

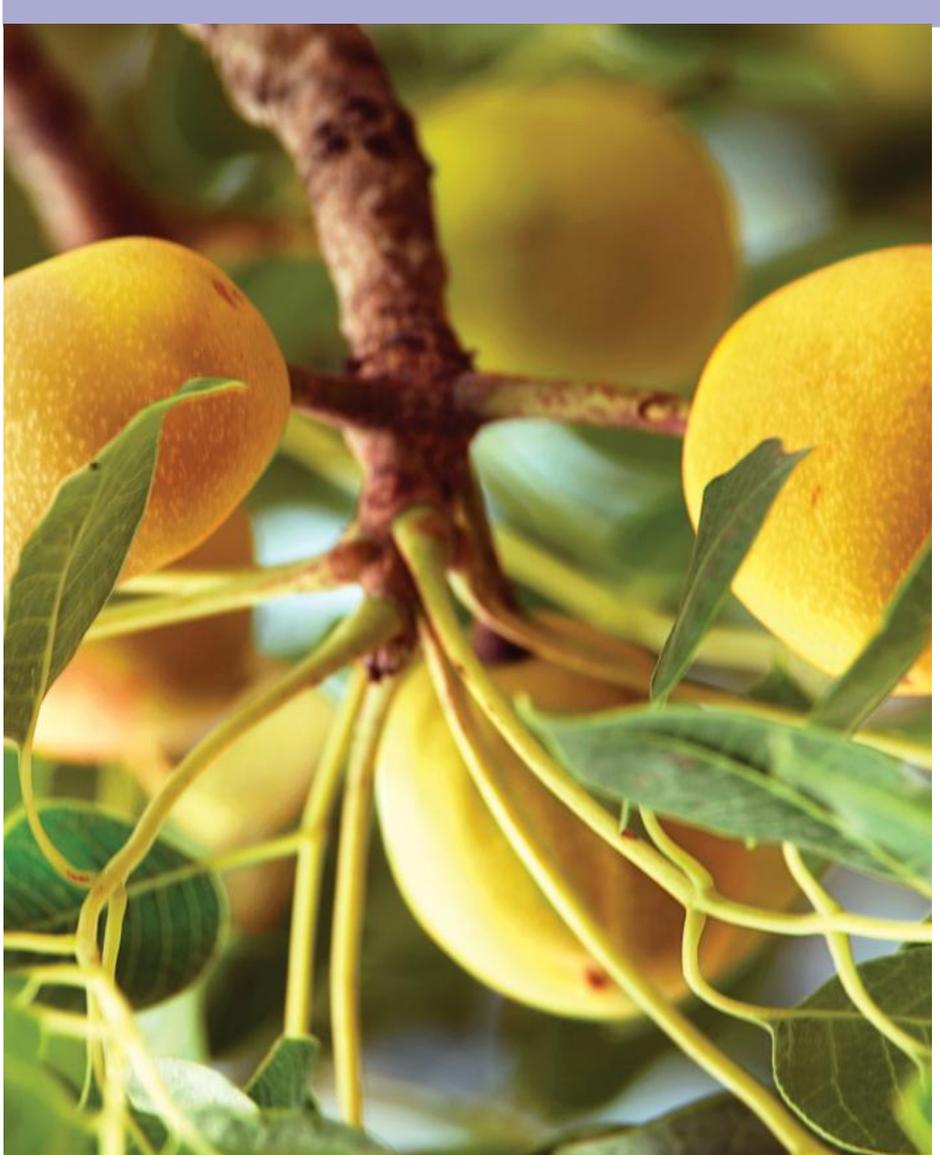


Food and Agriculture  
Organization of the  
United Nations



The International Treaty  
ON PLANT GENETIC RESOURCES  
FOR FOOD AND AGRICULTURE

Key descriptors for  
***Sclerocarya birrea***  
(marula)



INTERNATIONAL YEAR OF  
FRUITS AND VEGETABLES

2021



Key descriptors for  
***Sclerocarya birrea***  
(marula)

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World Agroforestry (ICRAF) is a centre of science and development excellence that harnesses the benefits of trees for people and the environment.

Leveraging the world's largest repository of agroforestry science and information, we develop knowledge practices, from farmers' fields to the global sphere, to ensure food security and environmental sustainability.

ICRAF is the only institution that does globally significant agroforestry research in and for all of the developing tropics. Knowledge produced by ICRAF enables governments, development agencies and farmers to utilize the power of trees to make farming and livelihoods more environmentally, socially and economically sustainable at scales.

