

Indazole-Type Alkaloids from *Nigella sativa* Seeds Exhibit

Antihyperglycemic Effects via AMPK Activation In Vitro

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Supporting Information Available

Part 1

1. Experimental procedures of the cell viability assay.
2. Results of the cell viability assay.

Part 2

For Compound **1**

Figure S1. ¹H NMR spectrum of 17-*O*-(β-D-glucopyranosyl)-4-*O*-methylnigellidine

(**1**) in methanol-d₄

Figure S2. ¹³C NMR spectrum of 17-*O*-(β-D-glucopyranosyl)-4-*O*-methylnigellidine

(**1**) in methanol-d₄

Figure S3. HSQC spectrum of 17-*O*-(β -D-glucopyranosyl)-4-*O*-methylnigellidine (**1**) in methanol-d₄

Figure S4. HMBC spectrum of 17-*O*-(β -D-glucopyranosyl)-4-*O*-methylnigellidine (**1**) in methanol-d₄

Figure S5. ¹H-¹H COSY spectrum of 17-*O*-(β -D-glucopyranosyl)-4-*O*-methylnigellidine (**1**) in methanol-d₄

Figure S6. HRESIMS of 17-*O*-(β -D-glucopyranosyl)-4-*O*-methylnigellidine (**1**)

For Compound **2**

Figure S7. ¹H NMR spectrum of nigelanoid (**2**) in methanol-d₄

Figure S8. ¹³C NMR spectrum of nigelanoid (**2**) in methanol-d₄

Figure S9. HSQC spectrum of nigelanoid (**2**) in methanol-d₄

Figure S10. HMBC spectrum of nigelanoid (**2**) in methanol-d₄

Figure S11. ¹H-¹H COSY spectrum of nigelanoid (**2**) in methanol-d₄

Figure S12. HRESIMS of nigelanoid (**2**)

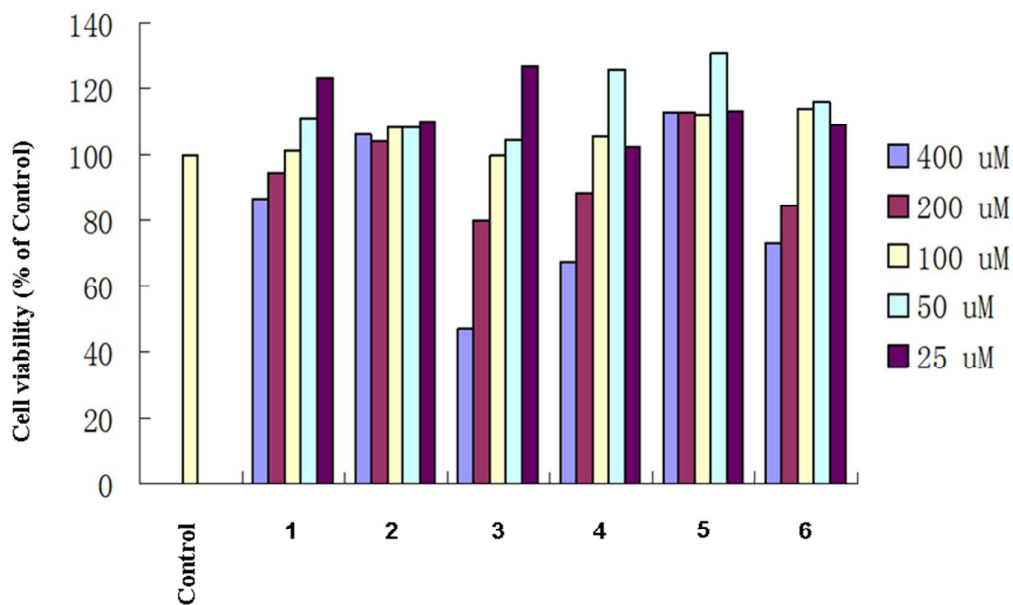
Figure S13. CD spectrum of nigelanoid (**2**) in methanol-d₄

Part 1

1. Experimental procedures of cell viability assay

The viability of HepG2 cells after 24 h of continuous exposure to the test compounds was determined by performing colorimetric MTS [3-(4,5-dimethylthiazol-2-yl)-5-(3-carboxymeth-oxyphenyl)-2-(4-sulphenyl)-2H-tetrazolium salt] assay (Promega, Madison, CA, USA) according to the protocol described previously. Briefly, after 24 h of treatment, 20 μ L of MTS reagent was added to each reaction well (in a 96-well format). After 2 h of incubation, the absorbance was measured at 490 nm using a spectrophotometer (SpectraMax M2, Molecular Devices Corp, Sunnyvale, CA, USA).

