UPOV
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ASSESSING ORNAMENTAL CROPS USING INDIVIDUAL PLANT MEASUREMENTS (MS)

Document prepared by experts from Germany, New Zealand and the United Kingdom

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This document contains presentations to be made at the fifty-third session of the Technical Working Party for Ornamental Plants and Forest Trees (TWO):

Annex I "Assessing ornamental crops using individual plant measurements (MS) – When and why we do it and how we proceed with the data", by an expert from Germany
Annex II "The use of MG and MS in Test Guidelines for Ornamental species", by an expert from New Zealand
Annex III "Assessing ornamental crops using individual plant measurements (MS) – a United Kingdom perspective", by an expert from the United Kingdom

[Annexes follow]

ANNEX I

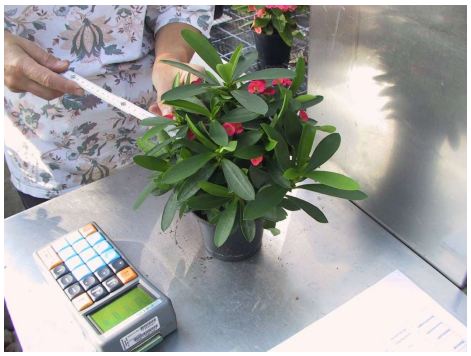
ASSESSING ORNAMENTAL CROPS USING INDIVIDUAL PLANT MEASUREMENTS (MS) – WHEN AND WHY WE DO IT AND HOW WE PROCEED WITH THE DATA

Bundessortenamt

TWO 2021

Assessing Ornamental Crops Using Individual Plant Measurements (MS)

When and why we do it and how we proceed with the data



Bundessortenamt

Overview

At Bundessortenamt we are testing ornamental varieties from 40 to 70 different species every year.

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Number of varieties in the trial

Depending on the species and the year the number of varieties in in a trial can vary between 3 to over 100.

	Number of varieties in the trial		
Genus/Species	**2019**	**2020**	**2021**
Calibrachoa	47	51	60
Pelargonium	60	76	107
Petunia	88	68	55
…..			
Impatiens	23	43	20
Kalanchoe	15	31	49
Osteospermum	44	23	43
……			
Lobelia	9	13	8
Rehmannia	3	3	0
Sutera	6	4	10

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Assessing quantitative characteristics

The way of assessing those quantitative characteristics which can be measured is depending on:

- the species
- the number of varieties in the trial
- the size of the organ or the plant

Woody species:
Visual observation or group measurement (MG)

Non-woody species:
Few varieties: visual observation or group measurement (MG)
Many varieties: individual measurement (MS)

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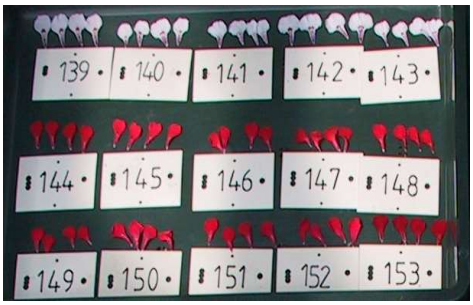
Assessing quantitative characteristics

When the size of the plant or the observed organ is very small the characteristic is always observed visually even if there are many varieties in the trial.

Example: Pelargonium: Upper petal: width



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Advantages of using measurements

The measurements are done by „helpers“ so that the examiner who is assessing all other characteristics has less work.

Ratio characteristics like length/width ratio can easily be calculated from the measured data.

When using individual measurements the variation within a variety and between varieties can be shown.

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Transforming measurements into notes

The measurements are transformed into notes with the help of example varieties. Only the notes are used in the variety description.

Example: Leaf length of Pelargonium varieties
Measurements of 10 plants per variety, one leaf per plant.

Variety No	mean (cm)	Example for note	Equal spaced states width of state: 0,60	Note in variety description
……				
96	4,1			3
67	4,3	3	4,0 - 4,6	3
122	4,8			4
99	4,9			4
55	5,6	5	5,4 – 6,0	5
320	5,7			5
199	6,1			6
202	6,3			6
75	7,0	7	6,8 – 7,4	7
181	7,4			7
…..				

