Royal Gorge, Iron County

Study of morphological variation within *Hypericum prolificum* (Hypericaceae)

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Outline

- Introduction
  - Classification
  - *Hypericum prolificum*
- Methods
  - Measurements
  - Field work
  - Analysis
- Results
  - PCA
  - Mclust: Principal components
  - Mclust: Raw data
- Discussion
  - Analysis
  - Further studies
- Acknowledgments

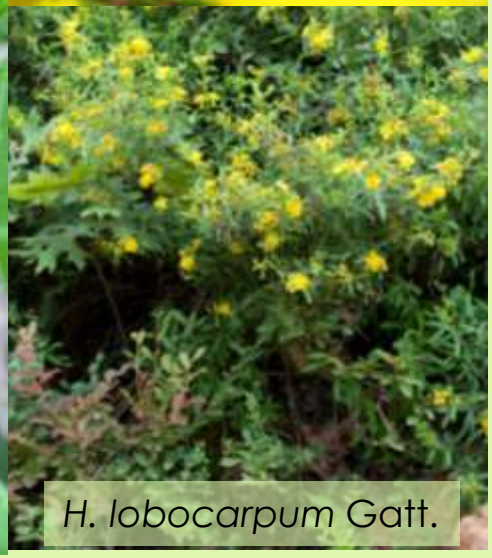
Hypericaceae

- Sect. Myriandra (Robson, 1996)
  - *Hypericum prolificum* L.

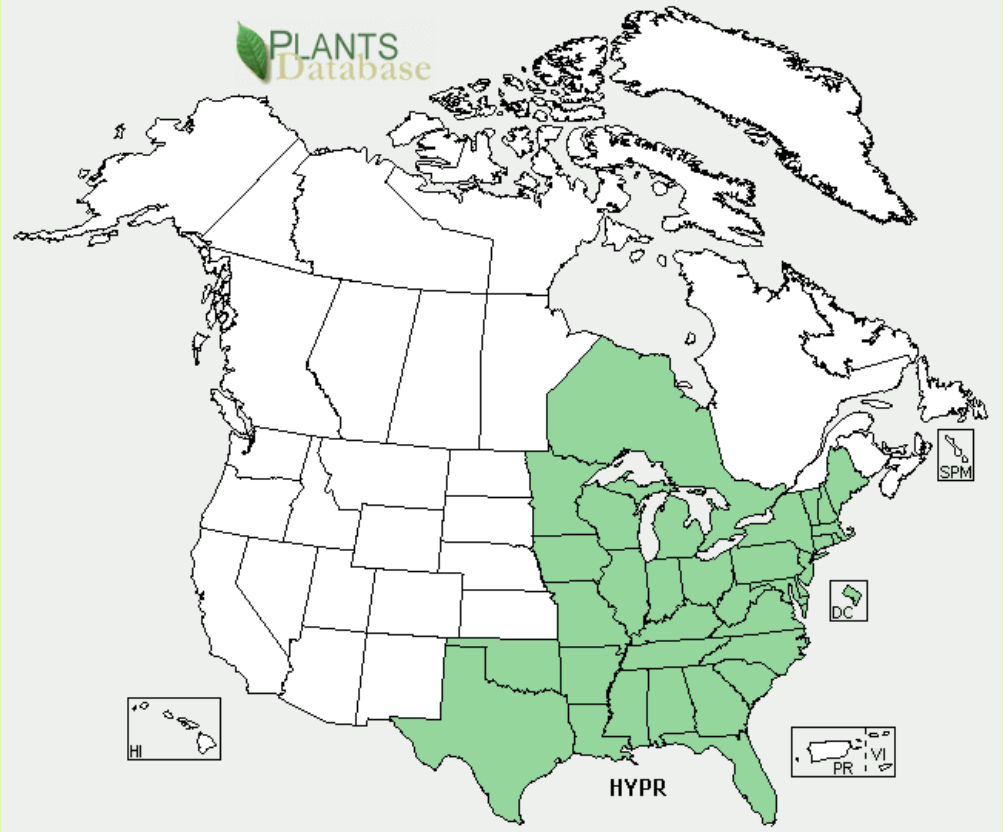

H. perforatum L.


H. punctatum Lam.


H. mutilum L.


H. lobocarpum Gatt.

Distribution



Habitat

Big Buffalo Creek, Ripley County

Introduction: *H. prolificum*

Rock Bridge State Park, Boone County

Prairie Garden Trust, Callaway County

Near West Plains, Howell County

Royal Gorge, Iron County

Introduction: *H. prolificum*

LINN 943.20

MO 957079

Controversies

- Svenson (1940, 1952)
  - Type specimen: a specimen upon which a taxon is based
- Fernald and Schubert (1948)
- Adams (1962)

Morphology

Hypothesis

- *H. prolificum* is one species.
  - Morphometric analysis

Measurements

- 1 measurement of a particular character= mean of ten measurements per specimen
  - **5 measurements
- 33 herbarium specimens

