



TGP/14.2.3.1 Draft 2

ORIGINAL: English only

DATE: May 23, 2006

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

DRAFT

Associated Document
to the
General Introduction to the Examination
of Distinctness, Uniformity and Stability and the
Development of Harmonized Descriptions of New Varieties of Plants (document TG/1/3)

DOCUMENT TGP/14

**“GLOSSARY OF TECHNICAL, BOTANICAL AND STATISTICAL TERMS
USED IN UPOV DOCUMENTS”**

**Section TGP/14.2.3.1: Botanical Terms:
Color: Color Characteristics**

*Document prepared by an expert from
the European Community*

to be considered by the

*the Technical Working Party for Vegetables at its fortieth session, to be held in Guanajuato,
Guanajuato State, Mexico, from June 12 to 16, 2006*

*the Technical Working Party for Fruit Crops at its thirty-seventh session, to be held in Salvador,
Bahia State, Brazil, from August 21 to 25, 2006*

*the Technical Working Party for Ornamental Plants and Forest Trees at its thirty-ninth session,
to be held in Fortaleza, Ceará State, Brazil, from August 28 to September 1, 2006*

<u>TABLE OF CONTENTS</u>	<u>PAGE</u>
PART I: INTRODUCTION	3
PART II: COLOR	3
1. COMPONENTS OF COLOR	3
2. DEVELOPMENT OF COLOR CHARACTERISTICS	4
2.1 Terms used for color.....	4
2.2 Developing characteristics.....	5
2.2.1 Type of expression.....	5
2.2.2 Order of states of expression.....	5
2.2.3 Color chart	6
2.2.4 Examples.....	6
2.2.4.1 Qualitative characteristics	6
2.2.4.2 Quantitative characteristics	6
2.2.4.3 Pseudo-Qualitative characteristics	6
2.3 Unsuitable color names	7
2.4 Timing of observations.....	7
PART III: COLOR DISTRIBUTION / PATTERN	8
1. TERMS USED FOR COLOR DISTRIBUTION	8
1.1 Main/Secondary/Tertiary Color.....	8
1.2 Ground/Over Color.....	8
1.3 Variegation	8
1.4 One-/Self-Colored	8
2. TERMS USED FOR COLOR PATTERNS.....	9
2.1 Flush/Blush.....	9
2.2 Spotted/Dotted/Patched/Blotched/Mottled	9
2.3 Veined/Midrib	9
2.4 On Margin/Picotee/Marginal Zone.....	9
2.5 Speckled/Striped/Striated/Aciculate/Banded/Central Band/Central Bar	9
2.6 Other color patterns or pattern related characteristics	10
3. DEVELOPMENT OF CHARACTERISTICS FOR COLOR DISTRIBUTION / PATTERN	10
4. EXAMPLES OF COLOR DISTRIBUTION / PATTERN CHARACTERISTICS	11
4.1 Main/Secondary/Tertiary Color.....	11
4.2 Ground/Over Color.....	11
4.3 Variegation	12
4.4 One-/Self-/Two-Colored	12
4.5 Color patterns	12
PART IV: DEFINITIONS	13
PART V: LITERATURE	15

PART I: INTRODUCTION

The purpose of this document is:

(a) To provide guidance on the development of characteristics related to colors and color patterns;

(b) To provide standard illustrations and examples in relation to colors and color patterns which may be useful for inclusion in the Test Guidelines, whilst noting that illustrations for specific characteristics can be found in the relevant Test Guidelines and noting that searches for relevant individual characteristics can be made through TGP/7 “Collection of Approved Characteristics”; and

(c) To provide definitions of botanical terms with an indication of whether those terms are generally used in Test Guidelines, or whether alternative terms might be more appropriate for use in Test Guidelines.

PART II: COLOR

1. COMPONENTS OF COLOR

1.1 Color is complex and can be defined in terms of 3 main elements: HUE (distinguishes the kind of color), SATURATION (the element of color that indicates the purity or grayness of the color) and the BRIGHTNESS (distinguishes the total amount of light that is reflected by the color, how the color is perceived by the eye on the dark to light scale). However for the purposes of UPOV Test Guidelines it is more practical to use a separation of 2 elements of color: COLOR and INTENSITY. The illustration below shows the 2 elements: COLOR in the horizontal cross section and INTENSITY in the vertical axis:



2. DEVELOPMENT OF COLOR CHARACTERISTICS

2.1 Terms used for color

2.1.1 As explained in Section 1, for the purposes of UPOV Test Guidelines, it can be useful to consider color according to the following terms:

COLOR: HUE and SATURATION are, in general, combined in a single characteristic for color
(see 2.1.2 below)

INTENSITY (synonym: LIGHTNESS): (Inverse of BRIGHTNESS): indicates the amount of light that is absorbed by the color, indicated in a light to dark scale, e.g. *light, medium, dark*
(see 2.1.3 below)

2.1.2 There are various forms in which color may be presented as states of expression in the Test Guidelines:

(a) Simple color

e.g. yellow, red, green, blue etc. or

(b) Color combination

e.g. "green red"

in such combinations, the second color indicates the predominant color. For example "green red" belongs to the red group and "red green" belongs to the green group.