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Use of measurements

The decision on distinctness and uniformity in the DUS test of ornamentals is always taken by **looking at the plants** and **not** by comparing variety descriptions (or measurements).

In small species measurements can be helpful as addition to notes when example varieties are not yet existing, or when it is difficult to get hold of their material.

When plant material needs to be checked for its identity it can be helpful to have measured data additionally to notes because the basis for the decision is broader.

When decisions are challenged by an applicant or a third party measurements can be used to support the notes and the decisions.

Thank you!

[Annex II follows]

ANNEX II

THE USE OF MG AND MS IN TEST GUIDELINES FOR ORNAMENTAL SPECIES

Method of observation for characteristics involving ratios

1. Characteristics involving ratios have proven to be useful for the description of a variety and for the determination of distinctness. The use of ratios can be helpful with establishing a quantitative range of expression for a characteristic and can be reliably used to compare varieties grown in different years, climates or environments. It is important to recognise that the ratio characteristic is a derived characteristic and cannot be effectively determined without the evaluation of the two component characteristics. In some cases a ratio characteristic can be more reliable and consistent than the individual components.

Examples of ratio characteristics:

- Leaf blade: length/width — derived from Leaf blade: length and Leaf blade: width
- Leaf: length of petiole relative to blade — derived from Petiole: length and Leaf blade: length
- Fruit: height/diameter — derived from Fruit: height and Fruit: diameter
- Fruit: width of core relative to fruit — derived from Fruit: width of core and Fruit: width
- Ripe fruit: ratio fruit length/seed length — derived from Ripe fruit: length and Seed: length
- Fruit: diameter of calyx in relation to fruit — derived from Fruit: diameter of calyx and Fruit: width

Derived characteristics such as ratios can be determined using several methods of observation.

2. A ratio characteristic may be assessed visually by assessing the individual component characteristics or by observing the characteristic as a whole. For visual assessment to be reliable a set of example varieties would be advantageous.

3. The components of a ratio characteristic are often measurable and can be combined to calculate the ratio values. The calculation of the ratio values can be determined by a plot or group approach following the principle of MG or values determined per plant or per organ following an MS approach.

4. The collected data can be evaluated in three different ways:

(i) A value per plant, were several organs are measured and combined to determine the value per plant and then those are combined to determine the value for the characteristic MS
(ii) A value per sample, were individual organs are measured to determine a value per organ and those values are combined to determine the value for the characteristic MS
(iii) A value per plot, were one or more organ measurements determine the representative value for the characteristic MG

Example

- Fruit: height
- Fruit: width
- Fruit: height/width ratio

Tree	One			Two			Three			Four			Five			average
Sample	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Fruit height mm	71	81	65	74	76	73	72	76	75	75	74	81	72	75	73	74
Tree mean	72			74			74			77			73			74
Fruit width mm	75	72	68	74	73	72	68	70	76	72	76	78	73	74	73	73
Tree mean	71			73			71			75			73			73
Fruit Ratio per sample	0.95	1.13	0.96	1.00	1.04	1.01	1.06	1.09	0.99	1.04	0.97	1.04	.99	1.01	1.00	
Fruit ratio per tree	1.01			1.01			1.04			1.03			1.00			1.01

MS approach

(i) The mean ratio value per tree falls in a range of 1.00 to 1.04

(ii) The ratio value per fruit sample falls in a range of 0.95 to 1.13

MG approach

- The ratio derived from all fruit height samples and all fruit width samples

= 1.01

Conclusion

Based on the above example the ratio values may fall in a similar range of expression as determined by the testing authority, irrespective of the approach taken. The decision on how to observe the ratio characteristic using MG or MS should be primarily influenced by the authority's testing practice. The above example provides no evidence to suggest that the method of observation influences or alters the state of expression.

