



národní
úložiště
šedé
literatury

Molecular description of *Blumeria graminis* f. sp. hordei isolates

Komínková, Eva; Malečková, Eva; Vanžurová, Hana; Dreiseitl, Antonín; Doležel, Jaroslav;
Valárik, Miroslav
2015

Dostupný z <http://www.nusl.cz/ntk/nusl-188958>

Dílo je chráněno podle autorského zákona č. 121/2000 Sb.

Licence Creative Commons Uveďte autora-Neužívejte dílo komerčně-Nezasahujte do díla 3.0 Česko

Tento dokument byl stažen z Národního úložiště šedé literatury (NUŠL).

Datum stažení: 18.10.2017

Další dokumenty můžete najít prostřednictvím vyhledávacího rozhraní nusl.cz .

Molecular description of *Blumeria graminis* f. sp. *hordei* isolates

Eva Komínková¹, Eva Malečková¹, Hana Vanžurová¹, Antonín Dreiseitl², Jaroslav Doležel¹ & Miroslav Valárik¹

¹Institute of Experimental Botany, Centre of the Region Haná for Biotechnological and Agricultural Research, Šlechtitelů 31, CZ-783 71 Olomouc, Czech Republic
²Agrotest Fyto Ltd., Havlíčkova 2787, CZ-767 01 Kroměříž, Czech Republic

INTRODUCTION

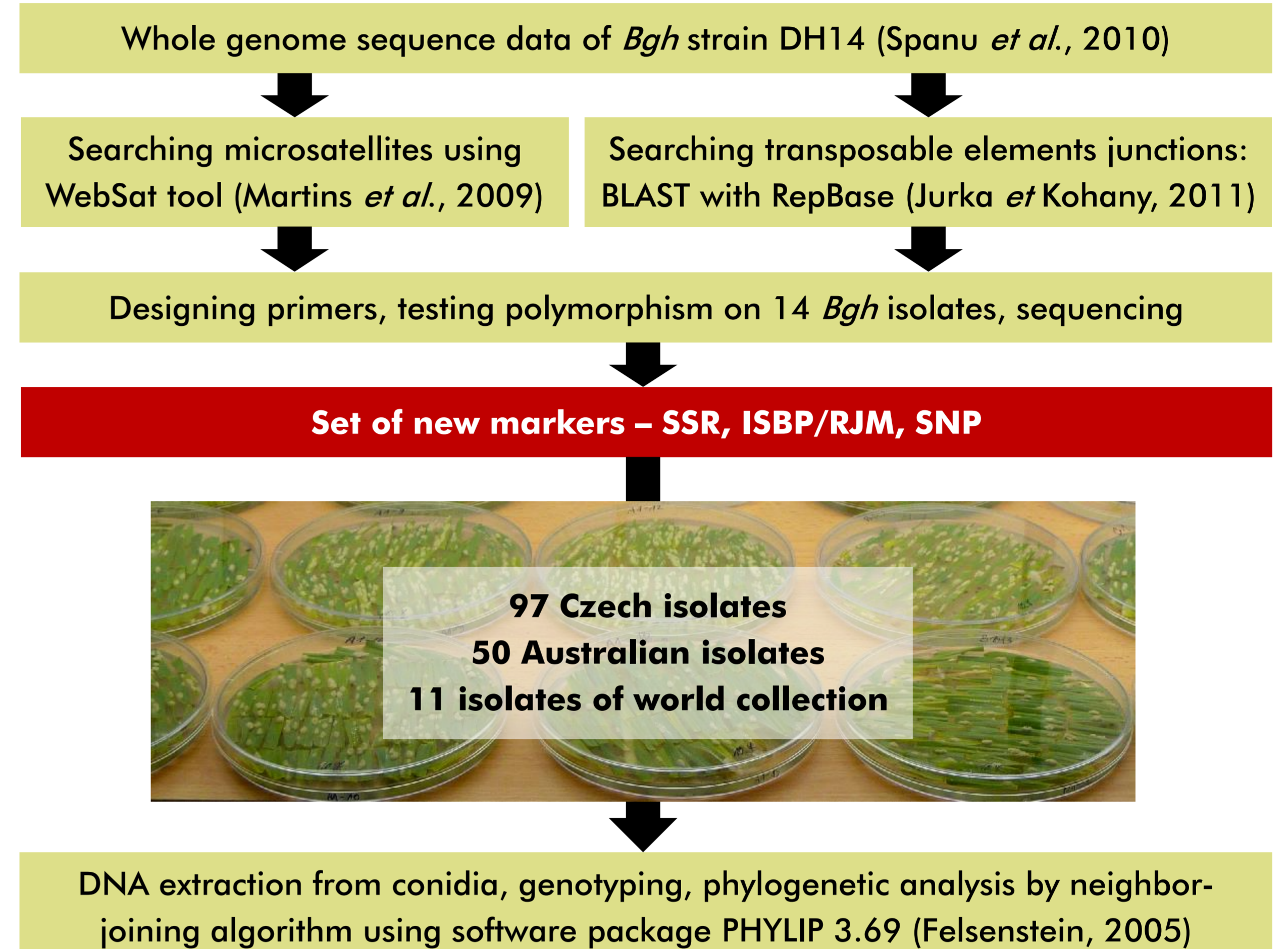
The air-borne fungus *Blumeria graminis* f. sp. *hordei* (*Bgh*) is a causal agent of barley powdery mildew. The pathogen attracts substantial attention due to its destructiveness (Fig. 1). However, molecular diversity studies based on “house-keeping” genes do not provide sufficient resolution when applied to isolates from geographically limited regions. This study focuses on developing a more efficient genotyping system capable to discriminate between closely related isolates. Furthermore, it demonstrates application of new markers on a set of isolates including Czech *Bgh* population together with selected isolates originating from different parts of the world.



