

Supplementary material

Screening results in ER Binding, ERE-luciferase, and Alkaline Phosphatase Assays

Plant or sample name and plant part	Extract Type	¹ Binding		^{2,3} ERE-luc		^{3,4} ALP		^{3,4} SRB		¹ Binding		^{2,3} ERE-luc		
		ER alpha	ER beta	ER alpha	ER beta	Estrogenic	Antiestrogenic	Cytotoxicity	ER beta	ER beta	ER beta	ER beta		
17 β estradiol	Control	95 \pm 1		21 \pm 7		100 \pm 10				4 \pm 2		90 \pm 1		
4-hydroxy tamoxifen	Control	96 \pm 1		1 \pm 0.1		0 \pm 5				2 \pm 1		94 \pm 1		
DMSO	Control	0		1 \pm 0.2		1 \pm 2				1 \pm 2		0		
<i>Alisma plantago-aquatica</i> (Water Plantain) rhizomes	Petroleum ether Dichloromethane 75% ethanol	31 \pm 5 25 \pm 13 2 \pm 2		0.9 \pm 0.4 2.4 \pm 1.5 1.2 \pm 0.4		-7.3 \pm 4.2 -9.8 \pm 11 -10.4 \pm 7.8		-1.5 \pm 13.3 3.3 \pm 14 -2.1 \pm 10.4		10.7 \pm 16.2 -5.7 \pm 7.8 -17.8 \pm 11.8		51 \pm 7 26 \pm 3 8 \pm 6		
<i>Angelica sinensis</i> (Dang-Gui) roots	⁵ Methanol ⁵ Petroleum ether ⁵ Chloroform ⁵ Butanol ⁵ Water	8 \pm 7 81 \pm 10 19 \pm 9 4 \pm 3 7 \pm 11		1.8 \pm 0.5 9.7 \pm 3.5 5.9 \pm 3 9.5 \pm 2.2 1.3 \pm 0.8		-2.3 \pm 5.5 -4.7 \pm 6.2 12.3 \pm 4.7 12.4 \pm 8.2 -0.3 \pm 1.2		15.3 \pm 8.8 48.7 \pm 9.5 19.4 \pm 9.8 -16.3 \pm 4.5 -13.5 \pm 2.5		3.1 \pm 17.1 16.4 \pm 13.6 30.6 \pm 8 3.3 \pm 15.2 -9.4 \pm 6.1		34 \pm 5 99 \pm 9 46 \pm 6 0 \pm 2 0 \pm 4		1.3 \pm 0.6 1.1 \pm 0.4 0.8 \pm 0.5 1.2 \pm 0.2 1 \pm 0.1
<i>Asclepias tuberosa</i> (Butterfly weed) roots	Petroleum ether Dichloromethane 75% ethanol	69 \pm 7 16 \pm 9 0 \pm 2		1.1 \pm 0.4 4.1 \pm 3.1 3.9 \pm 4.3		-17.9 \pm 15.5 -26.5 \pm 4.5 -10.3 \pm 8.9		-9.1 \pm 21 114.6 \pm 6.7 110.1 \pm 8.5		-19.9 \pm 9.8 106.1 \pm 5.3 99.1 \pm 3.6		85 \pm 5 32 \pm 10 5 \pm 8		1.1 \pm 0.8 10.7 \pm 0.8 1.3 \pm 1.1
<i>Beta vulgaris</i> (Beets) roots	Petroleum ether Dichloromethane 75% ethanol	35 \pm 10 33 \pm 11 6 \pm 5		4.7 \pm 1.9 3.2 \pm 2 1 \pm 0.2		-2.4 \pm 17.4 -2.3 \pm 5.5 -7.4 \pm 10.4		4.4 \pm 14.8 43.7 \pm 8.6 -8.7 \pm 17.7		-15.9 \pm 29.4 -20.2 \pm 30.9 -14 \pm 33.7		44 \pm 7 30 \pm 5 8 \pm 13		1.1 \pm 0.3 1.1 \pm 0.1 1.1 \pm 0.4
<i>Cimicifuga americana</i> (Yellow cohosh) roots	Petroleum ether Dichloromethane 75% ethanol	37 \pm 8 31 \pm 5 9 \pm 8		1.6 \pm 0.7 2.8 \pm 1.1 1.1 \pm 0.2		-5.8 \pm 14.4 -16.2 \pm 14.9 -4.4 \pm 14.3		27.1 \pm 27.5 79.2 \pm 19.5 -10 \pm 12.4		-3.7 \pm 37 5.8 \pm 32.1 -22.4 \pm 25		47 \pm 10 21 \pm 9 7 \pm 6		1.4 \pm 0.3 1.4 \pm 0.6 1 \pm 0.1

¹ Percent binding at 200 μ g/mL.

² Fold Induction where DMSO is 1.

³ Tested at 20 μ g/mL.

⁴ Percent induction (estrogenic), inhibition (antiestrogenic), or cytotoxic.

⁵ Fraction instead of partition.

⁶ Bold face-type indicates assay activity.

