

Republic of the Philippines  
DEPARTMENT OF AGRICULTURE  
**BUREAU OF PLANT INDUSTRY**  
PLANT VARIETY PROTECTION OFFICE



**GUIDELINES**  
**FOR THE CONDUCT OF TESTS**  
**FOR DISTINCTNESS, UNIFORMITY AND STABILITY**



**PINEAPPLE**

*Ananas comosus* L.

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## **I. Subject of these Guidelines**

These Test Guidelines apply to all varieties of *Ananas*.

## **II. Material Required**

1. The Plant Variety Protection Office (PVPO) decides, when, where and in what quantity and quality the seed required for testing the variety is to be delivered. Applicants outside the Philippines must make sure that all custom formalities are complied with. As a minimum, for each year of test the following quantity of seed is recommended.

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2. 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. The minimum duration of tests should be two similar growing periods.
2. The tests should be normally conducted in one place. If any important characteristics of the variety can not 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. The size of the plots should be such that plants or plant parts of plants may be removed for measurement and counting without prejudice to observations which must be made up to the end of the growing period. As a minimum, each test should include 35 plants. In all cases the total number of plants should be divided between two or more replicates. Separate plots for observation and for measuring can only be used if they have been subject to similar environmental condition.
4. Additional tests for special purposes may be established.

## **IV. Methods and Observations**

1. All plants indicated under Chapter III above should be used for the testing of uniformity. A population standard of 1% and an acceptance probability of 95% should be applied. The maximum number of types allowed would be one.
2. Unless otherwise indicated, all observations determined by measurement should be made on 20 plants or parts of 20 plants.
3. All observations on the leaf should be recorded on fully developed leaves during the appearance of the first female flower.
4. Unless otherwise indicated, all observations on the fruit should be made on first well developed, mature fruits.

5. All observations on the seeds should be made on mature and dry seeds after washing and drying in the shade.
6. When resistance characteristics are used for assessing distinctness, homogeneity and stability, records must be taken under conditions of controlled infection.

## **V. Grouping of Varieties**

1. The collection 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 and which in their various states are fairly distributed within the collection.
2. It is recommended that the competent authorities use the following characteristics for grouping varieties:
  - (i)
  - (ii)
  - (iii)

## **VI. Characteristics and Symbols**

1. To assess distinctness, homogeneity and stability, the characteristics in the Table of characteristics should be used.
  2. Notes (1-9), for the purposes of electronic data processing, are given opposite the states of the different characteristics
  3. Legend
- (\*) Characteristics that should be used every growing period for the examinations of all the varieties and should always be included in the description of the variety, 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 for Pineapple

Trait No.	Characteristics	Description/Category	Reference Varieties	Notes Remarks
1. (*)	Plant: foliage attitude	erect	Perola	3
		semi-erect	Cayenne	5
		spreading	Perolera	7
2. (+)	Plant: leaf emission rate (number of leaves produced from 4 months after planting to forcing)	low	Perola	3
		medium	S. Cayenne	5
		quick		7
3. (+)	Reference leaf: length	short	Queen	3
		medium	Cayenne, Perola	4
		long	Perola	7
4. (+)	Reference leaf: maximum width	narrow	Queen	3
		medium	Cayenne	5
		large or broad	Perola	7
5.	Reference leaf: weight	low	Queen	3
		medium	Cayenne	5
		high	Perola	7
6. (*)	Leaf: predominant color (on upper face)	pale green	S. Cayenne	1
		green	Cayenne	2
		dark green	Jupi, Perola	3
		red	Roxo de tefe	4
		dark red or purple		5
7.	Leaf: presence of variegations (on upper	absent	Perola, S. Cayenne	1

