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## APPENDICES

# APPENDIX A

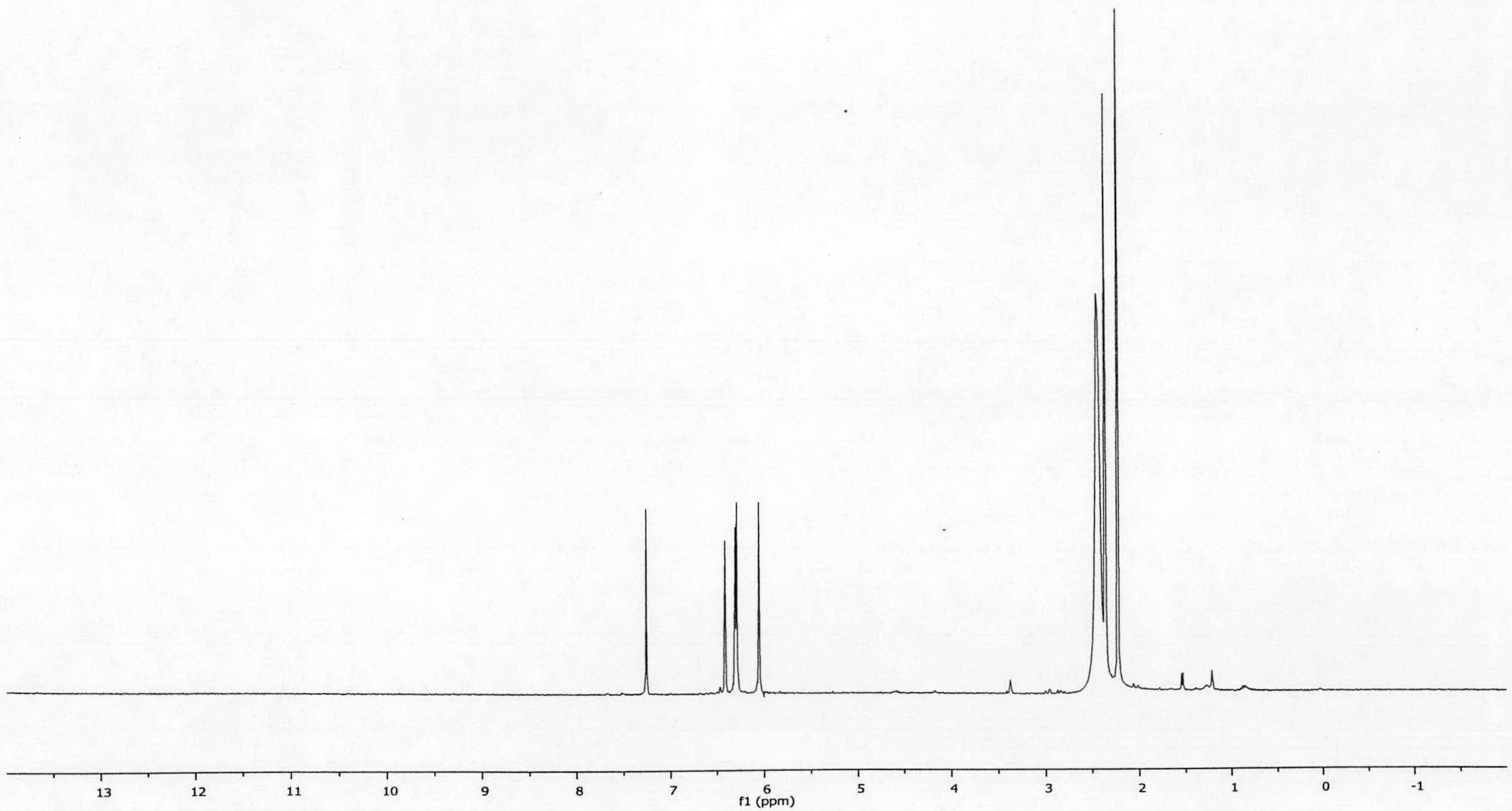


**Figure A-1** $^{1}$H-NMR spectrum of barakol