Plant or sample name and plant part	Extract Type	¹ Binding		^{2,3} ERE-luc		^{3,4} ALP		^{3,4} SRB		¹ Binding		^{2,3} ERE-luc	
		ER alpha	ER beta	ER alpha	ER beta	Estrogenic	Antiestrogenic	Cytotoxicity	Cytotoxicity	ER beta	ER beta	ER beta	ER beta
<i>Cimicifuga racemosa</i> (Black cohosh) aerial parts	DCM extract	34 ± 7	6.6 ± 3.2	-2.5 ± 1.3	3.5 ± 8.7	8.3 ± 5.2		8.3 ± 5.2	45 ± 3	1.1 ± 0.4			
	75% EtOH	21 ± 5	5.8 ± 1.8	4.3 ± 5.3	-48.4 ± 4.9	0.1 ± 5.7		0.1 ± 5.7	23 ± 3	1 ± 0.2			
	PE extract	55 ± 8	3.2 ± 1.5	-4.5 ± 4.8	21.3 ± 7.2	4.8 ± 10.9		4.8 ± 10.9	64 ± 8	1 ± 0.5			
<i>Cimicifuga rubrifolia</i> (Appalachian bugbane) aerial parts	Petroleum ether	56 ± 2	2.5 ± 2	-13.1 ± 12.4	33.2 ± 17	-23.2 ± 25		-23.2 ± 25	66 ± 6	1.1 ± 0.5			
	Dichloromethane	51 ± 5	7.4 ± 1.1	0.3 ± 15.9	21 ± 14.2	4.4 ± 19.8		4.4 ± 19.8	40 ± 8	0.8 ± 0.3			
	75% ethanol	4 ± 3	2.3 ± 1.4	6 ± 13	-30.5 ± 22.1	6.8 ± 11.7		6.8 ± 11.7	4 ± 7	1.1 ± 0.6			
<i>Cornus officinalis</i> (Dogwood) fruits	Petroleum ether	26 ± 16	24.3 ± 6.6	2.6 ± 5.9	41.8 ± 4.1	11.5 ± 3.4		11.5 ± 3.4	48 ± 4	1.5 ± 0.5			
	Dichloromethane	0 ± 4	2.5 ± 0.7	-2.2 ± 4.8	24.9 ± 5.2	30.6 ± 19.1		30.6 ± 19.1	0 ± 2	1.3 ± 0.3			
	75% ethanol	17 ± 2	0.5 ± 0.7	-0.2 ± 7.9	-10.8 ± 6.3	-8.9 ± 6.1		-8.9 ± 6.1	5 ± 3	1 ± 0.5			
<i>Daucus carota</i> (Carrots) roots	Petroleum ether	21 ± 6	12.3 ± 5.1	-6.8 ± 11.2	-26.6 ± 14.6	-18.7 ± 19.1		-18.7 ± 19.1	36 ± 6	0.9 ± 0.5			
	Dichloromethane	22 ± 5	5.4 ± 1.8	-5.7 ± 8	-11.5 ± 16.1	13.7 ± 14.1		13.7 ± 14.1	26 ± 6	0.7 ± 0.2			
	75% ethanol	8 ± 8	0.8 ± 0.6	-7.7 ± 8.7	-19.5 ± 14.9	-6.3 ± 9.5		-6.3 ± 9.5	19 ± 10	1 ± 0.5			
<i>Paeonia moutan</i> (Peony) bark	Petroleum ether	21 ± 5	2.8 ± 1	-9.7 ± 11.4	8.7 ± 16.7	7.7 ± 19.7		7.7 ± 19.7	60 ± 6	2 ± 1.7			
	Dichloromethane	19 ± 6	3.4 ± 2.8	-10.7 ± 13	24.4 ± 14.7	11.5 ± 16.1		11.5 ± 16.1	19 ± 5	1.8 ± 0.2			
	75% ethanol	14 ± 13	0.8 ± 0.3	-10 ± 8.9	-30.2 ± 22.7	-10.1 ± 18.3		-10.1 ± 18.3	3 ± 5	1 ± 0.4			
⁷ <i>Polygonum multiflorum</i> (Fo-Ti) roots	Petroleum ether	15 ± 8	21.7 ± 8.5	6.5 ± 1.8	1.2 ± 3.3	7.6 ± 14.3		7.6 ± 14.3	50 ± 9	1.4 ± 0.7			
	Dichloromethane	30 ± 7	25.8 ± 11.2	12.3 ± 3.4	0.4 ± 12.3	12.7 ± 17.8		12.7 ± 17.8	36 ± 13	3 ± 2.5			
	75% ethanol	4 ± 3	1.5 ± 0.2	0.7 ± 3.3	3.9 ± 18.2	2.7 ± 7.5		2.7 ± 7.5	0 ± 3	1.2 ± 1.1			
⁸ <i>Polygonum multiflorum</i> (Fo-Ti) roots	Petroleum ether	22 ± 16	15.1 ± 9.1	-1.5 ± 0.6	36.1 ± 48.6	18.4 ± 22.6		18.4 ± 22.6	26 ± 9	1.2 ± 0.9			
	Dichloromethane	16 ± 5	16 ± 3.4	-0.2 ± 1.6	68.3 ± 11.5	31.1 ± 19.1		31.1 ± 19.1	16 ± 7	0.9 ± 0.7			
	75% ethanol	5 ± 3	0.7 ± 0.2	-0.4 ± 2.5	16.5 ± 26.2	18 ± 20.5		18 ± 20.5	0 ± 3	1 ± 0.2			
<i>Pueraria lobata</i> (Kudzu) aerial parts	Petroleum ether	32 ± 2	10.3 ± 2.8	-10.8 ± 12.6	46.9 ± 18.9	12.7 ± 30		12.7 ± 30	36 ± 2	1.5 ± 1.4			
	Dichloromethane	63 ± 6	24.5 ± 9.9	-0.3 ± 25.6	36 ± 32.6	-3.3 ± 5.5		-3.3 ± 5.5	45 ± 19	1.2 ± 0.5			
	75% ethanol	17 ± 16	26.9 ± 12.7	-1.3 ± 13.8	28.9 ± 40.7	7.6 ± 50.1		7.6 ± 50.1	63 ± 3	3.5 ± 1.3			
<i>Pueraria mirifica</i> (Kwao Keur) bark	Petroleum ether	12 ± 8	⁹ N.T.	-2.7 ± 2.6	58.5 ± 37	100.6 ± 38.8		100.6 ± 38.8	18 ± 12	N.T.			
	Dichloromethane	12 ± 5	25.7 ± 9.5	-4.2 ± 1.1	101.1 ± 8.6	115 ± 2.2		115 ± 2.2	19 ± 11	3.2 ± 1.6			
	75% ethanol	18 ± 7	28 ± 8.6	-1.4 ± 4.8	52.2 ± 61	60.4 ± 62.2		60.4 ± 62.2	31 ± 8	2.4 ± 1.3			
<i>Valeriana officinalis</i> (Valerian)	Petroleum ether	43 ± 11	7.2 ± 3.1	-7.8 ± 7.6	33.7 ± 16.8	12.5 ± 19.3		12.5 ± 19.3	81 ± 4	1.3 ± 0.8			
	Dichloromethane	13 ± 12	5.9 ± 1.6	-8.5 ± 7.7	19.4 ± 8.2	-7.6 ± 21		-7.6 ± 21	13 ± 6	0.7 ± 0.1			

