

Supporting information for

Exotic tree species have consistently lower herbivore load in a cross-Atlantic tree biodiversity experiment

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Appendix S1

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Table S1: Schematic overview of tree species mixtures in IDENT-Auclair and IDENT-Freiburg. Values in parentheses below species acronyms are the number of plots for each mixture (first number in Auclair + second number in Freiburg). At each site the experiment consists of four identical blocks (except for a few additional plots in Freiburg, indicated by *). The full design of IDENT-Freiburg also contains 216 plots with different fertilizer treatments and 24 unfertilized plots with 4-species mixtures, but these treatments only contain native species and were not included in the present study.

species richness:	1		2		6			
	EU	NA	EU	NA	EU-NA	EU-NA	EU-NA	
	ACPL (4+4)	ACSA (4+4)	ACPL-BEPE (4+4)	ACSA-BEPA (4+4)	ACPL-BEPA (4+4)	LADE-QURO (4+4)	ACSA-ACPL (4+1*) (4+4)	6 EU (4+4)
	BEPE (4+4)	BEPA (4+4)	ACPL-PIAB (4+4)	ACSA-PIGL (4+4)	ACPL-QURU (4+4)	LALA-PISY (4+5*)	LALA-BEPE (4+0) (4+4)	6 NA (4+4)
	LADE (4+4)	LALA (4+4)	BEPE-PISY (4+4)	BEPA-PIST (4+4)	ACSA-PIAB (4+4)	PIAB-PIGL (4+4)	PIGL-LADE (4+0) (4+4)	6 angio (4+4)
	PIAB (4+4)	PIGL (4+4)	BEPE-QURO (4+4)	BEPA-QURU (4+5*)	ACSA-QURO (4+5*)	PIAB-PIST (4+4)	PIGL-PIST (4+0) (4+4)	6 gymno (4+4)
	PISY (4+4)	PIST (4+4)	LADE-QURO (4+4)	LALA-PIST (4+4)	BEPA-BEPE (4+4)	PIGL-QURO (4+4)	PISY-LADE (4+0) (4+4)	EUgymnoNAangio (4+4)
	QURO (4+4)	QURU (4+4)	PIAB-PISY (4+4)	LALA-QURU (4+4)	LADE-LALA (4+4)	PIST-PISY (4+4)	QURO-QURU (4+0) (4+4)	EUangioNAgymno (4+4)
number of plots:	48 in Auclair +48 in Freiburg		120+100		24+24		192+172 = 364	

Species acronyms:

angio = Angiosperms: ACPL = *Acer platanoides* L., ACSA = *A. saccharum* Marshall, BEPE = *Betula pendula* Roth, BEPA = *B. papyrifera* Marshall, QURO = *Quercus robur* L., QURU = *Q. rubra* L.

gymno = Gymnosperms: LADE = *Larix decidua* Mill., LALA = *L. laricina* (Du Roi) K. Koch, PIAB = *Picea abies* (L.) H. Karst., PIGL = *P. glauca* (Moench) Voss [in Freiburg, *Picea pungens* var. *glauca* Engelm. was erroneously supplied by the nursery and thus planted instead], PISY = *Pinus sylvestris* L. and PIST = *P. strobus* L.

EU = European species, NA = North American species

Table S2: Arthropod abundance per arthropod taxon (order, plus relevant sub-taxa) and site

Taxon ^{1,2}	Auclair	Freiburg	feeding guild
Arachnida	394	1006	
- Araneae	337	613	predator
- Acari	43	366	other
- Opiliones	14	26	predator
Coleoptera	826	697	
- Curculionidae	701	165	herbivore (adult leaf-chewer)
- Chrysomelidae	-	42	herbivore (adult leaf-chewer)
- Coccinellidae	3	72	predator
- Latridiidae	74	249	other
Dermaptera	-	44	Predator
Diptera	203	399	other
Hemiptera	603	6482	
- Auchenorrhyncha	37	371	herbivore (sap-sucker)
- Heteroptera	43	858	
○	24	397	herbivore (sap-sucker)
○	13	17	predator
- Sternorrhyncha	516	5244	herbivore (sap-sucker)
Hymenoptera	172	444	
- Symphyta (larvae)	1	3	herbivore (larval leaf-chewer)
- (all others)	171	431	other
Lepidoptera	123	106	
- (larvae) ³	114	88	herbivore (larval leaf-chewer)
Neuroptera	12	18	predator
Orthoptera ⁴	-	22	other
(other arthropod orders)	157	1536	other
total arthropod abundance	2490	10754	

¹The following literature and online resources were used for identification and guild assignments: Biedermann and Niedringhaus (2004), Bright and Bouchard (2008), Hassler and Rheinheimer (2010), Schaefer (2009), <http://www.aphidsonworldsplants.info>, <http://coleonet.de/>, among others (various field guides).

²In addition, selected specimens were identified using DNA-Barcoding, based on matching COI-barcode sequences to BOLD (<http://www.boldsystems.org/>) and other databases (contract work by AIM - Advanced Identification Methods GmbH, Leipzig, Germany).

