

# Configuration Mode of Ornamental Plants in Norbulingka of Tibet and Application of Landscape Color

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## Abstract

The application of plant landscape color has a great effect on the landscape of the scenic spot. By colorful foliage and ornamental plants with high color recognition, visitors can deepen their impressions, and thus increase the landscape aesthetic expectations and psychological recognition of the landscape sense. The plants in Norbulingka were taken as research object in this paper. Via field investigation and consulting a lot of data, color characters of ornamental plants from each genus and family were identified from the angle of plant characteristics of arbor, shrub and herb. CMYK color card value was used to collect color data of leaves, flowers and fruits from different plants, and quantitative analysis on color difference of leaves, flowers and fruits from ornamental plants was conducted, to obtain evaluation method and reasoning basis of plant color design in Norbulingka. The results showed that: 1) in color values of leaves, percentage of purple herb = red shrub; cyan herb > light green herb, dark green arbor > grass green arbor, yellow shrub > jade green shrub, bitter orange arbor < bottle green arbor; 2) in color values of flowers, percentage of bitter orange herb < blue shrub, cyan herb > light green herb, dark green arbor > grass green arbor, yellow shrub > jade green shrub, bitter orange arbor < bottle green arbor; 3) in color values of fruits, percentage of purple shrub > yellow shrub, yellow arbor > red arbor, blue herb = green arbor, red shrub < green shrub.

## Keywords

Plant Configuration, Color, Landscape Application

## 1. Introduction

Garden plant landscape is mainly composed of plant configuration landscape and plant color landscape, and they interplay with each other, in which color sense is an intuitive expression that is easily identified and recognized by humans. There are different views on the configuration of garden plants in East and West. During the Renaissance, European gardens were dominated by regular garden, and the color tone was mainly green, which was single. In the era of Victorian gardens and Edwardian gardens, a large number of bright flowers were applied to gardens and became the main elements of garden design. In ancient books of China, plant color configuration was recorded in the *Zhangwuzhi Flowers and Trees* and *Huajing*. The color matching of the traditional garden plant design is simple, elegant and far-reaching, and color is regarded as the plant's own "character". In the collocation, it blends feelings with scenes, and uses color to set off ambience. Modern researchers in each country further understood and studied plant color configuration. "Color season theory" proposed by American Carroll Jackson in the early 1980s was introduced into China by Ms. Ximan in 1998. In 1996, England color planning expert Michael Lancaster further proposed the concept of "color landscape" in the evolution of color in modern city (Susan, 2007). At present, there are fewer studies on landscape color application of plant configuration in Tibet at home and abroad.

Plant color is mainly shown by its leaves, branches, flowers and fruits (Zhang, 2015), in which the color of plant leaves more has viewing characteristics in the time and space. The color area of the colorful plant is greater than that of the flowering plant, and it is easy to form landscape area. Due to the limitation of geographical environment, plant twigs in Norbulingka are roughly similar in color, and their recognition is not high, which is not studied in this paper. Combining relevant literatures, field survey, regional characteristics, and plant configuration mode, 62 kinds of representative ornamental plants were screened out to quantitatively analyze color values of their leaves, flowers and fruits, and carry out color difference analysis.

## 2. Research Zone and Method

### 2.1. Research Zone

Norbulingka belongs to national key cultural relics protection unit, and is located in the western suburb of Lhasa. Its construction model represents the formation period of traditional Tibetan garden—palace garden, and it is one of main traditional Tibetan garden forms. Meanwhile, the establishment of Norbulingka also marks the formation of traditional Tibetan garden art (Minamik, 2018). On the one hand, the construction form of Norbulingka absorbs the characteristic of manor gardens, Zongbao gardens and temple gardens focusing on greening, thereby causing the natural garden features of greenery. On the other hand, the construction pays attention to the overall garden effect, emphasizes

the theme of architecture, forms a spatial layout of specific pattern and landscape conception of plant configuration. At plant configuration aspect, Norbulingka possesses rare tree species across the Tibetan Plateau, and there are also subtropical and temperate plants, a total of more than 230,000 trees. Among them, there are national first and second protection tree species (*Cupressus gigantea* Cheng et L.K. Fu, *P. griffithii* McClelland, *Cedrus deodara* (Roxb.) G. Don, *Pinus armandii* Franch, *Sabina tibetica* Kom, *Xanthoceras sorbifolium* (Bunge), tropical plants (*Fargesia spathacea* Franch, *Albizia julibrissin* Durazz.), precious flower species *Hydrangea macrophylla*, and old trees more than 200 years old. Cover area of green land occupies 83% of total, and creation model of whole garden is mainly based on natural garden construction techniques (Xu, 2015; Deng, 2005).

## 2.2. Research Methods

Color quantification method of plant landscape was used in this paper. Using A-6NCS1950 color card (Yue & Song, 2017), CMYK value of leaf color data of plant in Norbulingka was collected by CAD, Photoshop and EXCEL. By combining dynamic change of plant color, plant configuration and color characteristics in Norbulingka were analyzed.

