

A tale of three sages: A comparison between ethnomedicinally important southern African *Salvia* species

Ryan D. Rattray and Ben-Erik van Wyk

Department of Botany and Plant Biotechnology, University of Johannesburg, P. O. Box 524 Auckland Park, Johannesburg, 2006, South Africa

Introduction

- Southern Africa is home to 28 *Salvia* species, 14 of which are endemic to the region.
- Three closely related blue-flowered species are of ethnobotanical importance, and are *Salvia africana* (Figure 1A), *S. chamelaeagnea* (Figure 1B) and *S. dentata* (Figure 1C). These three species are of similar morphology but can be distinguished from one another by the the trichomes (hairs) on their calyces.
- Ethnobotanical records exist for these three species, however, no study has ever examined the similarities of uses among them.
- The essential oil chemistry of *Salvia africana* and *S. chamelaeagnea* have been well studied. However, there have not been any chemical analyses for *S. dentata* - an important medicinal species for the Namaqualand and western Karoo regions of South Africa.

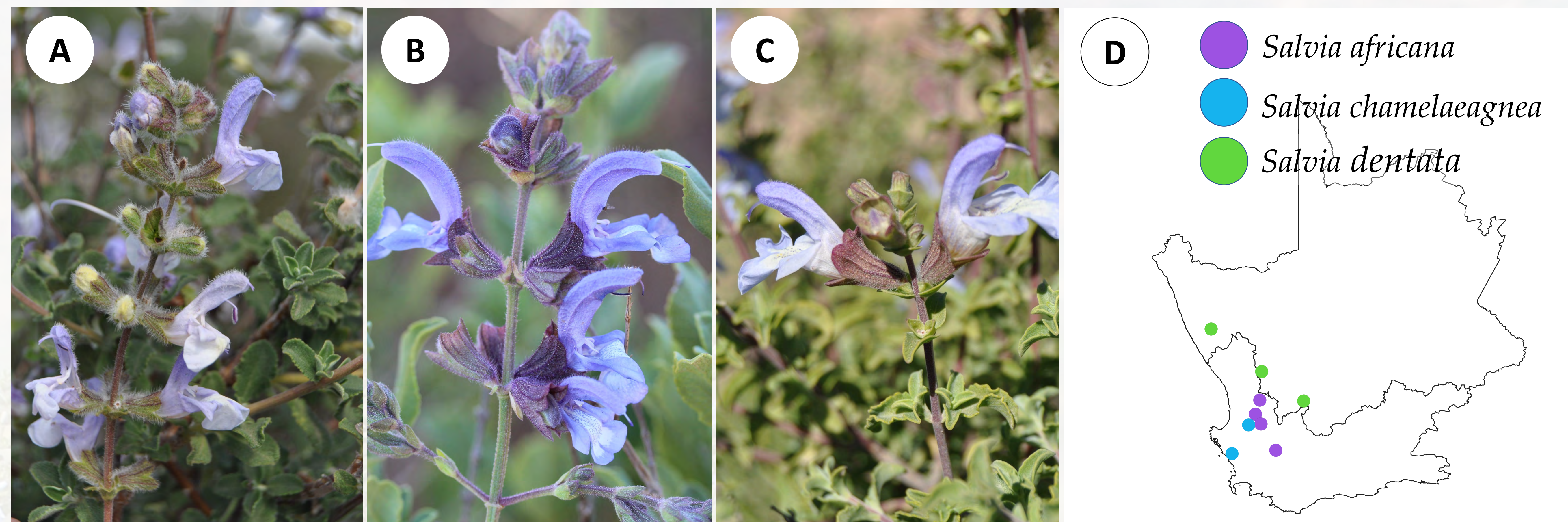


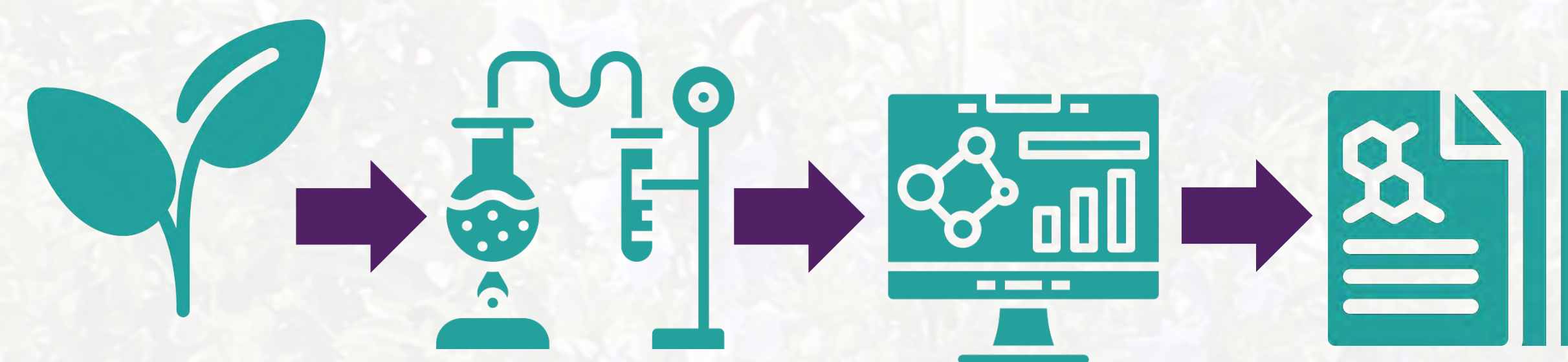
Figure 1: (A) *Salvia africana*, (B) *S. chamelaeagnea*, (C) *S. dentata* and (D) collection sites of the study.

Material and Methods

Ethnobotany



- Literature was gathered from popular search engines (i.e. Google Scholar, ScienceDirect), books, dissertations and theses.



