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TC/52/19
ORIGINAL: English
DATE: February 18, 2016

UPOV

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

Geneva

TECHNICAL COMMITTEE

Fifty-Second Session
Geneva, March 14 to 16, 2016

REVISION OF DOCUMENT TGP/8: PART II: SELECTED TECHNIQUES USED IN DUS EXAMINATION, NEW SECTION: DATA PROCESSING FOR THE ASSESSMENT OF DISTINCTNESS AND FOR PRODUCING VARIETY DESCRIPTIONS

Document prepared by the Office of the Union

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1. The purpose of this document is to present developments concerning a possible new section for document TGP/8 "Data Processing for the Assessment of Distinctness and for Producing Variety Descriptions".

2. The following abbreviations are used in this document:

CAJ: Administrative and Legal Committee
TC: Technical Committee
TC-EDC: Enlarged Editorial Committee
TWA: Technical Working Party for Agricultural Crops
TWC: Technical Working Party on Automation and Computer Programs
TWF: Technical Working Party for Fruit Crops
TWO: Technical Working Party for Ornamental Plants and Forest Trees
TWPs: Technical Working Parties
TWV: Technical Working Party for Vegetables

3. The structure of this document is as follows:

BACKGROUND

4. The Technical Committee (TC), at its forty-eighth session, held in Geneva from March 26 to 28, 2012, considered Annex III: "TGP/8 PART I: DUS Trial Design and data analysis, New Section 6 – Data processing for the assessment of distinctness and for producing variety Descriptions" in conjunction with Annex VIII: "TGP/8 PART II: Techniques used in DUS Examination, New Section 13 - Methods for data processing for the assessment of distinctness and for producing variety descriptions" of document TC/48/19 Rev. It agreed that the information provided in Annex VIII of document TC/48/19 Rev. and at the UPOV DUS Seminar, held

in Geneva in March 2010, together with the method provided by Japan and the method used in France for producing variety descriptions for herbage crops, as presented at the TWC at its twenty-sixth session (see document TWC/26/15, TWC/26/15 Add. and TWC/26/24), provided a very important first step in developing common guidance on data processing for the assessment of distinctness and for producing variety descriptions, but concluded that the information as presented in Annex VIII of document TC/48/19 Rev. would not be appropriate for inclusion in document TGP/8. It agreed that the Office of the Union should summarize the different approaches set out in Annex VIII of document TC/48/19 Rev. with regard to aspects in common and aspects where there was divergence. As a next step, on the basis of that summary, consideration could be given to developing general guidance. The TC agreed that the section should include examples to cover the range of variation of characteristics. It further agreed that the detailed information on the methods should be made available via the UPOV website, with references in document TGP/8 (see document TC/48/22 "Report on the Conclusions" paragraph 52).

5.   At their sessions in 2012, the TWPs received a presentation prepared by the Office of the Union on "Summary of different approaches of transformation of measurements into notes for Variety Description", as reproduced in the Annex I of document TC/50/25 "Revision of document TGP/8: Part II: Selected Techniques Used in DUS Examination, New Section: Data Processing for the Assessment of Distinctness and for Producing Variety Descriptions".

6.   The TWC, at its thirtieth session, held in Chisinau, Republic of Moldova, from June 26 to 29, 2012, agreed that the experts from Finland, Italy and the United Kingdom would support the Office of the Union to summarize the different approaches for further developing common guidance on data processing for the assessment of distinctness and for producing variety descriptions (see document TWC/30/41 "Report", paragraph 42). It also agreed that experts from the United Kingdom in cooperation with experts from France and Germany should conduct a practical exercise. The exercise would be to process a common data set to produce variety descriptions in order to determine the aspects in common and where there was divergence among the methods (see document TWC/30/41 "Report", paragraph 43)

7.   The background to the developments concerning a possible new section for document TGP/8 "Data Processing for the Assessment of Distinctness and for Producing Variety Descriptions" prior to the fifty-first session of the of the Technical Committee (TC) are provided in document TC/51/7 "Revision of document TGP/8: Part II: Selected Techniques Used in DUS Examination, New Section: Data Processing for the Assessment of Distinctness and for Producing Variety Descriptions".