Trait No.	Characteristics	Description/Category	Reference Varieties	Notes Remarks
	face)	present	Abacaxi Tricolor	9
8.	Leaf: distribution of variegations (on upper face)	variegated with white margins		1
		variegated with white groove		2
9.	Leaf: presence of anthocyanins (on upper surface)	absent	Spanish vert	1
(*) (+)		present	Perola, S. Cayenne	9
10.	Leaf: level of expression of anthocyanins	weak	Pot a eau	3
(*)		medium	Champaka	5
		strong or high	Rondon	7
		very strong or high	Roxo de Tefe	9
11.	Leaf: cross distribution of anthocyanins	mainly on margins	Singapore canning	1
		mainly in the groove	Rondon	2
		uniform on margins and in the groove		3
12.	Leaf: distribution of anthocyanins lengthwise	mainly towards the base	Manzana	1
		mainly towards the apex	Cayenne	2
		all along the leaf		3
13	Leaf: presence of trichomes on lower surface	few		3
(+)		medium	Perolera	5
		a lot	Cayenne	7
	Leaf: spines	absent		1
		inconspicuous		2

Trait No.	Characteristics	Description/Category	Reference Varieties	Notes Remarks
		conspicuous		3
14.	Leaf: leaf edges aspect (*)	ricing		1
		not ricing		2
15.	Leaf aspect of not ricing leaf edges (*)	spines along all margins	Mac Gregor	1
		spines occur irregularly along both margins	Fina de hiero	2
		spines behind tip only	Champaka	3
		sand paper	Samba	4
		smooth	Singapore canning	5
	Leaf: Distribution of spines at margin	at base only		1
		at apex only	S. Cayenne	2
		at base and apex		3
		regular	Perola	4
		irregular		5
16.	Leaf: color of spines	same as limb	Ananas bouteille	1
		different than limb	Queen	2
17.	Leaf: spine size	small	Perola	3
		medium	Singapore canning	5
		large	Queen	7
18.	Leaf: distance between spines	small	Perola	3
		medium		5

Trait No.	Characteristics	Description/Category	Reference Varieties	Notes Remarks
		large	Queen	7
19. (*)	Peduncle: color of ventral upper face of bract leaves	green		1
		pale pink		2
		pink	50 A	3
		dark pink	46 C	4
		red	44 B	5
		dark red	45 A, 45 B	6
20.	Inflorescence: floral bract size	small	Perola	3
		medium	Queen	5
		large	Singapore canning	7
21.	Inflorescence: flowering pattern	flowering proceeds from bottom to top	Champaka	1
		flowering proceeds in any order	Perola	2
22.	Inflorescence: proportion of open flowers	null		1
		weak	Singapore canning	2
		high (all)	Champaka	3
	Inflorescence: number of flowers	low	Perola	3
		medium	S. Cayenne	5
		high		7
23.	Inflorescence: petal tip coloration	whitish		
		light purple		
		medium purple	S. Cayenne	



Trait No.	Characteristics	Description/Category	Reference Varieties	Notes Remarks
		blue-purple	Perola (98 A)	
		red-purple or dark purple	Cayenne (89 A)	
24.	Inflorescence: area of petal without coloration (without removing the flower from the fruit)	absent or very small	Singapore canning	1
		small	Cayenne	3
		medium	Perolera	5
		large	Jupi, Perola	7
25.	Inflorescence: petal length	small	Singapore canning	3
		medium	Cayenne	5
		large	Rondon	7
	Flower: petals base	free		1
		fused		2
	Flower: imbricate petals	absent		1
		present		9
26.	Inflorescence: sepal length	small	Perola	3
		medium	Cayenne	5
		large	Queen	7
	Predominant color of sepal	whitish		1
		greenish		2
		purplish	S. Cayenne	3
27.	Inflorescence/stamens: relative size	greater than style		1
		equal to style		2
		smaller than style	Perola, S. Cayenne	3

