

# **General introduction to the Examination of DUS**



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# Contents

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## **1. Purpose of DUS test**

## **2. Role of DUS test**

- definition of a variety**
- How to observe characteristics**
- Examination of DUS**

# Plant Variety Protection system

## *New Variety*

*Breeding: needs a lot of time and money*

*Propagation: very quick and easy*

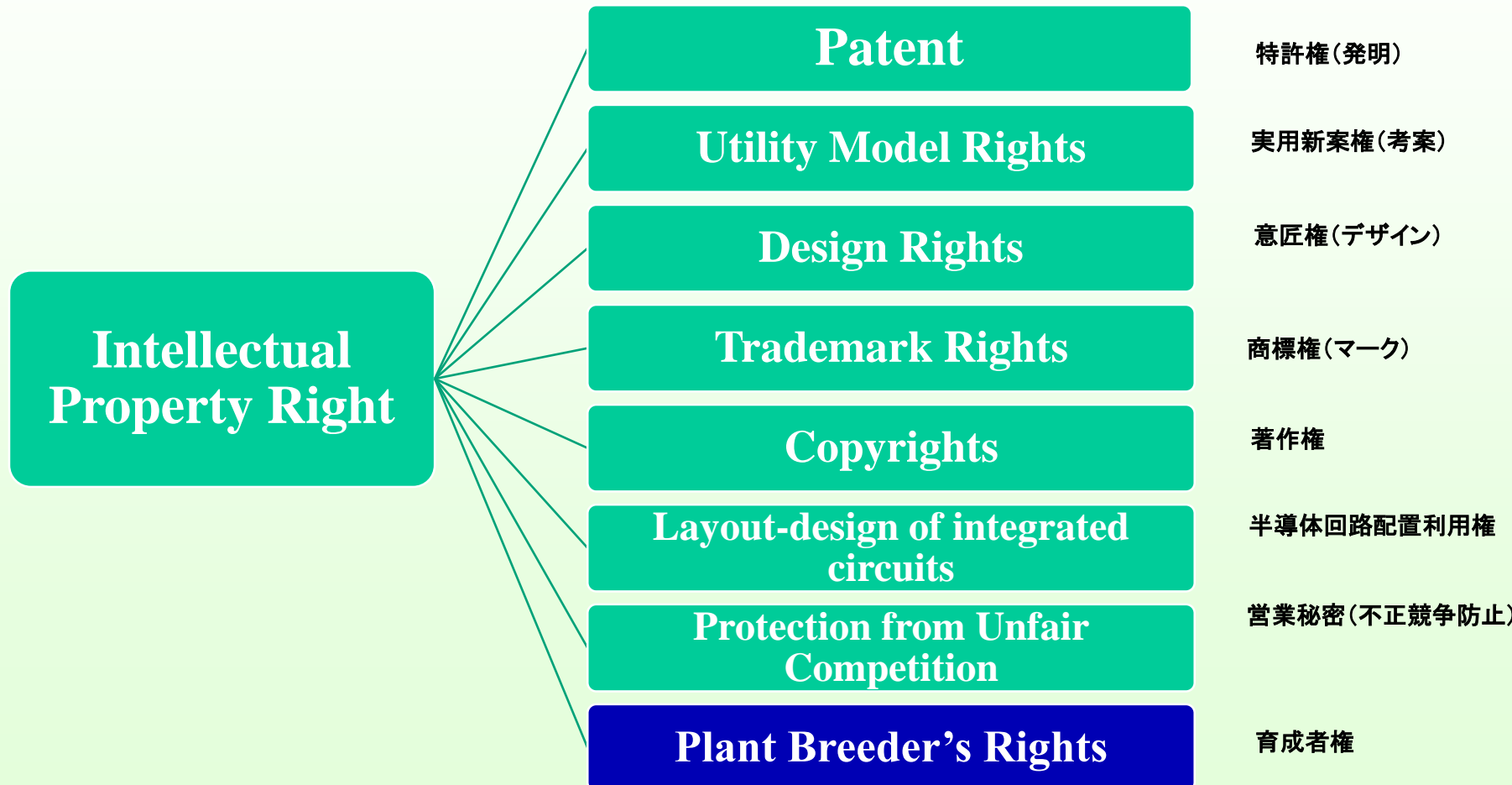
- ✓ *breeders may lose the chance to recover the cost of the breeding*

*Needs an effective system of PVP*

- ✓ *gives the breeder a chance to obtain a financial return*
- ✓ *encourage the development of new varieties more, then*
- ✓ *leads to contributing to agricultural development*



# Intellectual Property Right



# UPOV principles

## ■ Conditions for Protection

Article 5; 91 Act of the UPOV

[Criteria to be satisfied] The breeder's right shall be granted where the variety is

- **New**
- **Distinct**
- **Uniform**
- **Stable**

[Other conditions] .....denomination, fees

# What is DUS?

Distinctness

**D:** must be distinguishable from any other varieties



# What is DUS?

**Uniformity**

**U:** must be uniform



# What is DUS?

Stability

**S:** must be unchanged after repeated propagation



Next  
generation



Next  
generation

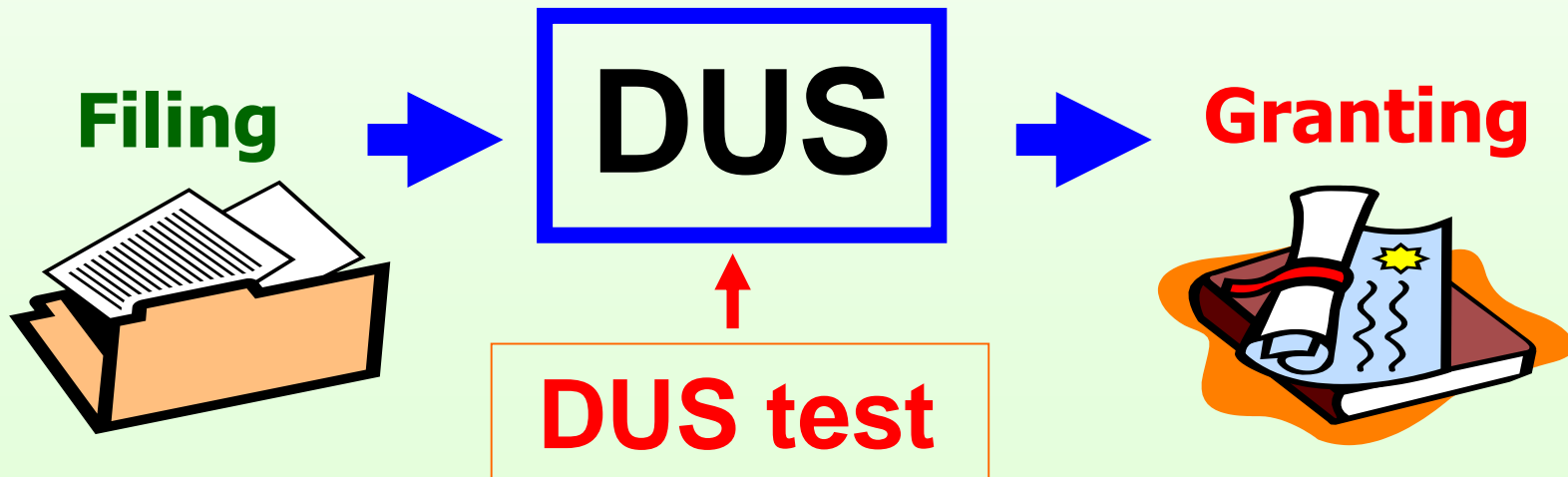


# UPOV principles

## ■ Examination of the Application

Article 12; 91 Act of the UPOV

Any decision to grant a breeder's right shall require an examination for compliance with the conditions under article 5 to 9.



