

Repellency of Carvacrol, Thymol, and Their Acetates against Imported Fire Ants

Pradeep Paudel¹, Farhan Mahmood Shah¹, Dileep Kumar Guddeti¹, Abbas Ali¹, Jian Chen², Ikhlas A. Khan^{1,3}, and Xing-Cong Li^{1,3,*}

¹ National Center for Natural Products Research, School of Pharmacy, The University of Mississippi, University, MS 38677, USA; phr.paudel@gmail.com (P.P.); fshah@olemiss.edu (F.M.S.); gdileepkumar19@gmail.com (D.K.G.); aali@olemiss.edu (A.A.); ikhan@olemiss.edu (I.A.K.)

² Biological Control of Pests Research Unit, USDA-ARS, Stoneville, MS 38776, USA; jian.chen@usda.gov

³ Department of BioMolecular Sciences, School of Pharmacy, The University of Mississippi, University, MS 38677, USA

*Correspondence: xcli7@olemiss.edu; Tel.: +1-662-915-6742

Legends

Figure S1: GC-MS profiles of (a) thyme and (b) red-thyme essential oils.

Figure S2: ^1H -NMR spectrum of carvacrol acetate in CDCl_3 .

Figure S3: ^{13}C -NMR spectrum of carvacrol acetate in CDCl_3 .

Figure S4: ^1H -NMR spectrum of thymol acetate in CDCl_3 .

Figure S5: ^{13}C -NMR spectrum of thymol acetate in CDCl_3 .

Table S1: List of compounds in Red-Thyme oil identified by GC-MS analysis.

Table S2: List of compounds in Thyme oil identified by GC-MS analysis.

