Table 1
^{1}H NMR spectroscopic data (δ ^{1}H, *J* in Hz) for **1**–**4** in *$CDCl_3$ or MeOD

Atom	*1	1	*2	2	3	4
1	1.83 *m*	1.81 *m*	2.89 *m*	2.89 *dt* (13.7, 3.6)	2.33 *dt* (13.6, 3.7)	2.33 *dt* (13.5, 3.5)
	1.12 *m*	1.13 *m*	1.19 *m*	1.21 *m*	1.32 m	1.42 m
2	1.99 *m*, 1.49 *m*	1.88 *m*, 1.50 *m*	1.94 *m*, 1.49 *m*	1.82 *m*, 1.48 *m*	1.85 *m*, 1.45 *m*	1.72 *m*, 1.31 *m*
3	3.98 *br m*	3.93 *dd* (11.6, 5.3)	3.98 *br m*	3.91 *br m*	3.93 *dd* (11.8, 5.4)	3.92 *dd* (11.8, 5.3)
5	1.79 *m*	1.76 *m*	1.83 *m*	1.78 *m*	1.83 *m*	1.87 *m*
6	4.43 *br m*	4.38 *dd* (3.8, 2.1)	4.37 *dd* (3.6, 2.0)	4.31 *dd* (3.7, 2.0)	4.32 *dd* (3.8, 2.0)	4.34 *dd* (3.8, 1.9)
7	5.30 *d* (3.9)	5.17 *d* (3.8)	5.26 *d* (3.6)	5.12 *d* (3.7)	5.15 *d* (3.8)	5.19 *d* (3.8)
9	1.56 *m*	1.60 *m*	1.65 *m*	1.68 *m*	2.01 *d* (11.3)	2.16 *d* (11.3)
11	1.74 *m* , 1.57 *m*	1.77 *m* , 1.60 *m*	4.30 *m*	4.20 *m*	5.48 *dt* (11.0, 5.3)	5.76 *dt* (10.8, 5.5)
12	1.51 *m* (2H)	1.55 *m* (2H)	1.81 *m*, 1.59 *m*	1.77 *m*, 1.69 *m*	1.79 *m*, 1.64 *m*	1.85 *m*, 1.77 *m*
13	1.53 *m*	1.59 *m*	1.67 *m*	1.69 *m*	1.75 *m*	1.81 *m*
15	1.55 *m*, 1.04 *m*	1.64 *m*, 1.04 *m*	1.45 *m*, 1.06 *m*	1.55 *m*, 1.02 *m*	1.56 *m*, 1.03 *m*	1.61 *m*, 1.06 *m*
16	1.22 *m*, 1.09 *m*	1.13 *m* (2H)	1.23 *m*, 1.11 *m*	1.16 *m* (2H)	1.17 *m*, 1.13 *m*	1.19 *m*, 1.14 *m*
17	0.98 *m*	1.04 *m*	0.97 *m*	1.03 *m*	1.05 *m*	1.07 *m*
19	1.53 *m*, 1.07 *m*	1.55 *m*, 1.11 *m*	1.54 *m*, 1.09 *m*	1.55 *m*, 1.14 *m*	1.50 *m*, 1.14 *m*	1.50 *m*, 1.16 *m*
20	1.83 *m*, 1.44 *m*	1.84 *m*, 1.45 *m*	1.85 *m*, 1.46 *m*	1.86 *m*, 1.47 *m*	1.85 *m*, 1.47 *m*	1.83 *m*, 1.46 *m*
21	2.20 *m*	2.21 *m*	2.21 *m*	2.22 *m*	2.22 *m*	2.23 *m*
23	5.36 *br m*	5.34 *br m*	5.40 *br m*	5.39 *dd* (3.7, 1.8)	5.41 *m*	5.40 *m*
	5.20 *br m*	5.20 *br m*	5.22 *br m*	5.21 *m*	5.22 *m*	5.19 *m*
25-Me	1.06 *s*	1.05 *s*	1.27 *s*	1.24 *s*	1.10 *s*	1.11 *s*
26-Me	1.62 *s*	1.67 *s*	1.65 *s*	1.69 *s*	1.75 *s*	1.81 *s*
27-Me	1.07 *s*	1.08 *s*	1.09 *s*	1.09 *s*	1.12 *s*	1.18 *s*
28-Me	0.68 *s*	0.71 *s*	0.70 *s*	0.74 *s*	0.72 *s*	0.73 *s*
29	4.64 *dd* (2.5, 1.3)	4.64	4.65 *dd* (2.5, 1.4)	4.64 *dd* (2.5, 1.4)	4.64 *dd* (2.4, 1.4)	4.65 *dd* (2.4, 1.4)
	4.62 *dm* (2.5)	4.60	4.62 *dm* (2.5)	4.59 *dm* (2.5)	4.60 *m*	4.60 *m*
30-Me	1.65 *s*	1.64 *s*	1.64 *br dd* (1.4, 0.6)	1.63 *br dd* (1.4, 0.6)	1.63 *s*	1.64 *s*
7-*O*-(4-OHBz)						
2,6	7.97 *d* (8.8)	7.93 *d* (8.9)	7.95 *d* (8.8)	7.92 *d* (8.8)	7.93 *d* (8.8)	7.94 *d* (8.8)
3,5	6.89 *d* (8.8)	6.85 *d* (8.9)	6.88 *d* (8.8)	6.84 *d* (8.8)	6.85 *d* (8.8)	6.86 *d* (8.8)
11-OAc						
Me					2.03 *s*	
11-*O*-(4-OHBz)						
2,6						7.89 *d* (8.8)
3,5						6.85 *d* (8.8)

