TG/08/1
Tarikh : 5 Mei 2009
Date : 5 May 2009

GARIS PANDUAN KEBANGSAAN UNTUK MENJALANKAN UJIAN KELAINAN, KESERAGAMAN DAN KESTABILAN

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

KOKO
COCOA

(*Theobroma cacao* L.)

Nama Lain:
Alternative Names:

Nama Botani *Botanical Name*	Nama Tempatan *Local Name*	Nama Biasa *Common Name*
Theobroma cacao L.	Koko	Koko *Cocoa*

JABATAN PERTANIAN MALAYSIA
DEPARTMENT OF AGRICULTURE MALAYSIA

MEI 2009
MAY 2009

JADUAL KANDUNGAN
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1.0 SUBJEK GARIS PANDUAN UJIAN
SUBJECT OF THESE TEST GUIDELINES

Garis panduan ini digunakan bagi semua varieti Theobroma cacao L. yang dibiak secara vegetatif.

These Test Guidelines apply to all vegetatively propagated varieties of Theobroma cacao L.

2.0 BAHAN YANG DIPERLUKAN
MATERIAL REQUIRED

2.1 Pihak yang kompeten memutuskan kuantiti dan kualiti bahan tanaman yang diperlukan bagi pengujian varieti serta bila dan di mana bahan tanaman itu perlu dihantar. Pemohon yang menyerahkan bahan dari negara selain Malaysia di mana ujian dijalankan mestilah memastikan semua formaliti kastam dan keperluan fitosanitari telah dipatuhi.

The competent authority 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 State other than that in which the testing takes place must ensure that all customs formalities and phytosanitary requirements are complied with.

2.2 Bahan perlulah dibekalkan dalam bentuk keratan mata tunas atau anak pokok bertunas atau pokok matang sepertimana yang diputuskan oleh pihak yang kompeten.

The material is to be supplied in the form of budsticks or budded seedlings or matured plants as decided by competent authority.

2.3 Kuantiti minimum bahan tanaman untuk dibekalkan oleh pemohon seharusnya:
The minimum quantity of plant material, to be supplied by applicant, should

i. 10 keratan mata tunas, cukup untuk membiakkan 10 pokok; atau
10 budsticks, sufficient to propagate 10 plants; or

ii. 10 pokok bertunas
10 budded plants

2.4 Bahan tanaman yang dibekalkan seharusnya kelihatan sihat, cergas dan tiada kesan kerosakan akibat daripada apa-apa perosak atau penyakit yang berbahaya.

The plant material supplied should be visibly healthy, not lacking in vigour, nor affected by any important pest or disease.

2.5 Bahan tanaman tidak seharusnya melalui apa-apa rawatan yang mungkin menjejaskan ekspresi ciri varieti, melainkan pihak yang kompeten membenarkan atau meminta rawatan itu dilakukan. Sekiranya bahan tanaman telah dirawat, butiran penuh rawatan mestilah diberikan.

The plant material must 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 KAEDAH PEMERIKSAAN
METHOD OF EXAMINATION

3.1 Bilangan Kitaran Perumbuhan
Number of Growing Cycles

3.1.1 Tempoh minimum bagi ujian seharusnya dua kitaran pertumbuhan bebas pada tempoh sekurang-kurangnya 36 bulan selepas penanaman di ladang.

The minimum duration of tests should be two independent growing cycles of at least 36 months age from field planting.

3.1.2 Kitaran pertumbuhan dianggap sebagai tempoh dari permulaan pertumbuhan vegetatif atau pembungaan yang aktif, berlanjutan sepanjang pertumbuhan vegetatif aktif, pembentukan bunga serta buah dan berakhir dengan kutipan buah.

A growing cycle is considered to be the period ranging from the beginning of active vegetative growth or flowering, continuing through active vegetative growth or flowering and fruit development and concluding with the harvesting of fruit.

3.2 Tempat Ujian
Testing Place

Biasanya ujian dijalankan di satu tempat. Jika ujian dijalankan di lebih daripada satu tempat, garis panduan diberi dalam dokument UPOV TGP/9: *Examining Distinctness*.

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 Keadaan bagi Menjalankan Pemeriksaan
Conditions for Conducting the Examination

3.3.1 Ujian seharusnya dijalankan di dalam keadaan yang memastikan pertumbuhan adalah memuaskan bagi menunjukkan ekspresi ciri berkaitan varieti tersebut dan bagi menjalankan pemeriksaan. yang dijalankan 36 bulan selepas penanaman di ladang.

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 36 months after field planting.

3.3.2 Peringkat tumbesaran bagi penilaian
Stage of development for the assessment

Peringkat tumbesaran yang optimum bagi penilaian setiap ciri ditunjukkan oleh huruf dalam kolum kedua Jadual Ciri. Peringkat tumbesaran yang ditandakan oleh setiap huruf diperihalkan dalam Bab 7.0.

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 Jenis pemerhatian
Type of observation

Kaedah pemerhatian ciri yang disyorkan diberikan oleh petunjuk berikut dalam kolum kedua Jadual Ciri:

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

MG: satu pengukuran ke atas sekumpulan pokok atau bahagian pokok;
single measurement of a group of plants or parts of plants;

MS: pengukuran bagi beberapa pokok atau bahagian pokok secara individu;
measurement of a number of individual plants or parts of plants;

VG: penilaian secara visual dengan satu pemerhatian ke atas sekumpulan pokok atau bahagian pokok;
visual assessment by a single observation of a group of plants or parts of plants;

VS: penilaian secara visual dengan memerhati setiap pokok atau bahagian pokok.
visual assessment by observation of individual plants or parts of plants.

3.3.4 Pemerhatian warna dengan mata
Observation of colour by eye

Oleh sebab sinaran cahaya siang berbeza-beza, penentuan warna yang dibuat berbanding carta warna hendaklah dilakukan sama ada di dalam kabinet yang sesuai yang menyediakan cahaya siang tiruan, atau pada waktu tengah hari di dalam bilik tanpa pancaran terus cahaya siang. Taburan spektrum punca cahaya bagi cahaya siang tiruan seharusnya mematuhi Piawai CIE Cahaya Siang Diutamakan D 6500 dan seharusnya termasuk dalam lingkungan julat tolerans yang ditetapkan dalam Piawaian British 950, Bahagian I. Penentuan warna seharusnya dibuat dengan bahagian tumbuhan diletak pada latar putih.

Because daylight varies, colour determinations made against a colour chart should be made either in a suitable cabinet providing artificial daylight or in the middle of the day in a room without direct sunlight. The spectral distribution of the illuminant for artificial daylight should conform with the CIE Standard of Preferred Daylight D 6500 and should fall within the tolerances set out in the British Standard 950, Part I. These determinations should be made with the plant part placed against a white background.

3.4 Reka Bentuk Ujian
Test Design

3.4.1 Setiap ujian seharusnya direka bagi menghasilkan jumlah sekurang-kurangnya 10 pokok.

Each test should be designed to result in a total of at least 10 trees.

3.4.2 Reka bentuk ujian seharusnya sebegitu rupa supaya pokok atau bahagian pokok boleh diasingkan untuk diukur atau dikira tanpa menjejaskan pemerhatian yang selanjutnya.

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 growing cycle.

3.5 Bilangan Pokok / Bahagian Pokok untuk Diperiksa
Number of Plants / Parts of Plants to be Examined

Kecuali dinyatakan sebaliknya, semua pemerhatian seharusnya dibuat pada 10 tanaman atau bahagian tanaman yang diambil setiap satu daripada tanaman itu. Bagi bahagian tanaman, bilangan yang perlu diambil daripada setiap tanaman mestilah minimum lima (5).

Unless otherwise indicated, all observations should be made on ten plants or parts taken from each of them. In the case of parts of plants, the number to be taken from each of the plants should be a minimum of five (5).

3.6 Ujian Tambahan
Additional Tests

Ujian tambahan, untuk memeriksa ciri berkaitan, boleh ditperiksa bila atau di mana perlu seperti berikut:

Additional test, for examining relevant characteristics, may be examined when/ where necessary as follows:

(a) Bunga : keserasian - ciri 26
Flower: compatibility - characteristic 26

(b) Bunga : kepadatan pembungaan - ciri 27
Flower: flowering intensity - characteristic 27

(c) Biji benih : kandungan lemak - ciri 28
Seed: fat content - characteristic 28

(d) Kerintangan terhadap penyakit : Vascular Streak Dieback (VSD– *Oncobasidium theobromae*) - ciri 29
Disease resistance: Vascular Streak Dieback (VSD – Oncobasidium theobromae) - characteristic 29

(e) Kerintangan terhadap penyakit : Black Pod - *Phytophthora palmivora*- ciri 30
Disease resistance: Black Pod - Phytophthora palmivora - characteristic 30

4.0 PENILAIAN KELAINAN, KESERAGAMAN DAN KESTABILAN
ASSESSMENT OF DISTINCTNESS, UNIFORMITY AND STABILITY

4.1 Kelainan
Distinctness

4.1.1 Syor Umum
General Recommendations

Amat penting bagi pengguna Garis Panduan Ujian ini untuk merujuk kepada *UPOV dokumen TGP 1/3: General Introduction* sebelum membuat keputusan berkenaan dengan kelainan. Walau bagaimanapun, perkara berikut diberikan bagi huraian lebih lanjut atau penekanan dalam Garis Panduan ini.

