UPOV

Union internationale pour la protection des obtentions végétales

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Comité technique **TC/54/27**

Cinquante-quatrième session
Genève, 29 et 30 octobre 2018

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NOMBRE DE CYCLES DE VEGETATION

Document établi par le Bureau de l'Union

Avertissement : le présent document ne représente pas les principes ou les orientations de l'UPOV

RÉSUMÉ

1. L'objet du présent document est de rendre compte de l'examen du nombre de cycles de végétation dans l'examen DHS.

2. Le TC est invité à prendre note des discussions qui ont été menées par les TWP, à leurs sessions de 2017 et de 2018, sur l'incidence du recours à différents nombres de cycles de végétation sur les décisions en matière d'examen DHS sur la base de données réelles.

3. Le présent document est structuré comme suit :

4. Les abréviations suivantes sont utilisées dans le présent document :

TC : Comité technique
TC-EDC : Comité de rédaction élargi
TWA : Groupe de travail technique sur les plantes agricoles
TWC : Groupe de travail technique sur les systèmes d'automatisation et les programmes d'ordinateur
TWF : Groupe de travail technique sur les plantes fruitières
TWO : Groupe de travail technique sur les plantes ornementales et les arbres forestiers
TWP : Groupe de travail technique
TWV : Groupe de travail technique sur les plantes potagères

RAPPEL

5. À sa cinquante-deuxième session tenue à Genève du 14 au 16 mars 2016, le TC a suivi les exposés ci-après sur les descriptions variétales et le rôle du matériel végétal, y compris le nombre minimum de cycles de végétation pour l'examen DHS (dans l'ordre de présentation) (voir le paragraphe 204 du document TC/52/29 Rev. "Compte rendu révisé") :

Les descriptions variétales et le rôle du matériel végétal, y compris le nombre minimum de cycles de végétation pour l'examen DHS;	France (M. Richard Brand)
Élaboration et utilisation des descriptions variétales	Allemagne (Mme Beate Rücker)
Nombre minimum de cycles de végétation	Pays-Bas (M. Kees van Ettekoven)
Utilisation des descriptions variétales et longueur de la période d'examen : le point de vue de la Nouvelle-Zélande	Nouvelle-Zélande (M. Chris Barnaby)

6. Le TC a tenu compte du débat sur le nombre de cycles de végétation dans l'examen DHS et il est convenu d'inviter les membres de l'Union à simuler l'incidence du recours à différents nombres de cycles de végétation sur les décisions en matière d'examen DHS sur la base de données réelles et à rendre compte de leurs résultats aux sessions des groupes de travail techniques de 2016 et à la cinquante-troisième session du TC.

7. À sa cinquante-troisième session tenue à Genève du 3 au 7 avril 2017, le TC a examiné le document TC/53/21 "Nombre de cycles de végétation" (voir les paragraphes 183 à 187 du document TC/53/31 "Compte rendu").

8. Le TC a examiné les exposés présentés par les experts aux sessions des TWP en 2016, simulant l'incidence du recours à différents nombres de cycles de végétation sur les décisions DHS sur la base de données réelles, qui figurent dans les annexes du document TC/53/21.

9. Le TC a pris note des propositions faites par les membres de l'Union de présenter des exposés aux groupes de travail techniques, à leurs sessions de 2017, sur l'incidence du recours à différents nombres de cycles de végétation sur les décisions DHS sur la base de données réelles et il est convenu d'inviter les groupes de travail techniques à rendre compte au TC à sa session de 2018.

10. Le TC a pris note de l'intérêt manifesté par les services vis-à-vis d'une réduction des coûts associés à l'examen DHS et il est convenu que le nombre de cycles de végétation pour l'examen DHS devait être le minimum nécessaire pour une décision DHS rigoureuse et l'établissement d'une description variétale fiable.

11. Le TC est convenu qu'il n'était pas approprié de généraliser en disant que les variétés ornementales devaient être examinées dans le cadre d'un seul essai en culture alors que d'autres types de plantes devaient être examinées dans le cadre de deux cycles de végétation, et il a estimé que le nombre de cycles de végétation devait être déterminé au cas par cas pour chaque plante.

EXPOSÉS PRÉSENTÉS AUX GROUPES DE TRAVAIL TECHNIQUES À LEURS SESSIONS DE 2017

Groupe de travail technique sur les plantes agricoles

12. À sa quarante-sixième session tenue à Hanovre (Allemagne) du 19 au 23 juin 2017, le TWA a examiné les documents TWP/1/21 “Number of growing cycles”, TWA/46/8 et TWA/46/8 Add “Impact of using different numbers of growing cycles on DUS decisions using actual data” (voir les paragraphes 36 à 41 du document TWA/46/10 “Report”).

13. Le TWA a suivi les exposés suivants, qui sont reproduits dans les documents TWA/46/8 et TWA/46/8 Add. :

a) “Incidence du nombre de cycles de végétation sur les descriptions variétales et pouvoir discriminant du blé et de l’orge”, établi par un expert de l’Allemagne
b) “Nombre de cycles de végétation pour la pomme de terre”, établi par un expert des Pays-Bas
c) “Nombre de cycles de végétation pour les variétés de pomme de terre – Examen DHS des germes”, établi par un expert de la Pologne
d) “Nombre de cycles de végétation : incidence sur les descriptions de variétés de céréales”, établi par un expert du Royaume-Uni

14. Le TWA est convenu que le débat sur le nombre de cycles de végétation dans l’examen DHS pour les plantes agricoles devait se poursuivre et il s’est félicité des propositions de l’Allemagne, de l’Australie, du Danemark, de la France, du Royaume-Uni et de l’ISF de présenter des exposés à sa quarante septième session.

Groupe de travail technique sur les plantes fruitières

15. Le TWF a examiné le document TWP/1/21 “Number of growing cycles” (voir les paragraphes 81 à 84 du document TWF/48/13 “Report”).

16. Le TWF a noté que le TC était convenu qu’il n’était pas approprié de généraliser en disant que les variétés ornementales devaient être examinées dans le cadre d’un seul essai en culture alors que d’autres types de plantes devaient être examinés dans le cadre de deux cycles de végétation. Il a ensuite noté que le TC était convenu que le nombre normal de cycles de végétation devait être déterminé au cas par cas pour chaque plante. Cependant, le TWF est convenu de préciser au TC que, dans le secteur des fruits, le nombre normal de cycles de végétation devait dans certains cas être déterminé au cas par cas pour chaque type de variété (par exemple, des variétés de porte-greffes, des variétés hermaphrodites).

Groupe de travail technique sur les systèmes d’automatisation et les programmes d’ordinateur

17. Le TWC a examiné le document TWP/1/21 “Number of growing cycles” (voir les paragraphes 45 à 51 du document TWC/35/21 “Report”).

18. Le TWC a examiné le document TWC/35/7 “Number of Growing Cycles in Potato” et suivi un exposé présenté par un expert des Pays-Bas contenant les résultats de la simulation sur l’incidence du recours à différents nombres de cycles de végétation sur les décisions en matière d’examen DHS sur la base de données réelles pour la pomme de terre. L’exposé est reproduit dans l’annexe du document TWC/35/7.

19. Le TWC a noté que, d’après les résultats, 73% des 37 caractères observés auraient eu la même note et 24% auraient présenté des différences d’une note seulement entre le premier cycle de végétation et les premier et deuxième cycles de végétation combinés.

20. Le TWC a noté que les Pays-Bas étudiaient la possibilité d’utiliser les informations des marqueurs moléculaires pour réduire le nombre de cycles de végétation pour l’examen DHS de variétés de pomme de terre.

EXPOSÉS PRÉSENTÉS AUX GROUPES DE TRAVAIL TECHNIQUES À LEURS SESSIONS DE 2018

Groupe de travail technique sur les plantes agricoles

21. À sa quarante-septième session tenue à Naivasha (Kenya) du 21 au 25 mai 2018, le TWA a examiné le document TWA/47/5 “Impact of the number of growing cycles on variety descriptions and discrimination power in potato” et suivi un exposé présenté par un expert de l’Allemagne qui est reproduit dans le document TWA/47/5 Add. (Voir les paragraphes 35 à 38 du document TWA/47/7 “Report”).

22. Le TWA est convenu que les descriptions variétales établies sur la base de deux cycles de végétation étaient plus rigoureuses que celles établies sur la base d’un seul. Il est également convenu que deux cycles de végétation permettaient une évaluation plus rigoureuse des différents caractères.

23. Le TWA est convenu qu’une décision rigoureuse sur la distinction pouvait être prise après un seul cycle de végétation sur la base d’une différence suffisamment importante des caractères.

24. Le TWA a noté que les marqueurs d’ADN pouvaient fournir des informations complémentaires dans le cadre de l’examen DHS, comme indiqué dans le document TGP/15 “Conseils en ce qui concerne l’utilisation des marqueurs biochimiques et moléculaires dans l’examen de la distinction, de l’homogénéité et de la stabilité (DHS)”. Il a pris note des données d’expérience fournies par les Pays-Bas selon lesquelles les informations des marqueurs d’ADN étaient également utilisées pour l’application des droits d’obtenteur combinée à la vérification deux à deux de la conformité du matériel végétal à une variété protégée.

Groupe de travail technique sur les systèmes d’automatisation et les programmes d’ordinateur

25. Le TWC a examiné les documents TWC/36/6 et TWC/36/6 Add. “Impact of the number of growing cycles on variety descriptions and discrimination power” et suivi un exposé présenté par un expert de l’Allemagne (voir les paragraphes 24 à 28 du document TWC/36/15 “Report”).

26. Le TWC a accueilli avec satisfaction l’analyse statistique quantifiant l’interaction entre le génotype et l’environnement pour les descriptions établies sur plusieurs années.

27. Le TWC est convenu que les descriptions variétales établies sur la base de deux cycles de végétation étaient plus rigoureuses que celles établies sur la base d’un seul.

28. Le TWC est convenu qu’il fallait préciser que les documents TWC/36/6 et TWC/36/6 Add. analysaient les différences présentées par les caractères sur plusieurs cycles et n’évaluaient pas les différences entre les variétés pour tous les caractères.

29. Le TWC a pris note du rapport verbal des Pays-Bas précisant qu’une étude était menée sur l’utilisation des marqueurs d’ADN comme informations complémentaires aux fins des décisions sur la distinction et il est convenu d’inviter les Pays-Bas à rendre compte de leurs travaux lors d’une prochaine réunion.

30. Le TC est invité à prendre note des discussions qui ont été menées par les TWP, à leurs sessions de 2017 et de 2018, sur l’incidence du recours à différents nombres de cycles de végétation sur les décisions en matière d’examen DHS sur la base de données réelles.

[Les annexes suivent]

ANNEXE I / ANNEX I / ANLAGE I / ANEXO I
[in English only / en anglais seulement / nur auf Englisch / solamente en inglés]

IMPACT OF NUMBER OF GROWING CYCLES ON VARIETY DESCRIPTIONS AND DISCRIMINATION POWER IN WHEAT AND BARLEY

Presentation by an expert from Germany at the forty-sixth session of the Technical Working Party for Agricultural Crops

Bundessortenamt

UPOV TECHNICAL WORKING PARTY FOR AGRICULTURAL CROPS
Forty-sixth Session, Hanover, Germany, June 19 to 23, 2017

Impact of number of growing cycles on variety descriptions and discrimination power in wheat and barley

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Bundessortenamt

Discrimination power of characteristics calculated in three steps:

(a) '1 cycle': Comparison of all varieties in the growing trial (year 0)
(b) '2 cycles': For all varieties which were 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 all varieties which were 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

The same analysis was performed for 2014, 2015 and 2016.

