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

STAR FRUIT
(Averrhoa carambola L.)

Alternative Names:

Botanical Name	*Local Name*	*Common Name*
Averrhoa carambola L.	Star fruit, Belimbing, Belimbing besi	Star fruit, Belimbing

DEPARTMENT OF AGRICULTURE MALAYSIA

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1.0 *SUBJECT OF THESE TEST GUIDELINES*

These Test Guidelines apply to all ~~vegetatively propagated~~ varieties of Averrhoa carambola L.

2.0 *MATERIAL REQUIRED*

2.1. *The competent authority (Plant Varieties Board) decides on the quantity and quality of the plant material required for testing the variety and when and where it is to be delivered. Applicants submitting material from a Country other than Malaysia in which the testing takes place must ensure that all customs formalities and phytosanitary requirements are complied with.*

2.2. *The material is to be supplied in the form of ~~vegetatively propagated~~ grafts or grafted trees.The rootstock of the variety should be agreed by the authority.*

2.3 *The minimum quantity of plant material, to be supplied by the applicant, should be 5 trees.*

2.4. *The plant material(s) should be visibly healthy, not lacking in vigour, nor affected by any important pest or disease.*

2.5. *The plant material should not have undergone any treatment, which would affect the expression of the characteristics of the variety, unless the competent authority allows or requests such treatment. If it has been treated, full details of the treatment must be given.*

3.0 *METHOD OF INSPECTION*

3.1. *Number of Growing Cycles*

3.1.1 *The minimum duration of tests should normally be two independent growing cycles.*

3.1.2 *~~The fruiting cycle is considered to be the period ranging from the beginning of active vegetative growth, flowering and fruit development and concluding with the harvesting of fruit.~~The growing cylcle is considered to be the period ranging from the beginning of flowering of an individual flower or inflorescence through fruit development and concluding with the harvest of fruit from corresponding individual flower or inflorescence.*

3.2 *Location of Testing*

Tests are normally conducted at one place. In the case of tests conducted at more than one place, guidance is provided in UPOV document TGP/9: Examining Distinctness.

3.3. *Conditions for Conducting the Examination*

3.3.1 *The tests should be carried out under conditions ensuring satisfactory growth for the expression of the relevant characteristics of the variety and for the conduct of the examination. In particular, it is essential that the trees produce a satisfactory crop of fruit in each of two fruiting cycles.*

3.3.2 *Stage of development for the assessment*

The optimal stage of development for the assessment of each characteristic is indicated by a letter in the second column of the Table of Characteristics. The stages of development denoted by each letter are described at Chapter 7.0.

3.3.3 *Type of observation*

The recommended method of observing the characteristic is indicated by the following key in the second column of the Table of Characteristics in Chapter 8.0 of this document:

MG: *single measurement of a group of plant or parts of plants*

MS: *measurement of a number of individual plant or parts of plants*

VG: *visual assessment by a single observation of a group of plant or parts of plants*

VS: *visual assessment by observation of individual plant or parts of plants*

3.4. *Test Design*

3.4.1 *Each test should be designed to result in a total of at least 5 plants with compatible pollinizer as and when necessary.*

3.4.2 *The design of the tests should be such that plants or parts of plants may be removed for measurement or counting without prejudice to the observations which must be made up to the end of the fruiting period.*

3.5. *Number of Plants / Parts of Plants to be Examined*

Unless otherwise indicated, all observations should be made on 5 plants or parts

taken from each of 5 plants. In the case of parts of plants, the number to be taken from each of the plants should be 2.

3.6. Additional Tests

Additional tests for specific purposes may be established.

4.0 *ASSESSMENT OF DISTINCTNESS, UNIFORMITY AND STABILITY*

4.1. *Distinctness*

A plant variety is distinct if on the date of filing of an application, the variety is clearly distinguishable from any other plant variety, the existence of which is a matter of common knowledge.

4.1.1 *General Recommendations*

It is of particular importance for users of these Test Guidelines to consult the UPOV document TGP 1/3: General Introduction prior to making decisions regarding distinctness. However, the following points are provided for elaboration or emphasis in these Test Guidelines.

