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**USE OF COY-D AND COY-U APPROACH IN MORE THAN ONE LOCATION IN
FORAGE CROPS**

Document prepared by the experts from France

Introduction:

The use of information coming from more than one testing center to assess DUS is discussed in this paper.

Background:

COYD and COYU are recommended methods to help the experts with computations on quantitative data for crops where intra-varietal variation (variation between the plants of a given variety) occurs; which is the case for most forage crops for instance.

In most countries the trials are carried out in one testing center and the tests are conducted two or three years before a decision on DUS is taken by the experts.

COY stands for **C**ombined **O**ver-**Y**ears. The principle of the methods (COYD for distinctness, COYU for Uniformity) is described in TC/33/7 and in TGP/9 (D) TGP/10 (U).

For Distinctness, the difference between pairs of varieties is tested on a character by character basis. To determine the minimum difference necessary to establish distinctness, the result of an Analysis of Variance is used.

The more consistent between years the position of the different varieties is, the smaller is the minimum difference necessary to assess distinctness.

On the other hand, if for a character there is a strong interaction (changes in ranking of the varieties in the different years for instance) the minimum distance is enlarged. In other words the stability of the “relative varieties values” obtained over years is taken into account.

For Uniformity, for each character the set of varieties which have the most similar values to the candidate are used to compute a “reference homogeneity value” against which the homogeneity value of the candidate is checked.

There have in the past been discussions about the use of the method not only in the cases where we have only one trial a year, in a unique location.

A list of some reasons why the use of other situations might be interesting to consider is listed below:

- if there are already two (or more) locations in which the varieties are tested and measured, the information available has to be used efficiently.
- in order to have decisions in less than 4 or 3 years, the use of more than one center could be a way to help to assess DUS, more information being collected in a given year.
- Co operation between two countries in order to perform DUS (for the European OCVV for instance) could be an interesting new approach.
- For some crops (some vegetables for instance) we might conduct more than one trial in a given year.

“Years” are used to check the varieties “over time” which in practice in open air conditions means “in similar soil/culture conditions” but “in different climatic conditions”. The main aim for the expert is to observe clear differences. The goal for a UPOV decision is likely to be the same if the same varieties would have been studied in other conditions (another UPOV member state, another set of years, another field test center,...)

This general aim is necessary in order that UPOV rights are given on a common basis, and to avoid a decision being positive in one study and negative in the other.

All the work of UPOV on harmonization (Crop Guide lines, international exchange between experts, fixing sample sizes, use of common software methods,...) is along these lines.

The new general introduction states: Two varieties have to be considered distinct if the difference

- has been established in at least one testing place,
- is consistent and
- is clear.

The meaning of the above paragraph is subject to interpretation. One can consider that a difference must be established “testing place by testing place” others can consider that, as consistency is important, more than one testing place can be used.

Using more information than one trial a year in a unique testing center:

The author’s opinion is that a strict restriction to the use of only one testing center is not well founded in a UPOV context.

The possibility to use “separately” two centers and have decision rules such as

- if the two varieties are distinct in all the centers, then distinctness is assessed;
- if the two varieties are distinct in any of the centers, then distinctness is assessed,

is an option.

In such cases the use of COYD and COYU method in its principle and for the computation; is straight forward. Only the decision rule differs.

This does not prevent a discussion because, applying the rule “one character is enough to distinguish, but all characters used must be homogeneous”, the stringency of the method will vary, as illustrated below for different decision rules for distinctness.

- A. If the two varieties are distinct in any of the centers, then distinctness is assessed.
- B. If the two varieties are distinct in the only center, then distinctness is assessed.
- C. If the two varieties are distinct in all the centers, then distinctness is assessed.

Case A is more lenient than the present situation.

Case B is the present situation.

Case C is more stringent than the present situation.

This is a very general statement because the impact of the number of observations used, the magnitude of variety X year interaction, the alpha level, the fact that a candidate is very different from or similar to other varieties, might affect the stringency.

The recommended COYD method replaces a previous method in which the analysis was on a year by year basis. UPOV experts agreed that the use of the combination of the trials was more appropriate to assess distinctness according to the aims stated by the agronomists. In that respect, combining the information from different environmental conditions rather than considering centers separately has a logic.

The author considers the possibility that having two trials in the same location is not in line with the principles of UPOV.

“All” pedo-climatic conditions being the same in a given year is equivalent to multiplying by two the sample size which is studied. No interaction is then introduced in the process. No bio-agronomic effect is introduced between the two trials.

It is not the same if we have two different locations in a given year. In such cases the soil and climatic conditions will be different from one trial to the other.

Different situations can occur:

1. The differences between locations are smaller than on the same location between years.
2. The differences between locations are of the same order as on the same location between years.
3. The differences between locations are bigger than on the same location between years.

“Differences” in the above text integrates not only the differences between varieties, but also the interaction.

- In case 2 we are in a similar situation to the usual practice.
- In case 1 we “under emphasize” pedo-climatic effects and will tend to be more lenient on distinctness if we keep the same alpha levels.
- In case 3 we “over emphasize ” pedo-climatic effects and will tend to be more strict on distinctness if we keep the same alpha levels.

Oral Presentation:

In the oral presentation actual data are used to illustrate situations where two centers are available. Synthetic parameters such as the lambda coefficient to summarize interaction magnitude, LSD values to summarize the minimum difference to assess distinctness will be shown.

Graphical representations showing the differences between varieties and the interaction are also used in order to illustrate different situations.

Discussion:

This question might not be a critical issue for UPOV, as for various reasons (cost of the studies, reduction of the number DUS sites within a country, absence of efficient use of the

data available using present recommendation, ...) the cases in which more than a testing center is available is decreasing.

Cooperation for studies between countries is for the time being usually a bilateral agreement in which one country does the testing and the other buys the results. A cooperation in which the varieties are studied in both countries could be a sound way in the future within the European Union. It has a logic in the sense of the UPOV Convention. If this type of cooperation were to take place and data were collected in both countries, then the question would have to be dealt with.

There is a pressure in order to obtain results as soon as possible. In some crops decision is obtained after one year of test, whereas for other crops 2 or 3 years is at present a minimum. Discussions showed that the use of only one sowing is not excluded for these crops, using for instance long term LSD and more stringent risks levels.

In that context, the author thinks that the use of more than one location is also a sound possibility, which will be more able to take into account consistency in different environmental conditions.

Conclusion:

When the information is available and locations are sufficiently different the use of more than one center can be a possibility to assess distinctness. The amount of data then available, and the use of information on consistency of the differences in different environmental conditions are advantages.

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