nak tuinbouw

NARO 農研機構
National Agriculture and Food Research Organization

CALIBRATION MANUAL

Harmonized with

Naktuinbouw and NCSS(/NARO)

DUS Test for Watermelon

Citrullus lanatus (Thunb.) Matsum. et Nakai.

Established in August 28, 2017

Comply with UPOV TG/142/5

CALIBRATION MANUAL
DUS Test for Watermelon

Contents

1. Purpose
   This Calibration Manual was established by collaborative activities between Naktuinbouw (Netherlands) and NCSS (/NARO) (Japan).
   The purpose of this Calibration Manual is to harmonize technique of DUS examination in the two countries and use it also internationally.

2. Use of this Calibration Manual
   This Calibration Manual indicates only methods of observation for morphological characteristics included in UPOV Test Guidelines.

3. Explanations covering several characteristics
   Characteristics containing the following key in the second column of the Table of Characteristics should be examined as indicated below:

   (a) Cotyledon: Observations on the cotyledon should be observed when the cotyledons are fully developed and before the development of the first leaf: the surface is flat and the attitude is horizontal.

   (b) Leaf blade: Observations on the leaf blade should be made on fully developed leaves on the main vine, from the 10th to the 15th leaf, during fruit set, before the fruits are developed.

   (c) Fruit: Observations on the fruit should be made on first well developed, mature fruits.

   (d) Seed: Observations on the seed should be recorded on fully developed, mature seeds harvested from the fruit.

4. Grouping characteristics:

The following have been agreed as useful grouping characteristics:

(a) Ploidy (characteristic 1)

(b) Fruit: weight (characteristic 11)

(c) Fruit: shape in longitudinal section (characteristic 12)

(d) Fruit: ground color of skin (characteristic 16)

(e) Fruit: width of stripes (characteristic 19)

(f) Fruit: margin of stripes (characteristic 22)

(g) Fruit: main color of flesh (characteristic 28)

(h) Only diploid and tetraploid varieties: Seed: length (characteristic 31)

(i) Only diploid and tetraploid varieties: Seed: ground color of testa (characteristic 33)

5. Disclaimer

The information contained in this Calibration Manual is for general information purposes only. The information is provided by Naktuinbouw and NCSS(/NARO) and while we endeavor to keep the information up to date and correct, we make no representations or warranties of any kind, express or implied, about the completeness, accuracy, reliability, suitability or availability with respect to the Calibration Manual or the information contained on the Calibration Manual for any purpose. Any reliance you place on such information is therefore strictly at your own risk.

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
1 (*) (+)	**VG**	**Ploidy**				
QL		diploid	SP 4, Sugar Baby, Yamato 3	SP 4, Sugar Baby, Yamato 3	SP 4, Sugar Baby, Yamato 3	2
		triploid	Boston, TRIX 313	Boston, TRIX 313	Boston, TRIX 313	3
		tetraploid				4

Remarks

Stage of observation: Testing for ploidy involves a laboratory test. Depending on the method the laboratory applies, (young) leaf material has to be supplied (a, b, c). Triploid varieties can be tested in a trial on the fruits (d).

Method of observation: Ploidy level may be detected by several methods:

a. by counting chromosomes of cells under the microscope;

b. by counting the number of chloroplasts of stomatal guard cells using a leaf peel under the microscope;

c. by flow cytometry.

d. triploid varieties show a whitish seed coat without embryo and no seeds with embryo.

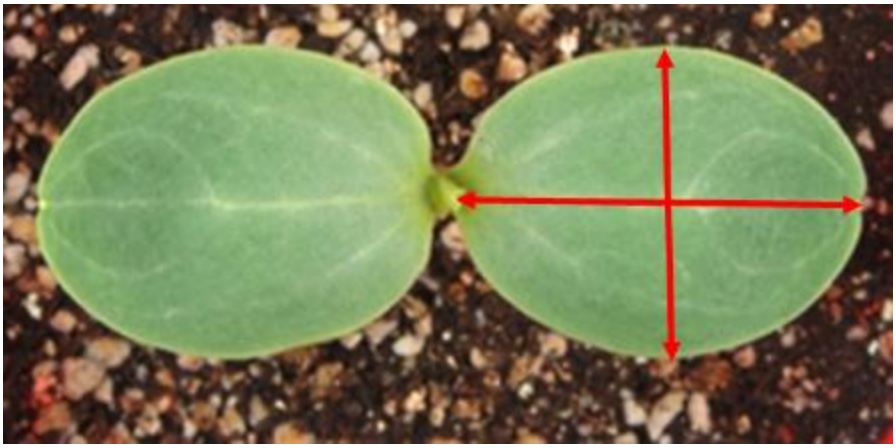
6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
2	**MS/ VG**	**Cotyledon: size**				
QN	**(a)**	small	Crimson Glory, Kanro, Rapid	Crimson Glory, Kanro, Rapid		3
		medium	Crisby, Granit, Panni, Yamato 3	Crisby, Granit, Panni, Yamato 3	Yamato 3	5
		large	Farao, Kurobe, Royal flesh hybrid	Farao, Kurobe, Royal flesh hybrid	Kurobe	7

Remarks

VG method: Visual observation of a group of seedlings at the right stage. Calibrate using example varieties.

MS method: Measure the maximum length and width of the cotyledon. The size could be assumed by the product of the length and width of the cotyledon. Calibrate using example varieties.

