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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 TEST GUIDELINES FOR PRICKLY PEAR
(*Opuntia* spp.)**

Document prepared by experts from Mexico

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I. Subject of these Guidelines

These Test Guidelines apply to all vegetatively propagated varieties of *Opuntia* spp. (Cactaceae).

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 customs formalities are complied with. As a minimum, the following quantity of plant material is recommended:

8 plants of three years old.

If accepted by the competent authority, the applicant may submit:

10 branches that include three successive cladodes, sufficient to propagate 8 plants.

2. The plant material supplied should be visibly healthy, not lacking in vigor or affected by any important pests or diseases. *It should preferably not be obtained from in vitro propagation. If it has been produced by in vitro propagation this fact has to be stated by the applicant. (To add ???)*

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, it is essential for the plants under test to bear a satisfactory crop of fruit for at least three growing periods.

2. The tests 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.

3. The tests should be carried out under conditions ensuring normal growth. As a minimum, each test should include a total of 8 plants. Separate plots for observation and for measuring can only be used if they have been subject to similar environmental conditions.

4. Additional tests for special purposes may be established.

5. The cactus pears items can be separated into two groups as follows:

Cactus Pear (*Opuntia* spp.): fruits with medium peel, insipid and occupying 1/4 to 2/4 of the total thickness of the total fruit. The seeds are disposed in all the flesh, funiculus filled with sugars, sweet, flowering once a year, the fruit is persistent from 1 to 2 months.

Xoconostles (*Opuntia joconostle*, *Opuntia matudae*, *Opuntia oligacantha*, *Opuntia leucotrica*, *Opuntia hielabravoana*, *Opuntia spinulifera*): fruits with thick peel derived from

the receptacle of wide flowers, seeds disposed in the central part, dry funiculus, two flowerings a year, persistence of fruit up to 6 or 8 months, juicy and acid.

IV. Methods and Observations

1. Unless otherwise stated, all observations determined by measurement, weighing or counting should be made on 6 (5?) plants or 10 (12?) typical parts, 2 from each of 6 (5?) plants, with the exception of the observations on fruit, which should be made on at least 20 (fruits?).
2. For the assessment of uniformity a population standard of 1% with an acceptance probability of at least 95% should be applied. In the case of a sample size of 5 plants, the maximum number of off-types allowed would be 1.
3. All observations on cladodes should be made on mature cladodes of one or two years old, unaffected by biotic and/or abiotic factors.
4. All observations of the characteristics of areola spines and glochides should be made with the help of a stereoscopic microscope in intact fruits.
4. All observations on the flower should be made on 50% of flowering time. All observations on the flower must be at anthesis. (???)
6. All observations on the fruit should be made on 20 fully consumption mature fruits without cleaning.
7. The observations of fruit diameter, peel thickness, acidity and total soluble solids should be made in the middle of the fruit.

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:
 - (a) Cladode: color of areole (characteristic 14)
 - (b) Fruit: seed size (characteristic 62)??? or *Fruit: size of normal seeds (charac. 54)*
 - (c) Fruit: harvest time (characteristic 64)??? or *Time of harvest maturity (charac. 60)*

VI. Characteristics and Symbols

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

2. Notes (numbers), for the purposes 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 render this impossible.

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

VII. Table of Characteristics/Tableau des caractères/Merkmalstabelle/Tabla de caracteres

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
1. Plant: growth habit					
(+)					
upright				Roja, Cardona	1
spreading				Chapeada, Cristalina	2
decumbent				Pabellón, Rojo Pelón	3
drooping				Sanjuanera	4
2. Plant: shape					
elongated (width<height)				Rubí Reyna	3
rounded (width=height)				Cristalina	5
flat (width>height)				Pabellón	7
3. Plant: height					
short				Tapona de Mayo	3
medium				Cristalina	5
tall				Rubí Reyna, Reyna	7
4. Cladode: shape					
(+)					
elliptic				Milpa Alta	1
circular				Tapón	2
oblong				Tlaconopal, COPENA F-1	3
narrow obovate				Rubí Reyna	4
obovate				Fafayuca	5
rhombic				Atlixco, Trompa de Cochino	6

