

## Implementation of landscape design solutions with the color and texture of plants

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**Abstract** Today due to intensive construction, open spaces that people can use are decreasing. Thus, recreation centers in urban centers can fully contribute to completing the recreational needs of users who are constantly changing. Identifying the specific causes of the priority issues that need to be tackled to achieve sustainable green spaces would help to find effective solutions that are specific to the creation of richer esthetic areas, but at the same time contributing to the improvement of environment. This is possible by knowing and using a certain principle of designing the green space with the help of color and texture. Understanding the basic principles of using colors in landscape design can help you achieve that image that you want for your garden. Using the color wheel and texture of plants is the easiest way to illustrate these concepts. Designers which plane a garden must take into consideration that form, space, color, and balance are the basics of the garden, while the overall texture created by all of these together is the major element that adds elegance and finesse to design. Without a great mix of color and texture, even with all the other elements, the garden can really fall short of people expectation. In this context, introducing new and alternative solutions for landscape architecture design using basic elements as color and texture is a solution to find the best idea for improves the green areas. Present paper was focused on the general aspects of color and texture of plant which can use in landscape design concept, because in Romania there are lots of space that can be subject of landscape design in urban. The proposed solution is practical by using design programs available to anyone to get a set of color and texture patterns using plants.

### Key words

green area, chromatic, plants, texture, design elements

In creating a new landscape must be observed the visual harmony of the plants and the components to be integrated by making harmonious composition which ultimately contribute to increasing the quality of life. Vegetation through subtle means such as, the harmony of colors and forms, texture and structure of leaves and flowers, the delicate scent, as well as the invisible effect of the bioenergetics field of plants acts on the mental state of people, influencing their tone positively.

Creating landscapes by varying tones and colors, act on mental mood. The living, powerful ones- red, orange – irritate when they are dominant, but invigorates when they are arranged as chromatic accents; the predominant green vegetation is reassuring; the warm colors of flowers (pink, golden-yellow, cream-colored, lilac), their harmonious joints, enhanced by the presence of white, of pale blue predispose to good mood and calm [9].

The gardens of the 20<sup>th</sup> century are marked by the revival of the architectural style in their arrangement knowing a new approach influenced by the evolution of currents in plastic art. During this time in Great Britain, there is a new way to approach the garden, knows as "Country House" and Gertrude Jekyll (1843-1932) is the one who studied the color and its various ways of combining in nature, being also considered an innovative plant use [10].

To achieve a harmonious composition, which to attract visitor's eyes we must emphasize the places of interest of the arrangement by the unified combination of forms, colors and even the perfume of plants. Thus, for a functional landscape we need to place the vegetation in consideration of several aspects. The present paper is focused on two basic characteristics: color and texture, which from a landscape viewpoint is a visual feature of great attractiveness and variety, which enriches and embellishes the parks and the gardens

through an unrivaled color palette and multiple design options for color surfaces and plant texture.

Color is the most important landscape quality according to which species are chosen, placed and associated. Colors attract the eye, invigorate and embellish certain areas of landscapes; their majestic joints and associations with the colors of other elements of the landscapes associate this art with painting [9].

In green spaces, colors play a defining role. Colors create an ambience full of optimism.

Of the five senses (sounds, colors, textures, tastes and scents) the color and texture of plants used in landscaping directly influences the mood, evoking memories and emotions, and the present work is based on their importance and role in achieving of a successful landscaping.

## Materials and Methods

### Colors - the visual sense

Color is a specific attribute of each element in the environment and has an important role in beautifying and perceiving objects.

Color is the perception of the eye of one or more frequencies (wavelengths) of light. Perception of color is influenced by biology, by the evolution of the same observer or the colors in the immediate vicinity of the perceived, this being the explanation of many optical illusions [16].

The simple or primary colors are red, yellow and blue. They are not created by combining other colors and have the highest degree of shine. These colors are that three from which the other color „start”. By combining them in varying proportions and with the help of non-colors, all the colors of nature are obtained. It is important when we combine two primary colors resulting a secondary or complementary color: orange, green or purple, as can be seen in the figure 1.

