# Application of a New Illustration Technique in Plant Systematics: Composite Images of Two Autumn Flowering *Crocus* L. (Iridaceae) Taxa from Series Biflori in Turkey

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## Abstract

In this study, composite images of two rare and endemic *Crocus* taxa, *C. biflorus* Miller subsp. *nerimaniae* (Yüzb.) Kerndorff & Pasche and *C. biflorus Miller* subsp. *wattiorum* B.Mathew were depicted with a new illustration method application in plant systematics.

**Key words:** Composite images, *Crocus,* Iridaceae, Virtual Herbarium
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## Introduction

Nowadays, accessing information is more important than producing it. Electronic documents supply easy archiving and rapid access to data. An electronic document is transferred computer information via keyboard, scanner, camera, music set, e-mail, fax, etc. All sorts of text, voice, and image, graphics can be an electronic document. Various fields of the natural sciences use computers for electronic documentation (Odabaş 1999).

In systematic botany, scanning plant specimens and database generation is not a new idea. Herbarium sheets have been scanning for a long time. At the present day, most modern herbaria have a virtual herbarium. A virtual herbarium is a web-based collection of digital images of preserved plants or plant parts. Each virtual specimen is accompanied by information on where and when it was collected, by whom, its correct botanical name, and often information on associated species and ecological preferences (Erol et al. 2008b).

Pressed, dried plants mounted on sheets, in the form of herbarium specimens, have long formed an important reference tool for botanists. For botanical purposes, we suggest the concept of a 'composite image' (Simpson 2005) as an additional tool to supplement ISTF (Istanbul University Science Faculty Herbarium) garden specimens. Such image specimens could be especially useful for those plants which for some reason do not press well, or where diagnostic color is lost on drying. They could significantly boost information held in herbaria.

A composite image is; a digitally created plant portrayal showing the diagnostic and

characteristic features of the taxa, compiled on a white background. It should be combined in a botanically reasonable, yet eye-catching, composition with all parts shown to a proper scale and with all the component parts shown without confusing or obscuring shadows. An important consideration is that the majorities of parts are completely isolated from any background, and therefore are separately transferable and scalable. The illustration is largely, but not necessarily completely, based on digital photography, since digital versions of other illustrative material can readily be included. Additional information, such as any textual component of title block, lettering of parts, and other information relating to the taxa, may be incorporated to suit requirement. The composite images are independent of language, understood by readers around the world and are easily accesible to viewers of a wide range of interest (N. Simpson 2008, personal communication). The purpose of this paper is to introduce a new imagining method "Composite Image" for the Turkish botanisty.

**Materials and Methods**

Specimens collection;

*C. biflorus* subsp. *nerimaniae* (Yüzb.) Kerndorff & Pasche, Aydın: Çine: Labranda, 19.10.2006, O. Erol & L. Şık. (Istanbul University Alfred Heilbronn Botanical Garden, accession number SB 16)

*C. biflorus* subsp. *wattiorum* B.Mathew, Antalya: Tahtalı d., 09.11.2006, O. Erol & L. Şık. ISTF 39932

Canon S3 digital camera was used for taking images of the observed taxa. Daylight was used throughout, with no artificial lighting, in order to avoid color bias and achieve as close as possible color accuracy without expensive apparatus. Images were processed on Adobe Photoshop 7.0 (A4 document, resolutions 300 pixels/inch). Color bars were arranged according to Royal Horticulture Color Chart. (Wilson 1938-1942)

Composite imaging steps:

(According to Simpson and Barnes, 2008, with some modifications)

1. Research and plan the illustration, making appropriate drawings, notes, etc.

2. Place the plant specimen and identify.

3. Shoot the plant and all the required diagnostic parts, including sections and dissections, with considered lighting angles, against a black velvet and in such a way as to reduce shadows to a minimum.

4. Either take careful measurement notes or add in a scale into the photographs as appropriate, and take any color references needed.

5. Download the photographs, assess, save and file.

6. Study the photographs obtained and make a final selection of those parts which, in grouping, show all the features required.

7. Re-take any unfortunate or missing shots.

8. Stitch up images together if necessary.

9. Where possible use pure photographs in order to retain the full truth of the botanical information. If essential, mend damaged areas, but manipulate and mend only as necessary, and always keep the full original photograph file for reference.