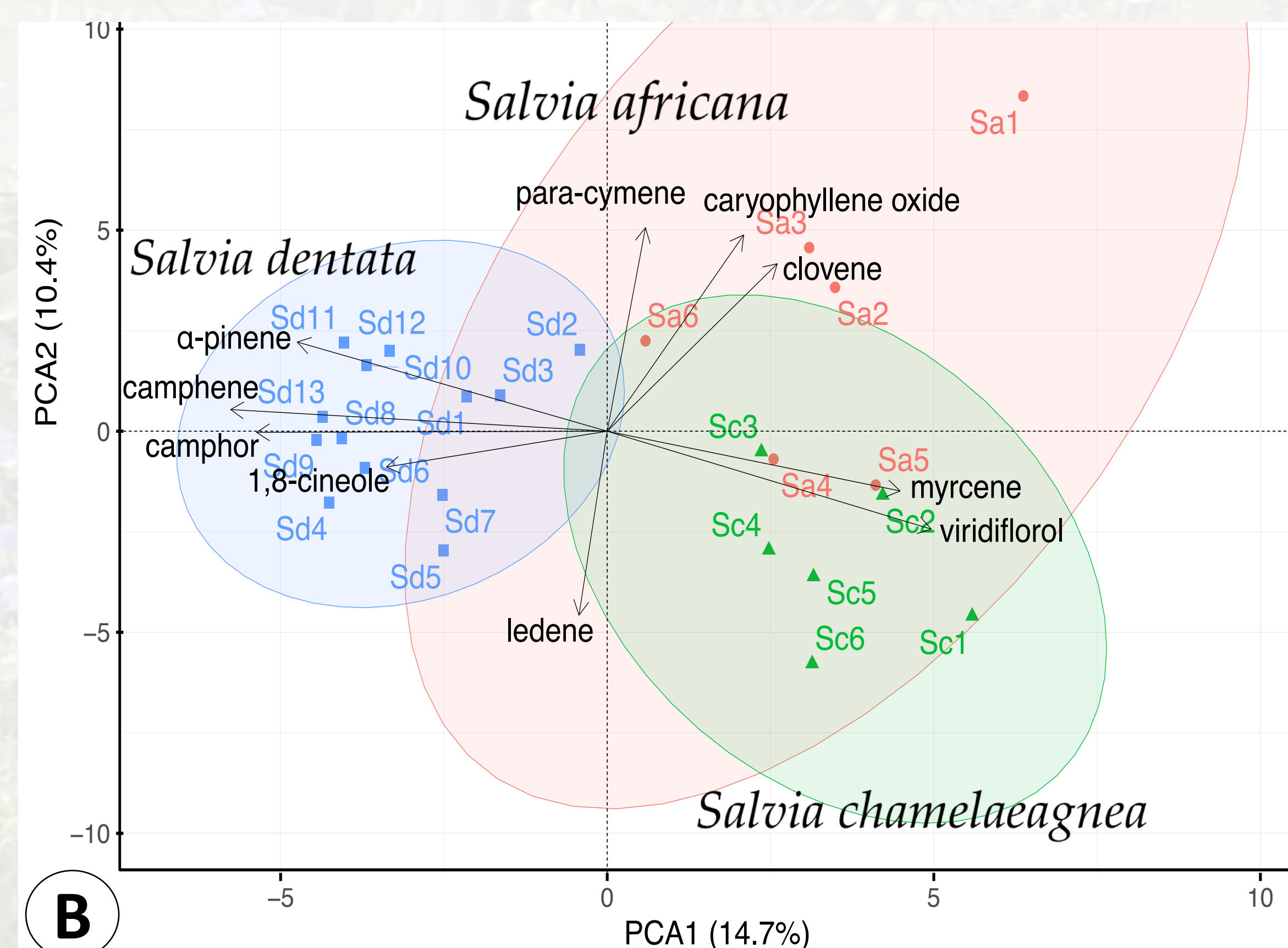
