UPOV

International Union for the Protection of New Varieties of Plants

E

Technical Working Party on Automation and Computer Programs **TWC/36/6 Add.**

Thirty-Sixth Session
Hanover, Germany, July 2 to 6, 2018

Original: English
Date: June 29, 2018

ADDENDUM TO IMPACT OF THE NUMBER OF GROWING CYCLES ON VARIETY DESCRIPTIONS AND DISCRIMINATION POWER

Document prepared by an expert from Germany

Disclaimer: this document does not represent UPOV policies or guidance

The Annex to this document contains a copy of a presentation on “Impact of the number of growing cycles on variety descriptions and discrimination power”, to be made at the thirty-sixth session of the Technical Working Party on Automation and Computer Programs (TWC).

[Annex follows]

ANNEX

IMPACT OF THE NUMBER OF GROWING CYCLES ON VARIETY DESCRIPTIONS AND DISCRIMINATION POWER

Presentation prepared by an expert from Germany

Bundessortenamt

UPOV TECHNICAL WORKING PARTY ON AUTOMATION AND COMPUTER PROGRAMS
Thirty-sixth Session, Hanover, Germany, July 2 to 6, 2018

Impact of the number of growing cycles on variety descriptions and discrimination power

Beate Rücker, Germany

Bundessortenamt, Osterfelddamm 80
30627 Hannover, Germany
Website: www.bundessortenamt.de E-Mail: bsa@bundessortenamt.de

Bundessortenamt

Introduction

- TC 2017 considered impact of number of growing cycles
- TC: number of growing cycles should be the minimum necessary for a robust DUS decision and the establishment of a reliable variety description.
- TC: number of growing cycles should be established on crop-by-crop basis.

- TGs wheat, barley and potato: minimum duration of tests should normally be two independent growing cycles.
- Aim of this study: to validate whether two growing cycles are necessary or the duration of test could be reduced.
- Impact of the number of growing cycles was analyzed on the basis of data from actual DUS trials in winter wheat, winter barley and potato performed in DE (see TWA/46/8 Annex I, TWA/47/5)

Bundessortenamt

1. Analysis of discrimination power

Data for Potato:

- Trials comprise about 360 varieties, incl. 50-70 candidates in 1st and 2nd year.
- Discrimination power of individual characteristics was calculated based on 2nd-year-candidates. Comparison to all varieties in the same growing trial.
- Two distinctness tests performed:
  - (a) '1-cycle': second year only (year 0)
  - (b) '2-cycles': second year and first year (year 0 / -1)
    Two varieties are considered to be distinct if a clear difference in the same direction was observed in both years.
- Same analysis 2013 to 2017. In total, about 130 candidates compared to 350 reference varieties, resulting in ca. 45,000 pairwise comparisons.

Bundessortenamt

Data for Winter Wheat and Winter Barley:

- Trials comprise about 600 varieties in wheat and 300 varieties in barley.
- Discrimination power of individual characteristics was calculated based on all varieties in the same growing trial(s).
- Distinctness analyzed in three steps:
  - (a) '1 cycle': Comparison of all varieties in the trial (year 0)
  - (b) '2 cycles': For varieties also grown in the year before, distinctness was assessed in both years (year 0 / -1)
    Two varieties are considered to be distinct if a clear difference in the same direction was observed in both years.
  - (c) '2 out of 3 cycles': For varieties also grown the two previous years, distinctness was assessed in all 3 years (year 0 / -1 / -2)
    Two varieties are considered to be distinct if a clear difference in the same direction was observed in at least 2 out of 3 years.