10. Isolate each part from its background to form a new “clipped” image. A variety of tools is now available to do this, such as color replacers, edge-finders and background erasers. Use whichever tool suits the particular situation

best and save each isolated part as a separate image from the original.

11. Make a decision on size and resolution of output of the final image and create the overall template for the illustration accordingly.

12. Put together the selected parts into a unified composite illustration on a white background, saving it at each stage. Size and orient each part to give the optimum combination and emphasis to the illustration.

13. Re-visit the plant at later dates to capture details which occur at different times of the year and add in these later parts into the work.

14. Improve the clarity of any parts with digital artwork if necessary and digitize any other artwork, diagrams, etc. to be included and add to the image.

15. Add scale bars in a consistent fashion for all parts shown and then any textual components, such as title/name, signature, copyright, etc. Letter or number the component parts.

16. Add any other information, such as color key, time-bar, origin details such as accession number, collection number, map location, etc.

17. Any metadata required needs to be added in the image file and then lastly, the final version needs to be named, dated and saved. Most important of all is to create a back-up copy of the file.

**Discussion and Conclusion**

In genus *Crocus*, the colors of the tepals are important diagnostic characters. (Mathew 1987) Usually, portraying the color is quite difficult. With this method, we can exhibit the original colors, the stripes and the blotches on tepals. Another advantage of the method is portraying the tunics in letter-perfect. Tunics supply extremely rich taxonomic characters, and they may be smooth coriaceous, smooth papery, splitting into rings at the base, papery but splitting into longitudinally parallel strips, wholly parallel fibrous, reticulate fibrous or fibres are distinctly plaited together. Although, each *Crocus* taxon has a sole tunic structure, the terms used for the structures of tunics are deficient (Erol *et al.* 2008a, Mathew 1982; Maw 1886). This indicates the need for clear technical drawings. Erol *et al.* (2008a) gave some clear tunic drawings but they lack color. The composite images of *Crocus* would be helpful describing tepals, corm tunics and other diagnostic parts of the genus.

With this new method, we also aim to share the plant specimens of I.U. "Alfred Heilbronn" Botanical Garden via Visual Herbarium of ISTF (Erol; 2008b). Virtual Herbaria are perfect and the easiest way to obtain information about the specimens. You can see the image of the plant, condition of the specimen, identity number, collector, collection date, locality information. Also you can request for the loan. Of course, they are informative for botany students. In this way, researchers can access and study plant specimens with original colors and scale bars.

Simpson (2005) and Simpson and Barnes (2007) showed the use of a “color key” inside digital composite illustrations, to provide color references for the diagnostic parts. This can be helpful for illustrating cultivars, where color can be diagnostic and to accompany herbarium specimens where color may be lost on drying. For the color recording in the examples shown, the color-reference used was the RHS Color Chart (Wilson; 1938-1942) which was created as a standard reference for recording color in cultivated plants.

A secondary advantage of digital images arises from their use of metadata. This is textual data about the image, and actually stored within the image itself. Metadata may contain useful camera-generated (EXIF) data such as date,

exposure and lens details, but also many user-editable fields, including title, caption, copyright information, the incorporation of GPS data, and many others which are of potential value to botanists, as well as artists (Simpson and Barns; 2008).

Composite images allow botanists to view the diagnostic characters of plants throughout the year, in full photographic pragmatism, using the power of the magnification tools in image software. They display how digital techniques can be tied together for the conception of reference-standard images for scientific illustration. The importance has not been for perfect photographs, but towards developing a manageable and reasonable technique to portray plants exactly. Such composite plates could be used for both published and on screen identification aids, by depicting the general characteristics of taxa or could form a graphical record of a particular plant specimen and so offer a supplement to the herbarium specimen of that particular plant in the form of a composite image (Simpson and Barnes 2008).