Trait No.	Characteristics	Description/Category	Reference Varieties	Notes Remarks
	Flower: disposition of anthers	separate		1
		grouped		2
28.	Inflorescence/stamens: pollen quantity	low	Cayenne, Perola	3
		medium	Queen	5
		high	Perolera	7
29.	Inflorescence: stamen length	short	Cayenne	3
		medium	Rondon	5
		long	Perolera	7
30.	Inflorescence: style length	short	Singapore canning	3
		medium	Red Spanish	5
		long	Perolera	7
31.	Fruit: predominant color when unripe (color before physiologic maturity, with the fruit completely shaped)	silvery green		
		white-green	157 C	1
		light green	Perola	
		medium green	143 A	2
		dark green	139 A, S. Cayenne	3
		brownish-green		4
		pink	52 A	5
		red	45 A	6
		dark red	187 A	7
		purple		
	brownish red	178 A	8	
	dark brown	200 A	9	

Trait No.	Characteristics	Description/Category	Reference Varieties	Notes Remarks
32.	Fruit: presence of trichomes when unripe	low	Perola	3
		medium		5
		high	Cayenne	7
33. (*)	Plant: fruit habit when ripe	flattened	Perolera	3
		bending	Cayenne	5
		upright	Perola	7
34.	Plant: part of the plant bending or flattening	fruit		1
		peduncle	Cayenne	2
		whole plant	Perolera	3
35.	Plant: height from the ground to the top of the foliage	short	Rondon	3
		medium	Queen	5
		high	Perola	7
36.	Plant: height from the ground to the fruit base	short	Queen	3
		medium	Perolera	5
		high	Rondon	7
37. (*) (+)	Peduncle length	short	Cayenne	3
		medium	Singapore canning	5
		long	Perola	7
38.	Peduncle: diameter (at middle)	small	Singapore canning	3
		medium	Cayenne, Perola	5
		large		7
	Peduncle: number of bracts	low		3
		medium		5

Trait No.	Characteristics	Description/Category	Reference Varieties	Notes Remarks
		high		7
	Imbricate bracts	absent		1
		present		9
	Peduncle: trichomes	absent		1
		present		9
39. (*)	Suckers: mean number of underground suckers per plant	none or very few	Manzana	1
		few	Cayenne, Perola	3
		medium	Red Spanish	5
		many	Singapore canning	7
40. (*) (+)	Suckers on peduncle: mean number of aerial suckers per plant	none or very few	Perolera, S. Cayenne	1
		few	Perola	3
		medium	Cayenne	5
		many	Queen, Perola	7
		very many		9
41. (*) (+)	Suckers on peduncle: size of aerial suckers at fruit harvest	small		3
		medium	Champaka	5
		large	Fils de Chalvet	7
42. (*)	Slips:	absent	Cayenne	1
		present	Queen, Perolera, Perola	3
	Fruit: detachable fruitlets	present		5
		absent		7
				9

Trait No.	Characteristics	Description/Category	Reference Varieties	Notes Remarks
	Fruit: relief of fruitlet	flat	S. Cayenne	1
		prominent	Perola	3
		very prominent		5
43. (*)	Slips: number of slips	few		3
		medium	Red Spanish	5
		many		7
44.	Slips: weight of the largest slips	light		3
		medium		5
		large	Perola	7
45.	Crown: crown foliage attitude	erect	Perola	3
		open	Cayenne	5
		spreading		7
		drooping or decumbent		9
46.	Crown: color of crown leaves	same as plant leaves		1
		with more anthocyanins than the plant leaves		2
47.	Crown: proportion of plants bearing crownlets	none or very few	Cayenne	1
		few	Perolera	3
		medium		5
		many		7
48.	Crown: number of crownlets per fruit	small	Perolera	3
		medium		5