obtained in $CDCl_3$ (Compound **1**)

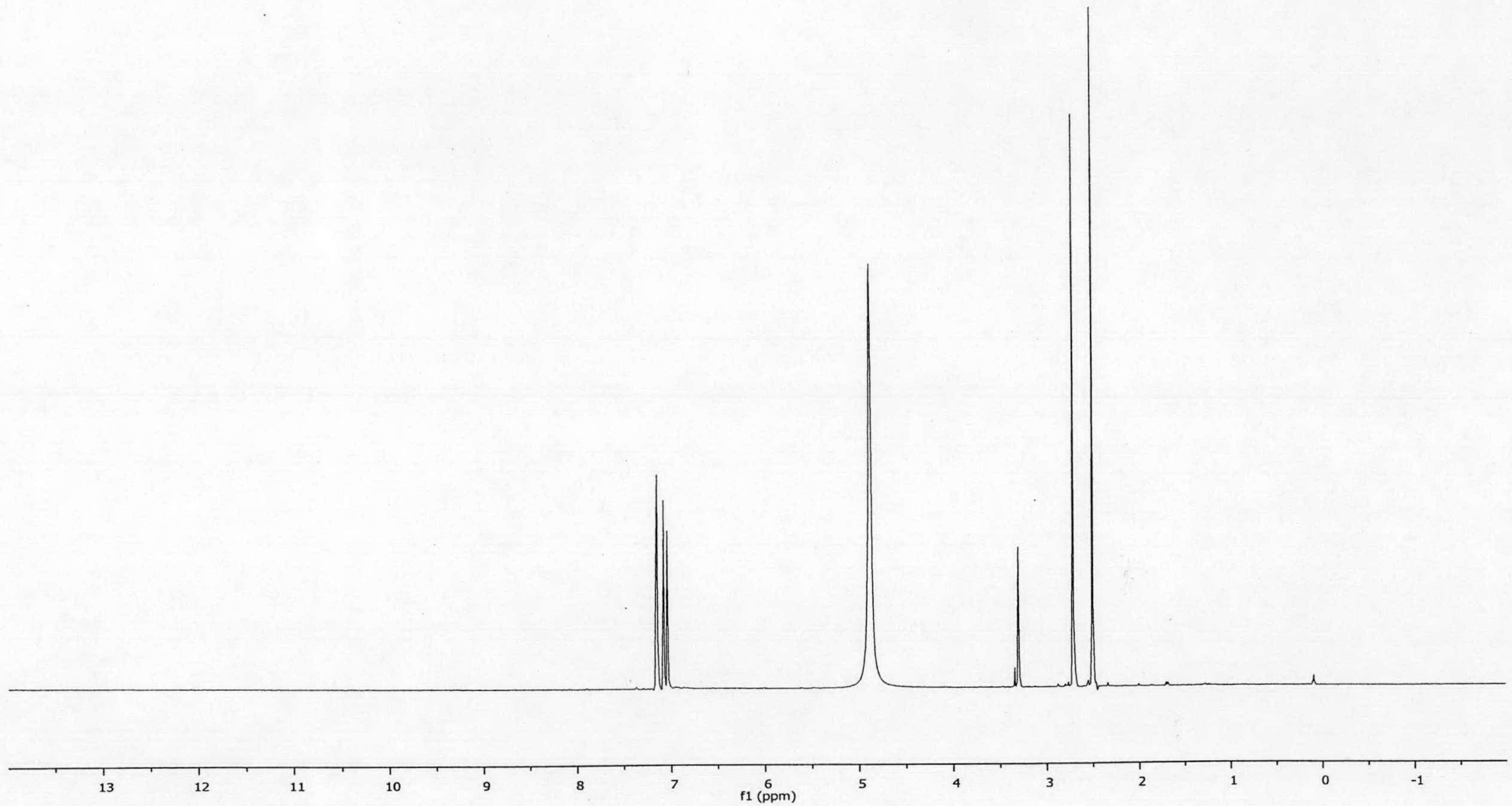


**Figure A-2** $^1$H-NMR spectrum of anhydrobarakol chloride obtained in $CD_3OD$ (Compound **3**)

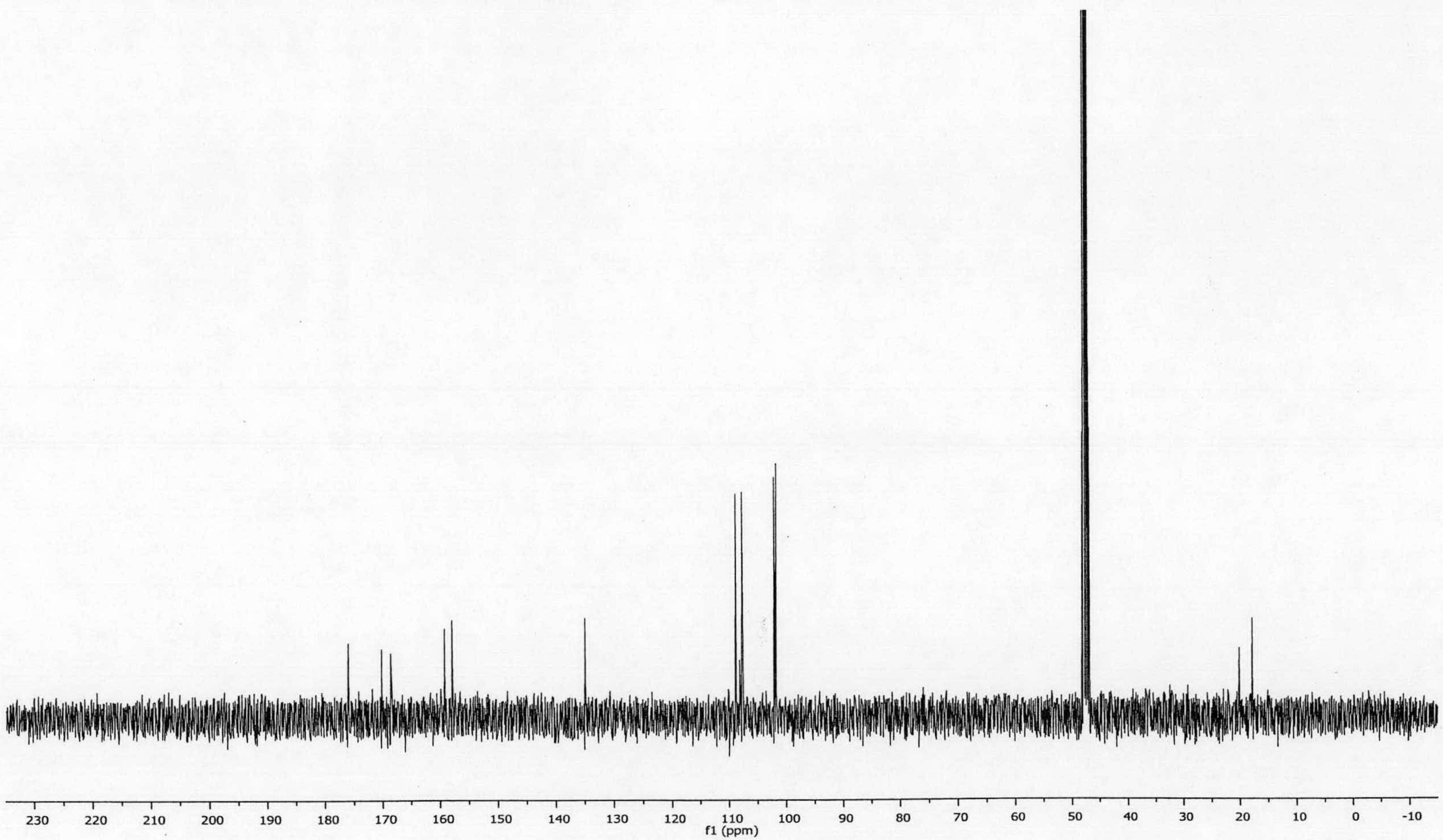


**Figure A-3** $^{13}$C-NMR spectrum of anhydrobarakol chloride obtained in $CD_3OD$ (Compound **3**)

