

Table S1: Fungal strains and marker gene sequences used in this study.

Genus, species	Strain / type material	ITS	EF1A	RPB1	RPB2	LSU	geographic origin	isolation source / natural host
<i>Akanthomyces uredinophilus</i>	CEP 054 (ARSEF 7460)	MH013232	MH062184	OP762608	OP762612	OP752150	Argentina	<i>Trialeurodes vaporariorum</i> (Hemiptera)
<i>Akanthomyces uredinophilus</i>	CEP 057 (ARSEF 7207)	MH013506	MH062186	OP762609	OP762613	OP752151	Argentina	<i>Trialeurodes vaporariorum</i> (Hemiptera)
<i>Akanthomyces uredinophilus</i>	CEP 108 (ARSEF 7462)	MH013508	MH062188	OP762610	OP762614	OP752152	Argentina	<i>Myzus persicae</i> (Hemiptera)
<i>Lecanicillium uredinophilum</i>	KACC 44066	n.a.	KM283808	KM283830	KM283850	KM283784	Korea	<i>Pucciniastrum agrimoniae</i> (Pucciniastraceae)
<i>Lecanicillium uredinophilum</i>	KACC 44082 TYPE	n.a.	KM283806	KM283828	KM283848	KM283782	Korea	<i>Pucciniastrum agrimoniae</i> (Pucciniastraceae)
<i>Lecanicillium uredinophilum</i>	KACC 47756	n.a.	KM283807	KM283829	KM283849	KM283783	Korea	<i>Pucciniastrum agrimoniae</i> (Pucciniastraceae)
<i>Lecanicillium uredinophilum</i>	KUN 101466	MG948305	MG948315	MG948311	MG948313	MG948307	China	undetermined insect
<i>Lecanicillium uredinophilum</i>	KUN 101469	MG948306	MG948316	MG948312	MG948314	MG948308	China	undetermined insect
<i>Lecanicillium uredinophilum</i>	QHLA	MZ768909	n.a.	ON107271	ON107270	MZ768916	China	Chinese caterpillar (Lepidoptera)
" <i>Lecanicillium</i> sp." / " <i>Lecanicillium zaquensis</i> "	HMAS 246917	MT789698	MT797811	MT797809	n.a.	MT789696	China	Not determined
<i>Akanthomyces lecanii</i>	CBS 101247 TYPE	JN049836	DQ522359	DQ522407	DQ522466	KM283794	US	<i>Coccus viridis</i> (Hemiptera)
<i>Akanthomyces lecanii</i>	CBS 102067	MH862778	KM283818	KM283838	KM283860	KM283795	Indonesia	<i>Coccus viridis</i> (Hemiptera)
<i>Akanthomyces attenuatus</i>	CBS 170.76 TYPE	MH872739	OP762607	OP762611	OP762615	OP752153	Poland	Carpocapsa (Lepidoptera)
<i>Akanthomyces attenuatus</i>	CBS 402.78 REPLACETYPE	AJ292434	EF468782	EF468888	EF468935	AF339565	UK	Not determined
<i>Akanthomyces muscarius</i>	CBS 143.62 TYPE	MH858126	KM283821	KM283841	KM283863	KM283798	England	<i>Trialeurodes vaporariorum</i> (Hemiptera)
<i>Akanthomyces dipterigenus</i>	CBS 126.27 TYPE	OP756342	KM283820	KM283840	KM283862	KM283797	Sri Lanka	<i>Icerya purchasi</i> (Hemiptera)
<i>Akanthomyces dipterigenus</i>	CBS 102072	n.a.	KM283819	KM283839	KM283861	KM283796	UK	<i>Macrosiphoniella sanborni</i> (Hemiptera)
<i>Akanthomyces pissodis</i>	CBS 118231 TYPE	n.a.	KM283822	KM283842	KM283864	KM283799	Canada	<i>Pissodes strobi</i> (Coleoptera)
<i>Akanthomyces pissodis</i>	BBC7	MT004829	MT027503	MT027506	MT027509	MT004835	Croatia	<i>Corythucha arcuata</i> (Hemiptera)
