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Data Article

Dataset of seed characteristics of the main weeds on Reunion Island

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ABSTRACT

Characterizing seeds of tropical weeds is crucial for future research to understand their ability to disperse in space and time through their seeds, and building up seed banks. Seeds of 55 weed species occurring on Reunion Island were collected and characterized. Seeds were described by their shape, size, color, texture, hairiness, or particular markings. Seed traits were recorded in a database in French and English. It has been published on the CIRAD AMATROP dataverse, which centralizes datasets on tropical weeds. It will be updated as new weed seeds from tropical regions are characterized. In a long-term perspective, these data allow for creating a multicriteria identification key to identify seeds to study seed stocks in agricultural fields.

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Specifications Table

Subject	Agronomy and Crop Science
Specific subject area	Weed sciences in tropical regions. Characterization of tropical weed species
Type of data	Table Filtered
Data collection	Seeds from 55 broadleaved weed species belonging to 17 families were harvested from October 2021 to August 2022 on Reunion Island (France) from fallow plots at CIRAD experimental sites at La Mare (−20.902, 55.532; 70 m altitude) and La Bretagne (−20.902, 55.532; 80 m altitude) stations. Seeds were harvested manually from weed plants at the seed maturity stage (BBCH scale of Zadoks [1]). The seeds were cleaned to remove impurities and, if necessary, extracted from the fruit. They were then air-dried before being stored and labeled. The seeds of each species were then described by (1) their shape, (2) their size (length and width, diameter in case of round seeds), (3) their color, (4) the texture of the tegument, (5) their hairiness and (6) other notable morphological characters (particular appendages, hilum…). The dissemination organs are also described if they are still present when the seeds are dispersed (e.g., capsule), based on the same characters mentioned above. Seed size (length, width, and diameter) was measured with the DinoCapture 2.0 software (version 1.5.44.D) integrated with the Dino-Lite AM4515ZT (R9) binocular loupe on ten seeds of each species, then averaged.
Data source location	• Institution: CIRAD • City/Town/Region: La Mare and La Bretagne, La Réunion. • Country: France • Latitude and longitude (and GPS coordinates, if possible) for collected samples/data: (−20.902, 55.532; 70 m altitude), and (−20.902, 55.532; 80 m altitude)
Data accessibility	Repository name: CIRAD AMATROP dataverse [2] Data identification number: doi: 10.18167/DVN1/A0LT82 Direct URL to data [3]: https://dataverse.cirad.fr/dataset.xhtml?persistentId=doi:10.18167/DVN1/A0LT82
Related research article	

1. Value of the Data

- In agriculture, weeds are the most damaging crop pests [4]. Weed management is thus a significant concern for farmers in Reunion Island [5]. However, the biology of tropical weeds remains very little studied.
- Seed identification is necessary to address two main issues: assessing the degree of purity of a seed lot (to prevent the introduction of exotic species into an environment) and accurately identifying a species from its seed, particularly in soil seedbank assessment.
- Several image and seed characteristic databases already exist for temperate species [6–9], but none for tropical weeds
- These data will allow further research on the temporal and spatial dynamics of the soil seedbank of tropical weeds. They can be used by all organizations in tropical areas studying tropical weed science because most of the species observed on Reunion Island are pantropical species.
- In the short term, seeds of other species will be collected and described progressively to complete the dataset with the aim of having a database available for most of the weed species of Reunion Island. Other seed traits (such as weight, surface area, coat thickness…) will be added to the dataset.
- In the long term, these data will help to build a multicriteria identification system that could be developed on the same model as the WIKWIO IDAO tool published for tropical weeds [10].

2. Background

Improving the efficiency of weed control practices and weed management in general requires a better understanding of the biology of weed species and, more specifically, their seeds (production, germination, dormancy…). Swanton and Booth [11] have identified four weed management strategies that target four important stages in their life cycle: (1) increasing seed mortality, (2) controlling seed germination and emergence, (3) reducing seed production, and (4) destroying above-ground weed biomass. Three of these four strategies require a good knowledge on weed seeds. However, the main weed management techniques implemented by farmers in tropical areas focus on the fourth strategy: limiting direct weed competition with the crop. A better understanding of seeds' temporal and spatial dynamics in the environment and soil seedbank could allow us to find other weed management practices that use the above strategies.