# DUS test

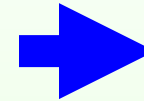
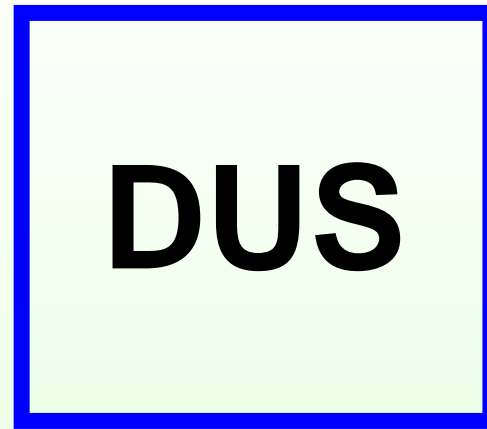
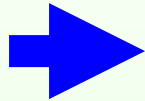
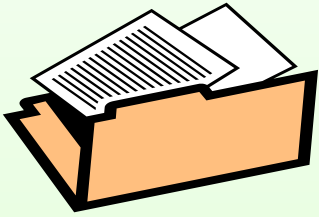


## ► DUS test

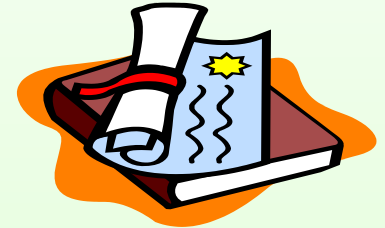
- ✓ to assess whether the variety meets the DUS requirements
- ✓ a test to be conducted before protection is granted for new varieties

# What is DUS test?

**Filing**



**Granting**



**Who?**

# Who does the DUS test?

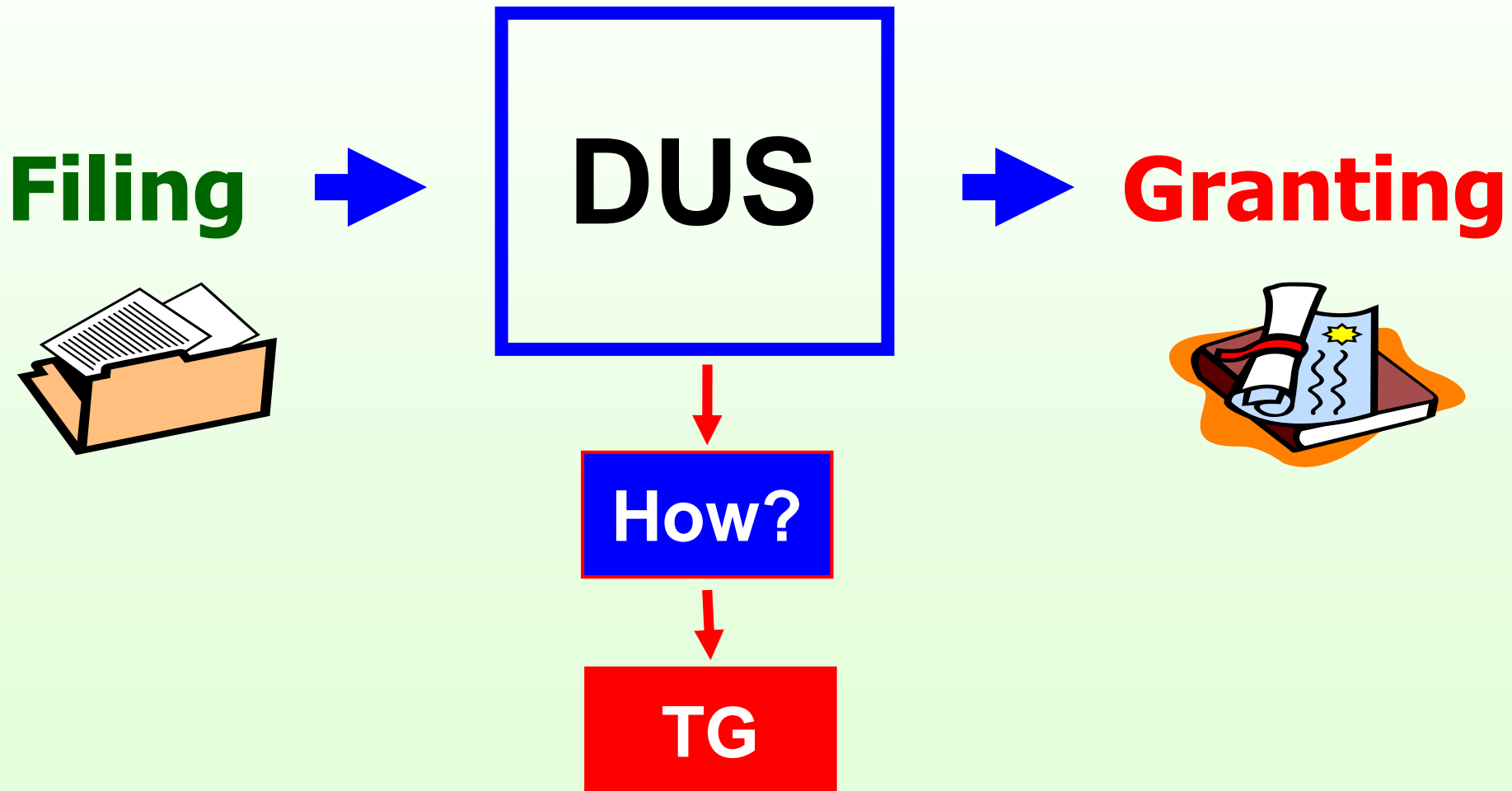
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Article 12; 91 Act of the UPOV

DUS growing test is conducted by

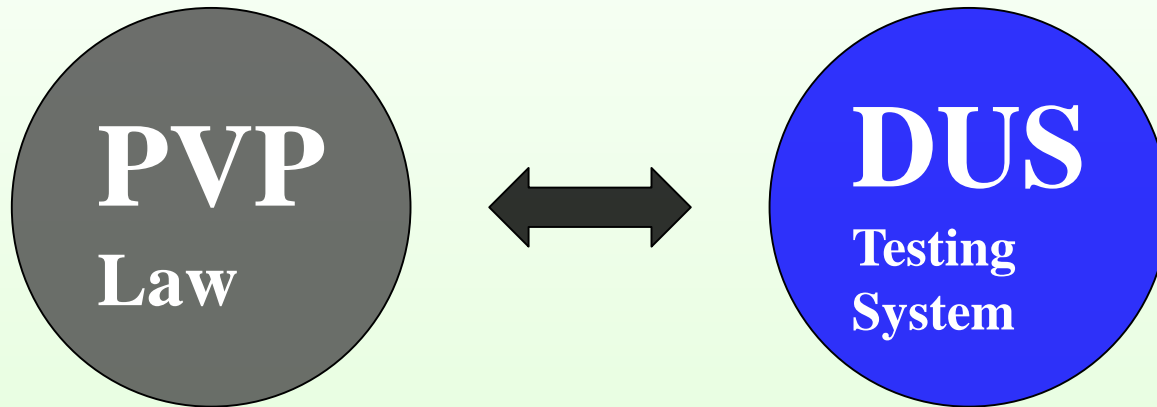
- ✓ Authority offices ( Public Institute...)
- ✓ Breeder
- ✓ Purchase the test result from other country