Table 2
^{13}C NMR spectroscopic data for **1**–**7** in *$CDCl_3$ or MeOD

Atom	***1**	**1**	**2**	**3**	**4**	**5**	***6**	**6**	**7**
1	40.4	41.8	43.6	43.6	43.7	41.8	42.4	43.7	41.6
2	32.5	33.2	33.7	33.7	33.7	33.3	32.9	33.7	37.2
3	73.1	74.0	74.1	73.8	73.8	74.0	73.1	74.1	204.8
4	149.1	151.1	151.6	151.3	151.2	151.1	149.6	151.7	146.6
5	50.5	51.6	51.8	51.3	51.2	51.6	50.6	51.9	51.9
6	71.7	72.0	72.0	71.8	71.8	72.2	71.8	72.2	69.8
7	75.5	77.3	77.0	76.6	76.6	77.8	75.4	77.3	77.1
8	46.7	48.2	49.8	50.1	50.2	48.3	48.5	49.9	49.6
9	49.3	50.8	55.3	52.9	53.2	51.3	54.5	55.7	54.7
10	38.4	39.8	41.3	40.8	41.0	39.9	39.8	41.3	38.9
11	21.4	22.7	71.0	74.5	74.8	23.0	70.5	71.1	71.0
12	24.1	25.4	37.0	32.8	32.9	25.6	36.6	36.9	36.9
13	48.1	49.7	48.3	47.9	47.9	50.5	47.4	48.9	49.1
14	44.3	45.6	45.3	45.2	45.2	45.2	43.6	44.9	44.9
15	35.1	37.0	36.9	36.8	36.8	36.1	33.9	35.9	36.0
16	21.4	22.4	22.6	22.5	22.5	21.2	20.2	21.2	21.2
17	53.7	54.9	55.0	55.0	55.0	140.9	138.5	140.4	140.2
18	44.2	45.5	45.3	45.3	45.2	51.2	49.4	50.9	50.9
19	40.6	41.7	41.4	41.3	41.2	43.2	41.7	42.8	42.9
20	27.1	28.3	28.3	28.3	28.3	28.2	27.4	28.4	28.4
21	48.0	49.5	49.4	49.4	49.4	137.3	136.8	137.7	137.7
22	148.0	149.0	149.0	148.8	148.8	27.6	26.3	27.6	27.6
23	105.3	105.9	106.0	106.5	106.4	105.9	105.5	106.0	122.2
25-Me	16.1	16.7	16.7	16.9	17.0	16.7	16.2	16.7	16.5
26-Me	12.7	13.2	13.8	13.9	14.0	12.8	13.2	13.6	13.7
27-Me	17.3	17.9	18.3	18.3	18.3	16.0	15.7	16.2	16.1
28-Me	15.1	15.6	15.4	15.4	15.4	19.4	18.4	19.0	19.1
29	109.6	110.3	110.3	110.5	110.5	22.3	21.8	22.3	22.2
30-Me	19.8	19.8	19.9	19.9	19.9	21.7	21.3	21.7	21.7
7-*O*-(4-OHBz)									
CO	165.1	167.8	167.8	167.6	167.7	167.6	164.9	167.6	167.4
1	123.3	123.4	123.4	123.2	123.1	123.3	123.1	123.2	123.1
2,6	132.0	133.2	133.1	133.2	133.2	133.2	132.1	133.2	133.2
3,5	115.5	116.3	116.3	116.4	116.4	116.3	115.5	116.3	116.3
4	159.9	163.6	163.7	163.7	163.7	163.6	160.0	163.7	163.7
11-OAc									
CO				172.1					
Me				22.1					
11-*O*-(4-OHBz)									
CO					167.3				
1					123.1				
2,6					133.1				
3,5					116.4				
4					163.8				

Table 3
^{1}H NMR spectroscopic data (δ ^{1}H, *J* in Hz) for **5**–**7** in *$CDCl^{3}$ or MeOD

