

Technical Working Party on Testing Methods and Techniques**TWM/1/5****First Session****Virtual meeting, September 19 to 23, 2022****Original:** English**Date:** August 17, 2022

COLOR IMAGING ANALYSIS SYSTEM*Document prepared by an expert from China**Disclaimer: this document does not represent UPOV policies or guidance***BACKGROUND**

1. Color Imaging Analysis System consists of software and hardware. Technique of 'Camera Colorimetric Characterization' was innovatively applied in color measurement in the software. Functions of the software include qualitative & quantitative analysis, background removing, color clustering, color chart (e.g. RHSCC) mapping and mapping error displaying. A photographing box was also independently developed as hardware interface supporting software use, with lights installed on the 4 sides of the bottom to eliminate shadow as well as illumination differences along with photographing heights. Height switching (from 20 to 650mm) and quick overall storage are also achieved in the box, for the purpose of portability and mobility in field operation. The System can provide technical support for color-oriented plant breeding, color testing and evaluation, to enhance the objectivity and efficiency of color analysis.
2. The annex to this document contains a copy of a presentation on "Color Imaging Analysis System", prepared by an expert from China, to be made at the first session of the TWM.

[Annex follows]

Color Imaging Analysis System

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Date: Sep. 2022



Content



- **Background**.....
- **Analysis Software**.....
- **Photographing Box**.....
- **Video Demo**.....

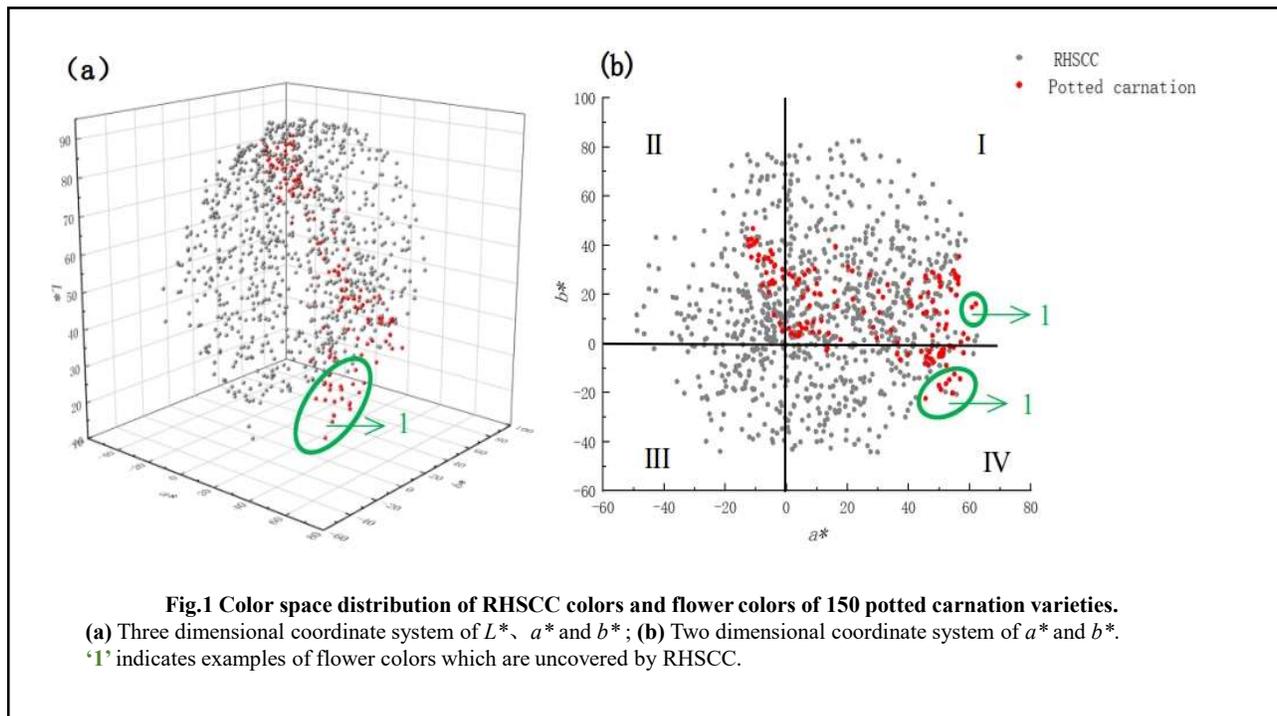
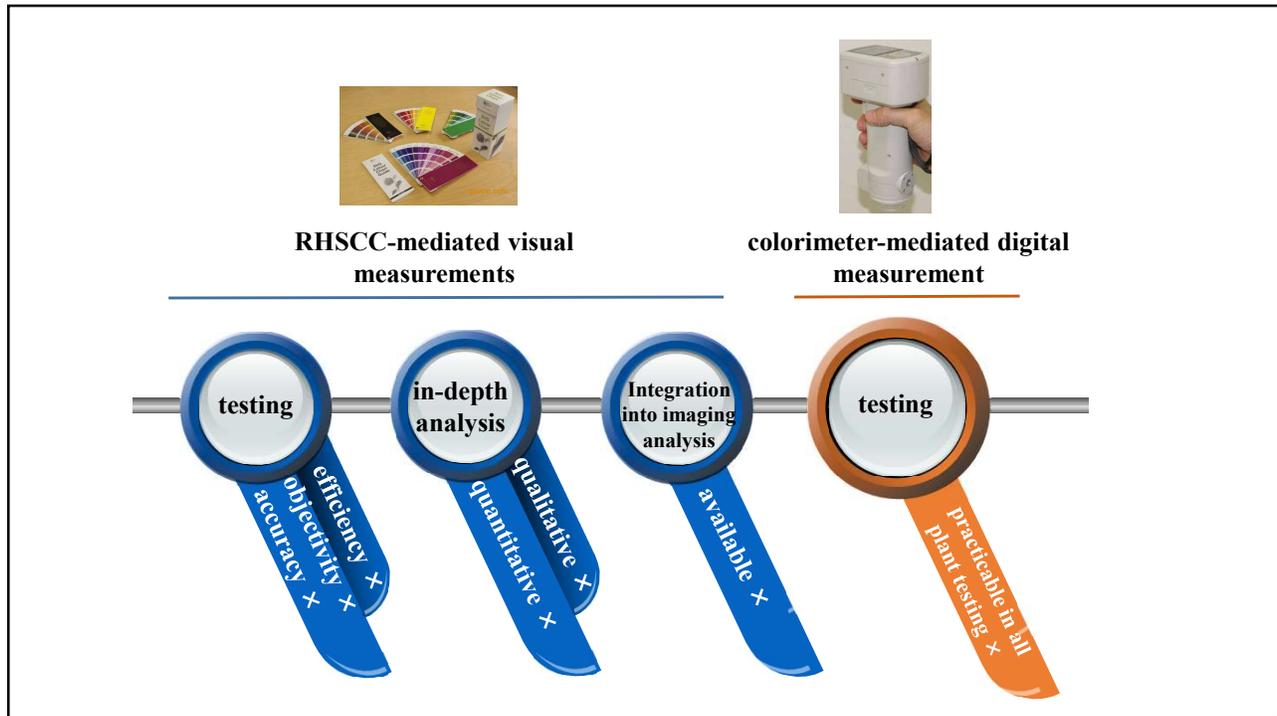


