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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS
GENEVA

**TECHNICAL WORKING PARTY
FOR
FRUIT CROPS**

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WORKING PAPER ON REVISED TEST GUIDELINES FOR ACTINIDIA
(*ACTINIDIA* LINDL.)

Document prepared by experts from New Zealand

**WORKING PAPER ON TEST GUIDELINES FOR
ACTINIDIA
(*Actinidia* Lindl.)**

I. Subject of these Guidelines

These Test Guidelines have primarily been prepared for vegetatively propagated varieties of kiwifruit, but they may be applied to all vegetatively propagated female, male and hermaphroditic varieties of the genus *Actinidia* Lindl.

II. Material Required

1. The competent authorities decide when, where and in what quantity and quality the plant material required for testing the variety is to be delivered. Applicants submitting material from a State other than that in which the testing takes place must make sure that all quarantine and customs formalities are complied with. As a minimum., the following quantity of plant material is recommended:

- 8 plants on their own roots or
- 8 plants on a clonal rootstock.

The competent authorities to select the most appropriate rootstock.

2. The plant material supplied should be visibly healthy, not lacking in vigour or affected by any important pest or disease. It should preferably not be obtained from *in vitro* culture. If test material is grafted onto a clonal rootstock, there should be information available stating how the rootstock may affect the expression of characteristics. In the case of a female variety the applicant should send in or at least indicate one male variety, which flowers at the same time and is compatible with the female variety under test. The male variety should preferably be of the same taxon and at the same ploidy level as the female variety.

3. The plant material must not have undergone any treatment unless the competent authorities allow or request such treatment. If it has been treated, full details of the treatment must be given.

III. Conduct of Tests

1. To assess distinctness of female and fruiting hermaphroditic varieties it is essential that the plants under test bear a satisfactory crop of fruit for at least two growing periods. To assess distinctness of fruit size and fruit shape it is important to ensure adequate seed set, either by hand pollination or by providing sufficient pollinators.

2. To assess distinctness of male and non-fruiting varieties it is essential that the plants under test produce two full flowerings over at least two growing periods. If it is claimed that a variety is hermaphroditic, tests should be carried out to determine whether it is self-fertile and self-setting. Pollen viability should be tested separately in addition to flowers being bagged to prevent pollination by outside pollen. Hand pollination is recommended.

3. The testing should normally be conducted at one place. If any important characteristics of the variety cannot be seen at that place, the variety may be tested at an additional place.
4. The tests should be carried out under conditions ensuring normal growth. As a minimum, each test should include all 8 plants. Separate plots for observation and for measuring can only be used if they have been subject to similar environmental conditions.
5. Additional tests for special purposes may be established.

IV. Methods and Observations

1. Unless otherwise stated, all observations should be made on 8 plants or 10 parts of 8 plants.
2. For the assessment of uniformity and stability, a population standard of 1% and an acceptance probability of 95% should be applied for varieties resulting from a crossing, and a population standard of 2% with the same acceptance probability for mutations. For a sample size of 8 plants, the maximum number of off-types allowed in both cases would be 1.
3. The shape, size and hairiness of leaves can vary greatly according to the type and vigour of the shoot on which they are borne. Unless specified, the shoots should be replacement canes, i.e., those that will be tied down and retained for the following season's flowering.
4. Unless otherwise stated, all observations on the young shoot should be made during active vegetative growth, on internodes 10 to 20 cm from the tip of growing shoots
5. All observations on the stem (including observations on the over-wintering buds and bud support) should be made in the middle third of the replacement stem after leaf fall.
6. All observations on the leaf should be made near the middle of the current season's growth on sufficiently mature, but not old leaves. The most basal leaves of a shoot should be excluded since they do not usually attain full size or typical shape.
7. All observations on the presence or absence of anthocyanin colouration in vegetative organs refer to the general appearance of the organ, irrespective of whether red pigments are present in hairs or in the underlying skin.
8. All observations on the flower should be made on recently fully-opened terminal (king) flowers.
9. Unless otherwise stated, all observations on the fruit should be made on fruits at harvest maturity.