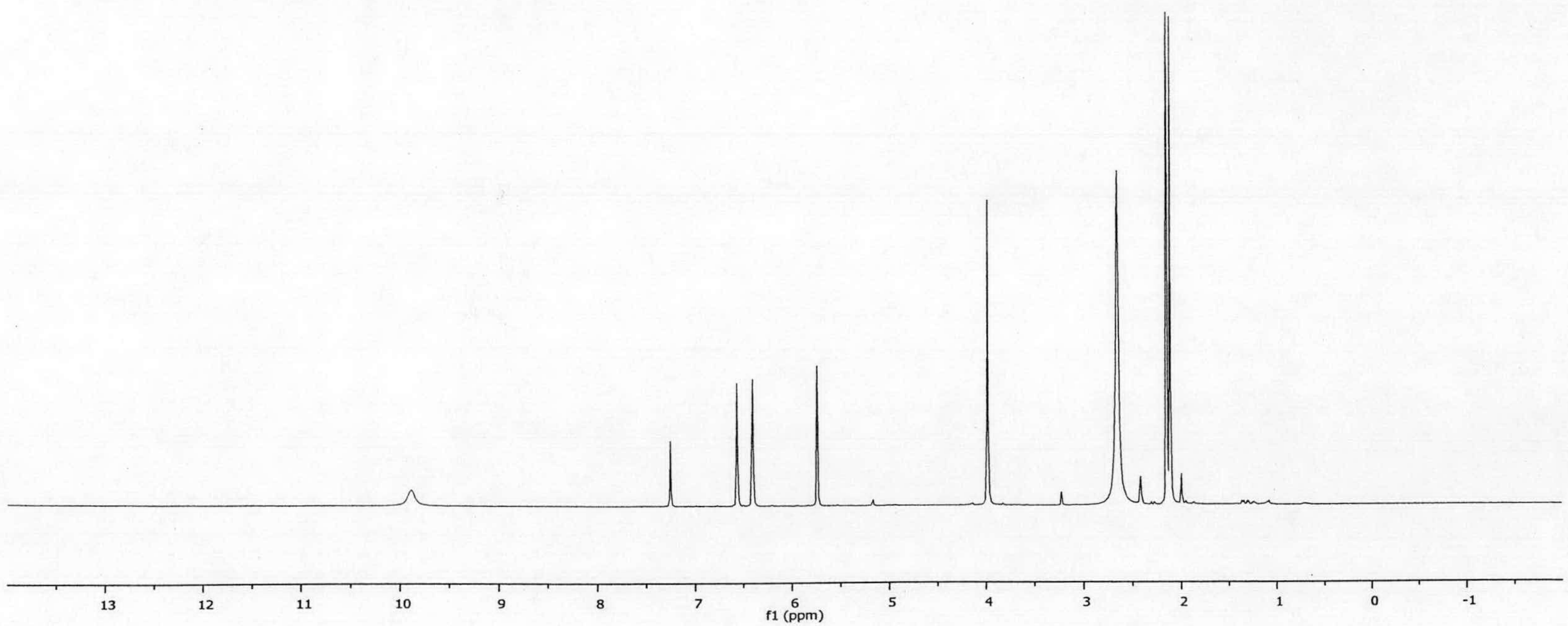


**Figure A-4** $^{1}$H-NMR spectrum of 5-acetonyl-7-hydroxy-2-methyl chromone obtained in $CDCl_3$/DMSO-$d_6$ (9:1) (Compound **27**)