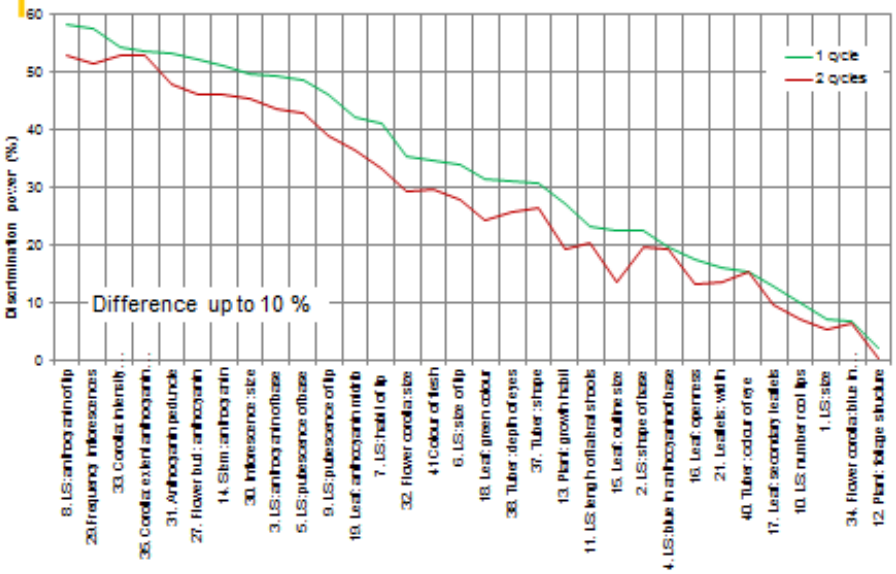
Bundessortenamt

- Two-year data are available for about 70% of the varieties and three-year data for about 50% of the varieties.
- Same analysis for 2014, 2015 and 2016
- Every year, the distinctness test included
  - (a) 1-cycle-comparisons: 40,000 in wheat and 30,000 in barley
  - (b) 2-cycle-comparisons: 25,000 in wheat and 15,000 in barley
  - (c) 2 out of 3 comparisons: 15,000 in wheat and 6,000 in barley

Bundessortenamt

Potato

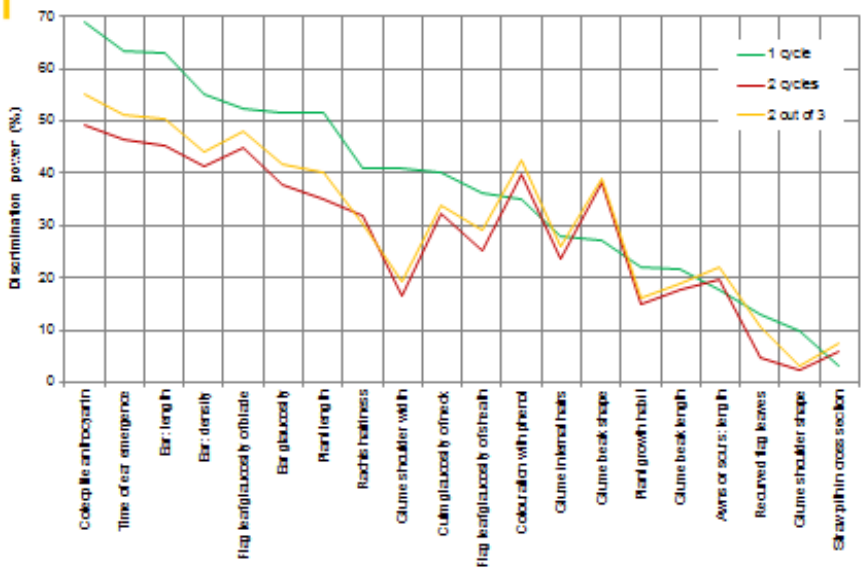
Impact of the number of growing cycles on discrimination power



Bundessortenamt

Wheat

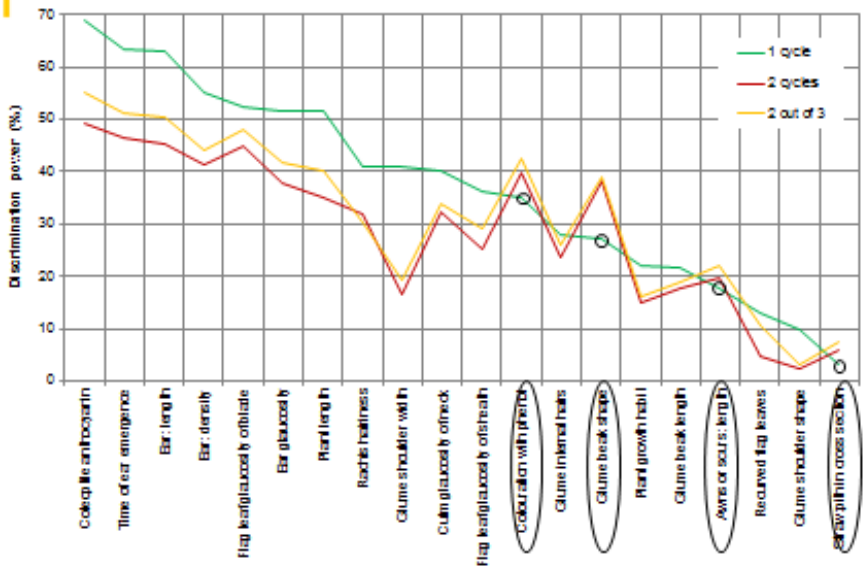
Impact of the number of growing cycles on discrimination power