Atom	**5**	**6 $CDCl_3$**	**6 MeOD**	**7**
1	1.82 *m*	2.90 *dt* (13.8, 4.0)	2.90 *dt* (13.6, 3.6)	3.18 *ddd* (13.6, 6.3, 3.9)
	1.16 *m*	1.20 *m*	1.22 *m*	1.58 *m*
2	1.89 *m*, 1.50 *m*	1.94 *m*, 1.50 *m*	1.82 *m*, 1.48 *m*	2.45 *m* (2H)
3	3.94 *dd* (11.7, 5.5)	3.98 *dd* (11.6, 5.5)	3.92 *dd* (11.8, 5.5)	
5	1.77 *m*	1.84 *br s*	1.80 *m*	2.45 *m*
6	4.37 *dd* (3.6, 2.0)	4.36 *d* (3.6, 2.0)	4.30 *d* (3.5, 2.0)	4.40 *dd* (3.6, 2.3)
7	5.17 *d* (3.6)	5.27 *d* (3.6)	5.13 *d* (3.5)	5.21 *d* (3.6)
9	1.60 *m*	1.69 *m*	1.72 *m*	1.83 *d* (10.7)
11	1.78 *m*, 1.56 *m*	4.25 *dt* (10.8, 4.8)	4.14 *dt* (10.5, 4.4)	4.19 *m*
12	1.47 *m* (2H)	1.77 *m*, 1.50 *m*	1.73 *m*, 1.57 *m*	1.75 *m*, 1.61 *m*
13	1.58 *m*	1.67 *m*	1.69 *m*	1.71 *m*
15	1.50 *m*, 1.22 *m*	1.36 *m*, 1.16 *m*	1.43 *m*, 1.18 *m*	1.46 *m*, 1.23 *m*
16	2.08 *m*, 1.85 *m*	2.09 *m*, 1.84 *m*	2.09 *m*, 1.87 *m*	2.10 *m*, 1.88 *m*
19	1.70 *m*, 1.35 *m*	1.69 *m*, 1.32 *m*	1.72 *m*, 1.39 *m*	1.73 *m*, 1.40 *m*
20	2.20 *m*, 2.13 *m*	2.20 *m*, 2.12 *m*	2.21 *m*, 2.16 *m*	2.23 *m*, 2.17 *m*
22	2.58 *m*	2.54 *septet* (6.9)	2.57 *m*	2.58 *septet* (6.9)
23	5.34 *m*	5.40 *m*	5.39 *m*	6.07 *dd* (2.5, 1.6)
	5.19 *m*	5.22 *m*	5.20 *m*	5.53 *dd* (2.5, 1.7)
25-Me	1.05 *s*	1.28 *s*	1.25 *s*	1.32 *s*
26-Me	1.60 *s*	1.59 *s*	1.62 *s*	1.64 *s*
27-Me	1.18 *s*	1.19 *s*	1.19 *s*	1.21 *s*
28-Me	0.86 *s*	0.84 *s*	0.89 *s*	0.89 *s*
29-Me	0.97 *d* (6.8)	0.95 *d* (6.9)	0.97 *d* (6.8)	0.97 *d* (6.8)
30-Me	0.88 *d* (6.8)	0.87 *d* (6.9)	0.88 *d* (6.8)	0.88 *d* (6.8)
7-*O*-(4-OHBz)				
2,6	7.94 *d* (8.8)	7.96 *d* (8.9)	7.92 *d* (8.8)	7.94 *d* (8.8)
3,5	6.85 *d* (8.8)	6.89 *d* (8.9)	6.85 *d* (8.8)	6.86 *d* (8.8)

Table 4. Analysis of variance (ANOVA) of the mean percent mortality and number of eggs laid per female when bruchids were exposed for six days to crude extracts, isolated *nor*-hopane compounds from *Zanha africana* root bark and compared with a rotenone positive control.

Treatment and concentration	Mean percent mortality[a]	Mean total number of eggs per female[a]
1 10ppm	49.81 [b,c]	11.99 [b]
1 100ppm	57.69 [b]	13.92 [b]
1 1000ppm	87.91 [a]	7.97 [b]
5 10ppm	52.73 [b,c]	12.72 [b]
5 100ppm	55.17 [b,c]	9.16 [b]
5 1000ppm	87.56 [a]	9.47 [b]
Rotenone 10ppm	94.64 [a]	9.50 [b]
Rotenone 100ppm	94.40 [a]	5.25 [b]
Rotenone 1000ppm	97.22 [a]	5.29 [b]
Chloroform 10% w/v	57.54 [b]	10.92 [b]
Methanol 10% w/v	50.09 [b,c]	13.55 [b]
Water 10% w/v	57.09 [b]	8.82 [b]
solvent control	27.55 [c]	23.08 [a]

[a] Values in the same column followed by the same letter are not significantly different from each other at the 95% confidence interval using Tukey's post-hoc Honestly Significant Difference (HSD) test.