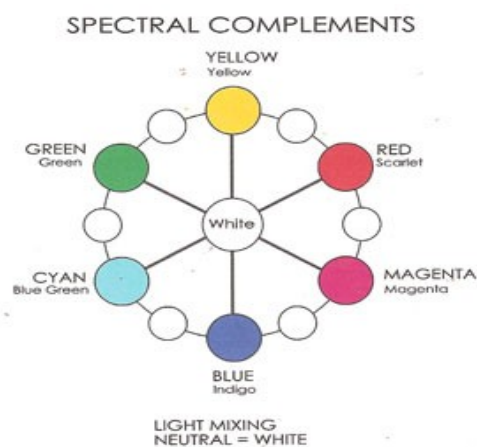


Fig. 1. Diagram of obtaining complementary colors  
Source: [17]

The color diminishes the space, and often changes reality in the visual plane through the effects it produces on human eye and mental. So, dark colors give you a sense of distance, therefore a dark-colored object will look more distant than it's real position, and in the case of light elements the object will be perceived less distantly than in reality. As can be seen in the figure below (Fig. 2), light stains in contrast to a dark background appear to be larger than the dark colored spots of the same size disposed on a light-colored background.

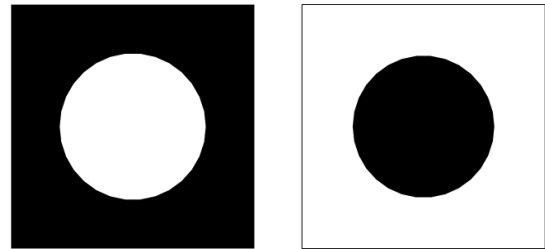


Fig. 2. Different perception of color dimensions;  
Source [12]

### Color association of plants

Color is important when species are chosen, placed and associated. To get the most outstanding aesthetic and visual effects, numerous experiences and observations have been made over time for the harmonious combination of floral plants and especially the very varied colors of flowers and leaves of these plants.

Location of floral species is recommended to be done starting with darker shades and colors in the first plane, and then will be used floral species with increasingly lighter shades, than the most vivid colors will be placed in the background. The perfect combination of contrasts is one of the color theories, these is done by alternating the layers of warm-colored flowers with those of cool colors [6]. Simple, red, yellow and blue colors as well as complementary green orange and purple make pleasing contrasts.

In a garden or in a green place it is necessary to use the correct colors, because it greatly influences the mood of those who look at colors, influencing to some extent the psyche, mood and attitude of people in the garden. It is possible to create different optical effects on the space, intercalating vegetation in a wide variety of ways, especially that floral one, because it has a very wide palette of colors.

The colors red, yellow and orange are considered ward colors (Fig. 3.) attracting everyone's eyes, inducing a state of optimism and vitality. They are preferred by social people who live in the community and have a restful and recreational effect. Species with red flowers can be combined with plants that have reddish leaves. They are perfect for creating an atmosphere of intimacy, especially in small placed that need to be marked by focal points. Colorful flowers will give the

impression of physical proximity, functioning as powerful visual markings especially when fitting a fountain or a alley. Yellow is one of the brightest colors, because it has powerful association with the sun and energy, it suggest joy and a desire for life. Flowers of this color are used in landscaping, especially to illuminate the dark corners [9].



Fig. 3. The warm and cool colors scheme; Source: [18]

Lower-size gardens can be highlighted by using cool colors (blue, purple and green) (Fig. 3) which fit the type of quiet person and serve to calm the viewer and create a distance effect or as a link in the landscape.

An important consideration when setting up a green space is the distance at which plants will be perceived. If a distance is too long and it may seem shorter, it is advisable to use the warm-colored flowers, such as red or orange, at the far end of this perspective. The live, bright colors suggest cheerfulness and vitality. They tend to cause reactions and lead the eye from one area to another in the landscape, the cold and blurred ones suggests reflections and contemplation and can be used to produce a sense of peace and relaxation.

Used in the first plan, there will be cool colors (blue or green) which will give the feeling of expanding the place. The feeling of the existence of a space between the first plan and the background increases because the warm colors seem to advice, while de cool colors seem to recede into the background, giving the impression that the space is larger. On too closed vegetation funds, too vivid colors will not be projected to not create the impression of stridency [14].

White and black are neutral colors and are recommended for attenuating the aesthetic impression, offering a gradual transition between warm and cold colors.

Color matching can be done in three ways: using a single color, using complementary colors and using a variety of colors.

The diagram presented in figure 3 shows the 6 major colors on the color wheel. Analogous colors include red and orange, orange and yellow, yellow and green, green and blue, blue and violet, and violet and red. Analogous colors can go beyond two colors, groups of red, orange, and yellow or blue, violet and red can also be considered analogous colors.