Bundessortenamt

Wheat

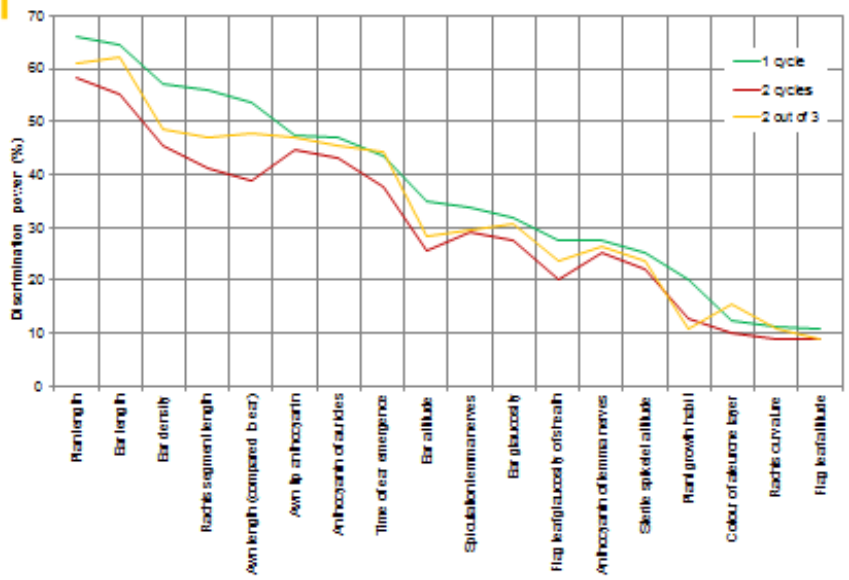
Impact of the number of growing cycles on discrimination power



Bundessortenamt

Barley

Impact of the number of growing cycles on discrimination power



Bundessortenamt

Impact on discrimination power:

- clear difference observed in one cycle was not always confirmed in the 2nd cycle
- consequently, discrimination power was lower after 2 cycles
- 3 cycles better than 2 cycles because a difference in 1 cycle can be confirmed in 3rd cycle (3rd cycle not analyzed for potato because normally there are sufficient characteristics with clear differences after 2 cycles)
- reliable decisions based on a single cycle, would require larger minimum differences for most characteristics
- larger minimum differences would lead to lower discrimination power

Bundessortenamt

2. Analysis of variety descriptions

Data for Potato:

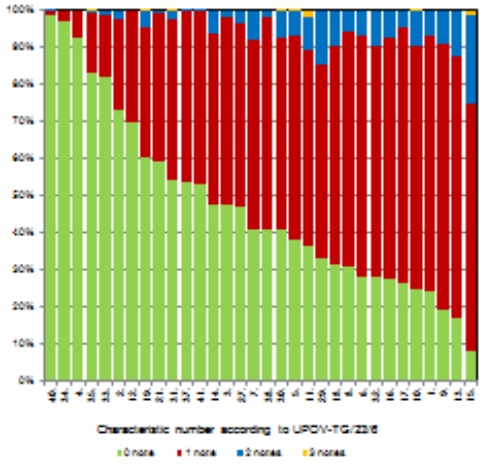
- Orthogonal DUS observations for 211 varieties in 6 successive growing cycles (2012-2017)
- For each variety establishment of
  6 annual descriptions and
  6 descriptions over 2 cycles
- The variation of descriptions over one and two cycles was analyzed (maximum difference between the 6 descriptions).
- Same characteristics as for distinctness analysis