Characters (mm)
Leaf length
Leaf width
Length to broadest point on leaf
Internode length
Apical notch length
Petiole length
Pedicel length
Bract length
Filament length**
Sepal length
Petal Length

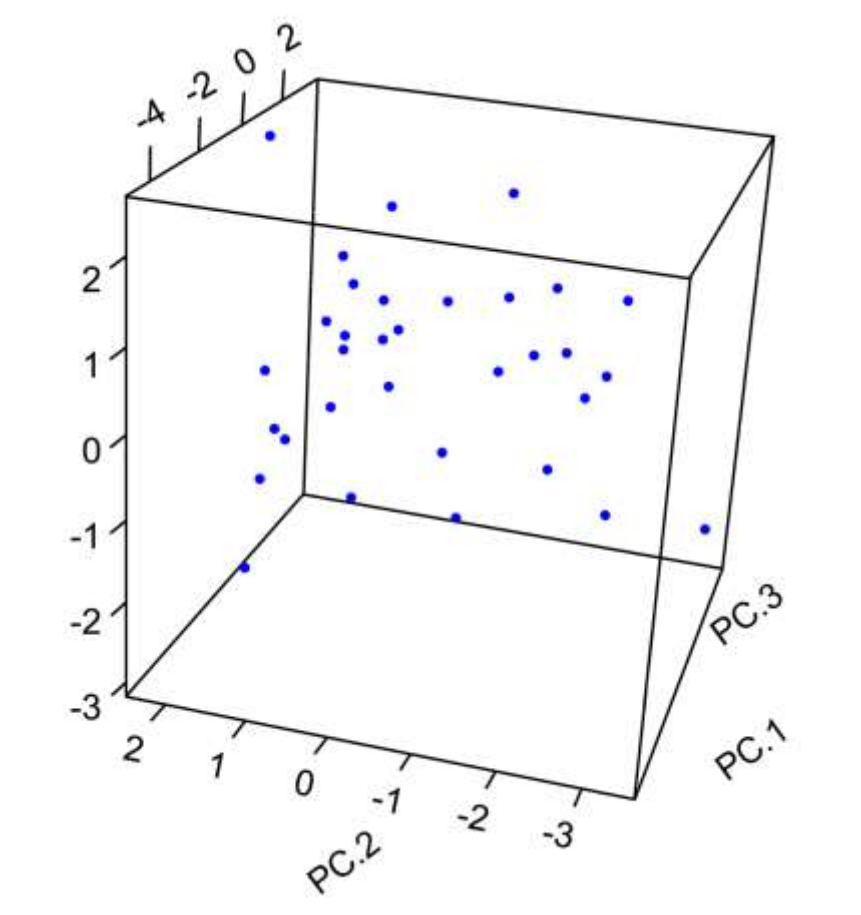
Methods: Measurements

- Herbarium specimens and high-resolution images of sheets
  - Ruler, optical micrometer, ImageJ

Analysis program

- R
  - prcomp
  - Mclust

Principal Components in 3D



Mclust: clustering models

Spherical	Diagonal	Elliptical
EII	EEI	EEE
VII	VEI	VVV
	EVI	EEV
	VVI	VEV

Model 3-letter acronyms:

- 1st letter:Volume
- 2nd letter: Shape
- 3rd letter: Orientation

Letter:

E: Equal

V: Variable

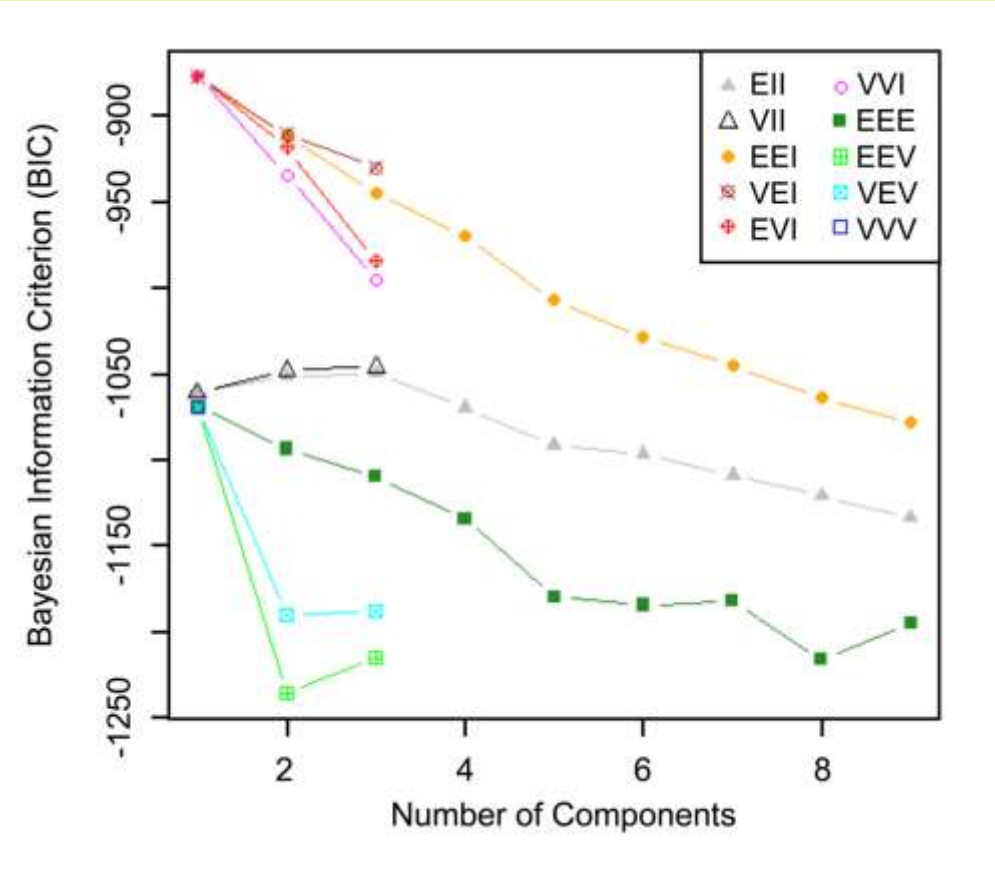
I: NA (spheres); coord. axis (diagonal)

