



TWO/29/17

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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS
GENEVA

**TECHNICAL WORKING PARTY
FOR
ORNAMENTAL PLANTS AND FOREST TREES**

**Twenty-Ninth Session
Tel Aviv, April 15 to 19, 1996**

REPORT OF THE SUBGROUP MEETING ON IMAGE ANALYSIS

(Hanover, Germany, October 1 and 2, 1996)

prepared by the Office of the Union

Opening of the Session

1. The meeting of the Subgroup on Image Analysis of the Technical Working Party for Ornamental Plants and Forest Trees (hereinafter referred to as "Subgroup") was held at Hanover, Germany, on October 1 and 2, 1996. The list of participants is presented in Annex I to this report.

2. Mr. H. Kunhardt (Germany), Deputy President of the Federal Office of Plant Varieties, Bundessortenamt, welcomed the participants to his office in Hanover. The session was opened by Mrs. U. Löscher (Germany), Chairman of the Technical Working Party for Ornamental Plants and Forest Trees.

Adoption of the Agenda

3. The Subgroup unanimously adopted the agenda for its session which is reproduced in document TWO/29/16. As several items were overlapping, the Subgroup agreed to discuss items 4, 5 and 6 partly together and also items 8 and 9.

Report on the Discussion of Use of Image Analysis in the DUS Testing of Ornamental Plants During the Last Session of the TWO

4. Mrs. Löscher recalled paragraphs 4 to 9 of document TWO/29/15 reproducing the results of the discussions held by the TWO during its last session, which led to the convocation of the present Subgroup meeting, which read as follows:

“The Use of Image Analysis in the DUS Testing of Ornamental Plants”

“4. The Working Party referred to its decision that it was more appropriate to continue discussing the subject in the whole Working Party, thus giving all member States the chance to participate and not only those four States which at present did research on that method, that emphasis should be laid on the observation of shape, size and color distribution of leaves and flowers and that it was important that breeders also participated in the discussions on image analysis, especially breeders from countries with a breeders’ testing system, as they would need to be able to follow if new characteristics were included in the Test Guidelines.”

“5. The expert from the Netherlands reported that the planned research on *Ficus* had had to be postponed until later this year and that in ornamental species no other research was being done. The expert from South Africa reported that some research was being done on seed identification. The expert from France reported on a study of comparing varieties, trying to get standardized images, comparing methods that could be used and standardizing seed analysis. The expert from Germany gave a short explanation on the progress made in the research on image processing which had been separated into image recording and image analysis. The research program on image recording (taking images and storing data) had been completed. It was now possible to search in the database for different varieties, display the images as well as other characteristics of the variety on the screen. It was also possible to use slides taken earlier and store the pictures in the system. Research would now start on image analysis. It was planned to use the same basis also in the Netherlands. A short summary of the report from the German expert is reproduced in Annex II to this report.”

“6. The Working Party concluded that, in the ornamental field, image analysis was still under research and not yet applicable for decisions on DUS and also not as a tool for measuring, e.g. length or width of plant organs. It was necessary to continue the research and to reach conclusions on the harmonization of the methods. For the future, it was therefore insufficient if only the experts continued discussions in the TWO sessions. Discussions should be held at two levels and

experts engaged in the research should also meet and exchange information, discuss problems and try to find solutions.”

“7. The Working Party, at the invitation of the experts from Germany, agreed to hold a Subgroup Meeting on Image Analysis at Hanover, Germany on September 26 and 27, 1996 [after the session changed to October 1 and 2, 1996]. The Subgroup’s agenda should cover an exchange of information and an inventory of the state of research in each country, including the hardware and software used, for which species the research had been successful, the use of the technique and a collection and discussion of the questions and problems encountered during the present research and a discussion of the questions raised by the Working Party. The Working Party agreed that only real problems and difficulties should be discussed, such as the analysis of, for example, leaf variation in *Ficus* varieties (in order to find an objective proof of difference in variegation), the saving of time in the measurement of length and width in numerous *Pelargonium* varieties or the question of repeatability of results. The Subgroup should also consider giving advice to other States on how to start with image analysis in a given State (hardware, software), how far one program could be used for different species and on how to work from existing photos or photos taken from different testing places and centrally processed by image analysis. Results of image analysis should be harmonized so as to enable their use by all member States.”

