso) Thell.	ea	2
T	*Camelina sativa* (L.) Crantz	m	1
T	*Capsella bursa-pastoris* (L.) Medik.	wp	1, 2, 3
T	*C. rubella* Reut.	m	1, 3
H	*Cardamine hirsuta* L.	wp	2
H	*Cardaria draba* (L.) Desv.	wp	1
T	*Diplotaxis muralis* (L.) DC.	wp	1
T	*Lepidium campestre* (L.) R. Br.	ea	1, 3
T	*Myagrum perfoliatum* L.	adv	2
T	*Raphanus sativus* L.	adv	3
T	*Rapistrum rugosum* (L.) All. subsp. *rugosum*	m	3
H	*Rorippa austriaca* (Crantz) Besser	m	1
T	*Sinapis alba* L.	m	3
T	*Sisymbrium officinale* (L.) Scop.	wp	1, 3
T	*Thlaspi arvense* L.	ea	1
	CAMPANULACEAE		
H	*Campanula rapunculus* L.	ea	1, 2, 3
T	*C. sibirica* L.	ea	1
T	*Legousia speculum-veneris* (L.) Chaix	se	1, 3
	CARYOPHYLLACEAE		
T	*Arenaria serpyllifolia* L.	wp	1
H	*Cerastium fontanum* Baumg. subsp. *vulgare* (Hartman) Greuter et Burdet	cirh	2
T	*C. glomeratum* Thuill.	wp	3
Ch	*C. tomentosum* L.	m	1, 2
H	*Dianthus carthusianorum* L.	m	1, 2, 3
H	*D. ferrugineus* Miller subsp. *liburnicus* (Bartl.) Tutin	m	1, 3
H	*D. sylvestris* Wulfen in Jacq. subsp. *tergestinus* (Reichenb.) Hayek	m	1, 2, 3
H	*Lychnis flos-cuculi* L.	ea	3
Ch	*Minuartia verna* (L.) Hiern subsp. *collina* (Neilr.) Domin.	ea	2
H	*Petrorhagia saxifraga* (L.) Link	m	1, 2
T	*Scleranthus annuus* L.	wp	2, 3
T	*Silene gallica* L.	wp	1, 3
H	*S. latifolia* Poir. subsp. *alba* (Mill.) Greuter et Burdet	ea	1, 3
H	*S. nutans* L.	ea	3
H	*S. vulgaris* (Moench.) Garcke subsp. *angustifolia* Hayek	m	1
T	*Stellaria media* (L.) Vill.	wp	1, 2
	CHENOPODIACEAE		
T	*Chenopodium album* L.	wp	1, 3
T	*C. hybridum* L.	wp	1