# What is DUS test?



# PVP System

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**What should we do in the DUS test?**

# Purpose of DUS test

## ■ Characteristics as the Basis for Examination of DUS

TG/1/3: 2.4

1. For any variety to be capable of protection *it must first be clearly defined*.
2. Only after a variety has been defined *can it be finally examined for fulfillment of the DUS criteria* required for protection.
3. a *variety is defined by its characteristics* and that those characteristics are therefore the basis on which a variety can be examined for DUS.

characteristics →  
basis for examining DUS of a variety.



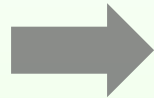
## purpose of DUS test

1. Definition of the variety using the characteristics
2. Examination of DUS

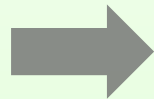


# Purpose of DUS test

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**Definition of the variety**



**Assessing the DUS**

**Role of**

# DUS test

## **1. Definition of a variety by the expression of characteristics**

*1. For any variety to be capable of protection it must first be clearly defined.*

*2. Only after a variety has been defined can it be finally examined for fulfillment of the<sup>18</sup>  
DUS criteria required for protection.*

# Definition of a variety

---

**To define the variety  
by the expression of characteristics**




**To clarify the expression of  
characteristics , then make a variety  
description of the variety**

# Definition of a variety

## ■ How to define the variety



		E			
		TG/44/11 Rev. ORIGINAL: English DATE: 2011-10-20 + 2013-03-20			
<b>INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS</b> GENEVA					
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <b>TOMATO</b>            UPOV Code: SOLAN_LYC  <i>Solanum lycopersicum</i> L.         </div>					
<b>GUIDELINES</b> <b>FOR THE CONDUCT OF TESTS</b> <b>FOR DISTINCTNESS, UNIFORMITY AND STABILITY</b>					
Alternative Names: <sup>*</sup>					
<i>Botanical name</i> <i>Solanum lycopersicum</i> L. <i>Lycopersicon esculentum</i> Mill. <i>Lycopersicon lycopersicum</i> (L.) Karstén ex Farw.	<i>English</i> Tomato	<i>French</i> Tomate	<i>German</i> Tomate	<i>Spanish</i> Tomate	
<p>The purpose of these guidelines ("Test Guidelines") is to elaborate the principles contained in the General Introduction (document TG/1/3), and its associated TGP documents, into detailed practical guidance for the harmonised examination of distinctness, uniformity and stability (DUS) and, in particular, to identify appropriate characteristics for the examination of DUS and production of harmonized variety descriptions.</p>					
<b>ASSOCIATED DOCUMENTS</b> These Test Guidelines should be read in conjunction with the General Introduction and its associated TGP documents.					
	deutch	español	Example Varieties	Note	
Blatt: Stellung des Blattstiel: im Verhältnis zur Hauptschne	Blatt: Stellung des Blattstiel: im Verhältnis zur Hauptschne	Hoja: parte del petiolo de los folíolos en relación con el eje principal	Blizard, Marmande VR	3	
waageschr	waageschr	horizontal	Souaria	5	
halberstängig	halberstängig	semicongate	Mouffette H63.5	7	
Inflorescencia: tipo					
überwiegend unversreigt	überwiegend unversreigt	principalmente uniparas	Dynamo	1	
intermediär	intermediär	intermedia	Harfbeer	2	
überwiegend versreigt	überwiegend versreigt	principalmente multiparas	Marmande VR	3	
Blüte: Farbe					
gelb	gelb	amarillo	Exota, Marmande VR	1	
orange	orange	anaranjado	Ottawa, Peachberry	2	
Blüte: Behaarung des Griffels					
abwesend	abwesend	ausente	Campbell 1327	1	
vorhanden	vorhanden	presente	Saint Pierre	9	
Peduncel: abscission layer	Peduncel: abscission layer	Pedunculo: anillo d'abscission	Blütenstiel: Bruchstelle	Pedunculo: caps de abscission	
absent	absent	fáltand	ausente	Aledo, Bandera, Count, Lerica	1
present	present	vorhanden	presente	Mouffette H 63.5, Roma	9

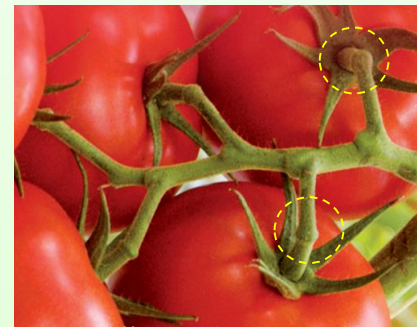
# Definition of a variety

19. (*)(+)	VG	Peduncle: abscission layer	Example varieties	Note
QL		absent	Aledo, Bandera, Count, Lerica	1
		present	Montfayet H 63.5, Roma	9



<http://www.johnnyseeds.com>

**1**  
**Absent**



<https://www.deruiterseeds.com>

**9**  
**Present**

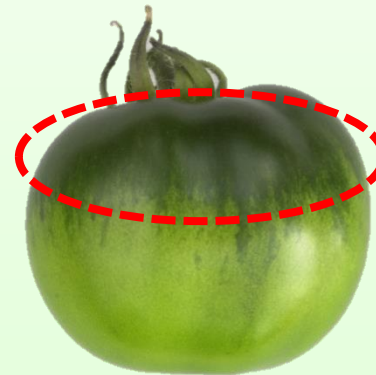
# Definition of a variety

TGs for Rice

21. (*)(+)	VG	Fruit: green shoulder (before maturity)	Example varieties	Note
QL	(b)	absent	Felicia, Rio Grande, Trust	1
		present	Daniela, Montfayet H 63.5	9



**1**  
**absent**

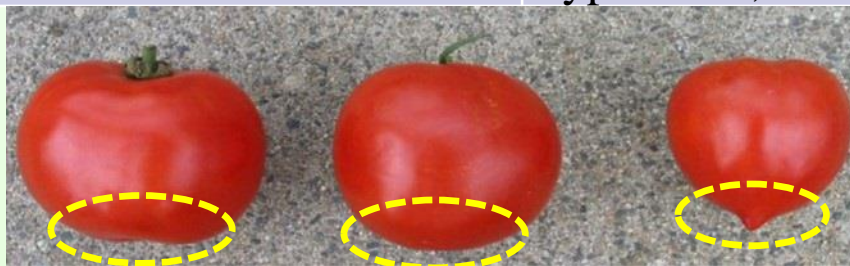


**9**  
**present**

# Definition of a variety

TGs for Rice

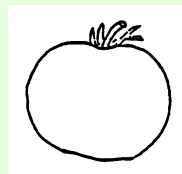
33. (+)	VG	Fruit: shape at blossom end	Example varieties	Note
QN	(c)	indented	Marmande VR, Super Mech	1
		indented to flat		2
		flat	Montfavet H 63.4, Montfavet H 63.5	3
		flat to pointed	Cal J, Early Mech, Peto Gro	4
		pointed	Europeel, Heinz 1706, Hypeel 244, Roma VF	5



1  
indented



2  
indented to  
flat



3  
flat



4  
flat to  
pointed



5  
pointed

# Definition of a variety

Example: the characteristics assessed are . . .



