

RBS Workshop, Wondo Genet, 27 Feb-1 Mar 2014

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Introduction

Rapid Botanic Survey (RBS) is a standardised method for assessing the flora across a region, as efficiently as possible (Hawthorne, 2012). RBS makes an excellent framework for training in field botany and vegetation assessment, and survey results are commonly used for a variety of purposes: statistical classification of vegetation types; Environmental Impact Assessments and conservation planning; generating checklists of plant species with details on geographic and ecological range, and maps; and bioquality scoring, showing the global rarity value of different areas of vegetation types, discussed below.

A presentation of the aims and benefits of RBS was given at the Arbopro final workshop^{1,2} in Wondo Genet college of Forestry and Natural Resources. Wondo Genet college is a part of Hawassa University whose main campus is nearby at Shashemene in Central Ethiopia. A three day Rapid Botanic Survey (RBS) training and demonstration workshop was then held in the college between 27 Feb and March 1, 2014. The fieldwork was conducted in the vegetation, mostly montane forest, around the college.

Given the short time frame, the RBS workshop was a demonstration and training session for the field activities involved in Rapid Botanic Survey: unfortunately, training for databasing, identification and analysis was not feasible in the time. However, in this report, results and analysis of the data from the RBS are discussed in the light of published data on the species and vegetation of the region. We conclude by suggesting how RBS could contribute to research and teaching in conservation and resource management in the college and more widely in Ethiopia.

Thanks

We would like to thank Wondo Genet College itself for hosting us, Peter Borchardt (Institute of Geography, University of Hamburg) and Ben Jones (University of Oxford Harcourt Arboretum), for inviting us to the ARBOPRO workshop; the German Ministry for Education and Research – BMBF, for supporting our visit and the workshop; and Prof. Sebsebe Demissew and the National Herbarium in Addis Ababa for allowing us to use their facilities to identify vouchers from the RBS.

¹ http://www.bgci.org/index.php?option=com_news&id=1104

² <http://www.nachhaltige.uni-hamburg.de/de/downloads/KNU-Praesentation-ARBORETUM-PROJECT-PBorchardt.pdf>

Participants in RBS training



Person	Institution
<i>Alemnega Degefa</i>	Wondo Genet College, herbarium curator
<i>Belaynesh Zewdie</i>	Wondo Genet College, Commercial projects coordinator
<i>Ben Jones (trainer)</i>	Oxford University, Harcourt arboretum
<i>Cicely Marshall (trainer)</i>	Oxford University, D.Phil. student
<i>Deneke Darcho</i>	Wondo Genet College, Graduate teaching assistant
<i>Dong-Ill Kim</i>	Wondo Genet College, Lecturer
<i>Fikadu Aseta</i>	Wondo Genet College, Forestry lecturer
<i>Gemechu Korosu</i>	Wondo Genet College, tree spotter
<i>Getachew Birham</i>	Wondo Genet College, herbarium technician
<i>Jens Oldeland</i>	Hamburg university, Post Doc research
<i>Kassahun Takek</i>	Wondo Genet College, Graduate teaching assistant
<i>Kirsty Shaw</i>	Botanic Gardens Conservation International,
<i>Senait Desaigne</i>	Wondo Genet College, Herbarium technician
<i>Weynshet Afework</i>	Wondo Genet College, lab technician
<i>William Hawthorne (trainer)</i>	Oxford University, Research Fellow
<i>Wisemayat Govems</i>	Wondo Genet College, Graduate teaching assistant

Activities and Methods

The vegetation was surveyed in four RBS sample areas. All species of vascular plant were collected in each, and canopy trees were enumerated according to the standard RBS protocol outlined by Hawthorne (2012). Voucher specimens of almost all species were collected, and photographs were taken of many. From the specimens and photos, most records have been identified using the Flora of Ethiopia, online resources (e.g. Jstor plants), or by comparison with specimens in the Ethiopian National Herbarium in Addis Ababa. As only a day was spent in the herbarium, at the time of writing c. 58/327 (17%) of records across all plots are of incompletely identified species (most of these to a vague name such as *Acacia sp.*). Although normally the identification would be completed for a higher proportion of records, by spending longer in the herbarium, the results have yielded enough determinations for this provisional analysis.

Data from plots were all input in a Brahms database (see herbaria.plants.ox.ac.uk/bol)



Results

The results of the RBS samples are shown in Annex 1.

Table 1 Summary of RBS, and of earlier plot survey by Kebede et al. 2013

Sample	Note	Date	No. recs	No. id species (including vague names)	Altitude (m)	Latitude	Longitude
WGSF01	Broken forest just above arboretum	27-Feb-14	47	31 (36)	1885	7.09889N	38.63566E
WGMF02	<i>Pouteria</i> forest around dam	28-Feb-14	61	42 (50)	1983	7.09919N	38.64235E
WGMF03	Forest between previous 2 samples	01-Mar-14	69	52 (56)	1907	7.09737N	38.6389E
WGSC04	Regeneration after plantation cleared	03-Mar-14	77	46 (54)	1816	7.10584N	38.62827E
WGMISC	Misc. records & photos from around college	26 Feb 2014	69	50	c. 1800		
A -RBS Overall	01-04 above	2014	323	159 (119)	1800-2000		
B - Checklist in Kebede et al. (2013)	Species checklist from paper	2010		239 (220)	1800-2500	See Map	
A&B Combined				(275)	1800-2500		

Analysis and discussion




The vegetation types of Wondo Genet have been amply covered by Kebede *et al.* (2013): the aim of this exercise was merely to demonstrate the principal of RBS and its potential for use more broadly.

Vegetation type

The map in Figure 1, and summary of plant communities in Kebede *et al.* (2013) show that our samples were conducted in a small portion of the range of vegetation in the area. Kebede *et al.*'s (2013) plots were similarly biased towards the woody vegetation: they recognised 5 community types in their 75 measured plots (see Figure 1) in a wider variety of vegetation and altitude range.

Normally, outputs from RBS survey would have many tens or hundreds of samples, and then the community types can be explored using ordination and cluster analysis, in the manner shown by Kebede *et al.* However, there is no point to ordinate just 4 RBS samples. With access to the results of Kebede *et al.*, it would be possible to integrate the new plots into their classification precisely, but in fact their stated indicator species and map position allow the correspondence in Table 1 to be deduced with some confidence.