Databases of images and characteristics of weed seeds already exist, such as Seed for Free [6]; I.D.SEED® of the GEVES (Groupe d'Etude et de contrôle des Variétés Et des Semences - Group for the Study and Control of Varieties and Seeds) [7]; Seed Identification Guide of the International Seed Morphology Association of ISMA [8] or Seed of South Australia [9]. However, all these databases are essentially about seeds of species from temperate regions. Thus, few seeds of tropical weeds have currently been characterized.

3. Data Description

Seeds of 55 broadleaved weed species from 17 families were collected and characterized. The corresponding dataset [3] has been published in 2023 under CC BY-SA 4.0 licence on the Amatrop Cirad dataverse [2].

The dataset contains 4 folders (2 in French and 2 in English):

(1) Description_graines_Fr
(2) Seed_description_En
(3) Description_variables_Fr
(4) Variable_description_En

In both French and English languages, the first two folders contain seed descriptions by 12 variables. In these two folders, lines correspond to species and columns correspond to variables. Folders 3) and 4) contain the list of the 12 variables described and their modalities or measure units. The different variables of the dataset are listed and described in Table 1.

4. Experimental Design, Materials and Methods

Seeds were harvested from October 2021 to August 2022 on Reunion Island (France) from fallow plots at La Mare (−20.902, 55.532; 70 m altitude) and La Bretagne (−20.902, 55.532; 80 m altitude) experimental CIRAD stations. About hundred seeds were harvested manually from several individuals of various weed species, at the seed maturity stage (BBCH scale of Zadoks [1]). The seeds were cleaned to remove impurities, malformed seeds, and, if necessary, extracted from the fruit. They were then air-dried before being stored and labeled. Ten seeds of each species were randomly selected for characterization, to consider heteromorphic forms present in certain species.

The seeds of each species were then described by (1) their shape, (2) their size (length and width, diameter in case of round seeds), (3) their color, (4) the texture of the tegument, (5) their pilosity and (6) other notable characteristics (particular appendages…). The organs of dissemination are also described if the seed remains embedded in it during dissemination (e.g., capsule), based on the same characteristics mentioned above. Seed size (length, width, and diameter) was measured with the DinoCapture 2.0 software (version 1.5.44.D) integrated with the Dino-Lite AM4515ZT (R9) binocular loupe on ten seeds of each species, then averaged.

Table 1
Variables of the dataset.

Variable names	Description
Weed species names	The currently accepted scientific name of weed species, according to GBIF taxonomic reference [12]. Weed species and family described in the dataset are listed in Table 2
EPPO codes	The international 5 letters code from the EPPO Global Database [13]
Identification key version	Dataset is linked to a weed seed identification key system available in different versions in CIRAD's open archives AGRITROP (see below) and on the Wiktrop portal dedicated to tropical weeds (https://portal.wiktrop.org/fr/document/show/368762)
Seed main shape	Five main shapes have been identified: (1) trigonal, (2) reniform, (3) round-globose, (4) oval-oblong-ovoid, and (5) elongated-fusiform. More anecdotal forms have also been observed (right pavement, piriform…) and grouped under "various forms"
Seed shape (precision)	Detail of the shape of the seed (example: rolled up on itself…)
Seed length	Seed length (in mm)
Seed width	Seed width (in mm)
Color of the seed tegument	Color of the seed tegument
Texture of the seed tegument	Texture of the seed tegument (example: smooth, reticulated, ribbed…)
Pubescence of the seed tegument	Hairiness of the seed tegument (example: glabrous, dense white hair, yellow pubescence…)
Other characteristics of the seed	Other characteristics of the seed (example: the presence of pappus - a small tuft of hair, bristles or scales located at the top of some seeds; description of the hilum - scar of the attachment point of the seed…)
Seed descriptive text	Summarizes all the characteristics of the seed in a short text

Table 2
Weed species and family described in the dataset.