2

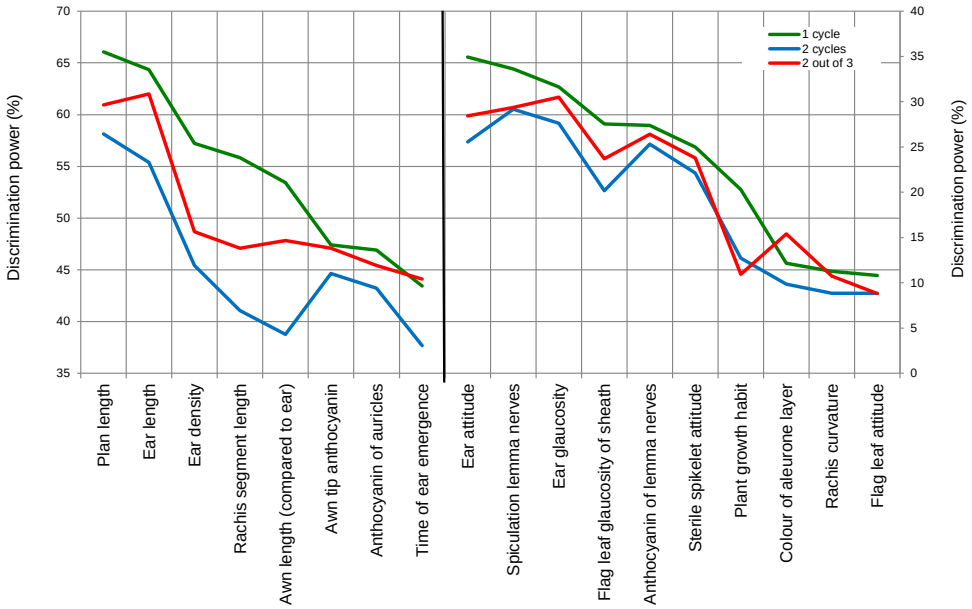
Bundessortenamt

Data for analysis of discrimination power from DUS growing trials:

- Trials comprise about 600 varieties in winter wheat and 300 varieties in winter barley.
- Two year data are available for about 70% of the varieties and three year data for about 50% of the varieties.
- 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

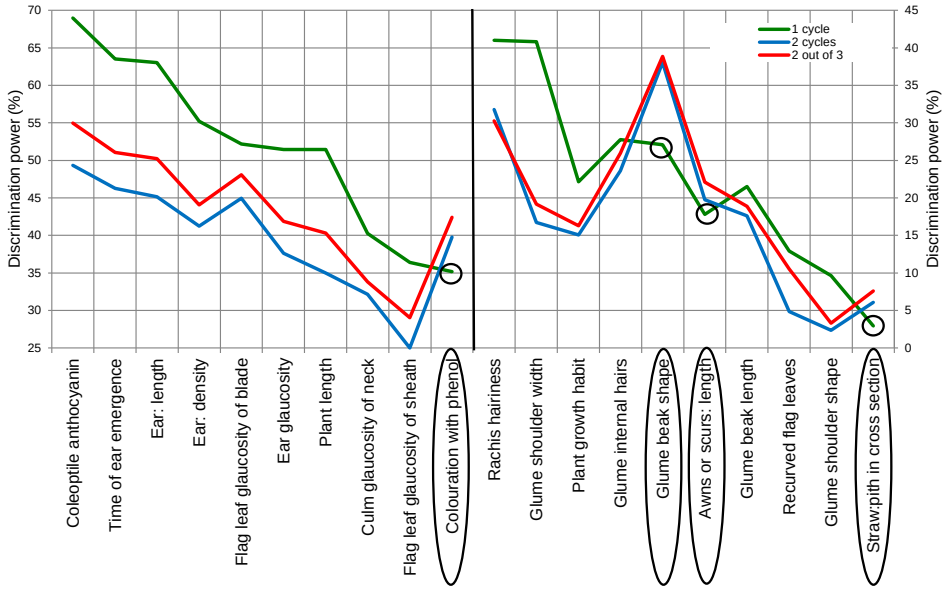
Bundessortenamt

Impact of the number of growing cycles on discrimination power – Barley



Bundessortenamt

Impact of the number of growing cycles on discrimination power – Wheat



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Bundessortenamt

Data for analysis of variety descriptions:

- 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

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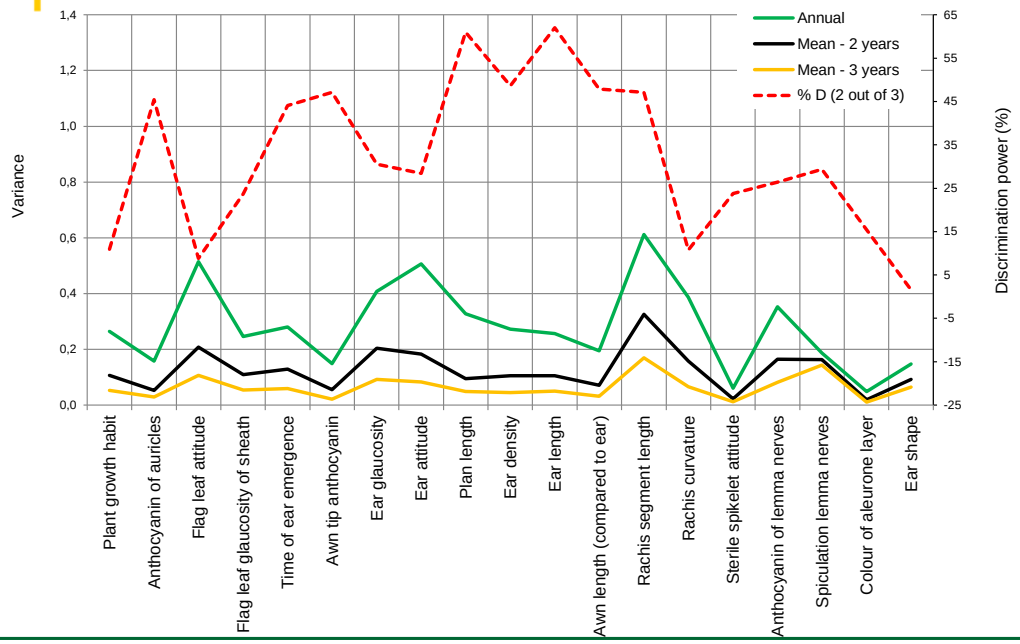
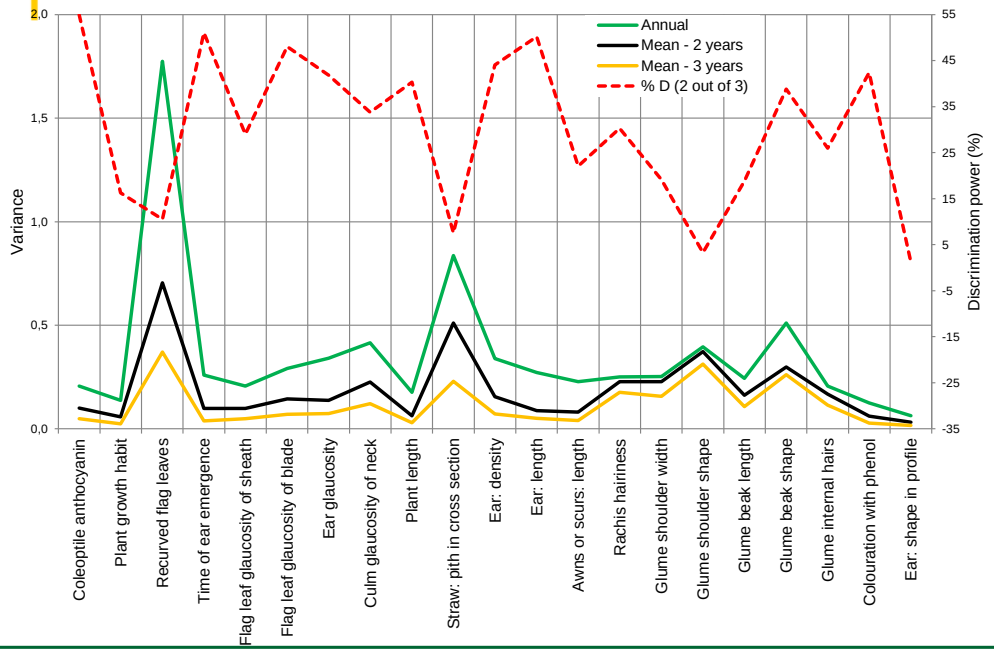
Bundessortenamt

Variance of variety descriptions over testing periods – Barley



Bundessortenamt

Variance of variety descriptions over testing periods – Wheat



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Conclusions:

- number of growing cycles has significant impact on distinctness decisions and variety descriptions
- Current recommendation in TG Barley and TG Wheat is appropriate: “The minimum duration of test should normally be two independent growing cycles”.
- Minimum duration of test should be followed to establish
  - official variety description – precondition for enforcement
  - “working description” – precondition for management of reference collection, in particular when databases are used
- Descriptions in a database should be based at least on the recommended minimum number of growing cycles. Any additional cycle can improve the quality of the description

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Bundessortenamt

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[L’annexe II suit /
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ANNEXE II / ANNEX II / ANLAGE II / ANEXO II
[in English only / en anglais seulement / nur auf Englisch / solamente en inglés]

NUMBER OF GROWING CYCLES: THE IMPACT ON CEREAL VARIETY DESCRIPTIONS

Presentation by an expert from United Kingdom at the forty-sixth session of the Technical Working Party for Agricultural Crops

NIAB TAG

Number of growing cycles:
the impact on cereal variety descriptions

Presentation to UPOV TWA June 2017

NIAB TAG

Summary

- Background
- Examples
  - Barley
  - Wheat
- Do all varieties react the same?
- Summary of observations

UPOV No.	Characteristic	2015 Note	2016 Note
1	PLANT: GROWTH HABIT	5	6
2	LOWER LEAVES: HAIRINESS OF LEAF SHEATHS	1	1
4	FLAG LEAF: INTENSITY OF ANTH. COLOUR. OF AURICLES	6	7
	FLAG LEAF: ATTITUDE	4	5
6	FLAG LEAF: GLAUCOSITY OF SHEATH	6	7
7	TIME OF EAR EMERGENCE (1st spk. vis. on 50% ears)	6	5
9	AWNS: INTENSITY OF ANTHOCYANIN COLOUR. OF TIPS	5	6
10	EAR: GLAUCOSITY	5	6
11	EAR: ATTITUDE	2	2
12	PLANT: LENGTH (stem, ears and awns)	4	4
13	EAR: NUMBER OF ROWS	1	1
14	EAR: SHAPE	3	3
15	EAR: DENSITY	4	4
16	EAR: LENGTH (excluding awns)	4	5
17	AWN: LENGTH (compared to ear)	7	7
18	RACHIS: LENGTH OF FIRST SEGMENT	4	4
19	RACHIS: CURVATURE OF FIRST SEGMENT	5	3
	EAR: DEVELOPMENT OF STERILE SPIKELETS	1	1
20	STERILE SPIKELET: ATTITUDE (in mid-third of ear)	n/a	n/a
21	MEDIAN SPIKELET: LENGTH OF GLUME+AWN cf GRAIN	2	2
22	GRAIN: RACHILLA HAIR TYPE	1	1
23	GRAIN: HUSK	9	9
24	GRAIN: ANTHOCYANIN COLOURATION OF NERVES OF LEMMA	6	4
25	GRAIN: SPICULATION OF INNER LATERAL NERVES OF DORSAL	1	1
26	GRAIN: HAIRINESS OF VENTRAL FURROW	1	1
27	GRAIN: DISPOSITION OF LODICULES	2	2
28	KERNEL: COLOUR OF ALEURONE LAYER	1	
29	SEASONAL TYPE	3	

NIAB TAG

Example: barley variety

Key:

- 2 notes difference between years
- 1 note difference between years

UPOV No.	Characteristic	2015 Note	2016 Note
1	COLEOPTILE: ANTHOCYANIN COLOURATION	3	-
2	PLANT: GROWTH HABIT	6	5
4	PLANT: FREQ. OF PLANTS WITH RECURVED FLAG LEAVES	1	1
5	TIME OF EAR EMERGENCE (first spkt visible on 50% of ears)	8	7
6	FLAG LEAF: GLAUCOSITY OF SHEATH	6	7
	FLAG LEAF: GLAUCOSITY OF BLADE (lower side)	5	6
7	EAR: GLAUCOSITY	6	6
8	CULM: GLAUCOSITY OF NECK	6	6
9	PLANT: LENGTH (stem, ears, awns and scurs)	2	3
10	STRAW: PITH IN CROSS SECTION	1	1
11	EAR: SHAPE IN PROFILE	2	2
12	EAR: DENSITY	6	6
13	EAR: LENGTH (excluding awns and scurs)	4	5
14	AWNS OR SCURS: PRESENCE	2	2
15	AWNS OR SCURS AT TIP OF EAR: LENGTH	9	9
16	EAR: COLOUR	1	1
17	APICAL RACHIS SEGMENT: HAIRINESS OF CONVEX SURFACE	4	4
18	LOWER GLUME: SHOULDER WIDTH	3	3
19	LOWER GLUME: SHOULDER SHAPE	6	6
20	LOWER GLUME: BEAK LENGTH	5	5
21	LOWER GLUME: BEAK SHAPE	4	4
22	LOWER GLUME: EXTENT OF INTERNAL HAIRS	4	3
24	GRAIN: COLOUR	2	-
25	GRAIN: COLOURATION WITH PHENOL	6	-
26	SEASONAL TYPE	1	1

NIAB TAG

Example: wheat variety

Key:

- 2 notes difference between years
- 1 note difference between years

UPOV No.	Characteristic	2015 Note	2016 Note	2015 Note	2016 Note
		Variety A		Variety B	
1	COLEOPTILE: ANTHOCYANIN COLOURATION	2		3	
2	PLANT: GROWTH HABIT	4	5	5	5
4	PLANT: FREQ. OF PLANTS WITH RECURVED FLAG LEAVES	5	5	7	5
5	TIME OF EAR EMERGENCE	3	5	8	8
6	FLAG LEAF: GLAUCOSITY OF SHEATH	5	7	8	8
	FLAG LEAF: GLAUCOSITY OF BLADE (lower side)	5	5	9	7
7	EAR: GLAUCOSITY	5	6	8	6
8	CULM: GLAUCOSITY OF NECK	5	7	8	7
9	PLANT: LENGTH (stem, ears, awns and scurs)	9	7	2	3
10	STRAW: PITH IN CROSS SECTION	1	1	2	2
11	EAR: SHAPE IN PROFILE	1	1	2	2
12	EAR: DENSITY	3	3	4	3
13	EAR: LENGTH (excluding awns and scurs)	6	5	4	4
14	AWNS OR SCURS: PRESENCE	2	2	2	2
15	AWNS OR SCURS AT TIP OF EAR: LENGTH	9	8	7	7
16	EAR: COLOUR	1	1	1	1
17	APICAL RACHIS SEGMENT: HAIRINESS OF CONVEX SURFACE	6	6	7	7
18	LOWER GLUME: SHOULDER WIDTH	3	3	5	5
19	LOWER GLUME: SHOULDER SHAPE	7	6	4	5
20	LOWER GLUME: BEAK LENGTH	5	5	4	4
21	LOWER GLUME: BEAK SHAPE	3	3	3	3
22	LOWER GLUME: EXTENT OF INTERNAL HAIRS	7	7	7	7
24	GRAIN: COLOUR	2		2	
25	GRAIN: COLOURATION WITH PHENOL	7		7	
26	SEASONAL TYPE	3	3	3	3

Do all varieties react the same way to environmental changes?