Table 2 Correspondence between previously established communities and the RBS samples

	<i>Kebede et al. community</i>	RBS samples	
1	<i>Acokanthera-Calpurnea</i>	WGSC04	
2	<i>Erythrococca – Millettia ferruginea</i>	WGMF02, WGMF03	
3	<i>Croton macrostachyus-Vernonia</i>	WGSF01 was on the borderline between type 3 & 2	
4	<i>Dodonea-Hypericum</i>	Not sampled in RBS workshop	
5	<i>Protea- Rhus</i>	Not sampled in RBS workshop	

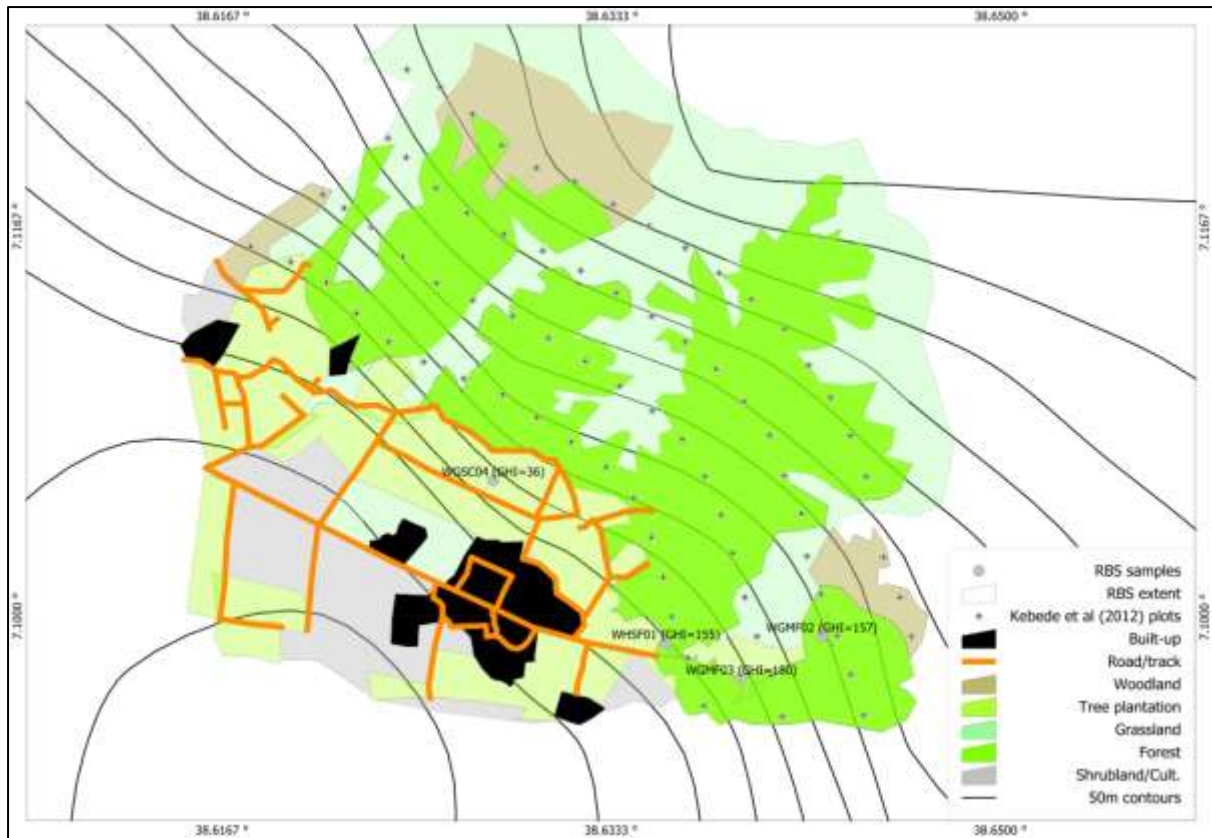


Figure 1 Map of Wondo Genet college and surrounding vegetation showing location of 4 RBS samples. Kebede *et al.* plots and other features adapted from map in Kebede *et al.* (2013). Contours were derived from a national 90m digital terrain model. WGSC04 was in an area of tree plantation that has been cleared in the last year, and within which the indigenous vegetation was regenerating.



Bioquality

The Genetic Heat Index (GHI) was calculated for each sample as outlined by Hawthorne (2012):

GHI is a ‘how hot is my hotspot’ score, allowing the hotspot temperature to be measured for small patches of vegetation on a globally standardised scale. It is a weighted average rarity score across all species in each sample, whereby globally rare species score more than more globally widespread species, in approximate proportion to their global rarity, estimated at a 1 degree square resolution. The richer a community is in rare species, and the rarer those species are, the higher the GHI score.

Rather than calculate a detailed range and weight for all species, which would be more precise but impractical, species (or varieties and subspecies) are always put into one of four categories called Stars, based on approximate global range. Stars are weighted according to the mean rarity of species within them. Black Star species are the globally rarest, then Gold, Blue and Green. Green Star species are widespread species of no rarity value, often familiar to botanists in many countries.

Table 3 Summary of provisional Stars for sampled species (d.s. = degree squares occupied)

Star	Typical range	Mean geographic Range (d.s.) expected for Star	Proportionate weight for calculating GHI)	Examples
Black	Endemic to a part of Ethiopia	2.67	27	<i>Habenaria cultriformis</i> , <i>Vepris dainellii</i> , <i>Coffea arabica</i> (special consideration in respect of wild coffee populations only – cultivated coffee would be Green Star)
Gold	Extending into Kenya /Uganda, or widespread in Ethiopia +- in adjacent countries	8	9	<i>Acanthus eminens</i> , <i>Justicia schimperiana</i> , <i>Solanecio gigas</i> , <i>Milletia ferruginea</i>
Blue	Intermediate Gold-Green. E.g. scattered on African mts or within E.Africa	24	3	<i>Polyscias fulva</i> , <i>Acokanthera schimperi</i> , <i>Pavetta abyssinica</i> , <i>Clusia lanceolata</i> , <i>Dombeya schimperiana</i> , <i>Afrocarpus falcatus</i>
Green	Widespread to South and /or West Africa	72	-	<i>Pseuderanthemum tunicatum</i> , <i>Aerva lanata</i> , <i>Cyathula cylindrica</i> , <i>Landolphia bucananii</i> , <i>Cordia africana</i> , <i>Combretum molle</i> , <i>Commelina erecta</i> , <i>Ageratum conyzoides</i> , <i>Solanecio angulata</i> , <i>Momordica foetida</i> , <i>Tectaria gemmifera</i> , <i>Cynodon dactylon</i> , <i>Leucas martinicensis</i> , <i>Calpurnia aurea</i> , <i>Nuxia congesta</i> , <i>Ficus sur</i> , <i>Maesa lanceolata</i> , <i>Drynaria volkensii</i> , <i>Vepris nobilis</i>

The guideline geographic ranges (in degree squares) for each Star, which are standardised across RBS projects, are shown in Table 3, with the corresponding weight. The aim is to classify species into Stars so that the mean range for a Star corresponds as closely as possible to this target value:

obviously there is some variation in geographic range for species of each Star. Other considerations, such as abundance of a species within its range; and existence of closely related taxa with much broader ranges, can be used to downgrade a Star rating from that suggested by the geographic extent alone. Globally rare subspecies, for instance, have a Star intermediate between that appropriate for a species of the same range and that of the combined range of all subspecies in the species.

Stars were assigned for all species recorded in Wondo Genet, as a first approximation based on the total geographic range derived from various resources and Floras, in particular Flora of Ethiopia, Flora of Tropical East Africa, GBIF³, the African plants⁴ database and Jstor-Global plants⁵ (Table 3). In any future RBS project, the Stars would be reappraised in more detail, for instance considering recent changes to ranges recorded in herbaria.

GHI is calculated as: Sum of (No. Species in each Star x Weight for that Star) x 100/ no. Species with any Star.