Figure 1: *Blumeria graminis* DC., currently considered to be the 6th most important fungal plant pathogen (Dean *et al.*, 2012).

A) Colonies of fungus visible on leaf surface. B) Conidiophores. C) Conidia.

MATERIAL & METHODS



CONCLUSIONS

- Whole genome sequence data of *Blumeria graminis* f. sp. *hordei* were employed to design a panel of molecular markers based on microsatellites and insertion sites of transposable elements. Altogether, 32 polymorphic markers of three different types (SSR, SNP, ISBP/RJM) were developed and used for further analysis.
- Genotyping of 158 *Bgh* isolates revealed high genetic variability allowing unambiguous identification in most of the cases. Resulting genotype profiles were used for phylogenesis inference analysis to demonstrate one of possible applications of these data.
- After supplementing with data on virulence of individual isolates, this study might open new opportunities of studying the host-pathogen relationship and patterns of the pathogen spatial and time distribution.

REFERENCES

- Dean, R., van Kan, J. A. L., Pretorius, Z. A., Hammond-Kosack, K. E., di Pietro, A., Spanu, P. D., Rudd, J. J., Dickman, M., Kahmann, R., Ellis, J., Foster, G. D. (2012): The Top 10 fungal pathogens in molecular plant pathology. *Molecular Plant Pathology* 13 (4): 414 – 430.
- Felsenstein, J. (2005): PHYLIP (Phylogeny Inference Package) version 3.6. Distributed by the author. Department of Genome Sciences, University of Washington, Seattle.
- Jurka, J., Kohany, O. (2011): LTR retrotransposons from barley powdery mildew. *Rebase Reports* 11 (9), 2 333 – 2 333. Accessible online at <http://www.girinst.org/>.
- Martins, W. S., Lucas, D. C. S., Neves, K. F. S., Bertoli, D. J. (2009): WebSat – a web software for microsatellite marker development. *Bioinformatics* 3 (6): 282 – 283. Accessible online at <http://wsmartins.net/websat/>.
- Spanu, P. D., Abbott, J. C., Amselem J., Burgis, T. A., Soanes, D. M. et al. (2010): Genome expansion and gene loss in powdery mildew fungi reveal tradeoffs in extreme parasitism. *Science* 330 (6010): 1 543 – 1 546.

ACKNOWLEDGEMENTS

This work has been supported by the Czech Ministry of Education, Youth and Sports (grant awards LD14105, LO1204).



RESULTS

Based on the approach described above, a genotyping marker panel comprising 16 SSR, 14 SNP and 2 ISBP/RJM markers was developed (Fig. 2).

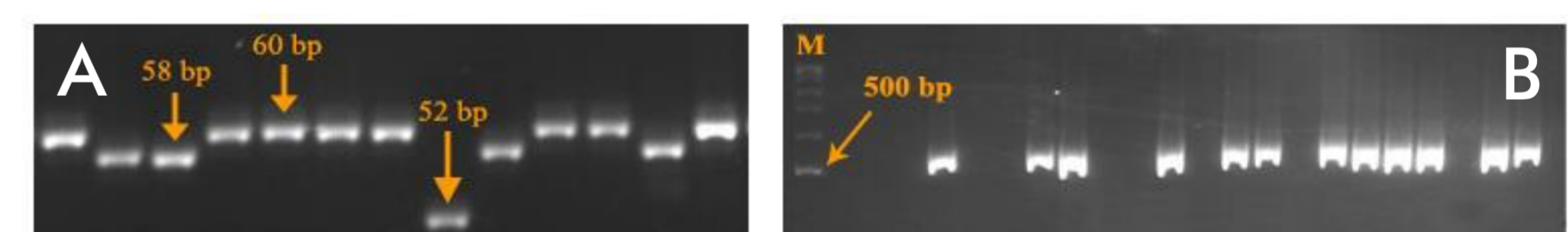


Figure 2: Examples of new markers amplified from *Bgh* isolates.