Species	Families
Aeschynomene americanum	Fabaceae
Ageratum conyzoides	Asteraceae
Amaranthus sp	Amaranthaceae
Argemone mexicana	Papaveraceae
Bidens pilosa	Asteraceae
Cajanus scarabaeoides	Fabaceae
Cardiospermum microcarpum	Sapindaceae
Centrosema pubescens	Fabaceae
Cleome viscosa	Cleomaceae
Coccinia grandis	Cucurbitaceae
Commelina benghalensis	Commelinaceae
Crassocephalum crepidioides	Asteraceae
Crotalaria juncea	Fabaceae
Crotalaria retusa	Fabaceae
Crotalaria spectabilis	Fabaceae
Crotalaria trichotoma	Fabaceae
Cyanthillium cinereum	Asteraceae
Desmanthus virgatus	Fabaceae
Desmodium tortuosum	Fabaceae
Distimake aegyptius	Convolvulaceae
Emilia sonchifolia	Asteraceae
Euphorbia heterophylla	Euphorbiaceae
Hibiscus surattensis	Malvaceae
Indigofera hirsuta	Fabaceae
Ipomoea eriocarpa	Convolvulaceae
Ipomoea hederifolia	Convolvulaceae
Ipomoea indica	Convolvulaceae
Ipomoea obscura	Convolvulaceae
Ipomoea triloba	Convolvulaceae

(*continued on next page*)

Table 2 (*continued*)

Species	Families
Leucaena leucocephala	Fabaceae
Leucas lavandulifolia	Lamiaceae
Macroptilium atropurpureum	Fabaceae
Malvastrum coromandelianum	Malvaceae
Melochia pyramidata	Malvaceae
Merremia tuberosa	Convolvulaceae
Mimosa diplotricha	Fabaceae
Momordica charantia	Cucurbitaceae
Mucuna pruriens	Fabaceae
Nicandra physaloides	Solanaceae
Oxalis corniculata	Oxalidaceae
Passiflora foetida	Malvaceae
Richardia scabra	Rubiaceae
Ricinus communis	Euphorbiaceae
Senna occidentalis	Fabaceae
Sida acuta	Malvaceae
Sida alba	Malvaceae
Solanum americanum	Solanaceae
Sonchus oleraceus	Asteraceae
Striga asiatica	Orobanchaceae
Synedrella nodiflora	Asteraceae
Tephrosia noctiflora	Fabaceae
Trichodesma indicum	Boraginaceae
Trichodesma zeylanicum	Boraginaceae
Tridax procumbens	Asteraceae
Youngia japonica	Asteraceae

Limitations

Seeds of 55 weed species were collected and characterized among the 220 weed species recorded on Reunion Island [14]. The species were chosen because they are widespread (frequent and abundant) in the island's agricultural plots and easy to collect. Seeds of other species will be collected and described progressively to complete the dataset with the aim of having a database available for most of the weed species of Reunion Island. Other measures will be added, such as seed weight, for example.

Ethics Statement

All of the authors have read and follow the ethical requirements for publication in Data in Brief and confirming that the current work does not involve human subjects, animal experiments, or any data collected from social media platforms.

Credit Author Statement

Marion Schwartz: Conceptualization, Methodology, Investigation, Writing – original draft, Data curation. **Sandrine Auzoux:** Data curation, Writing – review & editing, Visualization. **Abel Etheve:** Methodology, Investigation, Writing – review & editing. **Thomas Le Bourgeois:** Methodology, Validation, Writing – review & editing. **Mathias Christina:** Writing – review & editing, Project administration. **Aude Ripoche:** Writing – review & editing, Supervision.

Data Availability

Seed description (Original data) (Dataverse).

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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