IPKey

CHINA

Measuring Quantitative Characteristics
测量数量性状

Pavla Bímová, Ph.D. | ÚKZÚZ, Czech Republic | November 28, 2023
Pavla Bímová博士 | 捷克新品办，捷克共和国 | 2023年11月28日

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MEASURING QUANTITATIVE CHARACTERISTICS
测量数量性状

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OUTLINE /// 大纲

- Quantitative characteristics /// 数量性状
- Measurements /// 测量
- Examining distinctness /// 审查特异性
  - Self-Pollinated and Vegetatively Propagated Varieties /// 自花授粉和无性繁殖品种
  - Cross-Pollinated Varieties /// 异花授粉品种
- Examining uniformity /// 审查一致性
  - Self-Pollinated and Vegetatively Propagated Varieties /// 自花授粉和无性繁殖品种
  - Cross-Pollinated Varieties /// 异花授粉品种
- Examining stability /// 审查稳定性

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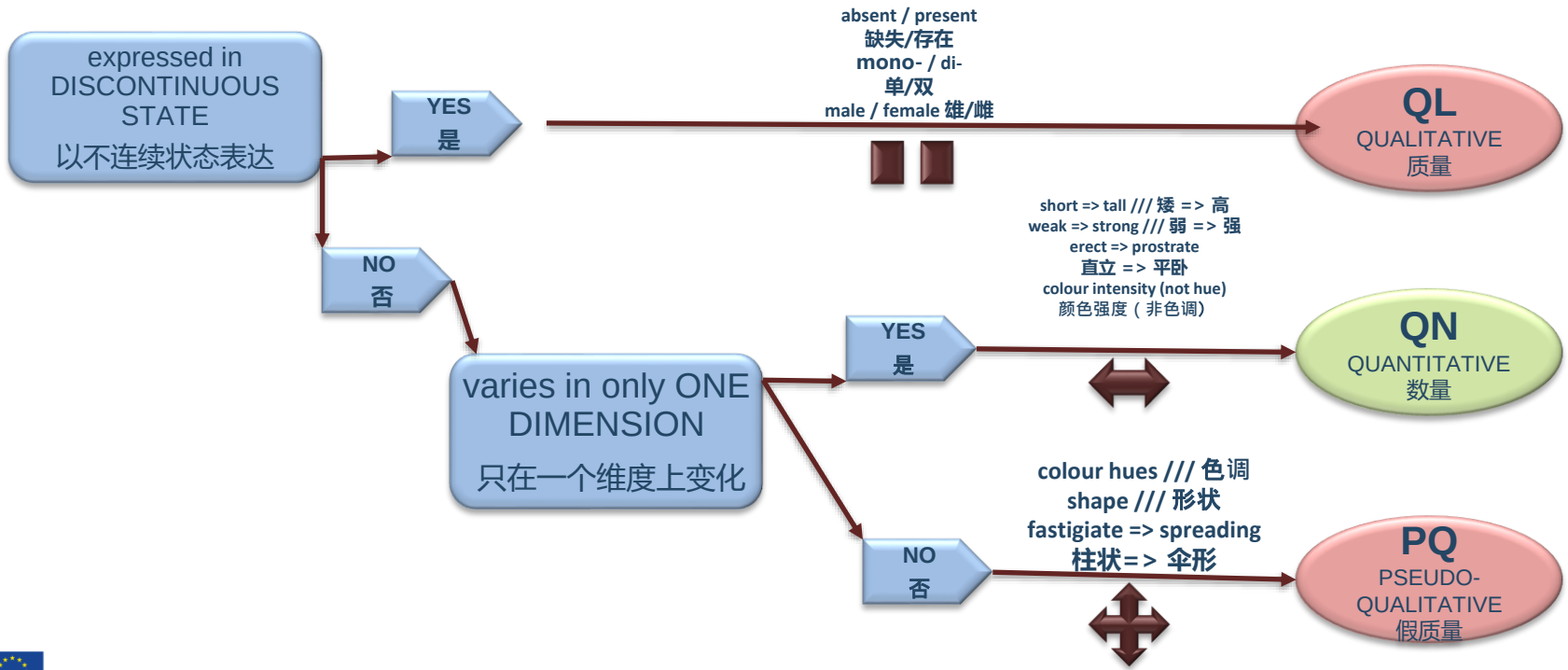
Types of expression of characteristics /// 性状表达类型



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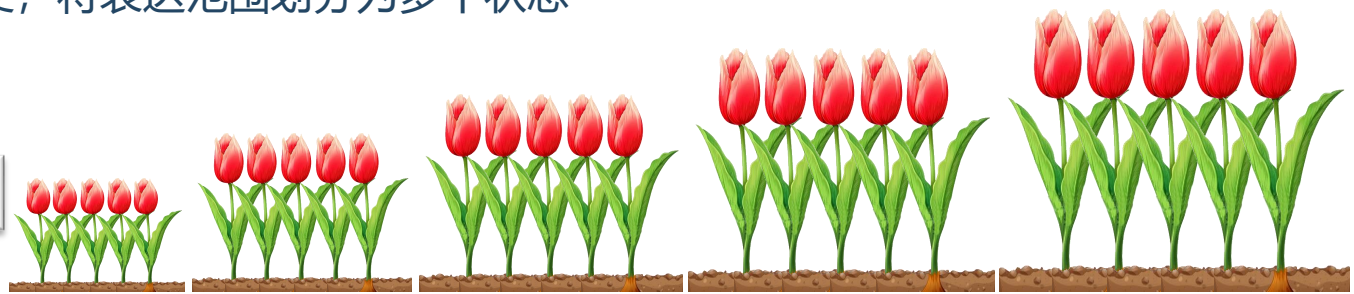
QUANTITATIVE characteristics /// 数量特征

- **expression covers the full range of variation → from one extreme to the other**
  表达涵盖了从端到端的全部变化范围
- **expressed in one-dimensional, continuous or discrete, linear scale**
  在一维连续或离散线性尺度上表达
- range of expression is divided into a number of states for the purpose of description
  为描述方便，将表达范围划分为多个状态

Plant: length
植株：长度



1	2	3	4	5	6	7	8	9
very short 极短		Short 短		Medium 中等		Large 长		very large 极长

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Measurements (MS/MG) /// 测量值 (MS/MG)

- an objective observation against a calibrated, linear scale (rulers, weighing scales, colorimeter, dates, counts, Image Analysis …) /// 借助经校准的线性标尺（尺规、称重秤、色度计、日期、计数、图像分析等）进行客观观测
- more precise data are provided /// 提供了更精确的数据
- **generally time-consuming and costly method /// 通常耗时且昂贵**

"Quantitative characteristics are not necessarily assessed by measuring or counting and can be assessed visually. Where there is doubt regarding the use of a normally visually assessed quantitative characteristic as the distinguishing characteristic in relation to another variety, it should be measured, if that is possible with reasonable effort." /// "数量性状不一定通过测量或计数来评估，可以通过视觉来评估。如果在区分不同品种时，使用目视评估的数量性状作为区分性状存在疑点，而在合理努力下可以测量的，则应该测量。"

„ TG1/3, General Introduction, Chapter 5.5.2.2.1"/// TG1/3，一般介绍，5.5.2.2.1

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Distinctness requirement /// 特异性要求