***Key to Composite Images***

A. Habit, B. Corm, C. Tunics, D. Cataphylls (first three) and in order bract and bracteole E.

Texture of the bracteole F. In order; front face and back face of outer perianth segments; front face and back face of inner perianth segments G. Stamens H. Stigma

Color Bars (Wilson 1938-1942)

| ***Crocus biflorus* subsp. *wattiorum*** | ***Crocus biflorus* subsp. *nerimaniae*** |
|---|---|
| 548/2 Ethyl Blue | 46/2 Cerulein Blue |
| 49/1 Porcelain Blue | 934 Plum Purple |
| 63/3 Uranium Green | 48/2 Enamel Blue |
| 821/1 Current Red | 10/1 Spanish Orange |
| 09/3 Majolica Yellow | 710 Persimmon Orange |
| 00918 Garnet Brown | 1030/1 Maroon |

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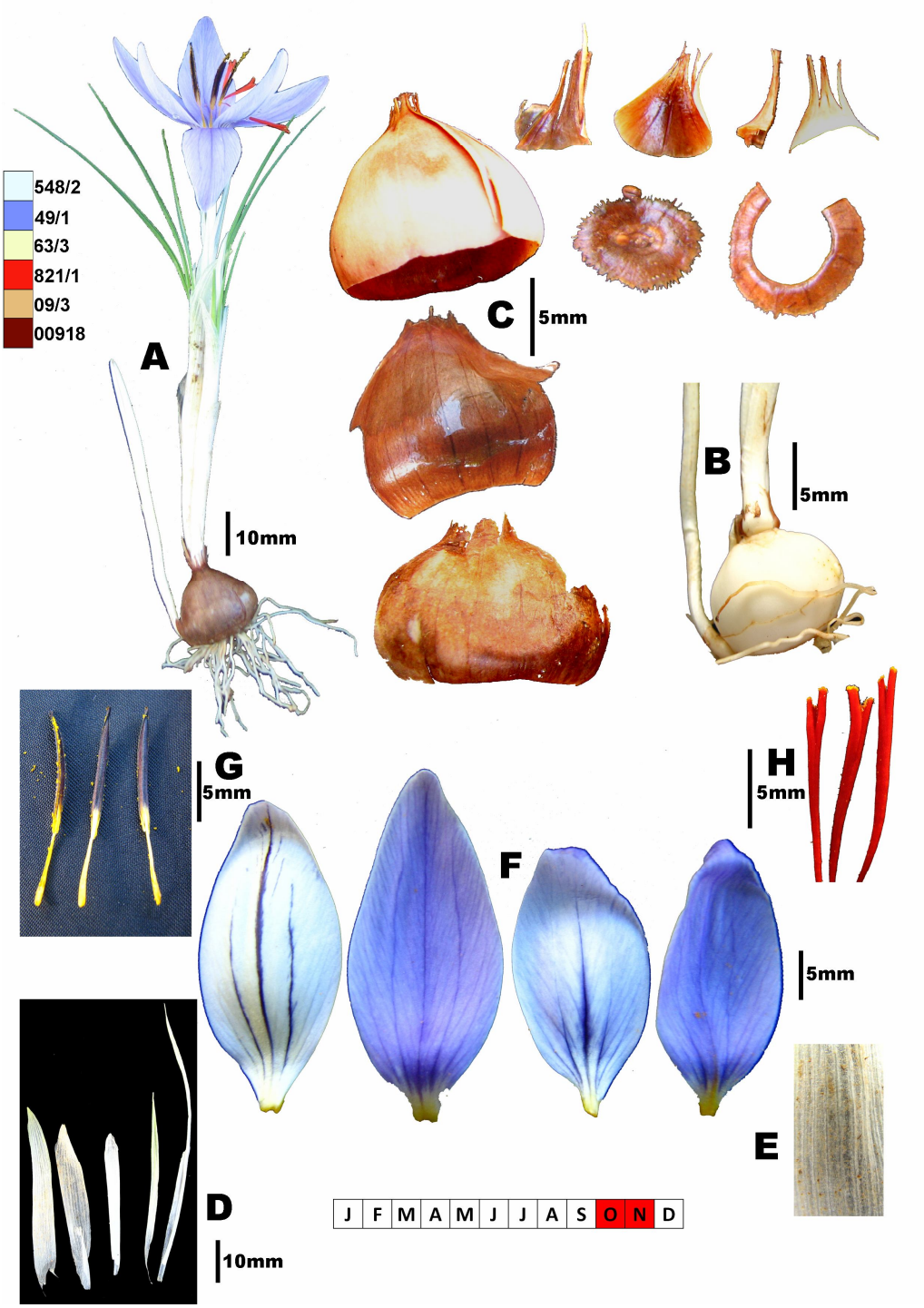