4.1.2 *Consistent Differences*

The differences observed between varieties may be so clear that more than one inspection is not necessary. In addition, in some circumstances, the influence of the environment is not such that more than one inspection is required to provide assurance that the differences observed between varieties are sufficiently consistent.

4.1.3 *Clear Differences*

Determining whether a difference between two varieties is clear depends on many factors, and should consider, in particular, the type of expression of the characteristic being examined, i.e. whether it is expressed in a qualitative, quantitative, or pseudo-qualitative manner. Therefore, it is important that users of these Test Guidelines are familiar with the recommendations contained in the UPOV document TGP 1/3: General Introduction prior to making decisions regarding distinctness.

4.2 *Uniformity*

A plant variety is uniform if, subject to the variation that may be expected from the particular features of its propagation, it is sufficiently uniform in its relevant characteristics.

4.2.1 *It is of particular importance for users of these Test Guidelines to consult the UPOV document TGP 1/3: General Introduction prior to making decisions regarding*

uniformity. However, the following points are provided for elaboration or emphasis in these Test Guidelines.

4.2.2 *For the assessment of uniformity, a population standard 1% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 5 plants, no off-type is allowed.*

4.3 *Stability*

A plant variety is stable if its relevant characteristics remain unchanged after repeated propagation or in the case of a particular cycle of propagation, at the end of each particular cycle.

4.3.1 *In practice, it is not usual to perform tests of stability that produce results as certain as those of the testing of distinctness and uniformity. However, when a variety has been shown to be uniform, it can also be considered to be stable*

5.0 *GROUPING OF VARIETIES*

5.1 *Candidate varieties are divided into groups to facilitate the assessment of distinctness aided by the use of grouping characteristics.*

5.2 *Grouping characteristics are those in which the documented states of expression, even where produced at different locations, can be used to select varieties of common knowledge. They can be compared to candidate varieties for examination of distinctness either individually or in combination with other such characteristics.*

5.3 *The following are useful grouping characteristics based on Table of Characteristics in Chapter 8.0:*

(a) *Flower : position of stigma in relation to anthers (Char. 19)*

(b) *Petal: distribution of anthocyanin coloration*

(c) *Fruit : shape (Char. 26)*

(d) *Fruit: apical point*

(e) *Fruit : color of skin (Char.32)*

5.4 *Guidance for the use of grouping characteristics, in the process of examining distinctness, is provided through the UPOV document TGP 1/3: General Introduction.*

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6.0 *INTRODUCTION TO THE TABLE OF CHARACTERISTICS*

6.1 *Categories of Characteristics*

6.1.1 *National Test Guidelines Characteristics*

National Test Guidelines characteristics are those which are proposed by appointed Examiners and Invited Experts and approved by the Plant Varieties Board for examination of DUS..

6.1.2 *Asterisked Characteristics*

*Asterisked characteristics (denoted by *) are those included in the Test Guidelines which are important for the international harmonization of variety descriptions and should always be examined for DUS and included in the variety description, except when the state of expression of a preceding characteristic or regional environmental conditions render this inappropriate.*

6.2 *States of Expression and Corresponding Notes*

6.2.1 *States of expression are given for each characteristic to define the characteristic and to harmonize descriptions. Each state of expression is allocated a corresponding numerical note for ease of recording of data and for the production and exchange of the description.*

6.2.2 *In the case qualitative and pseudo-qualitative characteristics (see Chapter 6.3), or relevant states of expression are presented in the characteristic. However, in the case of characteristic with 5 or more states and abbreviated scale may be used to minimize the size of Table of Characteristics. For example, in the case of quantitative characteristics with 9 states, the presentation of states of expression in the test guidelines may be abbreviated as follows:*

State	*Note*
Small	3
Medium	5
Large	7

However, each should be noted that all of the following 9 states of expression exist to described varieties and should be used as appropriate:

State	Note
Very small	1
Very small to small	2
Small	3
Small to medium	4
Medium	5
Medium to large	6
Large	7
Large to very large	8
Very large	9

6.2.3. *Further explanation of the presentation of states of expression and notes is provided in document TGP/7 "Development of Test Guidelines".*

6.3 *Types of Expression*

An explanation of the types of expression of characteristics (qualitative, quantitative and pseudo-qualitative) is provided in the UPOV document TGP 1/3: General Introduction.