The total number of species sampled in Wondo Genet is summarised in Table 4. The overall total (“A & B combined”) excludes the extra records made for the Wondo Genet area outside of RBS samples (filed under a sample “WGMISC”), as several of these, collected on and around the campus, had been planted and not strictly members of the Wondo Genet natural or naturalised flora. The bottom row of Table 4 therefore summarises the number of species sampled, in each Star, and the overall GHI of the sampled Wondo Genet vegetation as a whole is estimated from this as follows, using the weights 27, 9, 3, 0 for Black, Gold, Blue and Green species.

Sample calculation of GHI for A&B combined **numbers of each species** for each star and their **weights**

$$\text{GHI} = 100 \times ((4 \times 27) + (12 \times 9) + (19 \times 3)) / (4 + 12 + 19 + 199)$$

$$= 100(108 + 108 + 57) / 234$$

$$= 116.67$$

³ <http://www.gbif.org/>

⁴ <http://www.ville-ge.ch/musinfo/bd/cjb/africa/recherche.php>

⁵ <http://about.jstor.org/content/global-plants-formerly-jstor-plant-science>

Table 4 Summary of number of species in each Star for each RBS sample and previous checklist of Kebede et al.

Sample	Veg (see Table 2)	No. recs	No. id species (including vague names)	No. Species of Each Star					GHI
				Black	Gold	Blue	Green	?	
WHSF01	2-3	47	31 (36)	1	1	3	24	2	155
WGMF02	2	61	42 (50)	1	2	4	31	4	157
WGMF03	2	69	52 (56)	2	2	3	38	7	180
WGSC04	1	77	46 (54)	0	1	1	30	14	36
A -RBS Overall	1-3	323	119 (159)						134
B - Checklist in Kebede et al (2013)	1-5	?	219 (239)	3	12	17	181	6	117
A&B Combined	1-5		265	4	12	19	199		116

GHI is globally standardised, so can be used to compare hotspots around the world and regionally. Although they therefore make most sense when comparing many samples, the GHI translates roughly into biodiversity hotspot ‘temperatures’ as follows:

- GHI <50: Cold: typical scores for secondary vegetation dominated by ruderals, e.g. along roadsides and abandoned fields. Generally speaking, of little conservation value, except in some cases with respect to heavy use or high socio-economic value of many such species locally, or maybe because frequented by rare animals. Other scores can be devised using the same data to highlight ‘conservation priorities in respect of other values’.
- GHI 150-200: Warm: In many countries, areas with warm temperatures in this GHI range are protected on the basis of the perceived global distinctiveness of the flora. The fauna tends to be similarly rich in rare species.
- GHI 300+: Hot. Such temperatures apply to notable global endemic hotspots, such as the highest mountain top vegetation in Trinidad, West Africa (and maybe Ethiopia’s e.g. Bale mts); small enclaves of the wettest evergreen forest in Ghana and Liberia; probably the coastal forests of East Africa, and the endemic-rich small islands of southern Japan.

The overall Wondo Genet GHI of 117 applies to species from all *Kebede et al.* (2013) classes 1-5 – i.e. a score for the vegetation in the sampled areas combined. This is a modest GHI, but it can be seen from Table 4 that this is due to the combination of:

- low-scoring class 1 vegetation of *Acokanthera-Calpurnea*, exemplified by the secondary vegetation after a cleared plantation (WHSC04 – GHI =36);
- Relatively high scoring montane forest of the *Erythrococca-Millettia* community in the other RBS plots (highest scoring WGMF03 – GHI=180.



From the point of view of global species rarity, the Wondo Genet montane forest is of higher conservation value, with rarer species overall, than the other type of vegetation sampled. In an ongoing project, it would be possible to map the hotspot scores across a broad region, noting subtle hotspots and coldspots within general trends; this would put into context the conservation significance of any particular patch, particularly when combined with ordination to show similarities and differences of communities regardless of GHI.

The RBS dataset could also be used to assess value in terms of distribution of useful plants.

The trees of each species were individually counted in each of the RBS samples, and this gives the potential to analyse the tree populations independently. This could be used to make a tree-centred classification, or for instance for evaluating where rare or useful individual trees are concentrated.

What next?

RBS is an ideal framework for training botanists, including tree-spotters or those interested in useful plants; also for reinvigorating the Wondo Genet herbarium. Students trained in the process would be better equipped for many aspects of rural appraisal and land use management. During a broader regional or national survey, RBS teams would be able to collect living material for seed-banks, botanic gardens and arboreta, whilst providing good background data on the context of such collections. RBS also generates a database, including images, of great benefit in many arenas e.g. to help IUCN red-listing; choice of candidate species for agroforestry projects; to map aromatic, medicinal or rare plants. Analytic outputs, such as a hotspot map and botanic description of the area could be used to make educational material for the arboretum and e.g. lecture material for teaching staff, as well as academic outputs.

A summary of potential for future RBS projects at Wondo Genet

We talked during the Arbopro workshop about how a small botanic survey project could start with little delay with student and staff teams from the College. This team could work locally (e.g. without transport in the beginning) to survey the local vegetation more thoroughly. This could be a cheap enterprise, although travel and subsistence costs would need to be raised. The Oxford team would be happy to help and teach the analysis required to turn the data into e.g. a hotspot map, vegetation typology etc. Some species identification would need to happen in Addis, until the herbarium collection at Wondo Genet is comprehensive for the area.

- With a small grant (e.g. £5000-£10,000) Oxford staff could come out again to help with identification and help guide the survey (and provide motivation to get the project going), and give a BRAHMS course. A BRAHMS course was requested by both the college and the

National Biodiversity Centre, and would be necessary for storing the data in a way that we can access it and help with analysis in Oxford. Funds of this scale could also be used to pay a small stipend/daily allowance for the staff and students in the teams. Any remaining funds could be used to buy fuel to travel to forests further afield.

- Priority species could be identified by e.g. their global rarity, their ecological significance in the landscape, or their scent/other ornamental/medicinal features. A period of seed collection could follow to establish such species in the arboretum. In particular, scented and medicinal species would be of interest to the aromatic and medicinal centre adjacent to the College, who are interested to try cultivating Ethiopian aromatic/medicinal species alongside the European species that are being grown at the moment.



A bigger project (e.g. £300,000) would be more useful in the long run, whereby RBS team members work more or less full time to survey a wider region of Ethiopian Afromontane forest or other vegetation, and international institutions play a bigger role. The above project elements would be included in this proposal, with the difference that: A wider survey would require a significant budget for fuel, per diems and camping equipment or guest house costs. A remote sensing component would be built in.

- A budget for updating the arboretum e.g. removing *Eucalyptus* and replanting here and the surrounding areas with priority Ethiopian species, could be part of the same project.
- A series of workshops would be included to bring the users of the (college) forests together to discuss ways to reduce dependence on fuel wood from the forest, and to reduce fire-setting. Fuel wood collection in the forest is contributing to deforestation of the area. Funding would need to be reserved for implementing a solution to this dependence, whatever that may be. We would need to come up with a potential solution to try here - converting some of the unproductive timber plantations to coppiced areas for fuel wood, with due regard to the income the college makes from them currently.
- A collaboration with BGCI and other gardens of Ethiopia, and the biodiversity centre, would be envisaged, where these institutions contribute capacity building in *ex situ* species conservation and the grounds to do it in.
- Collaboration with national and regional herbaria could bring regional databases together with the new data collected. This database could be put online, along with Star and IUCN ratings and any other annotations.