We are guided by the broad development challenges pursued by CGIAR, a global research partnership for a food-secure future, which include poverty reduction, increasing food and nutritional security, and improved natural resource systems and environmental services. ICRAF's work also addresses many of the issues being tackled by the Sustainable Development Goals (SDGs), specifically those that aim to eradicate hunger, reduce poverty, provide affordable and clean energy, protect life on land, and combat climate change.

ICRAF's Vision is an equitable world where all people have viable livelihoods supported by healthy and productive landscapes.

The Centre's mission is to harness the multiple benefits trees provide for agriculture, livelihoods, resilience, and the future of our planet, from farmers' fields through to continental scales.

The objectives of the FAO International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) are the conservation and sustainable use of all plant genetic resources for food and agriculture (PGRFA) and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity (CBD), for sustainable agriculture and food security.

The ITPGRFA text stresses the importance of *in situ* conservation and the need to collect and make publicly available related information. Particularly Article 5d which states that Contracting Parties shall "*Promote in situ conservation of wild crop relatives and wild plants for food production, including in protected areas, by supporting, inter alia, the efforts of indigenous and local communities*".

Since 2015, the ITPGRFA has intensified its support to national institutions on the documentation and exchange of PGRFA data in the context of its Article 17 and the development of the Global Information System on PGRFA.

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## PREFACE

This Descriptor list consists of an initial minimum set of characterization and evaluation descriptors for *Sclerocarya birrea*. This strategic set aims at facilitating access to and utilization of this African indigenous fruit tree. It does not exclude the addition of other descriptors at a later date.

This work has been done jointly with the World Agroforestry (ICRAF) and the Food and Agriculture Organization of the United Nations (FAO). The list was based on a preliminary List developed by World Agroforestry. In addition, internet searches were carried out looking for the most updated information on relevant characteristics and traits. The original List was subsequently integrated with evaluation traits. Special attention was given to the inclusion of descriptors relevant to nutritional components and biotic stresses of particular importance in the context of emerging adverse weather events which are expected to intensify under current and future climate challenges. Those included in this Key set have been chosen because of their cosmopolitan nature and global impact since they have wide geographic occurrence and cause significant economic damage.

The key set of access and utilization descriptors was defined through an online survey, in which 22 experts from twelve countries participated. Survey results were subsequently validated in consultation with a Core Advisory Group (see 'Contributors') led by Joyce Chege from ICRAF.

The strategic set of data standards is designed to facilitate access to and utilization of plant genetic resources for food and agriculture information. Together with passport information (Alercia *et al.* 2018, 2015), descriptors are critical to the effective sharing of characterization and evaluation data and to the efficient use of plant genetic resources for food and agriculture.

The collaboration between World Agroforestry (ICRAF) and the FAO International Treaty on PGRFA has already produced the publication of the Key descriptors for *Dacryodes edulis* (Safou) and Key descriptors for *Strychnos cocculoides* (Monkey orange) in 2021. These standards, published on the occasion of the International Year of Fruits and Vegetables, are particularly helpful for researchers, plant breeders, and conservationists worldwide, in addition to national focal points of the International Treaty. The users can get access to a vast collection of resources on descriptors through the Global Information System.

## INTRODUCTION

*Sclerocarya birrea*, commonly known as marula is an important multipurpose fruit tree of the semi-arid and sub-humid zones of sub-Saharan Africa. It belongs to the family Anacardiaceae.

Its natural distribution stretches from Mauritania and Senegal eastwards to Ethiopia and Eritrea, and southwards to Mozambique and South Africa, and westwards to Namibia and Angola. It is also present in Madagascar. Three subspecies are recognized: subsp. *birrea* generally occurs north of the equator, subsp. *caffra* occurs south of the equator, and subsp. *multifoliolata* occurs in Tanzania.

The species is widespread throughout much of sub-Saharan Africa outside the humid forest zone. The tree occurs in wooded grasslands, riverine woodlands and bushland. It tolerates a wide range of soils, temperature, and rainfall.

The tree provides various benefits to communities where it occurs. The fruit pulp is an important source of vitamin C. It is eaten fresh or processed into jams, juices, and alcoholic beverages. The nut has a high protein, fat, and minerals content and is consumed fresh or roasted. Marula oil is pressed from the kernels and has a long history encompassing food and cosmetic uses. The mature fruits fall from the tree and ripen on the ground from where they are collected mainly by rural women for home consumption or processed into products for sale, thus providing a source of income. Subsp. *caffra* has been the focus for commercial development and the fruit is processed into products for the global market. The tree is also used as timber, in medicinal preparations and is a source of fodder for animals.

