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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

TECHNICAL COMMITTEE

Twenty-First Session
Geneva, November 12 and 13, 1985

COLOR STANDARDS
(Item 11 of the Draft Agenda)

Document prepared by the Office of the Union

1. The Office of the Union has received from the Commissioner of the Plant Variety Protection Office of the United States of America information on the investigations of the United States Department of Agriculture (USDA) on the utility of a new set of standard color samples and associated color notion designed to illustrate the CIE (International Commission on Illumination) color order system.
2. The letter of the Commissioner and the information of the USDA which was attached to that letter are reproduced in the Annex to this document.
3. The Technical Committee is invited to note the information given and to consider possible steps to be taken.

[Annex follows]

ANNEX



United States
Department of
Agriculture

Agricultural
Marketing
Service

Livestock
and Seed
Division

National Agricultural
Library Building
Beltsville, MD. 20705

July 12, 1985

Dr. Heribert Mast
Vice-Secretary General
International Union for the
Protection of New Varieties of Plants
34, Chemin des Colombettes
1211 Geneva 20
Switzerland


SUBJECT: Color Standards

Dear Dr. Mast:

Recently the enclosed U. S. Department of Agriculture memorandum brought to my attention a proposed project to develop a new set of standard color samples and associated color notation designed to illustrate the CIE (International Commission on Illumination) color order system. I am aware of the efforts of UPOV during the past several years to develop a suitable color reference standard for the use of all UPOV member countries; however, until now, I was unaware of the task proposed by the Agricultural Research Service of the U. S. Department of Agriculture in the attached memorandum.

We, of the U. S. Plant Variety Protection Office, agree that a suitable color standard reference system is urgently and universally needed by applicants for plant variety protection and the governmental agencies which must consider or test these varieties. However, because of a small staff and limited budget, the U. S. Plant Variety Protection Office is unable to fund the production of such a system. Even though we have not participated up to this time in the discussion of the production of a color chart, for information purposes, I am sending you a copy of this memorandum, just as I am sending Dr. Holsinger, the author of the memorandum, information on the work of the UPOV committees on color. Perhaps, you could bring the project proposed in the attached memorandum to the attention of the proper UPOV committee chairmen and they could correspond directly with Dr. Holsinger. Even though the U. S. Plant Variety Protection Office may not be directly involved in the production of a suitable color system, perhaps another agency of the U. S. Department of Agriculture with the help of outside funding and research facilities may be able to pursue such a task.

Sincerely,


Kenneth H. Evans, Commissioner
Plant Variety Protection Office
Telephone (301) 344-2518

Enclosure



United States
Department of
Agriculture
April 30, 1985

Agricultural
Research
Service

Office of the
Administrator

Washington, D.C.
20250

SUBJECT: CIELAB Color Standards: Color and Color Names
for Scientific Data

TO: Harold S. Ricker
Deputy Director, AMS
Marketing Research Division

As we discussed on the morning of April 29, I am writing to you to ask you for assistance in assessing the utility of a proposed new set of standard color samples and associated color notation designed to illustrate the CIE (International Commission on Illumination) color order system. This system was developed by Dr. Kent McKnight, a USDA research mycologist. Dr. McKnight is not familiar with how color measurements are used by food scientists, processors, and manufacturers; Dr. William Tallent, USDA-ARS, Office of Cooperative Interactions, has asked me to determine the applicability of Dr. McKnight's system to the food and feed area, not only for research and quality control, but also from a regulatory standpoint.

