Supporting Information

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Table S1. List of 53 plant species extract of which exhibited the JHAN activity and mosquito larvicidal toxicity

Plant family	Plant species	Plant part
Aceraceae	Acer takesimense	Trunk-bark
Araliaceae	Hedera rhombea	Fruit
Araliaceae	Kalopanax pictus	Trunk-bark
Araliaceae	Acanthopanax chiisanensis	Trunk
Araliaceae	Oplopanax elatus	Trunk
Araliaceae	Aralia continentalis	Whole
Aristolochiaceae	Aristolochia manshuriensis	Trunk
Betulaceae	Betula schmidtii	Leaf
Betulaceae	Alnus japonica	Flower
Betulaceae	Alnus firma	Flower
Celastraceae	Euonymus sieboldiana	Fruit
Compositae	Aster koraiensis	Flower
Compositae	Solidago serotina	Root
Compositae	Rudbeckia laciniata var. hortensis	Root
Compositae	Carpesium abrotanoides	Flower
Compositae	Siegesbeckia glabrescens	Whole
Compositae	Helianthus annuus	Fruit-seed
Cupressaceae	Thuja orientalis	Trunk-bark
Cupressaceae	Juniperus virginiana	Leaf-trunk
Cupressaceae	Juniperus communis	Trunk-bark
Ericaceae	Rhododendron micranthum	Leaf-trunk
Euphorbiaceae	Euphorbia ebracteolata	Root
Euphorbiaceae	Mallotus japonicus	Exciple
Lauraceae	Actinodaphne lancifolia	Whole
Lauraceae	Neolitsea sericea	Fruit
Lauraceae	*Lindera obtusiloba*	Trunk-bark
Lauraceae	*Lindera erythrocarpa*	Fruit
Leguminosae	*Trifolium pratense*	Whole
Leguminosae	*Sophora flavescens*	Root
Leguminosae	*Albizzia julibrissin*	Trunk-bark
Liliaceae	*Majanthemum dilatatum*	Flower
Magnoliaceae	*Magnolia sieboldii*	Trunk
Moraceae	*Ficus carica*	Trunk-bark
Pinaceae	*Pinus thunbergii*	Trunk-heartwood
Pinaceae	*Pinus banksiana*	Trunk
Pinaceae	*Pinus densiflora*	Root
Pinaceae	*Pinus koraiensis*	Root
Pinaceae	*Pinus densiflora for. multicaulis*	Trunk
Pinaceae	*Pinus bungeana*	Trunk
Primulaceae	*Primula modesta var. fauriae*	Whole
Pteridaceae	Matteuccia orientalis	Whole
Rosaceae	*Spiraea microgyna*	Seed
Rutaceae	*Citrus junos*	Root
Salicaceae	*Salix hallaisanensis*	Leaf
Saxifragaceae	*Hydrangea macrophylla for. otaksa*	Grass
Sterculiaceae	*Firmiana simplex*	Leaf-trunk
Taxodiaceae	*Sciadopitys verticillata*	Leaf
Umbelliferae	*Angelica czernevia*	Root
Umbelliferae	*Peucedanum japonicum*	Root
Urticaceae	*Pilea hamaoi*	Whole
Valerianaceae	*Patrinia scabiosaefolia*	Seed
Verbenaceae	*Caryopteris divaricata*	Seed
Zingiberaceae	*Zingiber officinale*	Root

Table S2. Prolonged effect of LE3B on mosquito development

	Overnight survival	Days to adult emergence	Peak day to adult emergence	Length of ovaries (μm)	Ovarian follicles: Mean diameter (μm)	Numbers of follicles per ovary
LE3B-1	10/20	8–14	10		89.5 ±11.4*	60.8 ± 24.2*
LE3B-2	15/20	10–18	11	Seven individuals		
LE3B-3	13/20	9–18	16	968.1 ± 224.9*		
Control-1	19/20	14–22	19		115.1 ± 16.1	102.8 ± 17.4
Control-2	18/20	14–23	19	Seven individuals		
Control-2	19/20	13–22	18	1,529.3 ± 215.2		

*$P < 0.001$, *t* test.

