

Agrovoc descriptors: ornamental plants, public parks, urban environment, public opinion, aesthetic value, ornamental value, public opinion, surveys

Agris category code: P01, A01

COBISS Code 1.01

Significant perceptual properties of outdoor ornamental plants

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Received January 16, 2006, accepted March 10, 2006

Delo je prispelo 16. januarja 2006, sprejeto 10. marca 2006

ABSTRACT

This research deals with the perception of outdoor ornamental plants. It examines whether methods used for perception research in the social sciences may also be applied to such specific material as outdoor ornamental plants. In an experiment involving 56 participants we tested the use of an adjective checklist, which consisted of 78 adjectives describing the features of 15 outdoor ornamental plants. The participants chose the adjectives suitable for describing individual plants with varying frequency; in subsequent research only those properties were considered which were chosen in more than 10% of the cases. An examination of the frequency of chosen features showed that people are favorably disposed towards plants; properties with negative meanings were rarely marked. By using statistical methods of classification into groups we determined which features of outdoor ornamental plants aggregate into larger, semantically similar groups.

Key words: aesthetic evaluation, outdoor ornamental plants, people - plants relationships, perception, adjective checklist, opinion poll.

IZVLEČEK

POMEMBNEJŠE PERCEPCIJSKE LASTNOSTI PARKOVNIH RASTLIN

Raziskava se ukvarja s percepcijo parkovnih rastlin. Preverja, če je možno metode, ki se za raziskovanje percepcije uporabljajo v psihologiji in družboslovju uporabiti tudi pri zelo specifičnem gradivu, to je pri parkovnih rastlinah. V poskusu z 56 udeleženci smo testirali uporabo pridevniškega seznama, sestavljenega iz 78 pridevnikov, ki so opisovali lastnosti 15 parkovnih rastlin. Anketiranci so pridevnike, primerne za opis posamezne rastline izbirali različno pogosto; pri nadaljnji obdelavi smo upoštevali samo tiste, ki so bili označeni v več kot 10%. Pregled pogostosti izbranih lastnosti pokaže, da na rastline ljudje gledajo z naklonjenostjo, lastnosti z slabšalnim pomenom so označevali zelo redko. Katere značilnosti parkovnih rastlin se med seboj družijo v večje, pomensko podobne skupine, smo ugotovili z uporabo statističnih metod razvrščanja v skupine.

Ključne besede: parkovne rastline, odnos ljudje - rastline, percepcija, estetske sodbe, pridevniški seznam, anketa.

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1 INTRODUCTION

Plants are a frequent and extremely important element of man's environment. Both (1983) finds that they are not merely structural elements of the environment, but they also imbue it with life and tinge it with beauty. "Human culture and evolution have been directly impacted by the beauty of plants. Without plants we could not live." (Relf, 2003).

"Plants in cities have a humanizing effect." (Relf, 2003). They enhance the general quality of the environment and also indirectly contribute to an increase in the value of other components of the environment, of buildings for example. The appropriate use of plants increases the quality of the environment up to 30% (Both, 1983).

Plants are also very important in horticultural therapy because of their "sensory stimulation of the tactile, aural, olfactory or visual senses" (Namazi and Haynes, 1994, op. cit. Relf, 2003).

Smardon (1988) define the role of plants in the human environment as being primarily visual and sensory, and secondary as symbolic.

Robinson (1992) writes that every human being responds in a personal way to individual plants. Therefore subjective responses to plants can be separated from their objective qualities, which all observers can - with certainty - be expected to perceive.

Tanguy and Tanguy (1985) distinguish between an "objective plant" and a "subjective plant": objective plants consist of their physical characteristics (habit, shape, leaf size etc.), while subjective plants are made up from the observer's interpretation of the objective plant. Many plants have strong associative and symbolic meanings, for individuals as well as for large groups of people, and in culture, generally speaking.

In view of the aspects mentioned above and of the importance of plants in the life of human beings, we have set two objectives in our research:

- objective 1: to establish whether research into the perception of plants will allow the acquisition of data with methodologies used in the social sciences, which are normally used in the collecting of opinions on the visual qualities of landscapes (opinion polls, use of adjective checklist);
- objective 2: to compile a list of properties that could be used to describe outdoor ornamental plants in their entirety, as well as establish differences between the individual species.