**Figure 1.** *Crocus biflorus* subsp. *wattiorum*

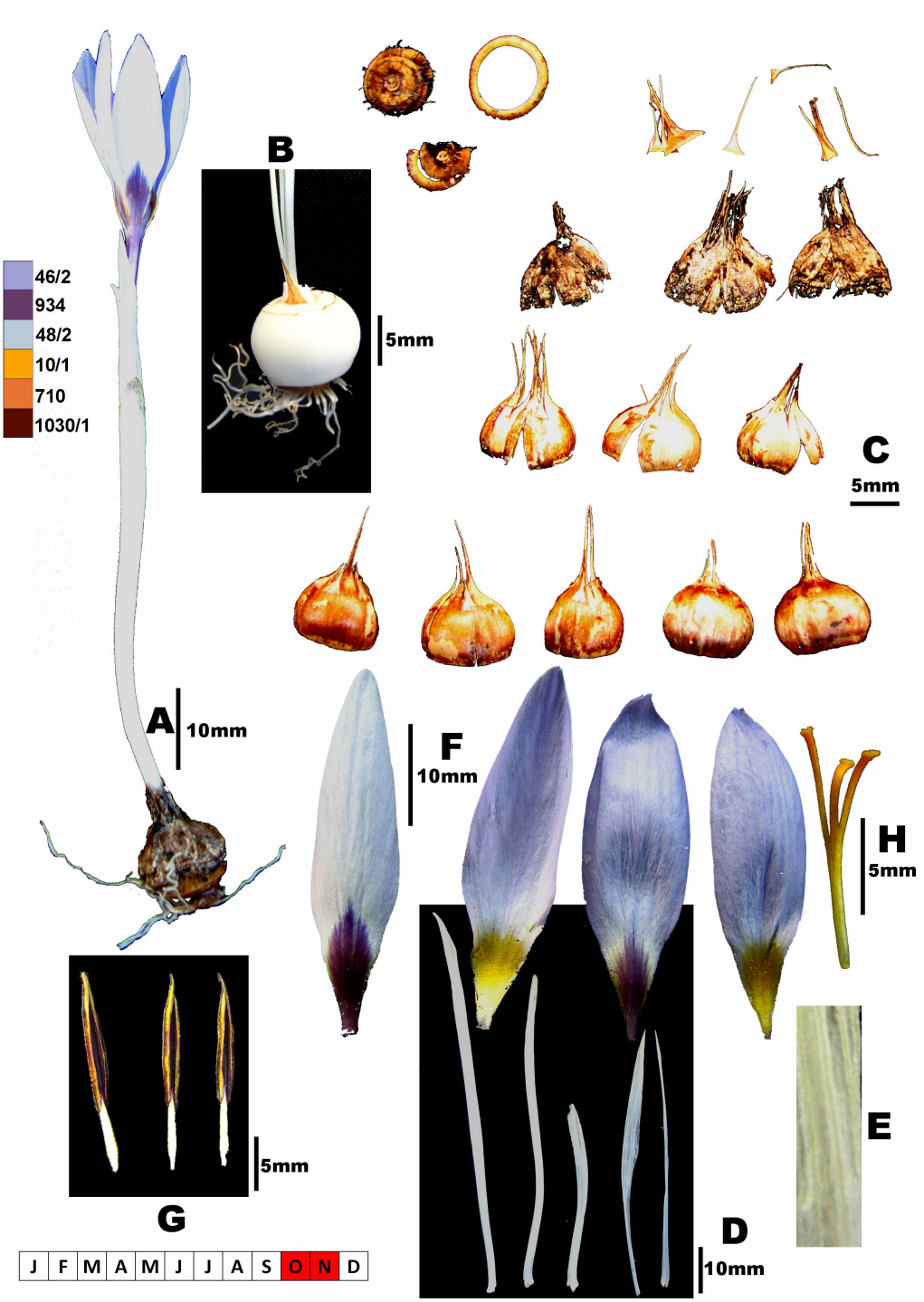


**Figure 2.** *Crocus biflorus* subsp. *nerimaniae*

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