(c) Multiple color combinations (use of "-ish")

in cases where there is a limited range of colors which are predominantly one color (e.g. yellow) or predominantly one color combination (e.g. yellow green), but which cover a minor presence of some other colors, the color can be described as, for example,

yellowish, covers all colors which are predominantly yellow (would include, for example, white yellow; brown yellow; orange yellow; etc.)

yellowish green covers all colors which are predominantly green with some yellow (would include, for example, white yellow green; brown yellow green; orange yellow green etc.)

"Whitish" is synonymous with "off white"

(d) Intensity

the intensity can be presented in combination with the color
e.g. light green, dark green etc.

(e) Color chart

Because of its worldwide availability, UPOV uses the color chart from the Royal Horticultural Society (RHS), the “RHS Colour Chart”. There are 3 editions of this color chart, dating from 1966, 1995 and 2001. Since 2005, the ‘RHS mini colour chart’ has also been published by the Flower Council Holland and is also frequently used by breeders. Some examination offices are still in the possession of a HCC colour chart of 1942 and use it beside the RHS Colour chart.

Document TGP/7 “Development of Test Guidelines” (see ASW 4(2)(d)) explains that “Because daylight varies, color determinations made against a color chart should be made either in a suitable cabinet providing artificial daylight or in the middle of the day in a room without direct sunlight. The spectral distribution of the illuminant for artificial daylight should conform with the CIE Standard of Preferred Daylight D 6500 and should fall within the tolerances set out in the British Standard 950, Part I. These determinations should be made with the plant part placed against a white background.”. When it is not possible to make observations under artificial daylight, for example when observations have to be made in the open, observations should not be made in direct sunlight. The observations should be made on a cloudy day with sufficient light intensity, or in a shaded area. When artificial shading is needed in the open, it should be ensured that the color of the shading cloth does not interfere with the observations.

When using the RHS Colour Chart, the reference number of the RHS color, the color name and the edition of the chart should be mentioned in the variety description. A proposal for naming the colors has been made in document TGP/14.2.3.2 [*cross ref.*].

2.2 Developing characteristics

2.2.1 Type of expression

As explained in Section I, color is complex and can be defined in terms of 3 main elements: hue, saturation and brightness (intensity). Therefore, any characteristic which combines more than one of those elements is likely to constitute a pseudo-qualitative characteristic. However, in some cases it may be appropriate to consider one of the elements as a quantitative characteristic. For example, it is common for the intensity of green color to be considered as a quantitative characteristic, with the states light, medium and dark. Where there is a clear discontinuity between color states (e.g. white and red), a qualitative characteristic is indicated.

2.2.2 Order of states of expression

In the Test Guidelines, the states of expression for colors are normally presented in the following order: white, green, yellow, orange, pink, red, purple, violet, blue, brown, black. (note: it is quite common to have the order white, yellow, green where only those colors

occur). However, the chronological appearance of the color (e.g. as the fruit ripens) may also be used (see also documents TGP/14.2, Glossary of Botanical, Statistical and Terms Used in UPOV Documents: Botanical Terms [*cross ref.*]) where appropriate. The same sequence should normally be used for organs with similar states within the same Test Guidelines (e.g. color of leaf and color of the stem).

2.2.3 Color chart

It is not always necessary, or even possible, to make color observations with the help of a color chart. Some examples where the use of a color chart is less useful are:

- in cases where the lightness of a color is observed (e.g. intensity of green color: light-medium-dark).
- where the size of the color surface is very small.
- where only limited, clearly separated, color expressions are present.