For monochrome combinations is used only one color or tones, the most used is red.

In the use of complementary colors, one of the primary colors prevails and the other flowers are introduced for the accent. In the use of a variety colors, they are used to create colorful images, most often this type of composition is used in the landscape of rustic gardens. The polymorphic combinations will be located near the viewer as the distance blurs the differences between colors, the more they occupy smaller areas [9].

For gardens made for meditation, white plants will be used (*Narcissus sp.*, *Crysanthemum leucanthemum*, *Gladiolus hybridus*, *Lilium candidum*) or blue plants (*Viola tricolor*, *Iris germanica*, *Aster sp.*, *Lavandula angustifolia*), comfortable chairs and spaces to practice meditation. The gardens of meditation are very similar to the healing gardens, these gardens offer a sense of tranquility and well-being.

The rule of thirds in landscaping refers to the types and plant species used in landscaping. In many situations many gardens fall into extremes, whether they didn't are too structured and have too much color in some seasons or they are very structured, but the plants used didn't color the surface. One of the targets achieved in setting up a garden is the balance between structure and color.

In achieving color harmony it is very important to avoid using too many colors in the same visual space, too strident or irritating for the eye of the viewer [8]. The simplicity and soothing atmosphere are the result of a successful chromatic harmony in a landscaping.

Along with the flowers, the leaves of ornamental plants often have a special decorative significance through the highlighted color, such as the mosaic species (*Iresine*, *Alternanthera*, *Coleus*, *Cineraria maritima*, *Gnaphalium* etc.), or to species that decorate through flowers, but also leaves (*Canna indica*, *Hosta plantaginea*, *Delphinium cultorum* etc.) [11].

Throughout the year, on seasons can make some combinations of floral plants that make gardens more expressive, brighter and dynamic:

- for the spring decor: *Viola wittrockiana* with *Tulipa gesneriana* or *Narcissus* sp.; *Silene rosea* with *Viola wittrockiana*; *Myosotis alpestris* with *Tulipa gesneriana*, etc.

- for the summer décor: *Lobelia erinus* with *Salvia splendens*; *Verbena venosa* with *Tagetes patula*; *Ageratum mexicanum* with *Dahlia variabilis*; *Pelargonium zonale* red with *Ageratum mexicanum* pink, begonias also have a new look, many with charmingly textured and colored leaves.

- for the autumn decor: ornamental cabbage (*Brassica oleracea*) with contrasting shapes and complementary colors, different varieties of pansies adding bright color to borders or backyards; *Antirrhinum majus* or *Calendula officinalis*, evergreen perennials and grasses will keep from late fall.

Plants offer different color options in different seasons with their colorful leaves, flowers and fruits. Study also revealed that purple, pink and white flowers were favorite, while red and white colors were unfavorable. In terms of fruit color, study also found that red and blue were favorite, while yellow and orange colors were unfavorable [2].

Color flower is an important factor in the children's preferences. Color preferences are personal and it is believed that they are over-stimulating.

Strong colors can be used in small spaces. But, in large spaces in which we spend more time, it would be better to use muted colors or mood stabilizers. Distinct and warm colors (red, yellow, and orange) are preferred by children over 6 years old. Boys preferred red color more than girls that are compatible with their behavior. Older children prefer blue color [1]. Beyond the personal preferences, there are also powerful therapeutic effects of the color [6].

### Texture - the sense of touch

Texture is a way to bring depth interest to a garden. By paying close attention to the elements of texture, you can create subtle optical illusions, as well as eye-popping combinations [4]. Even though color is a characteristic that draws special attention, the characteristics most often used to describe plants are shape and texture.

Texture is a physical feature of a plant and refers to how harsh or fine it is felt or perceived visually as a whole the surface or leaves of a plant. Texture may change temporarily or depending on the season.

The textures are found in the shape and size of the leaves, the bark of the plants, in branches, in the flowers. Variety of textures provides interest and contrast to the landscape as well as shape. *Rudbeckia* looks beautiful not only when in bloom, but also when it goes to seed and adds texture and interest to a garden. Dainty-leaved plants make a staccato of dots; grasses, irises, and daylilies paint pleasant, smooth stripes. Smooth hostas paired with astilbe's feathery flowers and serrated foliage makes a classic combination [19].