(Fraley *et al.* 2012)

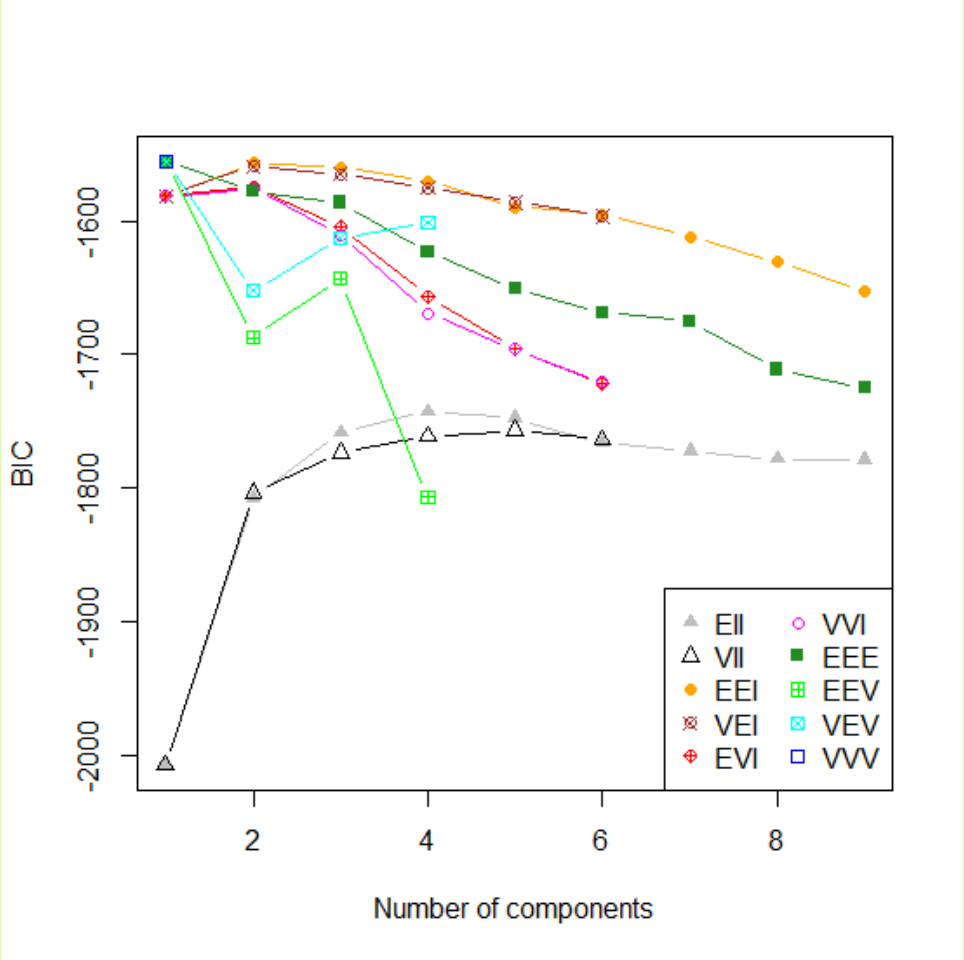
Mclust: Best-fit models

- Fits 10 models to the data for up to 9 mixture components (clusters)
- Gives Bayesian Information Criterion (BIC) values
  - Model with absolute value closest to zero is the best-fit cluster model.

Mclust for Principal Components



Mclust for Raw Data



Discussion: Analysis

- Null hypothesis was supported.
  - Highly variable
- 3-dimensional plot: random dispersion
- Mclust: PCA-Best-fit models for one mixture components
- Mclust: Raw data-Best-fit models for one mixture of components
  - More specimens/more characters to make a clear distinction, especially for Mclust with raw data

Hypericum lobocarpum

NW of Donaphan, Ripley County

Acknowledgments

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Thank you