

Genetic diversity of *Fallopia x bohemica* populations in southern Poland

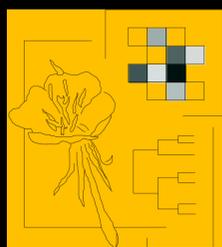
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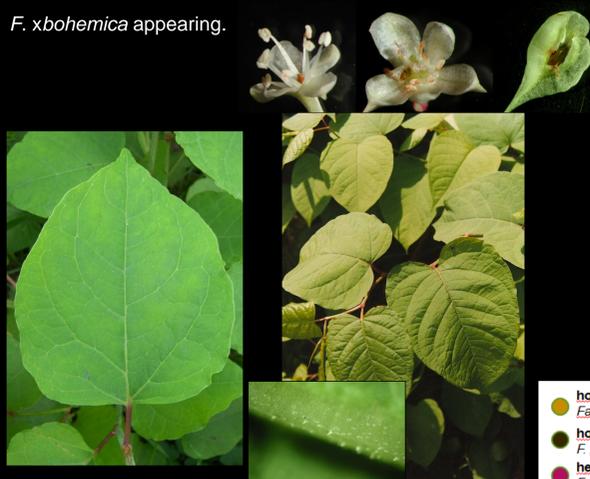
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Introduction

The invasive alien knotweeds, *Fallopia* spp. (Polygonaceae), are some of the most troublesome invasive species in Europe and North America (Bailey and Wisskirchen 2006; Tiébré et al. 2007; Tokarska-Guzik 2005). Hybridization of the widespread *F. japonica* var. *japonica* with *F. sachalinensis* resulted in the hybrid, *F. xbohemica* appearing.



F. xbohemica



F. japonica

F. sachalinensis

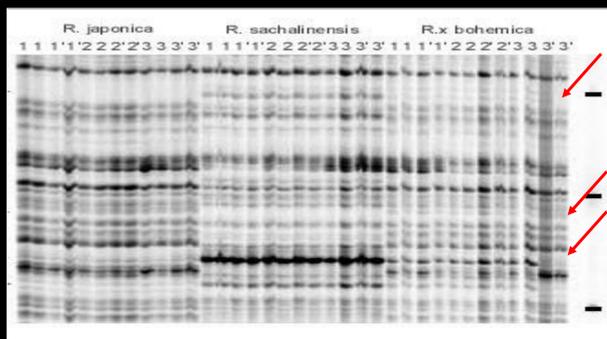


Fig. 2. Fragment of gel showing the pattern of genetic diversity *Fallopia* taxa. Arrows indicate polymorphic loci



Fig. 1. Location of sampled sites in southern Poland. Sites are indicated by the locality code (Table 1).

Materials and methods

We investigated local populations of the hybrid and its parents *F. japonica* and *F. sachalinensis* from different habitats. The main aim of the study was to examine the pattern of genetic diversity of the hybrid. Study sites were located in southern Poland, which is considered to be the most invaded region (Fig. 1, Tab. 1). The populations studied consisted of *F. x bohemica* exclusively (later called 'homogenous'), or were composed of two or three taxa cohabiting in the same area ('heterogenous'). AFLP markers (Amplified Fragment Length Polymorphism) have been used to measure polymorphism among 68 individuals from 6 selected populations, using 5 pairs of primers combinations. The assessment of genetic diversity within and between populations was performed in two parts. The first part was aimed at the polymorphism between taxa, based on individuals of *F. x bohemica* collected from 'homogenous' populations, while the second part investigated populations consisting of three or two taxa growing together (*F. x bohemica* with one or two parental species).

Tab. 1. Locality code, location/ ATPOL square (Zając, 1978), and sample sizes for the *Fallopia* individuals analyzed for variation in AFLPs.

Locality code	Location / ATPOL square	Geographic coordinates	Habitat type	Population size	Number of individuals		
					F. J.	F. x B	F. S.
hoDa	Dąbrowa Górnicza, ul. Stanisława Słazica 122	50°18'59"N 19°13'38"E	roadside, forest	clumps, occupy no more than 30% of the area		20	
hoGrz	Grzawa, DF73/32	49°57'34.8"N 19°3'26.2"E	roadside	clumps, occupy no more than 30% of the area		20	
heBo	Mysłowice - Janów Miejski, ul. ks. Bończyka, DF43/23	50°14'37.8"N 19°6'9.5"E	abandoned fields, roadside	cover 30-50% of the area	3	23	
heCm	Mysłowice - Ćmok, ul. Chopina Frydryka 42, DF43/34	50°14'20.9"N 19°7'20.0"E	roadside, urban areas	cover 30-50% of the area	3	23	
HeCz	Czechowice-Dziedzice, DF73/40	49°56'33.3"N 19°0'24.5"E	river valley, meadow	cover from 70-100% of the area	3	25	3
HeMuch	Katowice - Muchowiec, ul. Francuska 212, DF43/30	50°13'54.8"N 19°1'40.3"E	roadside, forest	cover from 70-100% of the area	3	25	3