**abscission layer**

**9: present**



**green shoulder**

**9: present**



**shape at blossom end**

**3: flat**



**The variety description which is defined by the expression of characteristics**



# Definition of a variety

## ■ Variety description



<http://o-e-c.net/syokuzai/tomato>

UP OV No.	Characteristics	States of Expression
1	Seedling: anthocyanin coloration of hypocotyl	9
2	Plant: growth type	1
3	Only determinate growth type varieties: Plant: number of inflorescences on main stem (side shoots to be removed)	5
4	Stem: anthocyanin coloration of upper third	3
5	Only indeterminate growth type varieties: Stem: length of internode (between 1st and 4th inflorescence)	
6	Leaf: attitude (in middle third of plant)	5
7	Leaf: length	5
8	.....	..
9	.....	..

# Definition of a variety

## ■ Variety description

total 41 chars.



Char No.	Characteristics	States of Expression	Notes
1	First leaf: anthocyanin coloration of sheath	medium	5
2	First leaf: shape of apex	rounded	3
3	Foliage: intensity of green color	medium	2
4	Leaf: undulation of margin of blade	intermediate	2
5	Leaf: angle between blade and stem	small	3
6	Leaf: curvature of blade	slightly recurved	3
7	Stem: degree of zig-zag	slight	2
8	Tassel: time of anthesis	early to medium	4
..	.....	..	

**The variety description → defined by the expression of characteristics**

# Definition of a variety

## ■ Variety description

total 65 chars.



Char No.	Characteristics	States of Expression	Notes
1	Coleoptile: anthocyanin coloration	weak	3
2	Basal leaf: sheath color	light purple	3
3	Leaf: intensity of green color	medium	5
4	Leaf: anthocyanin coloration	present	9
5	Leaf: distribution of anthocyanin coloration	margin only	2
6	Leaf sheath: anthocyanin coloration	present	9
7	Leaf sheath: intensity of anthocyanin coloration	weak to medium	4
8	Leaf: pubescence of blade	weak to medium	4
9	.....		..

**The variety description → defined by the expression of characteristics**

# How to observe

# Characteristics

- ✓ **Type of expression of characteristics**
- ✓ **Type of assessment**

# Type of expression of characteristics

- QL
- QN
- PQ

Type of expression of characteristics: **QL**

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**QL**

**Qualitative**

Characteristics

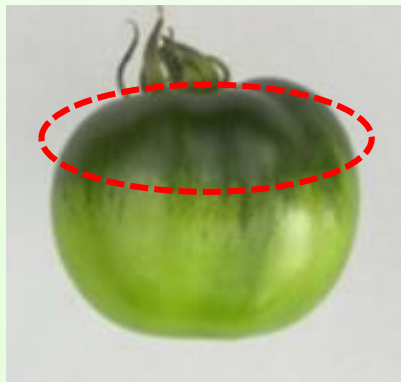
# Type of expression of characteristics: QL

- ✓ Expressed in discontinuous states
- ✓ As a rule, the characteristics are not influenced by environment

Fruit : green shoulder (before maturity)



Absent 1



Present 9

Stem: anthocyanin coloration of nodes (rice)



Absent 1



Present 9

# Type of expression of characteristics: QL

**Ligulate floret: incision of margin  
(Marigold)**



**Present 9**



**Absent 1**

**flower: presence of eye zone  
(Impatiens)**



**Absent 1**



**Present 9**



# Type of expression of characteristics: **QL**

## Tree: sex expression of flowers (persimmon)

16. (*)	(a) Tree: sex expression of flowers	Example variety	Notes
<b>QL</b>	female only	Fuyu, Hiratanenashi, Jiro	1
	female and male	Hanagoshi	2
	female, male and hermaphrodite	Kubogataobishi, Meotogaki	3



## ploidy (watermelon)

1	(*)	(+)	VG	Ploidy	Example variety	Notes
<b>QL</b>				diploid	SP 4, Sugar Baby, Yamato 3	2
				triploid	Boston, TRIX 313	3
				tetraploid		4

# Example of QL

---

- Anthocyanin coloration; absent, present
- Ploidy; diploid, triploid, tetraploid
- Sex; male, female
- Leaf margin; entire, serrate, dentate
- Flower type; single, double
- Color of vein; green, red
- Border of eye zone; sharp, diffuse
- Fruit: surface; smooth, bumpy

Type of expression of characteristics: **QN**

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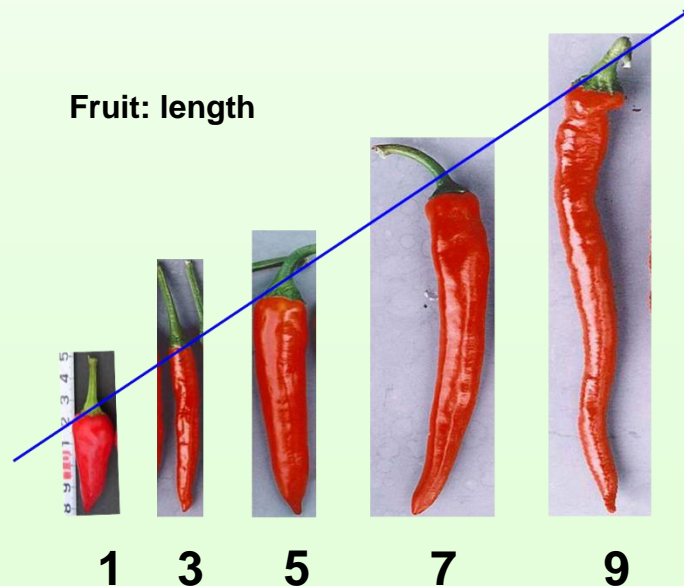
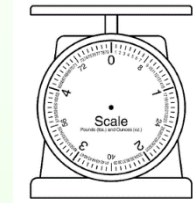
**QN**

**Quantitative**

Characteristics

# Type of expression of characteristics: QN

- ✓ are measurable on a one-dimensional scale and show continuous variation
- ✓ length, height, width, thickness, weight,...