V. Grouping of Varieties

1. The collection of varieties to be grown should be divided into groups to facilitate the assessment of distinctness. Characteristics which are suitable for grouping purposes are those which are known from experience not to vary, or to vary only slightly, within a variety. Their various states of expression should be fairly evenly distributed throughout the collection.

2. It is recommended that the competent authorities use the following characteristics for grouping varieties.

For male varieties

(53)Petal: type of colouration

(90) Time of beginning of flowering

For female and hermaphroditic varieties

(63)Fruit: size

(64)Fruit: general shape

(73)Fruit: skin hairiness

(81)Fruit: outer pericarp colour at maturity for consumption

(91)Fruit: time of maturity for harvest

VI. Characteristics and Symbols

1. To assess distinctness, uniformity and stability, the characteristics and their states, as given in the four UPOV working languages in the Table of Characteristics, should be used.

2. Notes (1 to 9), for the purpose of electronic data processing, are given opposite the states of expression for each characteristic.

3. Legend:

(*) Characteristics that should be used on all varieties in every growing period over which examinations are made and always be included in the variety descriptions, except when the state of expression of a preceding characteristic or regional environmental conditions renders this impossible.

(+) See Explanations on the Table of Characteristics in Chapter VIII.

TABLE OF CHARACTERISTICS

<u>English</u>	<u>Français</u>	<u>Deutsch</u>	<u>Español</u>	<u>Example Variety</u>	<u>Note</u>
1. Plant: sex					
(*) female				Hayward	1
male				Matua	2
hermaphrodite					3
2. Plant: fruit setting (hermaphrodite varieties only)					
absent					1
present					9
3. Plant: ploidy					
(+) haploid					1
diploid				Hort16A	2
triploid					3
tetraploid					4
pentaploid					5
hexaploid				Hayward	6
heptaploid					7
octoploid					8
4. Plant: vigour					
very weak					1
weak					3
medium				Hayward	5
strong					7
very strong				Matua	9
5. Young shoot: hairiness					
(*) absent					1
present					9
6. Young shoot: density of hairiness					
(*) sparse					3
medium				Hayward	5
dense				King	7
7. Young shoot: type of hairiness					
(+) downy					1
velutinous					2
tomentose					3
hirsute					4
bristly					5
hispid					6

8. Young shoot:**(*) anthocyanin colouration of growing tip**

absent or very weak	Hort16A	1
weak	King	3
medium	Tomua	5
strong		7
very strong		9

9. Stem: thickness

thin		3
medium	Hayward	5
thick	Bruno	7

10. Stem: colour of shoot**(*) on sunny side**

grey white		1
green white		2
grey brown	King	3
yellow brown	Sparkler	4
light brown	Hort16A	5
red brown	Ranger	6
purple brown	Bruno	7
dark brown		8

11. Stem: roughness of bark

smooth	Sparkler	3
medium	Meteor	5
rough	Hayward	7

12. Stem: hairiness

absent		1
present		9

13. Stem: density of hairiness

sparse	Meteor	3
medium	Hayward	5
dense		7

14. Stem: type of hairiness

(+) downy	Kaimai	1
velutinous		2
tomentose		3
hirsute		4
bristly	Hayward	5
hispid		6

15. Stem: size of lenticels

(*) very small	Kaimai	1
small	Monty	3
medium	Hayward	5

large	Hort16A	7
very large		9
16. Stem: number of lenticels		
(*) few	Meteor	3
medium	Hayward	5
many	Bruno	7
17. Stem: colour of lenticels		
(*) greyish white	Gracie	1
greyish yellow	Bruno	2
greyish brown	Hort16A	3
18. Stem: size of bud support		
(*) (bud support height in		
(+) relation to stem diameter)		
small	Sparkler	3
small to medium	Hayward	4
medium	King	5
medium to large	Kaimai	6
large		7
19. Stem: slope on bud		
(+) support distil face		
absent	Sparkler	1
present	Bruno	9
20. Stem: profile of bud		
support distil face		
(if sloping)		
convex	Hayward	1
flat	Bruno	2
concave	Matua	3
21. Stem: presence of		
(*) bud cover		
(+) absent	Hort16A	1
present	Hayward	9
22. Stem: size of opening		
(*) of bud cover		
(+) small	Abbott	3
medium	Hayward	5
large	Elmwood	7
23. Stem: leaf scar		
(+) flat	Meteor	1
shallow	Hort16A	2
deep	Monty	3
24. Stem: presence of pith		