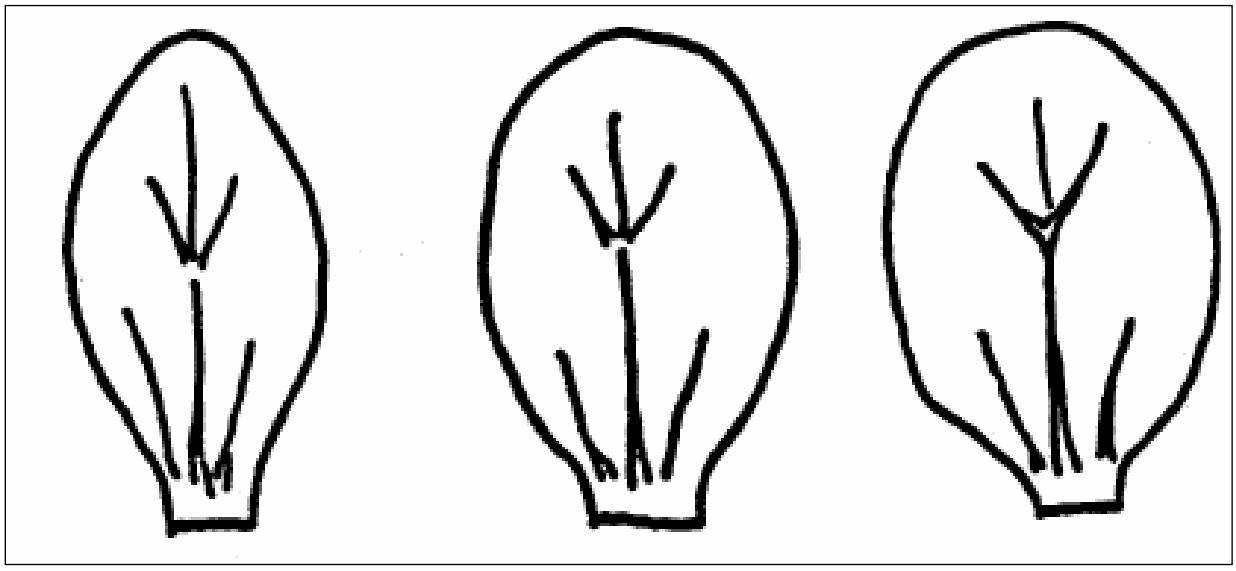


6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
3 (+)	**VG**	**Cotyledon: shape**				
QN	**(a)**	narrow elliptic	Kahô	Kahô	Kahô	1
		medium elliptic	Crimson Sweet, Farao, Napsugár, Yamato 3,	Crimson Sweet, Farao, Napsugár, Yamato 3,	Yamato 3	2
		broad elliptic	Kanro	Kanro	Fumin (tetraploid)	3

Remarks

Visual observation of a group of seedlings at the right stage. Calibrate using example varieties.



1: narrow elliptic 2: medium elliptic 3:broad elliptic

1
narrow elliptic

2
medium elliptic

3
broad elliptic

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
4	**VG**	**Cotyledon: intensity of green color**				
QN	**(a)**	light	À graine rouge à confire à chair verte, Shin Kurobe 7	À graine rouge à confire à chair verte, Shin Kurobe 7	Shin Kurobe 7	1
		medium	Jenny, Yamato 3	Jenny, Yamato 3	Yamato 3	3
		dark	Boston, Kahô, SP 4	Boston, Kahô, SP 4	Kahô	5

Remarks

Visual observation of a group of seedlings at the right stage. Calibrate using example varieties.

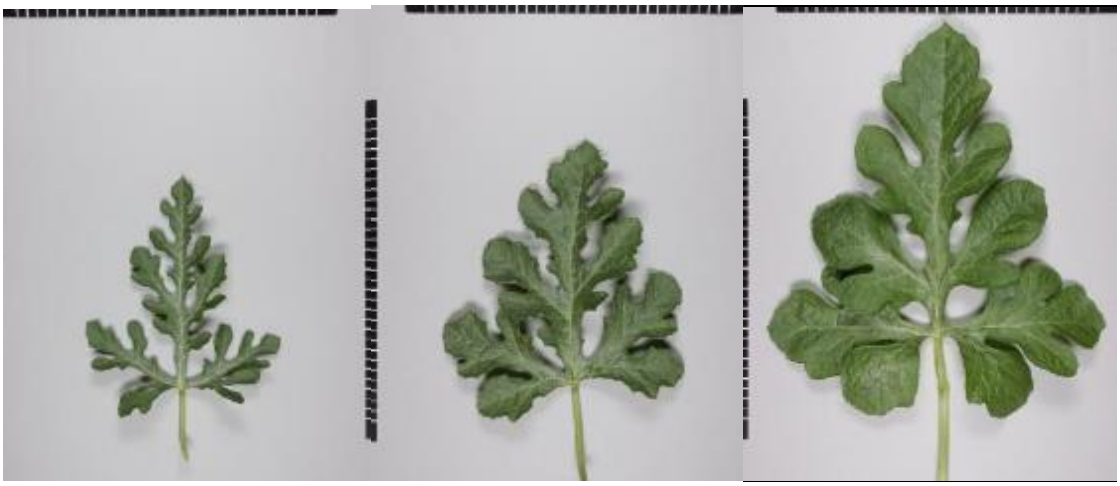
6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
5	**VG**	**Leaf blade: size**				
QN	**(b)**	small	SP 1, SP 4	SP 1, SP 4	Yamato 3	1
		medium	Sugar Baby	Sugar Baby	Miyako 3	3
		large	Topgun	Topgun		5

Remarks

VG method: Observe the total surface of the leaves to determine the size. Calibrate using example varieties.

MS method: When there are not enough example varieties in the trial, observations can be conducted by measurement. Measure the length and width of the leaf blade. The size could be assumed by the product of the length and width of the leaf blade. Calibrate using example varieties.



1
small

3
medium

5
large

These images serve only to illustrate the variation present in the crop and should not be used as an absolute reference

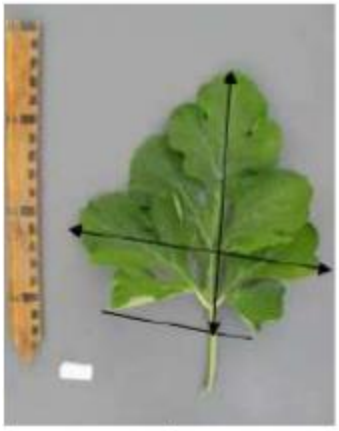
6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
6 (+)	**VG/ MS**	**Leaf blade: ratio length/width**				
QN	**(b)**	low	Kanro	Kanro		1
		medium	Sugar Baby, Yamato 3	Sugar Baby, Yamato 3		2
		high	Kurobe	Kurobe		3

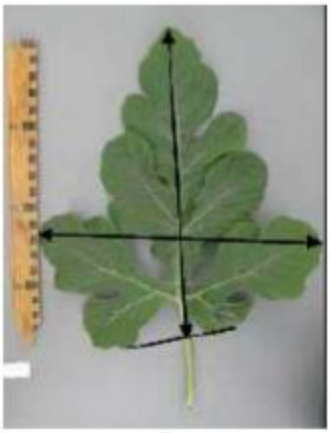
Remarks

VG method: Observe the total surface of the leaves to determine the ratio of length/width. Calibrate using example varieties.

MS method: Calculate the average ratio of the length/width of the leaf. Calibrate using example varieties.



1
low



2
medium

3
high

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
7	**VG**	**Leaf blade: color**				
PQ	**(b)**	yellowish green	Baby Fun, Okan	Baby Fun, Okan		1
		green	Crimson Sweet, Yamato 3	Crimson Sweet, Yamato 3		2
		greyish green	Sugar Baby	Sugar Baby		3
		bluish green	SP 4	SP 4		4

Remarks

Observe the total surface of the leaves to determine the color. Calibrate using example varieties.