Key:

2 notes difference between years

1 note difference between years

Summary of observations

- The state of expression can be variable over two years
- Quantitative characteristics are more variable
- Some QN characteristics are more variable than others
- Change in the environment does not affect all varieties the same way

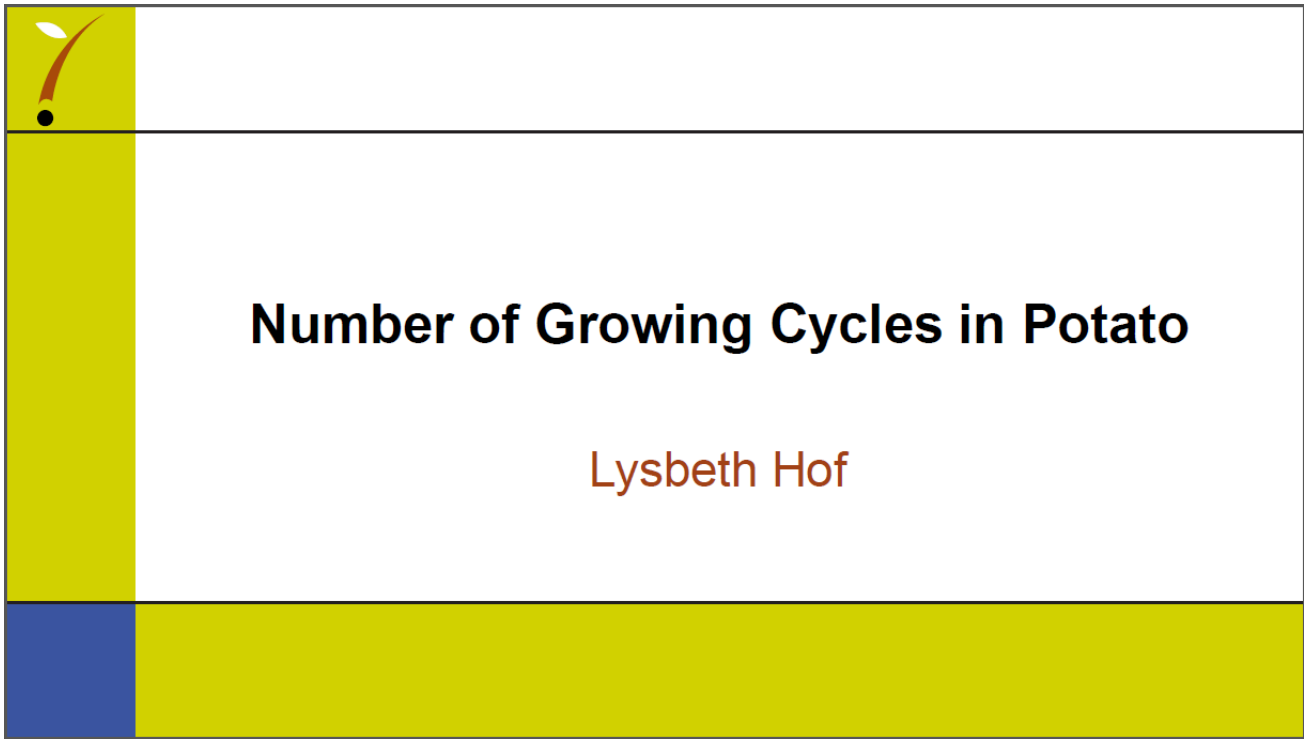
Two growing cycles produce more robust variety descriptions

[L'annexe III suit / Annex III follows / Anlage III folgt / Sigue el Anexo III]

ANNEXE III / ANNEX III / ANLAGE III / ANEXO III
[in English only / en anglais seulement / nur auf Englisch / solamente en inglés]

NUMBER OF GROWING CYCLES IN POTATO

Presentation by an expert from Netherlands at the forty-sixth session of the Technical Working Party for Agricultural Crops and at the thirty-fifth session of the Technical Working Party on Automation and Computer Programs



Introduction

- Question: Is it possible to reduce the number of growing cycles in potato to 1 without loss of quality?

  – Effect on variety description
  – Other practical issues

Effect on Variety Description

- Comparison of description after 1 cycle with description after 2 cycles
- All new applications in period 2013-2016
- All observations by 1 person
- Observations in 2nd year independent of 1st year
- All withdrawn applications deleted
- End total of 117 varieties

Effect on Variety Description

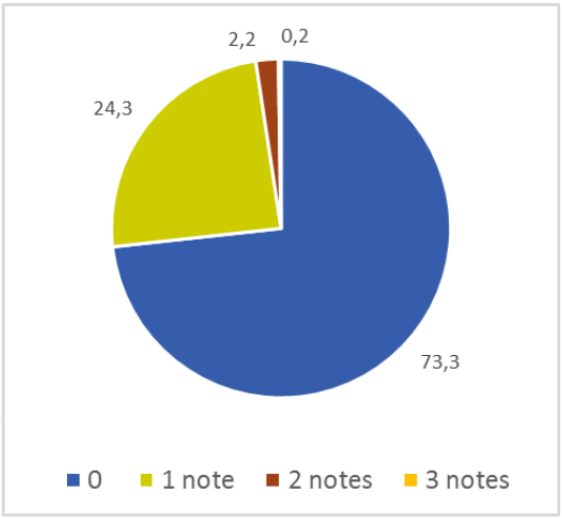
- Descriptions according to CPVO TP/23/2 (similar to UPOV TG/23/6, minus 5 characteristics)
- 37 char. (33 QN and 4 PQ)
- Nr observations per variety can be smaller than 37:
  - Char 29 and 30 only observed if flowers not white
  - Char 37 only observed if tuber is yellow

5

QN characteristics

Difference between scores after 1st cycle and final scores.
(QN char. only, 3673 obs., 117 var.)

Difference between 1st – final score	number of observations	%
0	2691	73,3
1 note	894	24,3
2 notes	79	2,2
3 notes	9	0,2
	3673	



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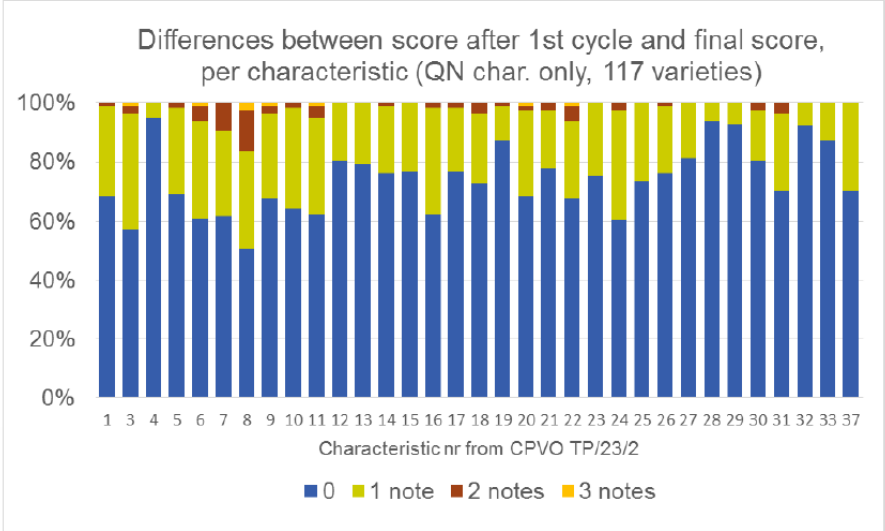
QN characteristics



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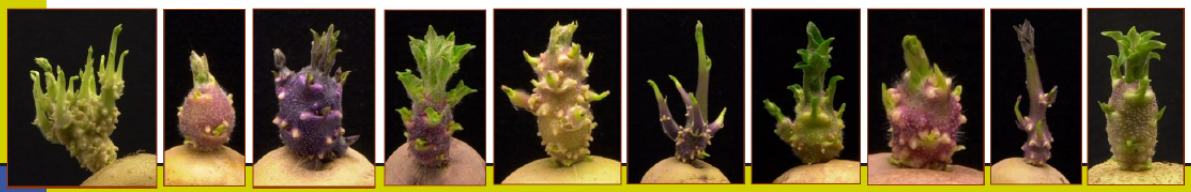
QN characteristics

- Char. 4 (colour of base of lightsprout), 28 (flower colour intensity) and 29 (flower colour) are very stable
- Char 8 (colour of tip of lightsprout) is less stable



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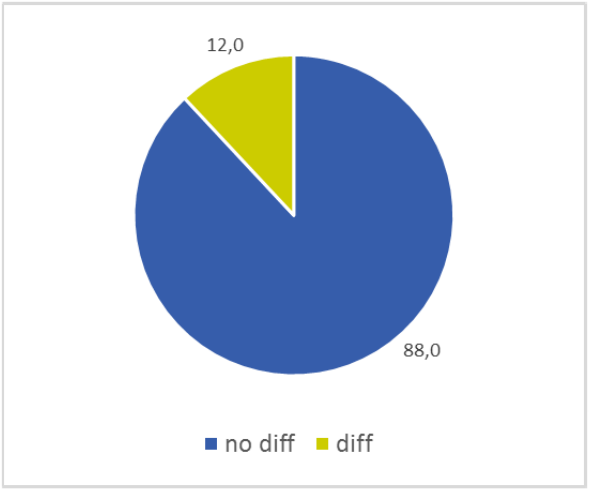
PQ characteristics

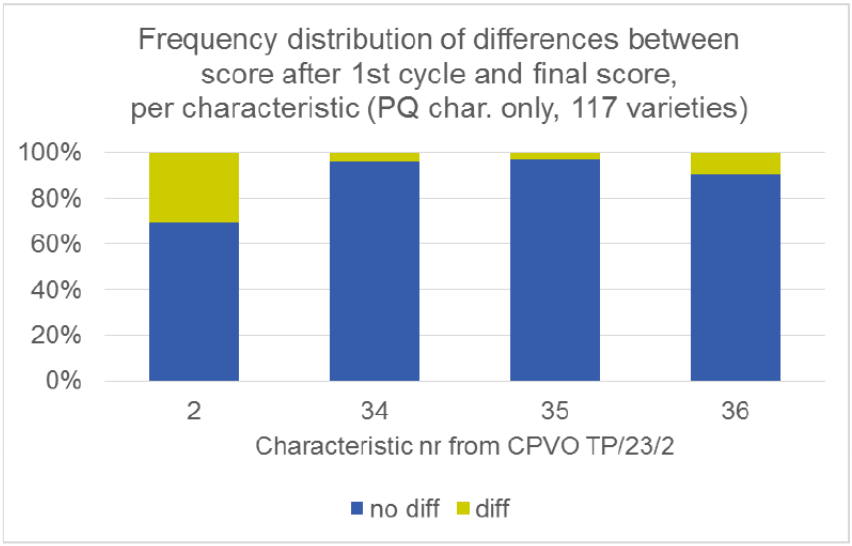
Difference between scores after 1st cycle and final scores. (PQ char. only, 468 obs., 117 var.)

Difference between 1st – final score	number of observations	%
No difference	412	88,0
Difference	46	12,0
	468	



9

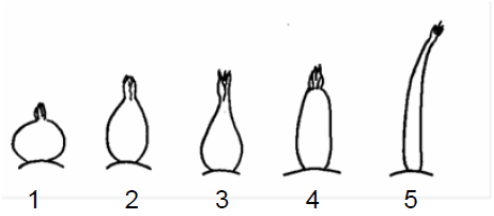
PQ characteristics



10

PQ characteristics

- Char. 34 (Tuber skin colour), and 35 (Tuber base of eye colour) are very stable
- Char 2 (Shape of lightsprout) is less stable



11

Effect on Variety Description

- Variety descriptions of potato are slightly adjusted when a second testing year is added
- But how significant/important are those adjustments?