2.2.4 Examples

2.2.4.1 *Qualitative characteristics*

Stem: color: green (1); red (2)

2.2.4.2 *Quantitative characteristics*

Leaf: intensity of green color: light (3); medium (5); dark (7) (1 to 9 scale)

2.2.4.3 *Pseudo-Qualitative characteristics*

(i) Simple colors

Flower: main color: white (1); yellow (2); orange (3); red (4)

(ii) Simple colors / color combination

Flower: main color: white (1); yellow white (2); yellow (3); yellow orange (4); orange (5)

(iii) Simple colors / intensity

Flower: main color: white (1); light yellow (2); medium yellow (3); dark yellow (4); orange (5)

(iv) Multiple color combinations (use of “-ish”)

Spathe: color of apex: whitish (1); yellowish (2); greenish (3)

(v) Color chart

Flower: main color: RHS Colour Chart (indicate reference number)

=> description: RHS 11D – light yellow orange

(sometimes the color observed differs slightly from the RHS Colour Chart number. Therefore it may be necessary to refer to several RHS Colour Chart numbers and/or to add a comment to the observed RHS Colour Chart Number, e.g.:

=> description: RHS 11D – light yellow orange, but slightly darker

=> description: RHS 11D to 19D – light yellow orange)

2.3 Unsuitable color names

Color terms such as “beige”, “bronze”, “fuchsia”, “gold”, “ochre”, “salmon”, “silver”, etc. should not normally be used in the Test Guidelines because they could cause confusion concerning the intended color. Therefore, those terms should be replaced by standard colors (e.g. orange brown instead of bronze). However, where those terms are intended to cover a wide range of colors and where those colors do not overlap with the colors in any other states of expression, they could be used in the Test Guidelines. For example: the use of “salmon” to cover all colors between pink and brown, where the only other possible colors are white and green.

Example: Flower: Pistil: Main color: white (1); green (2); salmon (3)

Furthermore, gold and silver might be used in Test Guidelines where the color to be described contains a standard color in combination with other characteristics (like waxy layers). See also TGP/14.2.1 Glossiness [*cross ref.*].

2.4 Timing of observations

2.4.1 It is very important that all color observations on the different organs of the plant should be made at a clearly defined stage of development of the organ. Color expression of the organ might change, for example, during aging of the plant/organ or the time of the day.

2.4.2 In cases where the genetically different speed of evolution of organs may disturb the fixation of appropriate stages of observation common for all varieties of one species, more characteristics to describe the color changes would be necessary.

Examples

Spadix: Main color of distal part shortly before dehiscence of anthers

Spadix: Main color of distal part shortly after dehiscence of anthers

PART III: COLOR DISTRIBUTION / PATTERN

1. TERMS USED FOR COLOR DISTRIBUTION

The following sets of terms can be used to describe the distribution of color

1.1 Main/Secondary/Tertiary Color

- (a) **MAIN COLOR:** color of the largest area of the (part of the) organ.
- (b) **SECONDARY COLOR:** when more than one color is present, the color of the second largest area of the (part of the) organ is the secondary color..
- (c) **TERTIARY COLOR:** when more than two colors are present, the third largest area is the tertiary color.

1.2 Ground/Over Color

- (a) **GROUND COLOR:** The first color to appear chronologically during the development of the organ and upon which other colors will develop in time in the form of spots, a macule, or a color flush or blush. It is not always necessarily the largest area of the (part of the) organ concerned.
- (b) **OVER COLOR:** In the case of an organ which has a ground color with a second color developing over time, usually in the form of a flush, which is not very sharply bordered, this flush is called the over color. It is not always necessarily the smallest area of the (part of the) organ concerned.

1.3 Variegation

VARIEGATION: well defined areas of different colors, especially as irregular patches or stripes on one organ.

1.4 One-/Self-Colored

- (a) **ONE-COLORED organ:** When an organ has either one color or a shading of colors within the same hue but with a different brightness or saturation, without clear borders between the different shades, the color of the organ is considered to be one-colored.
- (b) **SELF-COLORED organ:** A special case of a one-colored organ: when an organ has a shading of colors within the same hue but with a different brightness or saturation, without clear borders between the different shades, the color of the organ is considered to be self-colored.

2. TERMS USED FOR COLOR PATTERNS

2.1 Flush/Blush

- (a) FLUSH = different color hue as a thin layer over the ground color of a surface
- (b) BLUSH = special case of FLUSH where the color of the layer over the ground color of the surface is red or reddish

2.2 Spotted/Dotted/Patched/Blotched/Mottled

- (a) SPOTTED = with other color as sharply outlined spots (round or nearly round contour). Compare to “dotted”, where the spots are smaller.
- (b) DOTTED = finely spotted, if made with a pen. Compare to “spotted”, where the spots are larger and “patched”, where the spots are irregular.
- (c) PATCHED = with small irregular spots that have another color. Compare to “dotted”, “spotted” and “blotched”.
- (d) BLOTCHED = (Synonym: MACULATED) = with sharply outlined irregular large spots. Compare to “spotted”, where the spots are regular, and “mottled”, where the blotches are not sharply outlined.
- (e) MOTTLED = with other color as blotches which are not sharply outlined. Compare to “spotted” and “blotched”, which are sharply outlined.