DEVELOPMENTS IN 2015

Technical Committee

8.   The TC at its fifty-first session, held in Geneva from March 23 to 25 considered document TC/51/19 "Revision of document TGP/8: Part II: New Section: Data Processing for the Assessment of Distinctness and for Producing Variety Descriptions" (see document TC/51/39 "Report", paragraph 146).

9.   The TC welcomed the proposal made by the TWC, to compare the results of the practical exercise presented by the different participants to identify differences in the results obtained for further understanding of the different methodologies, for consideration at the thirty-third session of the TWC, to be held in Natal, Brazil from June 30 to July 3, 2015 (see document TC/51/39 "Report", paragraph 147).

10.   The TC noted that the European Union had reported that the project on a ring test on Apple for the management of variety description to be launched in 2015 had been suspended because of the high costs involved (see document TC/51/39 "Report", paragraph 148).

Consideration by the Technical Working Parties in 2015

11.   The TWV, TWC, TWA, TWF and the TWO considered documents TWV/49/18, TWC/33/18, TWA/44/18, TWF/46/18, and TWO/48/18 "Revision of document TGP/8: part II: selected techniques used in DUS examination, new section: data processing for the assessment of distinctness and for producing variety descriptions" which contained a document from an expert of France titled "Comparison of methods used for producing variety descriptions: Results of the Practical Exercise" as reproduced in the Annex to this document (see document TWV/49/32 Rev. "Revised Report", paragraphs 58 to 61, document TWC/33/30 "Report", paragraphs 36 to 42, document, TWA/44/23 "Report", paragraphs 48 to 51, document TWF/46/29 Rev. "Revised Report", paragraphs 51 to 54 and document TWO/48/26 "Report", paragraphs 46 to 49).

12.   The TWV, TWC, TWA, TWF and the TWO noted that the TWC and the TWA had agreed that the guidance on "Different forms that variety descriptions could take and the relevance of scale levels", as reproduced in Annex I to documents TWV/49/18, TWA/44/18, TWF/46/18, TWC/33/18 and TWO/48/18, should be used as an introduction to future guidance to be developed on data processing for the assessment of distinctness and for producing variety descriptions.

13.   The TWV, TWA, TWF and the TWO noted that the TWC had agreed to compare the results of the practical exercise presented by the different participants to identify differences in the results obtained for further understanding of the different methodologies, for consideration at the thirty-third session of the TWC, to be held in Natal, Brazil, from June 30 to July 3, 2015.

14.   The TWV, TWC, TWA, TWF and the TWO noted that the European Union had reported to the TC that the project on a ring test on Apple for the management of variety description to be launched in 2015 had been suspended.

15.   The TWC considered the information in document TWC/33/18, Annex III and reproduced in the Annex to this document, with regard to the steps used in the methods provided by the participants in the practical exercise. The TWC agreed that the methods to assign a note to the candidate varieties were based on a combination of division into equal-spaced states, use of the results of examples varieties and/or crop expert judgment.

16.   The TWC considered the differences in the results of the practical exercise presented by the different participants as a basis for understanding the differences in the methodologies provided by an expert from France, as presented in Annex III to document TWC/33/18 and reproduced in the Annex to this document.

17.   The TWC agreed that an "X" should be added to the United Kingdom "Method 2" in the column "example varieties" of document TWC/33/18 Annex III, page 1. On that basis, the TWC agreed that the different methods to assign notes to candidate varieties could be briefly summarized in the table below:

COUNTRY		Method : description	Example varieties	Crop expert judgment	Equal-spaced state
France	**Method 1**	Combined use of example varieties and reference collection	X		
	Method 2	Adjusted means from COY program + linear regression method calibrated with example varieties	X		
Italy		Average range of historical means + median used as "reference point" + partitioning into equal spaced states + calibration with crop expert judgment and example varieties	X	X	X
Germany		Adjusted mean from COY program + partitioning based on example varieties and crop expert judgment	X	X	
Japan		Adjusted Full Assessment Table (FAT) : states determined with historical data of example varieties	X		X
United Kingdom	**Method 1**	Range of expression of the over-year means for the reference collection varieties (for the past 10 years) divided into equal spaced states			X
	Method 2	Crop experts define delineating varieties whose over-year means are used to delineate each state	**X**	X	