2
green

3
greyish green

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
8 (*) (+)	**VG**	**Leaf blade: degree of lobing**				
QN	**(b)**	absent or very weak	Sunshade	Sunshade		1
		weak	Estrella, Karistan	Estrella, Karistan	Daisen	3
		medium	Crimson Sweet, Crisby	Crimson Sweet, Crisby	Yamato 3	5
		strong	Cadanz	Cadanz	Fumin	7
		very strong	SP 1	SP 1		9

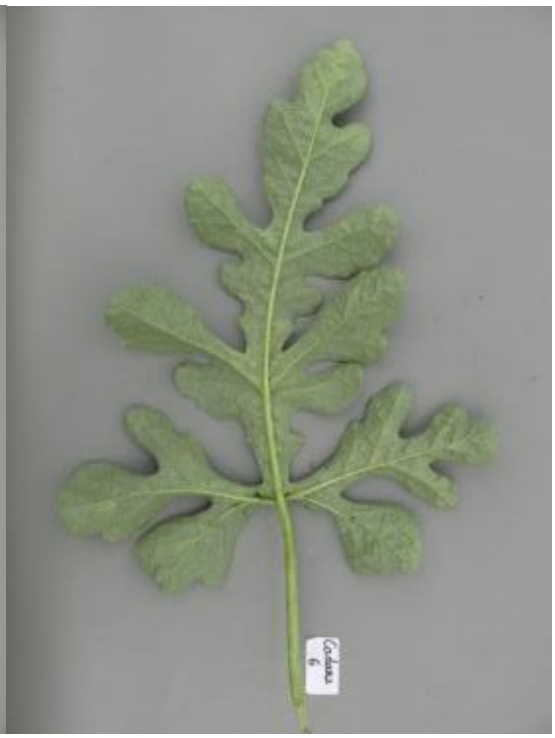
Remarks

Observe the total surface of the leaves to determine the degree of lobing. Calibrate using example varieties.

1
absent or very weak

3
weak

5
medium



7
strong

9
very strong

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
9 (+)	**VG**	**Leaf blade: blistering**				
QN	**(b)**	weak	Tabata, Estel	Tabata, Estel		1
		medium	Yamato 3	Yamato 3		2
		strong	Klondike Striped II, Sakura	Klondike Striped II, Sakura		3

Remarks

Observe the total surface of the leaves to determine the blistering. Calibrate using example varieties.

This image serves only to illustrate the variation present in the crop and should not be used as an absolute reference.

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
10	**VG**	**Leaf blade: color of veins**				
QL	**(b)**	green	Asahiyamato	Asahiyamato		1
		yellow	Taiyô	Taiyô		2

Remarks

Visual observation.

1
green
Asahiyamato

2
yellow
Taiyô

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
11 (*)	**MG/ MS**	**Fruit: weight**				
QN	**(c)**	very low	Monaco, New Hampshire Midget	Monaco, New Hampshire Midget		1
		very low to low	Mini, Petite Perfection	Mini, Petite Perfection		2
		low	Angela	Angela	Kodama (F1)	3
		low to medium	Pasion, Sugar Baby	Pasion, Sugar Baby	Otome	4
		medium	Boston	Boston	Asahiyamato	5
		medium to high	Crimson Sweet, Panonnia	Crimson Sweet, Panonnia	Fumin	6
		high	Fabiola	Fabiola	Yamato cream 1	7
		high to very high	Jubilee	Jubilee	Kurobe	8
		very high	Carolina Cross, Cobb's Gem, Florida Giant	Carolina Cross, Cobb's Gem, Florida Giant		9

Remarks

Assess the average weight of the first well developed fruit from each of 10 plants. Calibrate using example varieties.

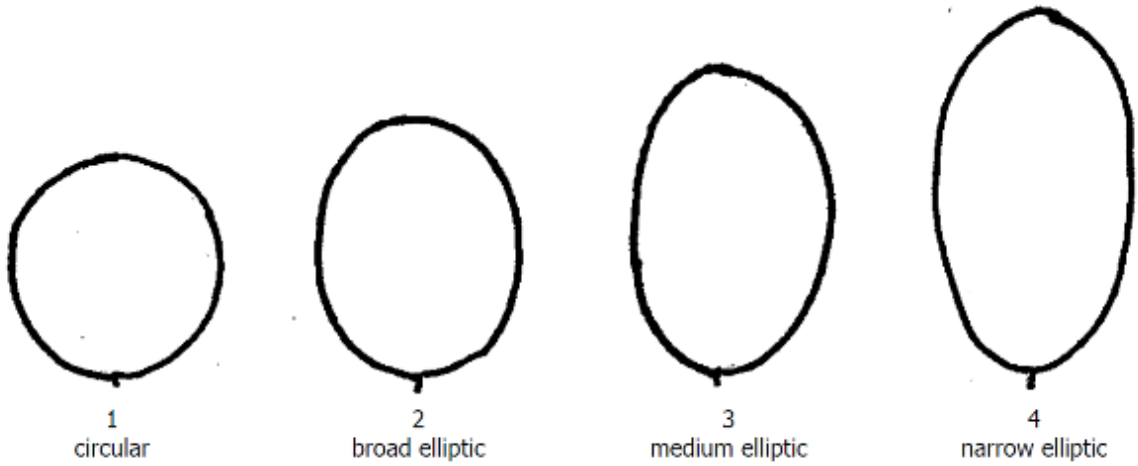
6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
12 (*) (+)	**VG**	**Fruit: shape in longitudinal section**				
QN	**(c)**	circular	Camilla, Kanro	Camilla, Kanro		1
		broad elliptic	Fumin, Gray Belle, Yellow Baby, Zorba	Fumin, Gray Belle, Yellow Baby, Zorba	Fumin	2
		medium elliptic	Congo, Kurobe, Picnic	Congo, Kurobe, Picnic	Kurobe	3
		narrow elliptic	All Sweet, Charleston Gray	All Sweet, Charleston Gray	Charleston Gray	4

Remarks

Visual observation. Calibrate using example varieties.

1 circular | 2 broad elliptic | 3 medium elliptic | 4 narrow elliptic

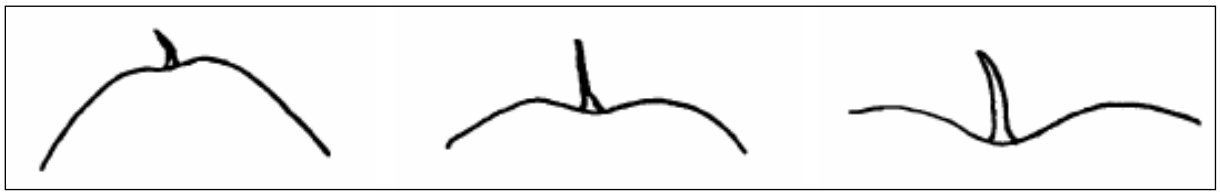


6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
13 (+)	**VG**	**Fruit: depression at base**				
QN	**(c)**	absent or very shallow				1
		shallow	Kahô, Yellow Baby	Kahô, Yellow Baby	Mikasa	2
		medium	Triple Sweet, Yamato 3	Triple Sweet, Yamato 3	Yamato 3	3
		deep	À graine rouge à confire à chair verte, Kanro	À graine rouge à confire à chair verte, Kanro	Miyako 3	4
		very deep				5

Remarks

Visual observation. Calibrate using example varieties.