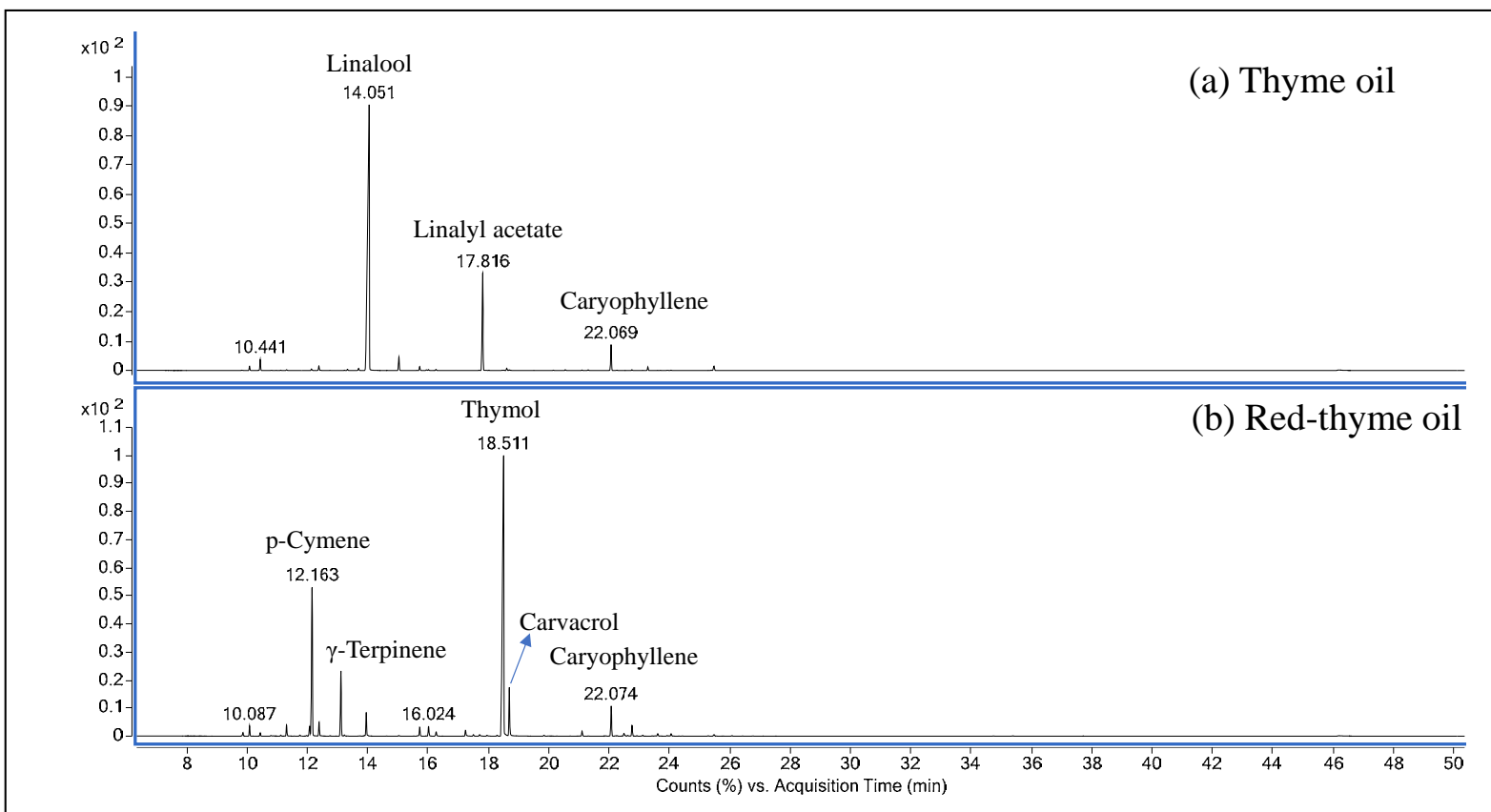


Figure S1: GC-MS profiles of (a) thyme and (b) red-thyme essential oils.

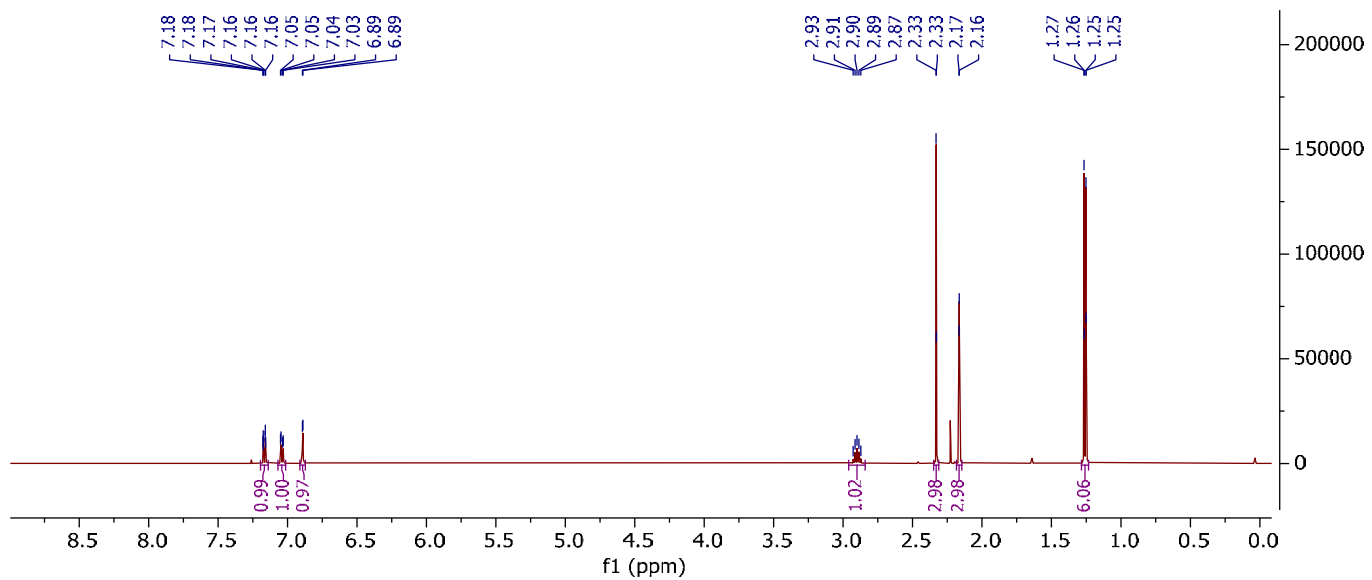


Figure S2: ¹H-NMR spectrum of carvacrol acetate in CDCl₃.

