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## A NEW WAY OF EDITING A FLORA

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### Abstract

Modern electronic tools have become common tools of most scientists. Flora writers and other botanists producing large manuscripts with a certain fixed structure may go even further and use the so-called Mail Merge option in a word processor such as Microsoft Word™. This tool allows structuring a document strictly, especially for the contributions of invited authors, to pre-format the final layout, and to simplify correspondence with contributors. Contributors fill in a structured Microsoft Excel™ spreadsheet with fixed headings, without any requirements for layout or formatting. The file is then used as data source for a merge document in the word processor. For completion of an entire Flora, such as the *Flore Analytique du Bénin* (Akoègninou *et al.*, 2006), this iteration was done with 45 authors, producing over 180 different manuscripts, *viz.* one for each family. Final editing includes a check on correct language, insertion of separately produced keys, figures, references, etc.

### Résumé

**Procédure nouvelle de publication d'une Flore.** La plupart des scientifiques utilisent communément des outils électroniques modernes. Les botanistes systématiciens et autres, qui rédigent des documents volumineux avec une structure fixe, peuvent aller plus loin en utilisant l'outil "lettre et publipostage" de Microsoft Word™. Celui-ci permet de structurer un document, surtout les contributions des auteurs afin de préparer la mise en page finale et ainsi faciliter la correspondance avec les contributeurs. Ces derniers remplissent un tableau croisé dans un chiffrier électronique avec des rubriques bien définies, sans exigence de formatage. Ensuite les feuilles Excel sont utilisées comme sources de données qui seront fusionnées sous le format Microsoft Word. Pour la réalisation d'une Flore complète comme la *Flore Analytique du Bénin* (Akoègninou *et al.*, 2006), cette procédure est expérimentée avec plus de 45 auteurs de 180 manuscrits différents. L'édition finale consistera en la correction des fautes d'orthographe et de grammaire, l'insertion des clés de détermination, figures, références bibliographiques, etc.

**Key words:** Benin, editing, Flora, mail merge, spreadsheet, word processor.

## Systematics and Conservation of African Plants

### 1 Introduction

#### 1.1 Flore Analytique du Bénin project

The present work was carried out in a joint research and development project financed by the Dutch Ministry of Foreign Affairs in the framework of the international Convention on Biological Diversity (CBD), in which the Netherlands agreed to support Costa Rica, Benin and Bhutan in developing their biodiversity management tools. Elements of this project were the establishment of a new herbarium building, the training of scientific and technical staff, including two PhD's, as well as making an extensive botanical inventory of the country (over 20,000 numbers collected), the establishment of a database, and the making of an analytical Flora: a Flora in one volume that covers the whole country and can be taken into the field by, for example, scientists for botanical or conservation research, by managers of natural parks, by high school and university teachers, and by amateurs to enjoy the natural diversity.

#### 1.2 Multi-author event

The challenge was to include as much relevant information as possible, without going outside the boundaries of the one-volume option. Making a Flora is a multi-author event. Taxonomists have their specialisations, usually a family or set of families, and editors need their valued input to make an up-to-date document. It is impossible for one person to be aware of all botanical and taxonomical literature of all plant groups occurring in a region as vast as Africa (many species having a much wider distribution than just Benin). On the other hand, some authors have the tendency to be very detailed, while others can be too brief. It was the editor's job to give such instructions that he would receive balanced contributions.

#### 1.3 Basis to work from

A Flora is not made from scratch: the major volume of information is collected from existing sources: old and new herbarium collections, as well as existing Floras and other literature. It is the task of the contributors to select relevant information from the literature, and to verify it with the specimens collected. For this purpose duplicates of the recent collections were sent to the contributors as a loan or gift. They then were able to identify the species with certainty, amend descriptions, and to make determination keys.

A similar approach was used for the line drawings: illustrations in existing Floras were compared with the herbarium specimens, and redrawn, adapted and amended by botanical artists in a simplified format especially developed for the Flora. In some cases entirely new drawings were made from nature. The illustrations were finally checked with the specialists.