6.4 *Example Varieties*

Where appropriate, example varieties are provided to clarify the states of expression of each characteristic.

6.5 *Legend*

(*) *Asterisked characteristic – see Chapter 6.1.2*
QL *Qualitative characteristic – see Chapter 6.3*

QN *Quantitative characteristic – see Chapter 6.3*
PQ *Pseudo-Qualitative characteristic – see Chapter 6.3*

MG: *see section 3.3.3*

MS: *see section 3.3.3*

VG: *see section 3.3.3*

VS: *see section 3.3.3*

(a) – (c) *See Explanations Covering Several Characteristics in Chapter 7.0.*

(+) *See Explanations for Individual Characteristics in Chapter 8.0.*

7.0 *Explanations on the Table of Characteristics*

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) *Branch: All observation should be made on the first year wood.*~~

~~(b) *Petiole: All observation should be made on the middle third from the branch which is not at a stage of active growth.*~~

(c) ~~*Mature*~~ *Leaf:* ~~*Unless specified,*~~ *all observations should be made on the middle third* ~~*from the tip*~~ *of* ~~*the*~~ *one-year old shoot* ~~*branch which is not at a stage of active growth*~~.

(d) ~~*Terminal*~~ *leaflet: All observations should be made on the middle pair of leaflets* ~~*should be the middle pair of terminal leaflets that is between the distal and terminal leaflets*~~.

(e) ~~*Flower:*~~ *Petal and sepal: All observations* ~~*on the inflorescence*~~ *should be made at the time of* ~~*fully bloom*~~ *anthesis*.

(f) *Fruit: All observations* ~~*on the fruit*~~ *should be made on the terminal fruit at the optimum eating stage* ~~*at 80%*~~ *maturity.*

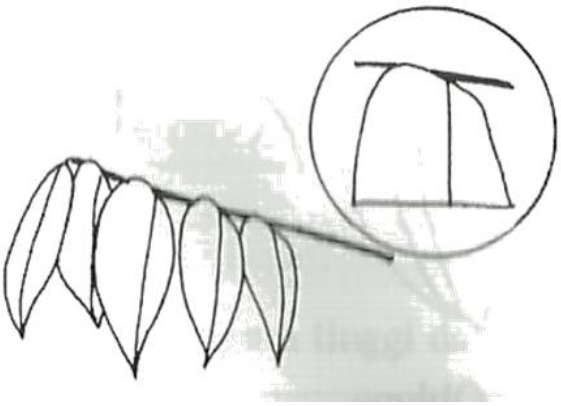
8.0 *TABLE OF CHARACTERISTICS*

BIL ***NO.***		**CIRI** ***CHARACTERISTIC***	**KEADAAN** ***STATE***	**VARIETI CONTOH** ***EXAMPLE VARIETIES***	**CATATAN** ***NOTE***	**remarks**
1. (*) (+) QN	VG	*Tree: growth habit*	*upright* ~~*upright to spreading*~~ *[semi upright]* *spreading*		1 2 3	To add explanation : to observe tree at less than 5 year old
2 (*) (+) QN	VG	~~*Tree: branch color*~~ *One-year old shoot: intensity of brown colour*	*light* ~~*brown*~~ *medium* ~~*brown*~~ *dark* ~~*brown*~~		1 2 3	To add explanation: To observe at the middle third of the branch
~~3~~ ~~(+)~~ ~~QN~~ ~~PQ~~	~~VG~~ ~~(a)~~	~~*Stem: texture of bark surface*~~	~~*smooth*~~ ~~*flackey*~~ ~~*fissured*~~		~~3~~ ~~[1]~~ ~~5~~ ~~[2]~~ ~~7~~ ~~[3]~~	To delete
4. ~~QL~~ QN	VG	*Young shoot:* ~~*presence of*~~ *anthocyanin coloration*	*absent or weak* *medium* *strong* ~~*present*~~		1 9 [3] 5	