It is currently proposed that such a project could be appealing to the UK Darwin Initiative.

References

Hawthorne, W.D. 2012 (updated occasionally). *A Manual for Rapid Botanic Survey (RBS) and measurement of vegetation bioquality.*

<http://herbaria.plants.ox.ac.uk/RBS/resources/rbs.pdf>

Kebede, M., Yirdaw, E., Luukkanen, O. & Lemenih, M. 2013. Plant community analysis and effect of environmental factors on the diversity of woody species in the moist Afromontane forest of Wondo Genet, Ethiopia. *Biodiversity Research and Conservation* 29: 63-80.

Annex 1: Checklist of Wondo Genet Species

Abutilon bidentatum (Hochst.) A.Rich. (Malvaceae) Star =GN : KEBEDE2012

Acacia abyssinica (Leguminosae) Star =GN : KEBEDE2012

Acacia brevispica Harms (Leguminosae) Star =GN : WGSC04 : KEBEDE2012



Figure 2 *Acacia brevispica* (Green Star)

Acacia sp. Brenan & Exell (Leguminosae) : WGMF02 : WGMISC2

Acanthaceae sp. (Acanthaceae) : WGMF03

Acanthaceae sp1 (Acanthaceae) : WGSC04

Acanthaceae sp2 (Acanthaceae) : WGSC04

Acanthus eminens C.B. Clarke (Acanthaceae) Star =GD : WHSF01 : KEBEDE2012

Acmella caulirhiza Delile (Compositae) Star =GN : KEBEDE2012

Acokanthera schimperii (A.DC.) Schweinf. (Apocynaceae) Star =BU : WHSF01 : WGSC04 : WGMISC2 : KEBEDE2012



Figure 3 *Acokanthera schimperii* (Blue Star)

Aeollanthus abyssinicus Hochst. ex Benth. (Labiatae) Star =GD : KEBEDE2012

Aerangis brachycarpa (A.Rich.) T.Durand & Schinz (Orchidaceae) Star =GN : KEBEDE2012

Aerva lanata (L.) Schult. (Amaranthaceae) Star =GN : KEBEDE2012

Afrocarpus falcatus (Thunb.) Mirb. (Podocarpaceae) Star =BU : WHSF01 : WGMF02 : WGMF03 : WGMISC : KEBEDE2012



Figure 4 *Acrocarpus falcatus* (Blue Star)

Ageratum conyzoides L. (Compositae) Star =GN : WHSF01 : KEBEDE2012

Albizia gummifera (J.F.Gmel.) C.A.Sm. (Leguminosae) Star =GN : WHSF01 : WGMF02 : WGMF03 : WGSC04 : WGMISC : WGMISC2

Albizia schimperiana (Leguminosae) Star =GN : KEBEDE2012

Albizia sp. (Leguminosae) : WGMISC2

Alepidea peduncularis A.Rich. (Umbelliferae) Star =GN : KEBEDE2012

Allophylus abyssinicus (Hochst.) Radlk. (Sapindaceae) Star =GN : KEBEDE2012

Allophylus ferrugineus Taub. var. *ferrugineus* (Sapindaceae) Star =GN : KEBEDE2012

Amaranthaceae sp. (Amaranthaceae) : WHSF01 : WGMF03

Ampelocissus abyssinica (A.Rich.) Planch. (Vitaceae) Star =GN : KEBEDE2012

Andropogon distachyos L. (Gramineae) Star =GN : KEBEDE2012

Apodytes dimidiata (Icacinaeae) Star =GN : KEBEDE2012

Arisaema sp. (Araceae) : KEBEDE2012

Aristea abyssinica Pax (Iridaceae) Star =GN : KEBEDE2012

Aristida adoensis Hochst. (Gramineae) Star =GN : KEBEDE2012

Asparagus africanus Lam. (Asparagaceae) Star =BU : KEBEDE2012

Asplenium bugoiense Hieron. (Aspleniaceae) Star =GN : KEBEDE2012

Asplenium mannii Hook. (Aspleniaceae) Star =GN : KEBEDE2012

Asplenium theciferum (Aspleniaceae) Star =GN : KEBEDE2012

Athrixia rosmarinifolia (Compositae) Star =GN : KEBEDE2012

Berkheya spekeana Oliv. (Compositae) Star =GN : KEBEDE2012

Bersama abyssinica (Melianthaceae) Star =GN : WHSF01 : WGMF02 : WGMF03 : WGSC04 : KEBEDE2012



Figure 5 *Bersama abyssinica* (Green Star)

Bidens pilosa L. (Compositae) Star =GN : WGSC04 : KEBEDE2012
Bidens sp. (Compositae) : KEBEDE2012
Borassus aethiopum Mart. (Palmae) Star =GN : WGMISC
Bougainvillea sp. (Nyctaginaceae) : WGMISC
Brachiaria brizantha (A.Rich.) Stapf (Gramineae) Star =GN : KEBEDE2012
Brachiaria ovalis Stapf (Gramineae) Star =GN : KEBEDE2012
Brucea antidyssenterica Lam. (Simaroubaceae) Star =GN : WGMF03 : KEBEDE2012
Brucea sp. (Simaroubaceae) : WGMISC2
Buddleja polystachya Fresen. (Loganiaceae) Star =GN : KEBEDE2012
Caesalpinia decapetala (Roth) Alston (Leguminosae) Star =GN : WGMF03



Figure 6 *Caesalpinia decapetala* (Green Star)

Callistemon viminalis (Myrtaceae) Star =GN : WGMISC
Calpurnia aurea (Aiton) Benth. ssp. *aurea* (Leguminosae) Star =GN : WGSC04 KEBEDE2012



Figure 7 *Calpurnia aurea* (Green Star)

Canthium oligocarpum (Rubiaceae) Star =GN : KEBEDE2012
Carduus leptacanthus Fresen. (Compositae) Star =GD : WGSC04 : KEBEDE2012
Carex chlorosaccus C.B.Clarke (Cyperaceae) Star =GN : KEBEDE2012
Carissa spinarum L. (Apocynaceae) Star =GN : WGMF02 : WGMF03 : KEBEDE2012
Cassipourea malosana (Baker) Alston (Rhizophoraceae) Star =GN : WHSF01 : WGMF03 : WGMISC : KEBEDE2012
Caylusea abyssinica (Fresen.) Fisch. & C.A.Mey. (Resedaceae) Star =GN : KEBEDE2012
Cayratia gracilis (Guill. & Perr.) Suess. (Vitaceae) Star =GN : KEBEDE2012
Celosia schweinfurthiana Schinz (Amaranthaceae) Star =GN : KEBEDE2012
Celtis africana Burm.f. (Ulmaceae) Star =GN : WHSF01 : WGMF02 :

WGMF03 : WGSC04 : WGMISC : KEBEDE2012
Ceropegia sp. (Asclepiadaceae) : KEBEDE2012
Chionanthus mildbraedii (Gilg & Schellenb.) Stearn (Oleaceae) Star =GN : WGMF02 : WGMF03 : KEBEDE2012
Chionanthus sp. (Oleaceae) : WGMISC2
Chlorophytum sp. (Anthericaceae) : KEBEDE2012
Christella chaseana (Schelpe) Holttum (Thelypteridaceae) Star =GN : KEBEDE2012
Cirsium sp1 (Compositae) : WGMF03
Clematis hirsuta Guill. & Perr. (Ranunculaceae) Star =GN : KEBEDE2012
Clutia lanceolata Forssk. (Euphorbiaceae) Star =BU : KEBEDE2012
Coffea arabica L. (Rubiaceae) Star =GN (if planted)
Coffea arabica f. (*wildpopulation*) (Rubiaceae) Star =BK : KEBEDE2012
WGMF03 : WGMISC



Figure 8 *Coffea arabica* (Black Star when wild pop.)