## states of expression

- very short
- very short to short
- short
- short to medium
- medium
- medium to long
- long
- long to very long
- very long

## Notes

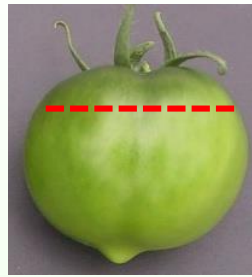
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

# Type of Expression: QN

Fruit: extent of green shoulder (before maturity)



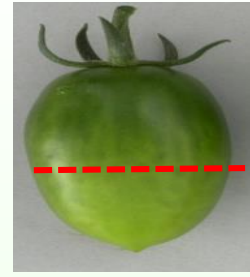
1  
very small



3  
small



5  
medium



7  
large

Fruit: ribbing at peduncle end



1  
absent or very  
weak

3  
weak

5  
medium

7  
strong

9  
very strong

# Type of expression of characteristics: **QN**

## Ear: length of peduncle



3



5



7

## Stem: anthocyanin coloration of brace roots



1



3



5



7



9

38

# Type of expression of characteristics: QN

“1-9” scale

notes	states
1	very small (or: absent or very small)
2	very small to small
3	<b>small</b>
4	small to medium
5	<b>medium</b>
6	medium to large
7	<b>large</b>
8	large to very large
9	very large

notes	states
1	very weak (or: absent or very weak)
2	very weak to weak
3	<b>weak</b>
4	weak to medium
5	<b>medium</b>
6	medium to strong
7	<b>strong</b>
8	strong to very strong
9	very strong

# Type of expression of characteristics: QN

## ■ Limited range

### “1-5” scale

Stem: attitude

note	states
1	erect
3	semi-erect
5	prostrate

### “1-4” scale

leaf blade: angle of apex

note	states
1	acute
2	Right-angled
3	moderately obtuse
4	strongly obtuse

### “1-3” scale

Flower: fragrance

note	states
1	Absent or very weak
2	weak
3	strong





# Example of QN

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- height, length, width, thickness, diameter, weight, size, number of flowers, firmness, time of flowering(harvest, maturity)
- intensity of green color, anthocyanin coloration, attitude of blade, hairiness, leaf: waxiness, leaf: waviness, leaf: undulation of margin, leaf: angle of apex, fragrance, glossiness, resistance to disease,

Type of expression of characteristics: PQ

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PQ

Pseudo Qualitative

Characteristics

# Type of expression of characteristics: PQ

- ✓ range of expression is at least partly continuous, but varies in more than one dimension
- ✓ shape, color

	English	Example variety	Note
18 (+)	Ligulate floret: shape		
PQ	flat	Teo	1
	intermediate	Ah-Kin	2
	trumpet	Tlalocan	3



flat



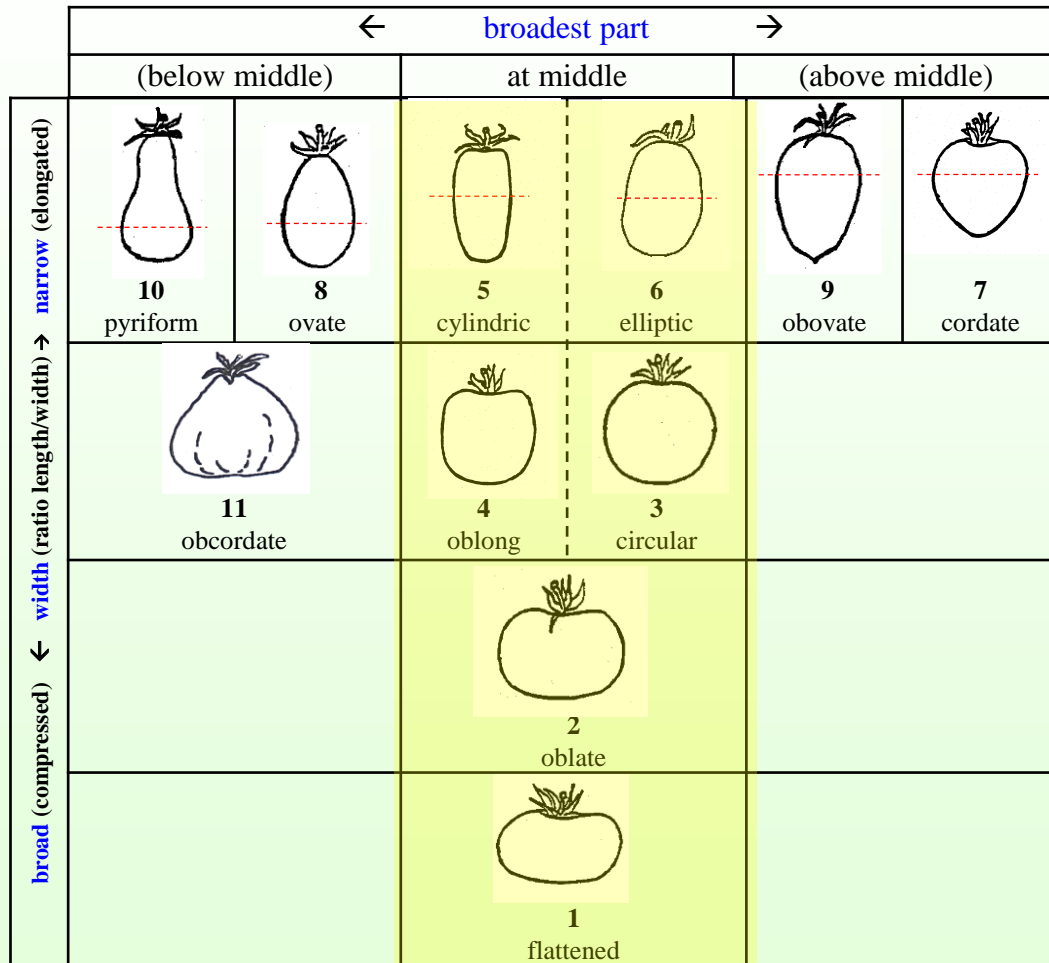
intermediate



trumpet

# Type of expression of characteristics: PQ

(Tomato)  
Fruit: shape in  
longitudinal  
section



← broadest part

width ↑

# Type of expression of characteristics: PQ

TG/44 Tomato

	English	Example variety	Note	
<b>28</b>	<b>Fruit: shape in longitudinal section</b>			
<b>(*)</b>				
<b>(+)</b>				
<b>PQ</b>		flattened	Campbell 28, Marmande VR	1
<b>VG</b>		oblate	Montfavet H 63.4, Montfavet H 63.5	2
		circular	Cerise, Moneymaker	3
		oblong	Early Mech, Peto Gro	4
		cylindric	Hypeel 244, Macero II, San Marzano 2	5
		elliptic	Alcaria, Castone	6
		cordate	Valenciano	7
		ovate	Dualrow, Soto	8
	obovate	Duquesa, Estelle Rimone, Rio Grande	9	
	pyriform	Europeel	10	
	obcordate	Cuore del Ponente, Magno	11	