2: shallow 3: medium 4: deep

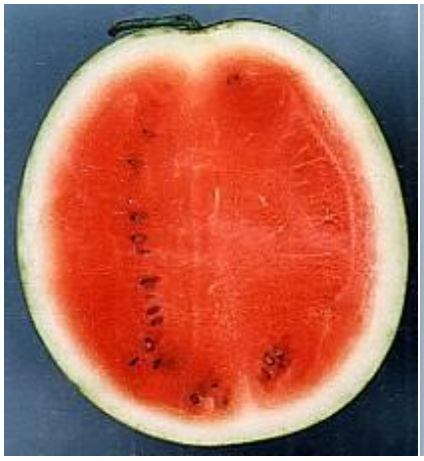
6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
14	**VG**	**Fruit: shape of apical part**				
(+)						
PQ	**(c)**	truncate	Cream Sinka, Kanro	Cream Sinka, Kanro		1
		truncate to rounded				2
		rounded	Glory, Sugar Baby, Toro, Yamato 3	Glory, Sugar Baby, Toro		3
		rounded to acute				4
		acute	Kahô	Kahô		5

Remarks

Visual observation. Calibrate using example varieties.

1
truncate



3
rounded

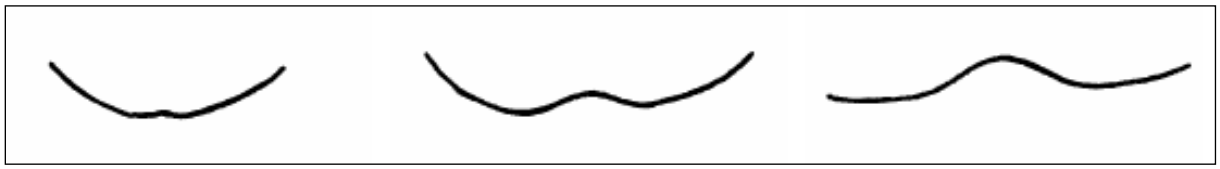
5
acute

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
15 (+)	**VG**	**Fruit: depression at apex**				
QN	**(c)**	absent or very shallow				1
		shallow	Burpee Hybrid, Kahô, Valdoria	Burpee Hybrid, Kahô, Valdoria		2
		medium	Asahi Miyako, Fumin	Asahi Miyako, Fumin		3
		deep	Cobb's Gem	Cobb's Gem		4
		very deep				5

Remarks

Visual observation. Calibrate using example varieties.



2
shallow

3
medium

4
deep

2
shallow

4
deep

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
16 (*) (+)	**VG**	**Fruit: ground color of skin**				
PQ	**(c)**	yellow	Taiyô	Taiyô	Taiyô	1
		very light green	Ipanema	Ipanema	Arizona	2
		very light green to light green	Napsugar	Napsugar		3
		light green	Tigre	Tigre	Yamato 3	4
		light green to medium green	Pepsin	Pepsin		5
		medium green	Ovation, Talete	Ovation, Talete	Asahiyamato	6
		medium green to dark green	Odem, Resistant, Sweet Marvel	Odem, Resistant, Sweet Marvel	Miyako 3	7
		dark green	Sugar Baby	Sugar Baby		8
		dark green to very dark green	Augusta, Rocio	Augusta, Rocio		9
		very dark green				10

Remarks

Visual observation. Calibrate using example varieties.

The ground color is defined as the lighter color and the color of the stripes is defined as the darker color.

1
yellow

2
very light green

3
very light green to light green

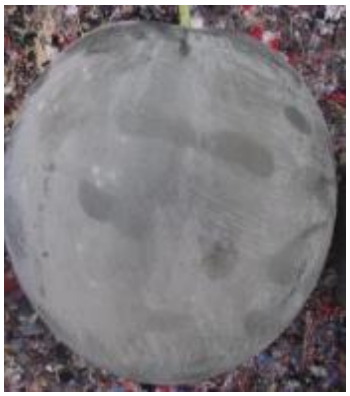
4
light green

5
light green to medium

6
medium green

7
medium green to dark green

8
dark green



9
dark green to very dark green

These images serve only to illustrate the variation present in the crop and should not be used as an absolute reference.

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
17 (+)	**VG**	**Fruit: conspicuousness of veining**				
QN	**(c)**	inconspicuous or very weakly conspicuous	Napsugar	Napsugar		1
		weak				2
		medium	Crimson Sweet	Crimson Sweet		3
		strong	Trix Palomar	Trix Palomar		4
		very strong				5

Remarks

Visual observation. Calibrate using example varieties.

1
inconspicuous or very weakly conspicuous

2
weak

3
medium

4
strong

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
18 (*) (+)	**VG**	**Fruit: pattern of stripes**				
PQ	**(c)**	only one colored	Congo	Congo		1
		one colored and veins	Trix Palomar	Trix Palomar		2
		one colored, veins and marbled	Boston	Boston		3
		one colored and marbled	Jenny	Jenny		4
		two colored, veins and marbled	Crisby	Crisby		5
		only veins				6

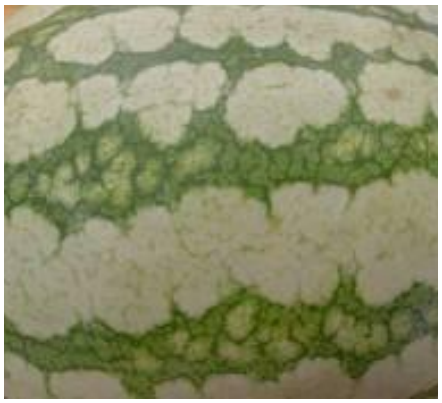
Remarks

Visual observation. Calibrate using example varieties.

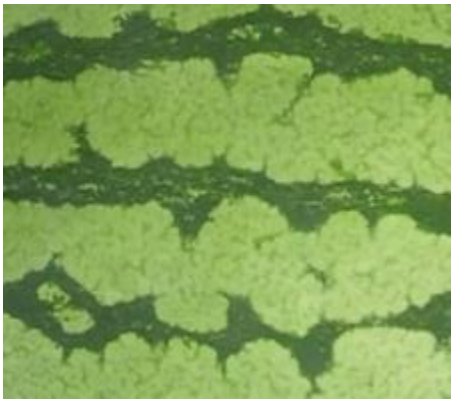
If the color of inside and outside of veins are the same, it would be evaluated as “6 only vein”. In that case, other characteristics on stripes are not observed for that variety. (Except characteristic 21: ‘Fruit: conspicuousness of stripes’. The note should be “1 inconspicuous or very weakly conspicuous” in that case.)