## 3. Plant Investigation and Configuration Characteristics

### 3.1. Investigation of Ornamental Plants

For climate characteristics of Tibet and growth feature of each plant, ornamental plants in Norbulingka were surveyed from September to October 2017 and March to May 2018. The species and color attributes of ornamental plants were investigated (Qi, Wang, & Gao, 2012), and investigation results were shown as **Table 1**.

**Table 1.** Investigation results of ornamental plants in Norbulingka.

No.	specific name	Plant	Family	Color attribute
1	<i>Spiraea chinensis</i>	<i>Spiraea Salicifolia</i> L.	Rosaceae	Pink
2	<i>Euphorbia</i> L.	<i>Euphorbia pulcherrima</i> Willd. et Kl.	Euphorbiaceae	Scarlet
3	<i>Euonymus</i> L.	<i>Euonymus alatus</i> (Thunb.) Sieb	Celastraceae	Brown or light brown seed coat
4	<i>Platycladus</i> Spach	<i>Platycladus orientalis</i>	Cupressaceae	Yellow male ball flower
5	<i>Agapanthus</i> L. Her.	<i>Lily Of The Nile</i>	Amaryllidaceae	Bright blue
6	<i>Viola</i> L.	<i>Johnny Jumpup</i>	Violaceae	Deep purple
7	<i>Ulmus</i> L.	<i>Ulmus pumila</i>	Ulmaceae	Gray brown or light grey
8	<i>Fuchsia</i>	<i>Hybrid Fuchsia</i>	Onagraceae	Reddish
9	<i>Verbena</i> Linn	<i>Verbena officinalis</i>	Verbenaceae	Blue and purple flowers
10	<i>Tropaeolum majus</i>	<i>Nasturtium</i>	Tropaeolaceae	Yellow, purple, orange or variegated flowers
11	<i>Consolida</i> (DC.) Opiz	<i>Consolida ajacis</i>	Ranunculaceae	Blue or purple blue

## Continued

12	<i>Morus</i> Linn	<i>Morus (Plant)</i>	Moraceae	Gray, red brown
13	<i>Althaea</i> Linn	<i>Hollyhock</i>	Malvaceae	Purple, pink, red, white
14	<i>Salix</i>	<i>Salix babylonica</i>	Salicaceae	Fawn
15	<i>Rose</i> L.	<i>Amur Rose</i>	Rosaceae	Purple brown or taupe
16	<i>Aucuba</i>	<i>Aucuba chinensis</i>	Cornaceae	Purple flowers, dark red in maturity
17	<i>Melilotus</i> Miller	<i>Melilotus officinalis</i>	Leguminosae	Tan
18	<i>Picea</i>	<i>Pices asperata</i>	Pinaceae	Light brown yellow, brown yellow
19	<i>Cupressus</i> Linn.	<i>Cupressus gigantean Cheng et L.K.Fu</i>	Cupressaceae	Light purple brown, gray purple brown
20	<i>Cedrus</i>	<i>Cedrus deodara (Roxb.) G.Don</i>	Pinaceae	Dark grey bark. Gray, light brown gray or dark gray twig. Light green or bottle green leaf. Light green fruit before maturity, with white powder, red brown in maturity
21	<i>Sabina</i> Mill.	<i>Sabina tibetica Kom</i>	Cupressaceae	Green, yellowish green or grayish green tree crown. Beige or hazel gray bark. Green or kelly scaly leaf
22	<i>Xanthoceras</i> Bunge	<i>Xanthoceras sorbifolium Bunge</i>	Sapindaceae	Maroon. White petal, magenta or yellow base
23	<i>Sinarundinaria</i> Nakai	<i>Fargesia spathacea Franch</i>	Gramineae	No white powder or with light white powder when young, with gray white short spiny hairs when young
24	<i>Albizia</i> Durazz.	<i>Albizia julibrissin Durazz.</i>	Fabaceae	Gray black tree trunk, and pink flowers
25	<i>Hydrangea</i> L.	<i>Hydrangea macrophylla</i>	Saxifragaceae	Changeable flower color, initially white, gradually turning into blue or pink
26	<i>Nelumbo</i>	<i>Nelumbo nucifera</i>	Nelumbonaceae	White, pink, crimson, lavender, or inter-color
27	<i>Pinus</i> Linn	<i>P. griffithii McClelland</i>	Pinaceae	Dark grayish brown bark, green annual branch, which turns into red brown after dried
28	<i>Pinus</i> Linn	<i>Pinus armandii Franch</i>	Pinaceae	Green or gray green annual branch, brown after dried
29	<i>Ulmus</i> L.	<i>Ulmus pumila L.</i>	Ulmaceae	Gray-brown or light grey, smooth sapling bark, turning into dark grey after growing into big tree
30	<i>Populus</i>	<i>Populus L.</i>	Salicaceae	Grey white
31	<i>Salix</i>	<i>Salix paraplesia Schneid. var. subintegra C. Wang e</i>	Salicaceae	Gray green
32	<i>Populus</i>	<i>Populus alba L.</i>	Salicaceae	White to gray, tan, grayish green or light brown bark
33	<i>Salix</i>	<i>Salix matsudana Koidz.</i>	Salicaceae	Dark grey black bark, green above, pale or white below
34	<i>Pyrus</i>	<i>Pirus, i, f.</i>	Rosaceae	Brown red or reddish brown. Green or red young leaves, turning into green after leaf exhibition
35	<i>Malus</i> Mill.	<i>Malus baccata (L.) Borkh.</i>	Rosaceae	Gray brown. Yellow brown new branch, hairless. Green and reddish brown young shoots. White flower
36	<i>Armeniaca</i> Mill.	<i>Armeniaca vulgaris Lam.</i>	Rosaceae	Light red flowers solitary or 2 - 3 flowers contemporary. White or reddish. Peels are mostly white, yellow to yellowish red, and the sunny side often has blush and spots; dark yellow flesh