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 Perbezaan yang Konsisten
Consistent Differences

Sekiranya perbezaan yang diperhatikan antara varieti amat jelas, satu kitaran pertumbuhan adalah mencukupi. Selain itu, dalam sesetengah keadaan sekiranya tidak terdapat perbezaan yang jelas yang mungkin disebabkan oleh faktor persekitaran, lebih daripada satu kitaran pertumbuhan diperlukan untuk memberikan kepastian bahawa perbezaan yang diperhatikan antara varieti supaya cukup konsisten. Satu cara untuk memastikan perbezaan dalam satu ciri yang diperhatikan dalam satu ujian penanaman cukup konsisten adalah dengan memeriksa ciri pada sekurang-kurangnya dua kitaran pertumbuhan yang bebas.

The differences observed between varieties may be so clear that more than one growing cycle is not necessary. In addition, in some circumstances, the influence of the environment is not such that more than a single growing cycle is required to provide assurance that the differences observed between varieties are sufficiently consistent. One means of ensuring that a difference in a characteristic, observed in a growing trial, is sufficiently consistent is to examine the characteristic in at least two independent growing cycles.

4.1.3 Perbezaan Jelas
Clear Differences

Menentukan sama ada perbezaan antara dua varieti adalah jelas bergantung pada banyak faktor, dan seharusnya mengambil kira terutamanya jenis ekspresi ciri yang diperiksa, iaitu sama ada ciri itu diekspresikan secara kualitatif, kuantitatif, atau pseudokualitatif. Justeru itu, penting bagi pengguna Garis Panduan Ujian ini untuk mengetahui syor yang terkandung di dalam *Dokumen UPOV TGP 1/3: General Introduction* sebelum membuat keputusan berkenaan kelainan.

Determining whether a difference between two varieties is clear depends on many factors, and should consider, in particular, the type of expression of the characteristics 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 Keseragaman
Uniformity

4.2.1 Amat penting bagi pengguna Garis Panduan Ujian ini untuk merujuk *UPOV dokumen TGP 1/3: General Introduction* sebelum membuat keputusan berkenaan dengan keseragaman. Walau bagaimanapun, perkara berikut diberikan sebagai huraian lebih lanjut atau penekanan dalam Garis Panduan ini.

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 Bagi penilaian keseragaman varieti yang dibiak secara tampang, piawaian populasi sebanyak 1% dan kebarangkalian penerimaan sekurang-kurangnya 95% seharusnya digunakan. Dalam kes saiz sampel 10 pokok, 1 jenis ganjil dibenarkan.

For the assessment of uniformity of vegetatively propagated varieties, a population standard of 1% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 10 plants, 1 off-type is allowed.

4.3 Kestabilan
Stability

4.3.1 Secara praktikalnya, ujian kestabilan adalah jarang dijalankan bagi menghasilkan keputusan yang begitu pasti seperti keputusan ujian kelainan dan keseragaman. Namun begitu, pengalaman menunjukkan bahawa bagi kebanyakan jenis varieti, apabila sesuatu varieti terbukti seragam, ia boleh dianggap sebagai stabil.

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, experience has demonstrated that, for many types of variety, when a variety has been shown to be uniform, it can also be considered to be stable.

4.3.2 Apabila sesuai atau jika terdapat keraguan, kestabilan boleh diuji, sama ada dengan menanam generasi selanjutnya, atau dengan menguji stok tanaman yang baru untuk memastikan tanaman itu menunjukkan ciri yang sama seperti ciri yang ditunjukkan oleh bahan yang dibekalkan sebelumnya.

Where appropriate, or in cases of doubt, stability may be tested, either by growing a further generation, or by testing a new plant stock to ensure that it exhibits the same characteristics as those shown by the previous material supplied.

5.0 PENGELOMPOKAN VARIETI DAN PERANCANGAN & PELAKSANAAN UJIAN PENANAMAN
GROUPING OF VARIETIES AND ORGANIZATION OF THE GROWING TRIAL

5.1 Pemilihan varieti yang diketahui umum untuk ditanam dalam ujian bersama-sama varieti calon dan cara varieti ini dibahagikan kepada kelompok bagi memudahkan penilaian kelainan, dibantu oleh penggunaan ciri pengelompokan.

The selection of varieties of common knowledge to be grown in the trial with the candidate varieties and the way in which these varieties are divided into groups to facilitate the assessment of distinctness are aided by the use of grouping characteristics.

5.2 Ciri pengelompokan ialah ciri yang keadaan ekspresinya telah didokumenkan walaupun dihasilkan di lokasi berlainan, boleh digunakan sama ada secara berasingan atau secara gabungan dengan ciri lain:

Grouping characteristics are those in which the documented states of expression, even where produced at different locations, can be used, either individually or in combination with other such characteristics:

(a) untuk memilih varieti yang diketahui umum yang boleh dikecualikan dalam ujian penanaman yang digunakan bagi memeriksa kelainan; dan

to select varieties of common knowledge that can be excluded from the growing trial used for examination of distinctness; and

(b) untuk mengaturkan ujian penanaman supaya varieti yang serupa dikelompokkan bersama.

to organize the growing trial so that similar varieties are grouped together.

5.3 Yang berikut telah dipersetujui sebagai ciri pengelompokan yang sesuai:
The following have been agreed as useful grouping characteristics:

(a) Pokok: sifat dahan (ciri 1)
Tree: branching habit (characteristic 1)

(b) Buah matang: bentuk (ciri 9)
Mature fruit: shape (characteristic 9)

(c) Buah matang: warna (cirri 14)
Mature fruit: colour (characteristic 14)

(d) Biji benih: warna kotiledon (ciri 24)
Seed: cotyledon colour (characteristic 24)

(e) Biji benih: bentuk (ciri 25)
Seed: shape (characteristic 25)

5.4 Garis panduan bagi penggunaan ciri pengelompokan, dalam proses memeriksa kelainan, diberi dalam *General Introduction*.

Guidance for the use of grouping characteristics, in the process of examining distinctness, is provided through the General Introduction.

6.0 PENGENALAN KEPADA JADUAL CIRI
INTRODUCTION TO THE TABLE OF CHARACTERISTICS

6.1 Kategori Ciri
Categories of Characteristics

6.1.1 Ciri Garis Panduan Ujian Kebangsaan
National Test Guidelines Characteristics

Ciri Garis Panduan Ujian Nasional ini merupakan ciri yang dicadangkan oleh Pegawai Pemeriksa Tanaman dan pakar tanaman dan diluluskan oleh Lembaga Varieti Tumbuhan bagi pemeriksaan DUS.

National Test Guidelines characteristics are those which are proposed by Crop Examiners and invited experts and approved by the Plant Variety Board for examination of DUS.

6.1.2 Ciri Bertanda Asterisk
Asterisked Characteristics

Ciri bertanda asterisk ditandakan dengan (*) ialah ciri yang termasuk dalam Garis Panduan Ujian yang merupakan ciri penting bagi penyelarasan deskripsi varieti pada peringkat antarabangsa dan seharusnya selalu diperiksa untuk DUS, dan dimasukkan dalam deskripsi varieti, kecuali apabila keadaan ekspresi ciri yang sebelumnya atau keadaan persekitaran kawasan menjadikannya tidak sesuai.

*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 Tahap Ekpresi dan Catatan yang Berkaitan
States of Expression and Corresponding Notes

Tahap ekspresi diberi bagi setiap ciri untuk menjelaskan ciri dan untuk menyelaraskan deskripsi. Setiap tahap ekspresi diperuntukkan catatan bernombor yang sepadan bagi memudahkan merekod data dan bagi penerbitan serta pertukaran deskripsi.

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.

6.3 Jenis Ekspresi
Types of Expression

Penjelasan tentang jenis ekspresi ciri (kualitatif, kuantitatif dan pseudokualitatif) diberi dalam *General Introduction*.

An explanation of the types of expression of characteristics (qualitative, quantitative and pseudo-qualitative) is provided in the General Introduction.

6.4 Varieti Contoh
Example Varieties

Di mana sesuai, varieti contoh diberi untuk menjelaskan keadaan ekspresi setiap ciri.