Table 1 Analysis of color difference

Distribution range of color difference value	RHSCC colors/ RHSCC colors ¹	In the same UPOV color group ²	In different UPOV color group ²	Colorimeter-mediated measurements / RHSCC-mediated measurements ³
0.50~1.50	60	56	4	5
1.50~3.00	211	182	29	20
3.00~6.00	473	335	138	78
>6.00	140	91	49	47
Total	884	664	220	150

Note:

RHSCC colors / RHSCC colors¹ indicates number of in-pair RHSCC colors with corresponding color difference values;

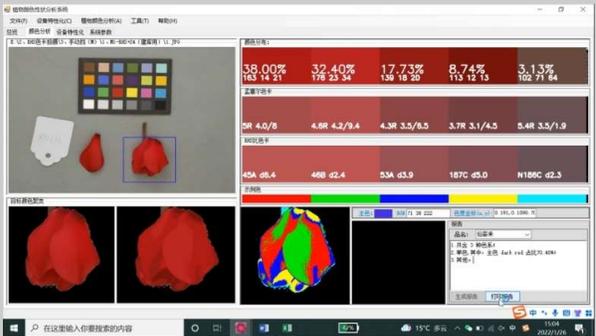
In the same / different UPOV color group² indicates number of in-pair RHSCC colors with corresponding color difference values, in the same / different UPOV color groups;

Colorimeter-mediated measurements / RHSCC-mediated measurements³ indicates number of in-pair flower color measurements (colorimeter-mediated measurements and RHSCC-mediated measurements) of 150 potted carnation varieties with corresponding color difference values.



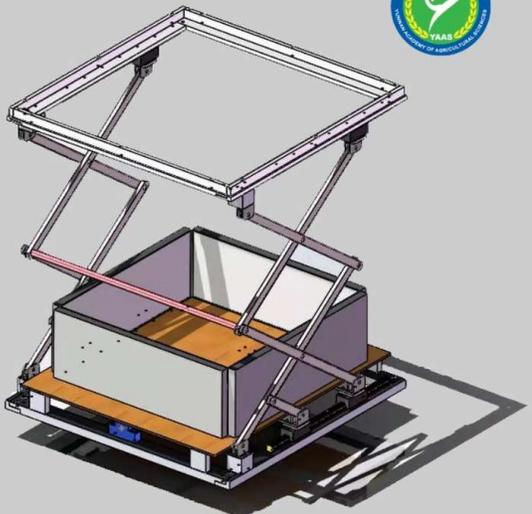
Fig.2 Examples of in-pair RHSCC colors with color difference values of less than 3.

