A target capture approach for phylogenomic analyses at multiple evolutionary timescales in rosewoods (Dalbergia spp.) and the legume family (Fabaceae)

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Abstract

Understanding the genetic changes associated with the evolution of biological diversity is of fundamental interest to molecular ecologists. The assessment of genetic variation at hundreds or thousands of unlinked genetic loci forms a sound basis to address questions ranging from micro- to macro-evolutionary timescales, and is now possible thanks to advances in sequencing technology. Major difficulties are associated with i) the lack of genomic resources for many taxa, especially from tropical biodiversity hotspots, ii) scaling the numbers of individuals analyzed and loci sequenced, and iii) building tools for reproducible bioinformatic analyses of such datasets. To address these challenges, we developed a set of target capture probes for phylogenomic studies of the highly diverse, pantropically distributed and economically significant rosewoods (Dalbergia spp.), explored the performance of an overlapping probe set for target capture across the legume family (Fabaceae), and built a general-purpose bioinformatics pipeline. Phylogenomic analyses of Dalbergia species from Madagascar yielded highly resolved and well supported hypotheses of evolutionary relationships. Population genomic analyses identified differences between closely related species and revealed the existence of a potentially new species, suggesting that the diversity of Malagasy Dalbergia species has been underestimated. Analyses at the family level corroborated previous findings by the recovery of monophyletic subfamilies and many well-known clades, as well as high levels of gene tree discordance, especially near the root of the family. The new genomic and bioinformatics resources will hopefully advance systematics and ecological genetics research in legumes, and promote conservation of the highly diverse and endangered Dalbergia rosewoods.

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West / NorthEast

IIEast

Panicles

D. arbutifolia

Jestrow 156142

D. melanoxylon

Bellefroid 2

South Africa

D. bracteolata

Randrianaivo 2401

Madagascar 1

D. ecastaphyllum

Jestrow 156143

Aeschynomene rudis

Stevens 32158

Aeschynomene scabra

Stevens 32088

C. nicaraguensis

Stevens 33214

C. brasilianus

Stevens 32488

M. nictitans

Choque Ajata 111

M. salvadorense

Stevens 27751

M. lunatum

Taylor 11781

D. oliveri

Tran 6

Vietnam

D. chapelieri s.l.

Emeline 1

9

D. chapelieri s.l.

Hassold 604

10

D. chapelieri s.l.

Bernard 2656

8

D. chapelieri s.l.

Rakotonirina 1

R

13

D. chapelieri s.l.

Hassold 3

12

D. chapelieri s.l.

Hassold 379

12

D. normandii

Hassold 156

13

D. normandii

Hassold 189

13

D. normandii

Bernard 1670

13

D. occulta

Hassold 452

12

D. occulta

Hassold 196

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D. occulta

Hassold 368

12

D. maritima

subsp. pubescens

Service Forestier 32824

D. maritima

subsp. pubescens

Bernard 2247

11

D. maritima

subsp. pubescens

Randrianaivo 3136

11

D. sp. 24

Hassold 200

13

D. sp. 24

Aridy 717

12

D. sp. 24

Hassold 47

13

D. madagascariensis s.l.

Hassold 233

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D. madagascariensis s.l.

Hassold 12

12

D. madagascariensis s.l.

Hassold 334

12

D. baronii

Rakotoarisoa 12

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D. baronii

Hassold 9

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D. baronii

Bernard 2257

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D. baronii

Bernard 2257

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12

D. urschii

Ranirison 765

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D. urschii

Ramanantsialonina 44

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D. urschii

Randrianaivo 2458

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D. trichocarpa

Hassold 634

D. trichocarpa

Randrianaivo 2470

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D. trichocarpa

Hassold 631

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D. bemarivensis

Randrianaivo 2478

3

D. chermezonii

Razafindrahaja 268

6

D. chermezonii

Razakamalala 6156

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D. greveana

Hassold 632

D. greveana

Randrianaivo 2480

14

D. greveana

Randrianaivo 2398

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D. purpurascens s.l.

Randrianaivo 2410

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D. purpurascens s.l.

Rakotovao 6679

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D. purpurascens s.l.

Bernard 2451

6

D. monticola

Hassold 560

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D. monticola

Hassold 565

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D. monticola

Hassold 609

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D. monticola

Hassold 290

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D. monticola

Hassold 482

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D. monticola

Hassold 394

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D. orientalis

Hassold 12

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