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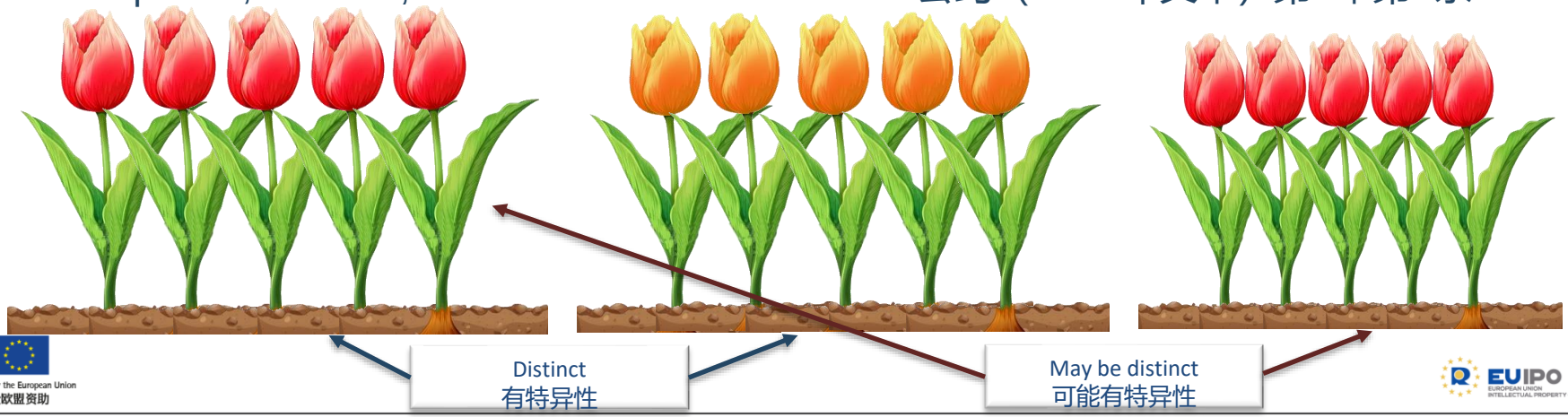
- The variety shall be deemed to be distinct if it is clearly distinguishable from any other variety whose existence is a matter of common knowledge at the time of the filing of the application. /// 如果一个品种在申请书登记之时显然有别于已知的任何其他品种，则这个品种应被认为是特异的。

Chapter III, Article 7; 91 Act of the UPOV /// UPOV公约（1991年文本）第3章第7条



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Summary of approaches for assessing distinctness /// 评估特异性的方法概要

Method of propagation of the variety 品种繁殖方法	Type of expression of the characteristic /// 性状表达类型		
	QL QUALITATIVE 质量性状	PQ PSEUDO-QUALITATIVE 假质量性状	QN QUANTITATIVE 数量性状
Vegetatively propagated, 无性繁殖, Self-pollinated 自花传粉	Notes (VG) /// 代码(VG)	Notes (VG) /// 代码(VG) Side-by-side (VG) /// 并排(VG)	Notes (VG/MG/MS) 代码(VG/MG/MS) Side-by-side (VG) 并排(VG) Statistics (MG/MS) 统计数据(MG/MS)

Cross-pollinated 异花授粉	Notes (VG) /// 代码(VG)
	Statistics (VS*) 统计数据(VS*)
		Notes (VG) /// 代码(VG)
		Side-by-side (VG) /// 并排(VG)
		Statistics (VS*) /// 统计数据(VS*)
			Statistics (MG/MS/VS) 统计数据(MG/MS/VS)
			Side-by-side (VG) 并排(VG)
			Notes (VG/MG/MS) 代码(VG/MG/MS)

Hybrids /// 杂交	Notes (VG) /// 代码(VG)
	Statistics (VS*) 统计数据(VS*)
		Notes (VG) /// 代码(VG)
		Side-by-side (VG) /// 并排(VG)
		Statistics (VS*) /// 统计数据(VS*)
			To be considered according to hybrid type 按杂交类型考虑

Visual observation 目测

Measurements 测量

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Quantitative characteristics and their effect to distinctness
数量性状及其对特异性的影响

D

- visual characteristics - notes are used for recording the characteristics as well as for assessment of DUS /// 目测性状—代码用于记载性状以及评估 DUS
- measured or counted characteristics - **DUS assessment is based on the recorded values** /// 测量或计数性状—记录值用于评估DUS
- **recorded values are transformed into states of expression only for the purpose of variety description /// 仅为品种描述之目的，将记录值转为状态表达**

QN are recorded on an ordinal, interval or ratio scale for the assessment of distinctness depending on the characteristic and the method of assessment. If the **records** are **taken from single plants** the same data **may be used for the assessment of distinctness and uniformity**. If distinctness is assessed on the basis of a single record of a group of plants, uniformity has to be judged with the off-type procedure (nominal scale).

根据评估的性状和方法，以顺序、等距或比率量表记录数量性状值QN，以评估特异性。如果**记录取自单一植株**，则相同数据**可用于评估特异性和一致性**。如已采用一组植株的单一记录来评估特异性，则一致性评估必须走异形株程序（称名量表）。

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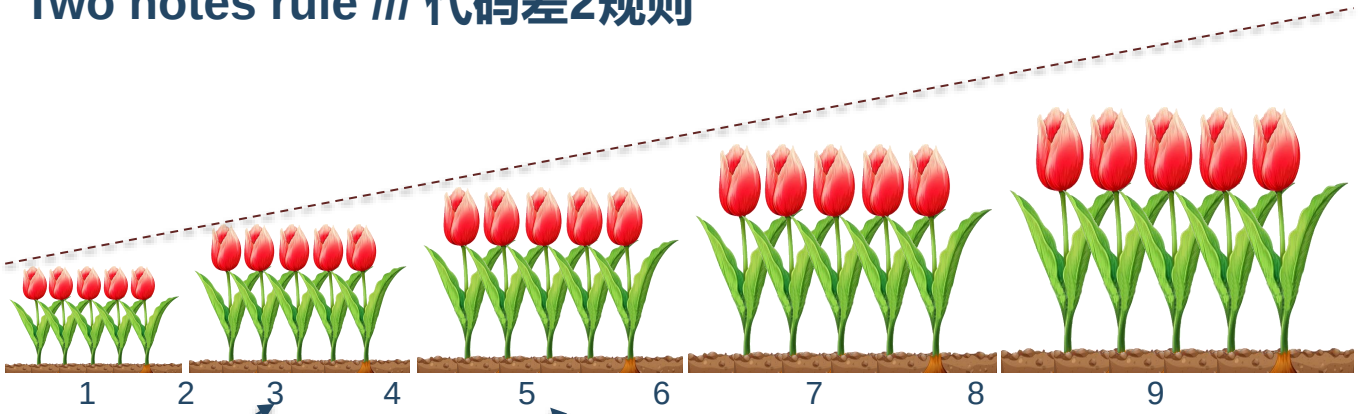
Distinctness in QN – clear difference /// 以数量评估判定特异性–明显差异

D

Two notes rule /// 代码差2规则



Plant: length
植株：长度

3 and 5
May be clear difference
3和5可能算明显差异

- difference of **two Notes to represent a clear difference if** the **comparison** between two varieties is **performed at the level of Notes**
- 如果两个品种在代码层面比较，则代码至少差2代表明显差异

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Distinctness in QN – clear difference /// 以数量评估判定特异性–明显差异

D

How do we get a „Note“ from measured value? /// 如何从测量值中得到“代码”？
How do we evaluate the difference between candidate variety and similar varieties? /// 如何评估待测品种与近似品种的差异?

(example /// 标准) “Plant: length /// 植株：长度” (MS)

Varieties 品种	Length (cm) 长度(cm)	Notes 代码	Distinctness 特异性
Candidate 待测	115	?	
Similar 1 近似1	91	?	**D or ND?** 是否有特异性?
Similar 2 近似2	98	?	**D or ND?** 是否有特异性?
Examlpe 1 标准1	60	**3**	
Example 2 标准2	140	**7**	

Fundec

Distinctness in QN – clear difference /// 以数量评估判定特异性–明显差异

D

How do we get a „Note" from measured value? /// 如何从测量值中得到“代码”？

Step 1: Making a Note Setting Table /// 第一步：制作代码设置表

- put “60”, “140” of Example varieties values into middle of Note 3, Note 7
  将标准品种值 “60”、“140”分别输入代码3和代码7
- width of one note /// 代码宽度 → (**140-60**) / (**7-3**) = **80**/4 = 20 cm

Notes /// 代码	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Measurements 测量值		← 20 →	**60** ← 20 →	← 20 →	← 20 →	← 20 →	**140** ← 20 →	← 20 →	

1 2 3 4

Exa.1 Exa.2

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Distinctness in QN – clear difference /// 以数量评估判定特异性–明显差异

D

How do we get a „Note" from measured value? /// 如何从测量值中得到“代码”？

Step 1: Making a Note Setting Table /// 第一步：制作代码设置表

- starting point of Note 3 /// 代码3的起点
  → 60-20/2 = 60-10 = 50

width of 1 Note = 20
一个代码的宽度=20

Notes 代码	1	2	3	4	5	6	7	8	9
Measurements 测量值			60				140		
		← 20 →	← 20 →	← 20 →	← 20 →	← 20 →	← 20 →	← 20 →	