2. Results of the cell viability assay



Part 2

Figure S1. ^1H NMR spectrum of compound **1**

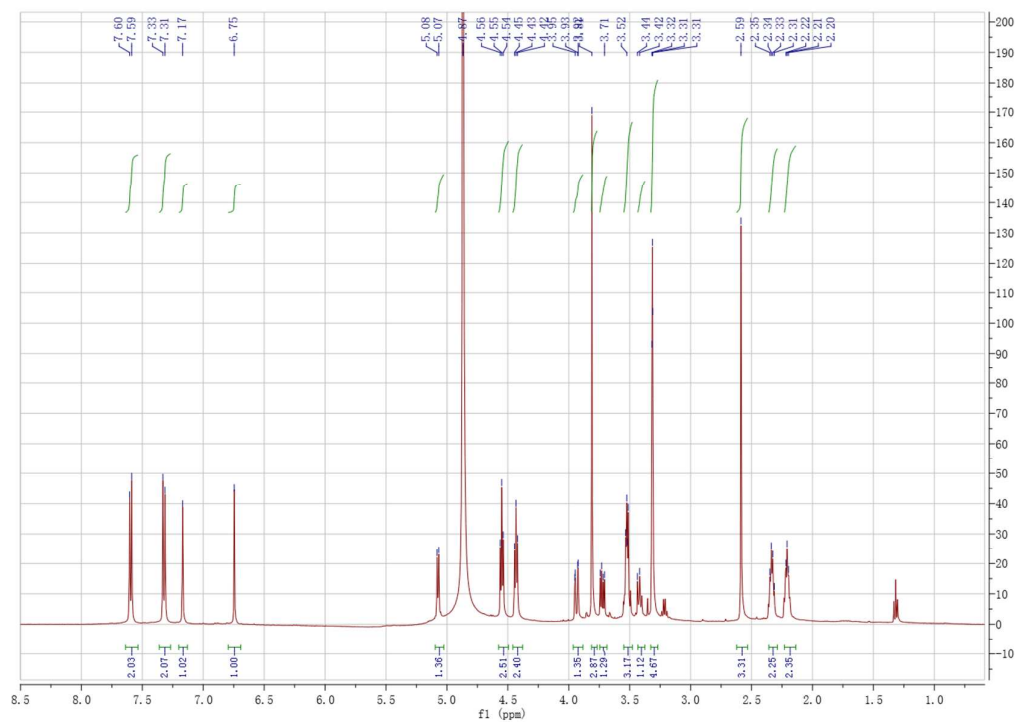


Figure S2. ^{13}C NMR spectrum of compound **1**