The multiplicity of color reference and notation systems in current use hinder scientific communication about color data. Development of a set of standard color samples and associated color notation with references to extant notations would provide a common language and reference base for color data as the metric system does for units of volume, mass, and distance. The proposed color standard will be based on the CIELAB system developed by the International Commission on Illumination and approved by 30 member countries. It has provided elements of standardization for the last 50 years, but has never produced a complete set of color samples and an accompanying set of color names as proposed here. This is due largely to the severe departure of the system from equal visual spacing, a concept deemed important for specification purposes, especially with respect to visual interpolation. Over the years, research has produced a series of mathematical transformations of CIE color space, designed to provide equal visual spacing resulting in the 1976 recommendation by CIE known as CIELAB. This makes the production and universal use of such a set of color standards feasible and highly desirable. The widely accepted and durable CIELAB color order system has inherent advantages in accuracy, spacing, ease of interpolation, and compatibility with modern measuring instruments and data processing systems. All modern color measurement instruments have readouts in CIELAB form. The proposed set of visual color standards permits visual notations in this same metric. CIELAB color data can be used readily in computer programs.

Opaque color collections (Munsell, Natural Colour System, DIN and those derived from them such as Nickerson) which are empirical have no mathematical relationship to CIE, so that they do not appear as instrument readout and are not easily converted to CIE. Their basis in charts of constant hue preclude their color collections from being evenly distributed throughout the color space. The Ostwald System has these same disadvantages, but is no longer available in any form. The collections are not computer friendly, and are valid only for the illuminant for which they were originally spaced. The OSA System has good visual spacing and color distribution, but is not CIE-related or computer compatible, and does not permit easy visual interpolation.

Harold S. Ricker

The proposed standards would enable scientists throughout the world to communicate their research results treating color in a readily understandable manner. A significant part of this research, including classification of plants, animals, fungi, bacteria, plant diseases, and soils, is vital to agricultural research as it supports integrated pest management, biological control, quarantine programs, germplasm resources, quality control, and decomposition and transport of commodities.

The handbook would contain approximately 1,425 colors. Research and development costs are estimated at approximately \$130,000 regardless of the number of copies produced. The cost for color matching alone will be about \$105,000 for 1,500 colors. The cost of production, including deposition of colors, printing, and binders or containers will bring the total production cost considerably higher. To take advantage of the lower price/copy provided by large quantity production, a production run of 10,000 copies is used as a base for estimating cost. On this basis the total production cost would be about \$460,000. A fair retail price is estimated at \$230/copy, compared with the current price of \$717/copy for the Munsell Book of Color, which, although inferior to the proposed CIELAB Standard, is the best now available.

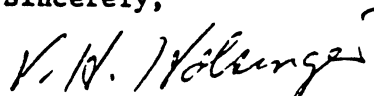
It is the responsibility of the National Bureau of Standards to publish national color standards. Although NBS has published a color standard, it is out of print and stocks are almost exhausted. This system is based on the Munsell color system and has the same inherent difficulties as the Munsell system. The USDA-ARS publications committee has recommended possible private development or joint Federal agency development through NBS. Groups such as the Entomological Society of America, the American Institute of Biological Sciences, the American Society for Horticultural Science, the American Society for Microbiology, and others have expressed their support and have identified needs for such a handbook within their own fields.

There appear to be real possibilities for mixed public-private funding of this handbook. The Entomological Society of America is willing to act as the publisher and would put up some of the money. The ASTM may contribute as much as \$100,000, and other groups are also interested.

What we need to do is identify additional areas where such a handbook might be used. I know that AMS and APHIS inspectors and graders use visual color standards in some of the commodities examined. I understand that color is particularly important in beef, pork, and poultry grading, and that decisions made are frequently subjective in nature. Can such a handbook help the inspector or grader make more consistent decisions? Would such a handbook be useful to AMS? How extensive would the use be? Does AMS consider this to be a worthy project? How extensive is the use of instrumentation for color measurement within AMS? Can you identify specific commodities where such a handbook might be useful? Can you suggest others that I might contact as part of this project?

Dr. Tallent and I would appreciate any assistance you can give us with assessing the utility of this proposed handbook. If we can help with further information, please contact us at (202) 447-4421.

Sincerely,



V. H. HOLSINGER
Supervisory Research Chemist
Engineering Science Laboratory

[End of Annex and of document]