Color Imaging Analysis System



38.00%	32.40%	17.73%	8.74%	3.13%
163 14 21	176 23 34	136 16 20	113 12 13	102 71 64

analysis software



photographing box

Content

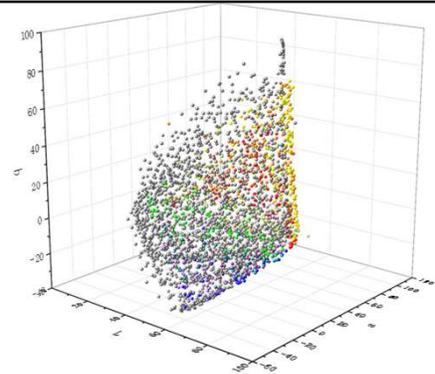


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Color is described in 3D space

equipment-dependent color spaces: CMY; HSL; RGB.....

equipment-independent color spaces: CIE XYZ; CIE LAB;



Taking advantage of the technique of camera colorimetric characterization, our software can transfer images' RGB color space, which is dependent on camera, to color spaces of CIEXYZ and CIELAB, which is independent of camera.

Training sample: 24 color card
Method: least square multiple regression

background removing

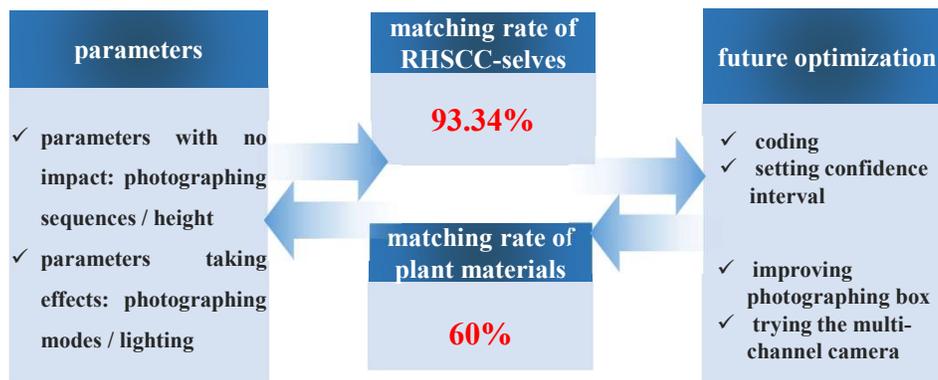
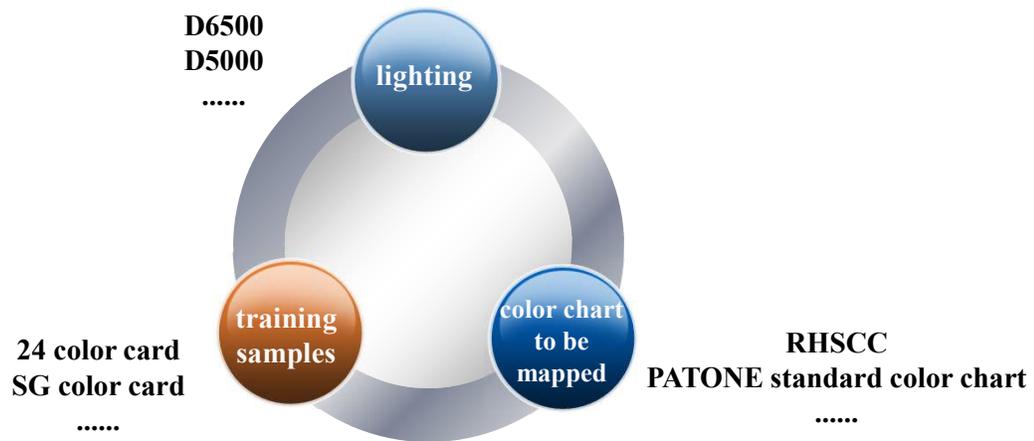
color clustering

quantitative analysis

qualitative analysis

RHSCC mapping / mapping error showing

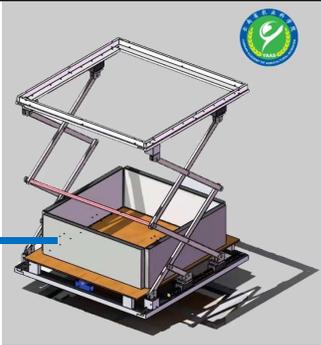
- ✓ Databases with different combination of parameters was established initially and integrated into software for color chart mapping purpose. Three kinds of parameters were taken into consideration, while photographing mode was fixed throughout.
- ✓ Our commonly used parameters included D6500, 24 color chart, RHSCC.



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lights (D6500):
installed on the 4 sides
of the bottom.



quick overall storage

该系统硬件平台使用自主研发的拍摄箱



height switching
(from 20 to 650mm)

实现20-650mm之间任一拍摄高度升降切换



portable and mobile
virtue for field
operation

特殊光学设计可消除拍摄阴影

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