Coarse texture is characteristic of plants with irregular shapes, such as: irregularly-pricked leaves, shoots and branches with thorns thick shoots and branches, variegated colors with striped. These plants with harsh textures (*Hortensia* sp., *Ilex* sp., *Mahonia* sp.) in green space design can break the lines, giving plants a lost form.

Fine texture include many ferns and grasses or a delicate structure such as a bent-wire trellis or arbor [19].

Fine texture is found in plants with thin and tall stems, lianas, with low foliage, fragile shoots with many branches, generally in voluminous, climbing plants (*Clematis* sp.)

The medium texture is found in plants characterized by simple leaves in terms of shape and fine edges. Medium-textured plants act as a background to bind and unify plants with rough or fine texture. Examples of medium texture plants: *Azalea*, *Agaphantus* sp., *Euonymus*, *Pittosporum*, *Viburnum* [7].

The most dominant texture is the harsh and tends to stand out individually, the fine texture is more subordinate and tends to unify the composition. The variety of textures, in form, provides interest and contrast in the landscape. The visual value of vegetation depends on the quality of light, the distance from which the plants are viewed, the moment of the year, the health status and the adjacent plants.

In a landscaping design plant texture can contribute to uniformity if the other elements of the garden are more prominent. Contrasting, strong colors make plants seem to have a harsher texture, while thin colors can flatten the texture. Also, if space is to be perceived smaller, will be located along the out perimeter plants with rough texture and those with fine texture closer to the viewer.

Texture evokes emotional responses. In a composite to achieve balance, it is recommended to mix the three types of textures (rough, medium and fine) and if one wishes to emphasize the color and shape of plant, a single texture is used. If the vegetation is to be emphasized, color and texture will be used together.

### Results and Discussions

Results obtained using various color features and textures of ornamental plants are given in figure 4,



where was presented a landscape design using different plants combining different color and texture.

In landscape design no matter how important the color is when planting is planned, the structural and textural qualities of different plants must be exploited - not only the foliage texture but also the shape of the flower [15].

Selecting plants requires thought, because each has a season of bloom ranging from a week or two to as long as several months [13].

To create a specific landscape, nature-based on the color and texture, a concept landscape plan was editing in Photoshop and CorelDraw program, according to the landscape architecture requirements mentioned before. A green space in urban area can be structured in more zones, as following in the next design project shown in figure 4.