12

Variety Descriptions across Europe

In 2005, a ringtest for potato was carried out in Europe:

- 12 varieties
- 12 countries
- Plant material (tubers) of same origin

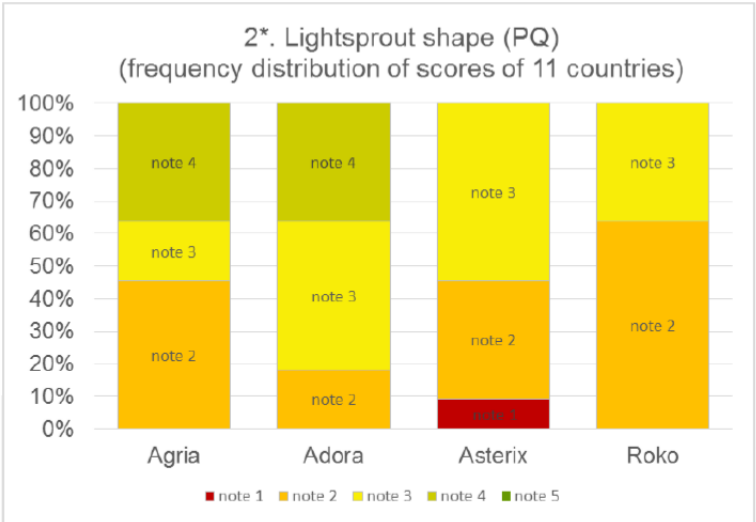
- Main sources of variation in observations:
  - Location (weather, soil, nutrition etc.)
  - Observer
  - Interactions

13

Variety Descriptions across Europe

Legend:
note 5 = narrow cylindrical
note 4 = broad cylindrical
note 3 = conical
note 2 = ovoid
note 1 = spherical

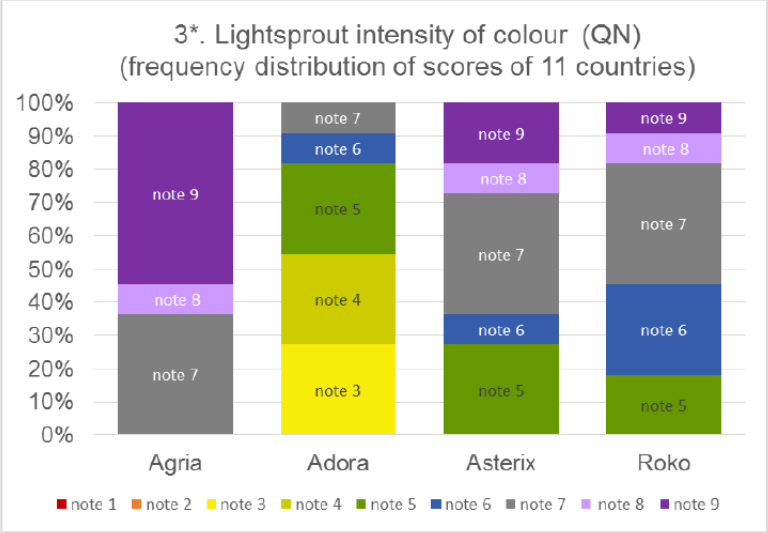
1 2 3 4 5



14

Variety descriptions across Europe

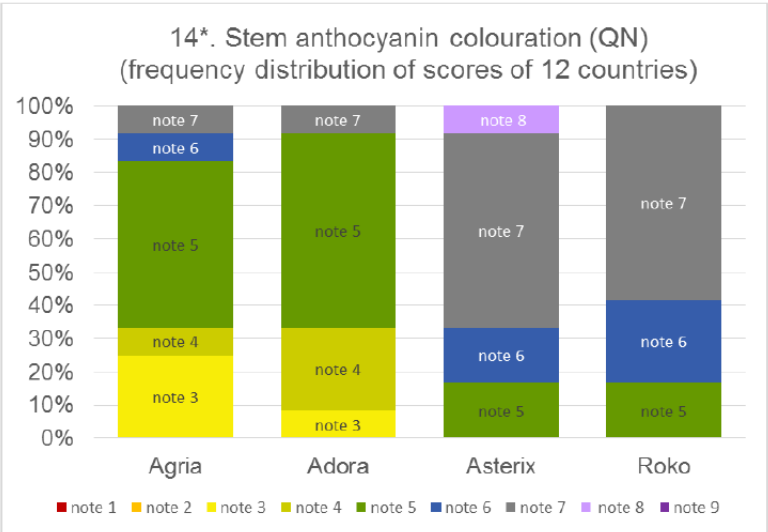
Legend
note 9 = very strong
note 1 = absent or
very weak



15

Variety Descriptions across Europe

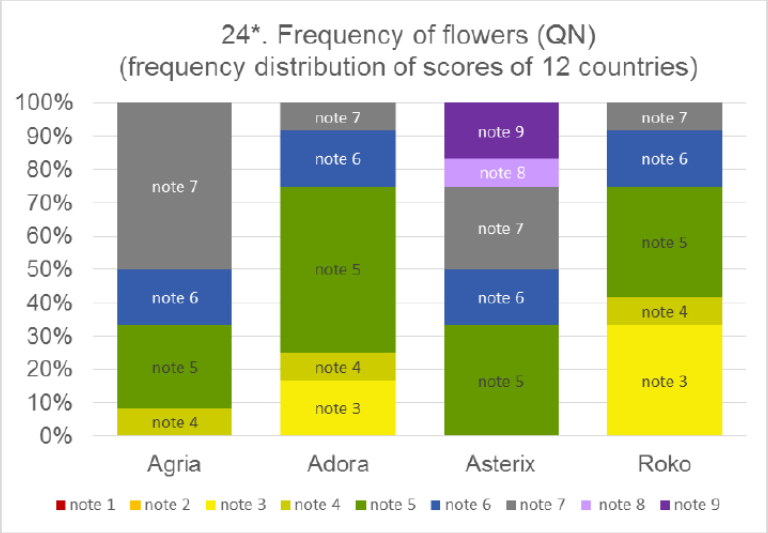
Legend
note 9 = very strong
note 1 = absent or
very weak



16

Variety Descriptions across Europe

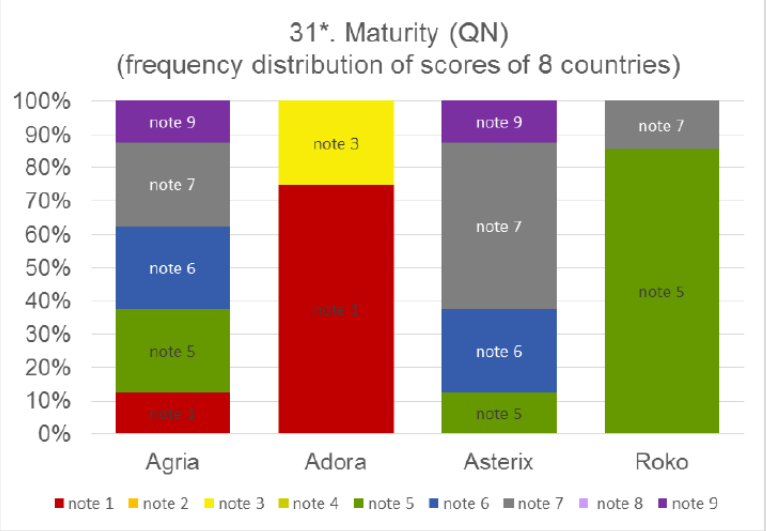
Legend
note 9 = very high
note 1 = absent or very low



17

Variety Descriptions across Europe

Legend
note 9 = very late
note 1 = very early

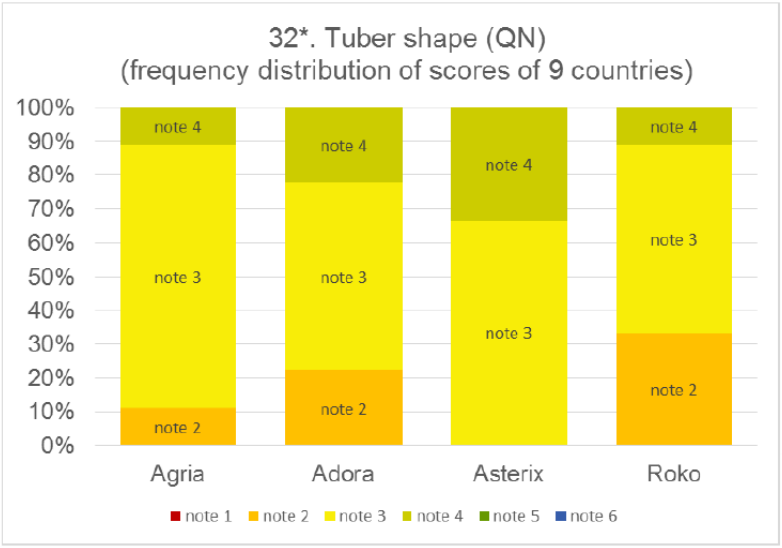


18

Variety Descriptions across Europe

Legend
note 6 = very long
note 1 = round

1 2 3 4 5 6



19

Effect on Variety Descriptions

Conclusions:

- Variety descriptions are very variable across Europe, especially for some characteristics
- In NL variety descriptions were relatively stable between both testing years:
  - the second year did not add much more information to the variety description
  - no effect on distinctness decision

20

From 2 cycles to 1?

- Question: Is it possible to reduce the number of growing cycles in potato to 1 without loss of quality?
  - Effect on variety description
  - Other practical issues

Current situation

- All new varieties are tested against morph. database(s) as well as DNA database
- DNA is very useful for selecting genetically close varieties (> 85% Jaccard similarity)
- DNA is very useful as supporting evidence with DUS
- DNA helps finding anomalies fast (wrong sample, mixtures)
- Distinctness and uniformity are rarely a problem in potato

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Database morphological char.

- NL database with variety descriptions
- As of 2018: European Common Database with potato descriptions since 2013 of all CPVO entrusted E.O.'s. Only 17 most stable characteristics.

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Database DNA

In addition: DNA database. In NL part of DUS since 2009.

- Currently ≈ 2000 varieties, mainly from Europe
  As of 2017 including all available varieties of Common Catalogue
- 9 SSR markers (≈ 115 alleles in total)
- Jaccard similarity < 85% = clear genetic difference (based on research evidence)
- DNA data will be included in European Common Database (morph. char/DNA/lightsprout pictures)

24

Time line DUS potato in NL

activity	year 1												year 2											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
subm. tubers																								
DNA																								
lightsprouts																								
field																								
data + report																								
subm. tubers																								
(DNA)																								
lightsprouts																								
field																								
data + report																								

25

Practical problems with 1 cycle

- Time schedule: DNA results in March. Field trials already prepared (pre-sprouting of tubers). No changes possible with regard to reference varieties. DNA results currently used for 2nd cycle.
- Some varieties do not (or hardly) flower. Currently extra test in 2nd cycle: cultivation on stone

26

Practical problems with 1 cycle?

Solutions:

- Shift submission of tubers to Jan 1st (or 15th at the latest)
- Shift DNA test to end of January (results available before planning of trial)
- Put all low frequency flowering varieties in flowering test (based on TQ data) or shift this test to summer/fall

27

Number of growing cycles in potato?

Conclusion:

- **Q:** can we reduce the number of growing cycles for DUS in potato to 1 without loss of quality?
- **A:** Yes for the majority of varieties, provided that time schedules can be adjusted.

- In case of doubt, add 2nd cycle.

- N.B. VCU will remain 2 yrs!