absent		1
present		9
25. Stem: type of pith		
solid		1
lamellate		2
hollow		3
26. Leaf blade: general shape		
(*) lanceolate	Kaimai	1
(+) ovate		2
broad ovate	Hayward	3
very broad ovate	Meteor	4
broad obovate	Bruno	5
very broad obovate	Matua	6
27. Leaf blade: shape of apex		
(*) emarginate		1
(+) retuse		2
rounded		3
acute	Hayward	4
acuminate	Kaimai	5
caudate		6
28. Leaf blade: arrangement		
(+) of basal lobes		
far apart	Kaimai	1
slightly apart	Matua	2
touching	Hort16A	3
slightly overlapping	Hayward	4
strongly overlapping		5
29. Leaf blade: hairs on upper surface		
absent or very sparse	Hort16A	1
sparse	Kaimai	3
medium	Bruno	5
dense	Meteor	7
very dense		9

30. Leaf blade: hairs on lower surface		
absent or very sparse		1
sparse		3
medium	Hayward	5
dense	Ranger	7
very dense		9
31. Leaf blade: puckering/blistering on upper side		
absent or very weak	Kaimai	1
weak	Hort16A	3
medium	Hayward	5
strong		7
very strong		9
32. Leaf blade: green		
(*) colour of upper side		
light		3
medium	Hayward	5
dark	Bruno	7
33. Leaf blade: colour		
(*) of lower side		
whitish		1
light green		2
medium green	Bruno	3
yellow green	Hayward	4
yellow brown		5
34. Leaf blade: variegation		
absent		1
present		9
35. Leaf blade: colour of variegation		
white and green		1
white, red and green		2
36. Leaf blade: spines along main vein on lower side		
absent		1
present		9

**37. Leaf : ratio petiole length/
blade length**

very small	Kaimai	1
small	Gracie	3
medium	Meteor	5
large	Hayward	7
very large		9

38. Petiole: density of hairiness

absent or very sparse		1
sparse	Kaimai	3
medium	Meteor	5
dense	Bruno	7
very dense	Tomua	9

**39. Petiole: anthocyanin
colouration on upperside**

absent or very weak	Kaimai	1
weak	Sparkler	3
medium	Hayward	5
strong	Tomua	7
very strong		9

**40. Flower bud: anthocyanin
colouration of protruding
petal ends (at calyx split)**

absent or very weak	Hort16A	1
weak		3
medium	Hayward	5
strong	Meteor	7
very strong		9

**41. Inflorescence: predominant
(*) number of flowers**

one	Hayward	1
2-5	Matua	2
6-10	Tomuri	3
> 10		4

42. Flower: diameter

(*) very small		1
small	Sparkler	3
medium	Matua	5
large		7
very large	Hayward	9

43. Flower: arrangement		
(*) of petals (viewed from		
(+) beneath)		
apart	Abbott	1
touching	Matua	2
overlapping	Hayward	3
44. Flower stalk: length		
(*) very short		1
short	Matua	3
medium	Hort 16A	5
long	Tomua	7
very long	Jade Moon	9
45. Flower stalk: density		
of hairiness		
absent or very sparse		1
sparse		2
dense		3
46. Flower stalk: length		
of hairs		
short	Hort16A	3
medium	Hayward	5
long	Tomuri	7
47. Sepal: predominant		
number		
2 or 3		1
4 or 5		2
> 5		3
48. Sepal: general colour		
(*) white		1
green	Hort16A	2
brown	Tomua	3
reddish-brown		4
49. Sepal: density of hairiness		
absent or very sparse		1
sparse		2
dense		3
50. Sepal: length of hairs		
short		3
medium		5
long		7