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37	<i>Juglans</i> L.	<i>Juglans</i>	Juglandaceae	Dark green above, hairless, light green below, yellow anther
38	<i>Sophora</i>	<i>Sophora japonica</i> Linn.	Papilionaceae (Fabaceae)	Light yellow flower, gray brown bark, grey white below. White or light yellow corolla
39	<i>Amygdalus</i> L.	<i>Amygdalus persica</i> L.	Rosaceae	Dark grey bark, solitary flower, pink or red from light to dark, sometime white
40	<i>Prunus</i> L.	<i>Prunus</i> L.	Rosaceae	White flower
41	<i>Malus</i> Mill.	<i>Malus pumila</i> Mill.	Rosaceae	The trunk is gray-brown, and the fruit is generally red
42	<i>Malus</i> Mill., <i>Chaenomeles</i>	<i>Malus</i> , <i>Chaenomeles</i>	Rosaceae	Red brown or purple brown at old time, pink and white petals of variants
43	<i>Jasminum</i> Linn.	<i>Jasminum nudiflorum</i> Lindl.	Oleaceae	Green calyx and yellow corolla
44	<i>Rhododendron</i> L.	<i>Rhododendron simsii</i> Planch.	Ericaceae	Red, pink, apricot, snow green, white, <i>etc.</i> flowers, which is colorful
45	<i>Magnolia</i> L.	<i>Magnolia grandiflora</i> Linn.	Magnoliaceae	Light brown or gray bark, dark green leaf surface, white flower
46	<i>Syringa</i> Linn.	<i>Syringa reticulata</i> (Bl.) Hara var. <i>Mandshurica</i> (Maxim.) Hara ( <i>S. Amurensis</i> Rupr.)	Oleaceae	White or yellow white corolla
47	<i>Paeonia</i> L.	<i>Paeonia suffruticosa</i> Andrews	Ranunculaceae	Yellow, green, red, dark red and silver red flowers are the top grades, especially yellow and green flowers. The peony is large and fragrant, so it is also known as the “national beauty and heavenly fragrance”
48	<i>Paeonia</i> L.	<i>Paeonia lactiflora</i> Pall.	Paeoniaceae	White, pink, red, purple, yellow, green, black, and complex-color flowers, with up to hundreds of petals. Chinese herbaceous peony has been hailed as “flower fairy” and “flower phase” and has been listed as one of the “Ten Famous Flowers”. It is also called “Flower God of May”. As a flower of love since ancient times, it has been honored as the representative flower of the Tanabata Festival. In addition, “Shixiangyun drunk sleep in peony” is known as one of the classic scenes from the <i>Dream of the Red Chamber</i>
49	<i>Matthiola</i>	<i>Matthiola incana</i> (L.) R. Br.	Brassicaceae	Red, pink, or white petals
50	<i>Dendranthema</i> (DC.) Des Moul.	<i>Dendranthema morifolium</i>	Asteraceae	Red, yellow, white, purple, green, pink, polychromatic, and inter-color flowers
51	<i>Tulipa</i> L.	<i>Tulipa gesneriana</i>	Liliaceae	Red or mixed with white and yellow tepals, sometimes white or yellow
52	<i>Narcissus</i> L.	<i>Narcissus tazetta</i> L. var. <i>chinensis</i> Roem.	Amaryllidaceae	The petals are yellowish at the end, covered with a tan coat, flowering is in spring
53	<i>Lobelia</i> L.	<i>Lobelia erinus</i>	Campanulaceae	Red, pink, purple, violet, white, <i>etc.</i> flowers
54	<i>Dichondra</i>	<i>Dichondra repens</i> Forst.	Convolvulaceae	Yellow
55	<i>Hydrangea</i> L.	<i>Hydrangea macrophylla</i> (Thunb.) Ser.	Saxifragaceae	With short pedicels, densely flowered, pink, pale blue or white; oblong petal, 3 - 3.5 mm long. Unripe capsule, long gyro; seed immature. Flowering is during June-August