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

6.5 Petunjuk
Legend

(*) Ciri bertanda asterisk – lihat Bab 6.1.2
Asterisked characteristic – see Chapter 6.1.2

QL Ciri kualitatif – lihat Bab 6.3
Qualitative characteristic – see Chapter 6.3
QN Ciri kuantitatif – lihat Bab 6.3
Quantitative characteristic – see Chapter 6.3
PQ Ciri pseudokualitatif – lihat Bab 6.3
Pseudo-Qualitative characteristic – see Chapter 6.3

MG: lihat bahagian 3.3.3
see section 3.3.3
MS: lihat bahagian 3.3.3
see section 3.3.3
VG: lihat bahagian 3.3.3
see section 3.3.3
VS: lihat bahagian 3.3.3
see section 3.3.3

(a) – (h) Lihat Penjelasan meliputi beberapa ciri dalam Bab 7.0.
See Explanations Covering Several Characteristics in Chapter 7.0.

(+) Lihat Penjelasan bagi ciri individu dalam Bab 8.0.
See Explanations for Individual Characteristics in Chapter 8.0.

7.0 PENJELASAN JADUAL CIRI
EXPLANATIONS ON THE TABLE OF CHARACTERISTICS

Penjelasan meliputi beberapa ciri
Explanations covering several characteristics

Ciri yang mengandungi petunjuk berikut dalam kolum kedua Jadual Ciri seharusnya diperiksa seperti yang ditunjukkan di bawah ini:

Characteristics containing the following key in the second column of the Table of Characteristics should be examined as indicated below:

(a) Pemerhatian pada daun muda seharusnya dibuat pada peringkat pertumbuhan daun baru aktif.
Observation on the leaf flushes should be made during the period of active flushing.

(b) Semua pemerhatian pada daun matang seharusnya dibuat pada daun yang terbentuk sepenuhnya di kedudukan satu pertiga dari puncak kanopi. Ukuran diambil dari daun matang keempat pada ranting yang mempunyai tunas terminal dorman.

All observations on mature leaves should be made on the fully developed leaves at the top third of the canopy. Measurement is taken on the fourth mature leaf on twig with dormant terminal bud.

(c) Pemerhatian pada peratusan penetapan buah bagi klon serasi sendiri seharusnya dibuat pada tempoh 21 hari selepas pendebungaan tangan dengan lebih daripada 10% penetapan buah. Minimum 30 pendebungaan seharusnya dilakukan bagi setiap klon.

Observation on percentage of fruit set for self compatible clone should be made at 21 days after hand pollination with more than 10% fruit set. A minimum of thirty pollinations should be done for each clone.

(d) Semua pemerhatian pada bunga seharusnya dibuat pada peringkat kembang.

All observations on flower should be made at blooming stage.

(e) Semua pemerhatian pada buah matang seharusnya dibuat pada pod koko buah yang telah terbentuk sepenuhnya sebelum bermulanya pemasakan buah.

All observations on mature fruit should be made on cocoa pod at fully developed fruit before onset of ripening.

(f) Semua pemerhatian pada buah masak seharusnya dibuat ke atas pod koko, pada peringkat dimana lebih dari 50% warna pod telah bertukar ke warna kuning atau merah.

All observations on ripe fruit should be made on cocoa pod at the stage when more than 50% of the pod colour has changed to yellow or red.

(g) Pemerhatian pada kekerasan pod seharusnya dibuat pada buah matang berusia 4.5 bulan menggunakan mesin Penetrometer (Model SP02).

Observation on pod hardness should be made on mature fruit aged 4.5 months using Penetrometer machine (Model SP02).

(h) Semua pemerhatian pada biji benih seharusnya dibuat selepas musilaj dibuang.

All observation on the seeds should be made after removal of mucilage.

8.0 TABLE OF CHARACTERISTICS
JADUAL CIRI

BIL. *NO.*		CIRI *CHARACTERISTICS*	KEADAAN *STATES*	VARIETI CONTOH *EXAMPLE VARIETIES*	CATATAN *NOTE*
1. (*) (+) QN	VG	Pokok: sifat dahan *Tree: branching habit*	tegak *erect* separa tegak *semi-erect* melempai *drooping*	BR 25, PBC 123 KKM 3, KKM 15 PBC 159, SCA 6	3 5 7

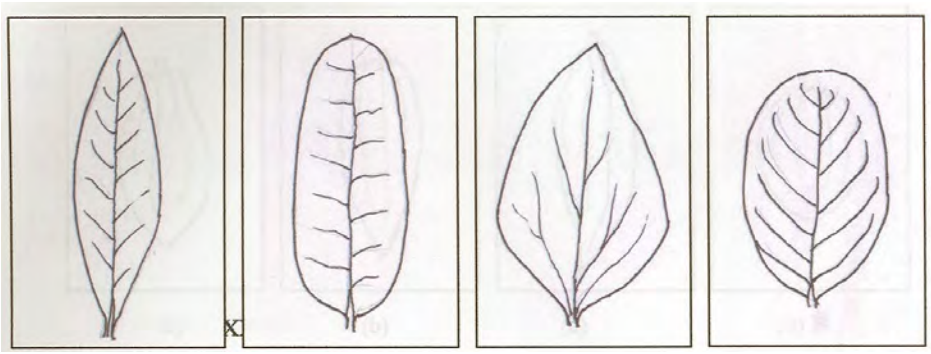
Tamb. (1): Pokok: sifat dahan
Ad. (1): Tree: branching habit

3
tegak
erect

5
separa tegak
semi erect

7
melempai
drooping

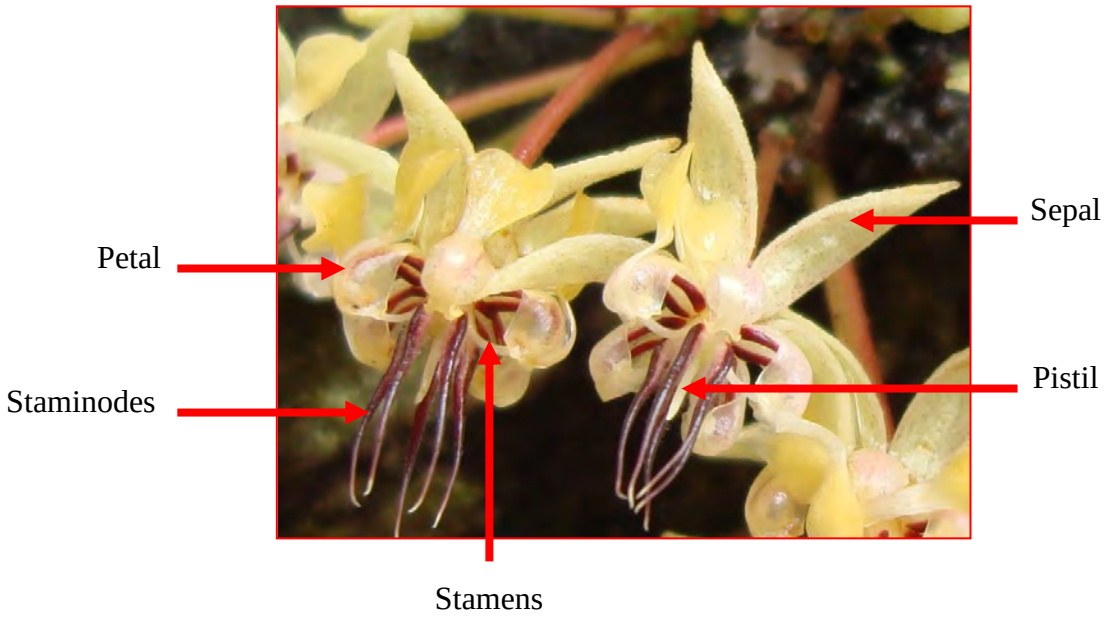
2. QN	VG	Pokok: tabiat pertumbuhan *Tree: growth habit*	lemah *weak* separa-cergas *semi-vigorous* cergas *vigorous*	PBC 159 KKM 1, BR 25 PA 76, BAL 209	3 5 7
3. QN	VG	Pokok: kepadatan kanopi *Tree: canopy density*	jarang *sparse* sederhana *moderate* padat *dense*	KKM 15, KKM 27 KKM 1 BAL 209, PBC 123	3 5 7

BIL. *NO.*		CIRI *CHARACTERISTICS*	KEADAAN *STATES*	VARIETI CONTOH *EXAMPLE VARIETIES*	CATATAN *NOTE*
4. (+) PQ	VG (b)	Daun: bentuk *Leaf: shape*	lanseolat *lanceolate* oblong *oblong* ovat *ovate* eliptik *elliptical*	KKM 3, KKM 4 SDS 4	1 2 3 4
Tamb. (4): Daun: bentuk *Ad. (4): Leaf: shape*  1 lanseolat *lanceolate* 2 oblong *oblong* 3 ovat *ovate* 4 eliptik *elliptical*					
5. (*) (+) PQ	VG (a)	Daun: keamatan pempigmenan pucuk *Leaf : intensity of flush pigmentation*	tiada *absent* lemah *weak* kuat *strong*	BAL 300, SDS 62 KKM 1, KKM 3 PBC 123, BR 25	1 2 3