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
5. Cladode: length					
(+)					
short				Pico Chulo, Pabellón	3
medium				Cristalina, Chapeada	5
long				Reyna, Montesa, COPENA Z-1	7
6. Cladode: width					
(+)					
narrow				Rubí Reyna, Sanjuanera	3
medium				Montesa, COPENA T-5	5
broad				Naranjón Legítimo, Mango, Tapón	7
7. Cladode: length/width ratio					
small				Tapón	3
medium				Reyna, COPENA T-5	5
large				COPENA F-1	7
8. Cladode: thickness					
(*)					
thin				COPENA T-2, Rubí Reyna, Sanjuanera	3
medium				Montesa	5
thick				Rojo Pelón, Pabellón, Tapón	7
9. Cladode: color					
yellow green				Cristalina, Reyna, Rojo Pelón	1
light green				Milpa Alta	2
medium green				Blanca Pepina	3
dark green				Morado Jalpa, Roja San Martín	4
bluish green				Tapón de Mayo	5

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
10. Cladode: surface waxiness					
absent or very low				Cristalina	1
present				Reyna	9
11. Cladode: pubescence on surface					
absent				Milpa Alta	1
present				Valterrilla, Cuaresmeño	9
12. Cladode: undulation of margin					
absent				Reyna	1
present				Bola de Masa, Oreja de Elefante	9
13. Cladode: number of areoles in central row					
few				Rojo Pelón, Tapón	3
medium				Rubí Reyna, Fafayuca, Mango	5
many				Reyna, Charola, Cardona	7
14. Cladode: color of areole (*)					
grey				Reyna, Milpa Alta	1
yellow brown				Burrona	2
brown				Chaveña	3
black				Cardona	4

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
15. Cladode: number of spines per areole					
(*)					
absent or very few				Rojo Pelón, Pabellón	1
few				Naranjón Legítimo	3
medium				Cristalina, Chapeado	5
many				Sanjuanera	7
very many				Cuaresmeño, Duraznillo	9
16. Cladode: attitude of the center spine					
(+)					
erect				Fafayuca	1
semi-erect				Tuna Morada II	2
horizontal				Cardona	3
17. Cladode: length of the longest spine					
short				Cristalina	3
medium				Pico Chulo, Montesa	5
long				Reyna, Sanjuanera	7
18. Cladode: color of spines					
white with yellow tip				Cristalina, Chapeado	1
grey				Cardona	2
white				Reyna	3
yellow				Tapón, Duraznillo	4
brown				Rosa de Castilla, San Pedreña	5

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
19. Cladode: surface of spines					
(+)					
smooth				Amarillo	1
longitudinal grooves				Reyna	2
prickled				Tapón	3
20. Cladode: flexibility of central spine					
flexible				Cristalina	1
rigid				Reyna	2
brittle				Burrona	3
21. Cladode: class of central spine					
straight				Burra, Sanjuanera	1
curved				Cardón de Castilla	2
twisted				Tuna de Azúcar	3
22. Cladode: twisting of central spine					
(+)					
absent				Burra, Sanjuanera	1
twisted (or <i>present?</i>)				Rubí Reyna, Sanjuanera	9
23. Cladode: shape of central spine					
acicular				Cuaresmeño, Burra	1
compressed				Amarilla	2
cylindrical				Montesa	3

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
24. Cladode: presence of glochides (*)					
few				Blanca San José, Rojo Pelón	3
medium				Reyna	5
many				Montesa, Tuna Mantequilla	7
25. Cladode: color of glochides					
yellow				Tapón, Amarilla	1
brown				Reyna, Rojo Pelón, Cristalina	2
26. Flower: number on one-year-old cladode					
few				Tapón de Mayo, Esmeralda	3
medium				Cristalina	5
many				Reyna	7
27. Flower: length (+)					
short				Memelo, Cardona	3
medium				Pico Chulo, Reyna	5
long				Cristalina, Montesa	7
28. Flower: color of perianth (*)					
greenish yellow				Duraznillo, Cardona	1
yellow				Tapón Macho	2
brownish yellow				Rojo Pelón	3
orange				Reyna, Chapeada	4
red				Tuna Rosa, Roja San Martín	5