Table S3. Phylogenetic distribution of plants with JHAN activity

Phylum	Class	Subclass	Family	Seventy-two species with anti-juvenoid activity	Hypergeometrical distribution	Fifty-three species with anti-juvenoid and larvicidal toxicity	Hypergeometrical distribution	1,651 total plant species
Angiospermae	Dicotyledoneae	Archichlamydeae	Aceraceae	2		1		21
Angiospermae	Dicotyledoneae	Archichlamydeae	Amaranthaceae	2		0		9
Angiospermae	Dicotyledoneae	Archichlamydeae	Araliaceae	5	0.0001	5	2.90E-05	13
Angiospermae	Dicotyledoneae	Archichlamydeae	Aristolochiaceae	1		1		4
Angiospermae	Dicotyledoneae	Archichlamydeae	Berberidaceae	1		0		7
Angiospermae	Dicotyledoneae	Archichlamydeae	Betulaceae	3		3		19
Angiospermae	Dicotyledoneae	Archichlamydeae	Celastraceae	2		1		14
Angiospermae	Dicotyledoneae	Archichlamydeae	Euphorbiaceae	2		2		22
Angiospermae	Dicotyledoneae	Archichlamydeae	Lauraceae	4	0.0016	4	0.0005	13
Angiospermae	Dicotyledoneae	Archichlamydeae	Leguminosae	4		3		71
Angiospermae	Dicotyledoneae	Archichlamydeae	Magnoliaceae	2		1		9
Angiospermae	Dicotyledoneae	Archichlamydeae	Moraceae	1		1		18
Angiospermae	Dicotyledoneae	Archichlamydeae	Rosaceae	1		1		107
Angiospermae	Dicotyledoneae	Archichlamydeae	Rutaceae	1		1		15
Angiospermae	Dicotyledoneae	Archichlamydeae	Salicaceae	1		1		18
Angiospermae	Dicotyledoneae	Archichlamydeae	Saxifragaceae	2		1		32
Angiospermae	Dicotyledoneae	Archichlamydeae	Simaroubaceae	1		0		2
Angiospermae	Dicotyledoneae	Archichlamydeae	Sterculiaceae	1		1		3
Angiospermae	Dicotyledoneae	Archichlamydeae	Theaceae	2		0		9
Angiospermae	Dicotyledoneae	Archichlamydeae	Umbelliferae	3		2		38
Angiospermae	Dicotyledoneae	Archichlamydeae	Urticaceae	1		1		15
Angiospermae	Dicotyledoneae	Sympetalae	Caprifoliaceae	1		0		30
Angiospermae	Dicotyledoneae	Sympetalae	Compositae	7		6		158
Angiospermae	Dicotyledoneae	Sympetalae	Ericaceae	1		1		6
Angiospermae	Dicotyledoneae	Sympetalae	Lentibulariaceae	1		0		1
Angiospermae	Dicotyledoneae	Sympetalae	Primulaceae	1		1		9
Angiospermae	Dicotyledoneae	Sympetalae	Valerianaceae	1		1		7
Angiospermae	Dicotyledoneae	Sympetalae	Verbenaceae	1		1		10
Angiospermae	Monocotyledoneae		Cyperaceae	1		0		32
Angiospermae	Monocotyledoneae		Gramineae	1		0		60
Angiospermae	Monocotyledoneae		Liliaceae	3		1		63
Angiospermae	Monocotyledoneae		Zingiberaceae	1		1		2
Gymnospermae	Coniferopsida		Cupressaceae	4	0.0008	3	0.004	11
Gymnospermae	Coniferopsida		Pinaceae	8	1.51E-07	6	7.40E-06	17
Gymnospermae	Coniferopsida		Taxodiaceae	1		1		4
Pteridophyta			Pteridaceae	2		1		32

Plant extracts that had either JHAN activity or both JHAN activity and larvicidal toxicity were grouped into the corresponding plant families. Significantly overrepresented families (hypergeometric distribution, $P < 0.01$) are highlighted in yellow.

Fig. S1. Pyriproxyfen-mediated binding of *A. aegypti* Met-CYC, *C. pipiens* Met-CYC, and *T. castaneum* Met-SRC was observed by means of the growth complementation test of Y2HGold yeast cells transformed with each corresponding pair of plasmids.

Fig. S1

Fig. S2. Quantitative β-galactosidase assay with Y187 yeast cells transformed with each corresponding pair of plasmids.

Fig. S2

Fig. S3. Molecular characterization of five PJHAN compounds isolated from two plant extracts: *L. erythorocarpa* fruits and *S. serotina* roots. ^{1}H–NMR spectrum of each compound (*A–E*), ^{13}C-NMR spectrum of each compound (*F–J*), and elemental composition report combined with HRESIMS spectrum and ULPC chromatogram of each compound (*K–O*) is shown.

Fig. S3

Fig. S4. The cytotoxicity test of purified compounds with HEK293 cells by WST-1 assay.

Fig. S4

Fig. S5. The exposure of mosquito second-instar larvae to LE3B impaired the ovary development in adult female mosquitoes that emerged from the diterpene-treated larvae.

Fig. S5