

Technical Working Party for Vegetables

Fifty-Sixth Session
Virtual meeting, April 18 to 22, 2022

TWP/6/11

Original: English
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Technical Working Party for Agricultural Crops

Fifty-First Session
Cambridge, United Kingdom, May 23 to 27, 2022

Technical Working Party for Ornamental Plants and Forest Trees

Fifty-Fourth Session
Hanover, Germany, June 13 to 17, 2022

Technical Working Party for Fruit Crops

Fifty-Third Session
Virtual meeting, July 11 to 15, 2022

Technical Working Party on Testing Methods and Techniques

First Session
Virtual meeting, September 19 to 23, 2022

THE COMBINED OVER YEARS UNIFORMITY CRITERION (COYU)

Document prepared by the Office of the Union

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EXECUTIVE SUMMARY

1. The purpose of this document is to consider a proposal for a draft revision of document TGP/8 “Trial Design and Techniques Used in the Examination of Distinctness, Uniformity and Stability”, Section 9 “The Combined-Over-Years Uniformity Criterion (COYU)”.

2. The TWPs are invited to note:

(a) that software for COYU Splines is under evaluation and is planned to be implemented in the United Kingdom from 2022;

(b) that evaluation versions of software for COYU Splines were made available in August 2021;

(c) the invitation for members of the Union to participate in the test campaign of the COYU Splines software and report outcomes to the expert from the United Kingdom; and

(d) the request for the TWC to prepare a report of the results of the test campaign of the software for COYU Splines for consideration by the TC, at its fifty-eight session, in conjunction with the revision of document TGP/8.

3. The structure of this document is as follows:

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4. The following abbreviations are used in this document:

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
TWM:	Technical Working Party on Testing Methods and Techniques
TWO:	Technical Working Party for Ornamental Plants and Forest Trees
TWPs:	Technical Working Parties
TWV:	Technical Working Party for Vegetables

BACKGROUND

5. The Combined-Over-Years Uniformity (COYU) criterion is a method used to assess uniformity on the basis of measured quantitative characteristics (see document TGP/8/3 “Trial Design and Techniques Used in the Examination of Distinctness, Uniformity and Stability”).

6. The TC, at its fifty-fourth session¹, noted that the statistical development of the new method of calculation of COYU had been completed, including the establishment of the probability levels required to most closely match decisions using the current method for calculation of COYU. The TC noted the invitation by the TWC for the expert from the United Kingdom to draft a replacement section for document TGP/8 on the method of calculation of COYU (see document TC/54/25 “Report”, paragraphs 221 to 224).

7. Comments from the Technical Working Parties at their sessions in 2021 are presented in Annex I to this document.

8. The United Kingdom software for COYU Splines available as a new module in the “DUSTNT” software and as a package in the statistical programming language “R”.

9. On August 4, 2021, the Office of the Union issued Circular E-21/116 inviting experts to evaluate software for the improved method of calculation of the Combined Over Years Uniformity criterion (COYU Splines). Instructions for obtaining the software and the evaluation process were provided in the Annex to the Circular. Interested experts were instructed to contact Mr. Adrian Roberts (United Kingdom) for queries and reporting the outcomes of evaluation by December 31, 2021. A copy of the Circular is attached as Annex II to this document.

10. Further background to this matter is provided in document TWP/5/11 “The Combined Over Years Uniformity Criterion (COYU)”.

Consideration by the Technical Committee

11. The TC, at its fifty-seventh session², considered documents TC/57/7 and TC/57/7 Add. (see document TC/57/25 “Report”, paragraphs 29 to 33).

12. The TC noted that software for COYU Splines was under evaluation and was planned to be implemented in the United Kingdom from 2022.

13. The TC noted that evaluation versions of software for COYU Splines were made available in August 2021.

¹ held in Geneva on October 29 and 30, 2018

² held via electronic means on October 26 and 27, 2021

14. The TC noted the invitation for members of the Union to participate in the test campaign of the COYU Splines software and report outcomes to the expert from the United Kingdom by December 31, 2021.

15. The TC agreed to request the TWC to prepare a report of the results of the test campaign of the software for COYU Splines for consideration by the TC, at its fifty-eighth session, in conjunction with the revision of document TGP/8.

16. *The TWPs are invited to note:*

(a) that software for COYU Splines is under evaluation and is planned to be implemented in the United Kingdom from 2022;

(b) that evaluation versions of software for COYU Splines were made available in August 2021;

(c) the invitation for members of the Union to participate in the test campaign of the COYU Splines software and report outcomes to the expert from the United Kingdom; and

(d) the request for the TWC to prepare a report of the results of the test campaign of the software for COYU Splines for consideration by the TC, at its fifty-eight session, in conjunction with the revision of document TGP/8.