2.3 Veined/Midrib

- (a) VEINED = different color of veins compared to the rest of the organ.
- (b) MIDRIB = with other color on or around the central vein (synonym MAIN VEIN for monocotyledonous plants)

2.4 On Margin/Picotee/Marginal Zone

- (a) ON MARGIN = (Synonym: EDGED) different color around the margin of an organ.
- (b) PICOTEE = flower characteristic, special form of EDGED with color pattern of margin on a flower, where the margin is narrow and has a different, contrasting, color.
- (c) MARGINAL ZONE = with another color on the marginal zone (see also ON MARGIN/EDGED and PICOTEE)

2.5 Speckled/Striped/Striated/Aciculate/Banded/Central Band/Central Bar

- (a) SPECKLED (maculate) = with many small spots, patches (irregular contour) or flecks (irregular spot, usually longer than broad)
- (b) STRIPED = with another color as more or less parallel stripes

- (c) STRIATED = finely striped = with another color as fine, more or less parallel stripes.
- (d) ACICULATE = with another color as fine, straight stripes, lying in different directions.
- (e) BANDED = broadly striped = with another color as broad, more or less parallel stripes. Compare to “striped” (narrower) and “striae” (much finer).
- (f) CENTRAL BAND = with another color as a horizontal band at the central part of the organ. Compare to “central bar” which is vertical.
- (g) CENTRAL BAR = with another color as a vertical bar at the central part of the organ. Compare to “midrib”, which is usually more narrow and “central band” which is horizontal.
- (h) MARBLING = resembling marble in color pattern
- (i) RETICULATE (synonyms NETTED, TESSELLATED)= with another color as in the form of a net over the surface of the organ.
- (j) SHADED = with a darker shade of the same hue (see also “one-colored” and “self-colored”)

2.6 Other color patterns or pattern related characteristics

- (a) ANTHOCYANIN COLORATION: flush, part of the organ or whole organ has an over color of anthocyanin. Usually, only the area where it is present, the hue and the intensity of the anthocyanin coloration is described.
- (b) GLAUCOSITY(BLOOM): The fact that the surface of an organ is coated with a whitish or grayish waxy layer which can be often be rubbed off or removed.
- (c) CONSPICUOUS: clearly visible, evident
- (d) INCONSPICUOUS: not clearly visible, obscure.

3. DEVELOPMENT OF CHARACTERISTICS FOR COLOR DISTRIBUTION / PATTERN

3.1 When organs have more than one color, the relative area of the surface that is covered with the color in question (including the color pattern) determines whether that color is considered as main color or secondary/tertiary..... color. In cases where the relative areas are equal, the expert should indicate which color is considered to be the main color. One could decide to take the most obvious color, the color located at the apical part or the main color of the visible part of the organ. The basis should be indicated in the Test Guidelines.

3.2 With regard to the order of characteristics, the following order can be considered:

- number of colors of the organ
- main color of the organ
- border between colors (sharply outlined/not sharply outlined); excluding varieties with single colored organs
- regularity of secondary color; excluding varieties with single colored organs
- color of secondary color; excluding varieties with single colored organs
- location of secondary color; excluding varieties with single colored organs
- description of the color pattern
- etc.

3.3 When preparing a list of characteristics to describe a color distribution it is recommended to study the Test Guidelines which are available and which contain similar color descriptions like Test Guidelines, for example: orchids, alstroemeria, ficus and fruit species.

4. EXAMPLES OF COLOR DISTRIBUTION / PATTERN CHARACTERISTICS

4.1 Main/Secondary/Tertiary Color

Flower: Main color: RHS Colour Chart (indicate reference number) (PQ)

Flower: Secondary color: RHS Colour Chart (indicate reference number) (PQ)

Flower: Tertiary color: RHS Colour Chart (indicate reference number) (PQ)

or white (1), red (2).....

(When the area of the tertiary color is relatively small, it will be difficult to describe the color with the RHS Colour Chart. The second option should be used in such a case.)