### 2 General procedure for the Flora

#### 2.1 Basic tool: a spreadsheet

In order to manage the collection of manuscripts, to make sure that all are in the same format and to be able to combine them easily in the end, it is necessary to provide contributors with ample but clear instructions. Moreover, it is very useful to supply them with one or more formats. In that way one can make sure that all data required are also delivered. When one does this in a word processing document, in which the

author has to repeat the captions for each species, it is very hard for an editor to tell whether all captions are completed and for all species. We found that Microsoft Excel™ could perhaps help us here: it consists of spreadsheets with cells, arranged in rows and columns. Many people are already familiar with data files with such a structure, so we thought this would be an ideal tool. However, as far as we know, this is the first time that botanists have been asked to contribute texts in the form of a spreadsheet, since these are typically tools for (financial) calculations.

## 2.2 Data collection structure

We decided to have the required entries in columns and the records (genera and species) in rows. The choice of required data was made at the beginning and we analysed several Floras and made a choice of what we needed. Then it was a challenge to translate these requirements into columns. Columns like family name, genus name, specific epithet, author's name, are self-evident, but we also needed columns for subspecies, varieties, basionyms, synonyms, etc. Since it would not be a monographic work, full synonymy was not necessary. Apart from the basionym, which was required, only those synonyms would be included that had been used relatively recently in Floras of the region as well as those necessary to avoid confusion. Therefore, it was decided to have a maximum of two sets of columns for synonyms complete with their respective literature, and if more were needed that they could exceptionally be added in the last column of the second set.

The columns were as follows:

- Genus: generic name only;
- Species: specific epithet;
- Author1: authority of the species;
- Literature: source of first valid publication; citations from recent floras;
- Var/spp: indication whether it is a variety or subspecies (if relevant);
- Nom: variety or subspecies name;
- Author2: author of this name;
- Literat: source of publication;
- Syn1-genus: basionym or in its absence an important synonym;
- Syn1-species: specific epithet of the same;
- Syn1-author: author of this name;
- Syn1-lit: source of publication of this name;
- Syn2: the same for a second synonym;
- Iconography: illustrations in other Floras, preferably from the region;
- Herbarium: citation of about six good representative collections, preferably collected across its entire distribution within the country;
- Distribution: occurrence in the (numbered) phytogeographic zones;
- Vernaculars: if available of six major local languages as well as French and English;
- Description: description of the plants in a few sentences in addition to the characters given in the keys;
- Phenology: essentially the months in which flowering and fruiting occurs, but also other pertinent details if available;
- Habitat: the habitat in which the plants have been found;
- Usage: utilisation of the plant and plant parts, often based on existing literature;
- Remark1: distribution over the continent and rest of the world;
- Remark2: taxonomic details if necessary, for instance taxonomic clarifications, uncertainties or a short note on very similar species.