³most common species was *Coleophora laricella*, a European species also introduced to Canada

⁴The few orthopterans found here contained at least some carnivorous species (*Meconema* sp.) and were thus not included in the herbivore guild

Table S3: Hypothesis 1 results for predators, “others” and larval chewers

predictor	predator abundance			"others" abundance			larval chewer abundance		
	df	Chisq	<i>p</i>	df	Chisq	<i>p</i>	df	Chisq	<i>p</i>
(Intercept)	1	45.75	< 0.001	1	18.82	< 0.001	1	32.90	< 0.001
site	1	1.19	0.274	1	44.82	< 0.001	1	0.21	0.644
genus	5	49.25	< 0.001	5	20.46	0.001	5	32.09	< 0.001
status	1	6.41	0.011	1	2.11	0.146	1	0.36	0.548
site*genus	5	10.26	0.068	5	18.47	0.002	5	11.79	0.038
site*status	1	0.50	0.478	1	1.03	0.309	1	0.50	0.479
genus*status	5	9.27	0.099	5	8.36	0.137	5	5.57	0.351
site*genus*status	5	5.07	0.407	5	11.34	0.045	5	4.56	0.472

Table S4: Hypothesis 2 results for predators, “others” and larval chewers

model predictor	predator abundance				"others" abundance				larval chewer abundance			
	Est.	SE	<i>z</i>	<i>p</i>	Est.	SE	<i>z</i>	<i>p</i>	Est.	SE	<i>z</i>	<i>p</i>
(Intercept)	-0.63	0.13	-4.75	< 0.001	-1.29	0.20	-6.60	< 0.001	-3.19	0.38	-8.44	< 0.001
site (FR)	1.62	0.12	13.11	< 0.001	0.72	0.09	7.63	< 0.001	-0.09	0.29	-0.31	0.757
status (exotic)	-0.29	0.14	-2.03	0.042	-0.41	0.17	-2.41	0.016	0.04	0.43	0.10	0.917
log(SR)	-0.01	0.09	-0.07	0.946	0.07	0.10	0.72	0.470	-0.05	0.27	-0.18	0.856
status exotic * log(SR)	0.18	0.11	1.64	0.100	0.04	0.14	0.30	0.763	0.13	0.35	0.38	0.702

Table S5: Intrageneric phylogenetic distance (PD) based on a dated phylogenetic tree for all tree species in IDENT (Christophe 2020). Due to a planting error in Freiburg, intrageneric PD for *Picea* differs between sites. For reference: the phylogenetic distance between angiosperms and gymnosperms has a value of 650.

genus	intrageneric PD (Auclair)	intrageneric PD (Freiburg)
<i>Acer</i>	18	18
<i>Betula</i>	35	35
<i>Quercus</i>	31	31
<i>Larix</i>	35	35
<i>Picea</i>	113	88
<i>Pinus</i>	72	72

Table S6: Number of leaves with rare and likely specialized leaf damage classes. Tree species exotic at a given site are marked in grey

genus	Auclair			Freiburg		
	Miners	Gallers	Rollers	Miners	Gallers	Rollers
<i>Acer platanoides</i>				24		2
<i>A. saccharum</i>					5	1
<i>Betula pendula</i>						
<i>B. papyrifera</i>						
<i>Quercus robur</i>				5	11	3
<i>Q. rubra</i>	3					
<i>Larix decidua</i>						
<i>L. laricina</i>						
<i>Picea abies</i>					5	
<i>P. glauca*</i>						
<i>Pinus sylvestris</i>						
<i>P. strobus</i>						

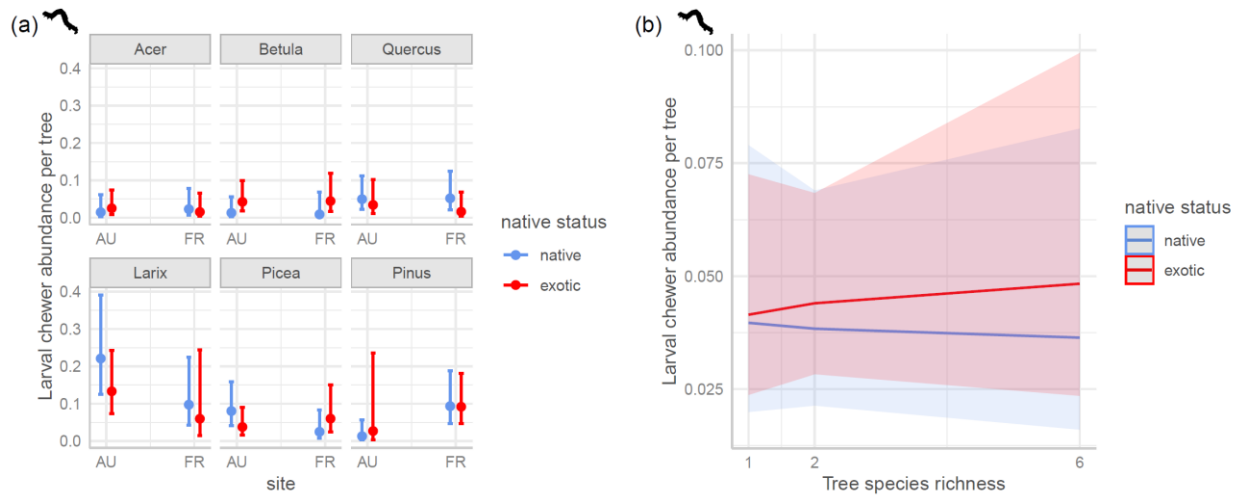


Figure S1: results for herbivore guild “larval leaf chewers”. Marginal effect plots are shown. a) is based on the “Hypothesis 1 model structure” and equivalent to Fig. 1 in the main text. b) is based on the “Hypothesis 2 model structure” and equivalent to Fig. 3 in the main text. 74

References in Appendix S1

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