	CISTACEAE		
P	*Cistus incanus* L.	m	2
P	*C. salvifolius* L.	m	1, 2, 3
Ch	*Fumana ericoides* (Cav.) Gand.	m	2
Ch	*F. procumbens* (Dunal) Gren. et Godr.	m	1
Ch	*Helianthemum nummularium* (L.) Mill.	se	1, 2
T	*H. salicifolium* (L.) Mill.	m	2
	CONVOLVULACEAE		
H	*Convolvulus althaeoides* L. subsp. *tenuissimus* (Sibth. et Sm.) Stace	m	1, 2, 3
G	*C. arvensis* L.	ea	1, 2, 3
H	*C. cantabrica* L.	m	2, 3
	CRASSULACEAE		
Ch	*Sedum acre* L.	e	1, 2
	DIPSACACEAE		
H	*Knautia arvensis* (L.) Coult.	ea	1
H	*K. integrifolia* (L.) Bertol.	m	2
H	*Scabiosa columbaria* L.	ea	1
	ERICACEAE		
Ch	*Calluna vulgaris* (L.) Hull	e	2
P	*Erica arborea* L.	m	1, 2
	EUPHORBIACEAE		
Ch	*Euphorbia amygdaloides* L.	e	1
H	*E. cyparissias* L.	ce	1, 2, 3
T	*E. helioscopia* L.	wp	1
Ch	*E. nicaeensis* All.	m	1, 2, 3
	FABACEAE		
H	*Anthyllis vulneraria* L.	m	1, 2
H	*A. vulneraria* L. subsp. *rubiflora* (DC.) Arcang.	m	2, 3
Ch	*Coronilla coronata* L.	se	3
H	*C. cretica* L.	se	1, 3
H	*C. varia* L.	cirh	2
Ch	*Dorycnium hirsutum* (L.) Ser.	m	2, 3
Ch	*D. pentaphyllum* Scop. subsp. *germanicum* (Gremli) Gams	se	1
Ch	*D. pentaphyllum* Scop. subsp. *herbaceum* (Vill.) Rouy	se	2
Ch	*Genista germanica* L.	e	2
P	*G. tinctoria* L.	ea	2
Ch	*Hippocrepis comosa* L.	ce	2
T	*Lathyrus aphaca* L.	m	3
T	*L. cicera* L.	m	1, 2
H	*L. latifolius* L.	se	1, 2, 3
G	*L. niger* (L.) Bernhardt	e	3
G	*L. tuberosus* L.	ea	1, 3
H	*Lotus corniculatus* L.	ea	1, 2, 3
H	*L. corniculatus* L. var. *hirsutus* Rothm.	ea	1, 2
T	*Medicago arabica* (L.) Huds.	m	1, 2, 3
T	*M. lupulina* L.	ea	2
T	*M. minima* (L.) Bartal.	ea	1, 2, 3
T	*M. orbicularis* (L.) Bartal.	m	1, 2, 3
H	*M. prostrata* Jacq.	se	2
H	*M. sativa* L.	wp	1, 2, 3
H	*M. sativa* L. subsp. *falcata* (L.) Arcang.	ea	2, 3
T	*Scorpiurus muricatus* L.	m	1, 2
T	*Securigera securidaca* (L.) Degen & Dörfler	m	3
T	*Trifolium angustifolium* L.	m	1, 2, 3
T	*T. campestre* Schreber	ea	1, 2, 3
T	*T. dubium* Sibth.	ea	2
T	*T. incarnatum* L.	m	3
H	*T. montanum* L.	se	2
T	*T. nigrescens* Viv.	m	3
H	*T. ochroleucon* Huds.	m	1, 2
T	*T. pallidum* Waldst. et Kit.	m	2
H	*T. pratense* L.	ea	1, 3