1
only one colored

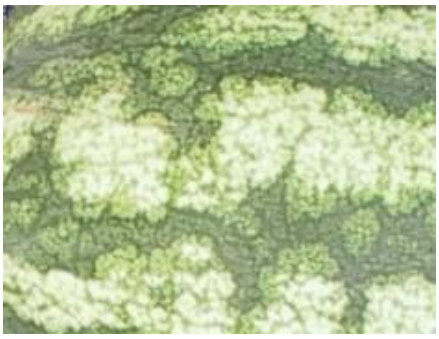
2
one colored and veins



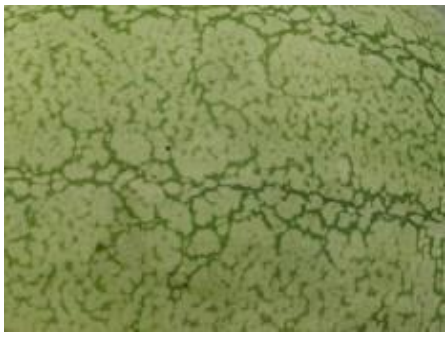
3
one colored, veins and marbled



4
ne colored and marbled



5
two colored, veins and marbled



6
only veins

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
19 (*) (+)	**VG**	**Fruit: width of stripes**				
QN	**(c)**	very narrow	SP 4, Tiny Orchid	SP 4, Tiny Orchid		1
		narrow	Boston	Boston		3
		medium	Crimson Sweet	Crimson Sweet		5
		broad	Sangria	Sangria		7
		very broad	All Sweet	All Sweet		9

Remarks

The ground color is defined as the lighter color and the color of the stripes is defined as the darker color.

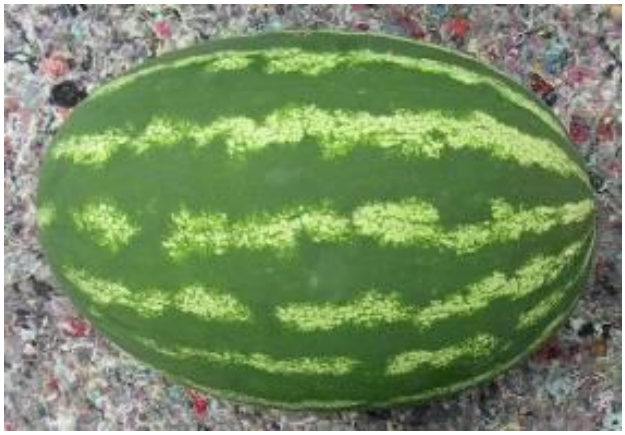
VG method: Visual observation. Calibrate using example varieties.

MS method: When there are not enough example varieties in the trial, observations can be conducted by measurement. Measure the middle part of the stripe. Calibrate using example varieties.

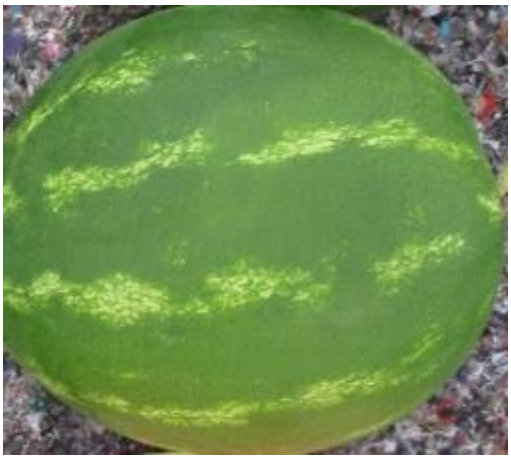
1
very narrow

3
narrow

5
medium



7
broad



9
very broad

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
20	**VG**	**Fruit: main color of stripes**				
(+)						
PQ	**(c)**	yellow				1
		very light green				2
		light green				3
		medium green				4
		dark green				5
		very dark green				6

Remarks

Visual observation. Calibrate using example varieties.

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
21 (*) (+)	**VG**	**Fruit: conspicuousness of stripes**				
QN	**(c)**	inconspicuous or very weakly conspicuous	Augusta	Augusta		1
		weak	Odem	Odem		2
		medium	Trix Palomar	Trix Palomar		3
		strong	Jenny	Jenny		4
		very strong	A graine rouge à confire à chair verte	A graine rouge à confire à chair verte		5

Remarks

Visual observation. Calibrate using example varieties.

1
inconspicuous or very weakly conspicuous

2
weak

3
medium

4
strong

5
very strong

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
22 (*) (+)	**VG**	**Fruit: margin of stripes**				
QN	**(c)**	diffuse	Crimson Glory, Crisby	Crimson Glory, Crisby	Daisen	1
		medium	Crimson Sweet	Crimson Sweet	Asahiyamato	2
		sharp	Jenny, Jubilee	Jenny, Jubilee	Sugar Baby	3

Remarks

Visual observation. Calibrate using example varieties.

1
diffuse

2
medium

3
sharp

6. Method of observation (example of characterization)

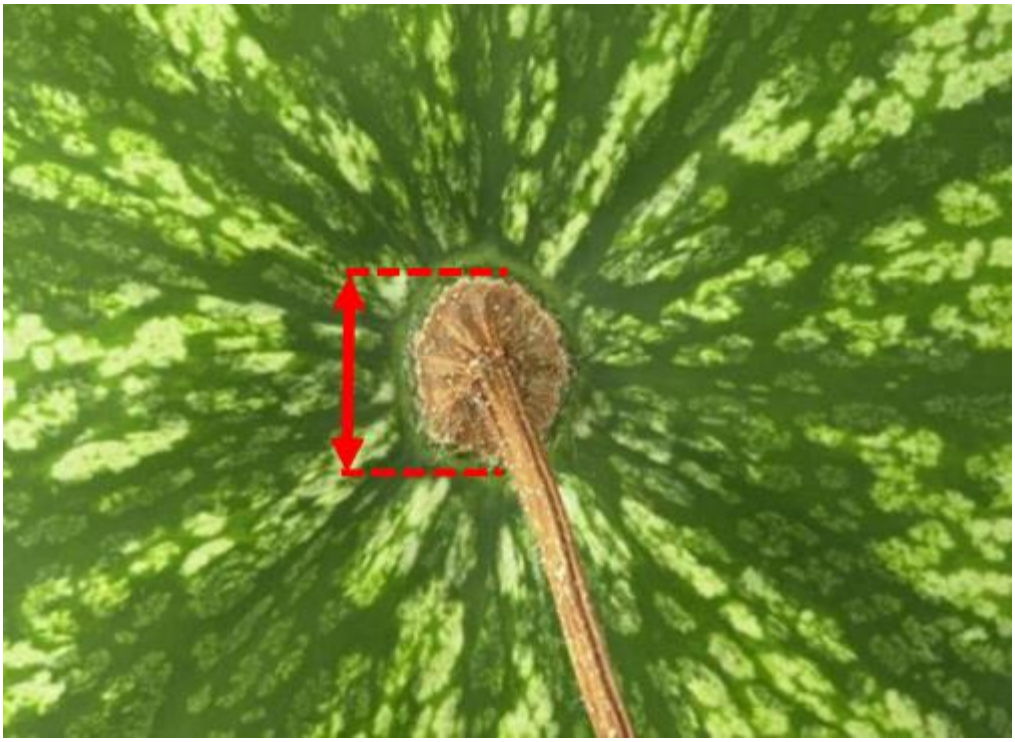
		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
23 (+)	**VG**	**Fruit: size of insertion of peduncle**				
QN	**(c)**	small	Charleston Gray, Sugar Bush	Charleston Gray, Sugar Bush	Charleston Gray	3
		medium	Fumin, Picnic	Fumin, Picnic	Fumin	5
		large	Dixie Queen, Kanro	Dixie Queen, Kanro		7

Remarks

The size of the insertion of the peduncle is absolute and not relative to fruit size.