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Each row contained either the data on a genus (restricted to the name, author and literature) or the data on representatives of that genus present in Benin. The cells may be filled with large amounts of text if needed. It is a strange experience at first to use this tool typically used for calculation purposes and now for generating a Flora. It was a new experiment, and some authors were reluctant at first, but soon most found the method most practical. In this way they as well as the editors could easily check all cells for completeness and correctness. The files or printouts were exchanged several times until everybody was satisfied.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Famille	No	Genre	Espèce	Auteur1	var/spp	Nom	Auteur2	Literat	Syn1-ge	Syn1-es	Syn1-au	Syn1-jit	Syn2-ge	Syn2-es
2	Orchidaceae		Orchidaceae						Gen. pl. 64 (1789), commelpar W.J. van der Burg						
3	Orchidac	1	Aerangis		Rchb.f.				Flora 48: 190 (1895); FWTA 3: 265						
4	Orchidaceae		Aerangis biloba	(Lindl.) Schltr.					Die OrchAngraec bilobum Lindl. FTA 7: 138						
5	Orchidac	2	Angraecum		Bory				Bory, Voy. 1: 359 (1804); FWTA 3: 253; FT 667						
6	Orchidac	1	Angraecibancoen		Burg				Burg, Misc. Pap. (Wageningen) 19: 26 (1980)						
7	Orchidac	2	Angraec distichum		Lindl.				Bot. Reg A. distichum Segerbäl Segerbäck (1983): 75						
8	Orchidac	3	Bulbophyllum		Thou.				Orch. Iles Austr. Afr. (1822); Vermeulen, J.J. (1987). Orchid Mor						
9	Orchidaceae		Bulbophy falcatum	(Lindl.) Rchb.f.					Walp. Ann. 6: 258 (1861); FWTA 3: 241; FT 669; Vermeulen (19						
10	Orchidac	4	Calyptrochilum		Kraenzl.				in Engl. Bot. Jahrb. 22: 30 (1895); FWTA 3: 251; FT 669						
11	Orchidaceae		Calyptrochristyan	(Rchb.f.) Summerh.					FWTA e Angraec christyan Rchb.f.  Gard. Chron. n.s. 13: 806 (1						
12	Orchidac	5	Cyrtorchis		Schltr.				Die Orchid. 595 (1914); FWTA 3: 266; FT 670						
13	Orchidac	1	Cyrtorchis arcuata	(Lindl.) Sssp.	variabilis	Summerh			Kew Bull Angraec arcuatum Lindl.  Companion Bot. Mag. 2: 20						
14	Orchidac	6	Diaphanthe		Schltr.				Die Orchid. 593 (1914); FWTA 3: 260; FT 671						
15	Orchidaceae		Diaphanthe bidens	(Sw.) Schltr.					Die Orch Limodori bidens Afzel. ex Kongl. Vetens. Akad. Handl.						
16	Orchidac	7	Disperis		Sw.				Vet.-akad. Handl. Stockh., ser. 2, 21: 218 (1800); FWTA 3: 203;						
17	Orchidaceae		Disperis togoensis	Schltr.					in Engl., D.  atacoren A.Chev.  Bot. 622, nomen nudum						

FIG. 1. Part of a spreadsheet with data entries with taxa in rows and categories in columns.

### 3 Detailed description of the Mail merge procedure

The merge operation we used was based on the mail merge operation that most secretaries use to create a direct mailing from a mailing list (Fig. 1). The merging procedure consists of the following steps:

#### Step 1: Creation of an Excel data file

First we create a data file. It can be our own or come from a contributor. After thorough checking and sending it back and forth for completion, we can use it for the Merge.

#### Step 2: Creating a Word document as template

A blank Word document is opened (Microsoft Office Word 2003: Tools > Letters and mailings > Mail merge, and follow the instructions). This includes linking the Word document to an external data file; this can be either a Word table or an Excel spreadsheet. The spreadsheet was preferred, because it is more rigidly structured and easier to use because the size of the cells remains the same independent of the amount of information.

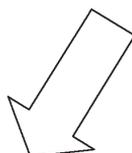
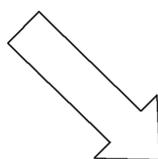
#### Step 3: Connect in Word to the data file and select records

Once the connection has been made one must indicate whether one wants the entire spreadsheet to be imported or only a selection of it.

FIG. 2 (opposite). Schematic presentation of the Mail Merge operation used to create a Flora text in MS Word from an Excel file.