Ch	*T. repens* L.	wp	1, 2, 3
H	*T. rubens* L.	ce	2, 3
T	*T. stellatum* L.	m	1, 2
H	*Vicia cracca* L.	cirh	2, 3
H	*V. grandiflora* Scop.	m	1, 3
T	*V. sativa* L.	ea	2, 3
T	*V. sativa* L. subsp. *nigra* (L.) Ehrh.	ea	1
H	*V. sepium* L.	ea	1
T	*V. villosa* Roth subsp. *varia* (Host) Corb.	se	1, 3
	GENTIANACEAE		
H	*Centaurium erythraea* Rafn subsp. *erythraea*	ea	2, 3
T	*C. pulchellum* (Sw.) Druce	wp	2
	GERANIACEAE		
T	*Erodium cicutarium* (L.) L´Hér.	wp	1
T	*Geranium dissectum* L.	wp	2
T	*G. molle* L.	wp	2, 3
T	*G. purpureum* Vill.	se	1, 2, 3
H	*G. robertianum* L.	wp	1, 2, 3
	HYPERICACEAE		
H	*Hypericum perforatum* L.	ea	1, 2, 3
	LAMIACEAE		
H	*Ajuga genevensis* L.	ea	2
H	*Ballota nigra* L.	se	2, 3
H	*Calamintha nepeta* (L.) Savi	se	1, 2, 3
H	*C. sylvatica* Bromf. subsp. *ascendens* (Jord.) P.W.Ball	e	1
H	*Clinopodium vulgare* L.	wp	1
T	*Lamium amplexicaule* L.	ea	3
H	*L. maculatum* L.	ea	3
T	*L. purpureum* L.	ea	1, 3
H	*Marrubium incanum* Desr.	m	1, 2, 3
H	*M. vulgare* L.	wp	1
H	*Melissa officinalis* L.	se	1
H	*Melittis melissophyllum* L.	e	1
H	*Mentha arvensis* L.	wp	1, 3
H	*M. longifolia* (L.) Hudson	wp	1, 3
H	*M. pulegium* L.	m	1, 3
H	*Prunella laciniata* (L.) L.	m	1, 2
Ch	*Salvia officinalis* L.	m	3
Ch	*S. pratensis* L.	m	1, 2, 3
Ch	*Satureja montana* L.	m	2
Ch	*S. montana* L. subsp. *variegata* (Host) P. W. Ball	m	2
T	*Stachys annua* (L.) L.	wp	1
H	*S. recta* L. subsp. *subcrenata* (Vis.) Briq.	m	1, 2
Ch	*Teucrium chamaedrys* L.	se	1
Ch	*T. montanum* L.	se	2
Ch	*T. polium* L.	m	1, 2
Ch	*T. polium* L. subsp. *capitatum* (L.) Arcang.	m	2, 3
Ch	*Thymus serpyllum* L.	e	1, 2, 3
	LINACEAE		
H	*Linum bienne* Mill.	se	3
T	*L. tenuifolium* L.	se	1, 3
	MALVACEAE		
T	*Althaea hirsuta* L.	m	1, 2
H	*Malva sylvestris* L.	ea	1, 3
	OROBANCHACEAE		
G	*Orobanche lutea* Baumg.	ce	2
T	*O. minor* Sm.	ea	2
	OXALIDACEAE		
T	*Oxalis corniculata* L.	wp	1
	PAPAVERACEAE		
T	*Fumaria officinalis* L.	wp	3
T	*Papaver argemone* L.	m	1, 2, 3
T	*P. rhoeas* L.	wp	1, 2, 3
	PLANTAGINACEAE		
H	*Plantago holosteum* Scop.	eaep	2, 3
H	*P. lanceolata* L.	ea	1, 2, 3
H	*P. major* L.	wp	1, 2, 3