51. Petal: curvature of apex (in longitudinal section)		
absent	Bruno	1
present	Hayward	2
52. Petal: main colour (* on adaxial side)		
white	Hayward	1
greenish white		2
yellowish white		3
yellowish green		4
yellow		5
orange		6
light pink		7
red pink		8
red		9
53. Petal: type of colouration (* (adaxial side))		
single-coloured		1
bicoloured	Meteor	2
54. Petal: shades of colour (* (for single-coloured varieties))		
absent		1
present		9
55. Petal: distribution of colour (* (for single-coloured varieties))		
lighter towards the base		1
lighter towards the top		2
56. Petal: secondary colour (for bicoloured varieties)		
white		1
green	Hayward	2
orange		3
light pink		4
dark pink	Meteor	5
57. Petal: distribution of secondary colour (for bicoloured varieties)		
marginal		1
blotched	Meteor	2
basal spot		3

58. Filament: colour		
white	Ranger	1
light green	Matua	2
light pink		3
dark pink		4
59. Anther: colour		
yellow	Hayward	1
yellow orange		2
grey		3
dark purple		4
black		5
60. Styles: number		
few		3
medium	Hort16A	5
many	Hayward	7
61. Styles: colour		
white		1
whitish yellow	Hayward	2
light green		3
62. Styles: attitude		
(*) erect		1
semi-erect	Hort16A	2
both erect and horizontal	Hayward	3
horizontal	Bruno	4
63. Fruit: size		
(*) very small		1
small		3
medium	Tomua	5
large	Hayward	7
very large	Jade Moon	9
64. Fruit: general shape		
(*) ellipsoid	Hayward	1
(+) oblong	Bruno	2
ovoid	Hort16A	3
obovoid	Monty	4
spheroid		5
obloid	Kuimi	6

65. Fruit: shape in cross**(*) section (at median)**

(+) circular	Bruno	1
oblate		2
transverse elliptic	Hayward	3

66. Fruit: general shape**(*) of stylar end**

(+) deeply depressed		1
slightly depressed	Jade Moon	2
flat	Hayward	3
round	Tomua	4
slightly blunt protruding	Skelton	5
strongly blunt protruding	Hort16A	6
slightly pointed protruding		7
strongly pointed protruding		8

67. Fruit: presence of**(+) calyx ring**

absent or very weakly expressed	Bruno	1
weakly expressed	Hayward	2
strongly expressed	Qinmei, Hort16A	3

68. Fruit: shape of shoulder**(*) on stalk end**

(+) square		1
rounded	Hayward	2
strongly sloping	Skelton	3

**69. Fruit: ratio stalk length/
fruit length**

very small	Wuzhi 3	1
small	Bruno	3
medium	Allison	5
large	Hayward	7
very large	Jade Moon	9

**70. Fruit: persistence of
sepals**

absent		1
present		9

71. Fruit: lenticels on skin

absent		1
present	Topstar Vantini	9

72. Fruit: skin colour

(*) light green		1
medium green	Hort16A	2
reddish green		3
greenish brown	Hayward	4
medium brown	Topstar	
	Vantini	5
reddish brown		6
dark brown		7

73. Fruit: skin hairiness

(*) absent		1
present		9

74. Fruit: density of

(*) hairiness		
very sparse	Topstar	
	Vantini	1
sparse	Hort16A	3
medium	Hayward	5
dense	Bruno	7
very dense		9

75. Fruit: type of hairiness

(*) downy	Hort16A	1
(+) velutinous		2
tomentose		3
hirsute	Hayward	4
bristly	Bruno	5
hispid		6

76. Fruit: distribution

(*) of hairs		
evenly spread	Hayward	1
mainly at stylar end	Topstar	
	Vantini	2

77. Fruit: colour of hairs

white		1
yellow		2
yellow-brown	Hort16A	3
medium brown	Hayward	4
reddish brown	Bruno	5
dark brown		6

78. Fruit: adherence of hairs**(*) to skin (when rubbed)**

weak	Hort16A	3
medium		5
strong	Hayward	7

79. Fruit: adherence of skin to flesh at maturity for consumption

weak		3
medium		5
strong		7

80. Fruit: skin colour at**(*) maturity for consumption**

light green		1
medium green		2
reddish green		3
yellow		4
orange yellow		5
orange		6
greenish brown		7
light brown	Hort16A	8
medium brown		9
reddish brown	Tomua	10
dark brown		11
purple-red		12

