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Relationship between the Names of People and Enterprises with Plant Origin with Phytotoponyms in Five Croatian Regions

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A B S T R A C T

In this study, the first and last names of people (FN and LN), enterprises (EN) (with plants' species roots in their names) and phytotoponyms (PT) in five Croatian regions are analyzed, in their relationships. The goals of the study were: to determine the correlations between FN, LN, EN and PT; to determine the latent structure of these variables; to forecast number of PT (criterion) on the base of predictors (FN, LN, EN); to determine grouping of the places (within certain regions) as cases by two plants' categorizations; to determine grouping of the plants as cases by regions. We have analyzed 15 places, grouped in five regions, with 39 different plant species. The results revealed that the only principal component highly positively correlated with the variables last name and office name, while the projections for the variables first name (moderate high) and phytotoponyms (low size) were negative. Prediction of the criteria phytotoponyms is satisfactorily good, using three predictors: last name, first name and the office name. First cluster analysis revealed that phytotoponyms are mostly related with trees and deciduous plants, while names are related with trees, deciduous and herbaceous plants. Second cluster analysis obtained clear distinction between regions in dominant PTs, based on certain plants' names. The results indicate clear association between phytotoponyms and names of people.

Key words: *correlation, nonlinear methods, plant species, regions*

Introduction

The interactive association (on both the material and symbolic level) among humans and plants have the roots from far history. This interaction could be perceived on different levels, and one of these levels are the names used by people, in their continuous efforts to define the objects in their environment and surrounding. The results of the study conducted by Čargonja, Đaković & Alegro[1] in five Croatian geographic regions, show that toponyms (in which the names of the plants can be recognized), represent both local climazonal vegetation of an area and ethno-linguistic and socio-cultural motives, obvious in the lives of the people in these regions. Therefore, cultural and historical heritage in a certain geographical space could be studied considering the relationship between first and last names of people (FN and LN), enterprises (EN) (with plants' origins) and names for settlements and other geographical objects (toponyms) in which plant names were recognized (hereinafter phytotoponyms (PT)), what is the issue of this article.

More or less purposeful naming the places where someone live is important to »mark« or/and appropriate a certain territory[2]. The toponymy could be a practical mindframe for considering particular sociocultural contexts, as well to investigate the interaction between societies and environment[3,4]. The toponyms provide valuable information for research, including linguistics, geography, history and ethnology[5]. Plants are very useful for this purpose, for example when studying spatial distribution of the phytotoponyms in Bretagne[2]. There are also other studies that describe ethnobotany issues, linked with phytotoponyms, among which some are presented here. In ethnobotanical project conducted in the western section of the province of Granada, in southern Spain, a study was made of place names derived from names related to plants (phytotoponyms and synphytotoponyms). A total of 98 plant species

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were found in as many as 593 place names in this area[6]. Phytotoponymy of the Iglesiente area in southwestern Sardinia, with 526 plant place names are mostly written in Campidanese dialect and refer to plants frequently found in the territory[7]. In their study, the most often plants in the place names are trees (51 %) and shrubs (11 %), spontaneous and cultivated, while almost all names are given by the combination of plant names with morphological elements of the landscape, e.g. rivers (16 %), mountains and peaks (32 %)[7]. Interesting approach to the phytotoponyms is used by Hernández Arena[8], who has analyzed the social significance of the phytotoponyms, specifically in their relative relations to the ethnomedicine. The author presents the properties of the phytotherapeutics and the social representation concerning some plants, which names also were applied to the geographical nomenclature[8]. Semantic meanings and geographical features, of phytotoponyms in Western Hubei (China) are studied by Shi, Ren, Du & Gao[9]. The results of their study revealed that the most common plant names, recognizable in place names, are common plants with a close connection with daily life and positive moral features in Chinese culture. The occurrence of plant names reflected the characteristics of the plants of a city. Absolute vegetation coverage rate is higher in regions where phytotoponyms are most often, than those in non-phytotoponym areas[9].

The insight in the history of a particular geographical name can be reviewed by detailed onomastic studies of Croatian toponymy, such as are the studies like on the toponymy of one Croatian island[10,11]. For example, the toponymy of Split and its urban area extended on its natural peninsula was analyzed, according to their Roman origin[12]. The index of the toponyms of the Municipality of Selca included phytotoponyms and zootoponyms, which are derived directly from the flora or fauna, or only metaphorically (indirectly) related to a stem of a plant or a body of an animal[13].