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
29. Flower: color of stigma lobes					
(+)					
yellow				Morada Jalpa	1
green				Reyna, Cristalina	2
30. Flower: color of style					
(*)					
(+)					
white				Montesa, Tapón	1
yellow				Cardona	2
green				Duraznillo	3
pink				Pico Chulo, Morada	4
red				Rojo Pelón, Pabellón	5
31. Flower: number of stigma lobes					
(+)					
few				Colorada, Sanjuanera	3
medium				Cristalina, Pabellón	5
many				Memelo, Rubí Reyna	7
32. Fruit: length					
short				Tapona de Mayo	3
medium				Reyna, Rojo Pelón	5
long				Cristalina, Burrona, Montesa	7
33. Fruit: diameter					
small				Rubí Reyna	3
medium				Rojo Pelón	5
large				Cristalina, Tapona de Mayo, Burrona	7

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
34. Fruit: ratio length/diameter					
small				Reyna, Burrona	3
medium				Rojo Pelón, Blanca de Castilla	5
large				Montesa, Rubí Reyna	7
35. Fruit: shape					
(+)					
narrow ellipsoid				Rubí Reyna	1
ellipsoid				Reyna	2
oblong				Torroja	3
spheroid				Cardona	4
obloid				Tapón de Mayo	5
obovoid				Roja Jalpa	6
36. Fruit: size					
(*)					
very small				Duraznillo	1
small				Pico Chulo	3
medium				Rojo Pelón, Reyna	5
large				Roja San Martín, Montesa	7
very large				Burrona, Cristalina	9
37. Fruit: thickness of peel					
thin				Montesa, Reyna	3
medium				Rojo Pelón, Cristalina	5
thick				Burrona, Mango	7

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
38. Fruit: weight of peel					
small				Reyna	3
medium				Montesa, Cristalina	5
large				Burrona, Chapeada	7
39. Fruit: weight of flesh					
very small				Duraznillo	1
small				Charola	3
medium				Pico Chulo, Chapeado	5
large				Amarillo Montesa, Naranjón Legítimo	7
very large				Burrona, Cristalina	9
40. Fruit: ratio flesh/peel					
small				Cascarón	3
medium				Fafayuca, Chapeada	5
large				Reyna, Cristalina	7
41. Fruit: uniformity of color of the peel					
absent				Chapeado	1
present				Burrona, Cristalina	9

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
42. Fruit: main color of peel (*)					
white				Blanca Platanillo	1
light green				Gavia	2
medium green				Esmeralda	3
dark green				Reyna, Burrona	4
yellow				Amarilla Plátano	5
orange				Naranjón, Pico Chulo, Montesa	6
pink				Memelo	7
red				Rojo Pelón, Rubí Reyna, Cardona	8
dark red				Cardona	9
purple				Roja San Martín, Morada Jalpa, Tapón	10
43. Fruit: color of flesh (*)					
light green				Reyna, Cristalina, Esmeralda	1
green				Burrona	2
yellow				Montesa	3
orange				Pico Chulo	4
pink				Memelo, Meloncillo Rosa	5
red				Rojo Pelón, Rubí Reyna	6
purple				Roja San Martín, Liria, Morada Jalpa	7

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
44. Fruit: firmness of flesh					
soft				Memelo	3
medium				Cristalina	5
firm				Fafayuca	7
45. Fruit: juiciness of flesh					
low				Memelo, Amarilla Plátano	3
medium				Reyna	5
high				Fafayuca, Cristalina, Burrona	7
46. Fruit: density of areoles					
sparse				Tapón de Mayo	3
medium				Cristalina	5
dense				Rubí Reyna	7
47. Fruit: glochides (*)					
few				Tapón de Mayo	3
medium				Cristalina	5
many				Reyna, Montesa, Rubí Reyna	7
48. Fruit: color of glochides (*)					
yellow				Blanca San José, Camueso, Tuna Mansa	1
brown				Pico Chulo, Amarrilla San Nicolás	2

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
49. Fruit: receptacle scar diameter					
small				Rubí Reyna, Montesa	3
medium				Cristalina, Pico Chulo	5
large				Tapón de Mayo	7
50. Fruit: attitude of receptacle scar (+)					
flattened				Rojo Pelón, Reyna	3
semi-depressed				Pico Chulo, Amarilla	5
depressed				Rubí Reyna	7
51. Fruit: length of peduncle (+)					
short				Reyna, COPENA T-5	3
medium				Montesa	5
long				Cristalina, Sanjuanera	7
52. Fruit: number of normal seeds (*)					
few				Charola, Montesa, Cardón	3
medium				Reyna, Cristalina, COPENA T-5	5
many				Burrona	7
53. Fruit: weight of normal seed (100 seeds)					
low				Cardona, Cáscarona	3
medium				Reyna	5
high				Burrona	7