[Annex follows]

DEVELOPMENTS AT THE TECHNICAL WORKING PARTIES

17. At their sessions in 2021, the TWV³, TWO⁴, TWA⁵ and TWF⁶ considered document TWP/5/11 “The Combined-Over-Years Uniformity Criterion (COYU)” (see documents TWV/55/16 “Report”, paragraphs 25 to 31; TWO/53/10 “Report”, paragraphs 29 to 33; TWA/50/9 “Report”, paragraphs 25 to 30; and TWF/52/10 “Report”, paragraphs 37 to 40).
18. The TWPs considered the proposed revision of document TGP/8, Section 9 “The Combined-Over-Years Uniformity Criterion (COYU);” on the basis of the draft presented in the Annexes to document TWP/5/11.
19. The TWO and TWA noted the report from the United Kingdom made at the TWV, at its fifty-third session, that DUS Centers in that country would evaluate the COYU Splines software on a range of crops in 2021 and that the COYU Splines method was likely to be implemented from 2022.
20. The TWV agreed to invite the United Kingdom to make a presentation at its fifty-sixth session to report on the evaluation of COYU Splines for any vegetable crops. The TWA agreed to invite the expert from the United Kingdom at the TWA to make a presentation and report developments at its fifty-first session.
21. The TWV, TWO, TWA and TWF noted that evaluation versions of software for COYU Splines in both “R” and “DUSTNT” software would be released in 2021. The TWV, TWO, TWA and TWF noted the expression of interest by experts from China, Finland, France and the United Kingdom to review the COYU Splines software. The TWV, TWO, TWA and TWF noted the invitation for members to participate in a test campaign of the COYU Splines software in 2021.
22. The TWV, TWO, TWA and TWF noted the request by the TC for the TWC to prepare a report of the results of the test campaign of the COYU Splines software for consideration by the TC, at its fifty-seventh session, in conjunction with the revision of document TGP/8.
23. The TWA noted the report from an expert from France that the COYU Splines software was under evaluation in that country. The TWA agreed to invite the expert from France to make a presentation and report developments at its fifty-first session.
24. The TWO recalled that COYU was not commonly used for ornamental plants.

Developments at the Technical Working Party on Automation and Computer Programs

25. The TWC, at its thirty-ninth session⁷, considered document TWC/39/5 “Development of software for the improved COYU method (splines)” and received a presentation from an expert from the United Kingdom, a copy of which is provided in document TWC/39/5 Add. (see document TWC/39/9 “Report”, paragraphs 7 to 9).
26. The TWC noted the progress on software development for COYU Splines and that evaluation versions of the software had been released in August 2021. The TWC noted that the Office of the Union had issued Circular E-21/116 on August 4, 2021, inviting experts to evaluate the software and report outcomes by December 31, 2021, to the expert from the United Kingdom.
27. The TWC agreed to invite the expert from the United Kingdom to report outcomes of the software evaluation at the first session of the Technical Working Party on Testing Methods and Techniques (TWM), in 2022. The TWC noted that results of the test campaign of the COYU Splines software were expected to be available in 2022 and agreed to invite the expert from the United Kingdom to report developments at the first session of the TWM.
28. The TWC agreed that further consideration would be required on whether to remove guidance on COYU moving average from document TGP/8, Section 9, and replace it by the explanation on the improved

³ at its fifty-fifth session, hosted by Turkey and held via electronic means, from May 3 to 7, 2021

⁴ at its fifty-third session, hosted by the Netherlands and held via electronic means, from June 7 to 11, 2021

⁵ at its fiftieth session, hosted by the United Republic of Tanzania and held via electronic means, from June 21 to 25, 2021

⁶ at its fifty-second session, hosted by China and held via electronic means, from July 12 to 16, 2021

⁷ hosted by the United States of America and held via electronic means from September 20 to 22, 2021

method (COYU Splines), on the basis that explanation on COYU moving average was made available on the UPOV website (see document TWC/39/9 "Report", paragraphs 32 to 36).

29. The TWC agreed that further discussion would be required on using COYU when a candidate had a level of expression in a characteristic outside that seen in other varieties (extrapolation) and agreed to invite the United Kingdom to make a presentation at the first session of the TWM.

30. The TWC noted that a report on evaluation versions of software for COYU Splines was provided in documents TWC/39/5 and TWC/39/5 Add.

[Annex II follows]

TWP/6/11

ANNEX II

UPOV Circular E-21/116

August 4, 2021

To: TC and TWPs

Dear all,

The purpose of this Circular is to invite experts to evaluate software for the improved method of calculation of the Combined Over Years Uniformity criterion (COYU Splines).