In the Croatian territory dominant climazonal vegetation are forest communities: the most dominant genera are oak and birch. Both threes have the special role in human material and symbolic life of these areas. The motive behind the need of people of these areas to name their surroundings after plants. This motive is based also on the importance and distinguishing role that certain plant entertains in the local human living[1].

The study conducted by Čargonja et al.[1] included only the most obvious representations of a name of the plant in the name of a geographical object as given in the most comprehensive publication of the geographical maps of Croatia,[14] and it is limited on limited knowledge of the Croatian language (with numerous influences). The findings in the study of Čargonja et al.[1] confirmed the hypothesis that the genera of climazonal vegetation of particular area are the most represented among the phytotoponyms. The results revealed that in the names of human environment (i.e. phytotoponyms), several can be described by ethno-linguistic and socio-cultural motives. Therefore, ethnobotanic and ethnolinguistic studies should be important point of view when considering the history of certain area, as well as human environment.

However, the most of the abovementioned studies, in spite of their interesting and diverse issues that they are considering, are mostly descriptive, from the methodological point of view. Therefore, in this study »added value« could be given by using more sophisticated statistical methods. Namely, multivariate quantitative methods and techniques strengthen the indicative and predictive value of factors or variables and allow for cross-cultural comparison of data between and among different groups and communities[15]. There are five basic applications of these techniques: 1) data reduction or structural simplification; 2) sorting and grouping; 3) explaining relationships among variables; 4) prediction, and 5) testing of hypotheses[16]. However, choosing of the most appropriate methodology to achieve maximum results depends on the research objectives, as well as the type of study. The most of the relationships between biodiversity variables are nonlinear[17,18]. Nonlinear multivariate techniques could be regarded as two-step techniques. First step is the nonlinear transformation of variables into optimally scaled variables, while the second step is application of the multivariate analysis methods to the optimally scaled variables[15]. In this study, the combination of »classical« and nonlinear multivariate methods is used in researching certain aspects of the biodiversity.

The scope of this article is that using the list of plant species in the Croatian geographical names found by Čargonja et al.[1], associate these phytotoponyms by places and by plant species with chosen socio-cultural features which consist some plant-based name (first and last names of people, names of enterprises) in the investigated areas. Different methods used in statistical analyses will reflect the motivation of the local human populations to use plant-based names in names of the geographical objects and people.

Hence, the general goal of this research is to elaborate the application of the abovementioned nonlinear multivariate analyses (and a single linear one – cluster analysis) in exploring the relationships between first (FN) and last (LN) names of people, names of enterprises (EN) (which have plants' species roots in their names), with phytotoponyms (PT) in five Croatian regions. Specifically, the goals are several: to determine the correlations between FN, LN, EN and PT (1); to determine the latent structure of these variables (2); to forecast number of PT (criterion) on the base of predictors (FN, LN, EN) (3); to determine grouping of the places as cases by two plants' categorizations (4); to determine grouping of the plants as cases by regions (5).

Methods

Data sources

Phytotoponym sources are taken from Čargonja et al.[1], originally from Veliki atlas Hrvatske[14], a collection of geo-

graphical maps of Croatia in the scale 1:100000. In order to better present the biodiversity of local vegetation, five areas, each of approximately the same surface, the authors selected the main Croatian phytogeographic regions, with belonging number of phytotoponyms (total N_p=247) and number of plant species in the phytotoponyms (total N_{ps}=39): Đurđenovac, Valpovo, Osijek (N_p=51; N_{ps}=18); Ivanec, Novi Marof, Križevci (N_p=76; N_{ps}=23); Karlobag, Gospić, Korenica (N_p=43; N_{ps}=18); Vodice, Drniš, Vrlika (N_p=22; N_{ps}=11); Brač, Hvar, Korčula (N_p=55; N_{ps}=16). For the purpose of data analysis, number of plant species in the phytotoponyms by places (as the cases) are structured in first database, while the number of plant phytotoponyms by certain plant species (as the cases) are structured in second database.

Second source of data was T-com phone registry (http://imenik.tportal.hr/) for Croatia in 2014, from which number of first and last names of people with plant names' »roots« are found, together with the names of enterprises, with plant names' »roots«, too. Only plant species from the research of Čargonja et al.[1] are taken, as well as only places, which are chosen in certain regions, from the same study (as a secondary source of information).