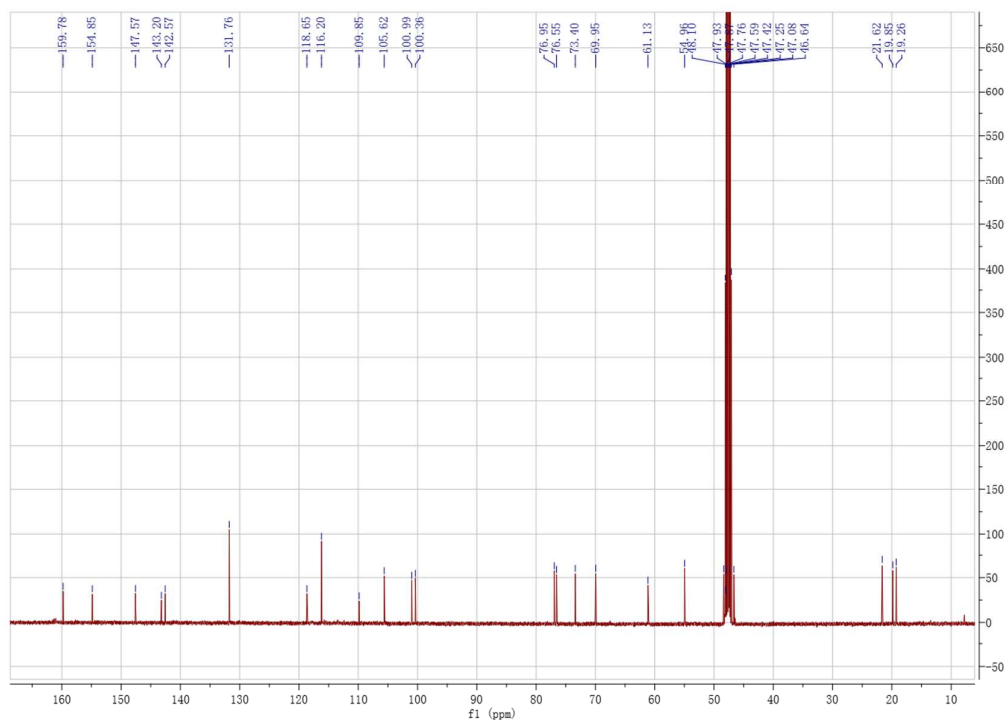


Figure S3. HSQC spectrum of compound **1**

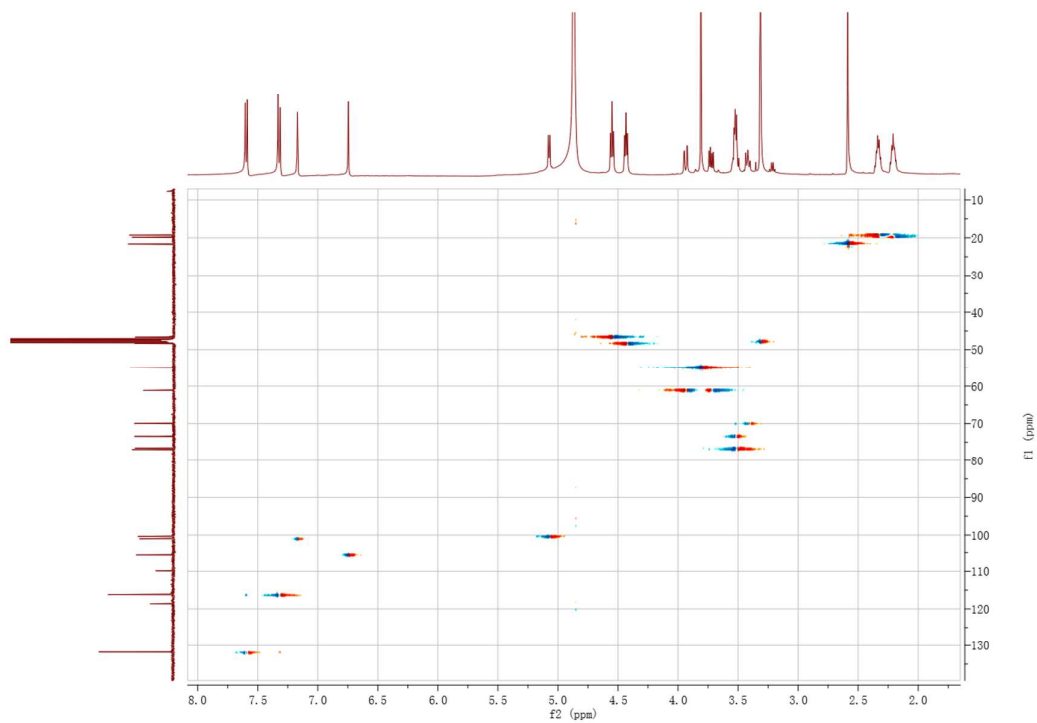


Figure S4. HMBC spectrum of compound **1**

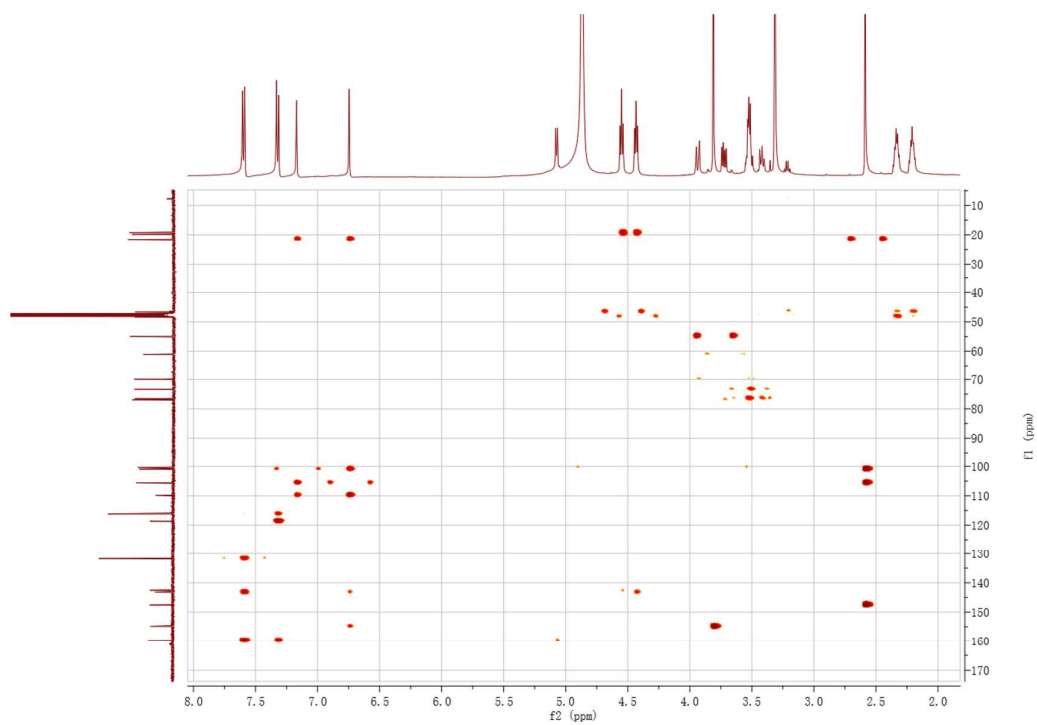