Combretum molle G.Don (Combretaceae) Star =GN : KEBEDE2012
Commelina africana (Commelinaceae) Star =GN : KEBEDE2012
Commelina erecta L. (Commelinaceae) Star =GN : KEBEDE2012
Compositae sp. (Compositae) : WGMISC
Compositae sp1,2,3,4,5,6,7 (Compositae) : WGSC04
Conyza pyrrocappa A.Rich. (Compositae) Star =GN : WGSC04 : KEBEDE2012



Figure 9 *Conyza pyrrocappa* (Green Star)

Cordia africana Lam. (Boraginaceae) Star =GN : WHSF01 : WGMF03 : WGMISC2 : KEBEDE2012



Figure 10 *Cordia africana* (Green Star)

Crassocephalum sp. (Compositae) : WGMF02 : KEBEDE2012
Crotalaria incana (Leguminosae) Star =GN : KEBEDE2012
Croton macrostachyus Delile (Euphorbiaceae) Star =GN : WHSF01 : WGMF02 : WGMF03 : WGSC04 : WGMISC : WGMISC2 : KEBEDE2012
Cucurbitaceae sp1 (Cucurbitaceae) : WGMF02
Cucurbitaceae sp2 (Cucurbitaceae) : WGSC04
Cupressus lusitanica Mill. (Cupressaceae) Star =GN : WHSF01
Cyathula cylindrica Moq. (Amaranthaceae) Star =GN : KEBEDE2012
Cyathula uncinulata (Schrud.) Schinz (Amaranthaceae) Star =GN : WGSC04 : WGMISC2

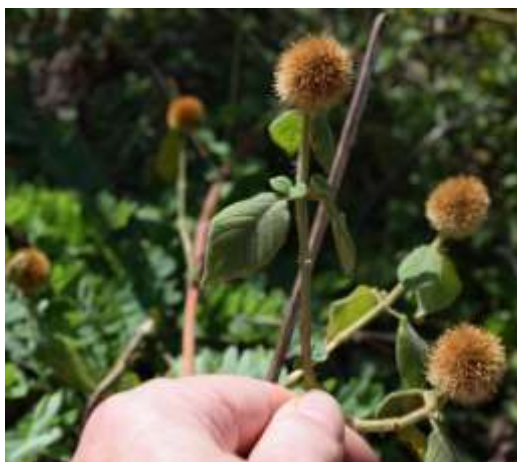


Figure 11 *Cyathula uncinulata* (Green Star)

Cynodon dactylon (L.) Pers. (Gramineae) Star =GN : WHSF01 : WGMF02 : WGMF03 : KEBEDE2012
Cynoglossum coeruleum (Boraginaceae) Star =GN : WGSC04 : KEBEDE2012
Cynoglossum sp. (Boraginaceae) : WGMISC2
Cyperaceae sp. (Cyperaceae) : WHSF01 : WGMF02 : WGSC04
Cyperus rigidifolius Steud. (Cyperaceae) Star =GN : KEBEDE2012
Cyphostemma niveum (Hochst ex Schweinf.) Desc. (Vitaceae) Star =GD : KEBEDE2012
Dalbergia lactea (Leguminosae) Star =GN : WHSF01 : WGMF02 : WGMF03 : KEBEDE2012



Figure 12 *Dalbergia lactea* (Green Star)

Datura sp. (Solanaceae) : WGMISC2
Desmodium repandum (Vahl) DC. (Leguminosae) Star =GN : KEBEDE2012
Dichondra repens (Convolvulaceae) Star =GN : KEBEDE2012
Digitaria abyssinica (A.Rich.) Stapf (Gramineae) Star =GN : KEBEDE2012
Dioscorea bulbifera (Dioscoreaceae) Star =GN : KEBEDE2012
Diospyros abyssinica (Ebenaceae) Star =GN : KEBEDE2012
Diospyros mespiliformis A.DC. (Ebenaceae) Star =GN : KEBEDE2012
Discopodium penninervium Hochst. (Solanaceae) Star =GN : KEBEDE2012
Disperis anthoceros (Orchidaceae) Star =GN : KEBEDE2012
Dissotis sp. (Melastomataceae) : KEBEDE2012
Dodonaea viscosa Jacq. var. *angustifolia* (L.f.) Benth. (Sapindaceae) Star =GN : WGMISC : KEBEDE2012



Figure 13 *Dodonaea viscosa* (Green Star)

Dombeya schimperiana A.Rich. (Sterculiaceae) Star =BU : WHSF01
Doryopteris concolor (Langsd. & Fisch.) Kuhn (Adiantaceae) Star =GN : KEBEDE2012
Dovyalis sp. (Flacourtiaceae) : WGMISC2
Dovyalis sp1 (Flacourtiaceae) : WGSC04
Dovyalis sp2 (Flacourtiaceae) : WHSF01
Dovyalis verrucosa Warb. (Flacourtiaceae) Star =GD : KEBEDE2012
Dracaena afromontana Mildbr. (Dracaenaceae) Star =GN : WGMF03 : KEBEDE2012
Dracaena steudneri Engl. (Dracaenaceae) Star =GN : WGMF02 : WGMISC : KEBEDE2012



Figure 14 *Dracaena steudneri* (Green Star)

Droguetia iners (Urticaceae) Star =GN : KEBEDE2012
Drymaria cordata (L.) Willd. ex Roem. & Schult. (Caryophyllaceae) Star =GN : KEBEDE2012



Figure 15 *Drynaria cordata* (epiphyte-Green Star)

Drynaria sp. (Polypodiaceae) : WGMISC2
Drynaria volkensii Hieron. (Polypodiaceae) Star =GN : WGMF03 : WGMISC : KEBEDE2012
Ehretia cymosa Thonn. (Boraginaceae) Star =GN : WGMF02 : KEBEDE2012
Ekebergia capensis Sparrm. (Meliaceae) Star =GN : KEBEDE2012
Embelia schimperi Vatke (Myrsinaceae) Star =GN : KEBEDE2012
Entada abyssinica A.Rich. (Leguminosae) Star =BU : KEBEDE2012
Eragrostis schweinfurthii Chiov. (Gramineae) Star =GN : KEBEDE2012
Erica arborea L. (Ericaceae) Star =GN : KEBEDE2012
Eriosema sp. (Leguminosae) : KEBEDE2012
Erucastrum arabicum Fisch. & C.A.Mey. (Cruciferae) Star =GN : KEBEDE2012
Erythrina brucei Schweinf. (Leguminosae) Star =GD : WGMISC
Erythrocca trichogyne (Müll.Arg.) Prain (Euphorbiaceae) Star =GN : WGMF02 : WGMF03 : WGMISC2 : KEBEDE2012