Bundessortenamt

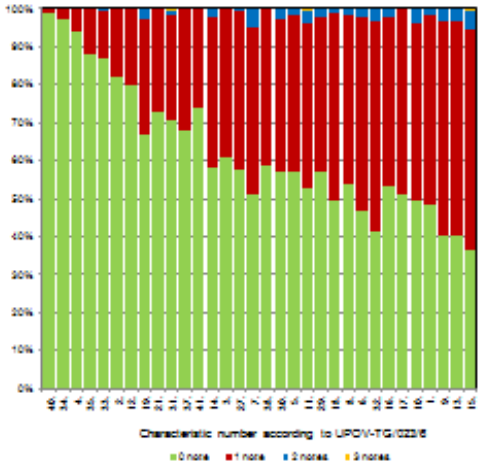
Difference between variety descriptions

(Maximum difference between 6 descriptions per variety, 211 varieties)

1-cycle variety descriptions



2-cycle variety descriptions

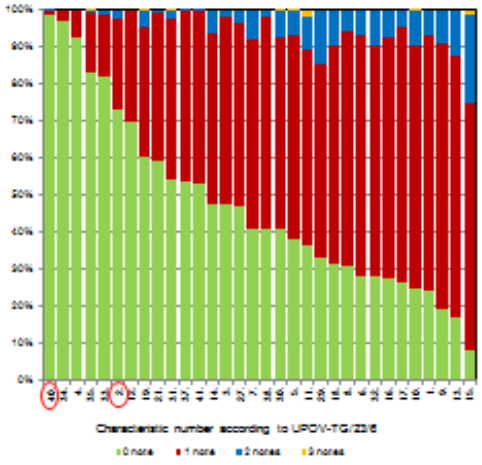


Bundessortenamt

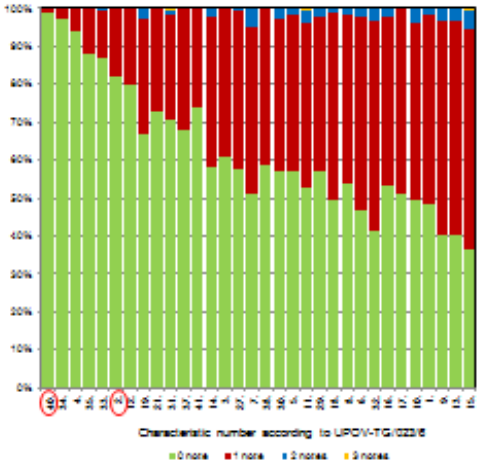
Difference between variety descriptions

(Maximum difference between 6 descriptions per variety, 211 varieties)

<u>1-cycle</u> variety descriptions



<u>2-cycle</u> variety descriptions



Bundessortenamt

Impact of the number of growing cycles on variety descriptions:

- Frequency of zero notes difference considerably higher between 2-cycle descriptions.
  Summary over all characteristics:

<u>Differences</u>	<u>1-cycle</u>	<u>2-cycles</u>
0 notes	47 %	62 %
1 note	47%	36 %
>1 note	6 %	2 %

- 1 note difference can be considered as quite stable descriptions.
  Nevertheless, +/- 1 note can lead to different decisions.
- Two cycles produce more robust descriptions.

Bundessortenamt

Data for Wheat and Barley:

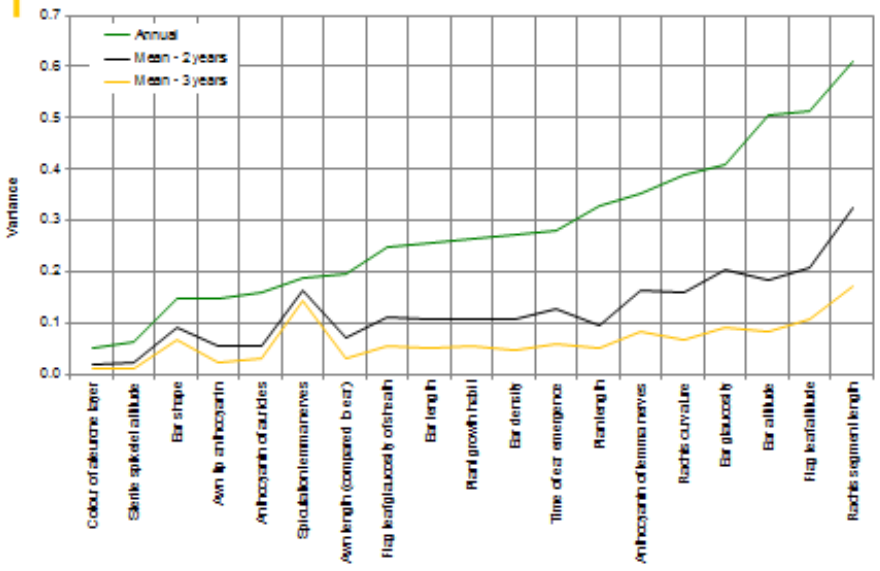
- DUS observations for 77 winter wheat varieties and 47 winter barley varieties in 6 successive growing cycles were used to establish
  - annual descriptions (year 0)
  - descriptions over 2 cycles (year 0 / -1)
  - descriptions over 3 cycles (year 0 / -1 / -2)