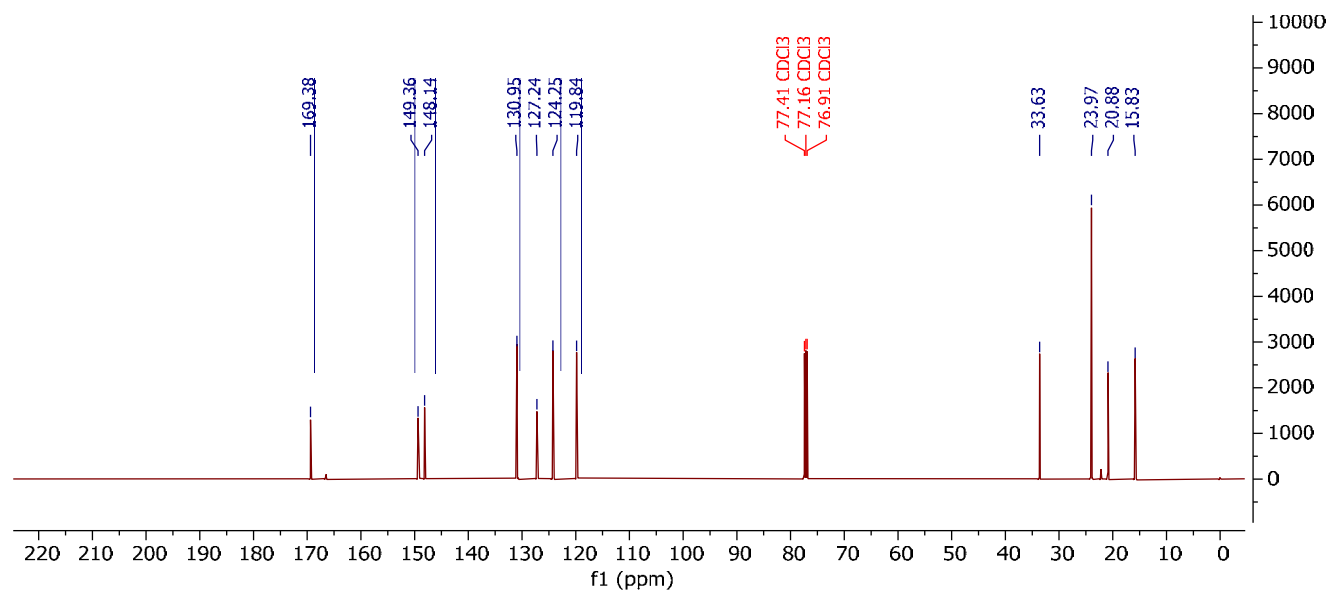


Figure S3: ¹³C-NMR spectrum of carvacrol acetate in CDCl₃.