In our research we were interested in the "subjective" image of the chosen plant species. We tried to determine in what way people experience individual plant species. We limited our research to discussing ornamental plants that can be grown outdoors in the continental climate of Slovenia. With a view to this, a series of studies was conducted, only the first of which is presented here, since it was the basis for all subsequent studies. This study investigated which terms in the Slovene language are used most often to describe plant species used outdoors for ornamental purposes. Our objective was to compile an as comprehensive as possible selection of properties ascribed to outdoor ornamental plants.

2 MATERIALS AND METHODS

Basic research data have been obtained by means of opinion polls. The questionnaire was prepared in the form of an adjective checklist that was compiled by browsing through numerous scientific, professional and popular articles on outdoor ornamental plants, and making a note of all terms used by the authors to describe them. What emerged was an extensive list of adjectives, some of which occurred often, while others appeared rarely or only exceptionally. Finally, we compiled a list of 78 adjectives that described either morphological features of the plants or characteristics that express an emotional relationship of the observers towards an individual plant. The attention in our subsequent work was centered on adjectives often used to describe plants, that do not refer to physical features but rather define the plants' aesthetic, visual and emotional dimensions.

Collected data were subjected to Cluster Analysis (SPSS), Ward's hierarchical method was used.

2.1 Participants

The study involved 56 persons of various ages (18 to 65 years) and of both sexes. Most participants were students and employees of the Biotechnical Faculty at the University of Ljubljana, Slovenia, consequently people who have a professional interest in plants and who themselves have encountered the problem of their description and appropriate presentation.

2.2 Stimulus material

The plants were presented to the participants with slides. The selection of plants included in the opinion poll aimed at including as much as possible of the varied features and forms of outdoor ornamentals: herbaceous and woody plants, conifers and deciduous trees, plants chosen for their striking flowering and others whose flowering has little ornamental value. Included were plants with different life spans (annuals as well as perennials). Each group of outdoor ornamentals was represented by three different species.

To represent the group of annual plants the following were chosen:

Floss flower (*Ageratum houstonianum* Mill.)
French marigold (*Tagetes patula* L.)
Zinnia (*Zinnia elegans* Jacq. 'Floradale Scarlet')

The species chosen ensured the inclusion of flowers of different color - blue (*Ageratum*), brownish-yellow (*Tagetes*) and red (*Zinnia*).

The following were chosen to represent herbaceous perennials:

White rock cress (*Arabis caucasica* Willd. ex Schlechtend.)
Delphinium (*Delphinium x cultorum* Voss)
Phlox (*Phlox paniculata* L.)

This selection also intentionally included species with flowers of varying coloration (white, blue or pink). The chosen species also differ in habit (ground cover vs. upright) and growth height.

The extensive group of ornamental shrubs was represented by the species:

Rock spray (*Cotoneaster horizontalis* Decne.)
Kerria japonica (L.) DC.
Apple blossom (*Weigela florida* (Bunge) A. DC.)

Weigela and *Kerria* were chosen as representatives of profusely flowering shrubs, and *Cotoneaster horizontalis* as representative of the many shrubs appreciated for bearing decorative fruits.

Deciduous trees were judged by the participants on examples of the following species that are introduced or indigenous in Slovenia:

Silver birch (*Betula pendula* Roth),

Sweet gum (*Liquidambar styraciflua* L.), introduced
White poplar (*Populus alba* L.)

Among conifers, the following were shown:

Common larch (*Larix decidua* Mill.)

Common spruce (*Picea abies* (L.) Karst.)

Aleppo pine (*Pinus halepensis* Mill.)

15 plants altogether were included in the study, three from each group, and the participants assessed them by selecting adjectives.

2.3 Procedure

The opinion poll was carried out in the following way: every person was given 15 sheets, with the 78 adjectives listed in two columns in alphabetical order. The participants were asked to go through the adjective list and to mark on it, without much deliberation, the words that in their opinion best describe that plant species shown. Every participant filled in 15 sheets, one for each plant shown.

3 RESULTS

The data obtained in the opinion poll were processed statistically. First the percentage of participants choosing the adjective for each plant species was calculated. The results are shown in Table 1.