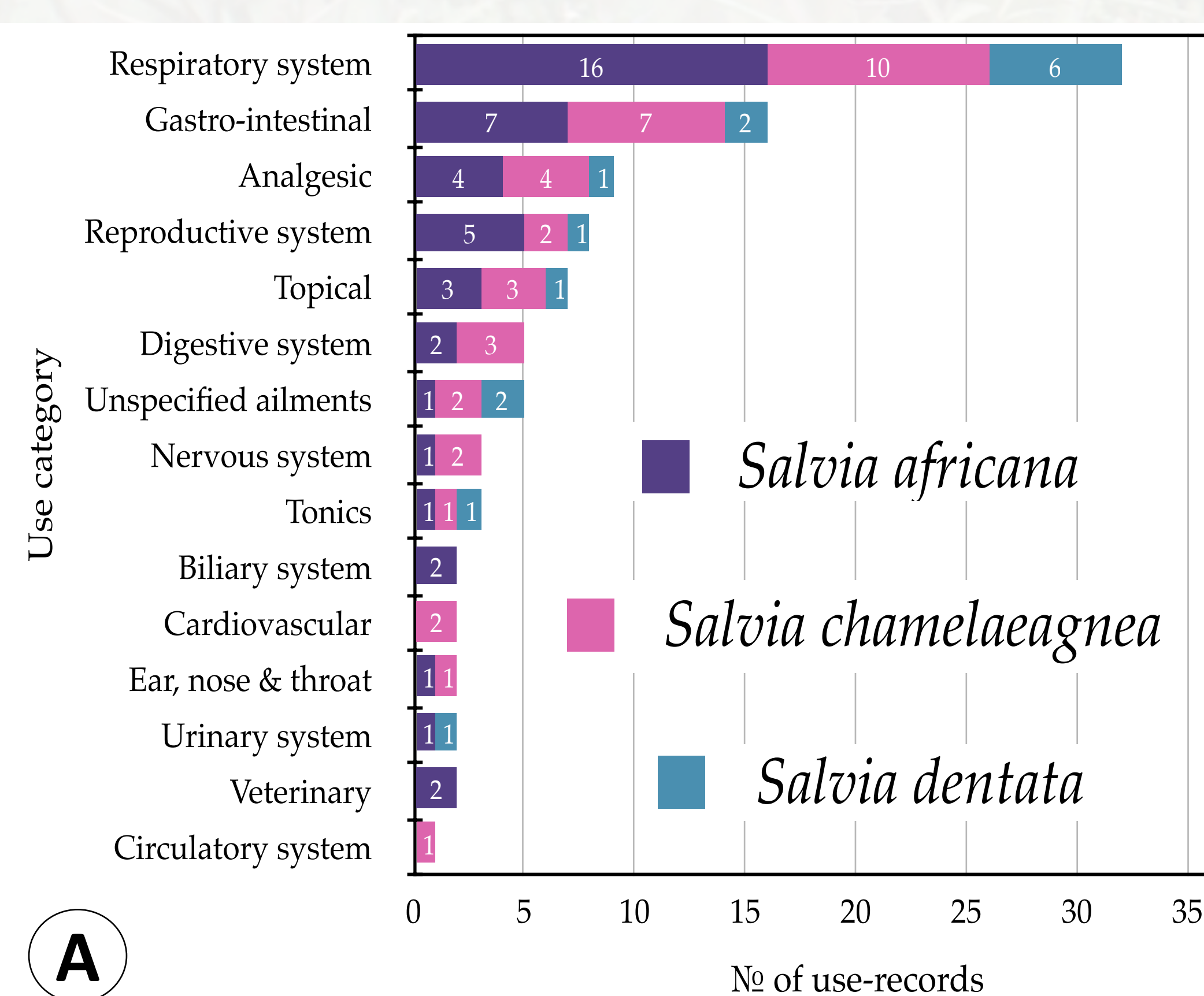
Chemistry