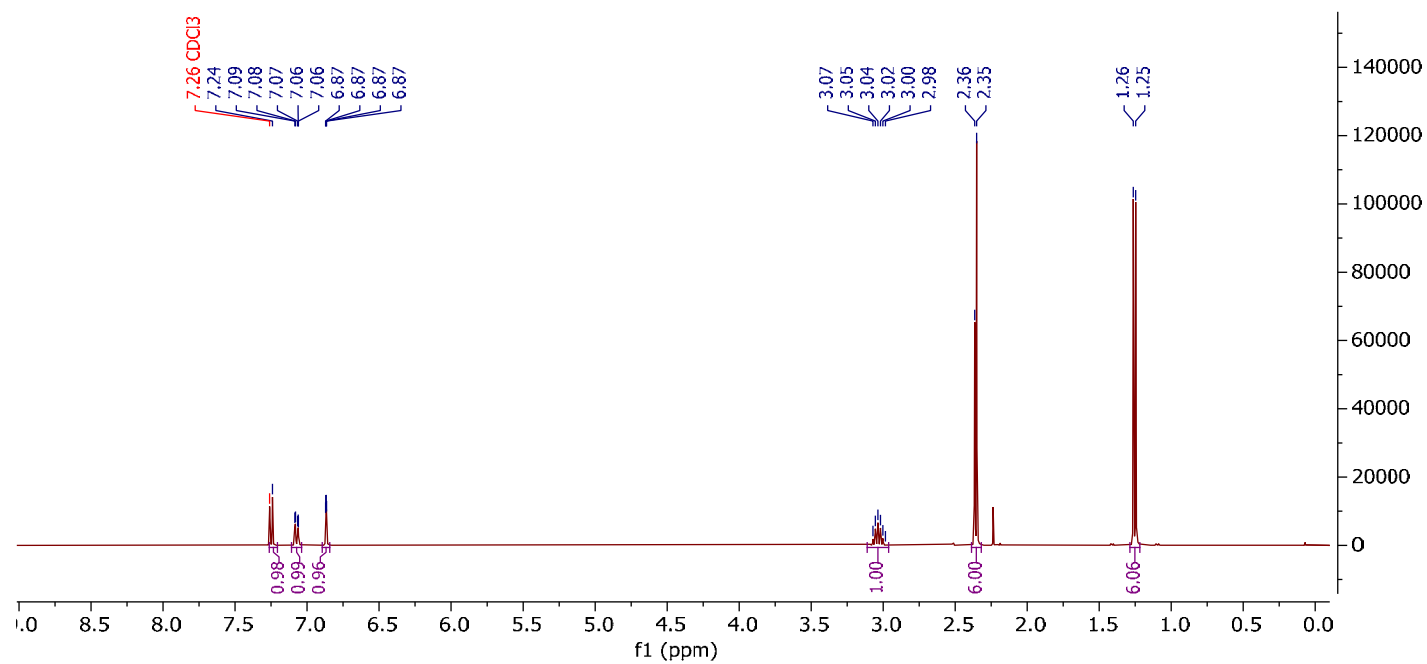


Figure S4: ¹H-NMR spectrum of thymol acetate in CDCl₃.