The first column in Table 1 was obtained as the average over all the 15 plants species. In subsequent processing and interpretation only those adjectives were considered where the percentage of appearance was at least 10%. Since the adjectives achieving this percentage differed from plant to plant, the group of adjectives qualifying for further processing also varied from plant to plant.

In order to find out which properties of outdoor ornamentals can be aggregated together into larger, semantically similar groups, responses were subjected to Cluster Analysis. Since the opinion poll gave dichotomous variables for which several similarity measures are known (which are determined by frequencies from contingency tables) similarity was measured using Sokal - Michner's coefficient. The hierarchical method for defining groups was used - by a process of combining several groups into one new group (Ward's method). The method uses a matrix of distances and differences between variables. We decided for the interpretation of a four-group association of features, since we found that with most plants there were four pronounced groups. The article presents only a four-group aggregation for all plants together (Table 2), even though analyses were done for every plant separately as well.

The results of the analysis have been graphically shown with dendrograms, namely one common for all plants, and one for each plant separately. Since the inclusion and interpretation of dendrograms for each individual plant would be too comprehensive for this article, we have decided to subsequently present only the one that deals with all plants included in the opinion poll (Figure 1).

Table 1: Percentage of participants (%) choosing the adjective for a specific plant

Properties	All plants together	<i>Tagetes patula</i>	<i>Ageratum houssiamum</i>	<i>Zinnia elegans</i> 'Flor. Scarlet'	<i>Phlox paniculata</i>	<i>Delphinium cultorum</i>	<i>Arabis caucasica</i>	<i>Weigela florida</i> 'Eva Rathke'	<i>Cotoneaster horizontalis</i>	<i>Kerria japonica</i>	<i>Betula pendula</i>	<i>Liquidambar styraciflua</i>	<i>Populus alba</i>	<i>Larix decidata</i>	<i>Picea abies</i>	<i>Pinus halepensis</i>
Decorative	40,5	26,8	28,6	64,3	12,5	30,4	17,9	64,3	57,1	66,1	39,3	46,4	17,7	53,6	14,3	67,9
Familiar	27,7	39,3	5,4	50,0	28,6	23,2	14,3	21,4	8,9	16,1	53,6	3,6	32,1	33,9	55,4	30,4
Upright	26,0	7,1	5,4	23,0	14,3	66,1	1,8	19,6	1,8	10,7	26,8	35,7	42,9	62,5	48,2	21,4
Simple	25,7	21,4	23,2	37,5	30,4	30,4	28,6	21,4	21,4	42,9	23,2	17,9	35,7	16,1	30,4	5,4
Tiny-leaved	25,5	21,4	17,9	0,0	14,3	17,9	51,8	14,3	73,2	28,6	39,3	14,3	25,0	30,4	19,6	14,3
Pleasant	25,5	35,7	25,0	26,8	16,1	16,1	21,4	35,7	35,7	33,9	25,0	14,3	17,9	23,2	21,4	33,9