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
54. Fruit: size of normal seeds (*)					
small				Curesmeño, Cardona, Cascarona	3
medium				Reyna, Pico Chulo	5
large				Burrona, Blanca San José, Chapeada	7
55. Fruit: presence of abortive seeds (*)					
few				Tapón, Cardona, Burrona	3
medium				Cristalina, Pico Chulo, Chapeada	5
many				Reyna, Charola	7
56. Fruit: acidity					
low				Blanca Larga	3
medium				Fafayuca	5
high				Blanca de Castilla	7
57. Fruit: total soluble solids (sweetness) (*)					
low				Tapón , Burrona	3
medium				Rojo Pelón, Cristalina, Pico Chulo	5
high				Reyna, Fafayuca	7
58. Time of beginning of flowering (*)					
early				Tapón, Sanjuanera	3
medium				Pico Chulo, Reyna, Rojo Pelón	5
late				Burrona, Charola, Cristalina	7

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
59. Flowering habit					
(*)					
once flowering				Reyna, Rojo Pelón, Cristalina	1
twice flowering				Cuaresmeño	2
60. Time of harvest maturity					
(*)					
early				Tapón	3
medium				Pico Chulo, Montesa, Reyna	5
late				Burrona, Fafayuca, Esmeralda	7
61. Harvesting period of fruit					
short				Torreoja, Chapeada	3
medium				Reyna, Pico Chulo	5
long				Burrona	7
62. Fruit shelf life					
short				Chapeada, Roja San Martín	3
medium				Reyna, Pico Chulo, Rojo Pelón	5
prolonged				Burrona, Cristalina, Esmeralda	7
63. Vegetative period					
short				Cristalina	3
medium				Reyna	5
large				Rojo Pelón	7

VIII. Explanations on the Table of Characteristics

Ad. 1: Plant: growth habit



1
upright



2
spreading



3
decumbent

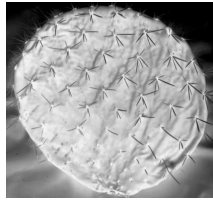


4
drooping

Ad. 4: Cladode: shape



1
elliptic



2
circular



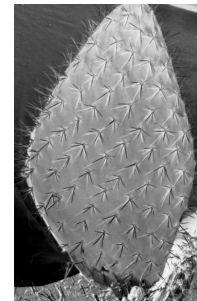
3
oblong



4
narrow obovate



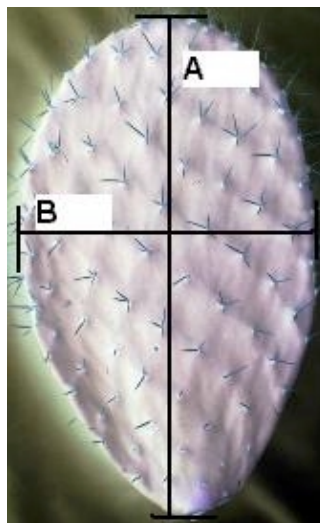
5
obovate



6
rhombic

Ad. 5: Cladode: length

Ad. 6: Cladode: width



A= length

B= width

Ad. 16: Cladode: attitude of center spine



1
erect

2
semi-erect

3
horizontal

Ad. 19: Cladode: surface of spines



1
smooth

2
longitudinal grooves

3
prickled

Ad. 21: Cladode: class of central spine



1

straight



2

curved

twisted (3) ???