“8. The Subgroup Meeting should be aimed mainly at the experts engaged in research on image analysis in ornamental species, but should also be open to other experts working in other species or other interested experts. The Chairman of the Working Party should chair the first meeting. Depending on the outcome of the first meeting, either a second meeting would be proposed in connection with the next session of the Working Party, to allow broader participation, or simply a report on the first meeting would be presented to the Working Party.”

“Picture of the Variety Added to the Official Variety Description”

“9. The Working Party noted that several States had added to the official variety description a color photo of organs of the variety or made such photo even part of the description. While most experts found that an additional photo provided very useful information, it could not recommend all States to follow the same procedure. At present, the printing of the color would still pose severe problems. In future, the use of photos on the screen may facilitate things. In the Netherlands some commercial flower sales organizations were already proposing descriptions of flower lots for sale by telephone and computer, including color photos of the plant material. An unresolved question in respect of color photos forming part of official descriptions was to whom the copyright belonged: Could the applicant claim copyright if he supplied the photo or would he have to accept unlimited use of his photo together with the description of his variety once protected?”

5. Mr. M.-H. Thiele-Wittig gave a short report on the present situation of the UPOV-ROM Plant Variety Database, where the first production disc had been distributed at the end of

August 1996; the second production disc was expected to be ready at the end of October 1996. A request for data submission for the third disc had already been made.

Reports of Participants of this Meeting on the Hard- and Software Used for Image Analysis (Illustrative Material, Literature and Off-prints are Appreciated), Subjects of Research and Routine Work and Results on Certain Species Reported by Participants of this Meeting and Exchange of Experience with Image Recording and Image Analysis

6. Mr. G. van der Heijden (Netherlands) reported on the species and on the hardware and software used in the Netherlands by the CPRO for image analysis. A summary of his report is reproduced in Annex II to this report.

7. Mrs. M.-H. Gandelin (France) reported on the species and on the hardware and software used in France in different institutes for image analysis. The details are reproduced in Annex III to this report.

8. Mr. D. Warren (United Kingdom) reported on the species and on the hardware and software used in the NIAB for image analysis. A summary of his report is reproduced in Annex IV to this report.

9. Mrs. A. Menne and Mrs. K. Sieber (Germany) reported on the hardware and software configuration used in the Bundessortenamt. Details of their reports are reproduced in Annex V (hard- and software configuration) and Annex VI (subjects of research and routine work and results on certain species) to this report. The report was followed by a practical demonstration and use of the hardware and software. Mr. T. Drobek (Germany) also gave a short explanation on the research on image analysis on rye.

10. Dr L. Puzone (IPGRI) reported on research done for the characterization and documentation of genetic resources utilizing multimedia databases to be used to describe morphological and chromatic characteristics useful for germ plasma documentation. Details of his report are reproduced in Annex VII to this report.

11. Mr. G. van der Heijden (the Netherlands) reported on the VISOR project, a project on an image recognition system for plant variety testing which intended to develop a procedure for the capture of images, a computer program to measure and describe the characteristics automatically and image database. Applications to obtain some financial help from the European Union (EU) has so far failed twice. From the remarks obtained together with the rejections of the application, it is now intended not to repeat the application for the financing of the project for a third time but to apply for financing of a concerted action to facilitate traveling and training to obtain more harmonization between the research going on in the different member States. All member States who were interested in such a revised project were invited to contact Mr. van der Heijden before the end of October 1996. Mr. van der Heijden would also be interested to be informed of other experts which might be interested in such a concerted action which could also involve other institutes, universities or breeding companies which were advanced in this area.