Natural	25,0	14,3	8,9	17,9	19,6	21,4	19,6	19,6	12,5	16,1	51,8	19,6	25,0	41,1	46,4	41,1
Attractive	24,0	12,5	21,4	30,4	10,7	17,9	10,7	41,1	35,7	39,3	21,4	25,0	10,7	39,3	5,4	39,3
Colorful	22,5	44,6	17,9	71,4	14,3	8,9	1,8	62,5	19,6	53,6	1,8	7,1	1,8	19,6	1,8	10,7
Useful	21,9	21,4	12,5	30,4	12,5	12,5	12,5	30,4	35,7	30,4	21,4	8,9	23,2	19,6	26,8	30,4
Tall	21,7	1,8	1,8	7,1	5,4	44,6	3,6	23,2	0,0	10,7	37,5	46,4	33,9	41,1	44,6	23,2
Popular	21,5	19,6	8,9	26,8	12,5	5,4	3,6	28,6	23,2	19,6	46,4	1,8	10,7	46,4	30,4	39,3
Bushy	21,0	17,9	16,1	7,1	21,4	1,8	17,9	35,7	8,9	32,1	3,6	50,0	3,6	7,1	28,6	62,5
Interesting	18,8	8,9	19,6	8,9	8,9	8,9	10,7	23,2	38,7	21,4	17,9	25,0	8,9	28,6	12,5	42,9
Distinctive	18,2	12,5	1,8	28,6	3,6	28,6	0,0	23,2	19,6	17,9	21,4	19,6	8,9	33,9	14,3	39,3
Undernanding	18,2	21,4	21,4	17,9	21,4	16,1	5,4	21,4	17,9	30,4	21,4	5,4	30,4	8,9	23,2	10,7
Humble	17,7	21,4	35,7	5,4	21,4	12,5	23,2	10,7	26,8	16,1	26,8	0,0	30,4	12,5	12,5	10,7
Beautiful	17,4	8,9	5,4	19,6	8,9	14,3	3,6	30,4	23,2	12,5	33,9	12,5	7,1	28,6	26,8	25,0
Friendly	16,9	17,9	10,7	21,4	17,9	17,9	14,3	23,2	10,7	26,8	37,5	3,6	7,1	17,9	12,5	14,3
Densely branched	16,8	5,4	7,1	1,8	3,6	0,0	16,1	50,0	12,5	30,4	7,1	42,9	3,6	5,4	30,4	35,7
Charming	16,7	14,3	12,5	19,6	19,6	8,9	23,2	21,4	26,8	30,4	19,6	5,4	7,1	17,9	3,6	19,6
Ordinary	16,2	32,1	12,5	17,9	30,4	16,1	12,5	7,1	8,9	3,6	23,2	1,8	32,1	12,5	21,4	10,7
Lively	16,2	30,1	5,4	42,9	7,1	10,2	3,4	43,4	21,4	35,7	12,5	3,6	1,8	7,1	0,0	12,5
Bright	16,0	12,5	3,6	7,1	16,1	48,2	19,6	5,4	5,4	33,9	37,5	10,7	14,3	14,3	0,0	10,7
Dynamic	16,0	12,5	3,6	14,3	10,7	5,4	8,9	30,4	25,0	26,8	8,9	25,0	10,7	16,1	7,1	33,9
Plain	15,4	21,4	12,5	10,7	30,4	19,6	5,4	8,9	7,1	7,1	19,6	8,9	32,1	10,7	30,4	5,4
Hardy	15,4	19,6	7,1	28,6	14,3	5,4	10,7	21,4	35,7	7,1	17,9	7,1	7,1	7,1	16,1	25,0
Picturesque	15,1	12,5	5,4	21,4	7,1	8,9	1,8	23,2	17,9	26,8	14,3	17,9	3,6	25,0	8,9	32,1
Appreciated	14,2	7,1	1,8	7,1	3,6	5,4	1,8	14,3	16,1	8,9	39,3	14,3	7,1	32,1	23,2	30,4
Tiny	13,3	12,5	37,5	1,8	16,1	5,4	44,6	8,9	32,1	26,8	5,4	0,0	1,8	5,4	0,0	1,8
Imaginative	13,2	7,1	8,9	10,7	5,4	16,1	14,3	19,6	23,2	37,5	5,4	12,5	3,6	16,1	0,0	17,9
Tender	12,7	8,9	33,9	0,0	16,1	21,4	12,5	8,9	5,4	25,0	33,9	0,0	3,6	17,9	0,0	3,6
Low	12,1	37,5	16,1	5,4	7,1	3,6	37,5	1,8	57,1	10,7	1,8	1,8	0,0	0,0	0,0	1,8
Lovely	12,0	19,6	32,1	10,7	7,1	7,1	17,9	14,3	19,6	21,4	16,1	0,0	3,6	8,9	0,0	1,8
Unitary	11,3	5,4	7,1	3,6	10,7	8,9	17,9	8,9	12,5	21,4	5,4	10,7	5,4	10,7	23,2	17,9
Luxuriant	10,4	0,0	1,8	5,4	5,4	5,4	5,4	21,4	3,6	12,5	5,4	30,4	1,8	14,3	19,6	23,2
Old-fashioned	9,2	14,3	17,9	10,7	23,2	14,3	8,9	0,0	0,0	3,6	10,7	3,6	10,7	0,0	19,6	0,0
Glowing	8,7	17,9	0,0	53,6	3,6	0,0	0,0	10,7	8,9	14,3	3,6	7,1	0,0	8,9	0,0	1,8