The method of observation for derived characteristics, such as ratios, should be decided independently of the method used to observe the component characteristics. There may be a connection with respect to the data collection process but there should not be the assumption that the derived characteristic is necessarily observed the same way as the component characteristics.

[Annex III follows]

ANNEX III

ASSESSING ORNAMENTAL CROPS USING INDIVIDUAL PLANT MEASUREMENTS (MS) – A UNITED KINGDOM PERSPECTIVE

Assessing ornamental crops using individual plant measurements (MS) – a United Kingdom perspective

Hilary Papworth, United Kingdom

Assessment of Ornamental crops – MG or MS?

- The majority of DUS testing for ornamental crops in the United Kingdom has been for varieties that are vegetatively propagated.
- Very wide range of different species.
- Due to the method of propagation a high level of uniformity is expected in nearly all cases.
- Observation of the variety characteristics is carried out by a small team of experienced examiners who work together at one testing station.
  - **Due to this combination of factors, QN characteristics such as plant height, leaf length or flower diameter are frequently assessed using MG as the method of observation.**

Assessment of Ornamental crops – Why MG?

- Using MG is a sufficient level of accuracy for most of the varieties the United Kingdom carries out trials on.
- No statistical analysis is used on the vegetatively propagated varieties.
- Decisions on Distinctness and Uniformity are made in front of the plants using comparison of notes.
- Experience tells us that this method is reliable for the allocation of notes.
- It is also an efficient method for obtaining the information.

Assessment of Ornamental crops – Why MS?

- One instance where MS might be used is in the case of seed propagated varieties.
- The uniformity standards may be different to vegetatively propagated variety.
- More observations may be required to establish if varieties are uniform and distinct using a statistical approach.
- More observations may be required in order to reliably allocate the appropriate note.

Species with multiple methods of propagation – observation by MG or MS?

- We have experience with several species where there are both seed raised and vegetatively propagated applications:
  - *Echinacea*
  - *Coreopsis*
  - *Saxifraga arendsii*
  - *Agastache*
- We observe all varieties in the same trial and compare all varieties that are similar irrespective of their method of propagation

NIAB world-class experience, skills and resources

Species with multiple methods of propagation – observation by MG or MS?

- The method of production of the variety is a factor in deciding the method of observation for seed raised varieties – is it self-pollinated or cross pollinated?
- For self-pollinated varieties the level of uniformity is often expected to be as high as vegetatively propagated varieties, in which case it may be possible to use MG.
- For cross-pollinated varieties the amount of variation may be greater but still be an acceptable level of uniformity, in which case it may be more appropriate to use MS.

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Species with multiple methods of propagation – observation by MG or MS?

- Both approaches may be used on characteristics in one trial e.g. Plant: height on the vegetative propagated varieties may be observed by MG, but on the cross pollinated seed raised varieties it may be observed by MS.
- However observation using MS may be needed on all types of variety (irrespective of their method of production) in order to carryout statistical analysis to establish distinctness.

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Example - *Echinacea*

- Most applications tested in the United Kingdom are vegetatively propagated.
- 2 DUS applications for cross pollinated, seed raised varieties have undergone testing.
- Uniformity was established by relative standards and by visual off-type.
- Observations on some of the QN characteristics, e.g. Leaf: length, Leaf: width, Flowerhead: diameter were completed using MS.

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Example – *Saxifraga arendsii*

- Most applications tested in the United Kingdom are vegetatively propagated.
- 1 DUS application for a cross pollinated, seed raised variety has undergone testing.
- Uniformity was established by relative standards and by visual off-type.
- Observations on some of the QN characteristics, e.g. Plant: height of foliage, Leaf: width, Flower stem: length were completed using MS.

Example - *Coreopsis*

- Most applications tested in the United Kingdom are vegetatively propagated.
- 1 DUS application for a self pollinated, seed raised variety has undergone testing.
- Uniformity was established by visual off-types.
- Observations on all relevant QN characteristics was carried out using MG.

[End of Annex III and of document]