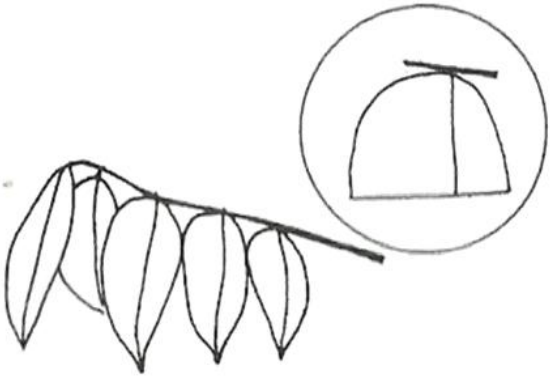
~~*Add. (4):Young shoot: presence of anthocyanin*~~ *To delete*  1 *absent* 9 *present*						
~~5.~~ ~~QN~~	~~VG~~	~~*Young shoot: intensity of antocyanin*~~	~~*weak*~~ ~~*medium*~~ ~~*strong*~~	~~B2, B11,~~ ~~B10~~ ~~B17~~	~~3~~ ~~5~~ ~~7~~	To delete
6. QN	MS (c)	~~*Leaf: petiole length*~~ *Leaf: length of petiole*	*short* *medium* *long*	B11 B10, B17	3 5 7	
Char. 8						
Char. 9						
7. (*) (+) QN	VG (c)	~~*Leaflet: shoulder in relation to petiole*~~ *Leaflet: position of base in relation to petiole*	~~*Upward*~~ *above* ~~*Horizontal*~~ *same* ~~*Downward*~~ *below*	B11 B3, B8, B10, B17	1 2 3	Move to char. 14

Add. (7):Leaflet: shoulder in relation to petiole

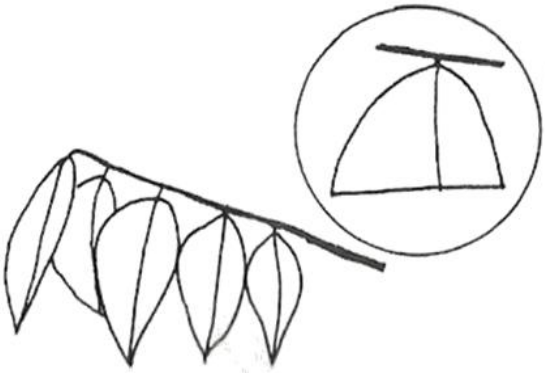
To change wording of state



1
upward



2
horizontal



3
downward

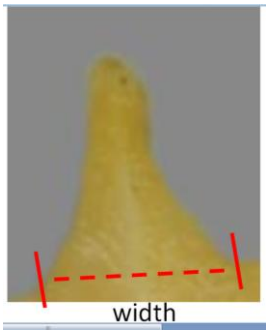
Char. 10						
8. (*) QN	VS/ VG (c)	~~*Leaflet: attitude of petiole in relation to main axis*~~ *Leaf: attitude in relation to shoot*	*upright* *horizontal* *drooping*	B10, B14, B17 B2 B1	3 5 7	Move after char. 6

9. (*) QN	VG (c)	~~*leaflet : color on upper surface*~~ *Leaf: intensity of green colour on upper side*	*light ~~green~~* *medium* *dark ~~green~~*		1 [3] 2 [5] [7]	
10. (*) PQ	VG (c)	~~*Leaflet : petiole color*~~ *Leaflet: colour of petiolule*	*greenish brown* *brown* *reddish brown*	B2, B8 B10 B17, B12	1 2 3	
11. (*) (+) PQ	VG (c)	*Terminal leaflet : shape*	~~*Elliptic*~~ *[ovate]* ~~*Ovate*~~ *[elliptic]* *Oblong* *obovate*		1 2 3 4	To add illustration INA to provide EV for ovate TH will check on oblong & obovate
12. QN	MS /MG (c)	*Terminal leaflet : length*	*short* *medium* *long*		3 5 7	
13. QN	MS MS /MG ~~(d)~~ (c)	*Terminal leaflet : width*	*narrow* *medium* *broad*		3 5 7	
14. QN	MS (d)	*Terminal leaflet : ratio length to width*	*Narrow [low]* *Medium[medium]* *Broad [high]*		3 5 7	
15. ~~QL~~ QN	VG (d)	*Terminal leaflet :glossiness ~~of~~ on upper surface*	~~*non-glossy*~~ *[absent or weak]* *medium* ~~*glossy*~~ *[strong]*	B17 B10, B14	1 [1] 9 [3] [5]	
16. QN	VG (d)	*Terminal leaflet : undulation of ~~leaf~~ margin*	*Weak* *medium* *strong*	B14, B17 B10 B11	3 [1] 5 [3] 7 [5]	

