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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

Geneva

TECHNICAL COMMITTEE

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

ADDENDUM TO DOCUMENT TC/52/20

REVISION OF DOCUMENT TGP/10: NEW SECTION: ASSESSING UNIFORMITY BY OFF-TYPES ON THE BASIS OF MORE THAN ONE GROWING CYCLE OR ON THE BASIS OF SUB-SAMPLES

Document prepared by the Office of the Union

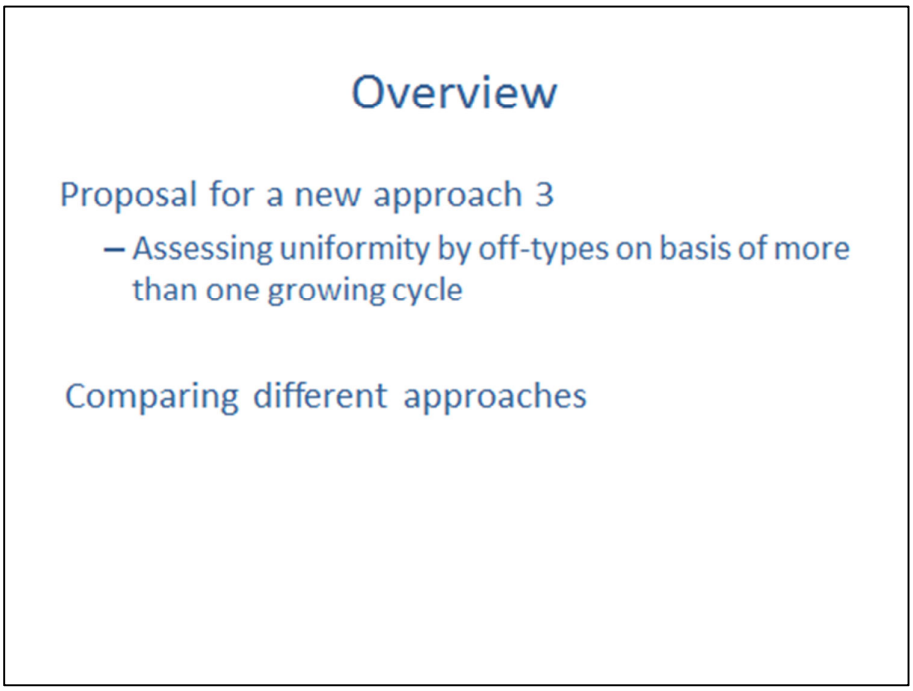
Disclaimer: this document does not represent UPOV policies or guidance

The Annex to this document contains a copy of a presentation by experts from Germany and the United Kingdom on assessing uniformity by off-types on the basis of more than one growing cycle (in English only) to be made at the fifty-second session of the Technical Committee, to be held in Geneva, from March 14 to 16, 2016.

[Annex follows]

ANNEX

ASSESSING UNIFORMITY BY OFF-TYPES ON THE BASIS OF MORE THAN ONE GROWING CYCLE
RISKS, BENEFITS AND COSTS



Assessing uniformity by off-types on basis of more than one growing cycle

- In 2015 draft, basic scheme is two growing cycles, assessed separately
- Two approaches
  - differ in how they deal with conflicting results between cycles

Approach 1

Third growing cycle in the case of inconsistent results

Approach 2

Combining the results of two growing cycles

Approach 1

Third growing cycle in the case of inconsistent results

Approach 2

Combining the results of two growing cycles in the case of inconsistent results

Suggested revised wording

Approach 1

Third growing cycle in the case of inconsistent results

Approach 2

Combining the results of two growing cycles in the case of inconsistent results

Approach 3

Combining the results of two growing cycles

Additional approach used for some United Kingdom crops

Proposed approach 3

- Two growing cycles
- Simply combine the number of off-types over the two cycles
- With all 3 approaches, it is important to verify whether the results for the two cycles are consistent

Example

Population standard 1%
Acceptance Probability 95%

Sample size for each approach and growing cycle

Approach	Growing cycle 1 n1	Growing cycle 2 n2	Growing cycle 3 n3	Combined n1+n2
1	50	50	50	n/a
2	50	50	0	100
3	50	50	0	100

Maximum number of off-types for each approach and growing cycle/stage

Approach	Growing cycle 1 n1	Growing cycle 2 n2	Growing cycle 3 n3	Combined n1+n2
1	2	2	2	n/a
2	2	2	n/a	3
3	3	n/a	n/a	3