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56	<i>Opuntia</i> Mill.	<i>Opuntia stricta</i> (Haw.) Haw. var. <i>dillenii</i> (Ker-Gawl.) Benson	Cactaceae	Except the real blue and black, there are all kinds of flower colors, and they are ever-changing. As the red flower, its color is different depending on the type. Many types of petals have a metallic luster and are very eye-catching. Many types of pistil stigma and stamen filaments have bright colors, especially some species of <i>Echinocereus</i> and <i>Noto-cactus</i> . The stigma is green and purple, with a velvety luster, splendouring with the petals, which is so beautiful
57	<i>Incarvillea</i>	<i>Incarvillea younghusbandii</i> Sprague	Bignoniaceae	Red and white
58	Crocus	<i>Crocus sativus</i> L.	Iridaceae	Light blue, red purple or white
59	<i>Populus</i>	<i>Populus cathayana</i> Rehd.	Salicaceae	Gray green, dark gray when old, cracked. Branches cylindrical, with angular prism sometimes. The branch is olive green when young, later turns into orange to grayish yellow, glabrous. Buds long conical, glabrous, purple brown or yellow brown, with mucilage
60	<i>Salix</i>	<i>Populus × beijingensis</i> W. Y. Hsu	Salicaceae	Bark grayish green, gradually turning into greenish gray, smooth; bark pores round or oblong, dense, ovate or broadly ovoid crown. Side shoots obliquely grows, tender twigs are slightly green or red, without ribs. Buds conical, apex curved, pale brown or dark red, with mucilage
61	<i>Fraxinus</i> L.	<i>Fraxinus mandshurica</i> Rupr	Oleaceae	Plant: taupe, dark brown. Leaf: dark green above, yellow green below
62	<i>Pinus</i> Linn	<i>Prunus mume</i>	Pinaceae	Gray green, dark gray when old, cracked. Branches cylindrical,

### 3.2. The Characteristics of Plant Configuration form

#### 3.2.1. Dominated by Local Tree Species

The tone of plant configuration in whole garden is constituted by local tree species, to highlight local characteristics, such as the large-area cultivation of *U. pumila*, *P. cathayana*, *P. alba*, *F. mandshurica*, and *S. paraplesia*. Especially *S. paraplesia* in Norbulingka, its shape likes a dragon, and the posture is diverse, which is rare in other places (Minamik, 2018; Wang, 2017).

#### 3.2.2. Valuing Plant Morphology

Plant morphology is an important link of garden plant configuration, and the isolated plant morphology is common. Using its branch morphology and the difference in flower color and leaf appearance, the style of scenic area is created. This is evident in Norbulingka. For example, Gesang Palace scenic spot highlights the bamboo to express its seclusion; Dadanmingjiu Palace scenic spot highlights pines and cypresses, to illustrate its solemnity; Cuoji Palace scenic spot uses flower sea to render its “heaven and wonderland” atmosphere (Ernie & Tony, 2004).

#### 3.2.3. Diversity and Unity

Plant configuration in Norbulingka ingeniously uses the textures, colors, lines,

postures, *etc.* of different plants, organically arranges bicolor plants and monochrome plants, large area of green and individual bright flowers, high + low tree species, rude + thin tree species, thereby reaching the unity in the change and the change in the unity.

#### 3.2.4. Valuing Level Contrast Relationship

Level contrast of flowers and trees is used to avoid monotony. Flowers and trees arrangement of Dadanmingjiu Palace at east, west and north are divided into four levels according to plant height. Flower is in the inner circle, followed by *Syzygium aromaticum* and fruit trees, outer ring is pine and cypress, and the plant height gradually rises from inside to outside. *Pterocarya stenoptera* is dominant in the forest of east wall, which is interspersed with *U. pumila*. Using the combination of twig height, crown shape, color, sharp contrast is formed (Zhang 2015; Ma & Zheng, 2013).

### 3.3. Plant Layout Characteristics of Space Node

Space node of Norbulingka is dominant by the space composition form of point + line + surface (Gong, 2015; Wang, Rong, & Li et al., 2017). When single attraction is taken as a main node, plant layout is dominated by large arbor position, and it mainly emphasizes that garden trees are dominant by cypress. It is because that Sakyamuni and his disciples had used “cypress seed to hunger”, and cypress is also the symbol of longevity and eternity. Peach is planted in front of the palace gates, and they are 7, 8, 15, 18 or 28 respectively, with the meaning of blessing. For example, Gesang Palace uses the plant configuration form of pine + cypress + walnut, playing the role of radiation from space composition. Norbulingka has two kinds of road layout models. One is ring, and it is dominant by turning road, meaning “reincarnation”. The other is line layout, and it mainly plays the space function. At this place, common plant configuration is hedge + flower, playing the role of “connection” from space composition. Large-area *U. pumila* and *Armeniaca vulgaris* Lam. are also cultivated in Norbulingka, mainly playing the roles of spaceseparation, delineation of scenic boundaries, barriers in space composition (Zheng, 2017; Lin, 2017). Plant layout model in three kinds of space nodes are shown as **Table 2**.