- The variation of descriptions over one, two and three cycles was calculated

Bundessortenamt

Barley

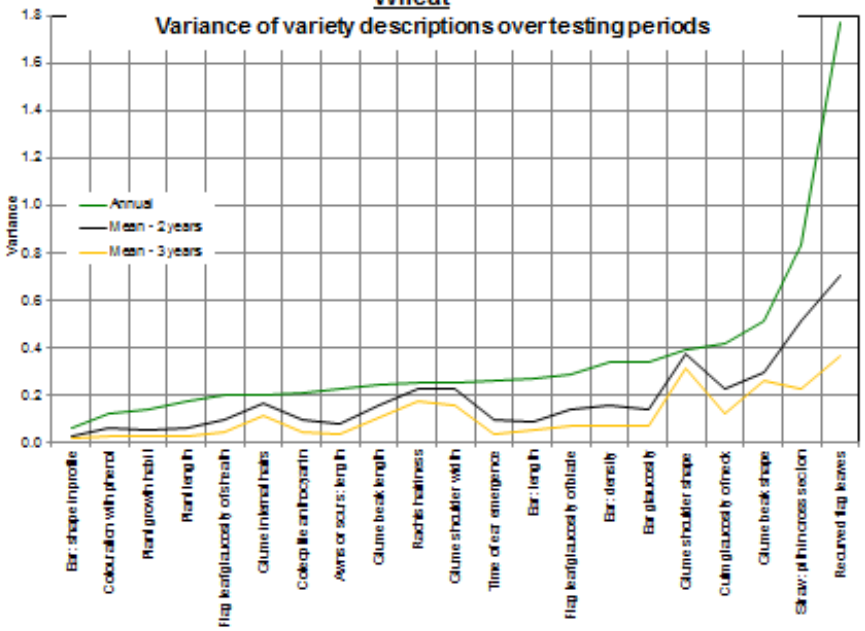
Variance of variety descriptions over testing periods



Bundessortenamt

Wheat

Variance of variety descriptions over testing periods



Bundessortenamt

Conclusions

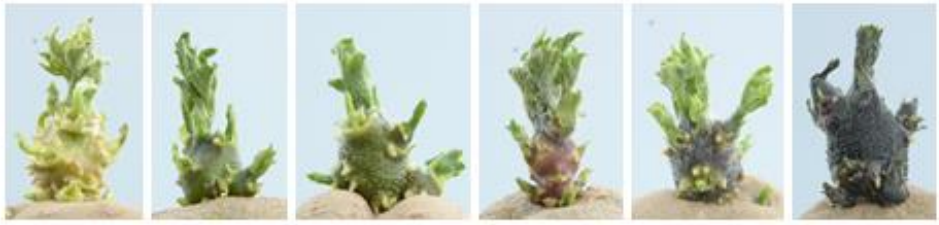
- Number of growing cycles has significant impact on distinctness decisions and variety descriptions
  - ➢ Impact on distinctness decisions for varieties compared in the same growing trials
  - ➢ Impact on the management of the reference collection on the basis of descriptions stored in a database.
- Two growing cycles produce more robust variety descriptions and DUS decisions.
- Current recommendation in TG Barley, TG Wheat and TG Potato is appropriate: "Minimum duration of test should normally be two independent growing cycles".

Bundessortenamt

- Minimum duration of test should be followed to establish official variety description (basis for identification & enforcement)
- Robust descriptions have particular importance in databases used for management of reference collections (impact on thresholds and efficiency to exclude varieties from growing trials).
- Descriptions in a database ("working description") should be based at least on the recommended minimum number of growing cycles. Any additional cycle can improve the quality of the description

Bundessortenamt

THANK YOU!



[End of Annex and of document]