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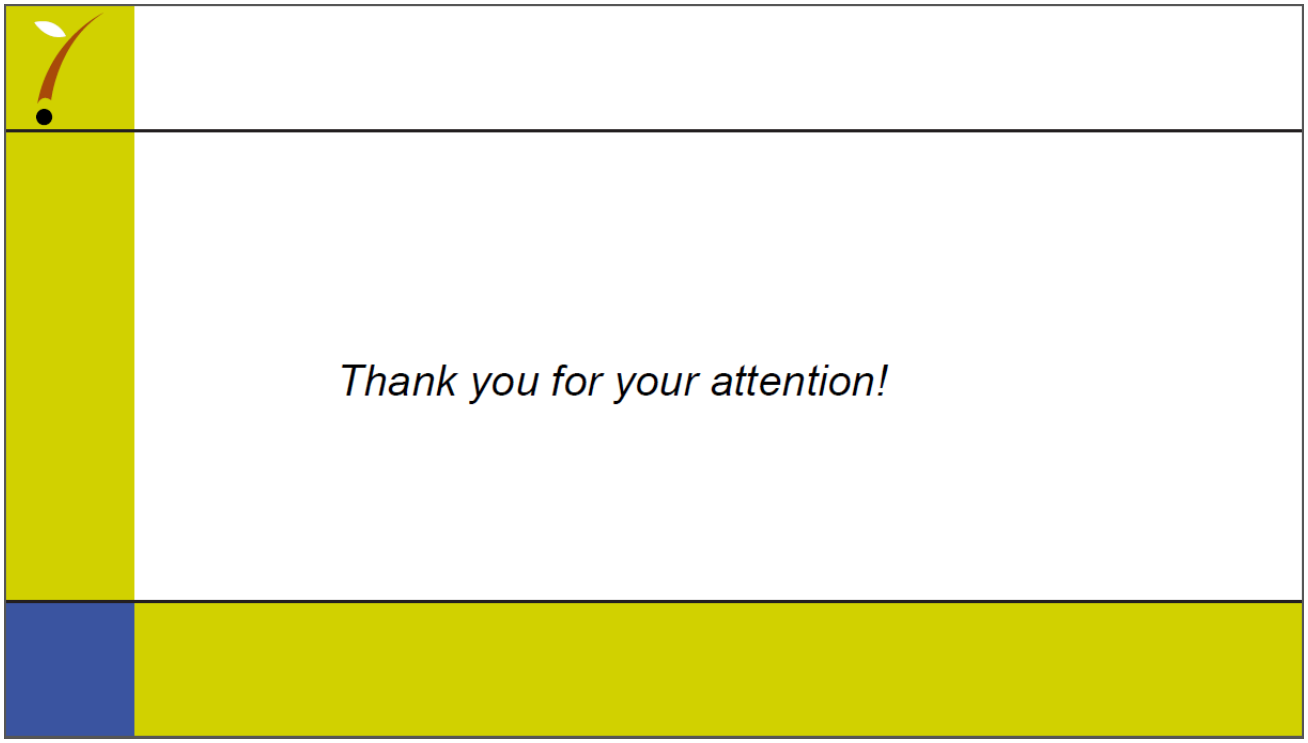
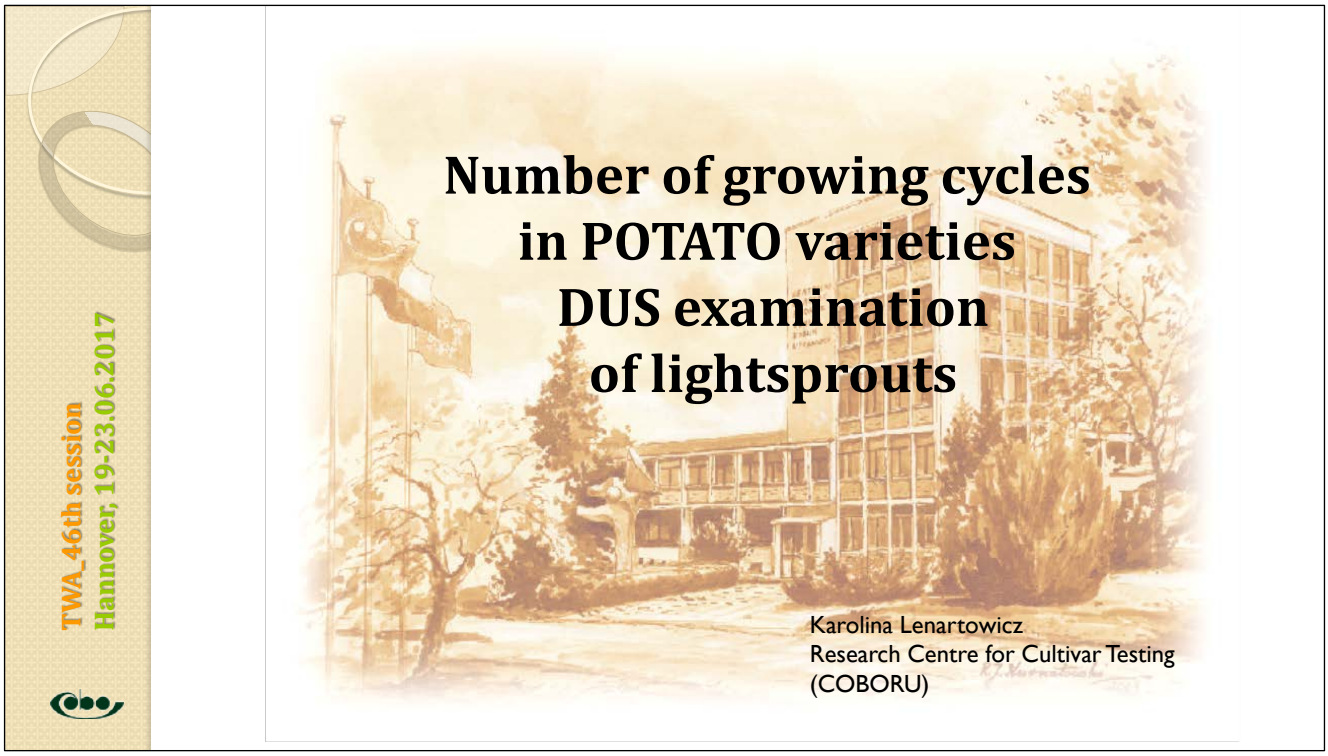


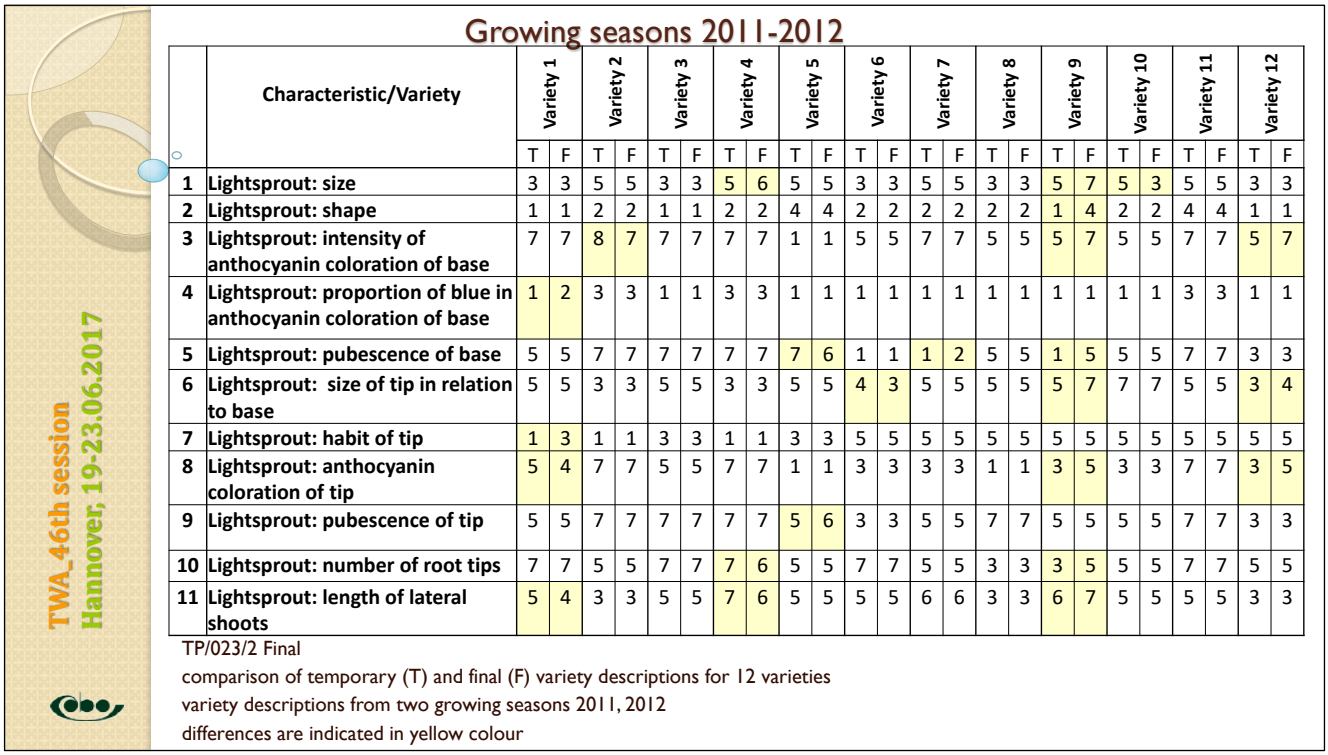
[L'annexe IV suit /
Annex IV follows /
Anlage IV folgt /
Sigue el Anexo IV]

ANNEXE IV / ANNEX IV / ANLAGE IV / ANEXO IV
[in English only / en anglais seulement / nur auf Englisch / solamente en inglés]

NUMBER OF GROWING CYCLES IN POTATO VARIETIES – DUS EXAMINATION OF LIGHTSPROUTS

Presentation by an expert from Poland at the forty-sixth session of the Technical Working Party for Agricultural Crops





Growing seasons 2011-2012

	Characteristic/Variety	Variety 1		Variety 2		Variety 3		Variety 4		Variety 5		Variety 6		Variety 7		Variety 8		Variety 9		Variety 10		Variety 11		Variety 12	
		T	F	T	F	T	F	T	F	T	F	T	F	T	F	T	F	T	F	T	F	T	F	T	F
1	Lightsprout: size	3	3	5	5	3	3	5	6	5	5	3	3	5	5	3	3	5	7	5	3	5	5	3	3
2	Lightsprout: shape	1	1	2	2	1	1	2	2	4	4	2	2	2	2	2	2	1	4	2	2	4	4	1	1
3	Lightsprout: intensity of anthocyanin coloration of base	7	7	8	7	7	7	7	7	1	1	5	5	7	7	5	5	5	7	5	5	7	7	5	7
4	Lightsprout: proportion of blue in anthocyanin coloration of base	1	2	3	3	1	1	3	3	1	1	1	1	1	1	1	1	1	1	1	1	3	3	1	1
5	Lightsprout: pubescence of base	5	5	7	7	7	7	7	7	7	6	1	1	1	2	5	5	1	5	5	5	7	7	3	3
6	Lightsprout: size of tip in relation to base	5	5	3	3	5	5	3	3	5	5	4	3	5	5	5	5	5	7	7	7	5	5	3	4
7	Lightsprout: habit of tip	1	3	1	1	3	3	1	1	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5
8	Lightsprout: anthocyanin coloration of tip	5	4	7	7	5	5	7	7	1	1	3	3	3	3	1	1	3	5	3	3	7	7	3	5
9	Lightsprout: pubescence of tip	5	5	7	7	7	7	7	7	5	6	3	3	5	5	7	7	5	5	5	5	7	7	3	3
10	Lightsprout: number of root tips	7	7	5	5	7	7	7	6	5	5	7	7	5	5	3	3	3	5	5	5	7	7	5	5
11	Lightsprout: length of lateral shoots	5	4	3	3	5	5	7	6	5	5	5	5	6	6	3	3	6	7	5	5	5	5	3	3

TP/023/2 Final
comparison of temporary (T) and final (F) variety descriptions for 12 varieties
variety descriptions from two growing seasons 2011, 2012
differences are indicated in yellow colour

TWA_46th session
Hannover, 19-23.06.2017

Growing seasons 2012-2013-2014

	Characteristic/Variety	Variety 1			Variety 2			Variety 3			Variety 4			Variety 5			Variety 6		Variety 7		Variety 8		Variety 9			Variety 10	
		T	F	3	T	F	3	T	F	3	T	F	3	T	F	3	T	F	T	F	T	F	T	F	3	T	F
1	Lightsprout: size	3	5	5	3	3	3	5	7	7	5	7	7	5	5	5	5	5	5	5	3	3	3	5	5	3	5
2	Lightsprout: shape	1	3	3	2	2	2	2	1	1	4	2	2	2	2	2	4	4	2	4	2	2	1	2	2	2	4
3	Lightsprout: intensity of anthocyanin coloration of base	5	7	7	1	1	1	5	5	5	5	5	5	1	7	7	1	1	7	7	6	6	1	1	1	7	9
4	Lightsprout: proportion of blue in anthocyanin coloration of base	2	3	3	3	3	3	2	1	1	1	1	1	3	1	1	3	3	2	1	2	2	1	1	1	3	3
5	Lightsprout: pubescence of base	6	7	7	3	3	3	5	5	5	5	7	7	3	5	5	7	7	3	4	1	1	5	3	3	5	7
6	Lightsprout: size of tip in relation to base	5	5	5	3	3	3	3	4	4	5	7	7	3	3	3	3	3	3	3	3	3	3	3	3	4	4
7	Lightsprout: habit of tip	3	5	5	3	3	3	5	5	5	5	5	5	5	3	3	5	5	3	3	3	3	3	3	3	3	5
8	Lightsprout: anthocyanin coloration of tip	4	5	5	5	5	5	5	1	1	3	1	1	3	4	4	3	3	3	1	7	7	1	1	1	7	7
9	Lightsprout: pubescence of tip	5	5	5	3	3	3	5	3	3	5	5	5	7	5	5	7	7	4	5	3	3	3	3	3	7	7
10	Lightsprout: number of root tips	6	7	7	7	7	7	5	5	5	5	7	7	7	7	7	7	7	7	6	5	5	7	7	7	5	7
11	Lightsprout: length of lateral shoots	5	5	5	3	3	3	3	3	3	5	7	7	7	5	5	3	3	5	5	3	3	5	5	5	5	5