60-10=50

50+20=70

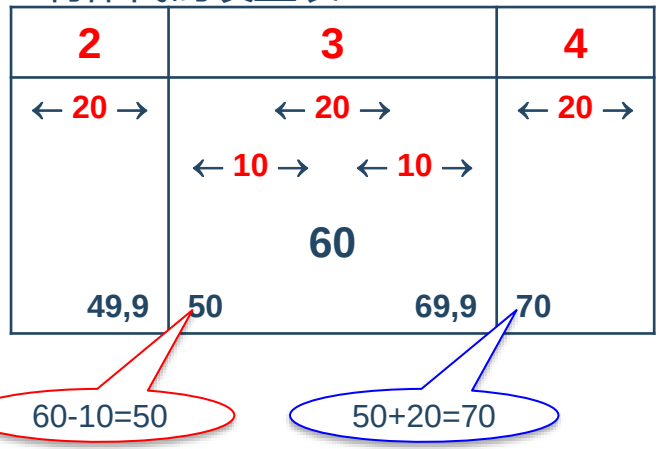
Exa.1 Exa.2

Distinctness in QN – clear difference /// 以数量评估判定特异性–明显差异

D

How do we get a „Note" from measured value?
如何从测量值中得到“代码”？
Step 1: Making a Note Setting Table

第一步：制作代码设置表



Notes 代码	Interval 区间	State of expression 表达状态
1	≤ 29,9	
2	30–49,9	
3	50–69,9	Short /// 短
4	70–89,9	
5	90–109,9	Medium /// 中等
6	110–129,9	
7	130–149,9	Long /// 长
8	150–169,9	
9	≥ 170	

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Distinctness in QN – clear difference /// 以数量评估判定特异性–明显差异

D

How do we get a „Note" from measured value? /// 如何从测量值中得到“代码”？

Step 2: Convert measured value to Note using the Note Setting Table

第二步：用代码设置表把测量值转为代码

Notes 代码	Interval 区间	State of exp. 表达状态
1	≤ 29,9	
2	30–49,9	
3	50–69,9	Short /// 短
4	70–89,9	
5	90–109,9	Medium /// 中
6	110–129,9	
7	130–149,9	Long /// 长
8	150–169,9	
9	≥ 170	

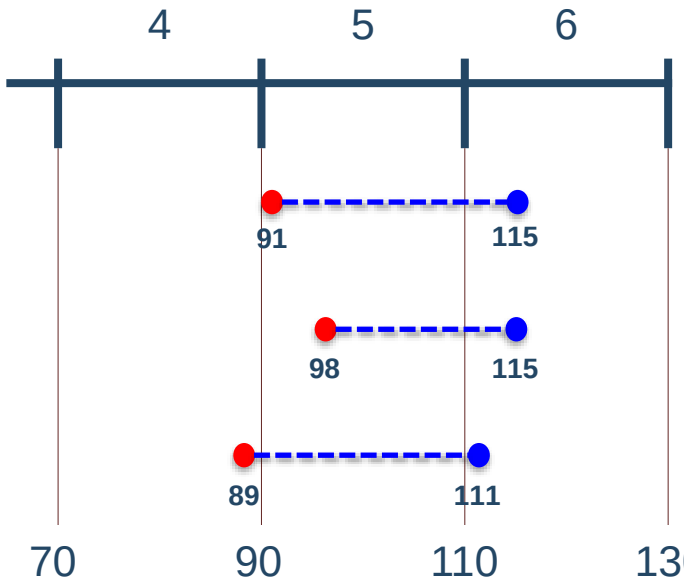
1 note difference
代码差为1

Plant: length; MS /// 植株：长度；MS

Varieties 品种	Length (cm) 长度(cm)	Notes 代码	Distinctness 特异性	Diff. 差值
Candidate 待测	115	6		
Sim. 1 近似1	91	5	D or ND? 是否有特异性?	24
Sim. 2 近似2	98	5	D or ND? 是否有特异性	17
Exa. 1 标准1	60	3		
Exa. 2 标准2	140	7		

Distinctness in QN – clear difference /// 以数量评估判定特异性–明显差异

D



	Notes 代码	Diff. in length 长度差	D / ND 特异性有无
Case 1 /// 案例1 Similar 1 vs Candidate 近似1 vs 待测	5 : 6	24	D
Case 2 /// 案例2 Similar 2 vs Candidate 近似2 vs 待测	5 : 6	17	ND
Case 3 /// 案例3	4 : 6	22	D

A "Two note rule" means that there is a difference of more than width of one note.

QN (MS) distinctness = at least ONE note difference!
“代码差2规则”意味着差值要超过一个代码宽度。
数量评估(MS)特异性 = 至少一个代码差值

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Examining Distinctness based on the growing trial /// 基于试种的特异性审查

D

Side-by-side visual observation /// 并排目测

Assessment by Notes / Single variety records (“Notes”) /// 按代码评估/单一品种记录(代码)

- D assessment based on the recorded state of expression of the characteristics of the variety /// 基于记录的品种性状表达状态进行特异性评估
- difference of two Notes often represents a clear difference /// 代码差2通常代表明显差异

Statistical analysis of the growing trial data /// 试种数据的统计学分析

- D based on a statistical analysis of the data obtained from the growing trial /// 基于试种数据的统计学分析进行特异性评估
- this approach requires a sufficient number of records for a variety /// 本方法需要一个品种的足量记录

The choice of approach depend on feature of propagation, type of expression of the characteristic (QN, QL, PQ), method of observation (V or M) and type of record (G or S).

方法选择取决于繁殖特征、性状表达类型（质量/数量/假质量）、观测方法（目测/测量）以及记录种类（群体/个体）

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Cross-pollinated 异花授粉	Notes (VG) /// 代码(VG)
	Statistics (VS*) 统计数据(VS*)
		Notes (VG) /// 代码(VG)
		Side-by-side (VG) /// 并排(VG)
		Statistics (VS*) /// 统计数据(VS*)
			Statistics (MG/MS/VS) 统计数据(MG/MS/VS)
			Side-by-side (VG) 并排(VG)
			Notes (VG/MG/MS) 代码(VG/MG/MS)

Hybrids /// 杂交	Notes (VG) /// 代码(VG)
	Statistics (VS*) 统计数据(VS*)
		Notes (VG) /// 代码(VG)
		Side-by-side (VG) /// 并排(VG)
		Statistics (VS*) /// 统计数据(VS*)
			To be considered according to hybrid type 视杂交类型而定

Visual observation 目测

Measurements 测量

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Examining distinctness - assessment based on Statistics
审查显著性 – 基于统计学评估

D

Self-Pollinated and Vegetatively Propagated Varieties
自花授粉和无性繁殖品种

- Least Significant Difference (LSD) /// 最小显著差异法

Cross-Pollinated Varieties
异花授粉品种

- Combined-Over-Years Distinctness (COYD) /// 特异性多年综合分析法 (COYD)
- 2x1% criterion /// 2×1%原则
- Other statistical method (ANOVA and multiple range tests) /// 其他统计手段 (ANOVA和多范围测试)

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Examining distinctness /// 特异性审查

D

Self-Pollinated and Vegetatively Propagated Varieties

自花授粉与无性繁殖品种

- Varieties can be considered clearly distinguishable if the difference between two varieties equals or exceed the **Least Significant Difference (LSD)** at the specified probability level with the same sign over an appropriate period, even if they are described by the same state of expression.
- 如果在适当时间范围内，品种间差异等于或超过指定概率水平的**最小显著差异（LSD）**，且符号相同，那么即使被描述为同一表达状态，相关品种仍可以判定为明显可区分。

Notes in the variety description are independent from D assessment!