## 4. Statistics and Analysis of Plant Color Value

### 4.1. Investigation Statistics of CMYK Value

Combining the data, color characteristics of leaves, flowers and fruits from each ornCMYK has the characteristics of high color identification and high color resolution. It can perform objective quantitative analysis and qualitative evaluation of color, and has scientific value and verifiability for monitoring the dynamic change of the seasonal color of plants.

Amental plant in Norbulingka were collected and analyzed from September to October, 2017 and March to May, 2018. Moreover, CMYK value was extracted









by the related software, and result was shown as **Table 3**.

Seen from **Table 3**, CMYK values of ornamental plants in Norbulinkaare richer, in which green line in leaf color value is the most, a total of 50; there are 7 red lines and 17 blue and violet lines in flower color value.

**Table 2.** Plant configuration at main nodes of Norbulingka landscape area.



















































Plant configuration node	Plant configuration region	Plant configuration model
Greening node	Gesang Palace	Pine + cypress + walnut
	Wuyao Palace	<i>S. japonica</i>
	Dadanmingjiu Palace	7 cypresses at two sides + 4 pines at four corners + 2 cypresses
	Jinse Palace	Pine + cypress + peach + <i>A. julibrissin</i> + walnut
	Kangsong Silun and around the stage	<i>M. baccata</i> + <i>U. pumila</i> + pine and cypress
	Cuoji Palace and around around pond	Cypress encircled
	Jinse Linka	<i>P. cathayana</i> at east section + pine and cypress at west section
Greening “strip”	Outside east gate of Jinse Palace	8 <i>Amygdalus davidiana</i>
	Flower and fruit forest belt	<i>M. baccata</i> + <i>A. vulgaris</i>
	Flower trail	Hedgerow + flowers
	Flower gallery	Vines twining
Greening surface	Natural landscape	<i>U. pumila</i> forest+ apricot garden
	Auxiliary landscape	Willow forest
	Space separation, delineation of scenic boundaries, barriers	Large-area cultivation

**Table 3.** Color difference values of leaves, flowers and fruits from each in ornamental plant in Norbulingka.

No.	Species name	NCS color of leaves	NCS color of flowers	NCS color of fruits
1	<i>Spiraea salicifolia</i> L.	C:83 M:62 Y:100 K:44	 C:0 M:0 Y:0 K:0	C:17 M:99 Y:95 K:0
2	<i>Euphorbiapulcherrima</i> Willd. et Kl.	C:0 M:89 Y:50 K:0	 C:3 M:97 Y:77 K:0	C:25 M:36 Y:89 K:0
3	<i>Euonymusalatus</i> (Thunb.) Sieb	C:60 M:22 Y:78 K:0	 C:3 M:98 Y:78 K:0	C:13 M:0 Y:51 K:0
4	<i>Platycladus orientalis</i>	C:67 M:47 Y:99 K:5	 C:48 M:31 Y:83 K:0	C:48 M:31 Y:83 K:0
5	<i>Lily Of The Nile</i>	C:53 M:53 Y:0 K:0	 C:73 M:72 Y:0 K:0	C:47 M:45 Y:0 K:0
6	<i>Johnny Jumpup</i>	C:78 M:100 Y:49 K:10	 C:10 M:19 Y:90 K:0	C:1 M:46 Y:91 K:0
7	<i>Ulmus pumila</i>	C:58 M:25 Y:86 K:0	 C:47 M:45 Y:0 K:0	C:47 M:45 Y:0 K:0
8	<i>Hybrid Fuchsia</i>	C:9 M:73 Y:0 K:0	 C:40 M:61 Y:0 K:0	C:22 M:70 Y:31 K:0




