TP/023/2 Final

comparison of temporary (T) and final (F) variety descriptions for 10 varieties

variety descriptions from two growing seasons 2012, 2013 and for some varieties additional (3) growing season 2014

differences are indicated in yellow colour

differences between 2012 a 2013 result from a change of the conditions in the growing chamber (light, temperature), for comparision added some variety descriptions from 2014

TWA_46th session
Hannover, 19-23.06.2017

Growing seasons 2013-2014

	Characteristic/Variety	Variety 1		Variety 2		Variety 3		Variety 4		Variety 5		Variety 6		Variety 7		Variety 8		Variety 9	
		T	F	T	F	T	F	T	F	T	F	T	F	T	F	T	F	T	F
1	Lightsprout: size	6	6	7	7	6	6	7	7	7	7	7	7	7	7	7	7	5	5
2	Lightsprout: shape	2	2	5	5	3	3	2	2	3	3	1	1	2	2	1	1	1	1
3	Lightsprout: intensity of anthocyanin coloration of base	3	3	1	1	4	4	7	7	3	3	9	9	7	7	1	1	9	9
4	Lightsprout: proport12ion of blue in anthocyanin coloration of base	1	1	2	2	2	2	1	1	2	2	3	3	1	1	1	1	2	2
5	Lightsprout: pubescence of base	3	3	4	4	4	4	3	3	3	3	5	5	5	5	7	7	7	7
6	Lightsprout: size of tip in relation to base	5	5	7	7	5	5	7	7	5	5	3	3	5	5	7	7	3	3
7	Lightsprout: habit of tip	5	5	3	3	5	5	5	5	3	3	1	1	3	3	5	5	1	1
8	Lightsprout: anthocyanin coloration of tip	1	1	1	1	4	4	3	3	1	1	7	7	5	5	1	1	5	5
9	Lightsprout: pubescence of tip	3	3	1	1	5	5	4	4	1	1	6	6	5	5	9	9	5	5
10	Lightsprout: number of root tips	4	4	7	7	7	7	7	7	6	6	7	7	7	7	7	7	7	7
11	Lightsprout: length of lateral shoots	3	3	3	3	3	3	4	4	5	5	3	3	5	5	6	6	5	5

TP/023/2 Final

comparison of temporary (T) and final (F)variety descriptions for 9 varieties

variety descriptions from two growing seasons 2013, 2014

differences are indicated in yellow colour

no differences – 2013-2014

TWA_46th session Hannover, 19-23.06.2017

Growing seasons 2014-2015

	Characteristic/Variety	Variety 1		Variety 2		Variety 3		Variety 4		Variety 5		Variety 6		Variety 7		Variety 8		Variety 9		Variety 10	
		T	F	T	F	T	F	T	F	T	F	T	F	T	F	T	F	T	F	T	F
1	Lightsprout: size	5	5	5	5	6	6	5	5	5	5	5	5	5	5	5	5	5	5	7	7
2	Lightsprout: shape	1	1	2	2	2	2	1	1	3	3	1	1	2	2	2	2	2	2	3	3
3	Lightsprout: intensity of anthocyanin coloration of base	5	5	7	7	4	4	9	9	5	5	7	7	7	7	3	3	1	1	1	1
4	Lightsprout: proportion of blue in anthocyanin coloration of base	1	1	1	1	1	1	3	3	1	1	1	1	3	3	1	1	1	1	1	1
5	Lightsprout: pubescence of base	3	3	3	3	5	5	5	5	4	4	4	4	7	7	5	5	1	1	5	5
6	Lightsprout: size of tip in relation to base	5	5	5	5	4	4	3	3	5	5	5	5	3	3	6	6	3	3	3	3
7	Lightsprout: habit of tip	5	5	5	5	5	5	3	3	5	5	5	5	5	5	3	3	3	3	3	1
8	Lightsprout: anthocyanin coloration of tip	4	4	1	1	1	1	9	9	1	1	1	1	7	7	2	2	1	1	1	1
9	Lightsprout: pubescence of tip	7	7	3	3	5	5	7	7	5	5	5	5	7	7	5	5	1	1	4	4
10	Lightsprout: number of root tips	5	5	7	7	5	5	7	7	7	7	5	5	7	7	7	7	3	3	5	5
11	Lightsprout: length of lateral shoots	4	4	4	4	3	3	3	3	3	3	3	3	4	4	3	3	3	3	5	5

TP/023/2 Final
comparison of temporary (T) and final (F) variety descriptions for 10 varieties
variety descriptions from two growing seasons 2014, 2015
differences are indicated in yellow colour

TWA_46th session Hannover, 19-23.06.2017

Growing seasons 2015-2016

	Characteristic/Variety	Variety 1		Variety 2		Variety 3		Variety 4		Variety 5	
		T	F	T	F	T	F	T	F	T	F
1	Lightsprout: size	7	7	5	5	5	5	7	7	7	7
2	Lightsprout: shape	2	2	1	1	2	2	1	1	1	1
3	Lightsprout: intensity of anthocyanin coloration of base	5	5	3	3	5	5	1	1	1	1
4	Lightsprout: proportion of blue in anthocyanin coloration of base	1	1	1	1	1	1	1	1	1	1
5	Lightsprout: pubescence of base	5	5	3	3	5	5	1	1	1	1
6	Lightsprout: size of tip in relation to base	3	3	3	3	3	3	3	3	3	3
7	Lightsprout: habit of tip	3	3	3	3	3	3	5	5	5	5
8	Lightsprout: anthocyanin coloration of tip	3	3	3	3	3	3	1	1	1	1
9	Lightsprout: pubescence of tip	1	1	1	1	1	1	3	3	3	3
10	Lightsprout: number of root tips	7	7	3	3	7	7	5	5	5	5
11	Lightsprout: length of lateral shoots	3	3	3	3	3	3	3	3	3	3

TP/023/2 Final
comparison of temporary (T) and final (F) variety descriptions for 5 varieties
variety descriptions from two growing seasons 2015, 2016
differences are indicated in yellow colour
no differences – 2015-2016

TWA_46th session
Hannover, 19-23.06.2017

Conclusions

- modification of growing conditions in the chamber(temperature, light) since 2013 growing season had significant impact on attributed notes
- there are generally slight differences (or no differences) between temporary and final variety descriptions for potato lightsprouts characteristics
- reduction of observation seasons for potato lightsprouts could be possible

TWA_46th session
Hannover, 19-23.06.2017

[L'annexe V suit /
Annex V follows /
Anlage V folgt /
Sigue el Anexo V]

ANNEXE V / ANNEX V / ANLAGE V / ANEXO V
[in English only / en anglais seulement / nur auf Englisch / solamente en inglés]

IMPACT OF NUMBER OF GROWING CYCLES ON VARIETY DESCRIPTIONS AND DISCRIMINATION POWER IN POTATO

Presentation by an expert from Germany at the forty-seventh session of the Technical Working Party for Agricultural Crops

Bundessortenamt

UPOV TECHNICAL WORKING PARTY FOR AGRICULTURAL CROPS
Forty-Seventh Session Naivasha, Kenya, May 21 to 25, 2018

Impact of number of growing cycles on variety descriptions and discrimination power in potato

Beate Rücker, Germany

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Bundessortenamt

Background

TC/53, 2017:

- TC invited presentations to the TWPs on the impact of using different numbers of growing cycles on DUS decisions using actual date
- TC agreed in relation to costs for DUS examination that the number of growing cycles should be the minimum necessary for a robust DUS decision and the establishment of a reliable variety description.
- TC agreed that the appropriate number of growing cycles should be established on a crop-by-crop basis.

TWA/47, 2017

- Examples on wheat and barley (DE, UK) and potato (PL, NL)
- Further examples invited for 2018

Bundessortenamt

Introduction

- TG/23/6 for 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 for quantitative characteristics in potato on the basis of data from actual DUS trials

3

Bundessortenamt

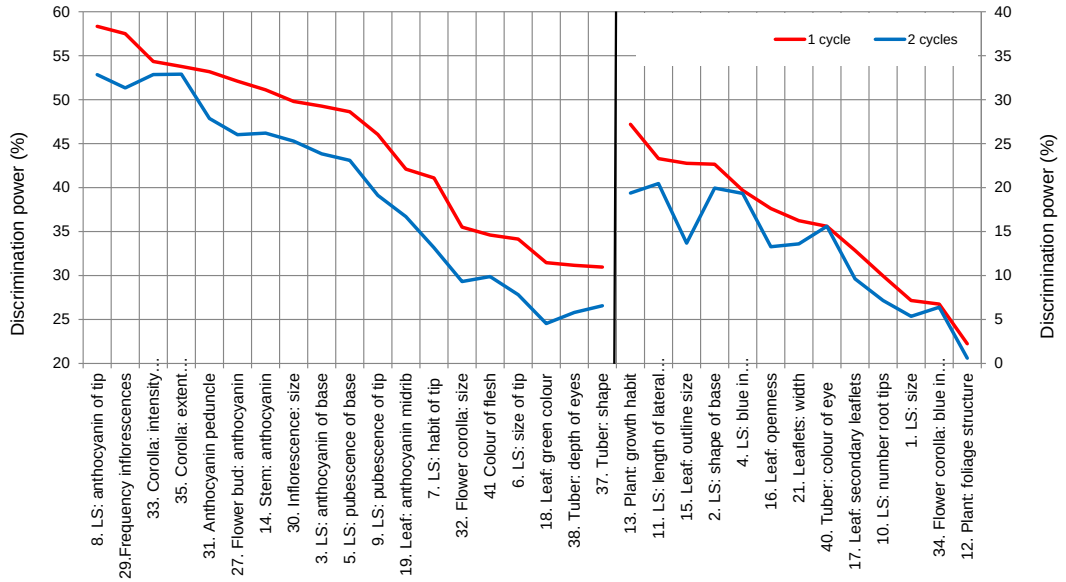
Data for analysis of discrimination power from DUS growing trials:

- 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.
    Two varieties are considered to be distinct if a clear difference was observed.
  - (b) '2-cycles': second year and first year.
    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.

4

Bundessortenamt

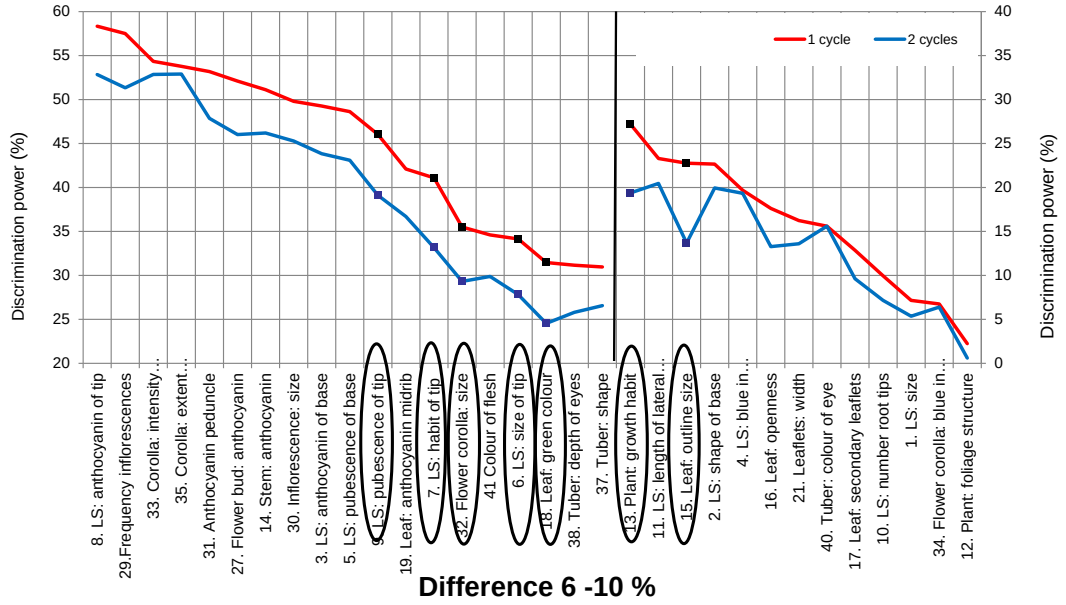
Impact of the number of growing cycles on discrimination power



5

Bundessortenamt

Impact of the number of growing cycles on discrimination power



Difference 6 -10 %

6

Bundessortenamt

Impact on discrimination power:

- discrimination power in a single cycle between 58 % and 2 %.
- clear difference observed in one cycle was not always confirmed in the second cycle
- consequently, discrimination power was lower after 2 cycles (up to 10 % less)
- '2 out of 3 cycles' option was not analyzed
- reliable decisions based on a single cycle, would require larger minimum differences for some characteristics
- larger minimum differences would lead to lower discrimination power