BIL. *NO.*		CIRI *CHARACTERISTICS*	KEADAAN *STATES*	VARIETI CONTOH *EXAMPLE VARIETIES*	CATATAN *NOTE*
Tamb. (5): Daun: keamatan pempigmenan pucuk *Ad. (5): Leaf: intensity of flush pigmentation*    1 tiada *absent* 2 lemah *weak* 3 kuat *strong*					
6. (+) QL	VG (d)	Bunga: pempigmenan pada sepal *Flower: pigmentation on sepal*	tiada *absent* ada *present*	KKM 1 SDS 62	1 9

BIL. *NO.*		CIRI *CHARACTERISTICS*	KEADAAN *STATES*	VARIETI CONTOH *EXAMPLE VARIETIES*	CATATAN *NOTE*

FLOWER OF COCOA



Tamb. (6): Bunga: pempigmenan pada sepal
Ad. (6): Flower: pigmentation on sepal

1
tiada
absent

9
ada
present

7. QN	MS (d)	Bunga: panjang pedunkel *Flower: peduncle length*	pendek *short* sederhana *medium* panjang *long*	ICS 75, ICS 89 CC 39, SCA 6 CC 10, UF 221	3 5 7

BIL. *NO.*		CIRI *CHARACTERISTICS*	KEADAAN *STATES*	VARIETI CONTOH *EXAMPLE VARIETIES*	CATATAN *NOTE*
8. QN	MS (d)	Bunga: panjang staminod *Flower: staminods length*	pendek *short*	EET 400, ICS 1	3
			sederhana *medium*	CC 39, UF 667	5
			panjang *long*	UF 668, Catongo	7
9. (*) (+) PQ	VG (e)	Buah matang: bentuk *Mature fruit: shape*	Amelonado *Amelonado*	KKM 4, KKM 15	1
			Cundeamor *Cundeamor*	MCB C5, QH 1003	2
			Angoleta *Angoleta*	KKM 19, KKM 6	3
			Calabacillo *Calabacillo*	LARANGE	4

Tamb. (9): Buah matang: bentuk
Ad. (9): Mature fruit: shape

1 Amelonado | 2 Cundeamor | 3 Angoleta | 4 Calabacillo

10. (*) (+) QN	VG (e)	Buah matang: rupa bentuk permukaan *Mature fruit: surface rugosity*	licin *smooth*	KKM 22, QH 968	3
			sederhana *intermediate*	PBC 130, KKM 28	5
			kasar *rough*	KKM 19, MCB C4	7

BIL. *NO.*		CIRI *CHARACTERISTICS*	KEADAAN *STATES*	VARIETI CONTOH *EXAMPLE VARIETIES*	CATATAN *NOTE*
Tamb. (10): Buah matang: rupa bentuk permukaan *Ad. (10): Mature fruit: surface rugosity*  3 licin *smooth*  5 sederhana *intermediate*  7 kasar *rough*					
11. (*) (+) QN	VS (e)	Buah matang: penyempitan pada pangkal *Mature fruit: basal constriction*	tiada *absent* lemah *weak* sederhana *intermediate* kuat *strong*	MCB C1, KKM 22, QH 37, PBC 123 KKM 25, QH 326	1 3 5 7
Tamb. (11): Buah matang: penyempitan pada pangkal *Ad. (11): Mature fruit: basal constriction* Penyempitan pada pangkal adalah kehadiran bentuk seperti leher botol. *The basal constriction is the appearance of bottle neck form.*  1 tiada *absent*  5 sederhana *intermediate*  7 kuat *strong*					

BIL. *NO.*		CIRI *CHARACTERISTICS*	KEADAAN *STATES*	VARIETI CONTOH *EXAMPLE VARIETIES*	CATATAN *NOTE*
12. (*) (+) QN	VS (e)	Buah matang: bentuk apeks *Mature fruit: apex shape*	bulat *round* tumpul *blunt* sederhana / perantaran *intermediate* tajam *sharp*	LARANGE PBC 154 KKM 4, QH 22 MCB C5, QH 1003	1 3 5 7

Tamb. (12): Buah matang: bentuk apeks
Ad. (12): Mature fruit: shape of apex

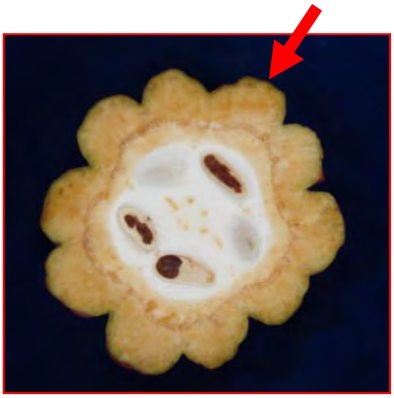
Bentuk pada hujung pod koko.
The form of the tip for cocoa pod.

3
tumpul
blunt

5
sederhana
intermediate

7
tajam
sharp

13. (+) QN	VS (e)	Buah matang: kepadatan rabung *Mature fruit: intensity of ridges*	lemah *weak* sederhana *intermediate* kuat *strong*	KKM 1, PBC 140 PBC 139, LS 4 KKM 28, PBC 123	3 5 7

BIL. *NO.*		CIRI *CHARACTERISTICS*	KEADAAN *STATES*	VARIETI CONTOH *EXAMPLE VARIETIES*	CATATAN *NOTE*
Tamb. (13): Buah matang: kepadatan rabung *Ad. (13): Mature fruit: intensity of ridges*    3 lemah *weak* 5 sederhana *intermediate* 7 kuat *strong*					
14. (*) (+) PQ	VS (e)	Buah matang: warna *Mature fruit: colour*	hijau muda *light green*	ICS75	1
			hijau *green*	MCBC5	2
			merah muda *light red*	KKM22	3
			merah *red*	PBC123	4
			campuran merah dan hijau (merah dominan) *mixture of red and green (red dominant)*	MHP421	5
			campuran merah dan hijau (hijau dominan) *mixture of red and green (green dominant)*	QH1176	6

BIL. *NO.*		CIRI *CHARACTERISTICS*	KEADAAN *STATES*	VARIETI CONTOH *EXAMPLE VARIETIES*	CATATAN *NOTE*
Tamb. (14): Buah matang: warna *Ad. (14): Mature fruit: colour*     1 hijau muda *light green* 2 hijau *green* 3 merah muda *light red* 4 merah *red*   5 campuran merah dan hijau - merah dominan *mixture of red and green – red dominant* 6 campuran merah dan hijau – hijau dominan *mixture of red and green – green dominant*					
15.1 (*) PQ	VS (f)	Buah masak: warna rabung *Ripe fruit: colour of ridges*	kuning *yellow* merah *red*	PA 7, NA 33 PBC 123, BR 25	1 2
15.2 (*) PQ	VS (f)	Buah masak: warna rabung *Ripe fruit: colour of ridges*	Carta Warna RHS *(RHS colour chart)*		

BIL. *NO.*		CIRI *CHARACTERISTICS*	KEADAAN *STATES*	VARIETI CONTOH *EXAMPLE VARIETIES*	CATATAN *NOTE*
16. (*) (+) QN	VS (e)	Buah matang: kedalaman alur *Mature fruit: furrow depth*	cetek *shallow* sederhana *medium* dalam *deep*	BAL 209, MCB C1 KKM 3, DESA 1 KKM 2, KKM 19	3 5 7

Tamb. (16): Buah matang: kedalaman alur
Ad. (16): Mature fruit: furrow depth

3
cetek
shallow

5
sederhana
medium

7
dalam
deep

17. QN (+)	MS (e)	Buah matang: panjang *Mature fruit: length*	pendek *short* sederhana *medium* panjang *long*	KKM 2, MCB C3 KKM 19, MCB C1 QH 1003, MCB C5	3 5 7

Tamb. (17): Buah matang: panjang
Ad. (17): Mature fruit: length

3
pendek
short

5
sederhana
medium

7
panjang
long

BIL. *NO.*		CIRI *CHARACTERISTICS*	KEADAAN *STATES*	VARIETI CONTOH *EXAMPLE VARIETIES*	CATATAN *NOTE*
18. (+) QN	MS (e)	Buah matang: lebar (pada bahagian tengah) *Mature fruit: width (at middle portion)*	sempit *narrow* sederhana *medium* lebar *broad*	SCA 6 PA 7 MOQ 413	3 5 7

Tamb. (18): Buah matang: lebar (pada bahagian tengah)
Ad. (18): Mature fruit: width (at middle portion)