81. Fruit: outer pericarp**(*) colour at maturity for****(+) consumption**

light green		1
medium green	Hayward	2
dark green		3
greenish yellow		4
medium yellow	Hort16A	5
dark yellow		6
yellowish orange		7
orange		8
red		9
red-purple		10

82. Fruit: inner pericarp**(*) colour (locules) at****(+) maturity for consumption**

light green		1
medium green	Hayward	2
dark green		3
greenish yellow		4
medium yellow	Hort16A	5
dark yellow		6
yellowish orange		7
orange		8
red		9
red-purple		10

83. Fruit: core diameter**(*) relative to fruit diameter****(+) (at largest diameter)**

small	Hort16A	3
small to medium		4
medium	Bruno	5
medium to large	Tomua	6
large	Hayward	7

84. Fruit: general core**(*) shape (in cross section)**

circular		1
oblate		2
transverse elliptic	Hort16A	3

85. Fruit: presence of core fluting (in cross section)

absent		1
present	Hayward	9

86. Fruit: core colour at**(*) maturity for consumption**

white		1
greenish white	Hayward	2
yellow-white	Hort16A	3
orange		4
red-purple		5

87. Fruit: sweetness at**(+) maturity for consumption**

very low	Jade Moon	1
low	Hayward	3
medium	Tomua	5
high	Hort16A	7
very high		9

88. Fruit: acidity

(+) at maturity for consumption

low		3
medium		5
high		7

89. Time of vegetative bud

(*) burst

early	Tomua	3
medium	Hayward	5
late		7

90. Time of beginning of

(*) flowering

early	Hort16A	3
medium	Abbott	5
late	Hayward	7

91. Time of maturity for

(*) harvest

early		3
medium	Tomua	5
late	Hayward	7

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EXPLANATIONS AND METHODS

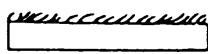
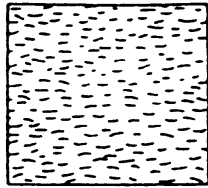
3 Plant: ploidy

Ploidy is determined by counting chromosomes or by flow cytometry. The basic chromosome number $n = 29$.

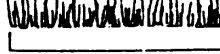
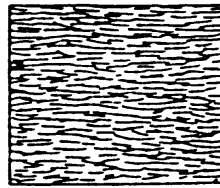
7 Young shoot: type of hairiness -

14 Stem: type of hairiness -

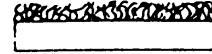
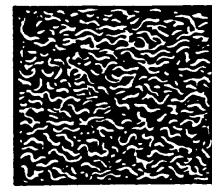
75 Fruit: type of hairiness -



downy



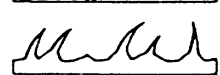
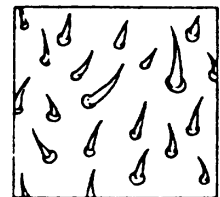
velutinous



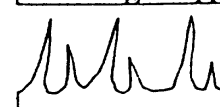
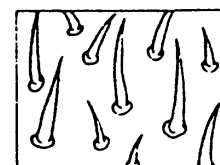
tomentose