Table 1 (continued)

Properties	All plants together	<i>Tagetes patula</i>	<i>Ageratum houstonianum</i>	<i>Zinnia elegans</i> 'Flor. Scarlet'	<i>Phlox paniculata</i>	<i>Delphinium cultorum</i>	<i>Arabis caucasica</i>	<i>Weigela florida</i> 'Eva Rathke'	<i>Cotoneaster horizontalis</i>	<i>Kerria japonica</i>	<i>Betula pendula</i>	<i>Liquidambar styraciflua</i>	<i>Populus alba</i>	<i>Larix decidua</i>	<i>Picea abies</i>	<i>Pinus halepensis</i>
Cheap	8,6	14,3	8,9	8,9	23,2	10,7	7,1	5,4	7,1	1,8	1,8	1,8	16,1	1,8	16,1	3,6
Boring	8,5	3,6	1,8	1,8	14,3	23,2	16,1	3,6	1,8	0,0	5,4	5,4	23,2	7,1	10,7	0,0
Monotonous	8,3	1,8	12,5	5,4	16,1	17,9	16,1	1,8	0,0	12,5	1,8	3,6	12,5	7,1	10,7	5,4
Convincing	8,2	1,8	0,0	3,6	1,8	10,7	1,8	10,7	10,7	8,9	12,5	7,1	5,4	8,9	12,5	26,8
Many-coloured	8,2	14,3	1,8	37,5	8,9	1,8	0,0	25,0	10,7	8,9	0,0	3,6	0,0	8,9	0,0	1,8
Asymmetrical	8,0	7,1	7,1	1,8	0,0	1,8	8,9	7,1	12,5	7,1	7,1	19,6	8,9	12,5	5,4	12,5
Wonderful	8,0	3,6	1,8	1,8	1,8	8,9	5,4	7,1	10,7	10,7	16,1	7,1	3,6	19,6	8,9	12,5
Indistinct	7,9	7,1	8,9	1,8	8,9	17,9	19,6	3,6	1,8	1,8	1,8	12,5	12,5	5,4	12,5	0,0
Dull	7,4	3,6	16,1	0,0	10,7	21,4	21,4	1,8	0,0	3,6	1,8	7,1	16,1	1,8	1,8	3,6
Majestic	7,1	0,0	1,8	1,8	1,8	3,6	1,8	1,8	0,0	0,0	5,4	23,2	8,9	8,9	28,6	19,6
Tidy	6,5	3,6	7,1	7,1	3,6	7,1	0,0	3,6	3,6	8,9	12,5	7,1	0,0	8,9	6,1	8,9
Unconvincing	6,2	10,7	8,9	1,8	16,1	8,9	14,3	5,4	0,0	3,6	1,8	7,1	7,1	3,6	3,6	0,0
Modern	6,2	1,8	1,8	1,8	1,8	1,8	1,8	7,1	25,0	8,9	5,4	5,4	3,6	8,9	1,8	16,1
Rigid	5,8	1,8	5,4	1,8	10,7	16,1	1,8	7,1	1,8	7,1	0,0	7,1	8,9	3,6	19,6	0,0
Uninteresting	5,8	3,6	12,5	1,8	12,5	7,1	12,5	1,8	0,0	3,6	3,6	1,8	19,6	1,8	5,4	0,0
Weeping	5,7	0,0	0,0	0,0	1,8	0,0	0,0	8,9	19,6	25,0	12,5	3,4	1,8	1,8	7,1	3,6