	PLUMBAGINACEAE		
Ch	*Plumbago europaea* L.	m	1
	POLYGALACEAE		
H	*Polygala nicaeensis* Risso ex Koch	m	1
H	*P. vulgaris* L.	ea	2
	POLYGONACEAE		
H	*Rumex acetosa* L.	cirh	1, 2, 3
H	*R. acetosella* L.	wp	1
H	*R. crispus* L.	wp	1, 3
H	*R. pulcher* L.	se	1, 2
	PORTULACACEAE		
T	*Portulaca oleracea* L.	wp	1
	PRIMULACEAE		
G	*Cyclamen repandum* Sibth. et Sm.	m	3
H	*Lysimachia nummularia* L.	ea	2
	RANUNCULACEAE		
T	*Nigella damascena* L.	m	3
H	*Ranunculus acris* L.	wp	1, 2, 3
T	*R. arvensis* L.	wp	1
G	*R. ficaria* L.	e	1, 2
H	*R. lanuginosus* L.	ea	1, 2
T	*R. muricatus* L.	m	3
	RESEDACEAE		
H	*Reseda lutea* L.	wp	1
	ROSACEAE		
H	*Filipendula vulgaris* Moench	ea	1, 2
H	*Fragaria vesca* L.	wp	2
H	*Geum urbanum* L.	cirh	3
H	*Potentilla cinerea* Chaix ex Vill.	se	2
H	*P. micrantha* Ramond ex DC.	m	1
H	*P. reptans* L.	ea	2
P	*Rubus caesius* L.	ea	1
H	*Sanguisorba minor* Scop.	ea	1, 2
H	*S. minor* Scop. subsp. *muricata* Briq.	ea	1
	RUBIACEAE		
Ch	*Asperula aristata* L.f.	se	2
H	*A. cynanchica* L.	m	1
T	*Galium aparine* L.	wp	1
H	*G. mollugo* L.	m	1, 2
H	*G. odoratum* (L.) Scop.	ea	1
H	*G. verum* L.	ea	3
T	*Sherardia arvensis* L.	m	2, 3
	SCROPHULARIACEAE		
T	*Rhinanthus alectorolophus* (Scop.) Pollich	ce	1
H	*Scrophularia heterophylla* Willd. subsp. *laciniata* (Waldst. et Kit.) Maire et Petitm.	m	1, 2
T	*S. peregrina* L.	se	3
H	*Verbascum chaixii* Vill.	ea	1
H	*V. densiflorum* Bertol.	e	1
Ch	*Veronica chamaedrys* L.	ea	3
	VERBENACEAE		
H	*Verbena officinalis* L.	wp	1
	VIOLACEAE		
H	*Viola reichenbachiana* Jord. ex Boreau	ea	2
H	*V. tricolor* L.	e	2, 3
	MONOCOTYLEDONEAE		
	AMARYLLIDACEAE		
G	*Galanthus nivalis* L.	ea	1
	CYPERACEAE		
G	*Carex flacca* Schreb.	e	1, 2, 3
G	*C. flacca* Schreb. subsp. *serrulata* (Biv.) Greuter	e	2, 3
G	*C. hirta* L.	e	2
H	*C. spicata* Huds.	ea	1
H	*Schoenus nigricans* L.	wp	3
	IRIDACEAE		
G	*Crocus biflorus* Mill.	ea	2
	JUNCACEAE		
H	*Luzula multiflora* (Retz.) Lej.	m	1, 2
	LILIACEAE		
H	*Allium ampeloprasum* L.	m	1, 3
H	*A. saxatile* M. Bieb.	m	3
H	*Asparagus acutifolius* L.	se	1, 2
H	*A. officinalis* L.	m	1, 2, 3
H	*Colchicum autumnale* L.	e	2
H	*C. neapolitanum* (Ten.) Ten.	se	2
H	*Muscari botryoides* (L.) Mill.	m	1, 3
H	*M. comosum* (L.) Mill.	m	1, 2
H	*Ornithogalum pyramidale* L.	ea	1, 2
P	*Ruscus aculeatus* L.	m	2, 3
	ORCHIDACEAE		
G	*Anacamptis pyramidalis* (L.) Rich.	m	2
G	*Orchis morio* L.	ea	2, 3
G	*O. tridentata* Scop.	m	2
G	*Spiranthes spiralis* (L.) Chevall.	e	2
	POACEAE		
T	*Aegilops neglecta* Req. ex Bertol.	m	1, 2
T	*A. triuncialis* L.	m	1
G	*Agrostis stolonifera* L.	wp	1
T	*Aira elegantissima* Schur	m	1, 2
H	*Anthoxanthum odoratum* L.	ea	1, 2, 3
H	*Arrhenatherum elatius* (L.) J.Presl et C.Presl	e	1
T	*Avena fatua* L.	se	1, 3
T	*A. sativa* L.	adv	1, 3
T	*A. sterilis* L.	se	1
H	*Brachypodium sylvaticum* (Huds.) P.Beauv.	ea	1, 2
T	*Briza maxima* L.	wp	1, 2
H	*B. media* L.	ea	1, 2
H	*Bromus erectus* Huds.	wp	1, 2
H	*B. inermis* Leyss.	m	1, 2, 3
T	*B. madritensis* L.	m	1, 2, 3
T	*B. sterilis* L.	wp	1, 3
H	*Chrysopogon gryllus* (L.) Trin.	m	1, 2, 3
H	*Cynodon dactylon* (L.) Pers.	wp	2
T	*Cynosurus echinatus* L.	m	1
H	*Dactylis glomerata* L.	ea	1, 2
H	*D. glomerata* L. subsp. *hispanica* (Roth) Nyman	m	1
H	*Dasypyrum villosum* (L.) P.Candargy	ea	1, 2, 3
T	*Desmazeria rigida* (L.) Tutin	m	1, 3
G	*Elymus repens* (L.) Gould	cirh	1, 2
H	*Festuca ovina* L.	ce	1, 2
H	*F. pseudovina* Hack. ex Wiesb.	e	2
H	*Holcus lanatus* L.	cirh	1, 2
T	*Hordeum bulbosum* L.	wp	1, 2, 3
T	*H. murinum* L.	wp	1, 3
H	*Koeleria splendens* C.Presl	m	1, 2
T	*Lagurus ovatus* L.	m	2, 3
T	*Lolium multiflorum* Lam.	m	1, 3
H	*L. perenne* L.	cirh	1, 2, 3
T	*Lophochloa cristata* (L.) Hyl.	ea	1
H	*Phleum pratense* L.	ce	1
H	*Poa bulbosa* L.	ea	3
T	*P. pratensis* L.	cirh	1, 2, 3
H	*P. trivialis* L.	ea	3
H	*Secale cereale* L.	adv	3
T	*Setaria viridis* (L.) P.Beauv.	ea	1
T	*Vulpia ciliata* Dumort.	se	3
T	*V. myuros* (L.) C.C.Gmelin	se	1, 2