品种描述中的代码独立于特异性评估！

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The Combined-Over-Years Criteria for Distinctness (COYD)
特异性多年综合分析法

D

Requirements for application of COYD method

应用COYD法的条件

- used with data on **QN characteristics for cross-pollinated and some self-pollinated varieties ///** 用于**异花授粉和某些自花授粉品种的数量性状**数据
- observation over **at least two years or growing cycles and at a single location ///** 在**单一地点**观测**至少两年/两个生长周期**
- need **at least 10, preferably 20 df** for the varieties-by-years mean square /// 品种–年份均方差需要**至少10个（最好20个）**自由度（df）
  - this correspond to **11 comparable varieties, two years** of trials or **8 comparable varieties, three years ///** 即**11个可比品种进行两年试验**，或者**8个可比品种进行三年试验**
  - where there small numbers of varieties in the test, Long Term COYD can be used /// 当试验中的品种数量较少时，可以采用长期COYD来进行评估

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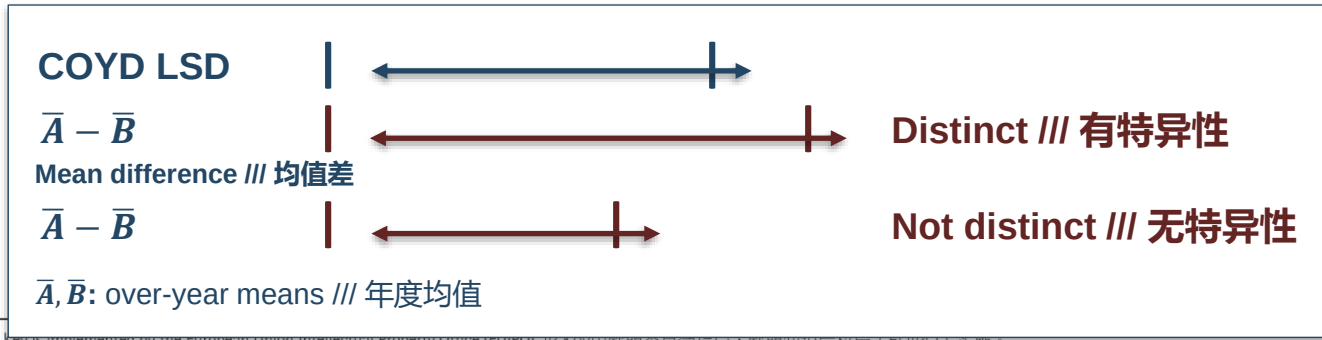
The Combined-Over-Years Criteria for Distinctness (COYD)
特异性多年综合分析法

D

- for each characteristic, taking the variety means from the two or three years of trials for candidates and comparable varieties and **producing over-year means for the varieties**; /// 对每个性状，从待测品种和可比品种的两年或三年试验中获取品种均值，并**计算出品种的年度均值**;
- **calculate a least significant difference (LSD)**, based on variety-by-years variation, for comparing variety means; /// 基于品种–年份的变异，**计算出最小显著差异（LSD）**，用于比较品种均值;
- if the **over-years mean difference between two varieties is greater than or equal to the LSD** then the varieties are said to be distinct in respect of that characteristic. /// 如果**两个品种的年度均值差异大于或等于LSD**，则称品种在该性状上具有特异性。



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The Combined-Over-Years Criteria for Distinctness (COYD)
特异性多年综合分析法

D

Main advantage of COYD method /// COYD法的主要优势

- combines information from several seasons into a single criterion (the “COYD criterion”) in a simple and straightforward way; /// 以简单明了的方式将多个季节的信息并入单一准则（“COYD准则”）中；
- it ensures that judgements about distinctness will be reproducible in other seasons; in other words, the same genetic material should give similar results, within reasonable limits, from season-to-season; /// 它确保对于特异性的判断在其他季节可重复；换句话说，相同的遗传材料在合理范围内应该给出类似结果，不受季节影响；
- the risks of making a wrong judgement about distinctness are constant for all characteristics. /// 错判特异性的风险对于所有性状等同。

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COYD illustrated /// COYD说明

D

Days to ear emergence in perennial ryegrass varieties
多年生黑麦品种出穗天数

Variety 品种	Year /// 年份 1	2	3	Over-Year Means 年度均值
Comparable /// 可比				
R1	38	41	35	38
R2	63	68	61	64
R3	69	71	64	68
R4	71	75	67	71
R5	69	78	69	72
R6	74	77	71	74
R7	76	79	70	75
R8	75	80	73	76
R9	78	81	75	78
R10	79	80	75	78
R11	76	85	79	80
Candidate /// 待测				
C1	52	56	48	52
C2	72	79	68	73
C3	85	88	85	86

- Use variety x year means to get an over-year mean for each variety /// 用品种x年均值算出各品种年度均值
- Do analysis of variance to get variety x year mean square /// 分析方差算出品种x年均方

Source 数据源	Df 自由度	Mean square 均方
Years /// 年	2	174,9
Variety /// 品种	13	452,59
Variety-by-years /// 品种年份	26	**2,54**
Total /// 总和	41	

- Calculate COYD criterion /// 计算COYD标准

$$LSD_{p\%} = t_p \; x \; \sqrt{2} \; x \; SE(\bar{x})$$

$$LSD_{p\%} = 2,779 \; x \; 1,414 \; x \; \sqrt{\frac{2,54}{3}} = 3,6$$

COYD illustrated /// COYD说明

D

Days to ear emergence in perennial ryegrass varieties
多年生黑麦品种出穗天数

Variety 品种	Year /// 年份 1	2	3	Over-Year Mean 年度均值	Difference to C2 与C2之差	Results 特异性判定
Comparable /// 可比						
R1	38	41	35	38	35	D
R2	63	68	61	64	9	D
R3	69	71	64	68	5	D
R4	71	75	67	71	2	ND
R5	69	78	69	72	1	ND
R6	74	77	71	74	-1	ND
R7	76	79	70	75	-2	ND
R8	75	80	73	76	-3	ND
R9	78	81	75	78	-5	D
R10	79	80	75	78	-5	D
R11	76	85	79	80	-7	D
Candidate /// 待测						
C1	52	56	48	52	21	D
C2	72	79	68	73	0	
C3	85	88	85	86	-13	D

COYD LSD = 3.6

C2 is Distinct
from R1, R2, R3, R9, R10, R11
相对于R1、R2、R3、R9、R10、R11，C2有特异性

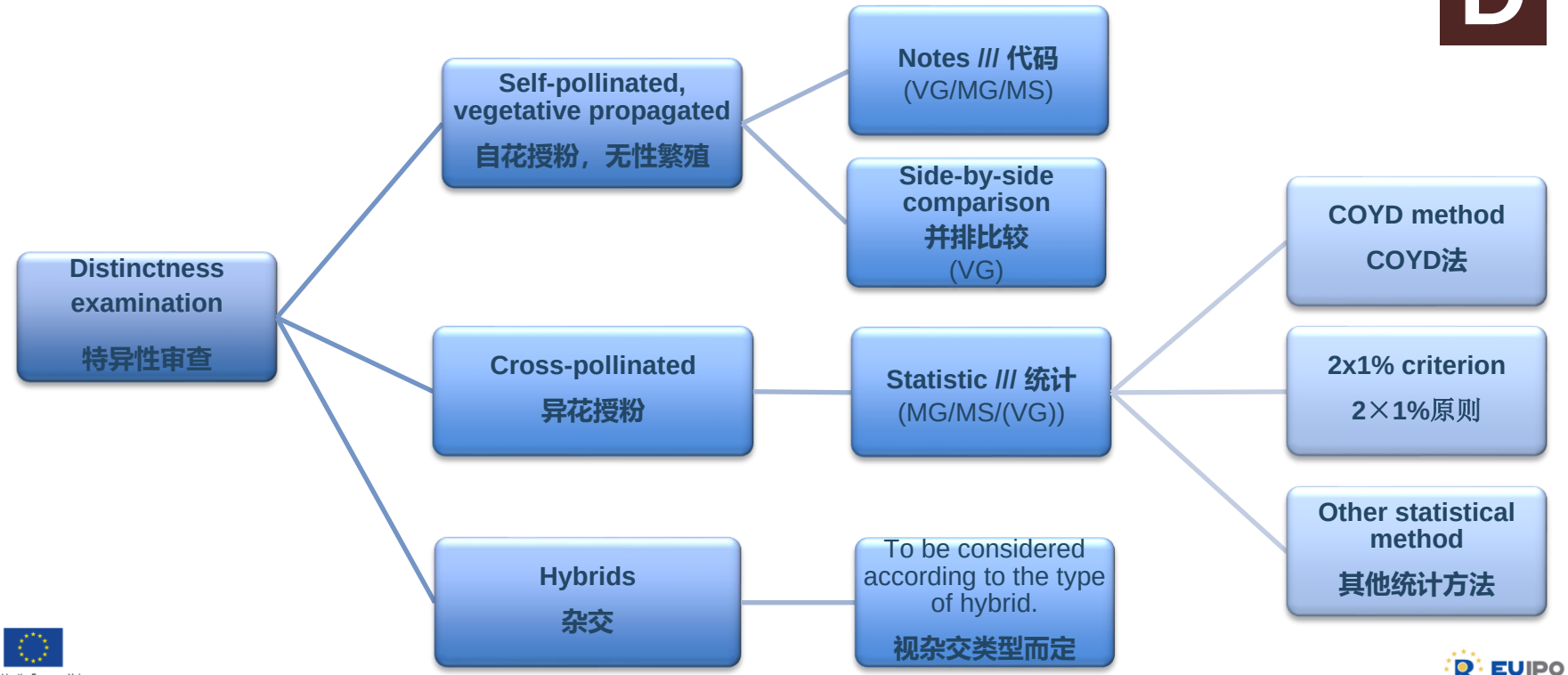
C2 is Not Distinct
from R4, R5, R6, R7, R8
相对于R4、R5、R6、R7、R8，C2无特异性