Example

Population standard 1%
Acceptance Probability 95%

Sample size for each approach and growing cycle

Approach	Growing cycle 1 n1	Growing cycle 2 n2	Growing cycle 3 n3	Combined n1+n2
1	50	50	50	n/a
2	50	50	0	100
3	50	50	0	100

Maximum number of off-types for each approach and growing cycle/stage

Approach	Growing cycle 1 n1	Growing cycle 2 n2	Growing cycle 3 n3	Combined n1+n2
1	2	2	2	n/a
2	2	2	n/a	3
3	3	n/a	n/a	3

Example

	Population Standard = 1%					
	Acceptance Probability ≥ 95%					
	Sample Size in each of growing cycles 1 and 2 = 50					
	Maximum number of Off-Types = 2					
	Sample Size in growing cycles 1 and 2 combined = 100					
	Maximum number of Off-Types = 3					
	Growing cycle		Decision			
	First	Second	Approach 1	Approach 2	Approach 3	
Number of Off-Types	1	1	uniform	uniform	uniform	←consistent
	2	2	uniform	uniform	non-uniform	←inconsistent
	0	3	third growing cycle	uniform	uniform	
	1	3	third growing cycle	non-uniform	non-uniform	
	1	4	third growing cycle	non-uniform	non-uniform	
	4	1	third growing cycle	non-uniform*	non-uniform*	

Care is needed when considering results that were very different in each of the growing cycles, such as when a type of off-type was observed at a high level in one growing cycle and was absent in another growing cycle.
* A variety may be rejected after a single growing cycle if the number of off-types found is sufficiently high.

Example

third cycle for Approach 1 only

	Growing cycle			Decision		
	First	Second	Third	Approach 1	Approach 2	Approach 3
Number of Off-Types	0	3	2	uniform	uniform	uniform
	0	3	3	non-uniform	uniform	uniform
	1	4	2	uniform	uniform	non-uniform
	1	4	3	non-uniform	non-uniform	non-uniform

Comparing different approaches

Factors to consider

- Costs
- Biological/agronomic issues
- Risks
- Time to decision
- ....

Comparing different approaches

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Risks

Risk of making the wrong decision on uniformity

Why?

- Looking at a sample of plants from a much larger population

Risks

Population standard 1%

Acceptance probability ≥ 95%

Sample size 100 plants

Maximum off-types 3 plants = 3%

Risks: type I and type II errors

Type I error: declare variety non-uniform when population is uniform

Type II error: declare variety uniform when population is non-uniform

Type I error

Type I error: declare variety non-uniform when population is uniform

Off-type tests set up to achieve a specified type I error

- Type I error = 1 – acceptance probability
- 5% in example

Type II error

Type II error: declare variety uniform when population is non-uniform

Different test can then be compared through the type II errors

- Type II errors are calculated at different levels of off-types in population
- e.g. 2 , 5 and 10 times the population standard

Type II errors in the Example

Population standard 1%
Acceptance probability 95%

Approach	Type II error			Max off-types	
	2%	5%	10%	Per cycle	Combined
1	98%	56%	3.5%	2	n/a
2	89%	33%	1.4%	2	3
3	86%	26%	0.8%	n/a	3

Approach 3 has the lowest type II errors

Pros and Cons of each approach

Efficiency:

- Approach 3 has lower type II errors than approaches 1 and 2 in this example
- Note can reduce type II errors for approaches 1 & 2 by using lower maximum number of off-types
- Conclusions may change if sample size is different (see TGP/8)

Costs/time:

- Approach 1 requires more testing for some varieties
- Approach 3 requires only one year of tests for varieties with many off-types
- *Approach 2 could also require only one year of tests for varieties with many off-types*

Dealing with conflicting results

- *Approach 1 allows for resolution of conflicting results between two cycles*
- *Note small differences are expected due to sampling*

Simplicity:

- Approach 3 is simpler than approach 1 and 2

Conclusions

- Proposed the addition of approach 3 to TGP/10 draft text
- Proposed change to title of approach 2
- Extend example to illustrate year 3 for approach 1
- Recommend that guidance be included on factors that might affect choice of approach
  - Looked at risks for the example
- Consider adjusting approaches 1 & 2 to reduce type II errors
  - Reduce maximum number of off-types in each cycle in example

[End of Annex and of document]