3
sempit
narrow

5
sederhana
medium

7
lebar
broad

19. (*) QN	MS (e)	Buah matang: ketebalan kulit (pada bahagian tengah) *Mature fruit: husk thickness (at middle portion)*	nipis *thin* sederhana *medium* tebal *thick*	KKM 1, KKM 2, KKM 3 KKM 2, KKM 4, KKM 6 KKM 22, BAL 209	3 5 7
20. QN	MS (g)	Buah matang: kekerasan lapisan sklerotik (pada bahagian tengah) *Mature fruit: Sclerotic Layer Hardness (at middle portion)*	lembut *soft* sederhana *medium* keras *hard*	PBC112 KKM25 LAFI7	3 5 7

BIL. *NO.*		CIRI *CHARACTERISTICS*	KEADAAN *STATES*	VARIETI CONTOH *EXAMPLE VARIETIES*	CATATAN *NOTE*
21. (*) QN	MS (f)	Buah masak: bilangan biji per pod *Ripe fruit: bean number per pod*	rendah *low* sederhana *medium* tinggi *high*	KKM 25 KKM 6, KKM 22 KKM 1, KKM 2	3 5 7
22. QL	VG (f)	Buah masak: kepadatan biji benih dalam pod (50% masak) *Ripe fruit: compactness of seeds in pod (50% ripeness)*	padat *compact* longgar *loose*	QH1213 QH441	1 2
23. (*) (+) QN	MS (h)	Biji benih: saiz biji kering *Seed: size of dry bean*	kecil *small* sederhana *medium* besar *large*	QH 441 KKM 4, PBC 123 KKM 25, UIT 1	3 5 7
Tamb. (23): Biji benih: saiz biji kering *Ad. (23): Seed: size of dry bean* Berat satu biji kering (biji bersih dikeringkan secara pengeringan oven). *The weight of one dry bean (oven dried clean-bean).*					
24. (*) (+) PQ	VG (h)	Biji benih: warna kotiledon (biji basah) *Seed: cotyledon colour (wet bean)*	putih *white* ungu muda *light purple* ungu *purple* ungu gelap *dark purple*	CATONGO KKM 2 ICS 60 KKM 4, KKM 15	1 2 3 4

BIL. *NO.*		CIRI *CHARACTERISTICS*	KEADAAN *STATES*	VARIETI CONTOH *EXAMPLE VARIETIES*	CATATAN *NOTE*
Tamb. (24): Biji benih: warna kotiledon (biji basah) *Ad. (24): Seed: cotyledon colour (wet bean)*  1 putih *white* 2 ungu muda *light purple* 3 ungu *purple* 4 ungu gelap *dark purple*					
25. (+) PQ	VG (h)	Biji benih: bentuk (biji basah) *Seed: shape (wet bean)*	pendek dan rata *short and flat* panjang dan rata *long and flat* pendek dan berisi *short and plump* panjang dan berisi *long and plump*	KKM 15, KKM 22 KKM 1, QH 1176 KKM 17, PBC 159 KKM 3, KKM 4	1 2 3 4

BIL. *NO.*		CIRI *CHARACTERISTICS*	KEADAAN *STATES*	VARIETI CONTOH *EXAMPLE VARIETIES*	CATATAN *NOTE*

Tamb. (25): Biji benih: bentuk
Ad. (25): Seed: shape

1
pendek dan rata
short and flat

2
panjang dan rata
long and flat

3
pendek dan berisi
short and plump

4
panjang dan berisi
long and plump

CIRI-CIRI TAMBAHAN
ADDITIONAL CHARACTERISTICS

BIL. *NO.*		**CIRI** *CHARACTERISTICS*	**KEADAAN** *STATES*	**VARETI CONTOH** *EXAMPLE VARIETIES*	**CATATAN** *NOTE*
26. QL	MS (d)	Bunga: keserasian *Flower: compatibility*	Tidak serasi diri *Self-incompatible* Serasi diri *Self-compatible*	KKM 4, KKM 15 BR 25, PBC 140	1 2
27. QL	VS (c)	Bunga: keamatan pembungaan (dua musim berbunga) *Flower: Flowering intensity (two flowering seasons)*	kurang *light* padat *intense*	QH 22 QH 1560	1 9
28. (+) QN	MG (e)	Biji benih: kandungan lemak *Seed: fat content*	rendah (<50%) *low* sederhana (50- 55%) *medium* tinggi (>55%) *high*	BR 25 KKM 4 KKM 1, PBC 159	3 5 7

Tamb. (28): Biji benih: kandungan lemak (%)
Ad. (28): Seed: fat content (%)

PROCEDURE FOR DETERMINATION OF TOTAL FAT IN DRIED COCOA BEANS AND NIBS

1.0 *Title*

Determination of total fat in dried cocoa beans and nibs.

2.0 *Field of application*

Applicable to cocoa dried cocoa beans and nibs.

3.0 *Definition*

The total fat content of dried cocoa beans and nibs is the amount of fat obtained by the method described.

4.0 *Principle of method, reactions, specificity*

The product is hydrolyzed with dilute hydrochloric acid and filtered. The dried mass containing the fat is extracted with petroleum ether, the solvent evaporated, and the residue weighed.

5.0 *Reagents and/or materials*

5.1 *Hydrochloric acid 25% wt/wt (d = 1.12). Mix 2 volumes 36% hydrochloric acid with 1 volume water.*

5.2 *Petroleum ether – boiling range, 30-60 °C, dry and redistill if necessary.*

5.3 *Silver nitrate solution – 0.1N.*

6.0 *Apparatus*

6.1 *Soxhlet extractor – siphon capacity about 100ml, with ground glass joint and 250 ml flat bottom flask.*

6.2 *Condenser*

7.0 *Procedure*

7.1 *Digestion of sample – grind materials such as dried cocoa beans and nibs,-to a maximum 150 microns.*

7.2 *Weigh sample to nearest 1 mg of 4-5g into 300 to 500 ml beaker.*

7.3 *With continuous stirring add 45ml boiling distilled water followed by 55ml hydrochloric acid, as in 5.1.*

7.4 *Add a few de-flatted incinerated pieces of pumice, pumice powder, or other anti bumping agent, cover with a watch glass and boil gently exactly 15 minutes. Wash watch glass with 100 ml distilled water into beaker. Filter the digest through a wet, fat free, fluted filter paper of pore size such as to allow filteration at reasonable speed (12,595,150).*

7.5 *Rinse beaker 3 times with distilled water, passing washing through filter, and continue washing until filtrate ceases to give a reaction with silver nitrate 5.3. Transfer wet filter paper and residue to fat-free extractor thimble. Place glass wool plug over paper and dry 6-18 hours at small beaker at 100 to 101 °C. Also dry original beaker and watch glass.*

7.6 *Extraction of fat – dry 1 h flat-bottom round flask (250ml) containing a few pieces of anti bumping agent, cool, weigh to-nearest 0.1 mg and connect to the Soxhlet extractor. Placed dried filter paper and thimble in Soxhlet. Support thimble on spiral or glass beads to ensure efficient of siphon. Wash both beaker and watch glass with 100 ml of petroleum ether, 5.2, into thimble in several portions. Extract digested sample and filter under reflux for 4 hours, allowing extractor to siphon over at least 30 times. Evaporate solvent on steam bath and dry to constant weight at 100 to 101 °C. Remove the last traces of petroleum ether after drying by blowing air through flask. Repeat drying until consecutive weighing differs by less than 0.05% of the weight of fat.*

8.0 *Calculation and expression and interpretation of results*

8.1 *Method of calculation and formulae*

$$\% \text{ Fat in sample} = \frac{100 \times F}{W}$$

$$\% \text{ Fat in dry matter} = \frac{10{,}000 \times F}{E \times W}$$

where, E = 100 - % moisture in sample
F = weight extracted fat in gram (weight flask + fat after drying – weight dry flask)
W = weight sample in gram

29. (+) QN	MG	Daya toleransi terhadap penyakit: Vascular Streak Dieback (VSD – *Oncobasidium theobromae*) *Disease tolerance: Vascular Streak Dieback (VSD – Oncobasidium theobromae)*	rentan *susceptible* separa rintang *moderately resistant* rintang *resistant*	*PBC 140, PBC 130* *KKM 22, BR 25* *PBC123, QH 1003*	3 5 7

Tamb. (29): Daya toleransi terhadap penyakit: Vascular Streak Dieback (VSD – *Oncobasidium theobromae*)
Ad. (29): Disease tolerance: Vascular Streak Dieback (VSD – Oncobasidium theobromae)

VASCULAR STREAK DIEBACK (VSD) DISEASE ASSESSMENT PROTOCOL FOR COCOA

A. METHODOLOGY OF ASSESSMENT

The extent of disease symptom severity or damage is quantified by using a disease severity or damage scale. The scale used is from 0-6 (Table 1) on progressive damage from chlorosis to defoliation to dieback. This method of measurement incorporates both the incidence and the extent of damage caused by the disease. The method applies for both the seedling and mature tree.