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9	<i>Verbena officinalis</i>	C:57 M:74 Y:0 K:0		C:59 M:78 Y:0 K:0		C:0 M:0 Y:0 K:0	
10	<i>Nasturtium</i>	C:77 M:46 Y:100 K:7		C:0 M:96 Y:78 K:0		C:52 M:68 Y:53 K:2	
11	<i>Consolida ajacis</i>	C:48 M:13 Y:52 K:0		C:84 M:73 Y:0 K:0		C:53 M:41 Y:0 K:0	
12	<i>Morus(Plant)</i>	C:84 M:56 Y:100 K:27				C:0 M:64 Y:38 K:0	
13	<i>Hollyhock</i>	C:63 M:43 Y:63 K:1		C:0 M:85 Y:0 K:0		C:14 M:66 Y:52 K:0	
14	<i>Salix babylonica</i>	C:79 M:61 Y:97 K:36					
15	<i>Amur Rose</i>	C:81 M:60 Y:92 K:36				C:13 M:17 Y:81 K:0	
16	<i>Aucuba chinensis</i>	C:60 M:22 Y:78 K:0				C:47 M:12 Y:51 K:0	
17	<i>Melilotus officinalis</i>	C:74 M:47 Y:91 K:7		C:16 M:12 Y:83 K:0		C:46 M:27 Y:93 K:0	
18	<i>Pices asperata</i>	C:73 M:46 Y:90 K:7					
19	<i>Cupressus gigantean Chenget L.K.Fu</i>	C:31 M:2 Y:52 K:0				C:16 M:5 Y:57 K:0	
20	<i>Cedrus deodara (Roxb.)G.Don</i>	C:34 M:3 Y:54 K:0				C:3 M:2 Y:52 K:0	
21	<i>Sabina tibetica Kom</i>	C:64 M:31 Y:94 K:0				C:66 M:30 Y:74 K:0	
22	<i>Xanthoceras sorbifoli um Bunge</i>	C:78 M:31 Y:76 K:0		C:58 M:100 Y:100 K:53		C:67 M:52 Y:100 K:11	
23	<i>Fargesia spathacea Franch</i>	C:57 M:14 Y:77 K:0					
24	<i>Albizia julibrissin Durazz.</i>	C:76 M:44 Y:97 K:4		C:2 M:55 Y:0 K:0		C:1 M:58 Y:23 K:0	
25	<i>Hydrangea macrophylla</i>	C:72 M:48 Y:87 K:7		C:56 M:34 Y:18 K:0		C:64 M:46 Y:66 K:2	
26	<i>Nelumbo nucifera</i>	C:81 M:51 Y:87 K:14		C:30 M:8 Y:37 K:0		C:37 M:45 Y:100 K:0	
27	<i>P.griffithii McClelland</i>	C:34 M:3 Y:54 K:0				C:31 M:2 Y:52 K:0	
28	<i>Pinus armandii Franch</i>	C:31 M:2 Y:52 K:0				C:16 M:5 Y:57 K:0	
29	<i>Ulmus pumila L.</i>	C:84 M:56 Y:100 K:27				C:63 M:43 Y:63 K:1	
30	<i>Populus L.</i>	C:76 M:44 Y:97 K:4				C:77 M:43 Y:97 K:4	

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31	<i>Salixparaplesia Schneid. var. subintegra</i> C. Wang e	C:76 M:54 Y:72 K:12					
32	<i>Populus alba</i> L.	C:88 M:44 Y:97 K:4					
33	<i>Salixmatsudana</i> Koidz.	C:77 M:44 Y:95 K:3					
34	<i>Pirus, i. f.</i>	C:74 M:42 Y:87 K:3		C:20 M:6 Y:12 K:0		C:40 M:49 Y:72 K:0	
35	<i>Malus baccata</i> (L.) Borkh.	C:75 M:55 Y:100 K:0		C:7 M:8 Y:10 K:0		C:56 M:67 Y:81 K:16	
36	<i>Armeniaca vulgaris</i> Lam.	C:66 M:33 Y:100 K:0		C:11 M:10 Y:2 K:0		C:18 M:37 Y:95 K:0	
37	<i>Juglans</i>	C:82 M:58 Y:100 K:32		C:4 M:2 Y:6 K:0		C:84 M:59 Y:100 K:36	
38	<i>Sophora japonica</i> Linn.	C:82 M:44 Y:100 K:6		C:2 M:2 Y:3 K:0		C:15M:17 Y:23 K:0	
39	<i>Amygdalus persica</i> L.	C:67 M:32 Y:51 K:0		C:25 M:66 Y:17 K:0		C:24 M:74 Y:41 K:0	
40	<i>Prunus</i> L.	C:75 M:35 Y:100 K:1		C:50 M:39 Y:59 K:0		C:55 M:90 Y:72 K:27	
41	<i>Malus pumila</i> Mill.	C:59 M:27 Y:92 K:0		C:1 M:1 Y:3 K:0		C:47 M:93 Y:78 K:14	
42	<i>Malus, Chaenomeles</i>	C:25 M:0 Y:73 K:0		C:35 M:70 Y:19 K:0		C:6 M:96 Y:90 K:0	
43	<i>Jasminum nudiflorum</i> Lindl.	C:75 M:44 Y:100 K:4		C:33 M:26 Y:92 K:0		C:59 M:54 Y:100 K:8	
44	<i>Rhododendron simsii</i> Planch.	C:74 M:43 Y:100 K:4		C:5 M:58 Y:17 K:0		C:23 M:81 Y:17 K:0	
45	<i>Magnolia grandiflora</i> Linn.	C:53 M:38 Y:100 K:0		C:33 M:28 Y:37 K:0		C:45 M:52 Y:100 K:1	
46	<i>Syringa reticulata</i> (Bl) Hara var. <i>Mandshurica</i> (Maxim.) Hara (S. <i>Amurensis</i> Rupr.)	C:65 M:27 Y:100 K:0		C:57 M:19 Y:100 K:0		C:43 M:41 Y:62 K:0	
47	<i>Paeonia suffruticosa</i> Andrews	C:62 M:26 Y:87 K:0		C:15 M:54 Y:8 K:0		C:7 M:29 Y:4 K:0	
48	<i>Paeonia lactiflora</i> Pall.	C:70 M:35 Y:99 K:0		C:31 M:100 Y:80 K:1		C:44 M:37 Y:71 K:0	
49	<i>Matthiola incana</i> (L.) R. Br.	C:41 M:11 Y:43 K:0		C:76 M:87 Y:0 K:0		C:53 M:50 Y:19 K:0	
50	<i>Dendranthema morifolium</i>	C:87 M:70 Y:100 K:62		C:37 M:39 Y:100 K:0		C:55 M:55 Y:100 K:6	
51	<i>Tulipa gesneriana</i>	C:63 M:38 Y:61 K:0		C:7 M:68 Y:79 K:0		C:28 M:42 Y:67 K:0	
52	<i>Narcissus tazetta</i> L. var. <i>chinensis</i> Roem.	C:82 M:60 Y:100 K:36		C:22 M:9 Y:23 K:0		C:3 M:38 Y:90 K:0	