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Bundessortenamt

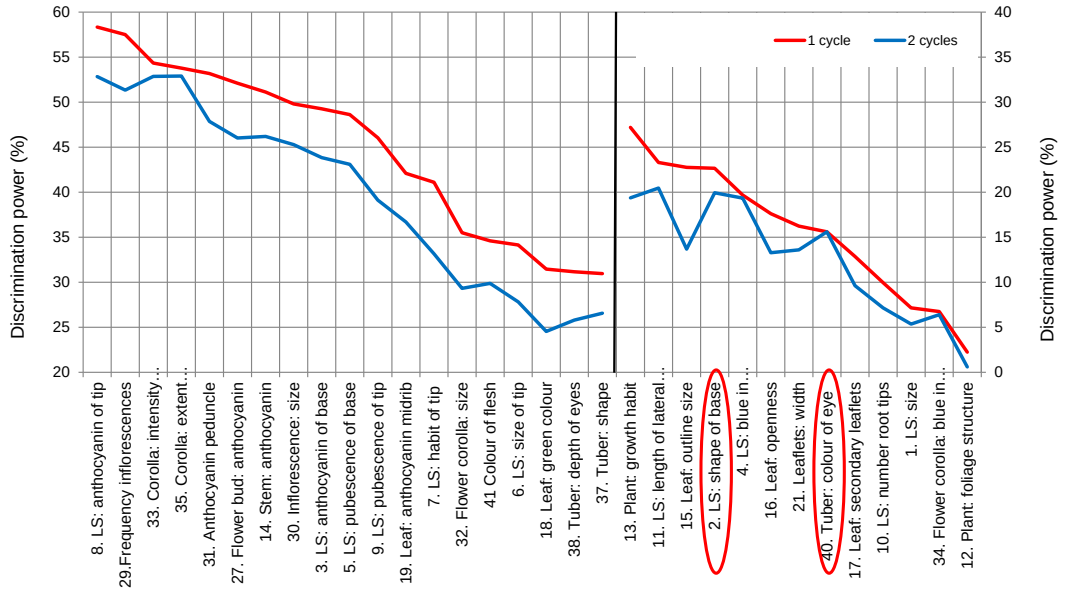
Data for analysis of variety descriptions:

- 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

8

Bundessortenamt

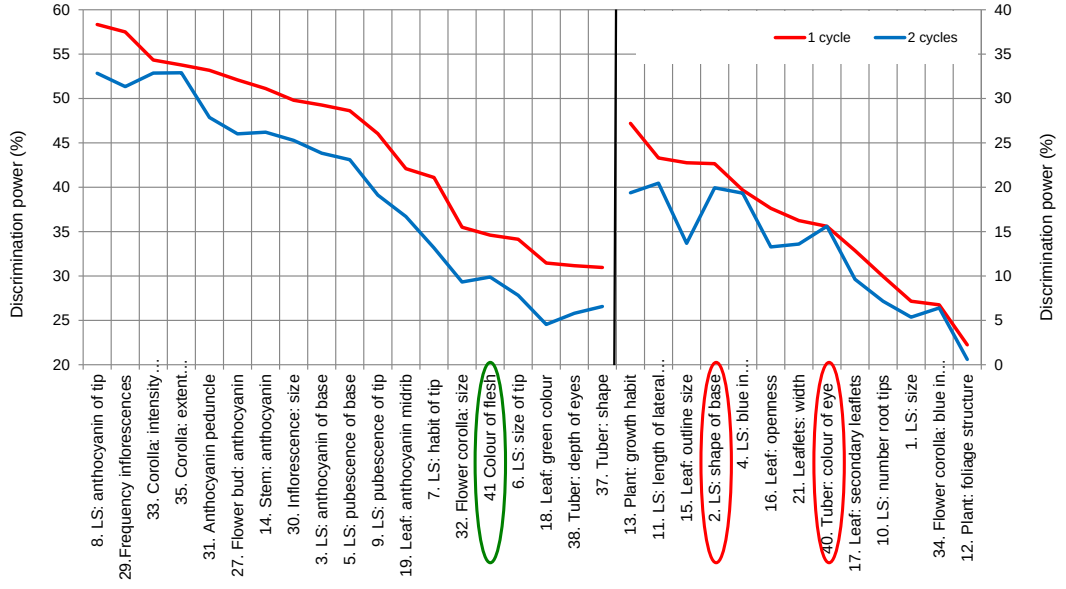
Impact of the number of growing cycles on discrimination power



9

Bundessortenamt

Impact of the number of growing cycles on discrimination power



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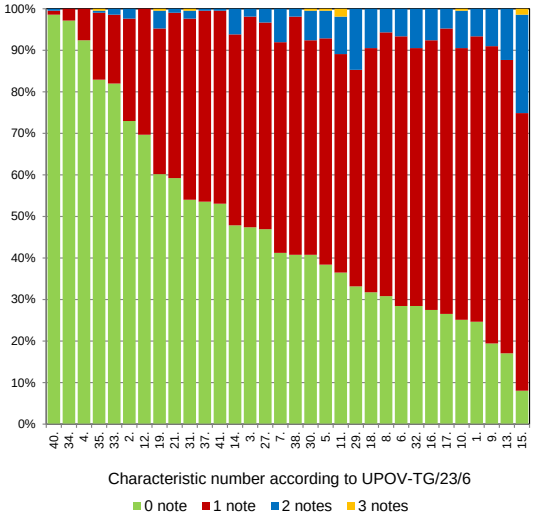
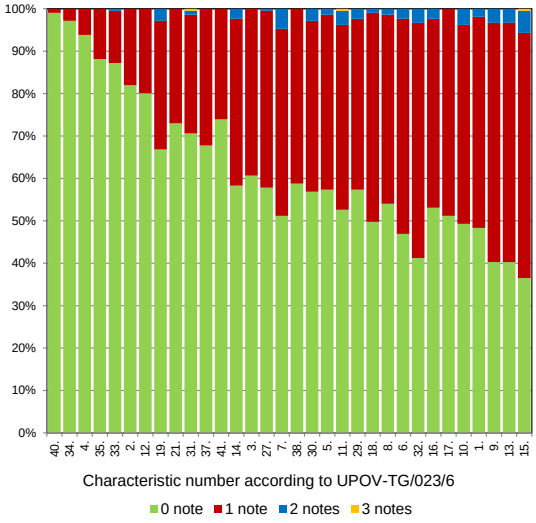
Bundessortenamt

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

1-cycle variety descriptions



2-cycle variety descriptions



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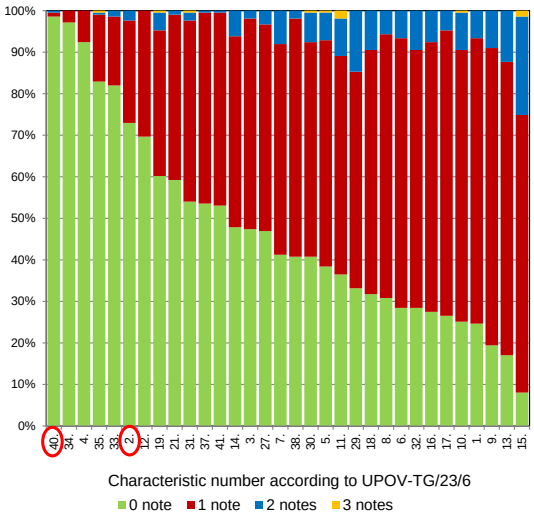
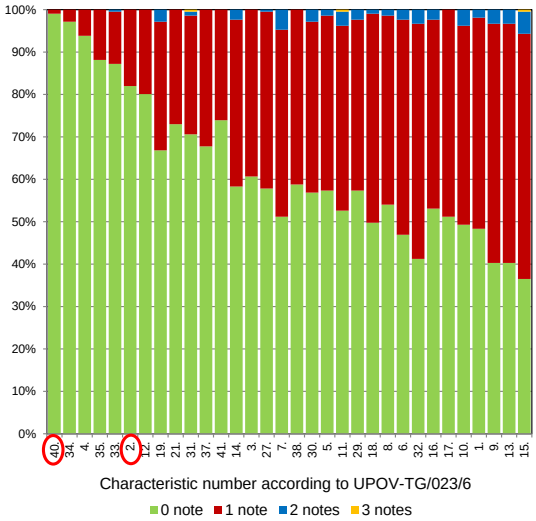
Difference between variety descriptions
(Maximum difference between 6 descriptions per variety, 211 varieties)

1-cycle variety descriptions



2-cycle variety descriptions



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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:

Differences	1-cycle	2-cycles
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.
- Robust descriptions have particular importance for databases used for management of reference collections (impact on thresholds and efficiency to exclude varieties from growing trials).

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Conclusion

- 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.
- The recommended minimum number of two growing cycles should be followed.
- Variety descriptions based on two cycles provide a better basis for enforcement.

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THANK YOU!

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[L'annexe VI suit /
Annex VI follows /
Anlage VI folgt /
Sigue el Anexo VI]

ANNEXE VI / ANNEX VI / ANLAGE VI / ANEXO VI
[in English only / en anglais seulement / nur auf Englisch / solamente en inglés]

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

Presentation by an expert from Germany at the thirty-sixth session of the Technical Working Party on Automation and Computer Programs

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

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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)

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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.

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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.

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- 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

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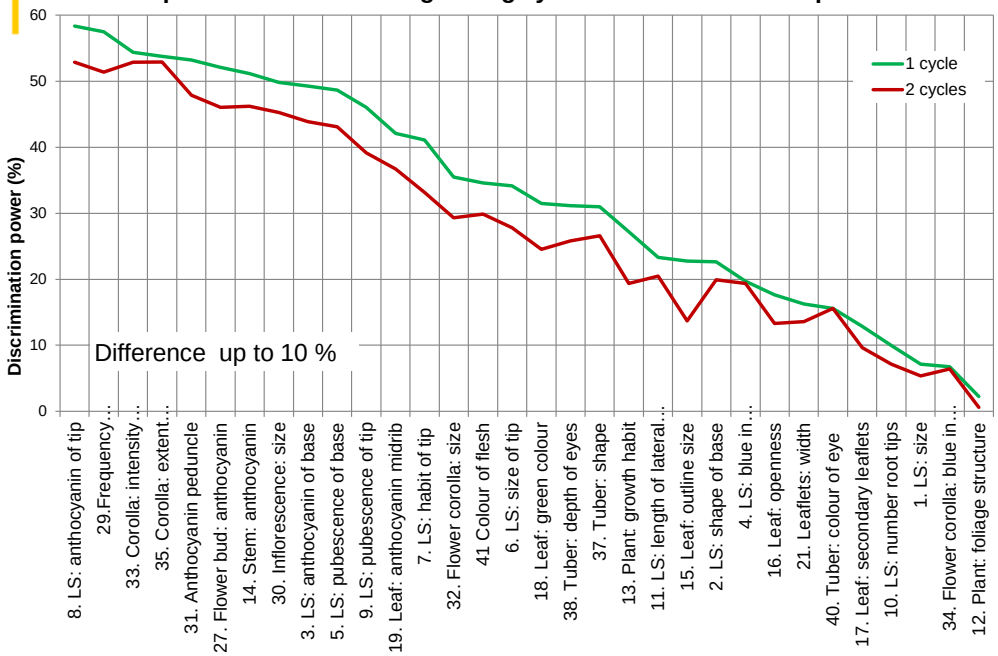
Potato

Impact of the number of growing cycles on discrimination power



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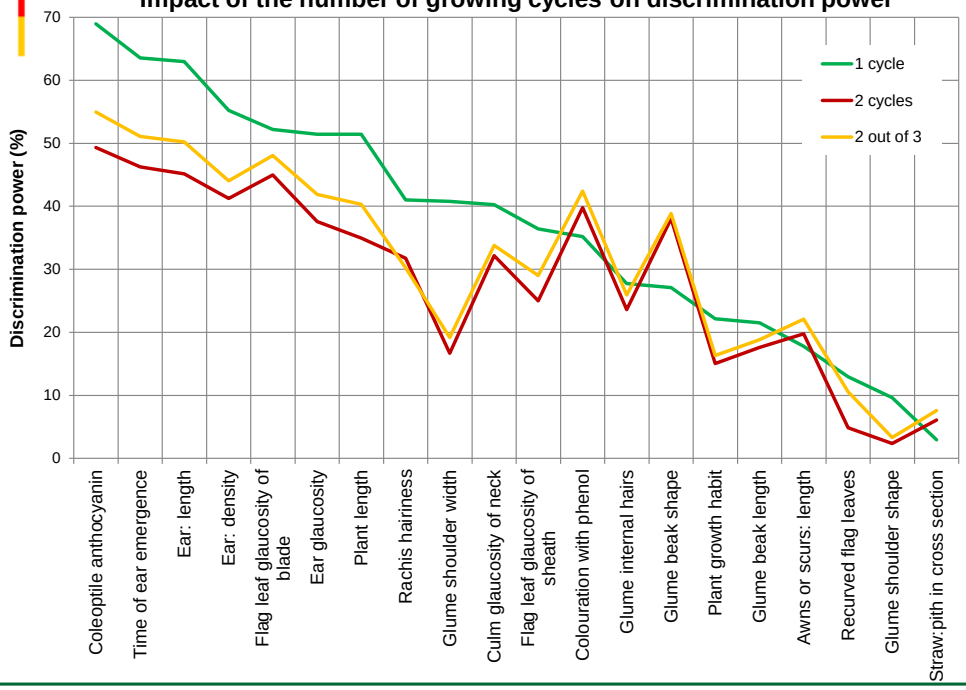
Wheat