VG method: Visual observation. Calibrate using example varieties.

MS method: When there are not enough example varieties in the trial, observations can be conducted by measurement. Measure the maximum diameter of insertion of peduncle. Calibrate using example varieties.



6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
24 (+)	**VG**	**Fruit: size of pistil scar**				
QN	**(c)**	small	Charleston Gray, Daisen	Charleston Gray, Daisen	Daisen	3
		medium	Yamato 3	Yamato 3	Yamato 3	5
		large	Kanro, Trix Palomar	Kanro, Trix Palomar		7

Remarks

The size of the pistil scar is absolute and not relative to fruit size.

VG method: Visual observation. Calibrate using example varieties.

MS method: When there are not enough example varieties in the trial, observations can be conducted by measurement. Measure the maximum diameter of the pistil scar. Calibrate using example varieties.

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
25	**VG**	**Fruit: grooving**				
(+)						
QN	**(c)**	absent or very weak	Sugar Baby	Sugar Baby		1
		weak	Augusta, Kanro, Rapid	Augusta, Kanro, Rapid		2
		medium	Asahi Miyako Hybrid, Bego	Asahi Miyako Hybrid, Bego		3
		strong	Marsowszky, Napsugár, Panni	Marsowszky, Napsugár, Panni		4

Remarks

Visual observation. Calibrate using example varieties.

1
absent or very weak

3
medium

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
26 (+)	**VG**	**Fruit: waxy layer**				
QN	**(c)**	absent or very weak	Betica	Betica		1
		medium	Sugar Baby	Sugar Baby		3
		very strong	Red Star, Romanza	Red Star, Romanza		5

Remarks

Visual observation. Calibrate using example varieties.

1	3	5
absent or very weak	medium	very strong

6. Method of observation (example of characterization)

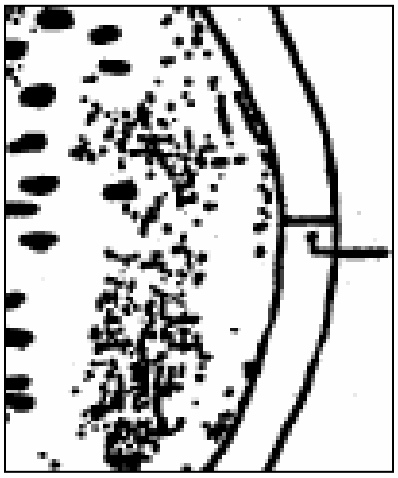
		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
27 (*) (+)	**VG/ MS**	**Fruit: thickness of pericarp**				
QN	**(c)**	very thin	Bibo, Tiny Orchid, Luciano	Bibo, Tiny Orchid, Luciano		1
		thin	À graine rouge à confire à chair verte, Beni-kodama, Jenny, Kahô, Kassai	À graine rouge à confire à chair verte, Beni-kodama, Jenny, Kahô, Kassai	Kahô	3
		medium	Panonnia, Sugar Baby, Sugar Belle, Yamato 3	Panonnia, Sugar Baby, Sugar Belle, Yamato 3	Yamato 3	5
		thick	Charleston Gray, Crimson Sweet, Kurobe, Triple Sweet, Sunrise	Charleston Gray, Crimson Sweet, Kurobe, Triple Sweet, Sunrise	Kurobe	7
		very thick	Coles Early, Kholodok	Coles Early, Kholodok		9

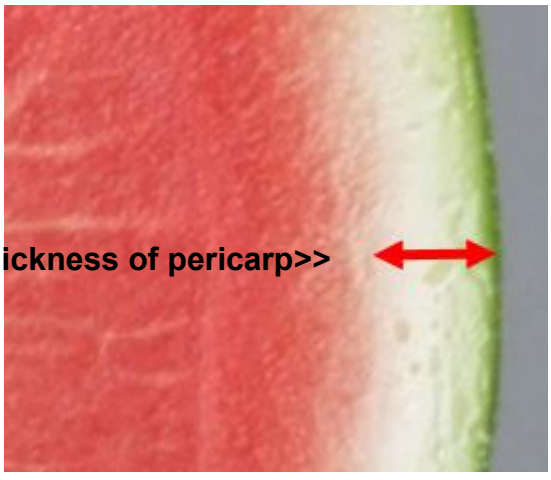
Remarks

Pay attention to the ripeness of selected fruits: do not use too young or too old fruits. Attention: the thickness of pericarp is absolute and not relative to fruit size.

VG method: Observe average well developed fruits that have been cut in longitudinal section. Calibrate using example varieties.

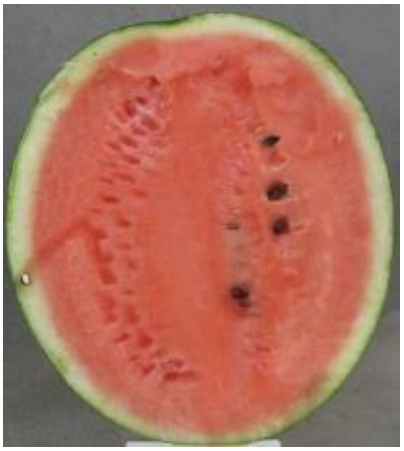
MG method: Measure the width of the middle part of the pericarp. Calibrate using example varieties.





1
very thin

3
thin



5
medium

7
thick

9
very thick

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
28 (*) (+)	**VS**	**Fruit: main color of flesh**				
PQ	**(c)**	white	SP 4, SP 1, Yamato Cream 3	SP 4, SP 1, Yamato Cream 3		1
		yellow	Napsugár, Yamato Cream 1	Napsugár, Yamato Cream 1	Yamato Cream 1	2
		orange	Kahô, Tendersweet	Kahô, Tendersweet	Sweet siberian	3
		pink	Sadul	Sadul	Kurobe	4
		pinkish red	Bingo, Crimson Sweet	Bingo, Crimson Sweet	Miyako 3	5
		red	Asahi Miyako Hybrid, Sugar Baby, Topgun	Asahi Miyako Hybrid, Sugar Baby, Topgun	Fumin	6
		dark red	Dixie Lee	Dixie Lee		7

Remarks

Observe average well developed fruits that have been cut in longitudinal section. Calibrate using example varieties. Pay attention to the ripeness of selected fruits: do not use too young or too old fruits.