Figure 16 *Erythrocca trichogyne* (Green Star)

Eucalyptus sp. (Myrtaceae) : WGMISC
Eulophia guineensis Lindl. (Orchidaceae) Star =GN : KEBEDE2012
Euphorbia schimperiana (Euphorbiaceae) Star =GN : WHSF01 : WGSC04 : KEBEDE2012
Euphorbia sp. (Euphorbiaceae) : WGMISC2
Exothea abyssinica (A.Rich.) Andersson (Gramineae) Star =GN : KEBEDE2012
Fagaropsis angolensis (Engl.) Dale (Rutaceae) Star =GN : KEBEDE2012
Fern sp, sp2, sp3, sp4, sp5 () : WGMF03
Ficus sur Forssk. (Moraceae) Star =GN : WGMF02 : WGMF03 : KEBEDE2012
Ficus thonningii Blume (Moraceae) Star =GN : WHSF01 : WGMF02 : WGMF03 : WGMISC : KEBEDE2012
Ficus vasta Forssk. (Moraceae) Star =GN : WGMISC : KEBEDE2012
Flacourtia indica (Burm.f.) Merr. (Flacourtiaceae) Star =GN : KEBEDE2012
Foeniculum vulgare Mill. (Umbelliferae) Star =GN : KEBEDE2012
Fuerstia africana T.C.E.Fr. (Labiatae) Star =BU : KEBEDE2012
Gardenia ternifolia (Rubiaceae) Star =GN : KEBEDE2012
Geranium sp. (Geraniaceae) : WGSC04 : KEBEDE2012
Girardinia bullosa (Steud.) Wedd. (Urticaceae) Star =GN : KEBEDE2012
Girardinia diversifolia (Link) Friis (Urticaceae) Star =GN : KEBEDE2012
Gnidia chrysantha (Solms) Gilg (Thymelaeaceae) Star =GN : KEBEDE2012
Gnidia lamprantha Gilg (Thymelaeaceae) Star =GN : KEBEDE2012
Gomphocarpus phillipsiae (N. E. Br.) Goyder (Asclepiadaceae) Star =GD : KEBEDE2012
Gongronema angolense (N.E.Br.) Bullock (Asclepiadaceae) Star =GN : WHSF01
Gouania longispicata Engl. (Rhamnaceae) Star =GN : WGMF03 : KEBEDE2012



Figure 17 *Gouania longispicata* (Green Star)

Gramineae sp. (Gramineae) : WGSC04
Grevillea robusta R.Br. (Proteaceae) Star =GN : WHSF01 : WGMISC
Grewia ferruginea Hochst. (Tiliaceae) Star =BU : KEBEDE2012
Guizotia sp. (Compositae) : KEBEDE2012
Habenaria cultriformis Kraenzl. ex Engl. (Orchidaceae) Star =BK : KEBEDE2012
Hagenia abyssinica (Bruce) J.F.Gmel. (Rosaceae) Star =GN : WGMISC

Helichrysum schimperi (A.Rich.) Moeser (Compositae) Star =GN : KEBEDE2012
Helinus mystacinus (Aiton) Steud. (Rhamnaceae) Star =GN : KEBEDE2012
Hesperantha petitiiana (A.Rich.) Baker (Iridaceae) Star =GN : KEBEDE2012
Heteromorpha arborescens Cham. & Schltl. (Umbelliferae) Star =GN : KEBEDE2012
Hyparrhenia hirta (L.) Stapf (Gramineae) Star =GN : KEBEDE2012
Hypericum peplidifolium A.Rich. (Guttiferae) Star =GN : KEBEDE2012
Hypericum quartianum A.Rich. (Guttiferae) Star =GN : KEBEDE2012
Hypericum revolutum (Guttiferae) Star =GN : KEBEDE2012
Hypoestes sp. (Acanthaceae) : WGMF02 : KEBEDE2012
Hypoxis villosa L.f. (Hypoxidaceae) Star =BU : KEBEDE2012
Impatiens hochstetteri (Balsaminaceae) Star =GN : KEBEDE2012
Indigofera sp. (Leguminosae) : KEBEDE2012
Ipomoea kituiensis Vatke (Convolvulaceae) Star =GD : KEBEDE2012
Ischaemum afrum (J.F.Gmel.) Dandy (Gramineae) Star =GN : KEBEDE2012
Jacaranda sp. (Bignoniaceae) : WGMISC
Jasminum abyssinicum Hochst. ex DC. (Oleaceae) Star =GN : WHSF01 : WGMF03 : KEBEDE2012
Justicia schimperiana T. Anderson. (Acanthaceae) (= *Adhatoda schimperiana*) Star BU: WGMF02 : WGMF03 : WGSC04 Star: WGMISC : KEBEDE2012



Figure 18 *Justicia schimperiana* (Blue Star)

Kalanchoe lanceolata (Forssk.) Pers. (Crassulaceae) Star =GN : KEBEDE2012
Kalanchoe sp. (Crassulaceae) : WGMISC2
Kohautia platyphylla (K. Schum.) Bremek. (Rubiaceae) : KEBEDE2012

Labiatae sp. (Labiatae) : WGSC04
Landolphia buchananii (Hallier f.) Stapf (Apocynaceae) Star =GN : WHSF01 : WGMF03 : WGSC04 : KEBEDE2012
Lantana camara L. (Verbenaceae) Star =GN : WGSC04
Leguminosae sp. (Leguminosae) : WGMISC : WGMISC2
Leguminosae-pap sp1 (Leguminosae) : WGMF02 : WGMF03
Leguminosae-pap sp2 (Leguminosae) : WGSC04
Leguminosae-pap sp3 (Leguminosae) : WGSC04
Lepidotrichilia volkensis (Gürke) J.-F.Leroy (Meliaceae) Star =GN : WGMF03 : WGSC04 : KEBEDE2012
Leucas martinicensis (Jacq.) R.Br. (Labiatae) Star =GN : KEBEDE2012
Lysimachia ruhmeriana Vatke (Primulaceae) Star =GN : KEBEDE2012
Maesa lanceolata Forssk. (Myrsinaceae) Star =GN : WGMF02 : WGMF03 : WGMISC : KEBEDE2012
Malvaceae sp. (Malvaceae) : WGSC04
Maytenus arbutifolia (A.Rich.) Wilczek (Celastraceae) Star =GN : WGMF02 : KEBEDE2012
Maytenus undata (Thunb.) Blakelock (Celastraceae) Star =GN : KEBEDE2012
Melinis repens (Willd.) Zizka (Gramineae) Star =GN : KEBEDE2012
Milletia ferruginea Hochst. (Leguminosae) Star =GD : WGMF02 : WGMF03 : WGMISC : KEBEDE2012