⁷ BC number 268.

⁸ BC number 286.

⁹ Not tested due to the limited quantities available.

Plant or sample name and plant part	Extract Type	¹ Binding		^{2,3} ERE-luc		^{3,4} ALP		^{3,4} SRB		¹ Binding		^{2,3} ERE-luc	
		ER alpha	ER alpha	ER alpha	Estrogenic	Antiestrogenic	Cytotoxicity	ER beta	ER beta	ER beta	ER beta		
roots	75% ethanol	12 ± 6	1.7 ± 1.1	-10.4 ± 9.5	-0.8 ± 5.4	-18.9 ± 15.6	7 ± 11	7 ± 11	1.1 ± 0.5				
<i>Viburnum opulus</i> (Guelder Rose) bark	Petroleum ether	17 ± 17	1.3 ± 0.4	-0.3 ± 0.9	-2.1 ± 5.8	7.1 ± 12.6	11 ± 8	11 ± 8	1.2 ± 0.6				
	Dichloromethane	11 ± 4	1.4 ± 0.2	1.6 ± 1.4	14 ± 7.4	22.5 ± 4	6 ± 2	6 ± 2	0.8 ± 0.2				
	75% ethanol	22 ± 10	1.4 ± 0.3	-1.2 ± 0.7	-17.5 ± 11.4	11.4 ± 6.9	24 ± 16	24 ± 16	0.7 ± 0.6				
<i>Viburnum prunifolium</i> (Black Haw) bark	Petroleum ether	12 ± 6	0.8 ± 0.3	-3.7 ± 0.7	-9.8 ± 0.8	7.7 ± 5.7	6 ± 3	6 ± 3	1 ± 0.5				
	Dichloromethane	3 ± 6	0.7 ± 0.5	-3.5 ± 3	68.5 ± 6.3	42 ± 4.4	3 ± 4	3 ± 4	1 ± 0				
	75% ethanol	10 ± 10	4.9 ± 3.7	-0.5 ± 2.2	-33 ± 7.9	-2.7 ± 11.2	3 ± 9	3 ± 9	0.9 ± 0.6				
<i>Vitex agnus-castus</i> (Chasteberry) fruits	Petroleum ether	37 ± 6	9.5 ± 2.5	-1.1 ± 1.6	43.5 ± 3.3	39.1 ± 8.3	68 ± 9	68 ± 9	1.1 ± 0.7				
	Dichloromethane	13 ± 3	9.6 ± 6.6	-2.3 ± 1.5	94.5 ± 7.2	112.5 ± 8.8	20 ± 19	20 ± 19	0.8 ± 0.3				
	75% ethanol	10 ± 8	2.3 ± 0.9	-1.5 ± 2.7	-14.3 ± 7.6	2.3 ± 7.9	7 ± 7	7 ± 7	1.3 ± 0.7				