Figure S5. ^1H - ^1H COSY spectrum of compound **1**

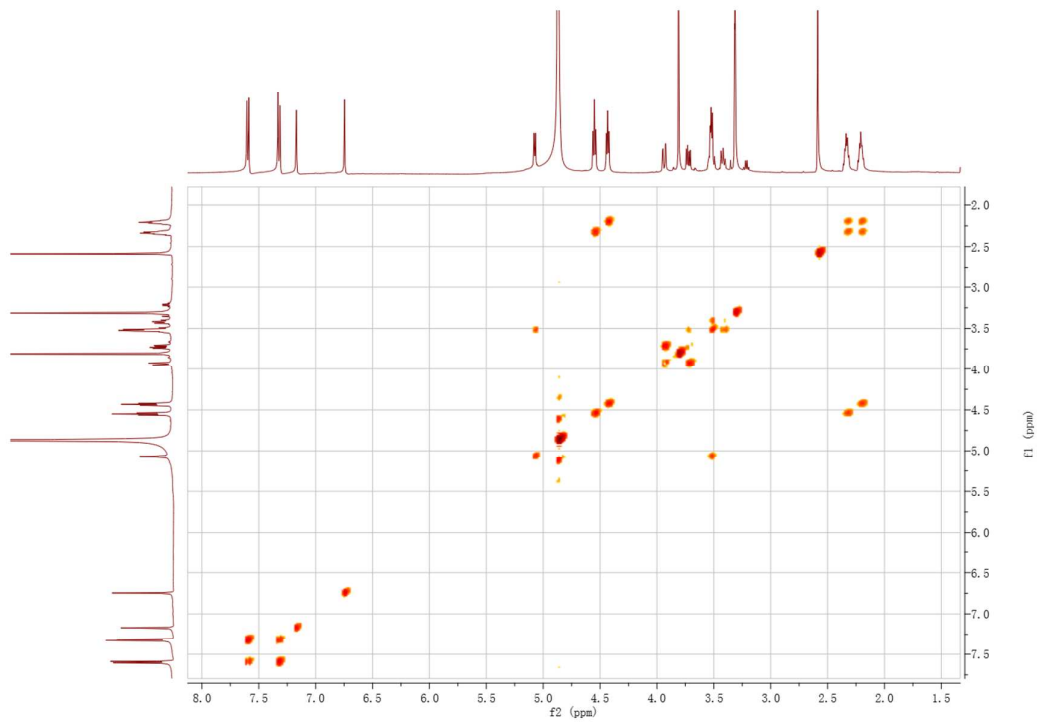


Figure S6. HRESIMS of compound **1**

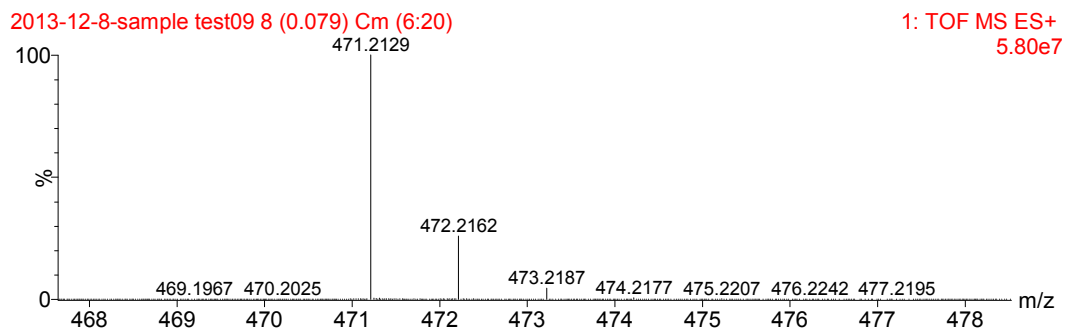