Ad. 22: Cladode: twisting of central spine



1

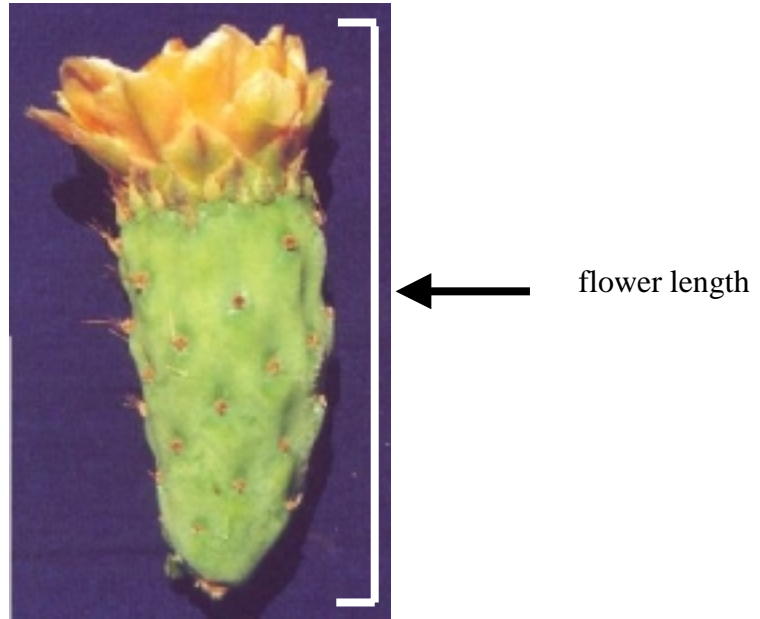
absent



9

present

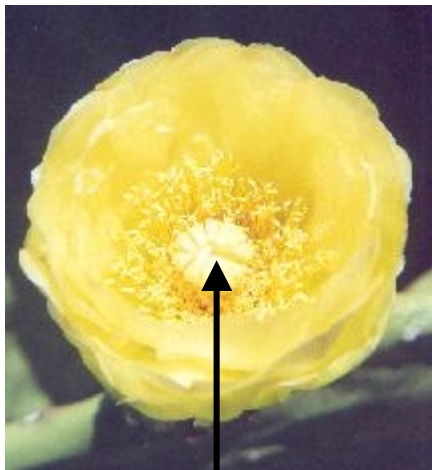
Ad. 27: Flower: length



Ad. 29: Flower: color of stigma lobes

Ad. 30: Flower: color of style

Ad. 31: Flower: number of stigma lobes



stigma lobe



style

Ad. 35: Fruit: shape



1
narrow ellipsoid



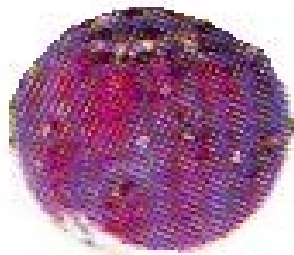
2
ellipsoid



3
oblong



4
spheroid



5
obloid



6
obovoid

Ad. 50: Fruit: attitude of receptacle scar



3
flattened

5
semi-depressed



7
depressed

Ad. 51: Fruit: length of peduncle



3
short



5
medium



7
long

Synonyms of the example varieties:

Example Varieties	Synonym(s)
Reyna	Alfajayucan, Tuna Blanca, Taxa-kähä
Montesa	Amarilla Montesa, Monteza, Amarilla Huesona, Miquihuana
Esmeralda	COPENA XXA
Fafayuca	Fafayuco, Octubreña
Torroja	Torroja, Frida, Frieda, COPENA XXXA
Milpa Alta	Tuna Morada
Pico Chulo	Naranjona, Apastillada, Copo de Oro
Amarilla Plátano	Milpa Alta Amarilla
Tuna Mansa	Blanca

IX. Literature

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X. Technical Questionnaire

	Reference Number (not to be filled in by the applicant)
TECHNICAL QUESTIONNAIRE to be completed in connection with an application for plant breeders' rights	
1. Species	<i>Opuntia</i> spp. L. PRICKLY PEAR
2. Applicant (name and address)	
3. Proposed denomination or breeder's reference	
4. Information on origin, maintenance and reproduction of the variety 4.1 Origin	(a) Seedling of unknown parentage [] (b) Produced by controlled pollination [] (indicate parent varieties) – Seed bearing parent (indicate parent) – Pollen parent (indicate parent)

(c) Produced by open pollination of (indicate seed bearing parent plant) []

.....

(d) Mutation or sport from (indicate original parent variety) []

.....

(e) Discovery (indicate where and when) []

.....

4.2 *In vitro* propagation

The plant material of the candidate variety has been obtained by *in vitro* propagation

yes	[]
no	[]

4.3 Virus status

(a) The variety is free from all known viruses as follows: (indicate from which viruses) []

.....

(b) The plant material is virus tested (indicate against which viruses) []

.....

(c) The virus status is unknown []

4.4 Other information

5. Characteristics of the variety to be indicated (the number in brackets refers to the corresponding characteristic in Test Guidelines; please mark the state of expression which best corresponds).