Trait No.	Characteristics	Description/Category	Reference Varieties	Notes Remarks
		high		7
49.	Crown: proportion of plants with multiple crowns	none or very low		1
		low		3
		medium		5
		high		7
		very high		9
50. (* (+)	Crown height	very short	Certain Queen	1
		short	Queen	3
		medium	Cayenne, Perola	5
		high	Singapore canning	7
51. (+)	Crown weight	small	Rondon	3
		medium	Mac Gregor, Perola	5
		large	Cayenne	7
52. (*	Fruit: breaking from peduncle	very easy		1
		easy		2
		difficult		3
53. (* (+)	Fruit: shape when ripe	trapezoid, upside down	Singapore canning	1
		cylindrical	Perolera, S. Cayenne	2
		cylindrical to conical		
		ovoid	Cayenne	3
		conical	Perola	4

Trait No.	Characteristics	Description/Category	Reference Varieties	Notes Remarks
		elliptic		
		trapezoid		5
		globular	Red Spanish	6
54. (*)	Fruit: "skin" predominant color when ripe	white cream	155 A	1
		green	147 A	2
		green and yellow		3
		light yellow	Perola	
		yellow	13 A	4
		golden yellow	21 A, S. Cayenne	5
		orange	32 A	6
		orange red	42 A	7
		red	53 A	8
		brown	200 A	9
55. (*)	Fruit: color uniformity when ripe	heterogeneous	Rondon	1
		with a gradient	Cayenne	2
		uniform	Queen	3
56.	Fruit: presence of deformations	None or very slight		1
		definite, in a hollow shape		2
		definite, in a hump shape		3
57.	Fruit: presence of knobs	absent		1

Trait No.	Characteristics	Description/Category	Reference Varieties	Notes Remarks
	on fruit base	present		9
58.	Fruit: presence of a neck	absent or sessile like	Cayenne	1
		short	Manzana	3
		medium		5
		large	Abacaxi verde	7
59. (* (+)	Fruit: height (without neck)	short	Singapore canning	3
		medium	Perolera, S. Cayenne	5
		high	Perola	7
60. (+)	Fruit: diameter at the lower part (at mid height of the one before last eye)	small	Perola	3
		medium	Singapore canning	5
		large or wide	Perolera, S. Cayenne	7
61. (*	Fruit: diameter at the middle	small	Perola	3
		medium	Cayenne	5
		large or wide	Red Spanish	7
62.	Fruit: diameter at the upper part	small	Rondon	3
		medium	Perola	5
		large or wide	Cayenne	7
63. (*	Fruit: weight (without crown)	very low	Victoria	1
		low	Singapore canning	3
		medium	Red Spanish	5
		high	Cayenne	7
		very high	Cabeza de onca	9



Trait No.	Characteristics	Description/Category	Reference Varieties	Notes Remarks
64.	Fruit: volume (without crown)	very low		1
		low		3
		medium		5
		high		7
		very high		9
65.	Fruit: apparent density (floatation)	fruit is floating	Rondon	3
		intermediate	Pomare	5
		fruit is sinking	Manzana	7
66.	Fruit: eyes number	small	Red Spanish	3
		medium	Cayenne	5
		large	Queen	7
67. (*)	Fruit: eye relative surface	small	Black Antigua	3
		medium	Cayenne	5
		large	Red Spanish	7
68. (*)	Fruit: eye profile	hollow or concave	Singapore canning	1
		flat	Perola	2
		slightly prominent	Rondon	3
		prominent	Queen	4
69.	Fruit: eye color	uniform	Queen	1
		with a gradient	Perola	2
70.	Fruit: relative size of the floral bract compared to eye	$\frac{1}{4}$		1
		$\frac{1}{2}$		3
		$\frac{3}{4}$		5

Trait No.	Characteristics	Description/Category	Reference Varieties	Notes Remarks
		equal to the eye		7
		greater than the eye		9
71. (*)	Fruit/flesh: color	white	Perola (155 A)	
		pale yellow	Cayenne (11 A)	1
		yellow	Perolera (13 B)	2
		golden yellow	Queen (21 A)	3
		orange		4
72.	Fruit/flesh: color uniformity from the bottom to the top	uniform	Queen	1
		with a gradient	Cayenne	2
73. (+)	Fruit/flesh: core diameter	small	Singapore canning	3
		medium	Queen	5
		large or wide	Champaka	7
74.	Fruit/flesh: eye depth	weak	Cayenne	3
		medium	Queen	5
		strong or deep		7
75. (*)	Fruit/flesh: visual appraisal of density or pulp density	weak	Queen	3
		medium	Cayenne	5
		strong	Perolera	7
76.	Fruit/flesh: firmness	weak or soft	Rondon, Perola	3
		medium	Cayenne	5
		strong or firm	Perolera, S. Cayenne	7