- Twenty five samples were collected from different localities in South Africa (Figure 1D). Plant material was air dried and subjected to hydrodistillation in a Clevenger apparatus for three hours. Essential oils were analysed using GC-MS and compounds identified using both the NIST database and retention indices. Statistical analyses were done in R-Studio.

Results and Discussion

Ethnobotanical Data

- For the three *Salvia* species, the overall use categories with the highest number of use-records are respiratory system (32 records), gastrointestinal (16 records), analgesic (9 records), reproductive system (8 records) and topical applications (7 records; Figure 2A).
- The ethnobotanical data show that *Salvia dentata* is mainly used for the treatment of respiratory ailments (colds, coughs and influenza), topical application, gastrointestinal (stomach complaints and diarrhoea) and unspecified medicinal uses.
- Interestingly all three of the species are documented to be used as treatment for similar ailments (colds, coughs, influenza, stomach complaints and woman's ailments) by different cultural groups across the Western and Northern Cape provinces of South Africa.



Chemical Data

- Major compounds (peak area > 5% identified in each species were:
 - Salvia africana***: viridiflorol (19.74%), β -caryophyllene (8.80%), α -pinene (8.25%), limonene (7.81%) and 1,8-cineole (6.02%).
 - Salvia chamelaeagnea***: viridiflorol (24.57%), limonene (10.58%) and β -caryophyllene (5.10%).
 - Salvia dentata***: camphor (14.37%), α -pinene (11.43%), camphene (10.18%), 1,8-cineole (9.42%), bornyl acetate (8.56%) and viridiflorol (5.95%).

Conclusions

- Although the three species of blue-flowered sages are closely related in terms of morphology and ethnobotanical uses, *Salvia dentata* presents a distinct chemical profile from the other two species (*S. africana* and *S. chamelaeagnea*; Figure 2B) due to the higher quantities of camphene, camphor, bornyl acetate and 1,8-cineole.
- The higher levels of camphor and 1,8-cineole supports the traditional use of *Salvia dentata* in the treatment for respiratory and gastrointestinal ailments, as these two molecules have been reported to exhibit potent and synergistic antimicrobial activity.

Acknowledgements



Contact



Figure 2: (A) Ethnobotanical data for the three *Salvia* species; (B) PCA plot (loadings and scatter plots).