Continued

53	<i>Lobelia erinus</i>	C:65 M:35 Y:92 K:0		C:73 M:68 Y:0 K:0		C:73 M:64 Y:0 K:0	
54	<i>Dichondra repens</i> Forst.	C:68 M:16 Y:97 K:0		C:11 M:0 Y:19 K:0		C:40 M:21 Y:59 K:0	
55	<i>Hydrangea macrophylla</i> (Thunb.) Ser.	C:72 M:48 Y:87 K:7		C:56 M:34 Y:18 K:0		C:64 M:46 Y:66 K:2	
56	<i>Opuntia stricta</i> (Haw.) Haw. var. <i>dillenii</i> (Ker-Gawl.) Benson	C:58 M:46 Y:48 K:0		C:22 M:94 Y:85 K:0		C:85 M:41 Y:100 K:3	
57	<i>Incarvillea younghusbandii</i> Sprague	C:79 M:53 Y:100 K:19		C:51 M:49 Y:67 K:1		C:57 M:68 Y:72 K:15	
58	<i>Crocus sativus</i> L.	C:62 M:33 Y:60 K:0		C:42 M:51 Y:7 K:0		C:35 M:97 Y:92 K:2	
59	<i>Populus cathayana</i> Rehd.	C:76 M:44 Y:97 K:4				C:77 M:43 Y:97 K:4	
60	<i>Populus</i> × <i>beijingensis</i> W. Y. Hsu	C:76 M:44 Y:97 K:4				C:77 M:43 Y:97 K:4	
61	<i>Fraxinus mandshurica</i> Rupr	C:58 M:1 Y:84 K:					
62	<i>Prunus mume</i>	C:43 M:0 Y:67 K:0				C:0 M:48 Y:69 K:0	

Note: *E. pulcherrima* belongs to potted plant. According to field survey, a large number of *E. pulcherrima* appear in Norbulinka. Started from landscape color use angle, *E. pulcherrima* is listed as ornamental plant for unified investigation and analysis.

#### 4.2. Analysis on Leaf Color Values of Ornamental Plants in Norbulinka

Seen from **Figure 1**, percentage of purple herb = red shrub; cyan herb > light green herb; dark green arbor > grass green arbor; yellow shrub > jade green shrub; bitter orange arbor < bottle green arbor.

#### 4.3. Analysis on Flower Color Values of Ornamental Plants in Norbulinka

Seen from **Figure 2**, percentage of bitter orange herb < blue shrub; cyan herb > light green herb; dark green arbor > grass green arbor; yellow shrub > jade green shrub; bitter orange arbor < bottle green arbor.

#### 4.4. Analysis on Fruit Color Values of Ornamental Plants in Norbulinka

Seen from **Figure 3**, percentage of purple shrub > yellow shrub; yellow arbor > red arbor; blue arbor = green arbor; red shrub < green shrub,

### 5. Results and Discussions

The results showed that 1) in color values of leaves, percentage of purple herb = red shrub; cyan herb > light green herb, dark green arbor > grass green arbor,

