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SHORT COMMUNICATION

Descriptors for jute (*Corchorus olitorius* L.)

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Abstract Detailed information about genetic differences among individuals or groups of accessions can be helpful for management and utilization of germplasm collections. So, descriptor assist scientists to improve their capacity to describe, store, manage and share information about plant resources, whether stored in genebanks or growing in natural environments. It is also an important tool to enable information sharing for crops, facilitate the international exchange and use of plant resources, uniformity in data description. Provide an international format and a universally understood language for plant genetic resources data. They are targeted at farmers, curators, breeders and users and facilitate the exchange and use of resources (Rana et al. 1991, Van Hintum in Genet Resour Crop Evol 40:133–136, 1993). This test guideline was developed to apply to all varieties of *C. olitorius* and *C. capsularis*. It is an important tool to enable gathering and sharing information about the two cultivated species, *C. olitorius* and *C. capsularis* biodiversity. *C. olitorius* and *C. capsularis*, are tall, usually annual herbs, reaching a height of 2.4 m. They are used as a major source of natural fibres mainly in Asian and Latin American countries. *C. olitorius* (jute mallow) is an important green leafy vegetable in many areas. Different parts of *C. olitorius* are also used in folk medicine (Patel and Datta in Grana Palynol 1:18–24, 1958; Rao in Sydowia 30:164–185, 1977; Sajib et al. in Plant Cell Tissue Organ Cult 95:333–340, 2008).

Keywords Abiotic stress · Biotic stress · *Corchorus olitorius* · Descriptor · Jute

Introduction

The genus *Corchorus* (jute) which belongs to the family of tiliaceae plants, consists of about 50–60 species distributed in the tropics, subtropics and warm temperate regions of the world (Subbalakshmi et al. 1992; Stearn 1995; Merlier 1972; Merlier and Montegut 1982; Morakinyo 1997). Some authors proposed that this species is native to India, Indo-Burma or Sri Lanka. On the other hand, due to the availability of several wild and weedy relatives there is a widely held assumption that the center of origin of *C. olitorius* is Africa (Mbaye et al. 2001; Makinde et al. 2009).

Africa accounts for the majority of species, with main geographical distribution in Ethiopia, Tanzania and South Africa. Jute cultivation is believed to have started 200 years ago in the tropics. The two cultivated species, *C. olitorius* L. and *C. capsularis* L. are used as a major source of natural fibers mainly in Asian and

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Latin American countries (Ogunkanmi et al. 2010; Talukder et al. 2001). In contrast, the latter species is not common in Africa, and the main use of *C. olitorius* (jute mallow) in this continent is as a vegetable crop. It has diverse common names bush okra, nalta jute, jute mallow and Jew's mallow, ewedu, melokhia and monoheiya (Bijlmakers and Verhoek 1995; Deton 1997; Fontem et al. 2003; IRD 2004; DAFF 2012; Faith et al. 2012).

Corchorus olitorius are tall, usually annual herbs, reaching a height of 2.4 m. The plant could be unbranched, or with only a few side branches. The leaves are alternate, simple, lanceolate, finely serrated or lobed margin (Nuwangburuka and Denton 2012; Smith 2000). The flowers are hermaphrodite, and are pollinated by insects. The flowers are small (2–3 cm diameter) and yellow, with five petals. The fruit is a multi-seeded capsule (Matsufuji et al. 2001; Banerjee et al. 2012). It is propagated by seed (Akoroda 1985; Hossain and Sasmal 2006; Kumar et al. 2006; Begum and Kumar 2011; Banerjee et al. 2012; Benor et al. 2012; Ghosh et al. 2012). The plant prefers light (sandy), medium (loamy), and heavy (clay soils).

It thrives well in acid, neutral and basic (alkaline) soils. It cannot tolerate shady environments and requires moist soil. Jute are self-pollinating and contain very limited genetic variability (Patel and Datta 1958; Yu and Li 1991; Olanrewaju and Nwangburuka 2012).