The pasture flora that was explored included 44 families, 197 genera, 302 species, 27 subspecies and one variety (Tab. 1). The most dominant group is *Dicotyledones* (*Magnoliatae*) with 266 species, subspecies and variety, followed by *Monocotyledones* (*Liliatae*) with 64 species and subspecies. Plants from *Pteridophyta* group were

Table 2. Analysis of quantity of taxa by localities of the family farms Krnica, St. Grgur, and Jadreški

Taxa / Locality	Family		Genus	Species	Subspecies	Variety
	Dicotyledones	*Monocotyledones*				
Krnica	32	5	146	197	16	1
St. Grgur	29	6	120	166	14	1
Jadreški	27	4	105	146	12	-

not found. The most dominant families are: *Asteraceae* (20.00%) with 57 species and three subspecies, followed by *Fabaceae* (15.00%) with 38 species, six subspecies and one variety, and *Poaceae* (14.00%) with 41 species and one subspecies. Other families are represented with a smaller number of taxa. Analysis of quantity of taxa by localities of researched family farms showed that the flora of the Krnica family farm had the most species (197) and subspecies (16) (Tab. 1, 2).

According to the spectrum of life forms, the most numerous life forms are hemicryptophytes (48.48%), followed by therophytes (34.24%) (Fig. 2).

Phytogeographical analysis (Tab. 1) has shown that most plants of the total number of registered species belong to the Mediterranean floral element (33.64%), followed by Euro-Asiatic floral element (23.94%) and widespread plants (16.67%).

On the researched area we determined the presence of *Papaver argemone* L., critically endangered plant of Croatian flora (CR) and *Orchis tridentata* Scop., vulnerable plant of Croatian flora (VU). We also established presence of two endemic plants: *Achillea virescens* (Fenzl) Heimerl and *Anthyllis vulneraria* L. subsp. *rubiflora* (DC.) Arcang.

Discussion

In the pastures of the Krnica, St. Grgur and Jadreški family farms in Istria, 330 autochthonous vascular plants (302 species, 27 subspecies and one variety) from 197 genera and 44 families were found. Most plants belong to the *Asteraceae*, *Fabaceae* and *Poaceae* families.