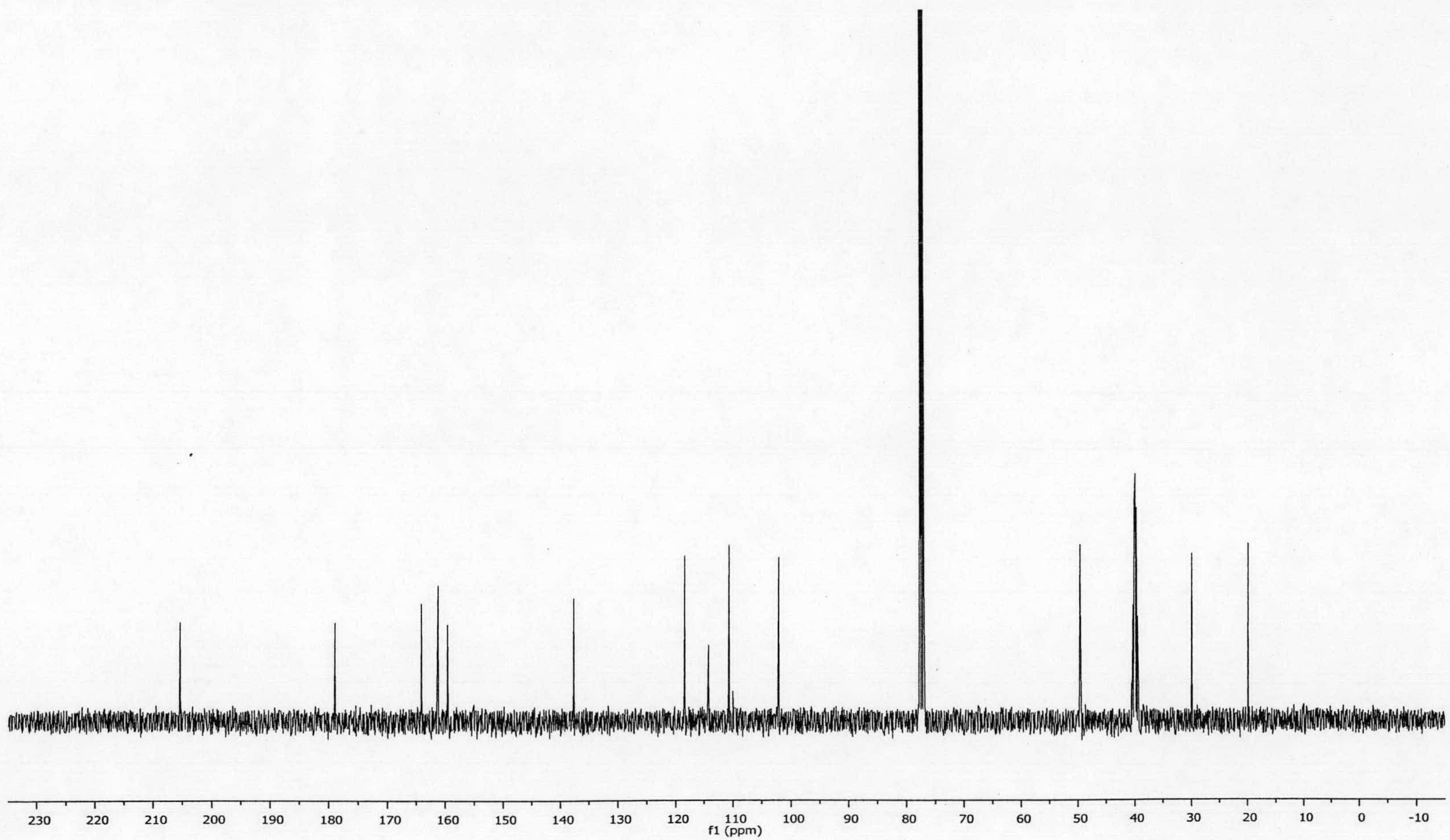


**Figure A-5** $^{13}$C-NMR spectrum of 5-acetonyl-7-hydroxy-2-methyl chromone obtained in $CDCl_3$/DMSO-$d_6$ (9:1) (Compound **27**)