Possibilities of Harmonization of Methods and Data Formats and Recommendations of Hard- and Software to be Used for Image Analysis

12. The Subgroup discussed at length the need for harmonization. As at present there was still rapid development in equipment, harmonization of hardware was still too early and almost impossible as it would prevent following the new development. Most experts agreed that there was little need to harmonize hardware or software in general. Not the methods should be harmonized but the results. Harmonization was not needed between research or testing on different species but only if different countries were doing tests on the same species. But even here the most important was only that the final results agreed with each other. As the results had to be transferred into states of expression of characteristics in agreed Test Guidelines a comparison was rather easy and results could be adjusted.

13. Several experts expressed the need for some harmonization on the capturing of color pictures and on their quality. There was a need to find standardized ways for the exchange of those pictures and on the exchange medium. The majority considered a writable CD-ROM to be the most appropriate medium and the cheapest. A trial should be made in order to find the best solution.

14. The most important was to keep in contact with each other, exchange information, discuss together the recent developments, visit each other's trials and thus benefit from the experiences gained. This would also ensure avoiding directions in research which result in a drifting apart from each other.

15. In order to get a better idea on what could be standardized and to prepare a catalogue of items and recommendations for harmonization the Subgroup agreed to make a small combined experiment. With Mr. van der Heijden (Netherlands) as leading expert together with experts from Germany, France and the United Kingdom it would study:

- (a) the exchange of stored color pictures and
- (b) the image analysis of leaves and petals or flowers

of a reduced number of rose varieties (e.g. 10). Other countries which would like to join that project should contact Mr. van der Heijden. The Subgroup expected that some progress report could be given to the TWO during its next session in 1997).

[Seven annexes follow]

ANNEX I

LIST OF PARTICIPANTS

I. MEMBER STATES

FRANCE

Marie-Hélène GANDELIN (Mrs.), GIP-GEVES, Sophia Antipolis, Route des Colles,
06410 Biot (tel.: +33-92 96 55 60, fax: +33-92 96 55 69)

GERMANY

Henning KUNHARDT, Leitender Regierungsdirektor, Bundessortenamt, Osterfelddamm 80,
30627 Hannover

Friedrich LAIDIG, Bundessortenamt, Osterfelddamm 80, 30627 Hannover
(tel. +49-511-9566-689, fax: +49-511-563 362)

Ulrike LÖSCHER (Mrs.), Bundessortenamt, Postfach 61 04 40, 30604 Hannover
(tel. +49-511-9566-725, fax +49-511-563 362)

Thomas DROBEK, Bundessortenamt, Postfach 61 04 40, 30604 Hannover
(tel. +49-511-9566-751, fax +49-511-563 362)

Andrea MENNE (Mrs.), Bundessortenamt, Postfach 61 04 40, 30604 Hannover
(tel. +49-511-95 66-723, fax +49-511-563 362)

Kathrin SIEBERT (Mrs.), Bundessortenamt, Osterfelddamm 80, 30627 Hannover
(tel. +49-511-95 66-751, fax +49-511-563 362)

B. SPELLERBERG, Bundessortenamt, Osterfelddamm 80, 30627 Hannover
(tel. +49-5138-6086-40, fax +49-511-563 362)

JAPAN

Takeaki OGASAHARA, Seeds and Seedlings Division, Agricultural Production Bureau,
Ministry of Agriculture, Forestry and Fisheries, 1-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100
(tel. +81-3-3591-0524, fax +81-3-3502-6572)

Kenji NUMAGUCHI, National Center for Seeds and Seedlings Division, Ministry of
Agriculture, Forestry and Fisheries, Kansai Station, 3-14-11 Nagayoshi-Nagaharahigashi,
Hirano-ku, Osaka (tel. +81-6-709-2100, fax +81-6-700-1396)

NETHERLANDS

Joost BARENDRECHT, CPRO-DLO, P.O. Box 16, 6700 AA Wageningen
(tel. +31-317-4768 93, fax +31-317-416 513 (as of 15/11/96: fax: +31-317-418 094),
e-mail: C.J.Barendrecht@crpo.agro.nl)