4.2 Ground/Over Color

Fruit: Ground color white (1); whitish yellow (2); yellow (3); ... (PQ)

Fruit: Relative area of over color absent or very small (1); small (3); medium (5); large (7); very large (9) (QN)

Fruit: Over color: orange red (1); pink red (2); red (3); purple red (4); brown red (5) (PQ)

Fruit: Intensity of over color light (3); medium (5); dark (7) (QN)

Fruit: Pattern of over color only solid flush (1); solid flush with weakly defined stripes (2); solid flush with strongly defined stripes (3); weakly defined flush with strongly defined stripes (4); only stripes (5); flushed and mottled (6); flushed, striped and mottled (7) (PQ)

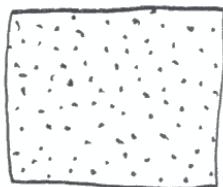
4.3 Variegation

Leaf: intensity of green color (excluding variegation)	light (3); medium (5); dark (7)	(QN: 1 to 9 scale)
Leaf: color of variegation <i>(followed by a description of the variegation like:)</i>	white (1); yellowish (2); light green (3)	(PQ)
<u>Varieties with variegated leaves only:</u> leaf: distribution of variegation	Near main vein (1); near margin (2); randomly spread (3)	(PQ)

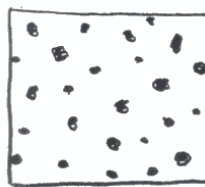
4.4 One-/Self-/Two-Colored

Ray floret: number of colors	one (1); two (2)	(QL)
	<i>(State (1) also includes self-colored)</i>	
<u>Only one-colored varieties</u>	none (1); lighter towards base (2); lighter towards apex (3)	
Ray floret: Color distribution of upper side	<i>(States of expression (2) and (3) are examples of self colored)</i>	

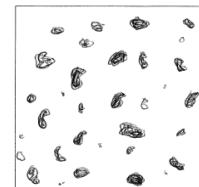
4.5 Color patterns



Dotted



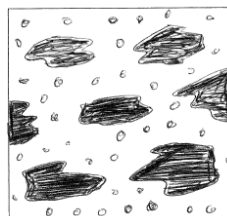
Spotted



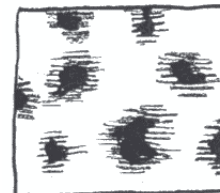
Patched



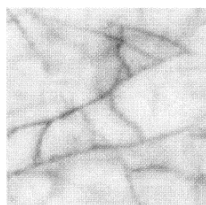
Blotched (Maculate)



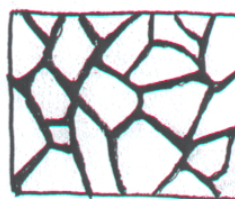
Speckled



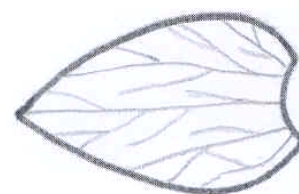
Mottled



Marbling



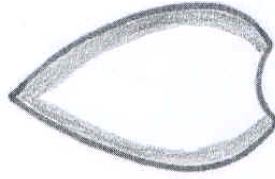
Reticulate (Netted, Tessellated)



Veined



Midrib



On Margin (Edged)



Picotee



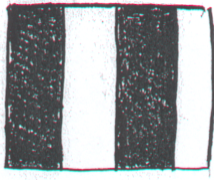
Marginal Zone



Central Band



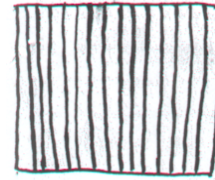
Central Bar



Banded



Striped



Striated



Aciculate

to be provided

Shaded

PART IV: DEFINITIONS

(to be provided for:)

Aciculate
Anthocyanin coloration
Banded
Bloom
Blotched
Blush
Brightness
Bronze
Central Band
Central Bar
Color
Conspicuous
Dotted
Edged
Fleck
Flush

Fuchsia
Glaucosity
Gold
Ground color
HCC colour chart
Hue
Inconspicuous
-ish
Lightness
Maculated
Main color
Main vein
Marbling
Marginal zone
Midrib
Mottled
Netted
Off white
On margin
One-colored
Over color
Patched
Picotee
Reticulate
RHS color
RHS colour chart
RHS mini colour chart
Salmon
Saturation
Secondary color
Self-colored
Shaded
Silver
Speckled
Spotted
Striated
Striped
Tertiary color
Tessellated
Variegation
Veined
Waxy layer
Whitish
Yellowish

PART V: LITERATURE

RHS Colour Chart, 2001, Royal Horticultural Society, London, UK

RHS Mini Colour Chart, 2005, Royal Horticultural Society, London, UK, published together with the Flower Council Holland, Leiden, NL.

Horticultural Colour Chart (HCC Chart), 1942, R.F. Wilson, Published by the British Colour Council in collaboration with the Royal Horticultural Society.

International Commission on Illumination C.I.E./USA: ISO 15469:2004/CIE S 011/E:2003, Spatial distribution of daylight – CIE standard general sky

Rochester Institute of Technology: Munsell Color Science Laboratory; website: <http://mcsl.rit.edu/>

[End of document]