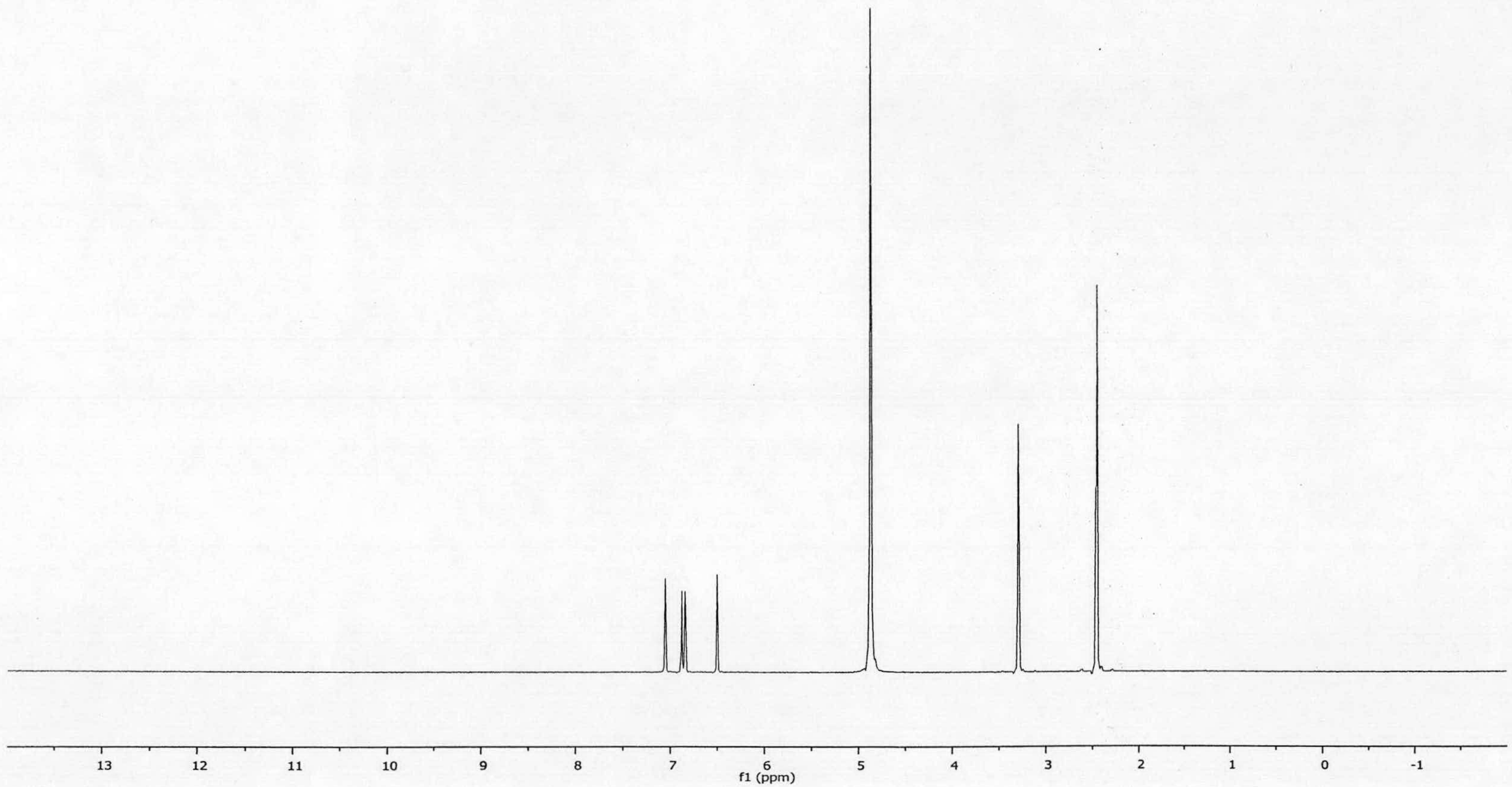


**Figure A-6** $^{1}$H-NMR spectrum of cassiarin A hydrochloride obtained in $CD_3OD$ (Compound **4a**)