Symmetrical	5,5	1,8	1,8	10,7	3,6	7,1	3,6	0,0	1,8	0,0	0,0	0,0	0,0	12,5	30,4	8,9
Dark	5,5	8,0	1,8	3,6	1,8	0,0	0,0	1,8	1,8	0,0	0,0	1,8	1,8	8,9	48,2	10,7
In muted colours	5,1	1,8	10,7	1,8	1,8	7,1	8,9	0,0	0,0	0,0	0,0	7,1	8,9	1,8	17,9	8,9
Unusual	5,0	0,0	3,6	0,0	1,8	7,1	5,4	3,6	10,7	3,6	5,4	12,5	0,0	10,7	1,8	8,9
Unity	5,0	1,8	0,0	1,8	3,6	7,1	12,5	3,6	8,9	1,8	1,8	12,5	8,9	3,6	5,4	1,8
Magnificent	4,5	1,8	0,0	5,4	0,0	1,8	3,6	5,4	3,6	0,0	8,9	1,8	1,8	8,9	3,6	7,1
Disjointed	4,4	5,4	3,6	1,8	0,0	3,6	7,1	7,1	5,4	7,1	3,6	5,4	1,8	5,4	1,8	7,1
Fashionable	4,3	0,0	5,4	1,8	1,8	1,8	1,8	5,4	7,1	1,8	8,9	1,8	1,8	14,3	3,6	7,1
Broad	4,2	1,8	3,6	1,8	0,0	0,0	3,6	10,7	8,9	3,6	0,0	10,7	1,8	0,0	7,1	8,9
Narrow	3,9	0,0	0,0	0,0	3,6	17,9	0,0	0,0	0,0	0,0	8,9	0,0	5,4	5,4	16,1	1,8
Changeable	3,7	3,6	0,0	1,8	0,0	0,0	3,6	3,6	3,6	1,8	8,9	8,9	1,8	14,3	2,8	2,8
Precious	3,7	0,0	0,0	0,0	0,0	3,6	0,0	1,8	1,8	0,0	1,8	3,6	1,8	16,1	14,3	10,7
Ungainly	3,5	3,6	3,6	1,8	5,4	0,0	0,0	0,0	1,8	1,8	0,0	12,5	5,4	0,0	7,1	8,9
Unchanging	3,5	1,8	5,4	0,0	3,6	0,0	1,8	1,8	3,6	3,6	5,4	3,6	3,6	7,1	8,9	1,8
Perfect	3,1	1,8	1,8	1,8	1,8	3,6	0,0	1,8	0,0	1,8	7,1	5,4	1,8	7,1	5,4	5,4
Large-leaved	3,0	0,0	1,8	10,7	1,8	0,0	0,0	0,0	0,0	5,4	3,6	17,9	3,6	0,0	0,0	0,0
Round-shaped	2,7	12,5	1,8	5,4	5,4	0,0	0,0	0,0	5,4	3,6	1,8	0,0	0,0	0,0	0,0	5,4
Foreign	2,4	1,8	3,6	0,0	1,8	1,8	5,4	1,8	0,0	1,8	0,0	16,1	1,8	0,0	0,0	7,1
New	2,1	0,0	3,6	0,0	0,0	0,0	3,6	1,8	0,0	7,1	0,0	8,9	1,8	0,0	0,0	5,4
Useless	2,0	1,8	1,8	0,0	5,4	5,4	1,8	0,0	0,0	1,8	1,8	0,0	3,6	1,8	3,6	1,8
Ugly	1,8	3,6	3,6	0,0	12,5	0,0	0,0	0,0	0,0	1,8	0,0	0,0	1,8	0,0	3,6	0,0
Imperfect	1,7	0,0	0,0	0,0	0,0	5,4	3,6	3,6	1,8	0,0	0,0	0,0	5,4	1,8	1,8	1,8
Demanding	1,1	0,0	1,8	0,0	3,6	3,6	0,0	1,8	0,0	0,0	0,0	1,8	0,0	3,6	0,0	0,0