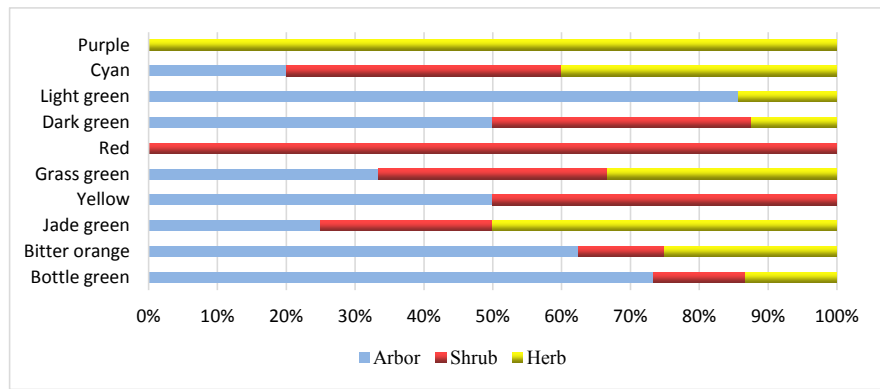


Figure 1. Difference analysis of leaf color values of ornamental plants in Norbulinka.

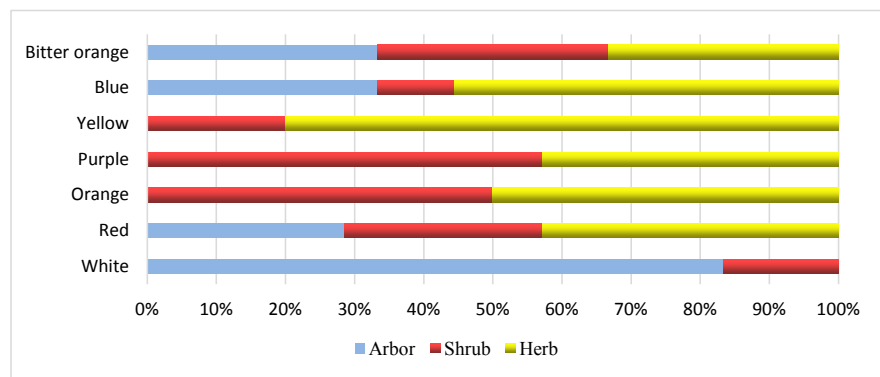


Figure 2. Difference analysis of flower color values of ornamental plants in Norbulinka.

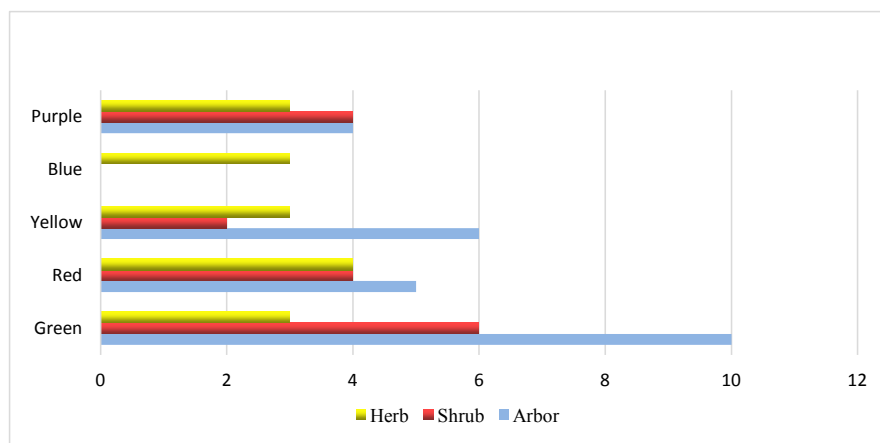


Figure 3. Difference analysis of fruit color values of ornamental plants in Norbulinka.

yellow shrub > jade green shrub, bitter orange arbor < bottle green arbor; 2) in color values of flowers, percentage of bitter orange herb < blue shrub, cyan herb > light green herb, dark green arbor > grass green arbor, yellow shrub > jade green shrub, bitter orange arbor < bottle green arbor; 3) in color values of fruits, percentage of purple shrub > yellow shrub, yellow arbor > red arbor, blue herb = green arbor, red shrub < green shrub.

The investigation time lasted for 4 months, which did not form complete cycle and could not completely reflect dynamic color change of ornamental plants in Norbulink. Meanwhile, the weights of perennial herb and tree change with time goes by, as well as its flower, fruit, leaf, twig and bark, and it needs further exploring the whole impact of plant color in Norbulink.

Based on the research, it could further study dynamic color changes of ornamental plants in Tibet theme park by quantitative analysis method.

## 6. Conclusion

Plant configuration in Norbulink combines Chinese gardening techniques, and a lot of local tree species are planted according to local situation. Meanwhile, the introduction of numerous exotic plants is to better use garden features. Based on prior investigation, plant color data in Norbulink was collected. Combining dynamic change of plant color, plant configuration and color characteristic in Norbulink were analyzed. Plant color data collected by CMYK as the basis of color design of plant landscape has the characteristic of qualitatively and quantitatively expressing color composition, and is the optimization method of scientifically and reasonably expressing color design of plant landscape. Color difference analysis method in this paper has certain research significance for the plant configuration and color matching of plateau garden landscape.

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