<b>Trait No.</b>	<b>Characteristics</b>	<b>Description/Category</b>	<b>Reference Varieties</b>	<b>Notes Remarks</b>
77. (*)	Fruit/flesh: texture	smooth	Perola	1
		crisp	Queen	2
		fibrous	Singapore canning	3
78.	Fruit/flesh: fibrousness	low	Perola	3
		medium	Cayenne	5
		high	Singapore canning	7
79.	Fruit/flesh: aroma	low		3
		medium	Perola	5
		high	S. Cayenne	7
80. (*)	Fruit/flesh: sugar taste	low	Singapore canning	3
		medium	Cayenne	5
		high		7
81. (*)	Fruit/flesh: acidic taste	low	Perola	3
		medium	Cayenne	5
		high	S. Cayenne	7
82. (*)	Fruit/flesh: juiciness	low	Pomare	3
		medium	Mac Gregor, S. Cayenne	5
		high	Cayenne, Perola	7
83. (*)	Fruit/juice: ascorbic acid content	low	Cayenne	3
		medium	Perola	5
		high	Perolera	7
84. (*)	Fruit/juice: free acids content	low	Perola	3
		medium	Rondon	5

Trait No.	Characteristics	Description/Category	Reference Varieties	Notes Remarks
		high	Red Spanish	7
85. (*)	Fruit/juice: sugar content (using refractometer)	low	Singapore canning	3
		medium	Perolera	5
		high	Cayenne	7
	Concentration of soluble solids (Brix degrees)	low		3
		medium	Perola, S. Cayenne	5
		high		7
86.	Resistance to <i>Fusarium subglutinans</i>	high susceptible		1
		susceptible		2
		medium susceptible		3
		medium resistant		4
		resistant		5
		high resistant		6

## VIII. Explanation on the Table of Characteristics

### 8.1 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) (Characteristics 1 to 18) All observations related to the vegetative characters should be made on 20 plants or parts of them at the time floral induction is provoked (about 8 months after planting – stage 1 – T).
- b) (Characteristics 3 to 5) The *reference leaf* is the longest at the time floral induction is provoked. Measurements to be taken on 20 leaves.
- c) (Characteristics 19 to 30): Observations related to flowering, inflorescence and flowers should be made on 20 inflorescences, at the time of anthesis (stage 2-A). Measurements of floral parts to be taken on 10 flowers removed at mid-anthesis.
- d) (Characteristics 31 and 32): Observations of fruits before maturity should be made on 20 fruits, 4 months after floral induction is provoked (immature fruit – stage 3-I).
- e) (Characteristics 33 to 85): Qualitative observations related to plant and fruit at harvest should be made in the plot on 20 plants and 20 fruits. It is considered that harvest time is the stage at which the fruit is good to be eaten (actual maturity – stage 4 – M). Measures to be made on 10 fruits.
- f) (Characteristics 83 to 85): Analysis should be made on 10 different juices taken from each of 10 fruits. Methods are appended to this document (appendix 1).

### 8.2 Explanations for individual characteristics

Plant: attitude

Plant: number of active leaves

low	< 40
medium	40 – 60
high	> 60

Leaf: length

short	< 90 cm
medium	90 – 120 cm
long	> 120 cm

Leaf: width

narrow	< 6,0 cm
medium	6,0 a 7,0 cm
broad	> 7,0 cm

Leaf: distribution of spines at margin

(“Inconspicuos” are microscopic spines, which can be detected through the sense of touch. When we touch our hands at the margins of leaves, we feel that it’s like a sandpaper.)