18.   The TWC noted that information on the methods used for data processing for the assessment of distinctness and for producing variety descriptions in China would be considered under agenda item 10 "Information on the methods used for data processing for the assessment of distinctness and for producing variety descriptions in China" of the agenda (see document TWC/33/23 "Application Management System (AMS) and Variety Description Database (VDD) in China").

19.   The TWC received a presentation by an expert from China on Application Management System (AMS) and Variety Description Database (VDD) in China.   A copy of the presentation is provided in document TWC/33/23 (see document TWC/33/30 "Report", paragraph 80).

20.   The TC invited to:

*   (a)   note the developments reported in this document and;*

*   (b)   consider the proposal made by the TWC, as presented in paragraph 18 of this document, to compare the results of the practical exercise presented by the different participants to identify differences in the results obtained for further understanding of the different methodologies, for consideration by the Technical Working Parties at their sessions in 2016, as a basis for a possible revision of TGP/8.*

[Annex follows]

ANNEX

COMPARISON OF METHODS USED FOR PRODUCING VARIETY DESCRIPTIONS: RESULTS OF THE PRACTICAL EXERCISE

Document prepared by an expert from France

1.   The main purpose of this practical exercise is to help developing a common guidance by clarifying and comparing the different methods used by UPOV members to transform quantitative characteristics into notes.

Dataset : Description

2.   A common dataset on Flax varieties was produced by experts from France for this practical exercise. The dataset is based on observations made on UPOV characteristic 21 (Stem: length from cotyledon scar to top boll). It's a restriction of a larger dataset, which finally has been restricted to observations on the first 20 plants of the varieties and years where 20 or more plants of the variety were observed in the year. This reduced common data set consists of 936 variety-by-year combinations for 153 reference varieties and 30 candidates in 10 years from 2002 to 2012, for which the variety-by-year means were calculated on the original scale of the characteristics.

Methods used by the UPOV members

3.   The different methods used by UPOV members in order to assign notes to the candidate varieties are briefly summarized in the table below.

COUNTRY		Method : description	Example varieties	Crop expert judgment	Equal-spaced state
France	Method 1	Combined use of example varieties and reference collection	x		
	Method 2	Adjusted means from COY program + linear regression method calibrated with example varieties	x		
Italy		Average range of historical means + median used as "reference point" + partitioning into equal spaced states + calibration with crop expert judgment and example varieties	x	x	x
Germany		Adjusted mean from COY program + partitioning based on example varieties and crop expert judgment	x	x	
Japan		Adjusted Full Assessment Table (FAT) : states determined with historical data of example varieties	x		x
United Kingdom	Method 1	Range of expression of the over-year means for the reference collection varieties (for the past 10 years) divided into equal spaced states			x
	Method 2	Crop experts define delineating varieties whose over-year means are used to delineate each state		x	

4.   We can first notice that all the UPOV members who performed the exercise use example varieties in their process to assign notes. In particular, the method used by Japan and the number 2 French method 2 rely directly on UPOV example varieties (or any other own example varieties), whereas UPOV example varieties are used by crop expert for final calibration in the German and the Italian methods.

5.   Italy, Japan and United Kingdom (method 1) divide the total range of expression of the characteristic for the reference varieties into equal-spaced states in order to set a note and Italy and Japan also adjust each state according to crop expert judgment or example varieties.