# Type of expression of characteristics: PQ

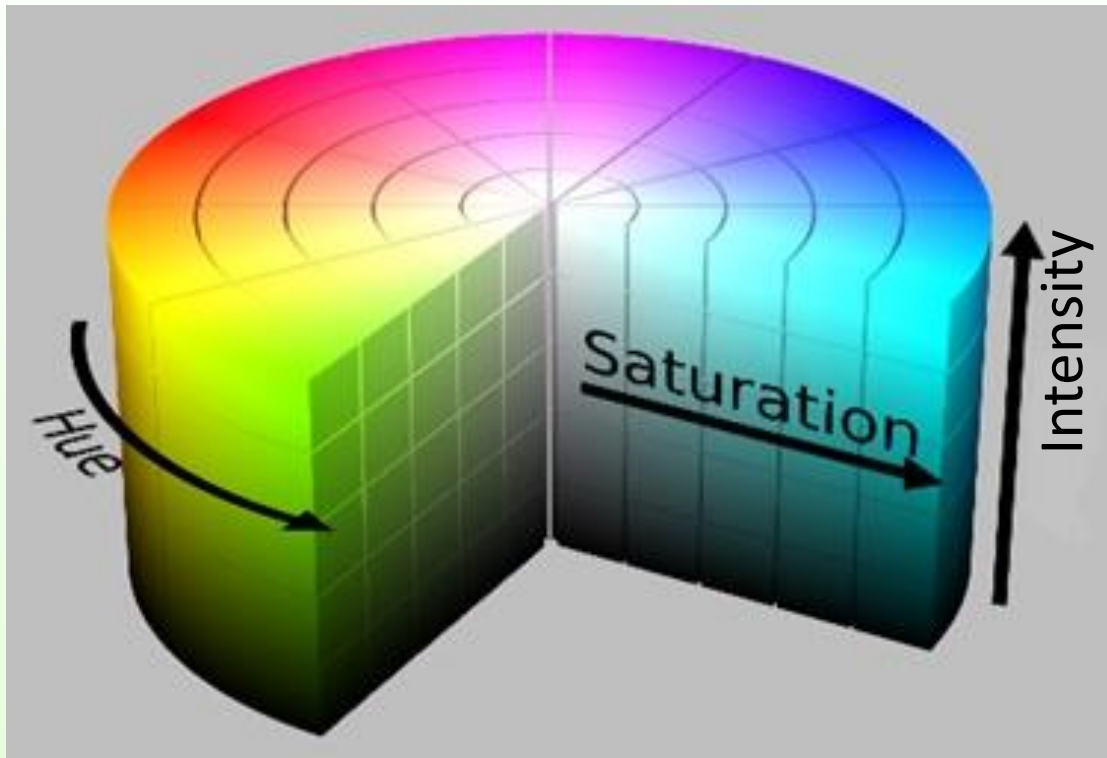
TGs for Rice

61 (* )	92 VS	Decorticated grain: color	Example varieties	Note
PQ		white	NTL1	1
		light brown	Bắc thơm số 7	2
		variegated brown		3
		dark brown		4
		light red		5
		red	DTL2	6
		variegated purple		7
		purple		
		dark purple/black		



Kaneda;2005

# Type of expression of characteristics: PQ



<https://codewords.recurse.com>

Color: three dimension

Hue



Saturation

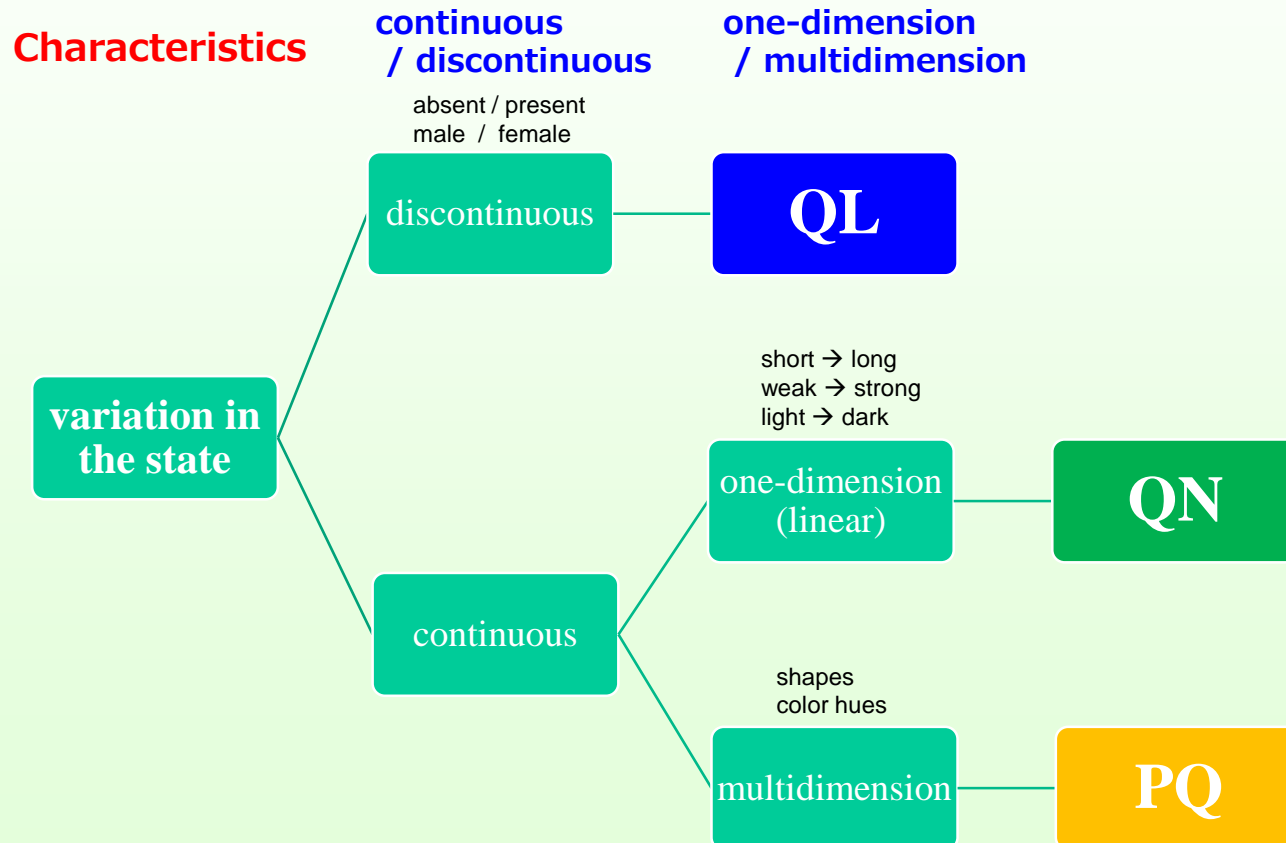


Intensity (Brightness)