1
white

2
yellow

3
orange

4
pink

5
pinkish red

6
red

7
dark red

These images for pink and red colors serve only to illustrate the variation present in the crop and should not be used as an absolute reference.

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
29	**VG**	**Only triploid varieties: Seed coat: size**				
QN	**(d)**	small	Petite Perfection	Petite Perfection		2
		medium	Boston, Valdoria, Sweet Sun	Boston, Valdoria, Sweet Sun		3
		large	Ortal, Tigre, Pasion	Ortal, Tigre, Pasion		4

Remarks

Cut the fruits and harvest fully developed seed coat in order to judge the size of the seed coat. Pay attention to the ripeness of selected fruits: do not use too young or too old fruits.

VG method: Visual observation. Calibrate using example varieties.

MS method: When there are not enough example varieties in the trial, observations can be conducted by measurement. The size could be assumed by the product of the length and width of the seed.

2	3	4
small	medium	large
Petite Perfection	Boston	Ortal

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
30	**VG**	**<u>Only diploid and tetraploid varieties:</u> Fruit: number of seeds**				
QN	**(d)**	none or few	Tanenashi Kôyô	Tanenashi Kôyô		1
		medium	Miyako 3	Miyako 3		2
		many	Fumin	Fumin		3

Remarks

Pay attention to the ripeness of selected fruits: do not use too young or too old fruits.

VG method: Observe average well developed fruits that have been cut in longitudinal section. Calibrate using example varieties.

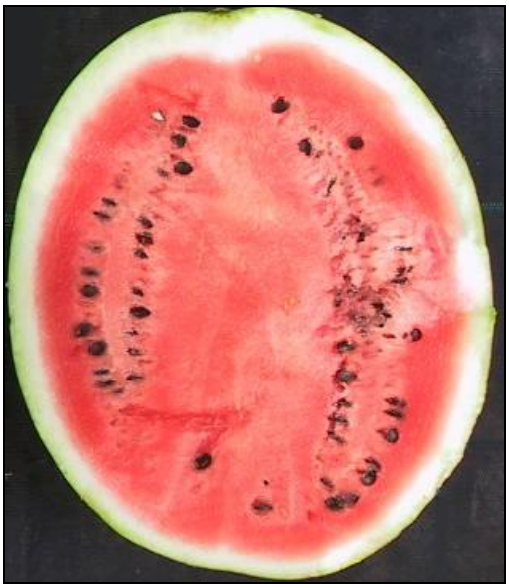
MS method: When there are not enough example varieties in the trial, observations can be conducted by measurement. Count the number of seeds. Calibrate using example varieties.

1

none or few

2

medium



3

many

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
31 (*)	**VG/ MS**	**Only diploid and tetraploid varieties: Seed: length**				
QN	**(d)**	very short	Kudam	Kudam		1
		short	Panonnia, Tabata	Panonnia, Tabata		3
		medium	Sugar Baby	Sugar Baby		5
		long	Charleston Gray, Kurobe	Charleston Gray, Kurobe		7
		very long	Malali, Wanli	Malali, Wanli		9

Remarks

Cut the fruits and harvest fully developed seeds. Make observations on the cleaned and dried seeds. It is advisable to harvest seed sample of the example varieties for purpose of seed collection.

VG method: Visual observation. Calibrate using example varieties.

MS method: Measure the maximum length of the seed. Calibrate using example varieties.

This image serves only to illustrate the variation present in the crop and should not be used as an absolute reference.

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
32 (+)	**VG/ MS**	**Only diploid and tetraploid varieties: Seed: ratio length/width**				
QN	**(d)**	very low	Wanli	Wanli		1
		low	Klondike	Klondike		2
		medium	Early Star	Early Star		3
		high	Nubia	Nubia		4
		very high	Green Citron	Green Citron		5

Remarks

Cut the fruits and harvest fully developed seeds. Make observations on the cleaned and dried seeds. It is advisable to harvest seed sample of the example varieties for purpose of seed collection.

VG method: Visual observation. Calibrate using example varieties.

MS method: Calculate the average ratio of the maximum length/width of the seed. Calibrate using example varieties.

1
very low

3
medium

5
very high

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
33 (*) (+)	**VG**	**<u>Only diploid and tetraploid varieties:</u> Seed: ground color of testa**				
PQ	**(d)**	white	Sanpaku	Sanpaku		1
		cream	Kurobe	Kurobe	Kurobe	2
		green	A confire allongée à graine verte, Green Citron	A confire allongée à graine verte, Green Citron	Citron (green seeded)	3
		red	A graine rouge à confire à chair verte, Red Citron	A graine rouge à confire à chair verte, Red Citron	Citron (red seeded)	4
		red brown	Kahô	Kahô	Kahô	5
		brown	Otome, Sugar Baby	Otome, Sugar Baby		6
		black	Yamato Cream	Yamato Cream	Miyako 3	7

Remarks

Cut the fruits and harvest fully developed seeds. Make observations on the cleaned and dried seeds. It is advisable to harvest seed sample of the example varieties for purpose of seed collection.

1 white | 2 cream | 3 green | 4 red | 5 red brown | 6 brown | 7 black

Photo's KANDA Seed Co. in: Shinohara, S., 1984: Vegetable Seed Production Technology of Japan Elucidated with Respective Variety Development Histories, Particulars, Volume 1. Shinohara's Authorized Agricultural Consulting Engineer Office, Tokyo, Japan