$|\bar{x}_1 - \bar{x}_2| \geq LSD$ ***Distinct /// 有特异性***

$|\bar{x}_1 - \bar{x}_2| < LSD$ ***Not Distinct 无特异性***

Summary of examining distinctness in measured QN
数量测量中特异性审查总结

D



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Uniformity requirement /// 一致性要求

U

- The variety shall be deemed to be uniform if, subject to the variation that may be expected from the particular features of its propagation, it is sufficiently uniform in its relevant characteristics.
一个品种从其繁殖的特点预期可能出现变异的情况下，如果其有关性状表达足够整齐一致，则该品种应被认为具有一致性。

„Chapter III, Article 8; 91 Act of the UPOV“ /// UPOV公约（1991年文本）第3章第8条

Uniform /// 一致

Non-uninform /// 不一致

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Summary of approaches for assessing uniformity
评估一致性方法总结

Method of propagation of the variety 品种繁殖方法	Type of expression of the characteristic /// 性状表达类型		
	QL **QUALITATIVE** 质量性状	**PQ** **PSEUDO-QUALITATIVE** 假质量性状	**QN** **QUANTITATIVE** 数量性状
Vegetatively propagated **无性繁殖**	Off-types 异型株	Off-types 异型株	Off-types (visual observation) 异型株 （目测） Standard deviation (measurements) 标准差（测量）
Self-pollinated **自花授粉**	Off-types 异型株	Off-types 异型株	Off-types (visual observation) 异型株 （目测） Standard deviation (measurements) 标准差（测量）
Cross-pollinated **异花授粉**	Off-types 异型株	Off-types 异型株	Standard deviation (measurements) 标准差（测量）
Single cross hybrid (in-bred parent lines) **单杂交种（亲本系内杂交）**	Off-types 异型株	Off-types 异型株	Off-types (visual observation) 异型株 （目测） Standard deviation (measurements) 标准差（测量）
Other hybrids **其他杂交**	To be considered according to the type of hybrid **视杂交类型而定**	To be considered according to the type of hybrid **视杂交类型而定**	To be considered according to the type of hybrid **视杂交类型而定**

Methods for Uniformity assessment /// 一致性评估方法

U

- **Off-types approach /// 异形株法**
- **Standard deviation approach** (COYU method, Relative variance method) /// **标准差法** (COYU法，相对方差法)

Features of propagation 繁殖特征	Genetic Variation 基因变异	Uniformity Assessment 一致性评估	Acceptable Off-types 可接受异形株
Vegetatively propagated **无性繁殖**	Lower 更低	Off-types **异形株**	Lower 更低
Self-pollinated **自花授粉**		Off-types **异形株**	
Single hybrid (inbred line) **单杂交种（系内杂交）**		Off-types **异形株**	Higher 更高
Cross-pollinated **异花授粉**		standard deviation 标准差	
Multiple cross Hybrid **多交杂种**	Higher 更高	standard deviation 标准差	

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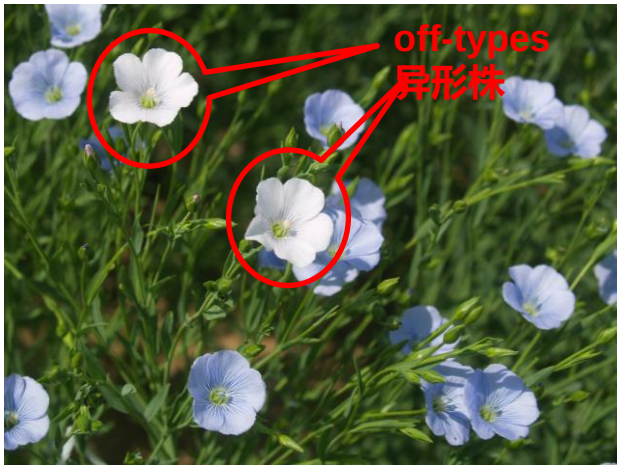
Off-types approach /// 异形株法

- Investigating plants with atypical expression /// 研究非典型表达植株
- Low level of genetic variation /// 低水平基因变异
- Where **all the plants of a variety are very similar** → for vegetatively propagate and self-pollinated varieties → **Uniformity** is assessed **by the number of off-types**

一个品种的所有植株非常近似→针对无性繁殖和自花授粉品种→**一致性**按**异形株数量**评估



How many off-types can we accept?
可以接受多少异形株

Off-types approach /// 异形株法

How many off-types can we accept? /// 可以接受多少异形株

- number of allowed off-types depends on the sample size

可接受异形株数量取决于样本量

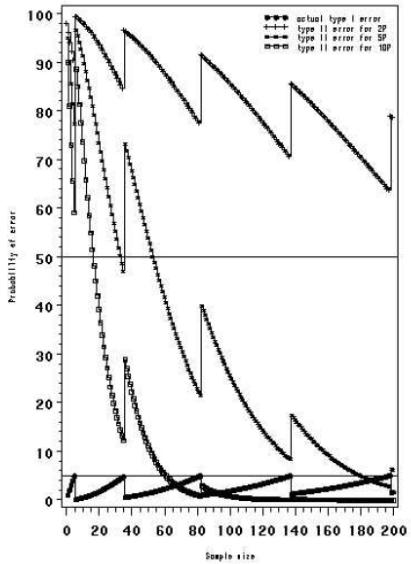
population standard = 1%
群体标准 = 1%
acceptance probability = 95%
接受概率 = 95%

Sample size 样本量	Max. number of off-types 异形株最大数量
1-5	0
6-35	1
36-82	2
83-137	3
138-198	4
199-262	5

TGP/8/5: PART II : 8 : THE METHOD OF UNIFORMITY ASSESSMENT ON THE BASIS OF OFF-TYPES
page 109

Table and figure 5: Population Standard = 1%
Acceptance Probability ≥95%
n=sample size, k=maximum number of off-types

n			k
1	to	5	0
6	to	35	1
36	to	82	2
83	to	137	3
138	to	198	4
199	to	262	5
263	to	329	6
330	to	399	7
400	to	471	8
472	to	544	9
545	to	618	10
619	to	694	11
695	to	771	12
772	to	848	13
849	to	927	14
928	to	1006	15
1007	to	1085	16
1086	to	1166	17
1167	to	1246	18
1247	to	1328	19
1329	to	1410	20
1411	to	1492	21
1493	to	1575	22
1576	to	1658	23
1659	to	1741	24
1742	to	1825	25
1826	to	1909	26
1910	to	1993	27
1994	to	2078	28
2079	to	2163	29
2164	to	2248	30
2249	to	2333	31
2334	to	2419	32
2420	to	2505	33
2506	to	2591	34
2592	to	2677	35
2678	to	2763	36
2764	to	2850	37
2851	to	2937	38
2938	to	3000	39



THE METHOD OF UNIFORMITY ASSESSMENT ON THE BASIS OF OFF-TYPES TGP/8 p.97
基于异形株法评估一致性方法 TGP/8 p.97

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Off-types approach /// 异形株法

Population standard (Acceptable Number of off-types) /// 群体标准 (可接受异形株数量)

- maximum percentage of off-types that would be permitted if all individuals of the variety could be examined (1, 2, 3 % ...)