4 DISCUSSION AND CONCLUSIONS

An examination of the percentage with which the properties were chosen shows a decidedly positive orientation in the opinions (Table 1).

People view plants with favor, plants evoke pleasant feelings. Features that carry negative meanings were not found among those chosen most often (ugly, incomplete, uninteresting, useless). At the same time a restrained, critical attitude to plants was noted, since explicitly positive properties (wonderful, magnificent, perfect) were also rarely emphasized. The adjective "decorative" was chosen most often. In analyzing this in more detail we find that it must *a priori* be an intrinsic quality of all types of outdoor ornamentals. It is a result of various combinations of morphological features that set a plant apart from the majority of plants in general and enable its use for special, decorative purposes.

If we count as more important those features relating to which the percentage in the answers was greater than 10%, we find that out of the total of 78 there are 36 such properties. Some of them serve only to describe the botanical features of the individual species, while most of them have connotative meanings. This is often quite obviously dependent on certain physical characteristics of the plant, and in some cases it cannot be explained with morphology. Some synonymous meanings are a reflection of the situation in Slovenian gardens and parks, while others even reflect the general cultural level of the participants, as well as that of the environment in which they live.

There are noticeable differences in the perception of the various groups of plants; while positive as well as negative features were ascribed to herbaceous plants (annuals and perennials alike), woody plants received only positive evaluations.

Negative attributes are used very rarely; slightly more often only in the case of a few species of which we think that people have become tired, since they are an almost obligatory ingredient in home gardens (phlox, spruce).

Of the selected plants, Aleppo pine was the species arousing the most intensive experiences with the greatest number of features; it was followed by kerria, while annuals left the weakest impression.

It is important for professionals involved in the design of public green spaces to know how people experience individual species of outdoor ornamentals. By the choice of species it is namely possible to create a planting that evokes more - or less - pleasant emotional responses in people. The results of our research may offer some useful information for this purpose.

Semantically similar properties

We determined the importance of a particular feature in the perceiving of outdoor ornamentals by the frequency of its choice on the adjective checklist. However, the mechanism of plant perception can be more accurately understood only after we take into account the connections between individual properties. These associations were established by processing the data from the opinion poll with the Ward's hierarchical method.

Table 2 presents an overview of how adjectives/properties aggregate into four groups.

Table 2: Aggregation into four groups for all plants together

1st group

Picturesque	Lively	Dynamic	Distinctive	Colorful	Densely branched
Bushy	Appreciated	Popular	Beautiful	Useful	Attractive
Interesting	Pleasant	Decorative			

2nd group

Familiar	Natural	Upright	Tall		
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3rd group

Unitary	Luxuriant	Imaginative	Charming	Lovely	Tender
Friendly	Bright	Tiny	Low	Tiny-leaved	

4th group

Undemanding	Hardy	Humble	Plain	Ordinary	Simple
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It is to be noticed that one group of properties is especially large. Of the physical features, the only one included in this group was "densely branched", which is connected with the complex of properties denoting diversity of the plant (bushy, colorful, distinctive, dynamic, lively, picturesque) and its evaluation (appreciated, popular, beautiful, useful, attractive, interesting, pleasant, decorative).

In the second group, the associated properties are defined by familiarity - in the terms familiar and natural, and by the plant's potentiality - in the adjectives upright and tall.

An examination of the dendrogram (Figure 1) reveals even more clearly the association of properties into four large groups, as well as that lowest level of association that shows which properties were evaluated as most similar. It thus emerges that lovely and tender are closely related; and from further associations we note that plants thus perceived are also seen as friendly and bright. In addition, the

adjectives tiny, low and tiny-leaved join those mentioned previously in the hierarchically higher group; these properties are typical of morphological determination and they are probably the actual, physical cause for the previously described perception.