(“Conspicuos” are spines, which are visible with the naked eye.)

Inflorescence: number of flowers

low	< 130
medium	130 – 170
high	> 170

Flower: ratio of the white color in the petal

low	< 30%
medium	30 – 60%
high	> 60%

Flower: length of style

shorter than the stamens  
with the same length of the stamens  
longer than the stamens

Suckers: number

low	< 1
medium	1 – 2
high	> 2

Peduncle: length

short	< 18 cm
medium	18 – 28 cm
long	> 28 cm

Peduncle: diameter at the middle portion

small	< 2,5 cm
medium	2,5 – 3,5 cm
large	> 3,5 cm

Peduncle: number of slips

low	< 5
medium	5 – 10
high	> 10

Fruit: length. Measured from base to top without consider the crown

short	< 15 cm
medium	15 – 20 cm
large	> 12 cm

Fruit: diameter of tip

small	< 6 cm
medium	6 – 10 cm
large	> 10 cm

Fruit: shape

1	2	3	4	5
conic	conic to cylindrical	cylindrical	elliptic	global

Fruit: number of fruit basal slips

low	< 1
medium	1 – 2
high	> 2

Fruit: diameter of central axis

small	< 1,5 cm
medium	1,5 – 2,5 cm
large	> 2,5 cm

Fruit: concentration of soluble solids (Brix degrees)

low	< 13
medium	13 – 16
high	> 16

Fruit: acidity (fixed in percentage)

low	< 0,5
medium	0,5 – 0,7
high	> 0,7

Crown: length

short	< 15 cm
medium	15 – 20 cm
long	> 20 cm

Crown: weight

low	< 100 g
medium	100 – 130 g
high	> 130 g

### 8.3 *APPENDIX: Methods of measurements (pineapple juice) from France Cirad*

#### Juice

The juice is squeezed out from pineapple flesh and strained through muslin. It can be frozen to be used later.

#### Sugar content (character 85)

Sugar content (Brix value) is recorded via refractometer. It is given as percentage (%Brix).

#### Free acid content (character 84)

Free acid content is determined by titration of 10 ml filtered juice with 0.1 NaOH with phenolphthaleine as indicator. The result is given in meq per 100 ml of juice (meq/100 ml).

#### Ascorbic acid content (character 83)



Ascorbic acid content is determined by titration with 2,6-dichlorophenol-indophenol (DCPIP). It is compared to a control scale (see below). Measure is brought to 100 ml of juice and is given in mg/100 ml.

*Reagents*

Sol 1: Metaphosphoric acid 2% / TCA 4%

Dissolve 2 mg metaphosphoric acid and 4 mg trichloroacetic acid in 100 ml distilled water.

Sol 2: DCPIP 250 mg/l

Dissolve 125 mg 2,6-dichlorophenol-indophenol in 500 ml warm distilled water, then filter

Add 104 mg sodium bicarbonate

*Note: Dissolved DCPIP is unstable. Protect from light.*

Sol 3: Ascorbic acid control

Dissolve 50 mg ascorbic acid in 100 ml Sol 1 + 100 ml distilled water

Control

Ascorbic acid content (mg):	0	0.25	0.50	0.75	1.0	1.25
Sol 3 (ml)	0	1	2	3	4	5
Sol 1 (ml)	4	3.5	3	2.5	2	1.5
Distilled water (ml)	4	3.5	3	2.5	2	1.5

Titration

Add 4 ml Sol 1 to 4 ml juice. Pour slowly Sol 2 until pink coloration appears. Compare the volume poured to the control scale to determine the ascorbic acid content within 4 ml juice.

*Note: if acid ascorbic measurement should be made later, add 4 ml Sol 1 to 4 ml juice immediately after it has been squeezed and strained (e.g. before freezing).*