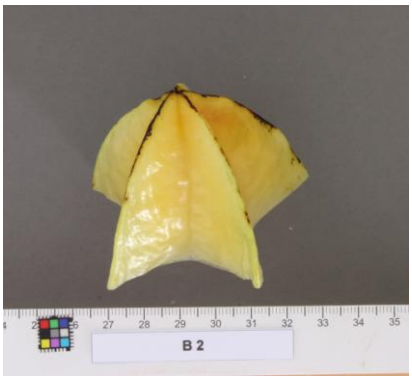
17. (+) QN	VG (d)	*Terminal leaflet : ~~shape~~ profile in cross section*	*Flat or slightly concave* *moderately concave* *strongly concave*	B8 B10 B17	3 [1] 5 [2] 7 [3]	
~~Add.(17): Terminal leaflet : shape in cross section~~ ~~To describe by using degree°~~						
~~18.~~ ~~PQ~~	~~VG~~	~~Jambak bunga: Jenis~~ ~~*Inflorescence: Type*~~	~~simple~~ ~~compound~~		~~1~~ ~~2~~	To delete
19. (*) (+) ~~QL~~ QN	VG (e)	*Flower :position of stigma in relation to anthers*	*~~above anther~~ [far above]* *same ~~level as anther~~* *~~below anther~~[far below]*	B2, B11 -- B17	1 2 3	To add illustration
20. QN	VG (e)	*~~Flower :~~ Sepal: ~~intensity~~ amount of anthocyanin coloration*	*Weak [low]* *Medium [medium]* *Strong [high]*	B2 B10 B17	1 3 5	
21. (+) PQ	VG (e)	*~~Flower :~~ Petal: shape of ~~tip~~ apex*	*~~acute~~* *~~obtuse~~* *rounded* *truncate* *~~obcordate~~*	 B17 B11 	~~1~~ ~~2~~ ~~3~~ [1] ~~4~~ [2] ~~5~~	
Add.(21): Flower : Petal: shape of tip To adjust  1 *acute* 2 *obtuse* 3 *rounded* 4 *truncate* 5 *obcordate*						

22. QN	VG (e)	~~*Flower :*~~ *Petal: intensity of anthocyanin coloration*	*weak* *medium* *strong*		3 5 7	
NEW (*) QN	VG	*Petal: distribution of anthocyanin coloration*	*Only lower third* *Lower and middle third* *Throughtout*	B2 B10 B17	1 2 3	
23. (+) QN	VG (e)	~~*Flower:p*~~ *Petal: curvature*	~~*Incurving*~~ *straight or weakly recurved* ~~*Straight*~~ *moderately recurved* ~~*Recurving*~~ *strongly recurved*	B2 --- B17	3 5 7	
24. QL	VG	*Very young fruit* ~~*Fruitlet*~~*: presence of anthocyanin coloration on* ~~*rib*~~ *wing*	*absent* *present*	B10, B17 ~~B17, B13~~ B5	1 9	
25. (*) ~~QN~~ PQ	VG	~~*Fruit: color of fruitlets*~~ *Very young fruit: colour*	*light green* *medium green* *dark green* *reddish and green*	B2 B17 B8 B5	1 2 3 4	
26. (*) ~~QN~~ PQ	VG	*Fruit : shape*	*Elliptic [ovate]* *Ovate [elliptic]* *oblong*	~~B2~~ [B10] ~~B10~~ [B2] B11, B17	1 ~~3~~ [2] ~~5~~ [3]	