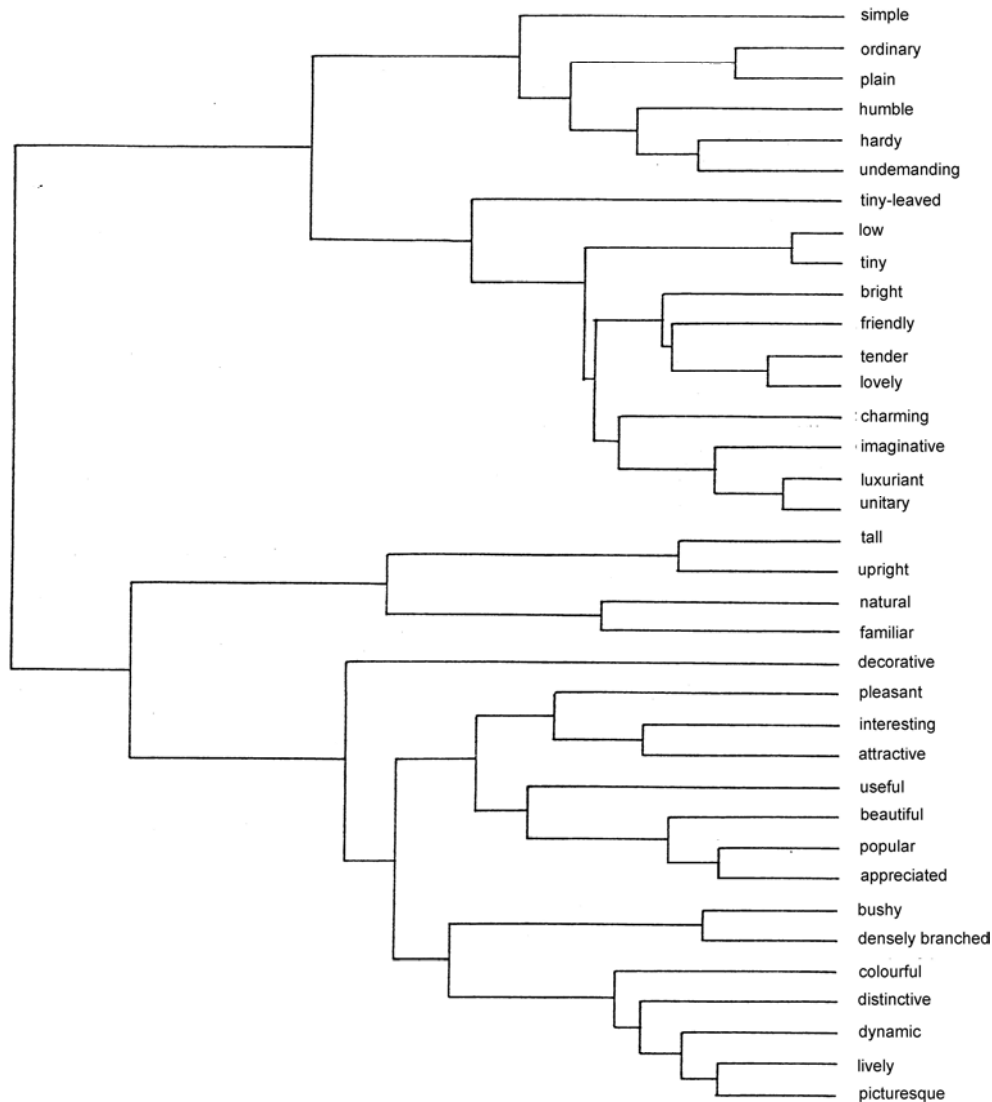


Figure 1: Dendrogram for all plants together

The properties associated in the fourth group mainly determine the mutual relationship between the plant and its habitat. In the opinion of participants, undemanding plants are also hardy and humble, plain and ordinary in appearance, and simple.

Even when associating properties into 10 groups, some of them remain connected, which points to their close semantic relationship and mutual cohesion. Somewhat simplified, one could say that the participants used some terms as synonyms. This applies particularly to the following pairs of adjectives: upright - tall, familiar - natural, undemanding - hardy, plain - ordinary, low - tiny, tender - lovely, unitary - luxuriant, popular - appreciated, picturesque - lively.

It is also interesting to note that the feature which stood out as most important in the opinion poll and which is represented by the adjective "decorative" - forms its own group already during aggregation into five groups. The reason for this may probably be found in the fact that this is actually a summary term to describe most properties ascribed to plants used for decoration - that is, to increase the aesthetic value of our environment.

We found that the research method we used was appropriate for establishing the relationship between people and plants. By using the mentioned research method we could easily reach the objective 1 on which our research was focused.

The research procedure made it possible to obtain a list of 36 characteristics, by which it is in Slovenian language possible to sufficiently correctly describe the whole of outdoor ornamentals. By using statistic methods we established which plant characteristics were similar between each other. Considering the fact that a comparatively small number of plants were included in the research, it would be advantageous to increase that number in future research and to include more people in the poll as well. This would enable us to generalize the results set in goal 2.

Although landscape architects in their selection of plants for planting plans usually take into consideration mainly designer viewpoints and personal plant preferences, they should not disregard feelings that non-professionals have about these plants. Our study namely confirmed the hypothesis that plants that differ in physical properties, will also evoke different responses in people. And it is also true that specific plant properties affect the spatial perception of green areas (Serpa, A. and Muhar, A., 1996). The differentiated way in which plants are perceived may be the conceptual starting point for creating such green areas in which people will feel comfortable, which they will enjoy and which will have a stimulating effect on their frame of mind.

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