Results by method

6.   The table below shows the notes attributed to the 31 candidate varieties with each method.

Variety	Over-year mean	Note France method 1	Note France method 2	Note Italy	Note Germany 2012	Note Japan 2012	Note UK method 1	Note UK method 2	Average note by variety
Variety 262	381.7	1	1	1	1	2	1	1	1.1
Variety 287	405.7	-	-	1	2	3	1	1	1.6
Variety 263	400.7	2	2	1	2	3	1	1	1.7
Variety 284	413.4	-	-	1	2	3	2	2	2
Variety 283	437.1	-	-	2	2	4	2	2	2.4
Variety 288	478.1	4	4	2	3	4	3	3	3.3
Variety 275	512.2	4	4	2	4	5	3	3	3.6
Variety 290	489	5	-	3	4	4	3	3	3.7
Variety 289	490.4	5	-	3	4	4	3	3	3.7
Variety 303	505.6	5	-	3	4	4	3	3	3.7
Variety 269	516.2	4	4	2	4	5	3	4	3.7
Variety 297	518.8	5	-	3	4	5	3	4	4
Variety 302	524.6	5	-	3	4	5	4	4	4.2
Variety 277	544.1	5	5	3	4	5	4	4	4.3
Variety 274	550.2	5	5	3	4	5	4	4	4.3
Variety 228	663.5	6	6	5	6	7	6	5	5.9
Variety 270	693.8	7	7	5	6	7	7	6	6.4
Variety 293	706.6	6	-	6	7	7	7	7	6.7
Variety 267	723.8	7	8	5	7	7	7	7	6.9
Variety 295	733.3	7	-	6	7	8	7	7	7
Variety 268	733.1	7	8	-	7	7	7	7	7.2
Variety 273	739.9	8	8	6	8	8	7	7	7.4
Variety 300	756.6	7	-	7	7	8	8	8	7.5
Variety 299	769.2	7	-	7	7	8	8	8	7.5
Variety 291	760.5	7	-	7	7	8	8	8	7.5
Variety 292	741.3	8	-	6	8	8	7	8	7.5
Variety 272	760.6	8	8	6	7	8	8	8	7.6
Variety 294	763.7	8	-	7	8	8	8	8	7.8
Variety 298	807.5	9	-	7	8	9	9	9	8.5
Variety 301	840.3	9	-	8	9	9	9	9	8.8
Variety 296	839	9	-	8	9	9	9	9	8.8
Mean by method		6.1	5.4	4.3	5.4	6	5.2	5.3	
Standard deviation		2	2.4	2.3	2.3	2.1	2.7	2.7	

7.   Only 13 out of the 31 candidate varieties have been noted with the French method 2 because this method requires having data of two years for the candidate varieties in order to calculate an adjusted mean with the COY program and then to assign the corresponding note.

8.   The presence of both linseed and flax varieties in the complete dataset is responsible for a non-normal distribution with a peak of small varieties with low notes (linseed) and a peak of tall varieties with high notes (flax). Consequently, the probability for a candidate variety to obtain a medium note (between the two peaks) is low. That's why, for several methods, one of the medium note has never been attributed to a candidate variety. For example, with the Italian method, each note but the note 4 has been assigned to at least one candidate variety.

9.   Some methods try to take into account the annual effect using COY adjusted means (French method 2, German method, UK method) or by calibrating their model with data of the year, as in the Japanese method with the FAT sliding adjustment or in the French method 1.