# Type of expression of characteristics

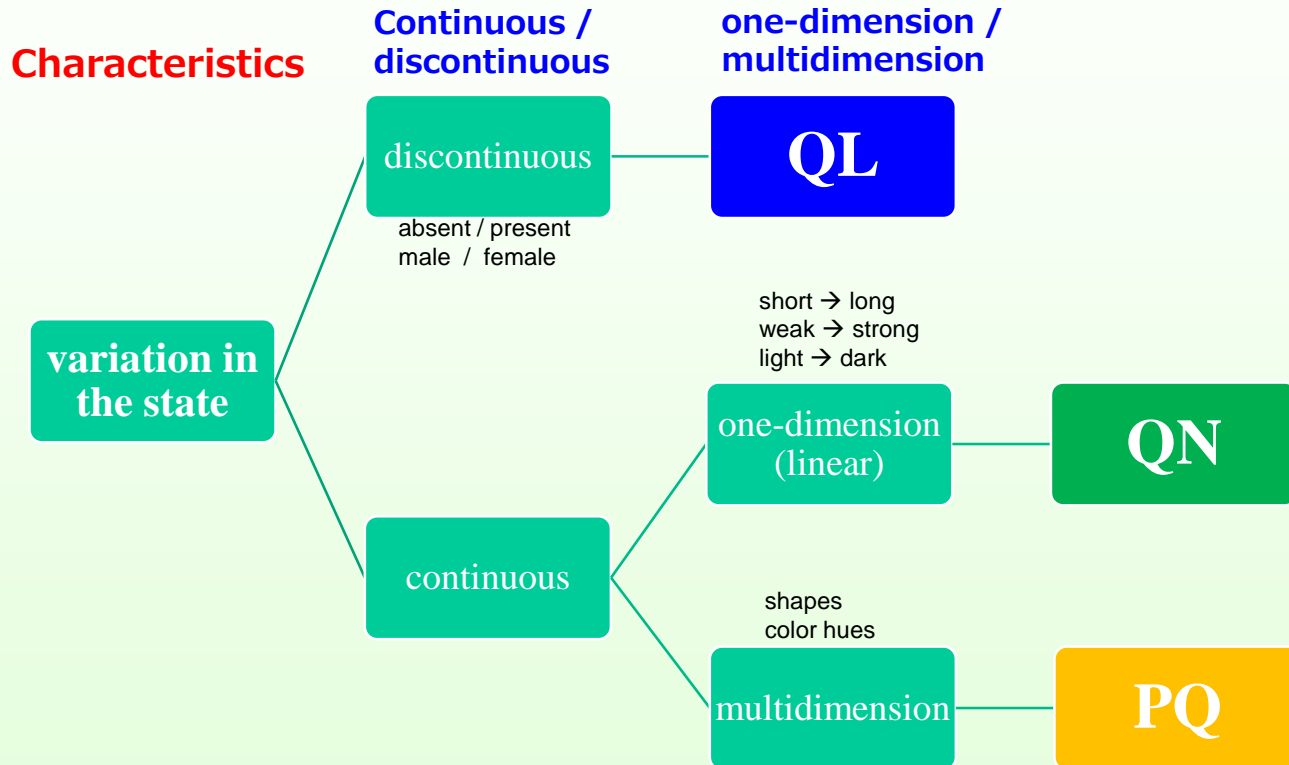
## Decision making chart





# Type of expression of characteristics

## Decision making chart



Leaf: intensity of green color **QN**



# Type of Expression

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**QL > PQ > QN**

**each type has different ability  
for distinctiveness**

# Type of assessment

- Method of Observation
- Type of record

# Type of assessment

			Corn
16. (*)	<b>VG</b>	<b>Ear: anthocyanin coloration of silks</b>	
QN		absent or very weak weak medium strong very strong	Bonus (SC), F7, F195, El Toro (SC), F257 F244, Gyöngymazsola (SC) W401 1 3 5 7 9
8.	<b>MG</b>	<b>Tassel: time of anthesis</b>	
PQ	(c)	very early very early to early early early to medium medium  medium to late late late to very late very late	Jazon, White Mirabell Goldene Königin, Yellow Pear Sungold Aichi First Daniela, Ferline, Montfavet H 63.5 Ozyrys Green Grape, Green Zebra AM1513 1 2 3 4 5  6 7 8 9

# Type of assessment

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## Method of observation

**M (measurement)** : using a ruler, weighing scales, dates, counts, etc.

**V (visual)** : visual observation includes smell, taste and touch

## Type of record

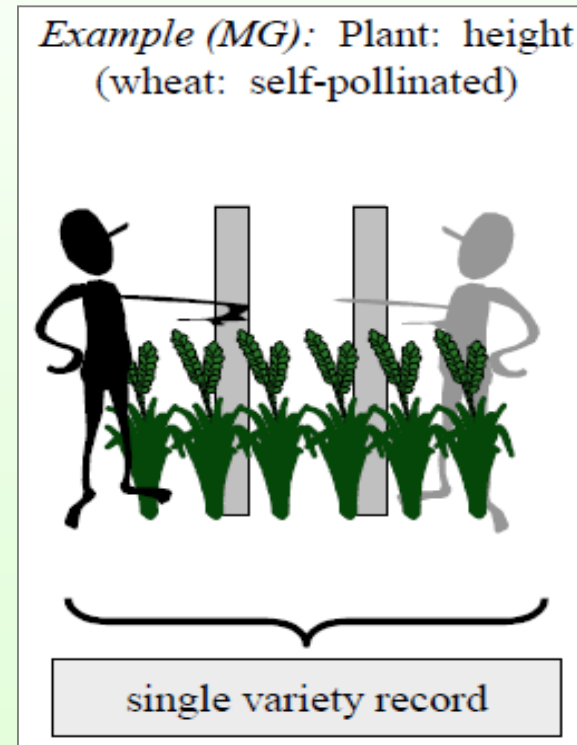
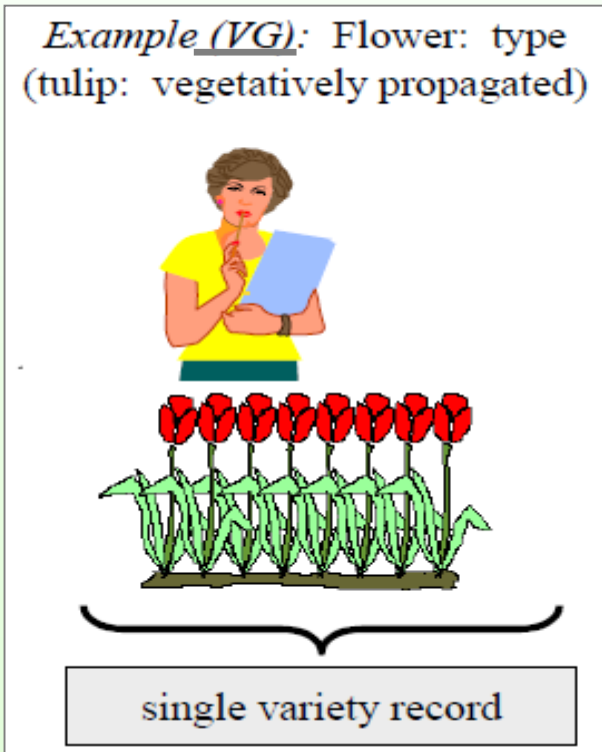
**G (Group)** : single record for a variety, or a group of plants or parts of plants