Instructions for obtaining the software and the evaluation process are provided in the Annex to this Circular.

Interested experts should contact Mr. Adrian Roberts (United Kingdom) for queries and reporting the outcomes of evaluation by December 31, 2021.

Yours sincerely,

UPOV Secretariat

The logo for the International Union for the Protection of New Varieties of Plants (UPOV). It features the word "UPOV" in a bold, green, sans-serif font. The letter "O" is stylized with a green leaf-like shape inside it.

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[Appendix to Annex II follows]

APPENDIX TO ANNEX II

Annex to Circular E-21/116

Thank you for agreeing to evaluate the software for the improved version of the Combined Over Years Uniformity criterion (COYU Splines). Here is some information about the evaluation.

Background

The Combined Over Years Uniformity (COYU) criterion is a method used to assess uniformity on the basis of measured quantitative characteristics (see document TGP/8/3 “Trial Design and Techniques Used in the Examination of Distinctness, Uniformity and Stability”). Since 2012, experts from the Technical Working Party on Automation and Computer Programs (TWC) have been developing an improved version of COYU (COYU Splines). Software for COYU Splines is now available. In this exercise, we ask participants to evaluate the new software. There is also the opportunity to compare COYU Splines with the old version (COYU Moving Average) on your own data.

What we would like you to do

The primary goal of this exercise is to evaluate the software for COYU Splines (in DUSTNT or R according to your preference). There is also the opportunity to make comparison on your own data for your own purposes and perhaps to report to the TWC if you wish.

We would like you to first assess the installation process. Then please run the software on some examples, check that it works, review the output and carry out a basic comparison to the old version of COYU (Moving Average). If using DUSTNT, it would be valuable if you could check other modules that you use regularly to ensure that these are unaffected.

Please note that COYU Splines does not give exactly the same results as COYU Moving Average and the presentation of results is updated (especially in DUSTNT). In particular, COYU Splines indicates the degree of extrapolation for a new variety (i.e. does its level of expression fall outside the reference varieties). For more information on extrapolation, see document TWC/38/6 “The Combined Over-Years Criterion (COYU)” Annex II (available at: https://www.upov.int/edocs/mdocs/upov/en/twc_38/twc_38_6.pdf).

We would be grateful if you could notify Mr. Adrian Roberts (a.roberts@bioss.ac.uk) of your intention to participate. Please send a report on your evaluation to Mr. Roberts before the end of December 2021. If you have made progress before 17 September 2021, please send an update so that this can be reported in the TWC meeting. Queries should also be sent to Mr. Roberts.

Setting probability levels

COYU Splines and COYU Moving Average were compared on several data sets that were contributed in a practical exercise (see document TWC/35/21 “Report”, paragraphs 81 to 84). Based on that comparison, the following advice was adopted for setting the probability levels required for the COYU criterion:

- For a final decision, if a probability level of 0.001 is used for the old COYU (Moving Average) then use a probability level of 0.003 for the improved method (COYU Splines).
- For early decisions on acceptance after two years in a three-year test, if a probability level of 0.01 is used for the old COYU (Moving Average) then use a probability level of 0.02 for the improved method (COYU Splines).

Software overview and access

The new method has been implemented in two software packages: R (a statistical programming language) and DUSTNT (a specialist software package specifically for DUS, maintained by AFBI in the United Kingdom). Both will be made freely available.

In the case of DUSTNT, we have added a new module alongside the old method. The new module is called COYUS9 (and the old COYU9). The “S” refers to the spline method being used rather than moving average. The new module actually brings in R code (all other modules are based on Fortran). The installation process for DUSTNT has been improved to fit better with current Windows structures. Unlike earlier versions of DUSTNT, it is vital that the software is run from the Windows Start menu – see the installation instructions. The new evaluation version of DUSTNT with installation instructions can be obtained from:

<https://eservices.afbini.gov.uk/dustdownload/evaluation.aspx>

For R users, we have created an R package. This is suitable for those with R experience, particularly those who would like to integrate with their own DUS tools based in R. The code is available either as source code or as a directly installable package. The latter is a simpler process but even so requires knowledge on how to install packages from files. An alternative method is to install DUSTNT, which will give access to the package (guidance is available on demand for this approach). In the longer term, we plan to put the package on CRAN to facilitate access and ease of maintenance.

The directly installable package is available at:

<https://github.com/BiomathematicsAndStatisticsScotland/coyus/releases/tag/v1.8-1>

Instructions on basic usage can be found within the package vignette, which should be read.

The source code is available at

<https://github.com/BiomathematicsAndStatisticsScotland/coyus>

[End of Appendix to Annex II and of document]