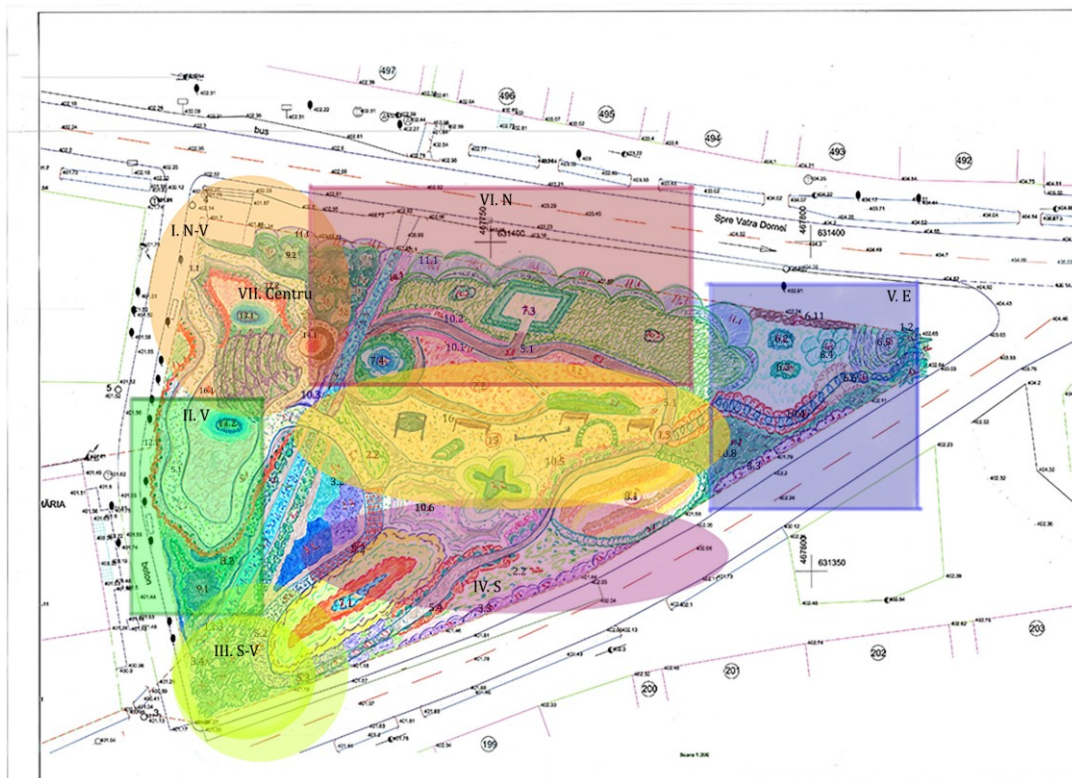


Fig. 4. Zoning the areas according to the rules of chromaticity and texture; Source: original

**Zone I (NV)** - is considered the decorative area of the proposal. Foliage trees (*Betula pendula*, *Salix matsudana*), medium-sized shrubs (*Callicarpa bodinieri*, *Cornus alba* Sibirica) are used to give a note of elegance to green space. The compositional center is focused by the existence of a pond with aquatic plants. There are used in this limited space both floating species (*Marsilea quadrifolia*, *Pistia stratiotes*, *Eichhornia crassipes*), and marginal plants *Pontederia cordata*, *Orontium aquaticum*, *Nymphaea* sp.).

**Zone II (V)** - is the most suitable area for rest, relaxation and contemplation. It is primarily intended for adults. The coniferous species that invite for relaxation and create the attractions of this area are *Abies* 'Silberlocke', *Abies koreana*, *Abies concolor* and *Picea orientalis* Aureospicata. Of the floral plants that provide an air of authenticity and stability to this area are the numerous varieties of *Tulipa hybrida*, *Hemerocallis fulva*, *Iris germanica* and *Aster novi belgii*. The alleys are made of natural materials: gravel,

wood, bark and put in value on the basis of evergreen vegetation (*Buxus sempervirens*).

**Zone III (SV)** - this area evokes dynamism and adventure. Characteristics of the studied area are accentuated by the species *Magnolia stellata*, *Acer palmatum* Atropurpureum, *Astilbe* sp., *Cornus sanguineum*, and among the floral species that give vitality and positive energy are the chromatic varieties of *Kniphofia uvaria*, *Rudbeckia hirta*, *Eremurus himalaicus*.

**Zone IV (S)** - can be defined as the edible area of the landscape composition. Here are the species such as *Crataegus monogyna*, *Malus floribunda*, *Prunus cerasifera* Pisardi whose fruits can feed the birds and other animals during the winter. *Lavandula angustifolia*, *Melissa officinalis*, *Rosmarinus officinalis*, *Tropaeolum majus*, *Begonia semperflorens*, *Calendula officinalis* by their double effect (edible and decorative) increase the efficiency of the green space. The species *Salvia officinalis*, *Thymus vulgaris* and

*Origanum vulgare* complement the range of aromas in **Zone V (E)** - is characterized as the area of contrasts. The chromatic palette of the species *Gaillardia pulchella* is highlighted and accentuated by the silhouettes of species with a particular texture: *Cineraria maritima*, *Eryngium planum*, *Stachys lanata*, *Alchemilla mollis* and *Heuchera x brizoides*. The pubescent and soft leaves of these species are also an attraction for small gardeners. This area also includes a stunning multitude of succulent species. The diversity of shapes and colors of the *Sempervivum* species enriches the visual field of viewers.

**Zone VI (N)** - is an area described as one of mystery, depth, coolness and represents the shades part of the composition. Here are species that support low light intensity. The hills of this area are the varieties of *Hosta plantaginea* and *Hosta undulata*, *Helleborus odorus*, *Heuchera sanguinea*. The texture lines of the composition are provided by *Carex umbrosa* and *Dryopteris filix mas*. The mysterious character is underlined by the presence of the species *Salix matsudana* Tortuosa, *Liquidambar styraciflua* and *Ceratonia siliqua*.

**Zone VII (C)** - as shown in Figure 4, this area, by its complexity, provides a place of relaxation and, at the same time, activity for both adults and children. It is the area of meditation and play, silence and adventure, reflection and expansion. The water games in the pond of this area and the aquatic plants (*Pistia stratiotes*, *Cyperus alternifolius*, *Carex elata*, *Nymphaea sp.*, *Lysimachia nummularia*) provide the comfort of wellbeing. On the opposite side, there is the playground for children. This area is flanked by a hedge of *Ligustrum vulgare* used to reduce sound pollution. Between the two compositions there is a chromatic area in which the white and brown colors (*Astilbe sp.*, *Heuchera x brizoides*, *Epimedium sp.* and varieties of *Coleus blumei*) predominate, giving a touch of elegance and personality to landscaping. The above mentioned information is considered to be an important resource for those working with open space designer for people.