Comparison of the results
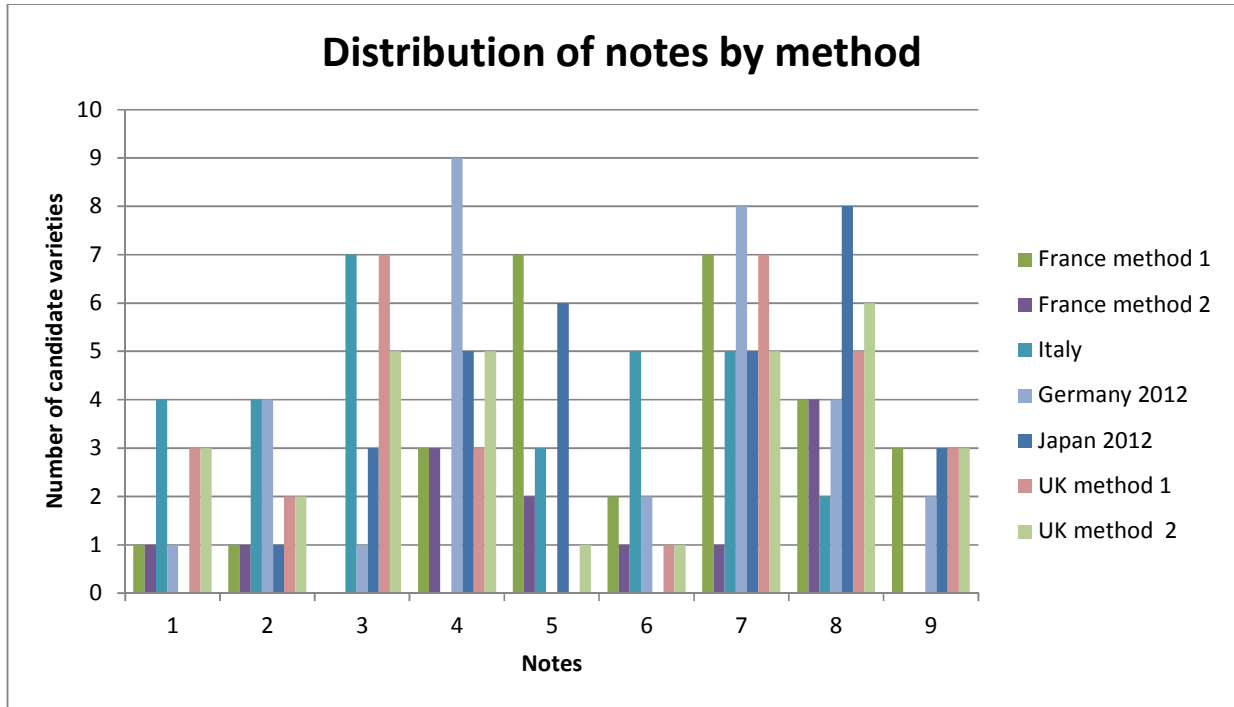
Distribution of notes by method

Figure 1 : Distribution of notes by method.

10.   The graph above shows that the distribution of notes is not normally distributed in the tested methods. But in most of the cases, distributions reveal two distinct peaks, which correspond to the two kinds of varieties: the first one corresponds to linseed varieties (smaller varieties with low notes) and the second one to flax varieties (taller varieties with higher notes).
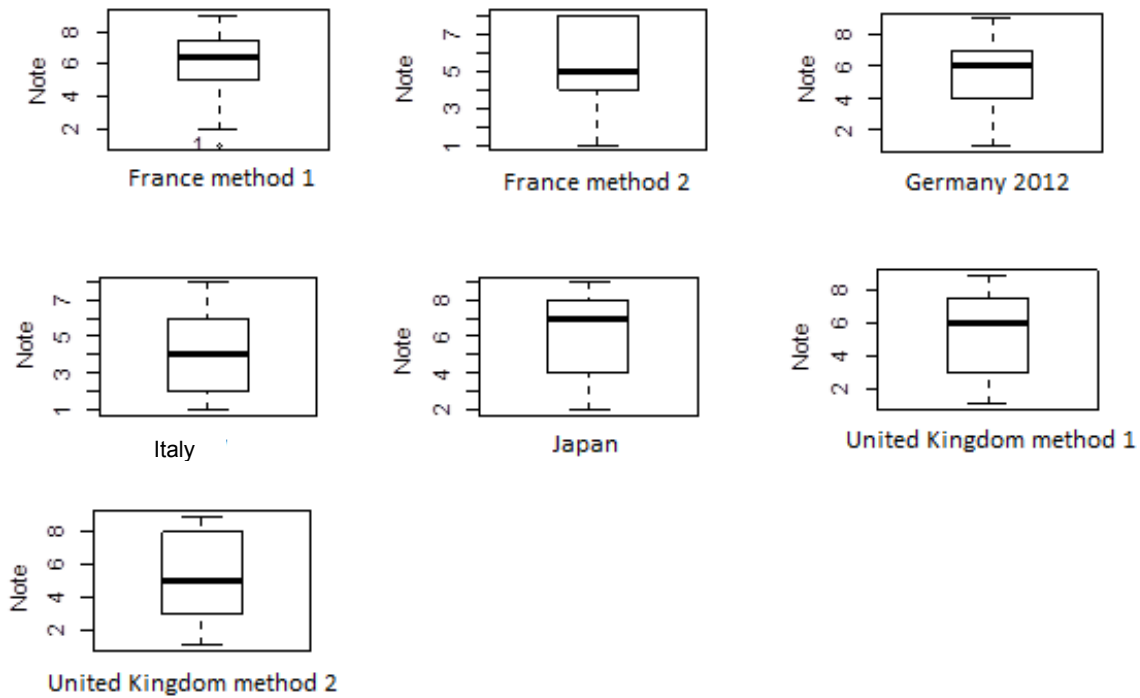