Table 1: Symptom Severity Scale

Severity scale	***Primary symptom severity of a flush***	***Associated symptom***
0	*Apparently uninfected or healthy*	*Leaves glossy, healthy*
1	*One or two infected leaves; infected leaves showing early signs of symptoms-loss of glossiness or shine; discrete brown vascular bundles on petiole of leaf scar or midrib of the leaf lamina.*	*Smooth bark of twigs or stem no swollen lenticels*
2	*Few infected leave, one showing or more showing chlorosis in progress*	*Lenticels on bark may or may not be swollen*
3	*Some leaves infected; one infected leaf abscised; one or more of the leaves showing chlorosis and necrosis in progress*	*Lenticels on bark may or may not be swollen*
4	*Two infected leaves abscised, some or all of the remaining leaves showing chlorosis and/or partial necrosis*	*Lenticels on bark may or may not swollen*
5	*Three or more infected leaves have abscised; remaining leaves infected, chlorotic or necrotic; apparent cessation of growth (of first flush)*	*Lenticels usually swollen; fruit bodies may or not be present*
6	*Near complete or complete defoliation from abscission of infected leaves; dieback (first flush) in progress as indicated by the drying of the twig/stem.*	*Lenticels usually swollen; fruit bodies may or may not be present; may or may not be any proliferation of auxiliary shoots.*

The scale is used to score the severity of the disease of a plant sub-unit. A plant sub-unit is defined as a flush region of seedling or twig or branch of a jorquetted plant. A plant unit is made up of the terminal three flushes of a seedling, twig or branch of a jorquetted plant. The assessment is conducted on the terminal three flushes because these bear the most photosynthetically active leaves.

When a plant unit is sampled, presence and absence of VSD has to be determined. The presence is confirmed by the characteristic symptom –discrete brown discoloration of the vascular bundles of infected leaf scars of base of leaf petioles. Plant units damaged by caused other than VSD should not be sampled.

The severity score (x) obtained for each plant sub-unit is then weighted with a factor according to the position or age of the flush or subunit. The higher the severity scores of the first or younger flush (subunit), the greater the observed severity of the dieback of the plant unit of given total un-weighted severity score.

The weighting factors (k) are arbitrarily set at 1 (k_1), ½ (k_2), and ¼(k_3) for the first, second and third flush respectively.

To obtain the weighted severity score of a plant subunit, multiply the assigned weighting factor with the severity score of the plant subunit.

b. DISEASE SEVERITY INDEXING PRODUCEDURE

i. dsi: disease severity index of a plant unit

To obtain the disease severity index of a plant unit (dsi), add up all the weighted severity scores of the plant subunit which constitute the plant unit. The sum divided by the number of severity classes (6) is the disease severity index of the plant unit. Thus:

$dsi = (k_1x_1 + k_2x_2 + k_3x_3) /6$

Where x_1, x_2 and x_3 are severity scores of first (1F), second (2F) and third flush (3F)

ii. DSI: disease severity index of a tree

To obtain the disease severity index of a tree (DSI), add up all the weighted severity scores or dsi's of all the plant units assessed and divide the sum by the number of plant units assessed (n). Thus:

DSI = (sum of dsi of n plant units assessed)/n

iii. EDSI: estimated disease severity index of a population of trees

To obtain an estimate of the disease severity of a population of trees, sum up all the DSI values of the trees assessed and divide the sum by the number of trees assessed (N). The gives average DSI per tree as estimated disease severity index of the population (EDSI). Thus:

EDSI = (sum of DSI values of N trees)/N

30. (+) QN	MG	*Daya toleransi terhadap penyakit: Black Pod - Phytophthora palmivora* *Disease tolerance: Black Pod - Phytophthora palmivora*	rentan *susceptible* separa rintang *moderately resistant* rintang *resistant*	DESA 1 KKM 1 BR 25, KKM 22	3 5 7

Tamb. (30): Daya toleransi terhadap penyakit: Black Pod - *Phytophthora palmivora*
Ad. (30): Disease tolerance: Black Pod - Phytophthora palmivora

PROCEDURE FOR SCREENING OF RESISTANCE TO BLACK POD DISEASE (Phytophthora palmivora) IN COCOA

[I] LEAF DISC INOCULATION

1. *Leaf Sampling*

   a. *Time of harvesting*

   Leaves should best be harvested within two hours time in the early morning hours (e.g. between 7 and 9 am). Leaves are labeled and placed into an ice box containing a humidified foam, to maintain 100% relative humidity.

   b. *Leaf age*

   Leaves should be in good physiological condition, without insect attacks, and of similar age and exposition to sunlight. The age should correspond to leaves of approximately two months old, attached to the part of twigs that begins to show a change in the colour of the cortex from green to light brown. The exposition of the leaves to light should correspond to medium shaded conditions (e.g. from outer part of the canopy of a shaded cocoa tree, but from inner lower part of the canopy of unshaded tree with open canopy growth).

   c. *Number of leaves*

   In order to estimate correctly the resistance of a genotype, a large leaf sample is required as well as the use of 2-4 repetitions in time (with approximately 1 or 2 months interval). For matured field plants, a minimum of 6-8 leaves is recommended for each inoculation series. If available, leaves should be taken of more than one plant per genotype (clone). For evaluation of individual seedling plants in the nursery (4-10 months old), the use of 2 leaves is recommended for each inoculation series. For the evaluation of the average resistance of clonal varieties or of seedlings progenies, it is recommended to use leaves from 6-10 and 15-25 plants, respectively.

   d. *Control variety*

   The use of at least two control varieties (one resistant and one susceptible) growing under same conditions as the test varieties is recommended. In case of seedling cross progenies, the ideal control would be the parental clones, grafted in the nursery. The controls allow to compare between inoculation series and to assess selection progress in relation to commercial varieties or parental genotypes. The control varieties should be sampled and treated in the same way as the test varieties (using 4-6 separately inoculated plants per control variety).

2. *Leaf Preparation and Inoculation*

   a. *Leaf discs preparation*

   Leaf disc (1.7 to 2 cm diameter) can be obtained by using a cork borer or a semi-automated perforating device. For each inoculation series, it is recommended to obtain 20-40 discs distributed over 3 trays (randomized repetitions). For example, if for individual field trees, 9 leaves were taken and 4 discs per leaf, the 36 discs should be randomly distributed over 3-4 inoculation trays; for individual nursery seedlings, 18 discs could be obtained from 2 leaves and distributed over 3 trays. Each tray could have a size of about 30 x 40cm which allows for 300-412 discs per tray (or 30-40 genotypes). During leaf discs preparation, the relative humidity in the laboratory should be high to avoid drying of leaf discs (atomizing water in the air may help to maintain humidity). Discs are placed with the lower leaf side up on humidified foam. After

completing an inoculation tray, discs can be lightly humidified by atomizing very fine droplet of sterile distilled water onto them. Trays are then closed and placed in the inoculation room.

b. *Inoculation*

Inoculation will be done in the morning next day. The density of the zoospores concentration may vary between 3 to 5 x 105. Automated repeatable dispenser displaying 10 ul droplets in the centre of each disc are recommended. As an alternative, round filter paper patches (7 mm diameter) soaked into the suspensions could be used for inoculation. The inoculation should be done perpendicular to the direction in which the cocoa genotypes are displayed. An intermediate aggressive isolate of the fungus, that results in average severity scores of 3-4 for susceptible genotypes after 5 days, is recommended (predominantly very low or high severity scores are unfavorable as part of the genetic variation may be masked).

c. *Incubation*

Incubation of the trays, that are closed with a hard plastic cover lid should be in the darkness, at temperature about 24-28^{o}C (air condition room). In the light, symptom development may be slower. Large daily temperature fluctuations should be avoided, as such may cause evaporation and condensation in the trays. After three days, trays are inspected; inoculation droplets that have not been absorbed yet should be dried up with a filter paper.

3. *Observations*

Severity of symptoms is scored at 5 and 7, or at 4 and 6, days after inoculation. The following five points assessment scale is based on increasing size of chlorotic/nectrotic are:

0: *no symptom*
1: *small localized penetration points*
2: *expanding penetration points with some connections between them*
3: *coalescence of brown spots*
4: *expanding lesion with light and dark brown spots*
5: *large dark brown lesion*

[II] *DETACHED POD INOCULATION*

1. *Collection and preparation of pods for inoculation*

Fully grown, unripe pods (matured unripe pods) of similar size to ripe pods (four to five months old) should be collected between 7:00 and 10:00am., and must be harvested with care and kept in labeled transparent plastic bags. Not more than two pods should be kept in one bag to avoid surface damage which may occur when many pods are kept together in close contact with each other. Rinse harvested pods in two changes of sterile water and arrange them in plastic trays lined with moist paper towels. Cover each tray with another inverted tray or a lid and enclose in a polythene bag to maintain high humidity. Keep at 25^{o}C for a minimum of 12 hours or overnight to obtain a uniform condition before inoculation is performed.