Statistical analysis

The following methods have been used in order to assess the relationships between the names (first and last names of people and names of the office): Categorical Regression (CATREG), Categorical Principal Components Analysis (CATPCA), and K-means cluster Analysis (CA)[19]. Using nonlinear transformations in CATREG and CATPCA allow the variables to be analyzed at a variety of levels to find the best-fitting model[19]. CATREG is used instead of standard linear (multiple) regression analysis, with the same purposes, but it can deal with smaller samples of participants (in this case, entities). The goal of principal components analysis (PCA) is to reduce an original set of variables into a smaller set of uncorrelated components that represent most of the information found in the original variables[20]. The optimal scaling approach allows variables to be scaled at different levels. Categorical variables are optimally quantified in the specified dimensionality. As a result, nonlinear relationships between variables can be modeled[20]. For the majority of the statistical analyses used in this study, the first database is used (plant species in the phytotoponyms as cases by places as variables) (Table 1-4), while only in last analysis (Table 5), the second database is used (plant phytotoponyms in places as cases by certain plant species as variables).

Results

After performing all statistical analyses, following findings are obtained (Table 1).

TABLE 1
CATEGORICAL PRINCIPAL COMPONENT ANALYSIS (CATPCA) ON THE VARIABLES THAT DESCRIBE LAST NUMBER OF PHYTOTOPONYMS, NAMES OF PEOPLE AND OFFICE NAMES (WITH PLANTS' ROOTS IN NAME)

	First dimension
phytotoponyms	–.331
last name	.940
first name	–.602
office name	.816
Eigenvalue	2.021
Reliability (Cronbach's Alpha)	0.673

Legend: loadings with unique principal component

In Table 1, it could be observed that only principal component, obtained using CATPCA, showed high positive projections for two variables last name and office name, while the projections for the variables first name (moderate high) and phytotoponyms (low size) are negative. Hence, in Table 2 is obvious that moderate high correlations are found between the variables which negatively correlate with principal component (first name and phytotoponyms), as well as for those which positively correlate with principal component (last name and office name)(Table 2).

When forecasting number of phytotoponyms (criterion) on the base of names' variables (predictors) using multiple regression with the application of optimal scaling transformations (see Table 3), it could be observed that the prediction of the criteria phytotoponyms is satisfactorily good using three predictors: last name, first name and the office name. The first name of the people appeared as the strongest predictor, but it was not statistically significant, as well as the others.

TABLE 2
CORELATIONS OF TRANSFORMED VARIABLES IN CATEGORICAL PRINCIPAL COMPONENT ANALYSIS (CATPCA)

	phyto-toponyms	last name	first name	office name
phytotoponyms	1	–.187	.446**	.113
last name		1	.016	.567**
first name			1	–.013
office name				1
Dimension	1	2	3	4
Eigenvalue	1.580	1.453	.661	.307

Legend: only high and significant Spearman correlations with p<.01 are marked, together with highest eigenvalues

TABLE 3
FORECASTING NUMBER OF NUMBER OF PHYTOTOPONYMS (CRITERION) ON THE BASE OF NAMES' VARIABLES (PREDICTORS) BY OPTIMAL SCALING MULTIPLE REGRESSION

Predictors	Beta	F-test	Std. Error
last name	–.288	1.826	.250
first name	.539	1.086	.232
office name	.275	1.447	.223
Criterion – Phytotoponyms	R=0.639*; R^2=0.310; F (3, 18)= 4.138*		

Legend: **p< 0.01 *p< 0.05

TABLE 4
CLUSTER ANALYSIS (PHYTOTOPONYMS BY PLANT SPECIES AS CASES, PLACES AS VARIABLES) – GROUPING BACES BY TWO CATEGORIZATIONS OF PLANTS

Variables	Clusters	
	1	2
phytotoponyms	9.11	4.55
last name	101.74	570.55
first name	43.42	114.70
office name	34.58	131.00
Number of cases	19	20
herbaceous plants	2	6
bushy plants	4	4
trees	13	10
evergreen	2	3
deciduous	15	11
other	2	6

Cluster analyses are performed using two different principles: handling the first time with phytotoponyms by plant species as cases and places as variables (see Table 4) and second time handling by phytotoponyms in places as cases and plants as variables (see Table 5).