Results

population type	genotype 1	genotype 2	% polymorphism
heterogenous population Katowice - Muchowiec	heMuchRJ	heMuchRJ	0
	heMuchRJ	heMuchRB	7,95-8,65
	heMuchRJ	heMuchRS	28,83-32,29
	heMuchRB	heMuchRB	0-1,17
	heMuchRB	heMuchRS	24,1-28,32
	heMuchRS	heMuchRS	13,67-14,51
heterogenous population Czechowice - Dziedzice	heCzRJ	heCzRJ	0
	heCzRJ	heCzRB	8,38-9,09
	heCzRJ	heCzRS	21,48
	heCzRB	heCzRB	0,45-2,93
	heCzRB	heCzRS	19
	heCzRS	heCzRS	0
heterogenous population Mysłowice - Bończyk	heBoRJ	heBoRJ	0
	heBoRJ	heBoRB	9,78-12,89
	heBoRB	heBoRB	0-8,29
heterogenous population Ćmok	heCmRJ	heCmRJ	0-0,22
	heCmRJ	heCmRB	15,04-16,21
	heCmRB	heCmRB	0-1,84
homogenous population Grzawa	hoGrzRB	heGrzRB	0-1,36
homogenous population Dąbrowa Górnicza	hoDaRB	heDaRB	0

Fig. 3. The level of polymorphism between *Fallopia* individuals

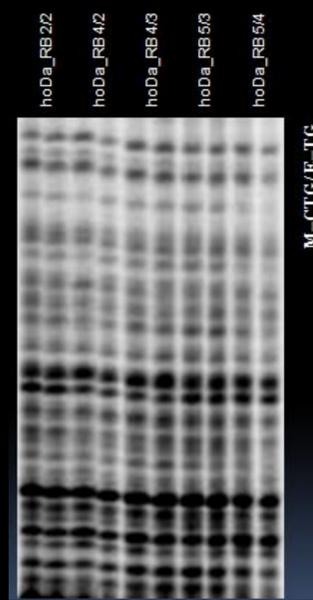


Fig. 4. Fragment of gel representing the monomorphic pattern in the homogeneous population of *F. xbohemica*

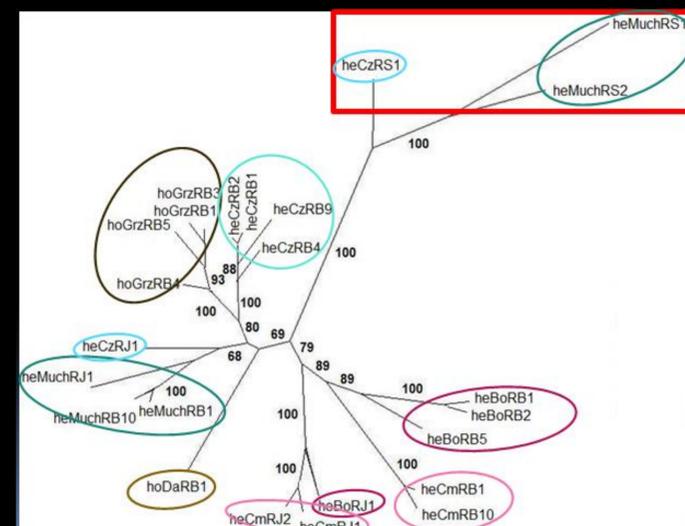
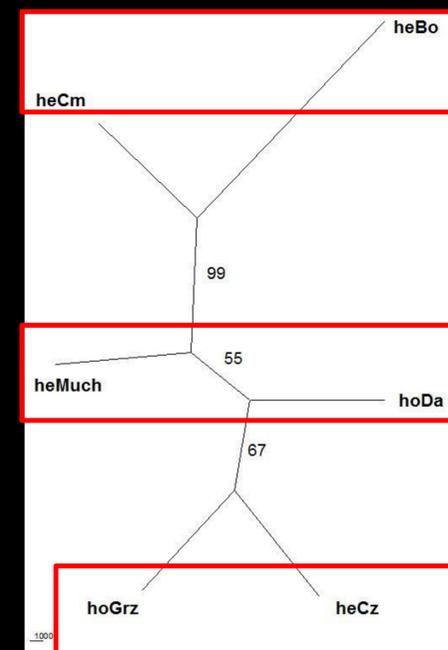


Fig. 5. Consensus (Majority rule consensus) Neighbor-Joining tree (NJ). At the appropriate branches of trees bootstrap values > 50% are indicated (Nei and Li 1979).

Conclusions

A high level of genetic diversity (8,29) was observed in populations of *F. x bohemica* cohabiting with parental species.

Our results showed that genetic diversity in *F. xbohemica* populations can be high even in a relatively limited area and could be explained by a different history of introduction.

AFLP markers are an efficient tool for understanding the genetic structure within and between complex populations, as well as for identifying particular taxa.

References

- Bailey JP, Wisskirchen R (2006) The distribution and origins of *Fallopia x bohemica* (Polygonaceae) in Europe. *Nordic Journal of Botany* 24:173-199.
- Nei, M. and W. H. Li. 1979. Mathematical model for studying genetic variation in terms of restriction endonucleases. *Proceedings of National Academy of Sciences* 78: 5269-5273
- Tiébré MS, Vanderhoeven S, Saad L et al (2007) Hybridization and sexual reproduction in the invasive alien *Fallopia* (Polygonaceae) complex in Belgium. *Annals of Botany* 99:193-203.
- Tokarska-Guzik B (2005) The establishment and spread of alien plant species (kenophytes) in the flora of Poland. Nr. 2372. Wydawnictwo UŚ, Katowice.
- Zając A. 1978. Atlas of distribution of vascular plants of Poland. *Taxon* 27: 481-484.