Taxonomic analysis showed that the flora of the Krnica farm comprises 197 species. According to Krebs (1989), the largest species richness is where the number of species is the largest. Since the pastures of the Krnica farm have 25.89% more species than the pasture flora of the Jadreški farm, and 15.74% more species than the pasture flora of the St. Grgur farm, it can be concluded that the Krnica farm pastures are habitats that contribute to the plant diversity of Istria and Croatia.

Phytogeographical analysis showed that the majority of plants on all three farms belong to the Mediterranean floral element (33.64%). Accordingly, the investigated pasture flora can be characterized as Mediterranean.

The domination of hemicryptophytes (48.48%) on all farms is typical for pasture flora. A relatively high proportion of therophytes (34.24%) shows the great influence of the eumediterranean zone. The abundance of geophytes indicates a floristically rich spring aspect of the studied pastures.

Until recently, several of the study grasslands were plough lands. This is evident in the relatively high composition (12.84%) of the grasses (*Poaceae*) and the presence of weed species (*Centaurea cyanus* L., *Ranunculus arvensis* L. and *Legousia speculum-veneris* (L.) Chaix). Furthermore, the presence of nitrophylous (*Marrubium incanum* Desr., *Marrubium vulgare* L. and *Lamium purpureum* L.) and prickly species (*Carduus*, *Carlina*, *Cirsium* genera) was recorded. On all farms, plants that are potentially poisonous as cattle fodder were observed: *Euphorbia cyparissias* L. and *Euphorbia nicaeensis* All. (Forenbacher 1998).

On the researched family farms, we established the presence of a critically endangered plant of the Croatian flora (CR): *Papaver argemone* L., and one vulnerable plant of the Croatian flora (VU): *Orchis tridentata* Scop. Also, two endemic plants were identified: *Achillea virescens* (Fenzl) Heimerl and *Anthyllis vulneraria* L. subsp. *rubiflora* (DC.) Arcang.

These data point out the high level of plant diversity and floristic importance of the studied pastures in the southern part of Istria, situated on the boundary of the sub- and eu-Mediterranean vegetation zones. These pastures are habitats which substantially enrich the plant and landscape diversity in Croatia. In order to conserve plant diversity, it is primarily necessary to sustain these pastures through grazing and/or mowing.

Conclusion

The autochthonous vascular pasture flora was researched at the locality of three family owned farms that breed sheep, situated in the southern part of the Istrian Peninsula.

On the family farms Krnica, St. Grgur and Jadreški, a total of 330 plant taxa (302 species, 27 subspecies and one

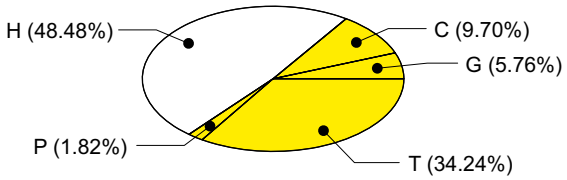

Figure 2.
Spectrum of life forms of the pasture flora from the family farms (Ch - Chamaephyta, G - Geophyta, H - Hemicryptophyta, P - Phanerophyta, T - Therophyta)

variety) were found. The taxa belonged to the 44 families and 197 genera. The majority are *Asteraceae*, followed by *Fabaceae* and *Poaceae*. It should also be noted that pasture flora on the locality of the Krnica family farm has the highest species richness.

The analysis of the biological spectrum of the pasture flora indicated a domination of hemicryptophytes (48.48%), which is characteristic for pasture flora, and the relatively high presence of therophytes (34.24%) suggesting the great influence of the eumediterranean zone.

According to phytogeographical analysis, most plants belong to the Mediterranean floral element (33.64%), followed by the Euro-Asiatic floral element (23.94%) which suggests the Mediterranean character of pasture flora of the investigated area.

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