When grouping phytotoponyms by plant species as cases by places as variables (Table 4), labeled by two plants' categorizations, it could be observed that the distinctive characteristics of the first cluster are higher number of phytotoponyms, as well as lower number of names (first, last, office). Distinctive characteristics of the second cluster are lower number of phytotoponyms, as well as higher number of names (first, last, office). For the first plants' categorization, higher number of trees (with lower number of herbaceous plants) is the distinctive feature for the first cluster, while lower number of trees (with higher number of herbaceous plants) is distinctive feature for second cluster. For second plants' categorization, high-

TABLE 5
CLUSTER ANALYSIS (PHYTOTOPONYMS IN PLACES AS CASES; PLANT SPECIES AS VARIABLES) – GROUPING CASES BY REGIONS

	Cluster	
	1	2
oak	2.89	5.67
birch	0.33	4.00
hornbeam	1.11	1.67
elm	0.78	0.67
lime	0.44	1.33
willow	1.44	0.00
juniper	0.89	0.00
pine	0.67	0.50
ash	0.56	0.67
poplar	0.00	1.17
beech	0.44	0.50
cornelian cherry	0.33	0.67
olive	0.78	0.00
wine grape	0.22	0.83
maple	0.56	0.17
nettle	0.00	1.00
fig tree	0.67	0.00
strawberry	0.44	0.33
chestnut	0.00	0.83
walnut	0.00	0.83
hawthorn	0.00	0.67
pear	0.22	0.33
been	0.33	0.00
apple	0.00	0.33
yew	0.22	0.00
sweet cherry	0.00	0.33
burdock	0.00	0.17
privet	0.11	0.00
blackberry	0.11	0.00
hazel	0.11	0.00
raspberry	0.00	0.17
rose	0.11	0.00
reed	0.00	0.17
plum	0.00	0.17
sour cherry	0.00	0.17
Number of cases	9	6
Đurđenovac,Valpovo, Osijek	0	3
Ivanec, Novi Marof, Križevci	0	3
Karlobag, Gospić, Korenica	3	0
Vodice, Drniš, Vrlika	3	0
Brač, Hvar, Korčula	3	0

er number of deciduous plants (with lower number of other and evergreen plants) is the distinctive feature for the first cluster, while lower number of deciduous plants (with higher number of other and evergreen plants) is distinctive feature for second cluster.

When grouping phytotoponyms in certain places are used as cases, by plant species as the variables (Table 5), willow, juniper, elm, olive, pine and fig tree, appeared as the most distinctive representatives of the first cluster. On the other hand, oak, birch, hornbeam, lime, poplar and nettle are the most distinctive representatives of the second cluster. Cases (places) in regions Karlobag, Gospić, Korenica, then Vodice, Drniš, Vrlika and finally Brač, Hvar, Korčula are grouped in the first cluster, while (places) in region Đurđenovac,Valpovo, Osijek and in the region Ivanec, Novi Marof, Križevci are grouped in the second cluster.

Discussion and Conclusions

The key findings from this study revealed that the variables last name (LN) and office name (enterprises or EN) highly positively correlated, as well as the variables first name (FN) and phytotoponyms (PT). However, LN and EN negatively correlated with FN and PT. Three predictors (last name, first name and the office name) are satisfactorily predicted the phytotoponyms. The results of two cluster analyses indicate expected results. First cluster analysis indicate that PTs are mostly related with trees and deciduous plants, while people's names and ENs are related with trees, deciduous and herbaceous plants. In second cluster analysis, clear distinction between regions in the profiles of dominant PTs, based on certain plants' names, could be obvious. The results indicate clear association between phytotoponyms and names of people. When number of phytotoponyms in certain Croatian places are used as cases, by plant species as the variables, it was observable that two clusters clearly make a separation between continental and maritime regions of Croatia. In the situation when with phytotoponyms by plant species are used as the cases, while the places in certain regions are used as the variables, trees (as opposed to herbaceous plants) were distinctive for differentiating two clusters. On the other hand, deciduous plants (as opposed to other and evergreen plants) were the distinctive features for two clusters. However, some of these findings are directly influenced by the results of research conducted by Čargonja et al.[1], where the trees are by far the most represented, among all the plants detected in toponyms. Even from the historical aspect, before human's intensive influence on environment, forests were dominant local vegetation in observed regions[1].

In spite of this shortcoming, clear link between first name (FN) and phytotoponyms (PT) on one side, as well as between last name (LN) and enterprise (office) name (EN), offers logically expected relationships. The linguistic origins of the first names are probably more attractive and more convenient to be founded on plant names, than last names and/or enterprises. On the other hand, plant names are for sure closely linked with phytotoponyms (they are same or they have the same linguistic „root"). Namely, in the study conducted by Čargonja et al.[1], fruit plants species recognized in the toponyms are: plum, sour cherry and mulberry, pear and strawberry. Some of these fruit names are very frequent first names (for example, sour cherry and strawberry). Link between last name and enterprise (office) name is absolutely expected, because it is very often event that enterprise (office) name is clearly deduced or the same as the last name of certain people.