hirsute



bristly

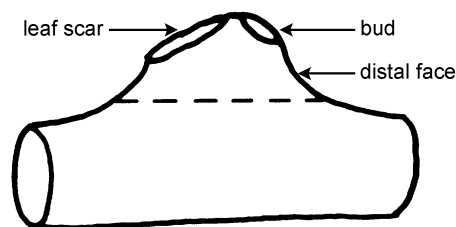


hispid

18 Stem: size of bud support (bud support height in relation to stem diameter)

19 Stem: slope on bud support distal face -

23 Stem: leaf scar -

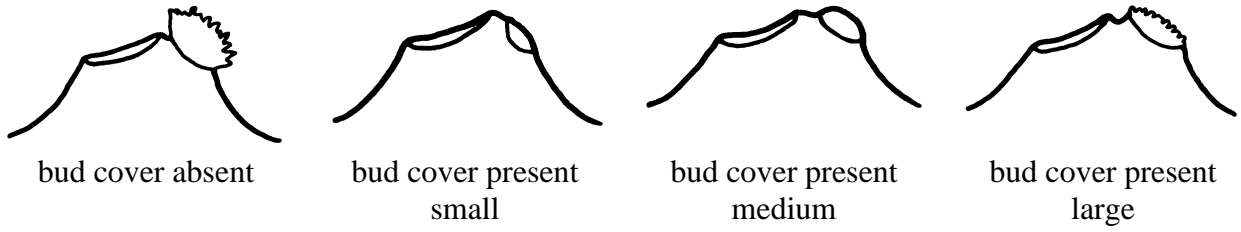


bud support height

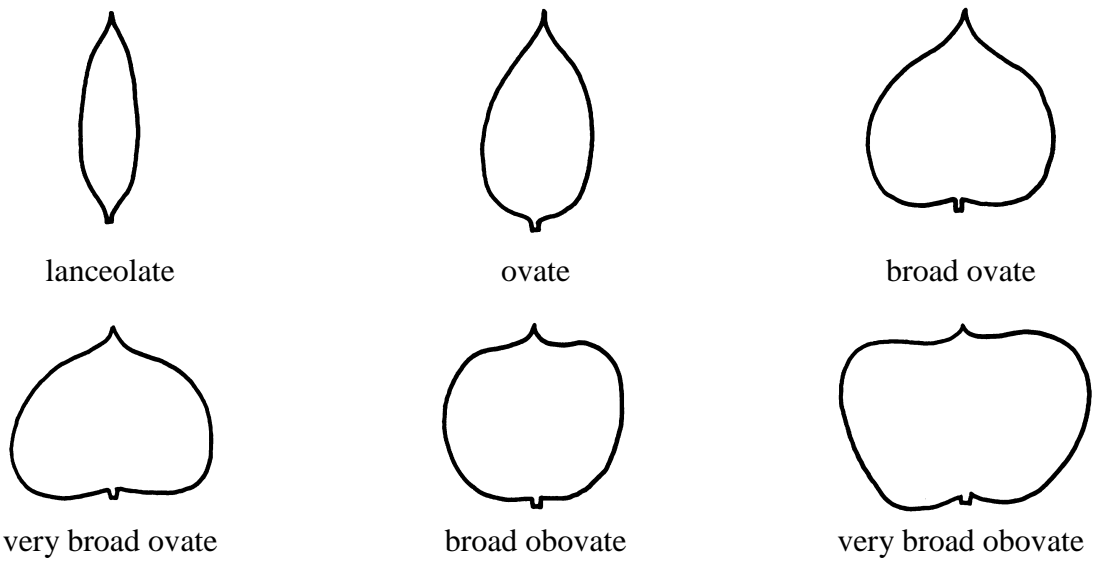
stem diameter

21 Stem: presence of bud cover

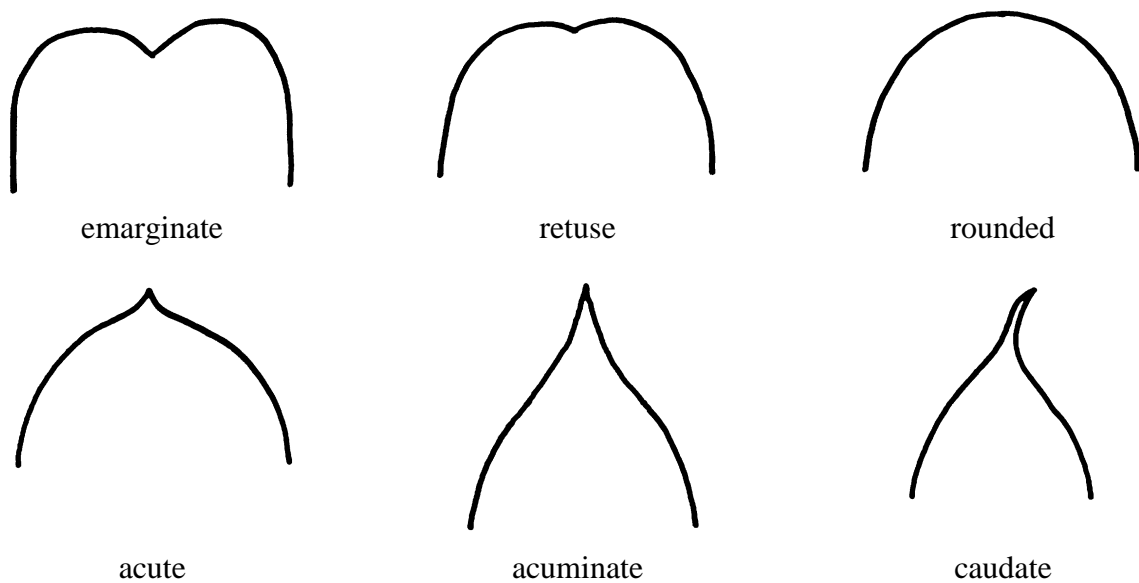
22 Stem: size of opening of bud cover



26 Leaf blade: general shape -



27 Leaf blade: shape of apex -



28 Leaf blade: arrangement of basal lobes -



far apart



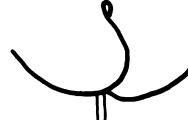
slightly apart



touching

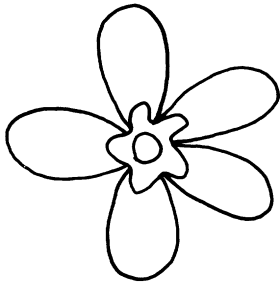


slightly overlapping