Characteristics	Example Varieties	Note
5.1 Cladode: thickness (8)		
thin	COPENA T-2, Rubí Reyna, San Juanera (or Sanjuanera?)	3[]
medium	Montesa	5[]
thick	Rojo Pelón, Pabellón, Tapón	7[]
5.1 Cladode: color of areole (14)		
grey	Reyna, Milpa Alta	1[]
yellow brown	Burrona	2[]
brown	Chaveña	3[]
black	Cardona	4[]
5.2 Cladode: number of spines per areole (15)		
absent or very few	Rojo Pelón, Pabellón	1[]
few	Naranjón Legítimo	3[]
medium	Cristalina, Chapeado	5[]
many	Sanjuanera	7[]
very many	Cuaresmeño, Duraznillo	9[]
5.3 Cladode: presence of glochides (24)		
few	Blanca San José, Rojo Pelón	3[]
medium	Reyna	5[]
many	Montesa, Tuna Mantequilla	7[]

Characteristics	Example Varieties	
5.4 Flower: color of style (30)		
white	Montesa, Tapón	1[]
yellow	Cardona	2[]
green	Duraznillo	3[]
pink	Pico Chulo, Morada	4[]
red	Rojo Pelón, Pabellón	5[]
5.5 Fruit: size (36)		
very small	Duraznillo	1[]
small	Pico Chulo	3[]
medium	Rojo Pelón, Reyna	5[]
large	Roja San Martín, Montesa	7[]
very large	Burrona, Cristalina	9[]
5.8 Fruit: main color of peel (42)		
white	Blanca Platanillo	1[]
light green	Gavia	2[]
medium green	Esmeralda	3[]
dark green	Reyna, Burrona	4[]
yellow	Amarilla Plátano	5[]
orange	Naranjón, Pico Chulo, Montesa	6[]
pink	Memelo	7[]
red	Rojo Pelón, Rubí Reyna, Cardona	8[]
dark red	Cardona	9[]
purple	Roja San Martín, Morada Jalpa, Tapón	10[]

Characteristics	Example Varieties
5.9 Fruit: color of flesh (43)	
light green	Reyna, Cristalina, Esmeralda 1[]
green	Burrona 2[]
yellow	Montesa 3[]
orange	Picho Chulo 4[]
pink	Memelo, Meloncillo Rosa 5[]
red	Rojo Pelón, Rubí Reyna 6[]
purple	Roja San Martín, Liria, Morada Jalpa 7[]
5.10 Fruit: glochides (47)	
few	Tapón de Mayo 3[]
medium	Cristalina 5[]
many	Reyna, Montesa, Rubí Reyna 7[]
5.9 Fruit: color of glochides (48)	
yellow	Camueso, Blanca San José, Tuna Mansa 1[]
brown	Pico Chulo, Amarrilla San Nicolás 2[]
5.10 Fruit: size of normal seeds (54)	
small	Curesmeño, Cardona, Cascarona 3[]
medium	Reyna, Pico Chulo 5[]
many	Burrona, Blanca San José, Chapeada 7[]
5.11 Fruit: presence of abortive seeds (55)	
few	Tapón, Cardona, Burrona 3[]
medium	Cristalina, Pico Chulo, Chapeada 5[]
many	Reyna, Charola 7[]

Characteristics	Example Varieties		
5.12 Flowering habit (59)			
once flowering	Reyna, Rojo Pelón, Cristalina		1[]
twice flowering	Cuaresmeño		2[]
5.13 Time of harvest maturity (60)			
early	Tapón		3[]
medium	Pico Chulo, Montesa, Reyna		5[]
late	Burrona, Fafayuca, Esmeralda		7[]
6. Similar varieties and differences from these varieties			
Denomination of similar variety	Characteristic in which the similar variety is different ^{o)}	State of expression of similar variety	State of expression of candidate variety
^{o)} In the case of identical states of expressions of both varieties, please indicate the size of the difference.			
7. Additional information which may help to distinguish the variety			
7.1 Resistance to pests and diseases			
7.2 Special conditions for the examination of the variety			
7.3 Other information			
A representative color photo of the variety should be added to the Technical Questionnaire.			

8. Authorization for release

- (a) Does the variety require prior authorization for release under legislation concerning the protection of the environment, human and animal health?

Yes [] No []

- (b) Has such authorization been obtained?

Yes [] No []

If the answer to that question is yes, please attach a copy of such an authorization.

[End of document]