Figure 2 : Boxplot of notes for candidate varieties by method.

11.   The boxplots show that the median of notes is higher with the Japanese method than the median of the French method 2 or the Italian method. 50% of the candidates' notes are concentrated between 2 and 6 with the Italian method.

12.   The percentage of common notes between each pair of methods has been calculated (number of varieties with identical notes divided by number of varieties notated with both methods) and summarized in the table below.

Method	Note France method 2*	Note Italy*	Note Germany 2012	Note Japan 2012	Note UK method 1	Note UK method 2
Note France method 1*	84,6%	18,5%	57,1%	53,6%	39,3%	39,3%
Note France method 2*		8,3%	46,2%	46,2%	30,8%	23,1%
Note Italy*			16,7%	0,0%	26,7%	26,7%
Note Germany 2012				35,5%	48,4%	58,1%
Note Japan 2012					38,7%	38,7%
Note UK method 1						83,9%

Table 1: Percentage of candidate varieties with identical notes.

*: total number of candidate varieties notated inferior to 31 (28 for the French method 1, 13 for the French method 2, 30 for the Italian method)

13.   The two French methods are the closest ones because 85% of the candidate varieties obtain the same note with these two methods. The Japanese method also shares nearly 50% of common notes with these two methods. These three methods seem to assign close descriptions.

14.   The two UK methods give very similar results (84% of identical notes) and the German method is also close to both UK methods. This can define a second group of close methods.

15.   The Italian method doesn't share many common notes with the other methods. In particular, the Japanese and the Italian methods appear to be quite distinct because they never produce identical notes for a candidate variety. A candidate variety obtains always a higher note with the Japanese method than with the Italian method. The average note for a candidate variety varies from 4,3 with the Italian method to 6,0 with the Japanese method. Moreover, the range of notes varies from 1 to 8 with the Italian method and from 2 to 9 in the case of the Japanese one.

16.   All the methods have then been compared with a non-parametric test, namely the Wilcoxon signed rank test for paired samples, because the distributions are not normally distributed. According to that test, the notes obtained with these methods are significantly different from one method to another, except for the two French methods, each French method with the Japanese method, the two UK methods and each UK method with the German method. Therefore, we can consider three different groups: a first one composed by the two French methods and the Japanese method, a second composed by the two UK methods and the German method. The third group contains only the Italian method which seems to be significantly distinct from every other method. This confirms the groups previously defined on the percentage of common notes.

17.   We can't distinguish a special common point between the methods used in each group.

Conclusion

18.   The methods used by UPOV members to assign a note to the candidate varieties rely on a combination of division into equal-spaced states, use of the results of examples varieties and crop expert judgment.

19.   The non-normal distribution of notes in most of the methods is explained by the composition of the dataset, which includes two different types of linseed and flax varieties among the candidate varieties.

20.   Despite the diversity between the UPOV member methods, the notes set for the candidate varieties are finally close. Nevertheless, we can distinguish 3 groups of methods which are significantly different based on the Wilcoxon signed rank test for paired samples:

- the two French methods and the Japan method;

- the two UK methods and the German method; and

- the Italian method. On average, a note assigned by the Italian method is lower than with the others methods.

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