Croatia geographically covers the meeting line of two big phytogeographical regions: Mediterranean and Eurosibirian-Northamerican region[21,22,23]. The highest numbers of phytotoponyms are found in two continental areas, which belong to Eurosibirian-Northamerican phytogeographic region: Đurđenovac, Valpovo, Osijek and area Ivanec, Novi Marof, Križevci. Areas Vodice, Drniš, Vrlika and area Brač, Hvar, Korčula are belonging to the Mediterranean phytogeographic region, where the number of phytotoponyms is quite smaller[1]. Possible explanation of this discrepancy could be in eventuality that people living in the continental and lowland parts of Croatia were directed more to the earth and plants as the main resources for their existence[1].

In Mediterranean regions of Croatia, a greater role than plants could be taken over by the sea, which enhances other modes of living, different habits, etc. In continental and lowland parts of Croatia mostly plants and green color are dominating. In one recent research[24], the meaning of water (mainly in terms of the sea), dominate in its abstract meaning as well as a symbol of identity, among the participants who are born near the sea[24]. The extension of this finding is prevalence of sea-related meanings of toponyms, or other origins of toponyms, which are more usual in Mediterranean regions of Croatia.

The application of the results obtained could be found in considering toponyms in any culturally related scientific research and/or practical situations. For example, in various cultural and historical contexts, toponyms can reflect very heterogeneous influences. Tucci, Ronza & Giordano[25] have analyzed the street names in the historical center of the city of Milan (Italy)[25]. Moreover, the relationship between landscape and ideology through an examination of Pamir Mountain toponyms is studied[26], while the relationship between street-names and nation-building is studied in Singapore[27]. Land toponymy, dependent on cultural and historical elements of human life, does not change very often. The study of the phytotoponyms, even related with other interesting variables, emphasizes the importance of considering the historical and cultural perspective of the landscape vegetation[1,9].The advantage of this study is putting together both phytotoponyms with names (first, last) of people and enterprises in the same study, which is not found in available literature, according to our knowledge. Second advantage of this re-

search is an overview about the relationships between human population and plant cover in particular area of human environment. Moreover, from the methodological aspect, application of nonlinear multivariate methods, together with »classical« multivariate methods, proved to provide useful information to the researchers[16], similarly as in the studies on the issues about indices of biodiversity and cultural diversity[28] in ethnobothany[17]. The main shortcomings of the study are the absence of the balance in various plants' species in certain regions (as it is abovementioned), while the source of the information about people's names and enterprises (T-com phone registry) is not complete. Namely, other telephone providers are available in Croatia, differently in various regions and local communities, while some people and enterprises have mobile phones only, or do not have a phone. Essential lack in similar studies always contains the possibility that some »plant-based« roots of some names have completely different origin[3]. All these shortcomings could be prevailed in future research, with larger and better representative samples of entities.

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ODNOS IMENA LJUDI I TVRTKI BILJNOG PORIJEKLA S FITOTOPONIMIMA U PET REGIJA HRVATSKE

SAŽETAK

U ovom radu analiziraju se imena i prezimena ljudi (FN i LN), tvrtki (EN) s korijenima naziva biljaka u imenima) i fitotoponimi (PT) u pet hrvatskih regija, te njihovi međusobni odnosi. Ciljevi istraživanja bili su: utvrditi korelaciju između FN, LN, EN i PT; utvrditi latentnu strukturu tih varijabli; prognozirati broj PT (kriterij) na temelju prediktora (FN, LN, EN); utvrditi grupiranje mjesta (unutar određenih regija) kao slučajeva prema dvjema kategorizacijama biljaka; utvrditi grupiranje biljaka kao slučajeva po regijama. Analizirali smo 15 mjesta grupiranih u pet regija te 39 različitih biljnih vrsta. Rezultati su pokazali da je jedina glavna komponenta u vrlo pozitivnoj korelaciji s varijablama prezime i imena tvrtki, dok su projekcije za varijable ime (umjereno visoka) i fitotoponimi (niska) bile negativne. Predviđanje kriterija fitotoponimi je zadovoljavajuće dobro pomoću tri prediktora: prezime, ime i ime tvrtke. Prva klaster analiza pokazala je da su fitotoponimi uglavnom povezani uz drveće i listopadne biljke, dok su imena (FN, LN, EN) povezana s drvećem, bjelogoričnim i zeljastim biljkama. Druga klaster analiza ukazuje na jasnu razliku između regija u dominantnim fitotoponimima, na osnovu imena pojedinih biljaka. Rezultati pokazuju povezanost između fitotoponima i imena ljudi.