Figure S7. ^1H NMR spectrum of compound **2**

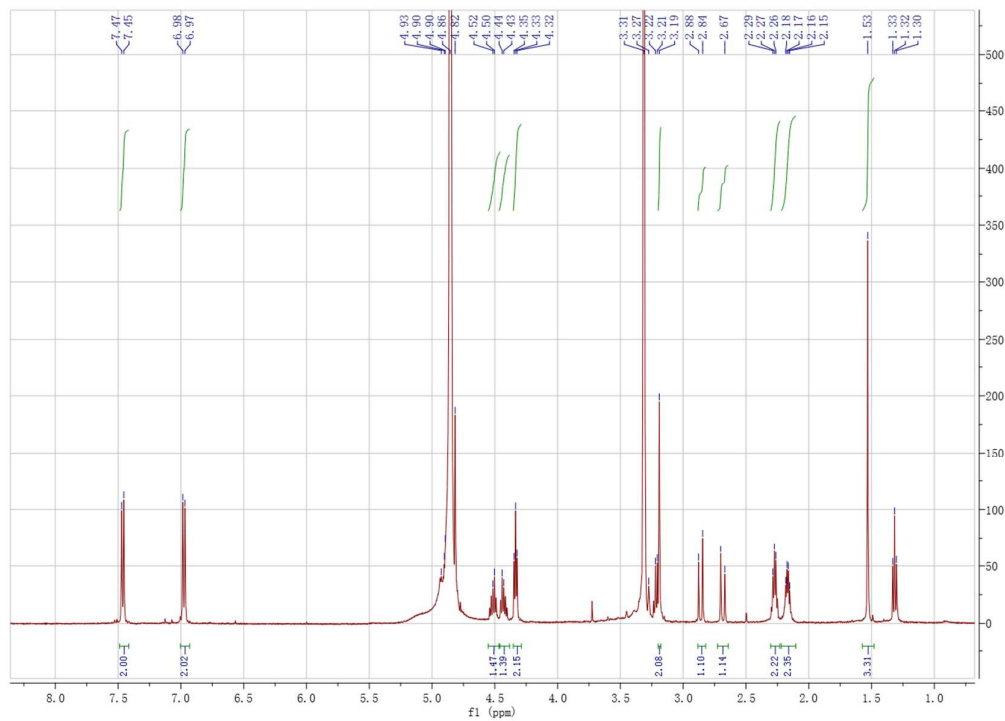


Figure S8. ^{13}C NMR spectrum of compound **2**

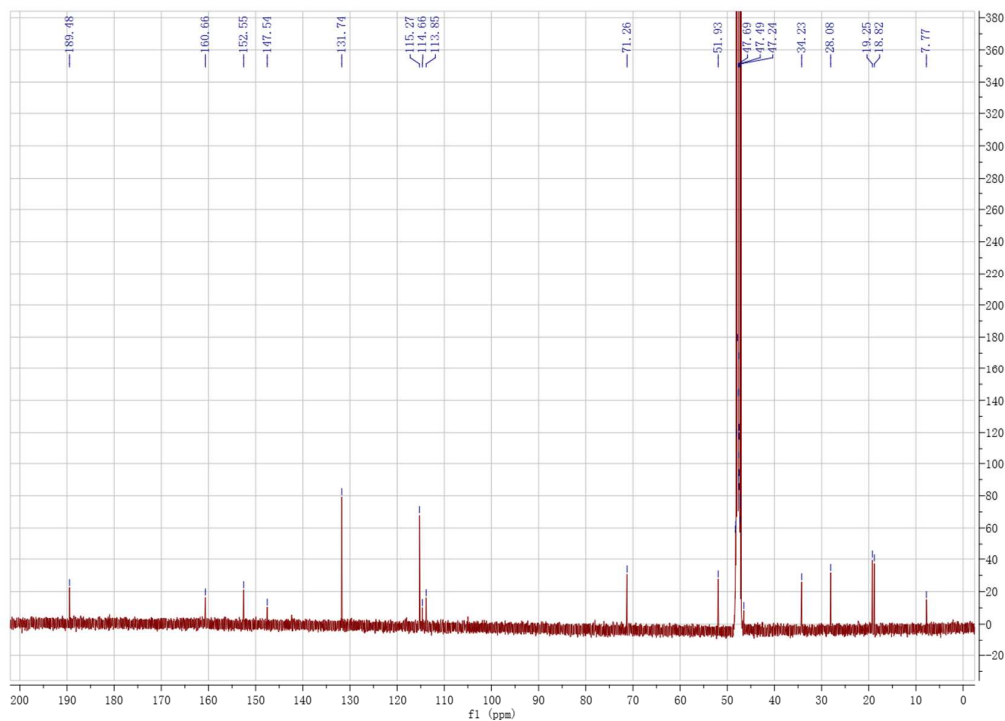


Figure S9. HSQC spectrum of compound 2