如果品种的所有个体可查，异形株的最高允许比例 (1, 2, 3 % ...)

Acceptance probability /// 接受概率

- minimum probability of accepting as uniform a variety with the population standard of off-types (95 %)

异形株群体标准下接受品种为一致时的最低概率 (95%)

Maximum number of off-types (acceptance probability 95 %)
异形株最大数量 (接受概率95%)

Sample size 样本量	Population Standard /// 群体标准						
	10 %	5 %	3 %	2 %	1 %	0,5 %	0,1 %
10	3	2	1	1	1	0	0
20	4	3	2	2	1	1	0
60	10	6	4	3	2	1	1
100	15	9	6	5	3	2	1

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Off-types approach /// 异形株法

U

Species 物种	Assessment of uniformity 一致性评估
Wheat 小麦	a sample of 2000 plants, a population (PS) of **0.3 %** and an acceptance probability (AP) of at least **95 %** should be applied. In the case of a sample size of 2000 plants, 10 off-types are allowed. 对于2000个植株的样本，应该应用**0.3%**的群体标准（PS）和至少**95%**的接受概率（AP）。在样本大小为2000株植株的情况下，允许出现10个异形株。 sample of 100 ear-rows, a PS of **1 %** and an AP of at least **95 %** should be applied. In the case of a sample size of 100 ear-rows, plants or parts of plants, 3 off-types are allowed. 对于100穗行的样本，应该应用**1%**的群体标准（PS）和至少**95%**的接受概率（AP）。在样本大小为100穗行、植株或植株部分的情况下，允许出现3个异形株。
Potato 马铃薯	a PS of **1 %** and an AP of at least **95 %** should be applied. In the case of a sample size of 60 plants, 2 off-types are allowed. In a sample size of 5 plants no off-type is allowed. 应该应用1%的群体标准（PS）和至少95%的接受概率（AP）。在样本大小为60株植株的情况下，允许出现2个异形株。在样本大小为5株植株的情况下，不允许出现离型植株。
Maize 玉米	inbred lines and single-cross hybrids a PS of **3 %** with an AP of **95 %** should be applied. In the case of a sample of 40 plants, the maximum number of off-types allowed would be 3. 对于自交系和单杂交种，应该应用**3%**的群体标准（PS）和至少**95%**的接受概率（AP）。在样本大小为40株植株的情况下，允许出现最多3个异形株。

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Standard Deviation approach /// 标准差法

U

- **COYU method /// COYU法**
- **Relative variance method /// 相对方差法**

- standard deviations approach means that a candidate variety should not be significantly less uniform than the comparable varieties

标准差法意味着待测品种在一致性上不应显著低于可比品种。

- for cross-pollinated varieties, relative uniformity should be applied

对于异花授粉的品种，应采用相对一致性。

The combined over years uniformity criterion (COYU)
一致性多年综合分析法(COYU)

U

- **for assessing uniformity using relative tolerances limit calculated based on Standard Deviation (SD) from over several years testing of comparable varieties**

用于评估一致性的相对公差极限计算源于可比品种多年测试的标准差

Requirements for application of COYU method /// 应用COYU法的条件

- used with data on **measured QN** characteristics **/// 用于数量性状数据**
- observations made on a plant basis **over two or more years /// 按植株观测至少两年**
- When there are some differences between plants of a variety, **representing quantitative variation rather than presence of off-types**

同一品种植株间存在差异**代表数量变异，而非存在异形株**

- need **at least 20 df /// 需要至少20个自由度**
  - this correspond to **11 comparable varieties, two years** of trials or **8 comparable varieties, three years**

  即11个可比品种进行两年试验，或者8个可比品种进行三年试验

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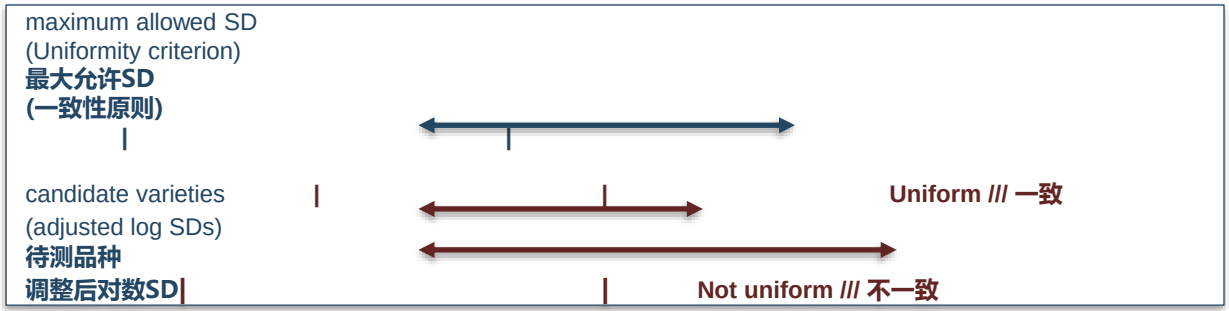
The combined over years uniformity criterion (COYU)
一致性多年综合分析法(COYU)

- Calculation of within plot SDs for each variety in each year /// 每年计算每个品种在每小区内的标准差（SD）
- Transformation of SDs: by adding 1 and converting to natural logarithms /// 对SD进行转换：加1并取其自然对数
- Estimation of the relationship between the SD and mean in each year /// 估计每年SD与均值之间的关系
- Adjustments of log SDs of candidate and comparable varieties based on the estimated relationships between SD and mean in each year
根据每年SD与均值估计关系调整待测品种和可比品种的对数SD
- Averaging of adjusted log SDs over years ///对调整后的对数SD进行多年平均
- Calculation of the maximum allowable SD (the Uniformity Criterion) /// 计算最大允许的SD（一致性原则）
- Comparison of the adjusted log SDs of candidate varieties with the UC /// 将待测品种的调整后对数SD与一致性原则进行比较



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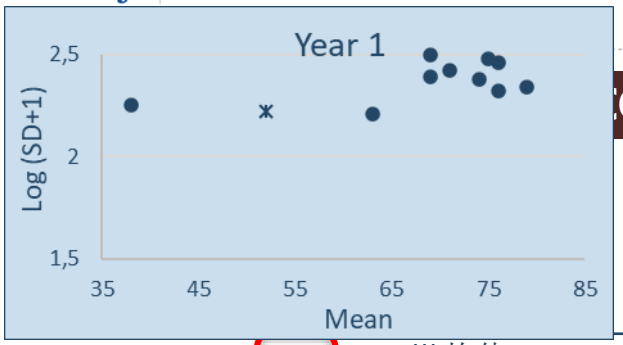


COYU illustrated /// COYU说明

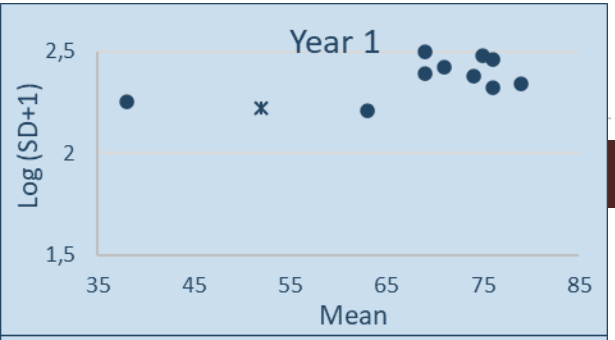
- Get variety x year Log (SD+1) /// 计算品种x年 Log (SD+1)
- Get variety x year Adjusted Log (SD+1) /// 计算品种x年 调整Log (SD+1)