Add.(26):Fruit : shape to adjust  1 *elliptic*  3 *ovate*  5 *oblong*						
27. (+) (*) ~~QL~~ PQ (?)	VG	*Fruit : tip of apex* *Fruit: apical point*	*pointed* *depressed*	B2 B10, B11,B17	1 2	To add illustration to show position
28. (+) ~~QL~~ QN	VG	~~*Fruit : ridge: shape in cross section*~~ *Fruit: profile of wing in cross section*	*Straight to slightly convex* ~~*slightly convex*~~ *moderately convex* *strongly convex*	B2 B10 B17	1 ~~2~~ ~~3~~ 2 ~~4~~ 3	To add diagram of fruit part To add diagram to explain the shape of wing
29. (+) QN	MG/ VG	~~*Fruit : ridge: size in cross section (the biggest ridge)*~~ *Fruit: width of wing in cross section*	~~*Small*~~ *narrow* *medium* ~~*large*~~ *broad*	B5, B13 B2 B10	3 5 7	MY to confirm EV



Add. (29):Fruit : ridge: size in cross-section (the biggest ridge) *Add. 27: Fruit: apical point*



3
I
small

5
medium

7
large

30. (*) (+) QN	MS /VG	*Fruit : length*	*short* *medium* *long*	B13 B11, B17 B10	3 5 7	Move before char. 26 To add illustration to explain more chars.
31. (*) (+) QN	MS /VG	*Fruit : width*	*narrow* *medium* *broad*	B13, B15 B11, B17 B10	3 5 7	Move before char. 26
NEW QN	MS	*Fruit: ratio length to width*	*Low* *Medium* *high*		3 5 7	

32. (*) PQ	VG (d)	*Fruit : color of skin*	*greenish yellow* *whitish yellow* *yellow* *yellowish orange* *orange*	Pasar minggu (INA) B2 B10 B17	1 2 3 4 5	INA to provide picture
33. (+) ~~QL~~ QN	VG (e)	~~*Flesh: colour uniformity from the bottom to the top*~~ *Fruit: gradient of skin colour intensity from apex to base*	~~*Uniform*~~ *absent or very weak* *Weak* *Medium* *strong* ~~*with a gradient*~~	B10 -- -- B17	1 2 [3] 5 7	
34. ~~QN~~ QL	VG	*Fruit :presence of white* ~~*dots*~~ *markings*	*absent* *present*	B10 B17	1 9	
35. (*) ~~QN~~ PQ	VG	*Fruit :* ~~*rib color*~~ *colour of rib*	*whitish yellow* *light green* *dark green*	B2 B10 B11	1 2 3	To include whole fruit diagram to indicate rib
36. ~~QL~~ QN	VG	*Fruit:* ~~*blistering*~~ *surface*	~~*Absent*~~ *smooth or slightly blistered* *Moderately blistered* *Strongly blistered* ~~*present*~~		1 9 [3] 5	MY to provide EV
37. QN	VG	~~*Flesh: texture*~~ *Fruit: texture of flesh*	*fine* *medium* ~~*fibrous*~~ *coarse*	B2 B10 B17	1 2 3	
38. (*) QN	~~MS~~ MG /VG	~~*Flesh: sweetness*~~ *Fruit: sweetness*	*low* *medium* *high*	B6 B10, B2 B17	3 5 7	

39. (*) QN	~~MS/~~ MG /VG	~~*Seed: numbers per fruit*~~ *Fruit: number of seeds*	*few* *medium* *many*	B5 B17 B2, B11	3 5 7	
NEW QN	VG	*Seed: intensity of brown colour*	*Light* *Medium* *Dark*	B2 -- B10	3 5 7	
NEW QN	VG	*One-year old shoot: number of lenticels*	*few* *medium* *many*	To be checked	3 5 7	To provide illustration of lenticel
NEW QN	VG	*Fruit: height of the wing*	*Short* *Medium* *High*	To be checked	3 5 7	To provide illustration