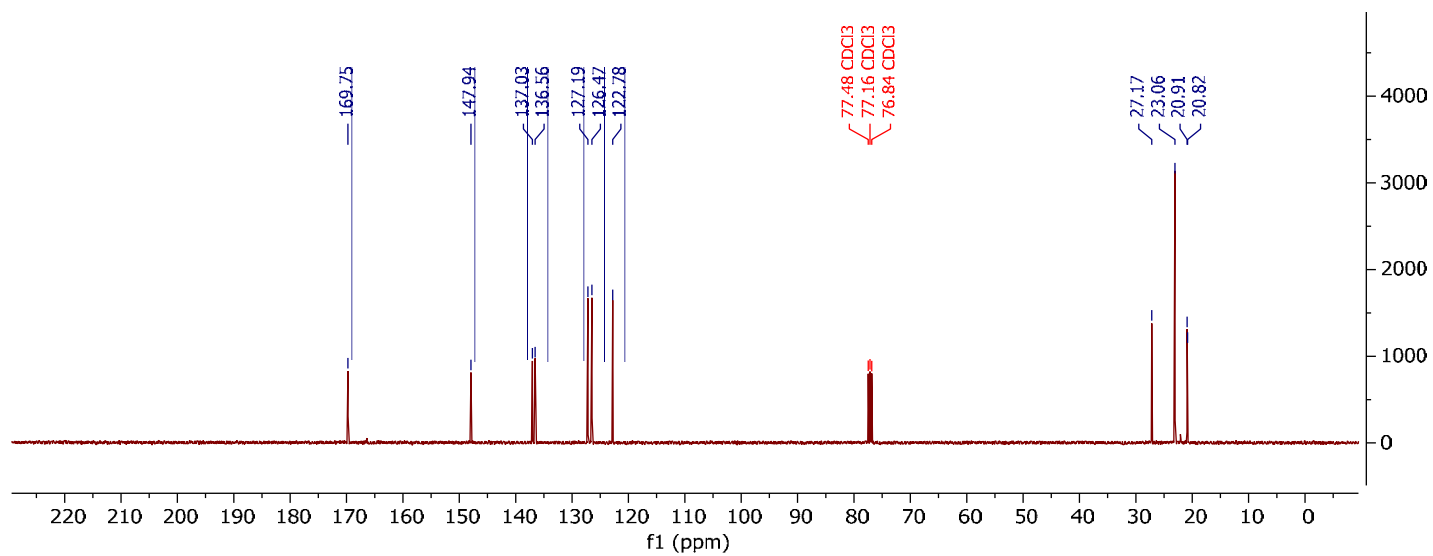


Figure S5: ^{13}C -NMR spectrum of thymol acetate in CDCl_3 .

Table S1: List of compounds in Red-Thyme oil identified by GC-MS analysis.

S. NO	Retention time (min)	Compound	% Composition
1	9.869	α -Thujene	0.369
2	10.086	(+)- α -Pinene	0.958
3	10.442	Camphene	0.314
4	10.799	1-Octen-3-ol	0.080
5	10.879	3-Octanone	0.053
6	11.125	β -Pinene	0.108
7	11.312	β -Myrcene	1.074
8	11.756	α -Phellandrene	0.121
9	11.975	3-Carene	0.069
10	12.077	Terpinolene	1.011
11	12.163	p-Cymene	16.321
12	12.393	Eucalyptol	1.423
13	12.751	β -Ocimene	0.049
14	13.115	γ -Terpinene	6.418
15	13.232	β -Terpineol	0.140
16	13.954	Linalool	2.432
17	15.040	Camphor	0.076
18	15.725	(+)-Borneol	1.018
19	16.024	(-)-Terpinen-4-ol	1.049
20	16.270	Terpineol	0.528
21	17.244	O-Methylthymol	0.648
22	17.506	Methyl Carvacrol	0.169
23	17.709	Geraniol	0.215
24	17.955	Citral	0.143
25	18.511	Thymol	48.829
26	18.699	Carvacrol	5.100
27	19.854	4-Isopropylanisole	0.107
28	20.282	Carvacrol acetate	0.027
29	21.111	α -Copaene	0.528
30	21.303	β -Bourbonene	0.027
31	22.074	Caryophyllene	3.137
32	22.496	Aromandendrene	0.363
33	22.764	Humulene	1.152
34	22.929	Alloaromadendrene	0.056
35	23.122	gamma.-Murolene	0.127
36	23.614	10s,11s-Himachala-3(12),4-diene	0.279
37	23.924	(+)- α -Murolene	0.084
38	24.069	Cadina-1(10),4-diene	0.276
39	25.486	Caryophyllene oxide	0.202

Table S2: List of compounds in Thyme oil identified by GC-MS analysis.

S. NO	Retention time (min)	Compound	% Composition
1	10.088	(+)- α -Pinene	0.511
2	10.441	Camphene	1.325
3	11.125	β -Phellandrene	0.050
4	11.318	β -Myrcene	0.114
5	12.142	p-Cymene	0.227
6	12.387	Eucalyptol	0.583
7	13.336	cis-Linalool oxide (furanoid)	0.171
8	13.704	trans-Linalool oxide (furanoid)	0.299
9	14.051	Linalool	71.891
10	15.035	Camphor	1.704
11	15.727	(+)-Borneol	0.513
12	15.951	3,7-Octadiene-2,6-diol, 2,6-dimethyl-	0.110
13	16.022	(-)-Terpinen-4-ol	0.154
14	16.267	α -Terpineol	0.180
15	17.816	Linalyl acetate	13.386
16	18.615	Bornyl acetate	0.303
17	18.696	Carvacrol	0.145
18	20.162	Geranyl palmitate	0.070
19	20.554	Geranyl acetate	0.111
20	21.309	β -Bourbonene	0.090
21	22.069	Caryophyllene	3.385
22	22.272	α -trans-Bergamotene	0.054
23	22.766	Humulene	0.105
24	23.290	Germacrene D	0.472
25	24.064	Cadina-1(10),4-diene	0.052
26	25.481	Caryophyllene oxide	0.716