2. *Sample size*

- *Assessment of an individual tree – use two to three pods in each of two trials are required.*
- *Assessment of a clone – use two to three pods in each of two trials are required.*
- *Control – use at least one susceptible and one resistant clone in each experiment as standards.*
- *Experimental design – completely randomized design.*

3. *Inoculum preparation*

A moderately aggressive Phytophthora isolate should be used. Grow the isolate on a 20% V8 juice – calcium

carbonate agar medium and from a ten-day-old culture, obtain a zoospore suspension by inundating each culture plate (9cm diam.) with 10ml sterile distilled water (chilled to 10°C), refrigerate for 25 minutes (5°C), to incubate in the dark at 25°C for minutes. Determine the zoospore concentration of the suspension using a haemocytometer and adjust to 100,000 ml^{-1}.

4. *Inoculation*

Uncover the pods prepared for inoculation to obtain a dry surface at room temperature. In a slanting position, spray half the surface area of each pod at a distance of 30cm using a chromist atomizer (Cat. No 51901 spray unit, Gelman Sciences, Ann Arbor, Michigan). An average of 1 ml of zoospore suspension should be deposited on 150 cm^2 of pod area. This quantitiy of inoculum is normally retained on the pod surface. When too much inoculum is sprayed on the pod surface, run-off will occur. Place inoculated pods in the plastic trays lined with moist paper towel, cover with another inverted tray as a lid and enclose in a polythene bag.

5. *Incubation*

Incubate the covered trays containing the inoculated pods for four days at 25°C (air condition room). Large daily temperature fluctuations, which cause evaporation and condensation in the trays, should be avoided.

6. *Assessment of pod reaction to inoculation*

After four days of incubation, assess inoculated pods for their reaction to inoculation. Assessment is based on the frequency and size of lesions formed. The severity of infection is rated on an eight-point scale as follows:

Disease rating	*Infection level*	*Susceptibility classification*
1	*No sypmtom*	*Highly resistant to penetration*
2	*1-5 localized lesions*	*Resistant*
3	*6-15 localized lesions*	*Moderately resistant*
4	*>15 localized lesions*	*Partially resistant / resistant to spread of lesion alone*
5	*1-5 expanding lesions*	*Partially resistant / resistant to penetration alone*
6	*6-15 expanding lesions*	*Moderately susceptible*
7	*>15 expanding lesions*	*Susceptible*
8	*Coalesced lesions*	*Highly susceptible*

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10.0 SOAL SELIDIK TEKNIKAL
TECHNICAL QUESTIONNAIRE

BORANG SOAL SELIDIK TEKNIKAL
TECHNICAL QUESTIONNAIRE

untuk dilengkapi berkaitan dengan permohonan Hak Pembiak Baka Tumbuhan
to be completed in connection with an application for Plant Breeders' Rights

UNTUK KEGUNAAN RASMI
FOR OFFICIAL USE

Nombor Rujukan : ***Reference Number***	**Tarikh Permohonan** : *Application date* **(tidak boleh diisi oleh pemohon)** (*not to be filled in by the applicant*)

1. BAHAN UJIAN
SUBJECT OF THE TECHNICAL QUESTIONNAIRE

1.1 Nama Botani : Theobroma cacao L.
Botanical Name

1.2 Nama Biasa : Koko, Cocoa
Common name

1.3 Nama Tempatan : Koko
Local name

2. PEMOHON
APPLICANT

Nama Pemohon : _____
Applicant Name

Alamat : _____
Address _____
_____

No. Telefon : _____
Telephone No.

No. Fax :
_____
Fax No.

E-mail address :
_____
Alamat e-mail

Pembiak Baka :
_____
Breeder
(jika berlainan daripada pemohon)
(if different from applicant)

3. NAMA YANG DICADANGKAN DAN RUJUKAN PEMBIAK BAKA
PROPOSED DENOMINATION AND BREEDER'S REFERENCE

Nama yang dicadangkan _____ _____ _____
Proposed denomination choice) **pilihan pertama** (*1st choice*) **pilihan kedua** (*2nd choice*) **pilihan ketiga** (*3rd*

Rujukan pembiak baka _____
Breeder's reference

4. MAKLUMAT SKIM PEMBIAKBAKAAN DAN PEMBIAKAN VARIETI
INFORMATION ON THE BREEDING SCHEME AND PROPAGATION OF THE VARIETY

4.1 Skim pembiakbakaan
Breeding scheme

Varieti terhasil daripada :
Variety resulting from

☐ Kacukan terkawal (sila nyatakan varieti induk)
Controlled cross (please state parent varieties)

☐ Mutasi (sila nyatakan varieti induk)
Mutation (please state parent varieties)

☐ Penemuan dan pembangunan (sila nyatakan di mana dan bila ditemui dan bagaimana dibangunkan)
Discovery and development (please state where and when discovered and how developed)

☐ Lain-lain (sila berikan butir-butir)
Other (please provide details)

4.2 Kaedah pembiakan varieti
Method of propagating the variety

4.2.1 Pembiakan vegetatif
Vegetative propagation

☐ Cantuman tunas
bud grafting

☐ pembiakan in vitro
in vitro propagation

☐ lain-lain (nyatakan kaedah)
other (state method)

4.2.2 ☐ Biji benih
Seed

4.2.3 ☐ Lain-lain (sila berikan butir-butir)
Other (please provide details)

Dalam kes varieti hibrid, skim pengeluaran bagi hibrid seharusnya diberi pada helaian yang berasingan. Helaian ini seharusnya memberikan butir-butir semua baris induk yang diperlukan bagi pembiakan hibrid berkenaan, contohnya:

In the case of hybrid varieties the production scheme for the hybrid should be provided on a seperate sheet. This should providedetails of all the parent lines required for propagating the hybrid e.g.

Hibrid Sehala
Single Hybrid

(… induk betina...) x (... induk jantan...)
(… female parent …) x (… male parent …)

Hibrid Tiga Hala
Three-Way Hybrid

(... baris betina ...) x (... baris jantan ...)
→ *hibrid sehala digunakan sebagai induk betina x (... induk jantan...)*

(… female line …) x (… male line …)
→ *single hybrid used as female parent x (… male parent …)*

dan seharusnya dikenal pasti terutamanya:
and should identify in particular:

(a) mana-mana baris mandul jantan
any male sterile lines

(b) sistem pengekalan baris subur jantan
maintenance system of male sterile lines

 # Pihak berkuasa mungkin membenarkan maklumat tertentu ini diberi dalam bahagian sulit Borang Soal Selidik Teknikal.
Authority may allow certain of this information to be provided in a confidential section of the Technical Questionnaire.

5. CIRI VARIETI UNTUK DINYATAKAN

CHARACTERISTICS OF THE VARIETY TO BE INDICATED

Nombor dalam kurungan merujuk ciri yang sepadan dengan ciri dalam Garis Panduan Ujian; sila tandakan catatan yang paling sepadan.

The number in brackets refers to the corresponding characteristic in Test Guidelines; please mark the note which best corresponds.

Bil. No.	**Ciri** *Characteristic*	**Keadaan** *State*	**Varieti Contoh** *Example varieties*	**Catatan** *Note*
5.1 (1)	Pokok: sifat dahan *Tree: branching habit*	tegak *erect*	BR 25, PBC 123	3 [ ]
		separa tegak *semi-erect*	KKM 3, KKM 15	5 [ ]
		melempai *drooping*	PBC 159, SCA 6	7 [ ]
5.2 (9)	Buah matang: bentuk *Mature fruit: shape*	Amelonado *Amelonado*	KKM 4, KKM 15	1 [ ]
		Cundeamor *Cundeamor*	MCB C5, QH 1003	2 [ ]
		Angoleta *Angoleta*	KKM 19, KKM 6	3 [ ]
		Calabacillo *Calabacillo*	LARANGE	4 [ ]

5.3 (14)	Buah matang: warna *Mature fruit: colour*	hijau muda *light green*	ICS75	1 [ ]
		hijau *green*	MCBC5	2 [ ]
		merah muda *light red*	KKM22	3 [ ]
		merah *red*	PBC123	4 [ ]
		campuran merah dan hijau (merah dominan) *mixture of red and green (red dominant)*	MHP421	5 [ ]
		campuran merah dan hijau (hijau dominan) *mixture of red and green (green dominant)*	QH1176	6 [ ]
5.4 (24)	Biji benih: warna kotiledon (biji basah) *Seed: cotyledon colour (wet bean)*	putih *white*	CATONGO	1 [ ]
		ungu muda *light purple*	KKM 2	2 [ ]
		ungu *purple*	ICS 60	3 [ ]
		ungu gelap *dark purple*	KKM 4, KKM 15	4 [ ]
5.5 (25)	Biji benih: bentuk (biji basah) *Seed: shape (wet bean)*	pendek dan rata *short and flat*	KKM 15, KKM 22	1 [ ]
		panjang dan rata *long and flat*	KKM 1, QH 1176	2 [ ]
		pendek dan berisi *short and plump*	KKM 17, PBC 159	3 [ ]
		panjang dan berisi *long and plump*	KKM 3, KKM 4	4 [ ]

6. VARIETI SERUPA DAN PERBEZAAN DARIPADA VARIETI CALON

SIMILAR VARIETIES AND DIFFERENCES FROM THESE VARIETIES

Sila gunakan jadual dan kotak berikut untuk komen dan untuk memberikan maklumat berkenaan dengan bagaimana varieti yang anda pilih berbeza daripada varieti yang, sejauh yang anda ketahui, paling serupa. Maklumat ini boleh membantu pihak berkuasa pemeriksaan untuk menjalankan pemeriksaan kelainan dengan cara yang lebih cekap.