A) SSR marker *obm28*. B) ISBP/RJM marker *obm14*. PCR products were visualized by ethidium bromide staining after electrophoretic separation on 6% and 4% polyacrylamid gel, respectively.

The final marker panel comprising 32 polymorphic markers provided significant resolution of 158 studied isolates, most of them showed unique genotype profiles. The analysis of phylogenetic relationship performed by neighbor-joining algorithm for 97 Czech isolates resulted in 87 separate clades and revealed high diversity of the pathogen population within a small geographical area (Fig. 3, 4).

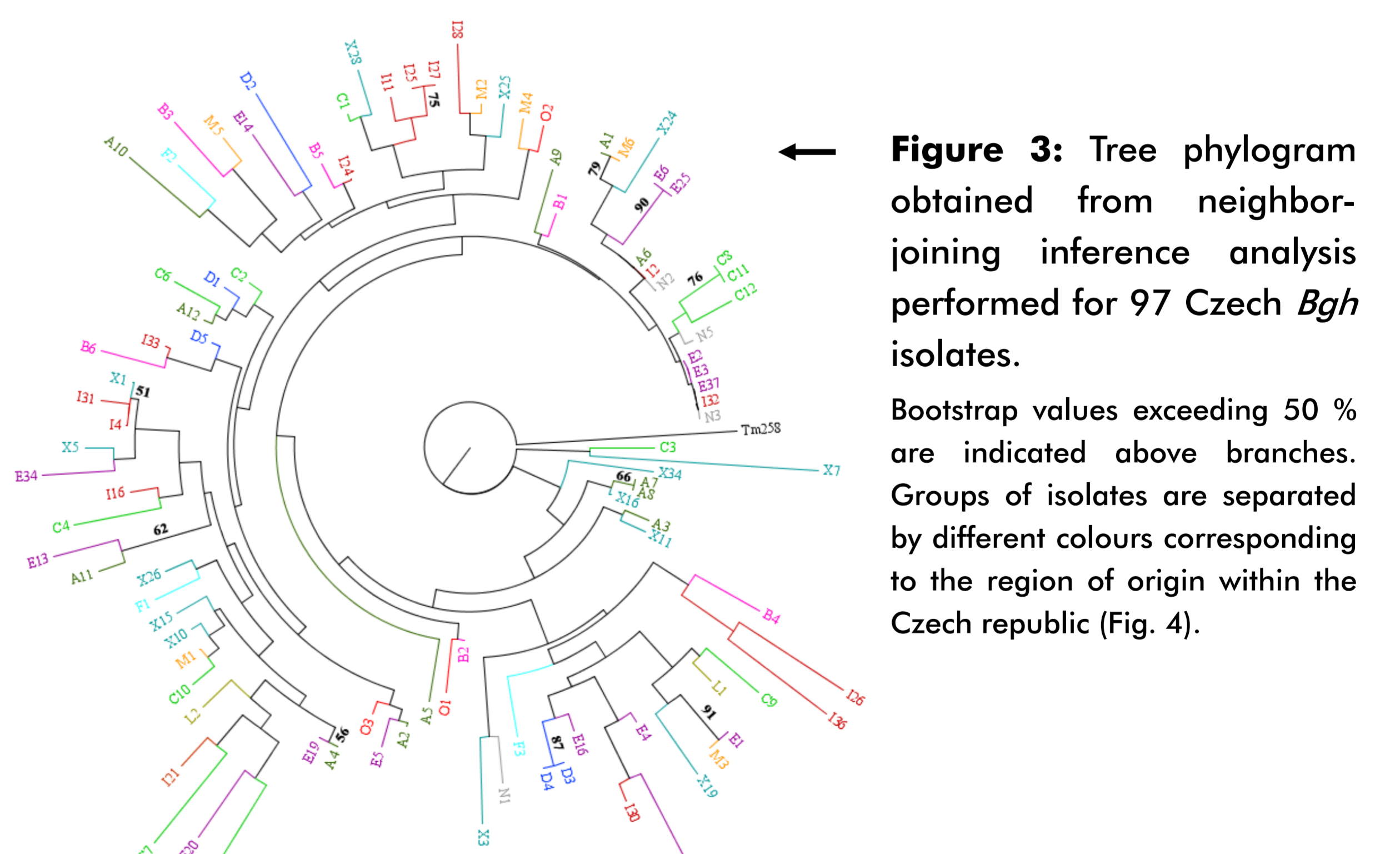


Figure 4: Distribution of studied isolates within the Czech republic.

Colours of individual sections correspond to colours of isolates on Fig. 3. Letters (A, B, C, D, E, F, I, L, M, N, O, X) represent groups of isolates collected in respective region.