<i>Akanthomyces sabanensis</i>	ANDES-F 1024 TYPE	KC633232	KC633266	n.a.	KC633249	KC875225	Colombia	<i>Parthenolecanium</i> sp. (Hemiptera)
<i>Akanthomyces sabanensis</i>	ANDES-F 1023	KC633237	KC633267	KC875222	n.a.	n.a.	Colombia	<i>Parthenolecanium</i> sp. (Hemiptera)
<i>Akanthomyces araneicola</i>	GZAC GY29011 TYPE	MK942431	MK955950	MK955944	MK955947	n.a.	China	Spider (Araneae)
<i>Akanthomyces araneogenum</i>	GZUIF SN1	MH978177	MH978188	MH978183	MH978186	n.a.	China	Spider (Araneae)
<i>Akanthomyces coccidioperitheciatus</i>	NHJ 6709	JN049865	EU369025	EU369067	EU369086	EU369042	n.a.	Spider (Araneae)
<i>Akanthomyces farinosa</i>	CBS 541.81 TYPE	AY624180	MF416498	MF416655	MF416449	MF416553	Ecuador	Spider (Araneae)
<i>Akanthomyces kanyawimiae</i>	TBRC 7242	MF140751	MF140838	MF140784	MF140808	MF140718	Thailand	Spider (Araneae)
<i>Akanthomyces lepidopterorum</i>	GZAC SD05151	MT705971	n.a.	n.a.	MT727044	n.a.	China	Lepidoptera
<i>Akanthomyces neocoleopterorum</i>	GZAC GY11241 TYPE	MN093295	MN097813	MN097816	MN097812	n.a.	China	Ladybug (Coleoptera)
<i>Akanthomyces noctuidarum</i>	BCC36265 TYPE	MT356072	MT477978	MT477994	MT477987	MT356084	Thailand	Noctuidae (Lepidoptera)
<i>Akanthomyces pyralidarum</i>	BCC28816 TYPE	MT356080	MT477982	MT478000	MT478007	MT356091	Thailand	Pyralidae (Lepidoptera)
<i>Akanthomyces tortricidarum</i>	BCC72638 TYPE	MT356076	MT478004	MT477997	MT477992	MT356088	Thailand	Tortricidae (Lepidoptera)
<i>Akanthomyces sulphureus</i>	TBRC 7248 TYPE	MF140758	MF140843	MF140787	MF140812	MF140722	Thailand	Spider (Araneae)
<i>Akanthomyces thailandicus</i>	TBRC 7245 TYPE	MF140754	MF140839	n.a.	MF140809	n.a.	Thailand	Spider (Araneae)
<i>Akanthomyces tuberculatus</i>	OSC 111002	JN049830	DQ522338	n.a.	DQ522435	DQ518767	n.a.	Lepidoptera
<i>Akanthomyces waltebergamsii</i>	TBRC 7252 TYPE	MF140748	MF140834	MF140782	MF140806	MF140714	Thailand	Spider (Araneae)
<i>Akanthomyces aculeatus</i>	HUA 186145 TYPE	n.a.	MF416465	n.a.	n.a.	MF416520	n.a.	n.a.
<i>Akanthomyces aculeatus</i>	NTUCC 20-060	MT974202	MW200213	MW200221	MW200230	MT974356	Taiwan	n.a.
<i>Samsoniella alboaurantia</i>	CBS 240.32 TYPE	AY624178	JF416019	JN049895	JF415999	JF415979	Netherlands	Lepidoptera
<i>Samsoniella aurantia</i>	TBRC 7271 TYPE	MF140764	MF140846	MF140791	MF140818	MF140728	Thailand	Lepidoptera
<i>Samsoniella inthanonensis</i>	TBRC 7915 TYPE	MF140761	MF140849	MF140790	MF140815	MF140725	Thailand	Lepidoptera
<i>Beauveria bassiana</i>	ARSEF 1564 TYPE	HQ880761	HQ880974	HQ880833	HQ880905	n.a.	Italy	<i>Hyphantria cunea</i> (Lepidoptera)
<i>Beauveria bassiana</i>	ARSEF 2991	n.a.	n.a.	n.a.	n.a.	EU334676	Canada	<i>Leptinotarsa decemlineata</i> (Coleoptera)

n.a. = data not available