Please use the following table and box for comments to provide information on how your candidate variety differs from the variety (or varieties) which, to the best of your knowledge, is (or are) most similar. This information may help the examination authority to conduct its examination of distinctness in a more efficient way.

Nama varieti yang serupa dengan varieti calon *Denomination(s) of variety(ies) similar to your candidate variety*	**Ciri varieti calon yang berbeza daripada varieti serupa** *Characteristic(s) in which your candidate variety differs from the similar variety(ies)*	**Terangkan ekspresi ciri bagi varieti serupa** *Describe the expression of the characteristic(s) for the similar variety(ies)*	**Terangkan ekspresi ciri bagi varieti calon** *Describe the expression of the characteristic(s) for your candidate variety*
[Contoh] *[Example]*	**[cth. Buah matang: warna]** *[e.g. Mature fruit: colour]*	**[cth. hijau]** *[e.g. green]*	**[cth. hijau muda]** *[e.g. light green]*

Komen :
Comments

7. MAKLUMAT TAMBAHAN YANG BOLEH MEMBANTU DALAM PEMERIKSAAN VARIETI

ADDITIONAL INFORMATION WHICH MAY HELP IN THE EXAMINATION OF THE VARIETY

7.1 Selain maklumat yang diberi dalam bahagian 5 dan bahagian 6, adakah apa-apa ciri tambahan yang boleh membantu untuk membezakan varieti?
In addition to the information provided in sections 5 and 6, are there any additional characteristics which may help to distinguish the variety?

☐ Ada *Yes* ☐ Tiada *No*

(Jika ada, berikan butir-butir) *(If yes, please provide details)*

7.2 Adakah apa-apa keadaan khusus bagi menanam varieti atau menjalankan pemeriksaan?
Are there any special conditions for growing the variety or conducting the examination?

☐ Ada *Yes* ☐ Tiada *No*

(Jika ada, berikan butir-butir) *(If yes, please provide details)*

7.3 Maklumat lain
Other information

7.4 Gambar berwarna yang mewakili varieti perlu disertakan bersama Borang Soal Selidik Teknikal ini.
A representative colour photograph of the variety should accompany the Technical Questionnaire.

 # Pihak berkuasa mungkin membenarkan maklumat tertentu ini diberi dalam bahagian sulit Borang Soal Selidik Teknikal.
Authority may allow certain of this information to be provided in a confidential section of the Technical Questionnaire.

8. KEBENARAN PENGELUARAN
AUTHORIZATION FOR RELEASE

8. (a) Adakah varieti memerlukan kebenaran sebelum pengeluaran di bawah undang-undang berhubung dengan perlindungan alam sekitar, kesihatan manusia dan kesihatan haiwan?
Does the variety require prior authorization for release under legislation concerning the protection of the environment, human and animal health?

☐ Ya *Yes* ☐ Tidak *No*

(b) Adakah kebenaran itu telah diperoleh?
Has such authorization been obtained?

☐ Ya *Yes* ☐ Tidak *No*

Jika jawapan kepada (b) ialah ya, sila kepilkan satu salinan kebenaran tersebut.
If the answer to (b) is yes, please attach a copy of the authorization.

9. MAKLUMAT BAHAN TANAMAN UNTUK DIPERIKSA ATAU DISERAH BAGI PEMERIKSAAN
INFORMATION ON PLANT MATERIAL TO BE EXAMINED OR SUBMITTED FOR EXAMINATION

9.1 Ekspresi satu ciri atau beberapa ciri varieti mungkin terjejas oleh faktor seperti haiwan perosak dan penyakit, rawatan kimia (contohnya bahan pembantut pertumbuhan atau pestisid), kesan kultur tisu,pokok penanti yang berlainan, sion yang diambil daripada fasa pertumbuhan pokok yang berlainan dan lain-lain.

The expression of a characteristic or several characteristics of a variety may be affected by factors, such as pests and disease, chemical treatment (e.g. growth retardants or pesticides), effects of tissue culture, different rootstocks, scions taken from different growth phases of a tree, etc.

9.2 Bahan tanaman tidak seharusnya melalui apa-apa rawatan yang menjejaskan ekspresi ciri varieti, kecuali pihak berkuasa yang kompeten telah membenarkan atau meminta rawatan sedemikian. Jika bahan tanaman telah melalui rawatan sedemikian, butir-butir penuh bagi rawatan mestilah diberikan. Berhubung dengan hal ini, sila tunjukkan di bawah ini, sepanjang yang anda ketahui, sekiranya bahan tanaman untuk diperiksa itu:

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 the plant material has undergone such treatment, full details of the treatment must be given. In this respect, please indicate below, to the best of your knowledge, if the plant material to be examined has been subjected to:

(a) terdedah kepada mikroorganisma (contohnya virus, bakteria, fitoplasma)
Microorganisms (e.g. virus, bacteria, phytoplasma)

☐ Ya
Yes

…….

Sila berikan butir-butir bagi jawapan “ya” yang anda berikan.
Please provide details for where you have indicated "yes”

☐ Tidak
No

(b) menjalani rawatan kimia (contohnya bahan pembantut pertumbuhan, pestisid)
chemical treatment (e.g. growth retardant, pesticide)

☐ Ya
Yes ……

…….

Sila berikan butir-butir bagi jawapan “ya” yang anda berikan.
Please provide details for where you have indicated "yes”

☐ Tidak
No

(c) dijalankan kultur tisu
tissue culture

☐ Ya
Yes

……

Sila berikan butir-butir bagi jawapan “ya” yang anda berikan.
Please provide details for where you have indicated "yes”

☐ Tidak
No

(d) disebabkan faktor lain
other factors

☐ Ya
Yes

……

Sila berikan butir-butir bagi jawapan “ya” yang anda berikan.
Please provide details for where you have indicated "yes”

☐ Tidak
No

10. PENGESAHAN
DECLARATION

Saya dengan ini mengesahkan, sepanjang yang saya ketahui, bahawa maklumat yang diberi dalam borang ini adalah betul.
I hereby declare that, to the best of my knowledge, the information provided in this form is correct.

_____
Tandatangan
Signature

Nama pemohon : _____
Applicant's name

Tarikh : _____
Date

11.0 PENGHARGAAN
ACKNOWLEDGEMENT

Jabatan Pertanian mengucapkan setinggi-tinggi penghargaan kepada Ketua Pengarah Pertanian dan terima kasih kepada Pengarah Bahagian Kawalan Kualiti Tanaman, Pn. Hjh. Norma Othman serta kakitangannya atas daya usaha dan inisiatif yang diambil bagi penyediaan Garis Panduan ini.

Department of Agriculture would like to express greatest gratitude to Director General of Department and thanks to Director of Crop Quality Control Division, Mrs. Hjh. Norma Othman and her staff for the hard work and initiative taken in preparing the Test Guidelines.

Penghargaan juga ingin disampaikan kepada pakar-pakar tanaman,
Appreciation also goes to our crop experts,

(1) En. *(Mr.)* Kelvin Lamin (LKM)

(2) En. *(Mr.)* Chong Tan Chun (DOA Sabah)

(3) En. *(Mr.)* Francis Aloysius (LKM)

(4) En. *(Mr.)* Haya Ramba (LKM)

(5) Pn. *(Mrs.)* Nuraziawati Mat Yazik (LKM)

atas sumbangan pandangan yang membina dan komitmen tidak terhingga bagi menjayakan penghasilan Garis Panduan ini.

upon contribution of constructive opinion and endless commitment towards the success of the development of the Test Guidelines.

** LKM: Lembaga Koko Malaysia (Malaysian Cocoa Board)*

[Dokumen Tamat]
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