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A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1	Famille	No	Genre	Espèce	Auteur1	var/ssp	Nom	Auteur2	Literat	Syn1-ge	Syn1-es	Syn1-au	Syn1-lit	Syn2-ge	Syn2-es
2	Orchidaceae		Orchidaceae						Gen. pl. 64 (1789), comme par W.J. van der Burg						
3	Orchidac	1	Aerangis		Rchb.f.				Flora 48: 190 (1895); FWTA 3: 265						
4	Orchidaceae		Aerangis biloba		(Lindl.) Schltr.				Die OrchAngraec(bilobum  Lindl. FTA 7: 138						
5	Orchidac	2	Angraecum		Bory				Bory. Voy. 1: 359 (1804); FWTA 3: 253; FT 667						
6	Orchidac	1	Angraec(bancoen		Burg				Burg. Misc. Pap. (Wageningen) 19: 26 (1980)						
7	Orchidac	2	Angraec(distichum		Lindl.				Bot. RegA. distichum] Segerbä Segerbäck (1983): 75						
8	Orchidac	3	Bulbophyllum		Thou.				Orch. Iles Austr. Afr. (1822); Vermeulen, J.J. (1987). Orchid Mor						
9	Orchidaceae		Bulbophyfalcatum		(Lindl.) Rchb.f.				Walp. Ann. 6: 258 (1861); FWTA 3: 241; FT 669; Vermeulen (19						
10	Orchidac	4	Calyptrochilum		Kraenzl.				in Engl., Bot. Jahrb. 22: 30 (1895); FWTA 3: 251; FT 669						
11	Orchidaceae		Calyptrochristyan		(Rchb.f.) Summerh.				FWTA e(Angraec(christyan Rchb.f.  Gard. Chron. n.s. 13: 806 (1						
12	Orchidac	5	Cyrtorchis		Schltr.				Die Orchid. 595 (1914); FWTA 3: 266; FT 670						
13	Orchidac	1	Cyrtorch(arcuata		(Lindl.) Sssp.	variabilis	Summerf		Kew Bull Angraec(arcuatun Lindl. Companion Bot. Mag. 2: 20						
14	Orchidac	6	Diaphanathe		Schltr.				Die Orchid. 593 (1914); FWTA 3: 260; FT 671						
15	Orchidaceae		Diaphan(bidens		(Sw.) Schltr.				Die OrchLimodor(bidens  Afzel. ex Kongl. Vetens. Akad. Handl.						
16	Orchidac	7	Disperis		Sw.				Vet.-akad. Handl. Stockh., ser. 2, 21: 218 (1800); FWTA 3: 203;						
17	Orchidaceae		Disperis togoensis		Schltr.				in Engl., D. atacorenA.Chev.  Bot. 622, nomen nudum						



«No»	«Genre»	«Espèce»	«Auteur1»
«varssp»	«Nom»	«Auteur2»	«Literat»
«Syn1genre»	«Syn1espece»	«Syn1auteur»	«Syn1lit»
«Syn2genre»	«Syn2espece»	«Syn2auteur»	«Syn2lit»
«Cono»			
«Herbier»			
«Distrib»			
«Vernac»			
«Descr»			
«Phen»			
«Habitat»			
«Usage»			
«Remarque1»	«Remarque2»		

<p><b>Orchidaceae</b> Juss., Gen. pl. 64 (1789), comme "Orchideae", nom cons.; FWTA 3: 180; FT 664. par W.J. van der Burg</p> <p><b>1. Aerangis Rchb.f.</b>, Flora 48: 190 (1895); FWTA 3: 265.</p> <p><b>Aerangis biloba (Lindl.) Schltr.</b>, Die Orchid. 598 (1914); FWTA 3: 265; FT 666; FIS 9: 459; FC 846. Syn.: <i>Angraecum bilobum</i> Lindl., FTA 7: 138. Illustr.: Morton (1961) fig. 77; FC 847. Herbier: Yaago, Dasso, Zou: Adjakidjè 4758; Jardin Bot. UNB, Abomey-Calavi (en culture, obs. pers.). Distr.: 3. Vernac.: angel orchid (angl.). Plante monopodiale à fils en touffe ou tige courte, souvent pendante. Infils longues de 20-30 cm, pendantes, à 5-15 flrs. Flrs blanches à éperon de jusqu'à 5 cm, firs étroitement cylindriques, 5-8 cm de long, 3-4 mm de large à maturité. Fr. août Épiphyte sur tronc et branches des arbres. Sénégal au Cameroum. Espèces proches: <i>A. kotschyana</i> (Rchb.f.) Schltr. avec éperon de plus de</p>	<p>Syn.: <i>A. distichum</i> var. <i>grandiflorum</i> Segerbäck, nomen, publ. ne pas valable, Segerbäck (1983): 75. Illustr.: Burg (1980): 27; Segerbäck (1983): fig. 111 &amp; 112 (comme <i>A. dist.</i> var. '<i>grandiflorum</i>'). Herbier: Porto Novo: Roberty 1547; Djérègbe: Akoégninou s.n. Distr.: 1. Vernac.: Hèngban, ohèn (f, g). Petite plante monopodiale à branches pendantes, ramifiées et recourbées. Fils 5-11 mm de long, imbriquées, amplexicaules, obliquement ovales, aplatiées latéralement. Flrs blanches petites, 7,5-10,5 mm de large, dépassant la longueur des fls. Labelle recourbé. Sommet de l'éperon étroit, recourbé. Presque toute l'année, surtout dans la saison des pluies. Épiphyte sur tronc et branches des arbres. Guinée à l'Ouganda, RD Congo et Angola.</p> <p><b>3. Bulbophyllum Thou.</b>, Orch. Iles Austr. Afr. (1822); Vermeulen, J.J. (1987). Orchid Monographs 2. Brill, Leiden.</p> <p><b>Bulbophyllum falcatum (Lindl.) Rchb.f.</b>,</p>
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### *Step 4: Add fields to the Word document*