Impact of the number of growing cycles on discrimination power



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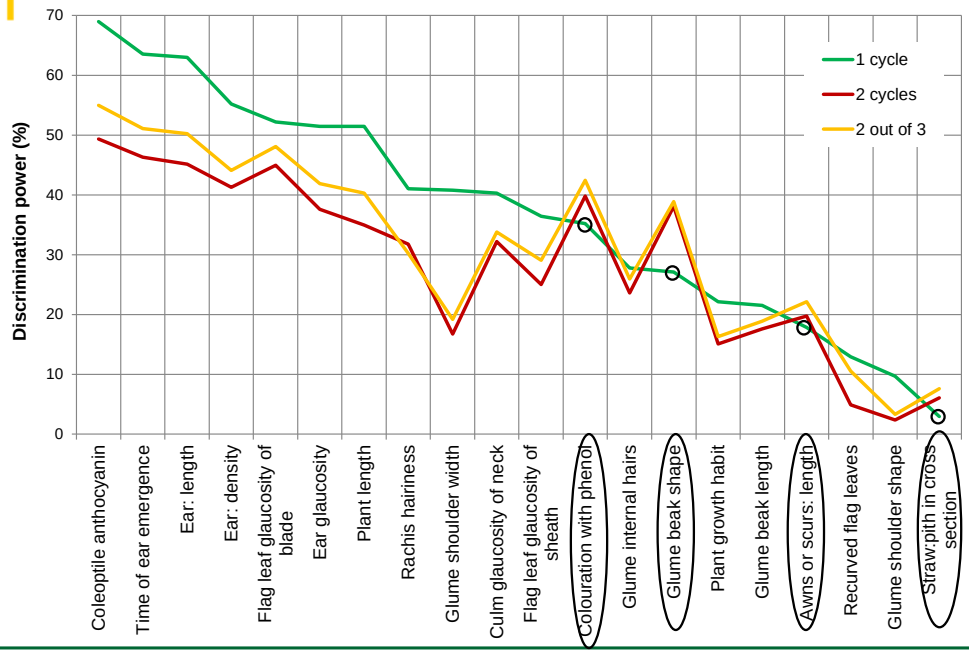
Wheat

Impact of the number of growing cycles on discrimination power



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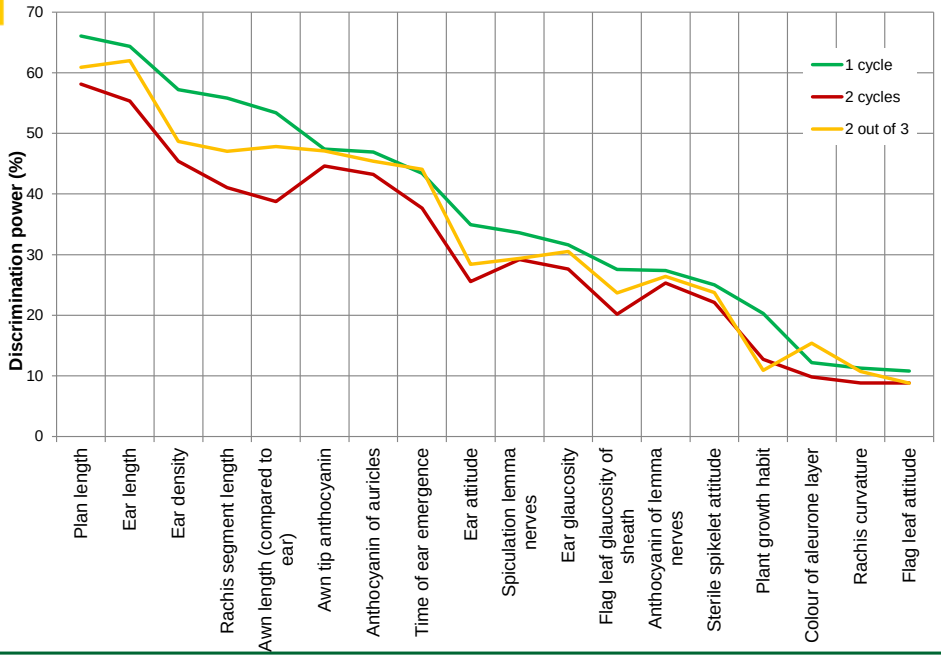
Barley

Impact of the number of growing cycles on discrimination power



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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

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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

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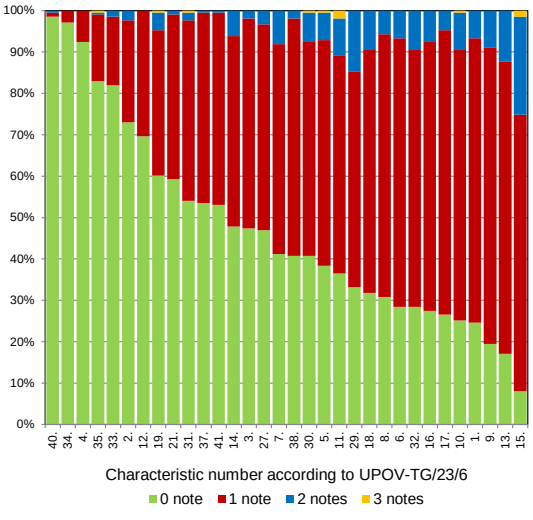
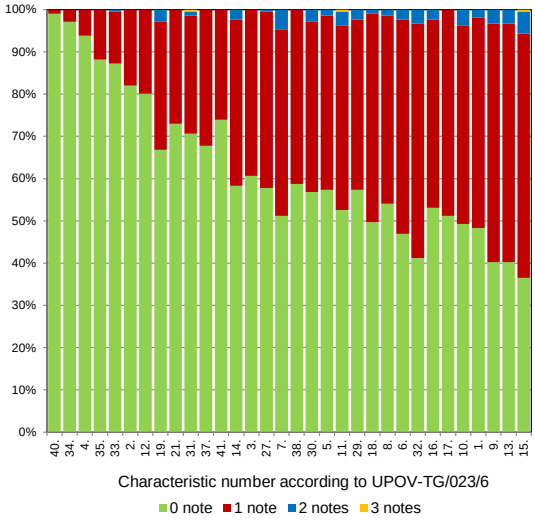
Difference between variety descriptions

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

1-cycle variety descriptions



2-cycle variety descriptions



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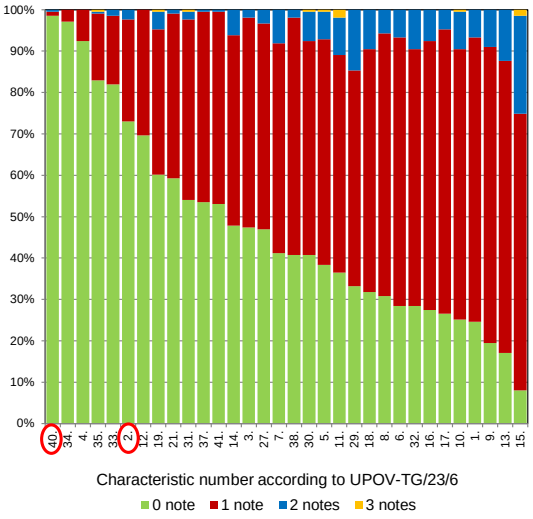
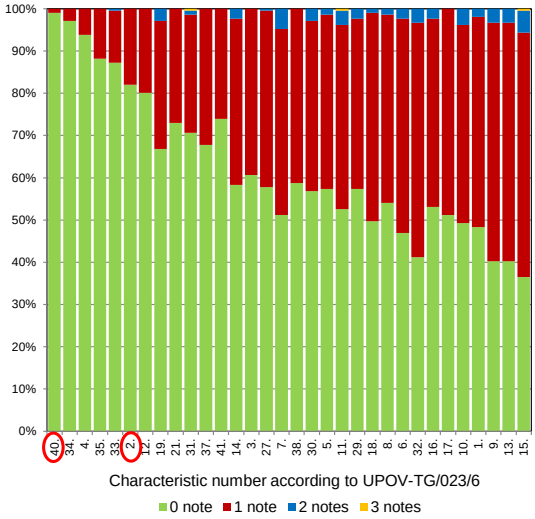


2-cycle variety descriptions



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

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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

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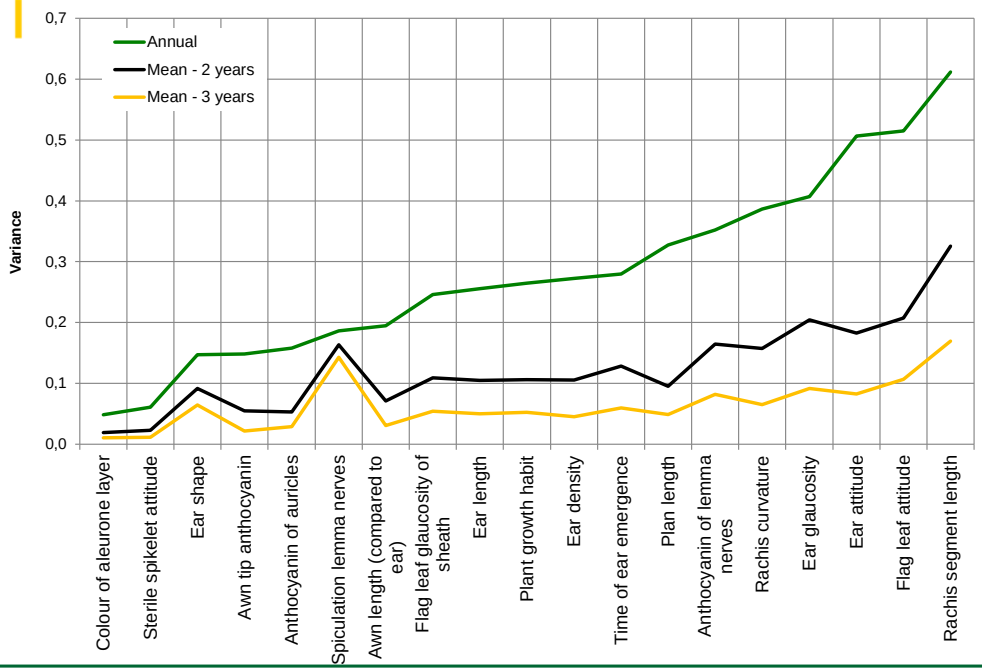
Barley

Variance of variety descriptions over testing periods



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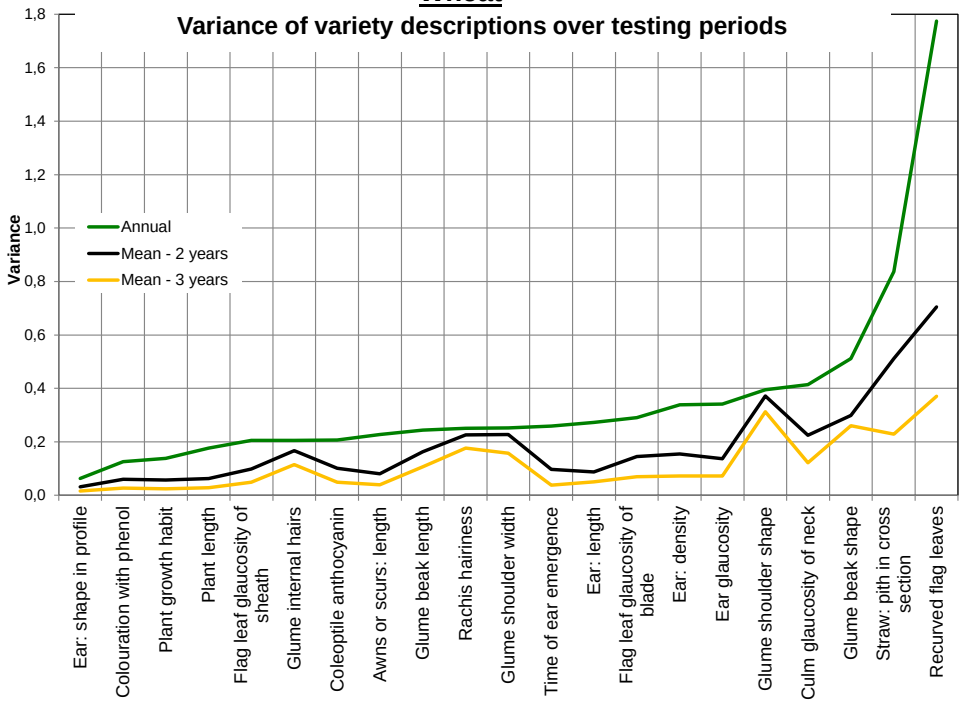
Wheat

Variance of variety descriptions over testing periods



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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”.

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- 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

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[End of Annex VI and of document /
Fin de l'Annexe VI et du document /
Ende der Anlage VI und des Dokuments /
Fin del Anexo VI y del documento]