**S (Single)** : record for a number of single, individual plants or parts of plants

# Type of assessment

**VG :** Visual assessment by a single observation of a group of plants or parts of plants.

**MG :** Measurement by a single observation of a group of plants or parts of plants.



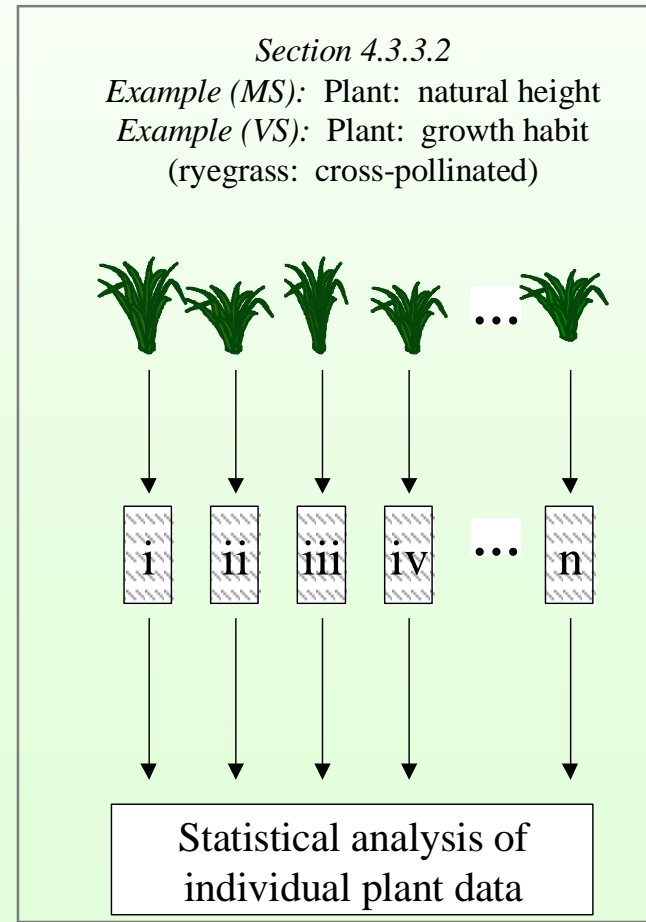
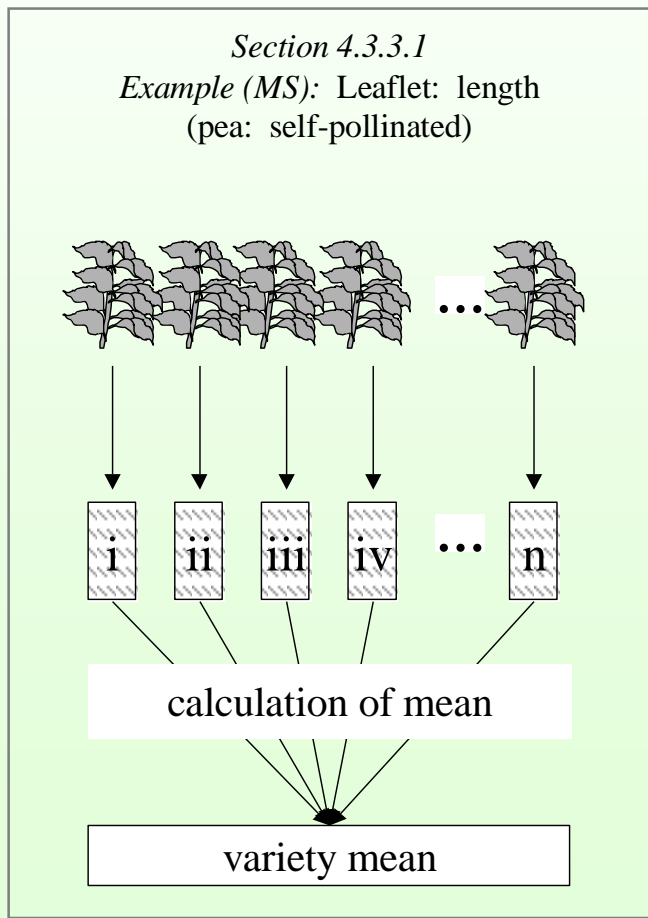
# Type of Assessment

<b>12.</b>	<b>VG</b>	<b>Leaf: intensity of green color</b>		
<b>QN</b>	<b>(a)</b>	<b>light</b>	<b>Macero II, Poncette, Rossol</b>	<b>3</b>
		<b>medium</b>	<b>Lucy</b>	<b>5</b>
		<b>dark</b>	<b>Allround, Daniela, Lorena, Red Robin</b>	<b>7</b>
<b>21.</b>	<b>VG</b>	<b>Fruit: green shoulder (before maturity)</b>		
<b>(*) (+)</b>				
<b>QL</b>	<b>(b)</b>	<b>absent</b>	<b>Felicia, Rio Grande, Trust</b>	<b>1</b>
		<b>present</b>	<b>Daniela, Montfavet H 63.5</b>	<b>9</b>
<b>37.</b>	<b>VG</b>	<b>Fruit: color (at maturity)</b>		
<b>(*) (+)</b>				
<b>PQ</b>	<b>(c)</b>	<b>cream</b>	<b>Jazon, White Mirabell</b>	<b>1</b>
		<b>yellow</b>	<b>Goldene Königin, Yellow Pear</b>	<b>2</b>
		<b>orange</b>	<b>Sungold</b>	<b>3</b>
		<b>pink</b>	<b>Aichi First</b>	<b>4</b>
		<b>red</b>	<b>Daniela, Ferline, Montfavet H 63.5</b>	<b>5</b>
		<b>brown</b>	<b>Ozyrys</b>	<b>6</b>
		<b>green</b>	<b>Green Grape, Green Zebra</b>	<b>7</b>

# Type of assessment

**MS** : Measurement of a number of individual plants or parts of plants.

**VS** : Visual assessment by observation of a number of individual plants or parts of plants.





# Type of Assessment

<b>43.</b>	<b>MS</b>	<b>Time of flowering</b>		
(+)				
<b>QN</b>		<b>early</b>	<b>Feria, Primabel</b>	<b>3</b>
		<b>medium</b>	<b>Montfavet H 63.5, Prisca</b>	<b>5</b>
		<b>late</b>	<b>Manific, Saint-Pierre</b>	<b>7</b>
<b>44.</b>	<b>MG</b>	<b>Time of maturity</b>		
(*) (+)				
<b>QN</b>		<b>very early</b>	<b>Dolcevita, Sungold, Sweet Baby</b>	<b>1</b>
		<b>early</b>	<b>Bianca, Rossol, Shiren</b>	<b>3</b>
		<b>medium</b>	<b>Gourmet, UC 82B</b>	<b>5</b>
		<b>late</b>	<b>Arletta, Durinta</b>	<b>7</b>
		<b>very late</b>	<b>Daniela</b>	<b>9</b>

# Type of Assessment

## ■ Type of assessment in Tomato TGs

	QL	PQ	QN	Total
VS	0	0	0	0
VG	11	3	19	33
VG/MS	0	0	12	12
MS	0	0	1	1
MG	0	0	1	1
	<b>11</b>	<b>3</b>	<b>33</b>	<b>47</b>

+ 23 QL : Disease char.

- **QL,PQ**; mainly Visual
- **QN**; Visual, Measurement