Figure 19 *Milletia ferruginea* (Gold Star)

Mirabilis jalapa L. (Nyctaginaceae) Star =GN : WGMISC
Momordica foetida Schumach. (Cucurbitaceae) Star =GN : WGSC04 : KEBEDE2012
Myrsine africana L. (Myrsinaceae) Star =GN : KEBEDE2012
Nervilia simplex (Thouars) Schltr. (Orchidaceae) Star =BU : KEBEDE2012
Nuxia congesta Fresen. (Loganiaceae) Star =GN : KEBEDE2012
Ochna holstii Engl. (Ochnaceae) Star =GN : WHSF01 : WGMF02 : KEBEDE2012
Ocimum grandiflorum (Lam.) Pic. Serm. (Labiatae) Star =BU : KEBEDE2012
Ocimum lamiifolium Benth. (Labiatae) Star =GN : WGSC04 : KEBEDE2012
Ocimum sp. (Labiatae) : WGMISC2
Olea europaea L. subsp. *cuspidata* (Wall. ex G. Don) Cif. (Oleaceae) : KEBEDE2012
Olea welwitschii (Knobl.) Gilg & Schellenb. (Oleaceae) Star =GN : KEBEDE2012
Olinia rochetiana A.Juss. (Oliniaceae) Star =GN : KEBEDE2012
Oncinotis tenuiloba Stapf (Apocynaceae) Star =GN : WGMF02 : WGMF03
Oncoba spinosa Forssk. (Flacourtiaceae) Star =GN : KEBEDE2012
Opilia amentacea Roxb. (Opiliaceae) Star =GN : WHSF01 : KEBEDE2012
Oplismenus compositus (L.) P.Beauv. (Gramineae) Star =GN : KEBEDE2012
Orchidaceae sp. (Orchidaceae) : WGMF02 : WGMF03
Osyris lanceolata Hochst. & Steud. (Santalaceae) Star =GN : KEBEDE2012

Oxalis obliquifolia A.Rich. (Oxalidaceae) Star =GN : KEBEDE2012
Oxalis sp. (Oxalidaceae) : WGSC04
Oxyanthus speciosus (Rubiaceae) Star =GN : WGMF02 : WGMF03 : WGSC04 : KEBEDE2012
Pavetta abyssinica (Rubiaceae) Star =BU : KEBEDE2012
Pelargonium sp. (Geraniaceae) : KEBEDE2012
Pellaea viridis (Adiantaceae) Star =GN : KEBEDE2012
Pennisetum thunbergii Kunth (Gramineae) Star =GN : KEBEDE2012
Pentas lanceolata (Rubiaceae) Star =GN : KEBEDE2012
Peperomia abyssinica Miq. (Piperaceae) Star =GN : KEBEDE2012
Peperomia tetraphylla (G.Forst.) Hook. & Arn. (Piperaceae) Star =GN : KEBEDE2012
Periploca linearifolia Quart.-Dill. & A.Rich. (Asclepiadaceae) Star =? : KEBEDE2012
Periploca sp. (Asclepiadaceae) : WGMF02
Phaulopsis sp. (Acanthaceae) : WHSF01
Phoenix reclinata Jacq. (Palmae) Star =GN : WGMF03 : WGMISC : KEBEDE2012
Phragmanthera macrosolen (Steud. ex A. Rich.) M. G. Gilbert (Loranthaceae) Star =GD : KEBEDE2012
Phyllanthus mooneyi M.G. Gilbert (Euphorbiaceae) : WGSC04
Phyllanthus sp. (Euphorbiaceae) : WGSC04 : KEBEDE2012
Physalis peruviana L. (Solanaceae) Star =GN : KEBEDE2012
Phytolacca dodecandra L'Hér. (Phytolaccaceae) Star =GN : WGMF02 : WGMF03
Pimpinella sp. (Umbelliferae) : KEBEDE2012
Pittosporum viridiflorum (Pittosporaceae) Star =GN : KEBEDE2012
Pittosporum viridiflorum Sims ssp. *viridiflorum* (Pittosporaceae) Star =GN : WHSF01
Plantago palmata Hook.f. (Plantaginaceae) Star =GN : KEBEDE2012
Plectocephalus varians (A. Rich.) C. Jeffrey in Cufod. (Compositae) Star =BU : KEBEDE2012
Plectranthus punctatus L'Hér. (Labiatae) Star =BU : KEBEDE2012
Pleopeltis macrocarpa (Bory. ex Wild.) Kaulf. (Polypodiaceae) : KEBEDE2012
Plumbago zeylanica L. (Plumbaginaceae) Star =GN : WGMISC
Plumeria rubra (Apocynaceae) Star =GN : WGMISC
Polyscias fulva (Hiern) Harms (Araliaceae) Star =BU : WGMF02 : WGMF03 : WGMISC2 : KEBEDE2012



Figure 20 *Polyscias fulva* (Blue Star)

Polystachya sp. (Orchidaceae) : KEBEDE2012
Pouteria adolfi-friedericii (Sapotaceae) Star =BU : WGMF02 : WGMF03 : KEBEDE2012
Premna schimperi Engl. (Labiatae) Star =GN : KEBEDE2012
Protea gagedi J.F.Gmel. (Proteaceae) Star =GN : KEBEDE2012
Prunus africana (Hook.f.) Kalkman (Rosaceae) Star =GN : WGMF02 : WGMF03 : KEBEDE2012
Pseuderanthemum tunicatum (Afzel.) Milne-Redh. (Acanthaceae) Star =GN : WGMF02
Psidium sp. (Myrtaceae) Star =GN : WGSC04
Psydrax schimperiana (Rubiaceae) Star =BU : KEBEDE2012
Pteridium aquilinum (Dennstaedtiaceae) Star =GN : KEBEDE2012

Pteris catoptera Kunze (Pteridaceae) Star =GN : WHSF01 : WGMF02 : WGMF03 : KEBEDE2012



Figure 21 *Pteris catoptera* (Green Star)

Pteroglossaspis eustachya Rchb.f. (Orchidaceae) Star =GN : KEBEDE2012
Rhamnus prinoides L'Hér. (Rhamnaceae) Star =GN : KEBEDE2012
Rhoicissus tridentata (L.f.) Wild & R.B.Drumm. (Vitaceae) Star =GN : KEBEDE2012
Rhus retinorrhoea Steud. ex Oliv. (Anacardiaceae) Star =GD : KEBEDE2012
Rhus vulgaris Meikle (Anacardiaceae) Star =GN : KEBEDE2012
Ritchiea albersii Gilg (Capparaceae) Star =GN : KEBEDE2012
Rothea myricoides (Hochst.) Steane & Mabberley ssp. *myricoides* var. *myricoides* (Labiatae) Star =GN : KEBEDE2012
Rubia cordifolia (Rubiaceae) Star =GN : KEBEDE2012
Rubus niveus Thunb. (Rosaceae) Star =GN : KEBEDE2012
Rubus sp. (Rosaceae) Star =GK : WGMISC2
Rubus steudneri (Rosaceae) Star =GN : WHSF01 : WGMF02 : WGMF03 : WGSC04 : KEBEDE2012