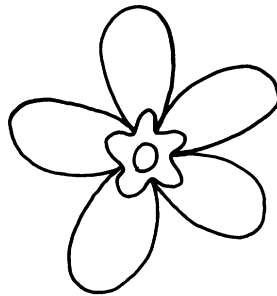


strongly overlapping

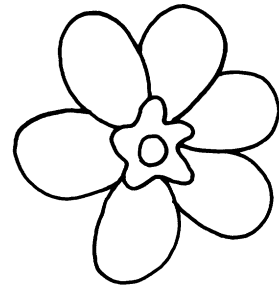
43 Flower: Arrangement of petals (from beneath)-



apart

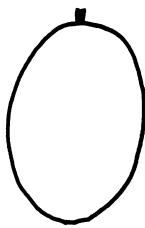


touching

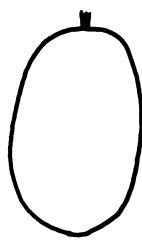


overlapping

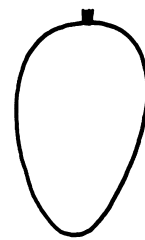
64 Fruit: general shape -



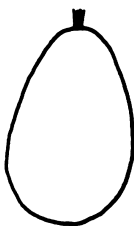
ellipsoid



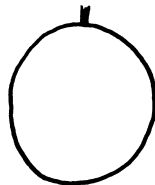
oblong



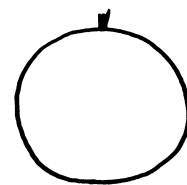
ovoid



obovoid

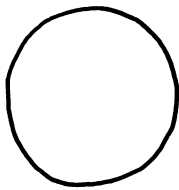


spheroid

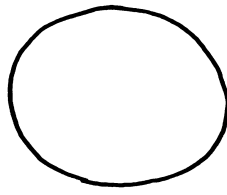


obloid

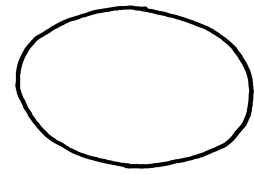
65 Fruit: shape in cross section (at median)-