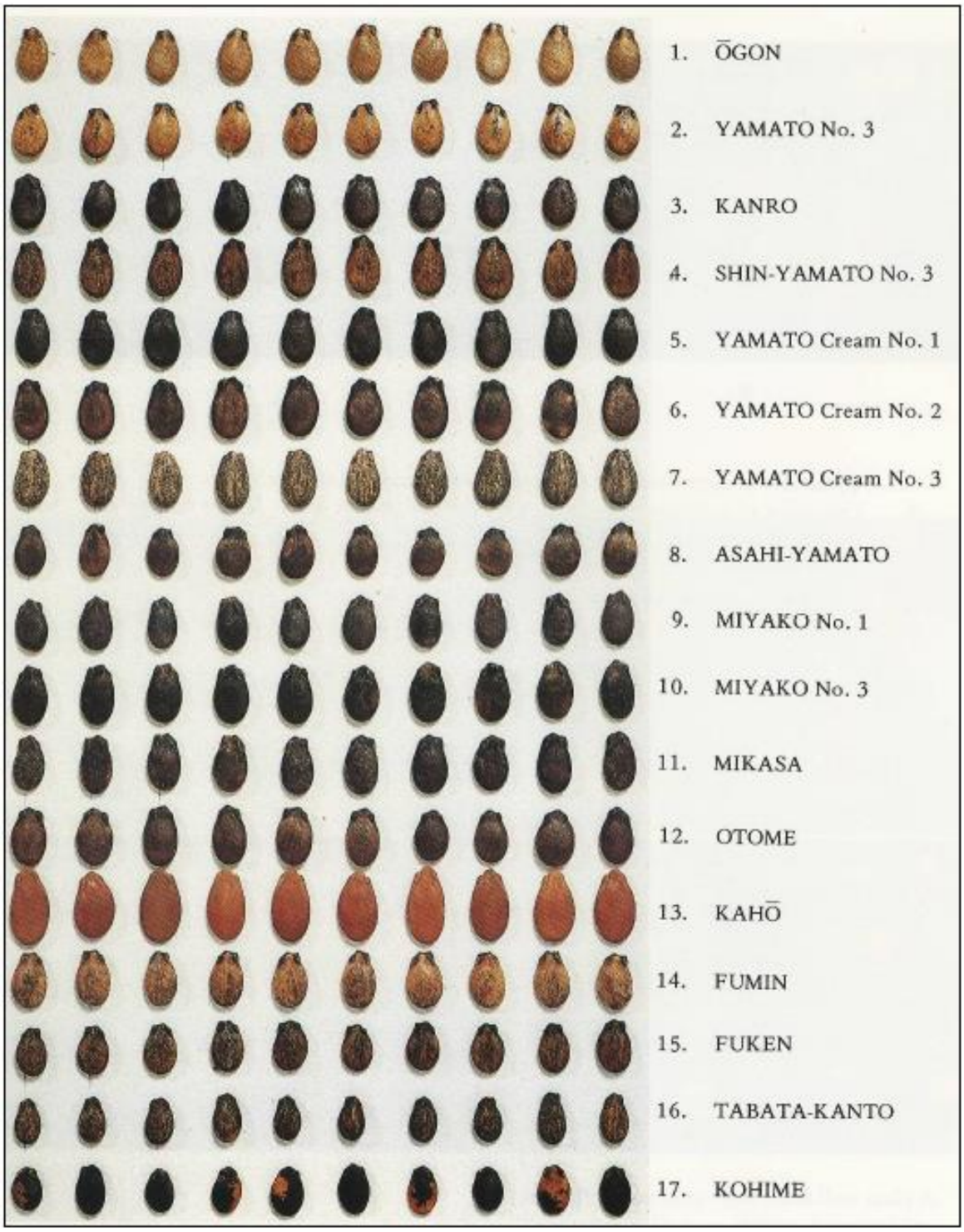


Photo KANDA Seed Co. in: Shinohara, S., 1984: Vegetable Seed Production Technology of Japan Elucidated with Respective Variety Development Histories, Particulars, Volume 1. Shinohara's Authorized Agricultural Consulting Engineer Office, Tokyo, Japan

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
34 (+)	**VG**	**<u>Only diploid and tetraploid varieties:</u> Seed: over color of testa**				
QL	**(d)**	absent	Kahô	Kahô		1
		present	Charleston Gray	Charleston Gray		9

Remarks

Cut the fruits and harvest fully developed seeds. Make observations on the cleaned and dried seeds. Calibrate using example varieties. It is advisable to harvest seed sample of the example varieties for purpose of seed collection.

The ground color is the first color of the testa to appear during the development of the seed. The over color is the color that develops over time upon the ground color, and appears as black spots.

1
Absent

9
present

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
35 (+)	**VG**	**<u>Only diploid and tetraploid varieties:</u> Seed: area of over color in relation to that of ground color**				
QN	**(d)**	very small	Estela roja	Estela roja		1
		small	Sugar Baby	Sugar Baby		3
		medium	Crimson Sweet	Crimson Sweet		5
		large	Furia	Furia		7
		very large	Starlich	Starlich		9

Remarks

Cut the fruits and harvest fully developed seeds. Make observations on the cleaned and dried seeds. Calibrate using example varieties. It is advisable to harvest seed sample of the example varieties for purpose of seed collection.

The ground color is the first color of the testa to appear during the development of the seed. The over color is the color that develops over time upon the ground color, and appears as black spots. (“Patches at hilum” should not be observed in Characteristic 35.)

1 very small | 3 small | 5 medium | 7 large | 9 very large

Photo 1: KANDA Seed Co. in: Shinohara, S., 1984: Vegetable Seed Production Technology of Japan Elucidated with Respective Variety Development Histories, Particulars, Volume 1. Shinohara’s Authorized Agricultural Consulting Engineer Office, Tokyo, Japan

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
36 (+)	**VG**	**<u>Only diploid and tetraploid varieties:</u> Seed: patches at hilum**				
QN	**(d)**	absent or very weak				1
		medium				2
		strong				3

Remarks

Cut the fruits and harvest fully developed seeds. Make observations on the cleaned and dried seeds. It is advisable to harvest seed sample of the example varieties for purpose of seed collection.

“Patches at hilum” are defined as the over color at hilum.

1 absent or very weak

2 medium

3 strong

Photo’s KANDA Seed Co. in: Shinohara, S., 1984: Vegetable Seed Production Technology of Japan Elucidated with Respective Variety Development Histories, Particulars, Volume 1. Shinohara’s Authorized Agricultural Consulting Engineer Office, Tokyo, Japan

6. Method of observation (example of characterization)

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
37 (+)	**VG**	**Time of female flowering**				
QN		early	Tiny Orchid	Tiny Orchid	Kahô	3
		medium	Sugar Baby, Yamato 3	Sugar Baby, Yamato 3	Yamato 3	5
		late	Kurobe	Kurobe	Kurobe	7

Remarks

The time of flowering is when 50% of the plants of a variety has at least one female flower. At a regular interval (preferably two to three days) count all plants with at least one female flower starting when the first flower is open. Calibrate using example varieties.

6. Method of observation (example of characterization)

Characteristic 39-42 are physiological characteristics.

See explanation of UPOV test guideline.

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
38 (+)	**VG**	**Resistance to *Fusarium oxysporum* f.sp*. niveum***				
38.1		**Race 0**				
QL		absent	Kahô, Sugar Baby	Kahô, Sugar Baby	Kahô, Sugar Baby	1
		present	Calhoun Gray, Charleston Gray	Calhoun Gray, Charleston Gray	Calhoun Gray, Charleston Gray	9
38.2		**Race 1**				
QL		absent	Charleston Gray, Kahô, Sugar Baby	Charleston Gray, Kahô, Sugar Baby	Charleston Gray, Kahô, Sugar Baby	1
		present	Calhoun Gray	Calhoun Gray	Calhoun Gray	9
38.3		**Race 2**				
QL		absent	Calhoun Gray, Kahô	Calhoun Gray, Kahô	Calhoun Gray, Kahô	1
		present	PI 296341-FR	PI 296341-FR	PI 296341-FR	9
39 (+)	**VG**	**Resistance to *Colletotrichum orbiculare***				
39.1		**Race 1**				
QL		absent	Black Diamond, Calhoun Gray, Kahô	Black Diamond, Calhoun Gray, Kahô	Black Diamond, Calhoun Gray, Kahô	1
		present	Charleston Gray, Congo, Jubilee	Charleston Gray, Congo, Jubilee	Charleston Gray, Congo, Jubilee	9