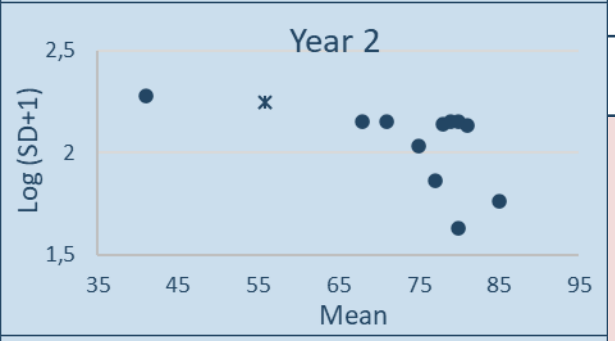
Variety 品种	Means /// 均值			Within Plot SD /// 小区内SD			Log (SD+1)			Adj Log (SD+1)
	Yr1	Yr2	Yr3	Yr1	Yr2	Yr3	Yr1	Yr2	Yr3	Yr1
Comparable /// 可比										
R1	38	41	35	8,5	8,8	9,4	2,25	2,28	2,34	2,36
R2	63	68	61	8,1	7,6	6,7	2,21	2,15	2,04	2,32
R3	69	71	64	9,9	7,6	5,9	2,39	2,15	1,93	2,42
R4	71	75	67	10,2	6,6	6,5	2,42	2,03	2,01	2,43
R5	69	78	69	11,2	7,5	5,9	2,50	2,14	1,93	2,52
R6	74	77	71	9,8	5,4	7,4	2,38	1,86	2,13	2,36
R7	76	79	70	10,7	7,6	4,8	2,46	2,15	1,76	2,43
R8	75	80	73	10,9	4,1	5,7	2,48	1,63	1,90	2,44
R9	78	81	75	11,6	7,4	9,1	2,53	2,13	2,31	2,52
R10	79	80	75	9,4	7,6	8,5	2,34	2,15	2,25	2,33
R11	76	85	79	9,2	4,8	7,4	2,32	1,76	2,13	2,28
Candidate /// 待测										
C1	52	56	48	8,2	8,4	8,1	2,22	2,24	2,21	2,32

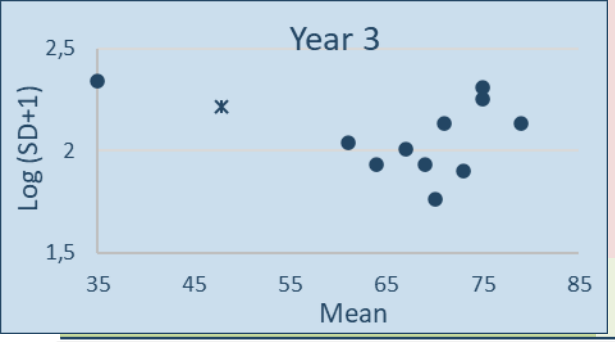
COYU illustrated /// COYU说明

U

- Get variety x year Log (SD+1) /// 计算品种x年 Log (SD+1)
- Get variety x year Adjusted Log (SD+1) /// 计算品种x年 调整Log (SD+1)







Within Plot SD /// 小区内SD			Log (SD+1)			Adj Log (SD+1)		
Yr1	Yr2	Yr3	Yr1	Yr2	Yr3	Yr1	Yr2	Yr3
8,5	8,8	9,4	2,25	2,28	2,34	2,36	2,13	2,30
8,1	7,6	6,7	2,21	2,15	2,04	2,32	2,00	2,00
9,9	7,6	5,9	2,39	2,15	1,93	2,42	2,10	1,95
10,2	6,6	6,5	2,42	2,03	2,01	2,43	1,96	2,06
11,2	7,5	5,9	2,50	2,14	1,93	2,52	2,14	1,96
9,8	5,4	7,4	2,38	1,86	2,13	2,36	1,84	2,16
10,7	7,6	4,8	2,46	2,15	1,76	2,43	2,19	1,80
10,9	4,1	5,7	2,48	1,63	1,90	2,44	1,70	1,91
11,6	7,4	9,1	2,53	2,13	2,31	2,52	2,16	2,24
9,4	7,6	8,5	2,34	2,15	2,25	2,33	2,23	2,09
9,2	4,8	7,4	2,32	1,76	2,13	2,28	1,78	1,96
8,2	8,4	8,1	2,22	2,24	2,21	2,32	2,08	2,17

COYU illustrated /// COYU说明

U

Variety /// 品种	Adj Log (SD+1) Yr1	Yr2	Yr3
Comparable /// 可比			
R1	2,36	2,13	2,3
R2	2,32	2,00	2,00
R3	2,42	2,10	1,95
R4	2,43	1,96	2,06
R5	2,52	2,14	1,96
R6	2,36	1,84	2,16
R7	2,43	2,19	1,80
R8	2,44	1,70	1,91
R9	2,52	2,16	2,24
R10	2,33	2,23	2,09
R11	2,28	1,78	1,96
Candidate /// 待测			
C1	2,32	2,08	2,17

Mean = 2,15
均值 = 2,15

Mean = 2,19
均值 = 2,19

- Use Adj log (SD+1) values for comparable varieties

可比品种用Adj log (SD+1) 值

- Do analysis of variance to get the comparable varieties‘ mean and an estimate of variability

分析方差得到可比品种均值和变异估计

Source 数据源	Df 自由度	Mean square 均方
Years /// 年	2	0,5098
Variety within years 年内品种	30	0,0202
Total /// 总和	32	

- Calculate COYU criterion $UC_{p\%} = SD_r + t_p \sqrt{V\left(\frac{1}{k} + \frac{1}{RK}\right)}$

计算COYU原则

$$UC_{p\%} = 2{,}15 + 3{,}118 \times \sqrt{0{,}0202\ x\left(\frac{1}{3} + \frac{1}{11\ x\ 3}\right)} = 2{,}42$$

- Is the max allowable candidate over-year mean Adj log (SD+1) → C1 is Uniform 最大可允许待测多年平均调整log (SD+1) → C1一致

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Relative variance method /// 相对方差法

U

- applied to any measured characteristic that is a continuous variable, irrespective of the method of propagation of the variety

适用于任何连续变量的测量性状，不论繁殖方法如何。

- in cross-pollinated varieties, taking 60 plants for measurements per characteristic per variety /// 在异花授粉品种中，每个品种每个性状需要测量60个植株。
- calculation of relative variance /// 计算相对方差:

$$\text{Relative variance} = \frac{\text{variance of the candidate}}{\text{average variance of the comparable varieties}}$$

相对方差 = （待测品种方差）/（可比品种方差平均值）

- compare relative Thresholds of F Table of the relevant sample size /// 比较相关样本量的F表相对阈值

Relative variance ≤ threshold **相对方差 ≤ 阈值**	**Uniform** **一致**
Relative variance ≥ threshold **相对方差 ≥ 阈值**	**Not uniform** **不一致**

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Relative variance method /// 相对方差法

Use of the relative variance method /// 使用相对方差法

- variances of candidate and comparable varieties for plant height data (QN, MS) /// 待测与可比品种植株高度数据（数量MS）方差

Candidate variety 待测品种	Comparable variety 1 可比品种1	Comparable variety 2 可比品种2	Comparable variety 3 可比品种3	Comparable variety 4 可比品种4
5,6	**7,8**	**4,5**	**3,2**	**5,8**

average variance = 5,32
平均方差 = 5,32

- number of observation per variety: 60 /// 每品种观测数：60
- average variance for comparable varieties is (7,8 + 4,5 + 3,2 + 5,8) / 4 = 5,32

  可比品种平均方差为 (7,8 + 4,5 + 3,2 + 5,8) / 4 = 5,32
- Relative variance = variance of candidate variety / average variance of the comparable varieties = 5,6 / 5,32 = 1, 05

  相对方差 = （待测品种方差）/（可比品种方差平均值）= 5,6 / 5,32 = 1, 05
- From F-table, for a sample size of 60 : ∞; the threshold = 1,47 /// 按F表，样本量60: ∞，阈值为1,47
- Relative variance : threshold = 1,05 < 1,47 → Relative variance is less then threshold, therefore, **the candidate variety is uniform for that characteristic**

  相对方差：阈值： 1,05 < 1,47 → 相对方差小于阈值，因此**待测品种该性状一致**

Relative variance method /// 相对方差法

- Threshold limit for relative variance for some different sample sizes

  不同样本量的相对方差阈值极限

Sample size of candidate 待测样本量	Threshold limit for relative variance (S^2) 相对方差阈值极限(S^2)
30	1,70
40	1,59
50	1,53
60	1,47
80	1,41
100	1,36
150	1,29
200	1,25