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## Conclusions

Color is crucial in a landscape design and brings a garden to life by adding dimension and interest. The flower of plants, leaves, bark, and branches all have texture. Using plants with different textures is a great way to create diversity in a garden.

Using a variety of plants with harmonious textures, shapes and colors can be important for patients with limited vision and stimulation of the sense of touch.

Use texture to contrast plants in groups or minimize architectural lines. When you planning a garden you can create contrast by manipulating various elements

the studied area.

such as color and texture.

When you chose plants have in mind that many annuals and perennials offer blooms over a long season. Cultivate spring, summer and fall flowers for a succession of blooms and multiseason appeal.

This study aimed at identifying plants by texture and color that can promote the level of calmness of the human psyche.

Individual participation in the design of an environment is one of the factors that affect the feeling of belonging to the place. These factors increase the interaction of the individual and keep the person continually in a familiar and controllable environment so that the individual's sense of ability to control the environment puts him and brings the mental calm of the individual by repeating presence in that place.

The work was organized on the basis of a context and a theoretical framework for developing and addressing design elements, sets of actions that could have a positive impact on future projects similarly designed by landscapers or amateurs in comparable initiatives.

## References

- 1.Acar, H., 2003. A study on determining plant preferences of users in children playgrounds:An example of Trabzon city, (In Turkish: Çocuk oyun alanlarında ullanıcıların bitki tercihlerinin belirlenmesi üzerine bir araştırma: Trabzon kenti örneği), Master Thesis, Karadeniz Technical University, Trabzon, Turkey.
- 2.Acar, H., 2013, Advances in Landscape Architecture, in. Chapter 12 Landscape Design for Children and Their Environments in Urban Context, Edited by Murat Özyavuz pp. 291.
- 3.Day, C., Midbjer, A., 2007. Environment and children: Passive lessons from the everyday environment, Architectural Press, Oxford.
- 4.DiNella G.R., 2004. Lawnscapeing. Meredith Books des Moines, Iowa, USA, pp. 94-95.
- 5.Draghia Lucia, Elena Liliana Chelariu, 2011. Floricultură. Ed."Ion Ionescu de la Brad" Iași, p. 333.
- 6.Dumitraş, Adelina, 2010. Compoziții florale utilizate în amenajări peisagistice, Ed. Mediamira Cluj-Napoca, pp. 31-37.
- 7.Dumitraş, Adelina, 2014. Analiza compoziției, Ed. AcademicPres, Cluj-Napoca.
- 8.Florincescu, Adriana, 1999. Arhitectura peisajului. Ed. Divja Cluj-Napoca, pp. 75-80.
- 9.Iliescu, Ana-Felicia, 2003. Arhitectură peisageră, Ed. Ceres București, pp. 222-225.
- 10.Jellico, G., Susan Jellicoe, P. Goode, M., Lancaster, 1991. The Oxford Companion to Gardens, Oxford University Press, New York.
- 11.Lovejoy Ann, Leona Holdsworth Openshaw, 1999. All about annuals. Merdith Books Des Moines, Iowa, pp. 6-9.

12. Mureșan P. 1988. Culoarea în viața noastră, Editura Ceres, București.
13. O'Sullivan Penelope, 2001. All about the Easiest Flowers to Grow. Meredith Books des Moines, Iowa, USA, pp. 9-11.
14. Poșta Daniela, Sabina, 2015. Arhitectura peisajului. Ed. EUROBIT Timișoara, pp. 166.
15. Wilson, M. (2008). Grădinăritul modern într-un climat în schimbare, Royal Horticultural Society, Editura Allfa, București, p. 174.
16. \*\*\*, <https://ro.wikipedia.org/wiki/Culoare>.
17. \*\*\*, [www.google.ro/search?q=diagrama+complementary+color+for+plant](http://www.google.ro/search?q=diagrama+complementary+color+for+plant)
18. \*\*\*, <https://www.provenwinners.com/learn/basic-design-principles-using-color-garden>
19. \*\*\*, <https://www.bhg.com/gardening/design>.