This descriptor list, which follows the international standardized documentation system for the characterization and study of genetic resources (Alercia 2011), is expected to support studies focusing on genetic and morphological diversity of marula, conservation of its genetic resources, domestication and to increase production and use of its products.

## **ACKNOWLEDGEMENTS**

The World Agroforestry (ICRAF) and the Food and Agriculture Organization of the United Nations (FAO) are grateful to all the scientists and researchers who have contributed to the development of this strategic set of 'key access and utilization descriptors'.

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## KEY SET OF CHARACTERIZATION AND EVALUATION DESCRIPTORS FOR *SCLEROCARYA BIRREA* (MARULA)

This is an initial, minimum set of Characterization and Evaluation descriptors for marula, that are useful in assisting researchers to utilize accessions more easily. This is not intended to be an exhaustive descriptor list, but rather a key list of descriptors and traits that are relevant to describing, categorizing, and especially utilizing germplasm of indigenous fruit trees.

- Ideally, observations should be made on trees of the same age, unless otherwise stated.
- For fruit descriptors, record the average measurement, or predominant shape of 25 ripe fruits randomly selected.

### CHARACTERIZATION

#### 1. **Tree height** [m]

Measured from ground level to the top of the tree.

##### 1.1 **Tree age** [y]

Indicate the age of the tree in years.

#### 2. **Trunk height** [m]

Distance from the ground level to the point of emergence of first branch. If grafted, also record height of graft union and rootstock name.

#### 3. **Trunk diameter** [cm]

Diameter recorded at breast height.

#### 4. **Crown diameter** [m]

Measured as the mean diameter using two directions [East-West, South-North].

#### 5. **Leaflet shape**

Record the predominant shape of 10 leaflets randomly selected

- 1 Round
- 2 Oblong
- 3 Lanceolate
- 4 Elliptic
- 5 Obovate
- 99 Other (specify in the **Notes** descriptor)

**6. Flower sex**

- 1 Female
- 2 Male
- 3 Hermaphrodite

**7. Fruit shape**

Record the predominant shape of 25 fruits randomly selected

- 1 Roundish or sub globose
- 2 Obovoid
- 99 Other (specify in the **Notes** descriptor)

**8. Fruit weight [g FW]**

Record the average fresh weight of 25 mature fruits randomly selected.

**9. Fruit length [cm]**

Record the average length of 25 mature fruits randomly selected at the longest point.

**10. Fruit diameter [cm]**

Record the average diameter of 25 mature fruits randomly selected at the widest point.

**11. Fruit pulp weight [g FW]**

Record the average weight of pulp from 25 mature fruits randomly selected.

**12. Fruit taste**

- 1 Sour
- 2 Sweet

**13. Fruit flesh juiciness**

- 3 Low
- 5 Intermediate
- 7 High

**14. Stone length [mm]**

Record the average length of 25 stones [nuts] randomly selected measured at the longest point.

**15. Stone width [mm]**

Record the average width of 25 stones randomly selected measured at the widest point.

**16. Number of kernels [seeds] per stone [nut]**

Average number of kernels per stone from 25 randomly selected stones.

**17. 100-Kernel weight [g]**

Record the average weight of 100 kernels randomly selected.

**18. Kernel length [mm]**

Record the average length of 25 kernels randomly selected measured at the longest point.

**19. Kernel width [mm]**

Record the average width of 25 kernels randomly selected measured at the widest point.

**EVALUATION****20. Flowering period**

- 1 Early
- 2 Late

**21. Fruiting season**

- 1 Early
- 2 Intermediate
- 3 Late

**22. Number of fruits per tree**

Record the total number of mature fruits on tree.

**23. Fruit fresh weight per tree [Kg FW]**

Record the total weight of all mature fruits on tree.

**Fruit nutritional content****24. Flesh Ascorbic acid content (Vitamin C) [mg/100g FW]****25. Flesh sucrose content [%]****26. Kernel protein content [%]****27. Kernel oil content [%]**

**Biotic stress susceptibility**

	<b>Causal organism</b>	<b>Common name</b>
28.	<i>Oidium mangiferae</i>	Powdery mildew
29.	<i>Pterandrus rosa</i>	Fruit fly
30.	<i>Heliothrips haemorrhoidalis</i>	Thrips
31.	<i>Capnodium</i> sp.	Sooty mould

**32. NOTES**

Specify any additional information here.

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