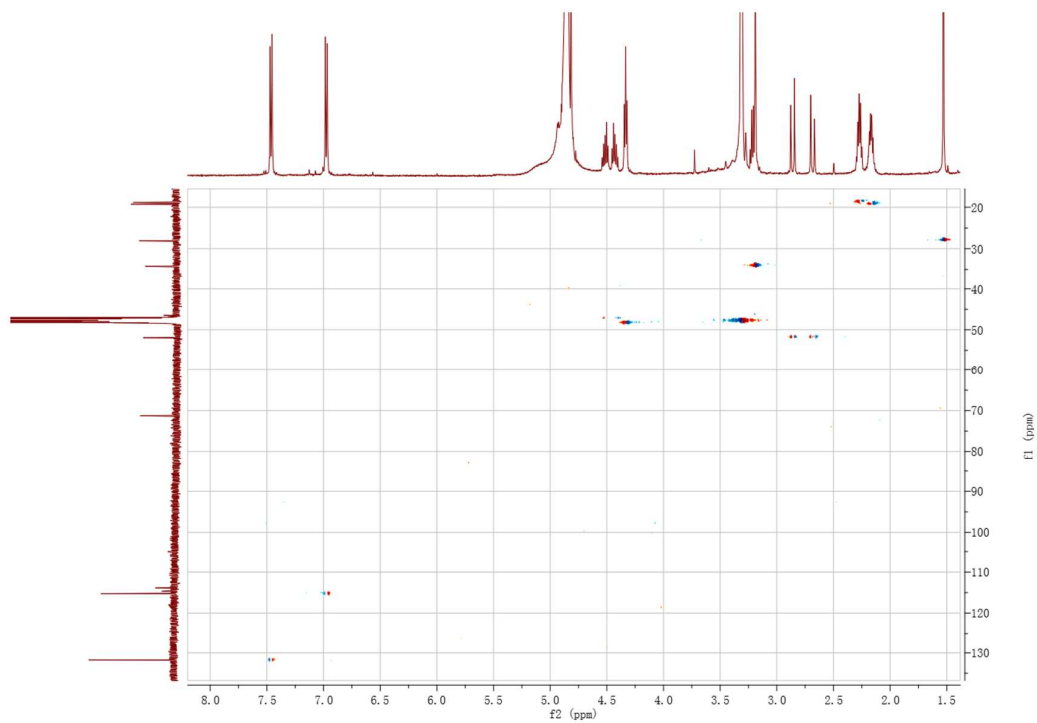


Figure S10. HMBC spectrum of compound 2

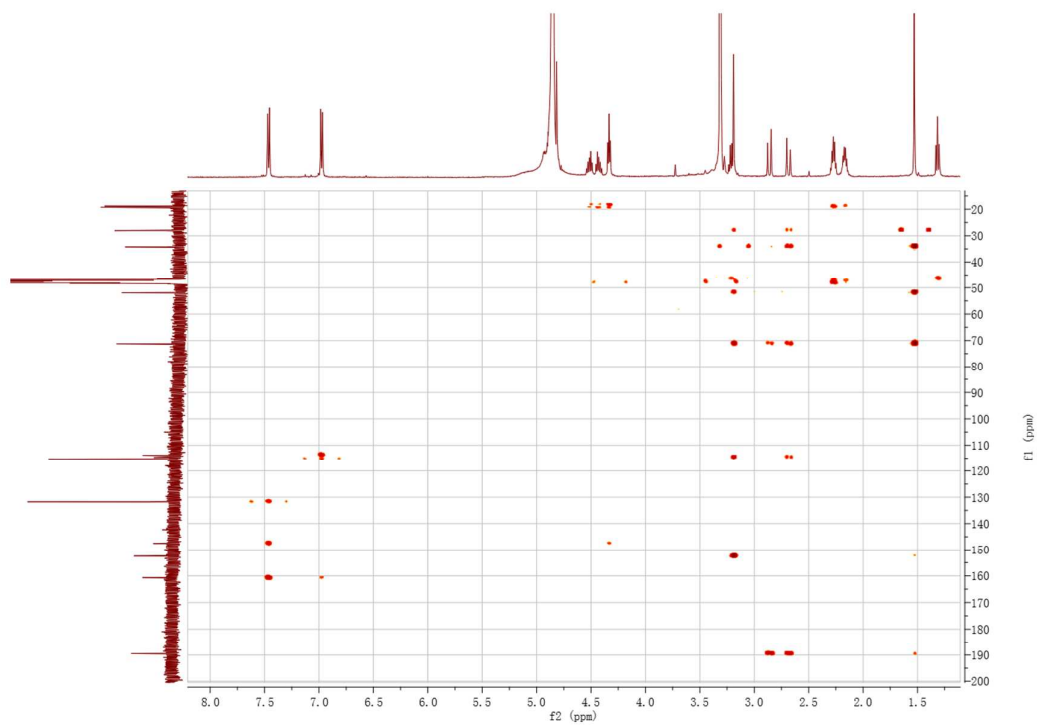


Figure S11. ^1H - ^1H COSY spectrum of compound **2**