In the fourth step the columns can be selected that we want to insert from a drop-down list and in what sequence (like genus name, specific epithet, author's name, etc) and give them the correct makeup. We can add conditions to each field, like skip if empty, or add a title like "Vernac.:" before the vernacular data, but only if the record contains data, else skip it including its heading. Now our Word document has become a template that is ready for the merge. This file we make only once, which is kept as template for all families to come.

### *Step 5: Merge and run macros*

With a click, the data from the Excel file will be inserted into a new Word file. Word prompts for conditions that you may require: like skipping a record under certain conditions. When all rows have to be included, this option will not be needed. The new document looks strange at first, because it contains one page per record. This is due to the mailing nature of the tool: each letter should be a new page, but in Floras we need continuous text. With Find and Replace we change the hard page breaks into line breaks: now the text is continuous.

### *Step 6: Insert keys and finalise layout*

A new document has now been created, which can be saved separately, leaving the template intact. The new Word document will need some editorial corrections, like removal of double spaces, double commas, etc. This can best be done by making a macro for this operation. Then the keys and figures can be inserted. The keys have to be made separately using a normal document type, because we cannot use the merge operation for creating keys. It is advisable to provide authors with an example of the correct paragraph makeup including spacing and tabulation, which they can edit. This will greatly facilitate editing later on. With cut and paste, the keys can be easily inserted. Now the manuscript of one family is ready. Final editorial activities consist of compiling the whole, insertion of introductory paragraphs, table of contents, a name index, and a list of sources of illustrations, literature references and cover pages. Then, in order to be able to generate an Index, we need to mark all the names that we want to show up in the Index. This is normally needed in any final editorial procedure and has nothing to do with the merge procedure itself.

After insertion of the figures, we have all the text ready and we can generate a table of contents as well as an index. It is sent to the publisher as one single PDF.

## 4 Conclusions

The mail merge tool in Microsoft Word in combination with Microsoft Excel spreadsheets proved a very powerful tool to generate the core text of a floristic work. It provided all concerned with a transparent procedure, which after some initial familiarisation had the enthusiastic approval of most users. In exceptional cases with scientists not familiar with computers, we had to recur to printed forms, with the proposed layout, enabling simple transfer into the electronic format.

### Acknowledgements

We thank our Beninese colleagues for their contributions and many editing sessions both with red pen on the printouts as well as in the electronic files. This research was carried out between 1997 and 2006 in the framework of a project financed by the Dutch Ministry of Foreign Affairs through the Royal Netherlands Embassy at Cotonou, the University of Abomey-Calavi in Benin, and Wageningen University and Research Centre, Plant Sciences Group.

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