Corchorus olitorius is an important green leafy vegetable in many areas including Egypt, Southern Asia, Japan, India, China, Lebanon, Palestine, Syria, Jordan, Tunisia and Nigeria. It is a leading leaf vegetable in Côte d'Ivoire, Benin, Nigeria, Cameroon, Sudan, Kenya, Uganda and Zimbabwe. It is also cultivated as leafy vegetable in the Caribbean, Brazil, India, Bangladesh, China and Middle East. It is cultivated for fiber in Asia (India, Bangladesh and China). The plant is widely grown in the tropics for the viscosity of its leaves. The leaves (either fresh or dried) are cooked into a thick viscous soup or added to stew or soup and are rich sources of vitamin and minerals. Nutritionally, *C. olitorius* on the average contain 85–87 g H_2O, 5.6 g protein, 0.7 g oil, 5 g carbohydrate, 1.5 g fiber 250–266 mg Ca, 4.8 mg Fe, 1.5 mg 3000 10 vitamin A, 0.1 mg thiamine, 0.3 mg riboflavin, 1.5 mg nicotinamide, and 53–100 mg ascorbic acid per 100 g (Matsufuji et al. 2001; Mazen 2004; Opabode and Adebooye 2005; Ndlovu and Afolavan 2008; Ibrahim and Fagbohun 2011; Nemb et al. 2011). Their edible leaves play an economical role in the strategy of food security of urban populations. Different parts of *C. olitorius* are also used in folk medicine notably the seeds as laxative, the leaves to relieve stomach pains, the roots for treating toothache and the stems for treating cardiovascular disorder (Merlier 1972; Deton 1997; Nemb et al. 2011; DAFF 2012).

Jute is a versatile and environment-friendly natural fiber that generates diversified value-added products. It falls into the best fiber category along with kenaf (*Hibiscus cannabinus* L.), industrial hemp (*Cannabis sativa* L.), ramie (*Boehmeria nivea* L.) and banana (*Musa acuminata colla*) fibers. India is the largest producer of jute contributing 58 % of jute fiber to the global jute production followed by Bangladesh with 33 % production (Siddiqur 2010; FAO 2016).

Gathering and sharing information about our agricultural biodiversity is vital to its conservation and use, for farmers, scientists, conservationists and breeders (FAO 1990, 1994, 2006; BI 2007). Detailed information about genetic differences among individuals or groups of accessions can be helpful for management and utilization of germplasm collections. So, descriptor assist scientists to improve their capacity to describe, store, manage and share information about plant resources, whether stored in genebanks or growing in natural environments. It is also an important tool to enable information sharing for crops, facilitate the international exchange and use of plant resources, uniformity in data description. Provide an international format and a universally understood language for plant genetic resources data. They are targeted at farmers, curators, breeders and users and facilitate the exchange and use of resources (Rana et al. 1991; Van Hintum 1993).

Descriptors are the basis of major information platforms such as GENESYS and EURISCO, and also the FAO World Information and Early Warning System (BI 2007; Gotor et al. 2008).

The following descriptors for jute (*C. olitorius* L.) was developed in the Institut des Régions Arides de Médenine (Tunisia) and Bioversity International, based on a general review of literature on *Corchorus* and subsequently compared with characterization work of local landraces cropped at IRA in the oasis of Tunisia. It was sent to experts for their comments and amendments.

Characterization

1. Plant descriptors

1.1 Vegetative

1.1.1 Stem colour

1 Green
2 Light-green
3 Dark-green
4 Red
5 Light-red
6 Dark-red
7 Purple
8 Pink
99 Other

1.1.2 Stem width (cm)
Mean stem thickness of single representative tiller from ten representative plants, is measured as width of stem at mid-height of plant at early pod initiation stage.

1.1.3 Stem hair

0 Absent
1 Present

1.1.4 Number of branches
It is the mean number of branches from basal nodes per plant taken from five representative plants (randomly selected) at flowering stage.

1.1.5 Branching from higher nodes

0 Non-branching
1 Branching
2 Mixed branching

1.1.6 Branching habit

0 Absent
1 Weak
2 Predominantly primary branches
3 Predominantly secondary branches

1.1.7 Plant growth habit

3 Upright
5 Intermediate
7 Prostrate

1.1.8 Plant height (cm)
The average of ten representative plants (randomly selected), to be measured at first flowering from ground to the tip of the plant.