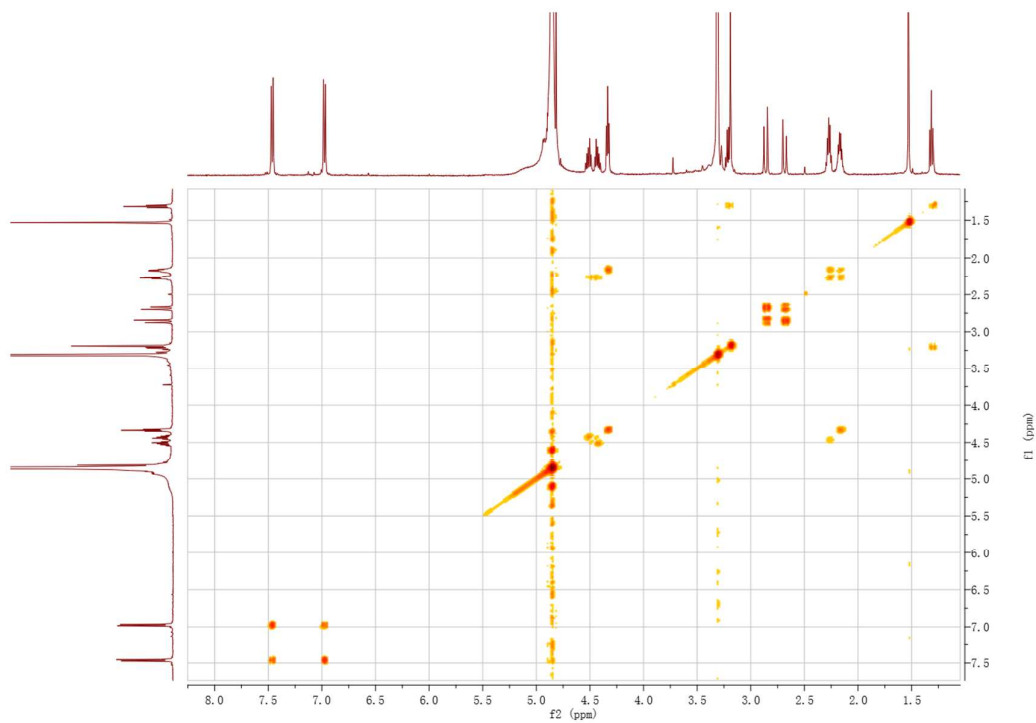


Figure S12. HRESIMS of compound **2**

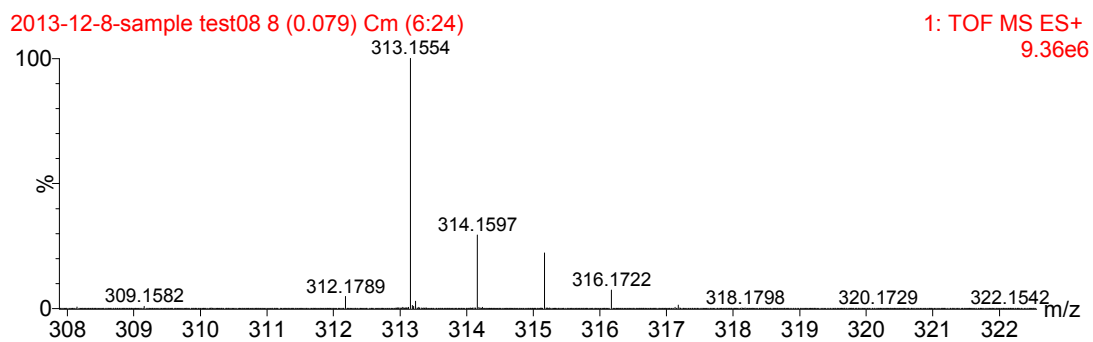
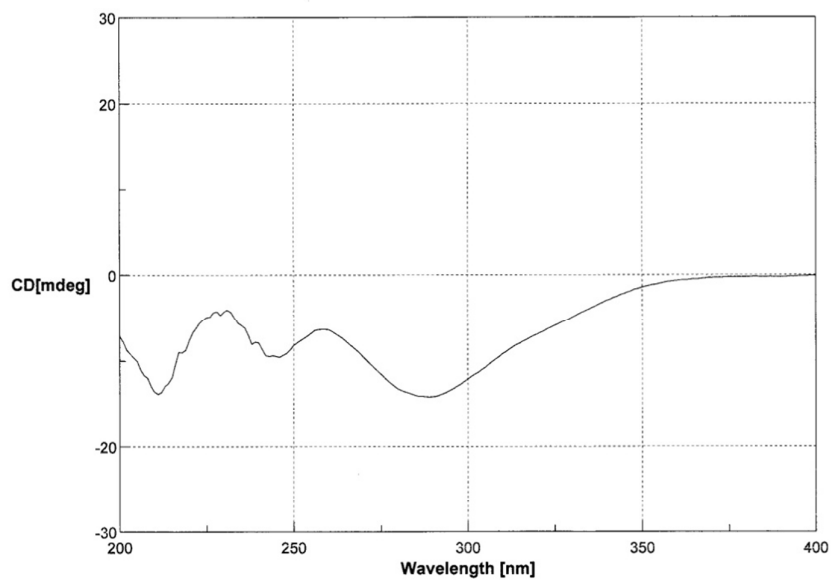


Figure S13. CD spectrum of compound 2 in methanol-d4



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Data pitch 1nm
Scanning speed 100 nm/min
Accumulation 3
Cell Length 1 cm
Temperature 25 C
Sample name TY-1
Operator TAO
Comment

Memory#4