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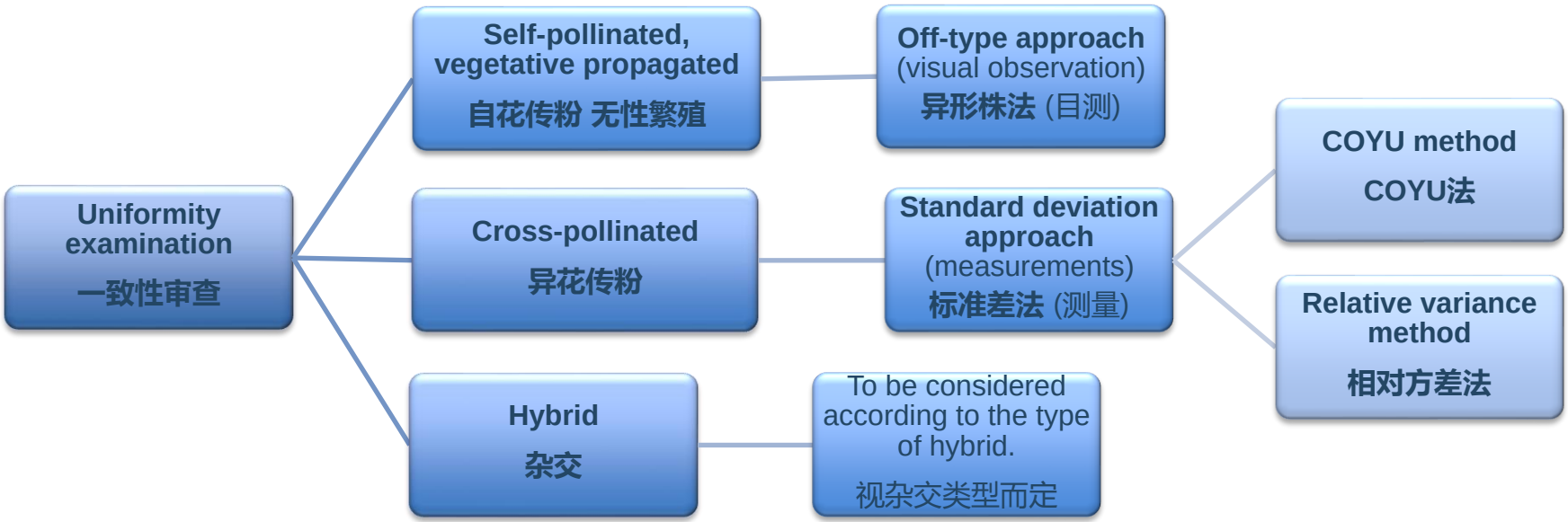
Summary of examining uniformity in measured QN /// 数量测量一致性审查总结

U



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Stability requirement /// 稳定性要求

S

- The variety shall be deemed to be stable if its relevant characteristics remain unchanged after repeated propagation or, in the case of a particular cycle of propagation, at the end of each.
如果一个品种经过反复繁殖其有关性状保持不变，或者在特定繁殖周期的每个周期末尾其有关性状保持不变，则该品种就应认为是稳定的。

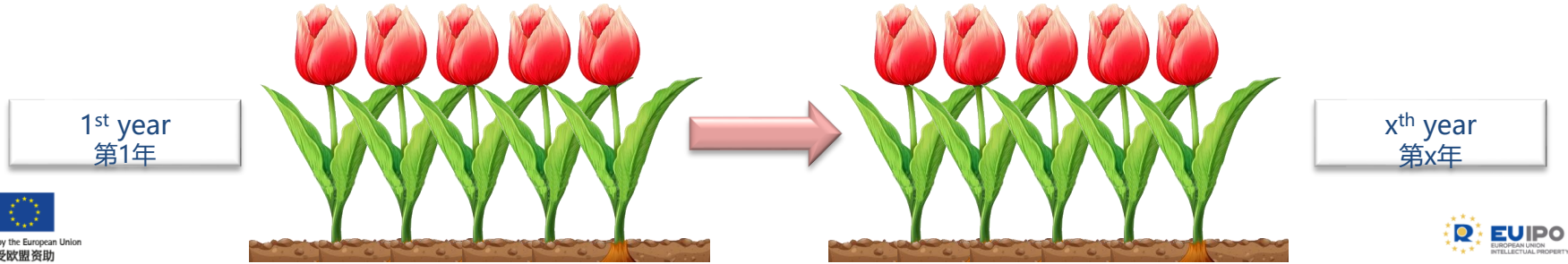
„Chapter III, Article 9; 91 Act of the UPOV“ /// UPOV公约（1991年文本）第3章第9条

- not usual perform to special test of stability in practice

在实践中通常不进行专门的稳定性测试。

- **when a variety has been shown to be uniform, it can also be considered to be stable**

当一个品种已经被证明有一致性，也可以认为其具有稳定性。



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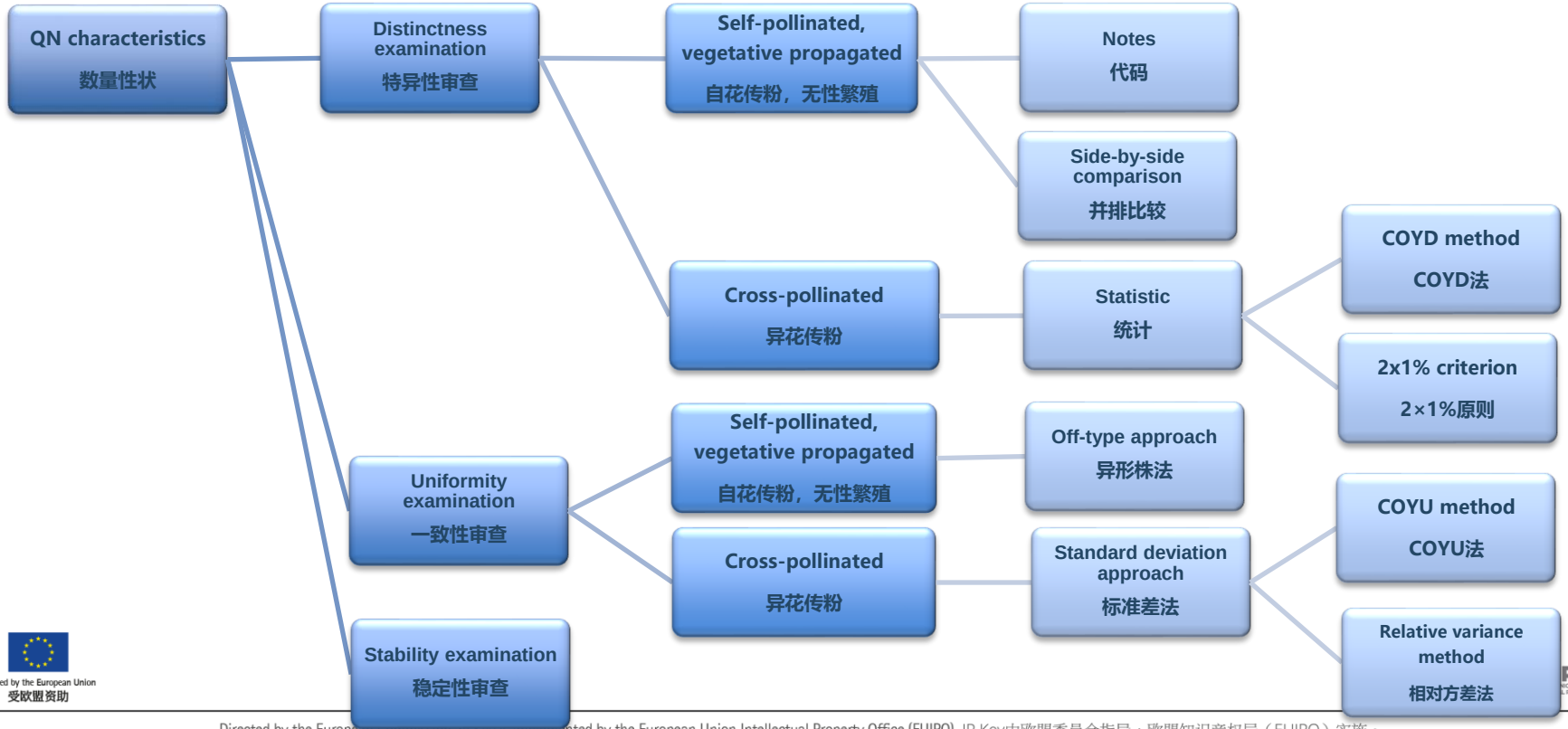
Summary of measured quantitative characteristics /// 数量性状测量总结



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THANK YOU
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