1.1.9 Leaf type

1 Light green
2 Dark green
3 Glossy light green
4 Glossy dark green
5 Red

1.1.10 Leaf vein colour

1 Green
2 Light green
3 Dark green
4 Red

1.1.11 Leaf petiole colour

1 Green
2 Light green
3 Dark green
4 Red
5 Purple

1.1.12 Leaf petiole length

3 Short
5 Intermediate
7 Long

1.1.13 Leaf petiole hairiness

0 Absent
1 Present

1.1.14 Leaf shape

1 Ovate
2 Elliptical
3 Lanceolate
4 Orbicular

1.1.15 Leaf blade length

3 Short
5 Intermediate
7 Long

1.1.16 Leaf blade width
To be recorded on mature leaves at the widest-point.

3 Narrow
5 Intermediate
7 Wide

1.1.17 Leaf base shape

1 Rounded
2 Oblique
3 Sagittate
4 Truncate
5 Hastate

1.1.18 Leaf apex shape

1 Very acute
3 Acute
5 Intermediate
7 Obtuse
9 Very obtuse

1.1.19 Leaf margin

1 Entire
2 Serrulate
3 Dentate
4 Serrate
5 Double serrate
6 Cleft

1.1.20 Presence/absence of leaf lobe

0 Absent
1 Present

1.1.21 Leaf basal setae

0 Absent
1 Present

1.1.22 Leaf basal setae length

3 Short
5 Intermediate
7 Long

1.1.23 Leaf basal setae orientation

3 Horizontal
7 Vertical

1.1.24 Leaf basal setae orientation straightness

3 Straight
5 Curving
7 Angular

1.1.25 Stipule colour

1 Light green
2 Green
3 Green with dark red base
4 Green with red tip
5 Red

1.2 Inflorescence and fruit

1.2.1 Days to 50 % flowering (d)
It is the number of days from sowing to the stage when 50 % of plants have begun to flower.

1.2.2 Days to maturity (d)
It is the number of days from sowing to the stage when over 90 % of pods have matured and turned brown.

1.2.3 Petal colour

1 Yellow
2 Bright yellow
3 Orange

1.2.4 Petal shape

1 Ovate
2 Obovate
3 Oblanceolate
4 Spathulate

1.2.5 Sepal colour

1 Light green
2 Green
3 Dark green
4 Purpul

1.2.6 Sepal shape

1 Acuminate
2 Torulose
3 Cucuilate
4 Lanceolate

1.2.7 Pedicel length

3 Short

5 Long

1.2.8 Absence, presence of pedicel hairs

0 Absent (Glabrous)
1 Present (Villous)

1.2.9 Number of flowers per inflorescence
It is the average of ten representative plants (randomly selected).

1.2.10 Number of pods per peduncle

1 Single pod per peduncle
2 Twin pods at least 10 % of the peduncle bear two pods

1.2.11 Pod length (mm)

3 Short (<15 mm)
5 Medium (15–20 mm)
7 Long (>20 mm)

1.2.12 Pods colour at maturity

1 Light (yellow)
2 Dark (brown/black)
3 Mixed

1.2.13 Pod angle/altitude at maturity (Observe second or third pod-bearing node)

1 Erect
2 Horizontal
3 Dropping
4 Mixed

1.2.14 Pod shape

1 Sub-cylindrical
2 Flattened constricted
3 Flattened non constricted
4 Mixed

1.2.15 Pod surface glossiness
To be observed wile pods are still tender.

1 Matte
2 Glossy
3 Mixed

1.2.16 Pod dehiscence at maturity

1 <10 % dehiscence
2 >10 % dehiscence

1.2.17 Pod shattering

0 Non shattering (wrinkled-pod type)
1 Shattering

1.2.18 Number of pods per plant
It is the mean of five representative plants.

1.2.19 Pod distribution on the stem

1 Uniform
2 Mainly basal
3 Mainly terminal

1.2.20 Height of lowest pod-bearing node at harvest (cm)
It is the mean of five representative plants.

1.3 Seed

1.3.1 Number of seed per pod
It is the mean of ten dry pods (at maturity) of each from five representative plants.

1.3.2 Testa texture

1 Rough
2 Smooth
3 Tuberculated

1.3.3 Ground colour of testa (seed coat)
To be observed immediately after harvest.

1.3.4 100-seed weight (g)
It is the average weight of 2 samples of 100 randomly chosen dry seeds.

1.4 Remarks
Specify here any additional information.

2. Abiotic stress susceptibility
To be scored under artificial and/or natural conditions, which should be clearly specified. These are coded on a susceptibility scale from 1 to 9, viz:

1 Very low or no visible sign of susceptibility

3 Low
5 Intermediate
7 High
9 Very high

2.1 High temperatures

2.1.1 Sunburn susceptibility of leaf
2.1.2 Sunburn susceptibility of flower
2.1.3 Sunburn susceptibility of pod

2.2 Salinity

2.3 Mineral deficiency

1 Nitrogen
2 Phosphorus
3 Potassium
4 Boron
5 Zinc
6 Copper
99 Other (specify in descriptor 8.7 Notes)

2.4 Mineral toxicity

1 Boron
2 Zinc
3 Chloride
4 Copper
5 Calcium
99 Other (specify in descriptor 8.7 Notes)

2.5 Waterlogging

2.6 Drought

2.7 Notes
Specify here any additional information.

3. Biotic stress susceptibility
In each case, it is important to state the origin of the infestation or infection, i.e. natural, field inoculation, laboratory. Record such information in descriptor 9.5 Notes. These are coded on a susceptibility scale from 1 to 9, viz:

1 Very low or no visible sign of susceptibility
3 Low
5 Medium susceptibility
7 High
9 Very high susceptibility

3.1 Insects

	Causal organism	Common name
3.1.1	*Phyllotreta* sp. and the followingsub-title	Flea beetle
3.1.2	*Ferrisia virgata*	Striped mealybug
3.1.3	*Polyphagotarsonemus latus*	Broad mite
3.1.4	*Pectinophora ossypiella*	Pink bollworm
3.1.5	*Earias insulana*	Spiny bollworm, Egyptian bollworm
3.1.6	*Spodoptera exigua*	Beet armyworm
	Spodoptera littoralis	Cotton (*Gossypium* sp.) leafworm
	Spodoptera litura	Tobacco (*Nicotiana tabacum*) cutworm
3.1.7	*Nisotra puncticollis*	Sliperi kabis or Neka flea beetle
	Nisotra uniformis (No common names have been associated with this taxon yet)	
	Nisotra dilecta (No common names have been associated with this taxon yet)	
3.1.8	*Bemisia tabaci*	Sweetpotato whitefly or silverleaf whitefly
3.1.9	*Helicoverpa armigera*	Old world bollworm
3.1.10	*Acraea eponina* (No common names have been associated with this taxon yet)	
3.1.11	*Podagrica decolorata*	Flea beetle
3.1.12	*Altica nigrita* (No common names have been associated with this taxon yet)	
3.1.13	*Chrysodeixis* sp.	Garden looper

(Declert 1987; Djiéto-Lordon et al. 2007; Rao 1977)

3.2 Nematodes

3.2.1	*Meloidogyne javanica*	Root Knot Nematode root-knot nematode
	Meloidogyne incognita	(Germani and Delattre 1981; Luc et al. 1964; Prot 1984)

3.3 Viruses

3.3.1	CLCu	Cotton leaf curl virus Okra (*Abelmoschus esculentus*
3.3.2	OkMV	mosaic virus
3.3.3	CoGM	*Corchorus* golden mosaic virus (Fauquet and Thouvenel 1980, 1987)

3.4 Fungi and Bacterial

3.4.1	Phytoplasmas	Yellow disease
3.4.2	*Macrophomina phaseolina*	Charcoal rot fungus
3.4.3	*Botrydiplodia theobromae*	
3.4.4	*Colletotrichum corchori*	
3.4.5	*Choanephora cucurbitarum*	Wet rot and blossom end rot
3.4.6	*Pythium aphanidermatum* (No common names have been associated with this taxon yet)	
3.4.7	*Albugo candida* (No common names have been associated with this taxon yet)	
3.4.8	*Rhisoctonia solani* (No common names have been associated with this taxon yet)	
3.4.9	*Alternaria alternata*	Alternaria rot fungus
3.4.10	*Cercospora macutensis* (No common names have been associated with this taxon yet)	
3.4.11	*Diplodia corchori* (No common names have been associated with this taxon yet)	
3.4.12	*Physoderma corchori* (No common names have been associated with this taxon yet)	
3.4.13	*Phyllosticta* sp. (No common names have been associated with this taxon yet)	
3.4.14	*Acrosporium* sp. (No common names have been associated with this taxon yet)	
3.4.15	*Pseudomonas solanacearum* (No common names have been associated with this taxon yet)	

3.5 Notes

Specify here any additional information.

4. Biochemical markers
   Specify methods used and cite reference(s). Refer to *Descriptors for genetic marker technologies*, available in PDF format from Bioversity International web site (http://www.bioversityinternational.org/) or by email request to bioversityinternational-publications@cgiar.org.
5. Molecular markers
   Refer to *Descriptors for genetic marker technologies*, available in PDF format from Bioversity International web site (http://www.bioversityinternational.org/) or by email request to bioversityinternational-publications@cgiar.org.
6. Cytological characters
   - 6.1 Chromosome number
     The chromosome count of normal autotetraploid individuals is $2n = 160$
   - 6.2 Ploidy level
   - 6.3 Trisomics
   - 6.4 Monosomics
   - 6.5 Other cytological characters
7. Identified genes
   Describe any known specific mutant present in the accession

Conclusion

This test guidelines apply to all varieties of *C. olitorius* and *C. capsularis*. It is an important tool to enable gathering and sharing information about the two cultivated species, *C. olitorius* and *C. capsularis* biodiversity for farmers, scientists, conservationists and breeders. Also, to assist countries improve their capacity to describe, store, manage and share information about their cultivated *Corchorus* resources, whether stored in genebanks or growing in their natural environments.

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