Gerie VAN DER HEIJDEN, CPRO-DLO, Postbus 16, 6700 AA Wageningen
(tel. +31-317-476 841, fax +31-317-416 094)

UNITED KINGDOM

David WARREN, National Institute for Agricultural Botany, Huntingdon Road, Cambridge,
CB3 0LE (tel. +44-1223-342 242, fax +44-1223-277 602)

Elizabeth SCOTT (Miss), Ornamental Plants Section, NIAB, Huntingdon Road, Cambridge
CB3 0LE (tel. +44-1223-342 399, fax +44-1223 342 229)

III. ORGANIZATION

Luigi PUZONE, International Plant Genetic Resources Institute (IPGRI) fellow, Department
of Agronomy and Plant Genetics of the University of Naples, Portici, Via Universita 100,
80055 Naples, Italy (tel.: +39-81-776 1646, fax: +39-81-77 535 79)

IV. OFFICER

Ulrike LÖSCHER (Mrs.), Chairman

V. OFFICE OF UPOV

Max-Heinrich THIELE-WITTIG, Senior Counsellor, 34, chemin des Colombettes,
1211 Geneva 20, Switzerland (tel. +41-22 730 9152, telex 412 912 ompi ch,
fax +41-22 733 54 28)

[Annex II follows]

ANNEX II

IMAGE ANALYSIS EQUIPMENT OF CPRO, THE NETHERLANDS

Hardware

- 3 SUN workstations
- 2 Apple Power Mac
- 2 Apple MacIntosh
- 2 Intel PC's (1 x 486, 1 x Pentium several
framegrabbers (Imaging Technology, Data
translation, Integral, IPC)
- 1 NEC Superscript 600 colorprinter (dye
sublimation)
- 3 Sony XC77CE B/W Cameras
- 1 Philips B/W Camera
- 1 JVC 3-CCD colo camera
- 1 Hitachi Hi8 video camera
- 1 Sonny 3-CCD color camera
- In-house built conveyer belt with illumination
chamber for recording onions, beans, carrots,
cucumbers, ...

Software

- Main package used is Scil-Image 1.3 extended with many in-house developed routines
in K8R-C.
- Several public domain packages are used like XV, Image Magick, NIH-Image, L View
....
- Image database, Aldus Fetch with images from many crops, including carnation,
gerbera, potato light sprouts.

	{ crops: flax seeds		
	{ pods of French bean	<u>In Development/Reseach</u>	{ Ficus leaves: variagation
<u>Ready</u>	{ pods of peas		{ Gerbera: color of flowers
	{ cucumbers		
	{ onions		

Other applications:

1. Germination automation
2. Seed purity grass seeds
3. X-ray seeds
4. Microscopic images.

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ANNEX IV

IMAGE ANALYSIS AT NIAB

Image analysis research and development work at NIAB is carried out on PCs (mainly 486s) running Windows for Workgroups. We are using HP document scanners with transparency adapters for acquiring leaf images and have several Patnix CCD cameras available. We use Visilog for developing image analysis procedures and Microsoft's Visual C++ for software development.

Currently we are using image analysis systems to measure oil seed rape cotyledons and faba bean pods.

Our research and development effort is concentrated on implementing a system for automatically generating descriptions of Chrysanthemum leaves for DUS assessment. The system examines samples of 10 leaves from each variety and produces a description in terms of the standard UPOV characteristics. It measures the length and width of each leaf and then assesses each of the leaf shape characteristics except for leaf texture, thickness and the presence of a claw in the base of the lower sinus; these will have to be assessed by hand or eye.

Preliminary comparisons of the leaf dimensions measured by machine and by hand are very encouraging. A test set of 20 varieties gave correlations of 0.99 between the machine and manual measurements. We are continuing to test the performance of the system on the more descriptive characteristics before passing the system over for trials in the Ornamentals section.

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Hard-and Software Configuration, Bundessortenamt, Germany

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**Subjects of Research and Routine Work and Results on Certain Species,
Bundessortenamt, Germany**

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