circular



oblate



transverse elliptic

66 Fruit: general shape of styler end -



deeply depressed



slightly depressed



flat



round



slightly blunt protruding



strongly blunt protruding

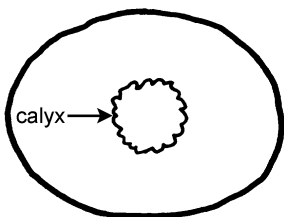


slightly pointed protruding

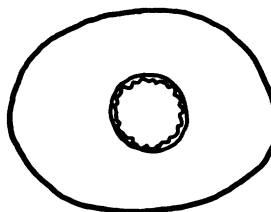


strongly pointed protruding

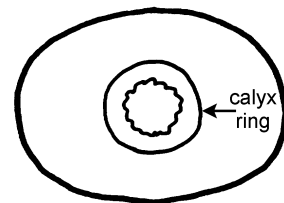
67 Fruit: presence of calyx ring



absent of very weakly expressed

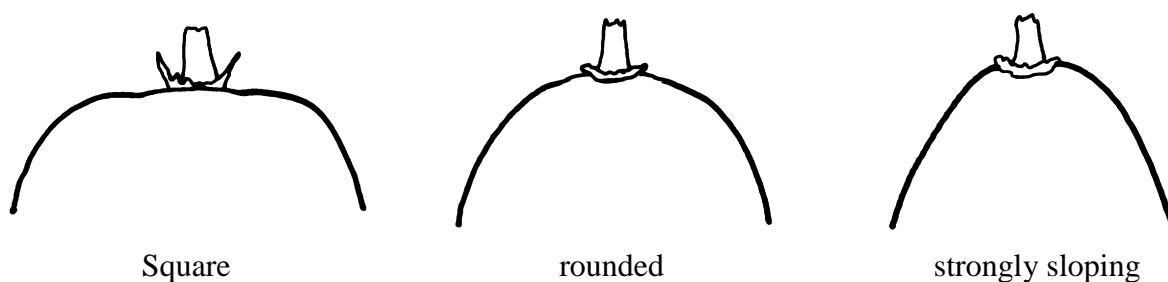


weakly expressed



strongly expressed

68 Fruit: shape of shoulder on stalk end

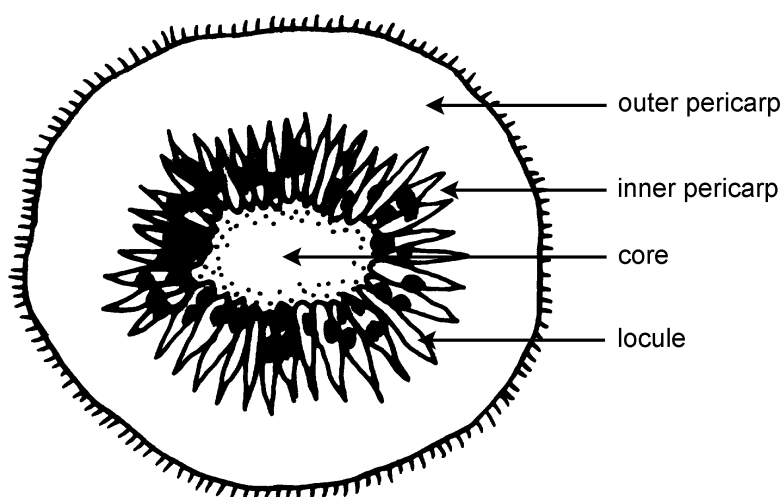


81 Fruit: outer pericarp colour at maturity for consumption

82 Fruit: inner pericarp colour at maturity for consumption

83 Fruit: core diameter relative to fruit diameter

86 Fruit: core colour at maturity for consumption



87 Fruit: sweetness at maturity for consumption

The soluble solids content (SSC) is measured by cutting a 15 mm slice from the stem and stylar ends of the dry fruit and an equal number of drops from each cut slice are squeezed on to the refractometer prism surface. Distilled water should be used to zero the refractometer and a 6% (w/w) sucrose solution used for calibration. Measurements are ideally carried out at 20° C.

88 Fruit: acidity at maturity for consumption

Titrateable acids are determined by titration against standard sodium hydroxide of an homogenate of a known weight of kiwifruit tissue (a sector of the fruit) in a known volume of deionised water and expressed in terms of citric acid.

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