Figure 22 *Rubus steudneri* (Green Star)

Rubus volkensii Engl. (Rosaceae) Star =BU : KEBEDE2012
Rumex abyssinicus Jacq. (Polygonaceae) Star =GN : KEBEDE2012
Rumex nepalensis Spreng. (Polygonaceae) : KEBEDE2012
Salix subserrata Willd. (Salicaceae) Star =GN : KEBEDE2012
Salvia tiliifolia Vahl. (Labiatae) Star =GN : KEBEDE2012
Satureja punctata (Benth.) Briq. ssp. *ovata* (Benth.) Seybold (Labiatae) Star =GN : KEBEDE2012
Schinus molle (Anacardiaceae) Star =GN : WGMISC

Schrebera alata (Hochst.) Welw. (Oleaceae) Star =GN : WGMISC2 : KEBEDE2012



Figure 23 *Schrebera alata* (Green Star)

Scleria bulbifera Hochst. ex A.Rich. (Cyperaceae) Star =GN : KEBEDE2012
Selaginella goudotiana Spring var. *abyssinica* (Spring) Bizzarri (Selaginellaceae) Star =GN : KEBEDE2012
Senna didymobotrya (Fresen) Irwin & Barneby (Leguminosae) Star =GN : WGSC04
Senna septemtrionalis (Viv.) Irwin & Barneby (Leguminosae) Star =GN : WGSC04 : KEBEDE2012
Senseli sp. () : WGMF02
Setaria megaphylla (Steud.) T.Durand & Schinz (Gramineae) Star =GN : KEBEDE2012
Setaria sp1 (Gramineae) : WGMF02 : WGSC04
Setaria sp2 (Gramineae) : WHSF01 : WGMF02
Sida acuta Burm.f. (Malvaceae) Star =GN : WGSC04
Sida collina Schldl. (Malvaceae) Star =GN : WGSC04
Sida sp. (Malvaceae) : WGMISC : WGMISC2
Sida tenuicarpa Vollesen (Malvaceae) Star =GN : KEBEDE2012
Simirestis goetzei (Loes.) R. Wilczek (Celastraceae) Star =GN : WGMF02 : KEBEDE2012
Solanecio angulatus (Vahl) C.Jeffrey (Compositae) Star =GN : KEBEDE2012
Solanecio gigas (Vatke) C. Jeffrey (Compositae) Star =GD : WGMF02 : WGMF03 : KEBEDE2012



Figure 24 *Solanecio gigas* (Gold Star)

Solanecio tuberosus (Sch.Bip. ex A.Rich.) C.Jeffrey (Compositae) Star =GN : KEBEDE2012

Solanum giganteum Jacq. (Solanaceae) Star =GN : KEBEDE2012
Solanum incanum L. (Solanaceae) Star =GN : WGSC04 : KEBEDE2012
Solanum nigrum L. (Solanaceae) Star =GN : KEBEDE2012
Solanum sp. (Solanaceae) : WGMISC2
Solanum villosum Mill. (Solanaceae) Star =GN : KEBEDE2012
Sonchus sp. (Compositae) : KEBEDE2012
Sopubia ramosa (Scrophulariaceae) Star =GN : KEBEDE2012
Spathodea campanulata P.Beauv. ssp. *nilotica* (Seem.) Bidgood (Bignoniaceae) Star =GN : WGMISC
Sporobolus pyramidalis P.Beauv. (Gramineae) Star =GN : KEBEDE2012
Stachys sp. (Labiatae) : KEBEDE2012
Steganothaenia araliacea Hochst. (Umbelliferae) Star =GN : KEBEDE2012
Stephania abyssinica (Menispermaceae) Star =GN : WHSF01 : WGMF03 : WGSC04 : WGMISC2 : KEBEDE2012



Figure 25 *Stephania abyssinica* (Green Star, medicinal)

Syzygium guineense (Willd.) DC. (Myrtaceae) Star =GN : WGMF02 : WGMF03
Syzygium guineense (Willd.) DC. ssp. *guineense* (Myrtaceae) Star =GN : KEBEDE2012
Syzygium guineense (Willd.) DC. ssp. *macrocarpum* (Engl.) F.White (Myrtaceae) : KEBEDE2012
Tagetes minuta L. (Compositae) Star =GN : WGSC04 : KEBEDE2012
Tectaria gemmifera (Fée) Alston (Dryopteridaceae) Star =GN : WGMF02 : WGMF03 : KEBEDE2012
Thalictrum rhynchocharpum Quart. & A. Rich. (Ranunculaceae) Star =GN : WGMF02 : KEBEDE2012
Themeda triandra Forssk. (Gramineae) Star =GN : KEBEDE2012
Tiliacora funifera (Miers) Oliv. (Menispermaceae) Star =GN : WGMF02 : WGMF03 : KEBEDE2012
Toddalia asiatica (L.) Lam. (Rutaceae) Star =GN : WHSF01 : WGMF03 : WGSC04 : WGMISC2 : KEBEDE2012
Tragia mixta M.G. Gilbert (Euphorbiaceae) Star =BU : WGMF02
Tragia sp. (Euphorbiaceae) : KEBEDE2012
Trema orientalis (L.) Blume (Ulmaceae) Star =GN : WGMISC
Triumfetta rhomboidea Jacq. (Tiliaceae) Star =GN : WGMF03 : WGSC04 : KEBEDE2012
Triumfetta sp. (Tiliaceae) : WGMF02 : WGMISC2
Urticaceae sp. (Urticaceae) : WGMF03
Vepris dainellii (Pic. Serm.) Kokwaro (Rutaceae) Star =BK : WHSF01 : WGMF02 : WGMF03 : KEBEDE2012



Figure 26 *Vepris dainellii* (Black Star)

Vepris nobilis (Delile) W. Mziray (Rutaceae) Star =GN : WHSF01 :
WGMF02 : WGSC04 : KEBEDE2012
Vepris simplicifolia (Verdoon) W.Mziray (Rutaceae) : KEBEDE2012
Vepris sp. (Rutaceae) : WGMISC2
Verbascum sp. (Scrophulariaceae) : KEBEDE2012
Vernonia amygdalina Delile (Compositae) Star =GN : WGMF02 : WGSC04
: WGMISC
Vernonia auriculifera Hiern (Compositae) Star =GN : WGMF03 :
KEBEDE2012
Vernonia brachycalyx O.Hoffm. (Compositae) Star =GN : KEBEDE2012
Vernonia hochstetteri (Compositae) Star =GN : KEBEDE2012
Vernonia inulaefolia Steud. (Compositae) Star =BK : KEBEDE2012
Vernonia sp. (Compositae) : WGMISC : WGMISC2
Wahlenbergia abyssinica (Campanulaceae) Star =GN : KEBEDE2012
Zehneria scabra (L.f.) Sond. (Cucurbitaceae) Star =GN : WGMF03 :
KEBEDE2012
Zollernia paraensis Huber. (Leguminosae) Star =GN : KEBEDE2012



Figure 27 *Vepris nobilis* (Green Star)