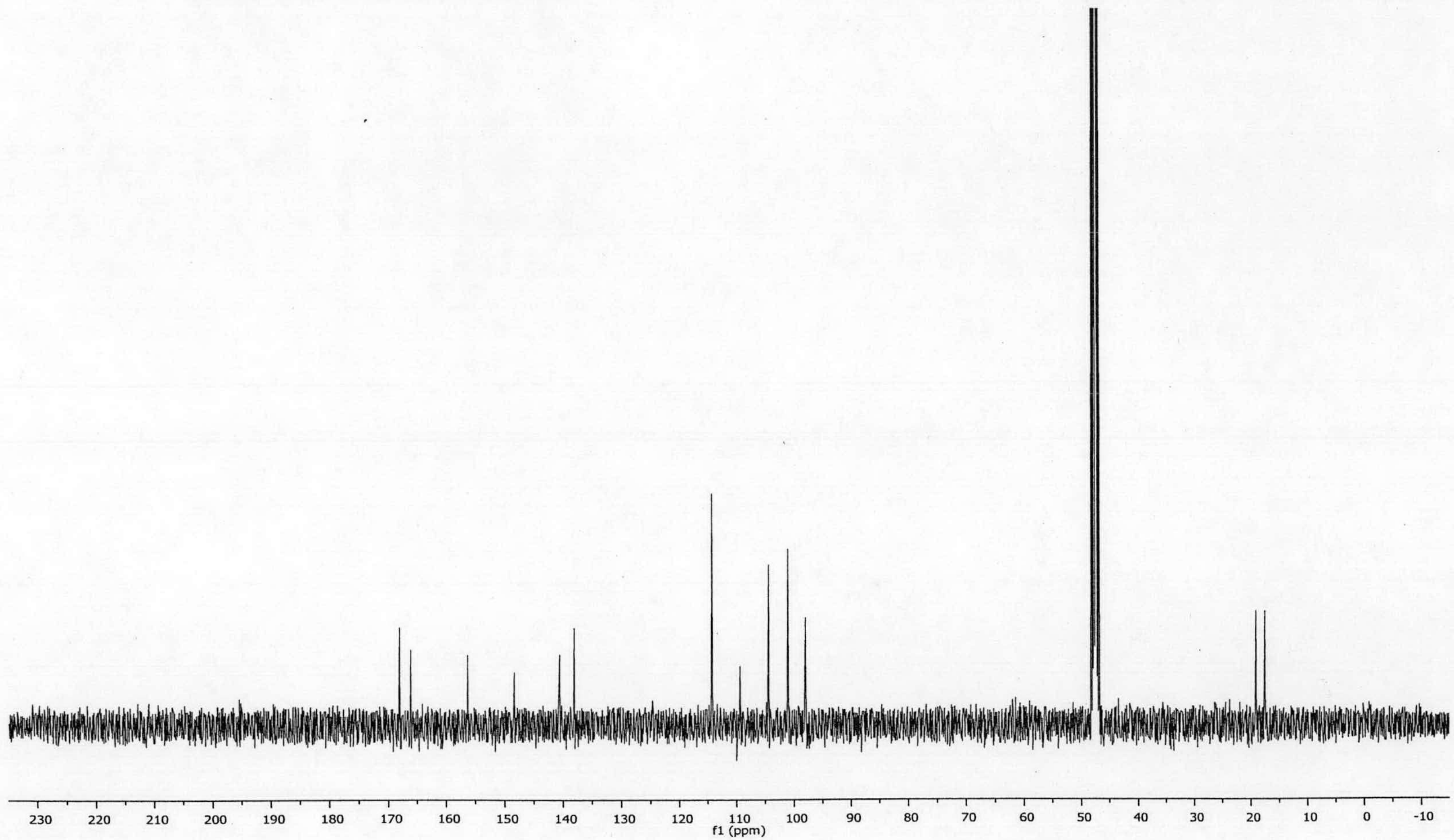


**Figure A-7** $^{13}$C-NMR spectrum of cassiarin A hydrochloride obtained in $CD_3OD$ (Compound **4a**)

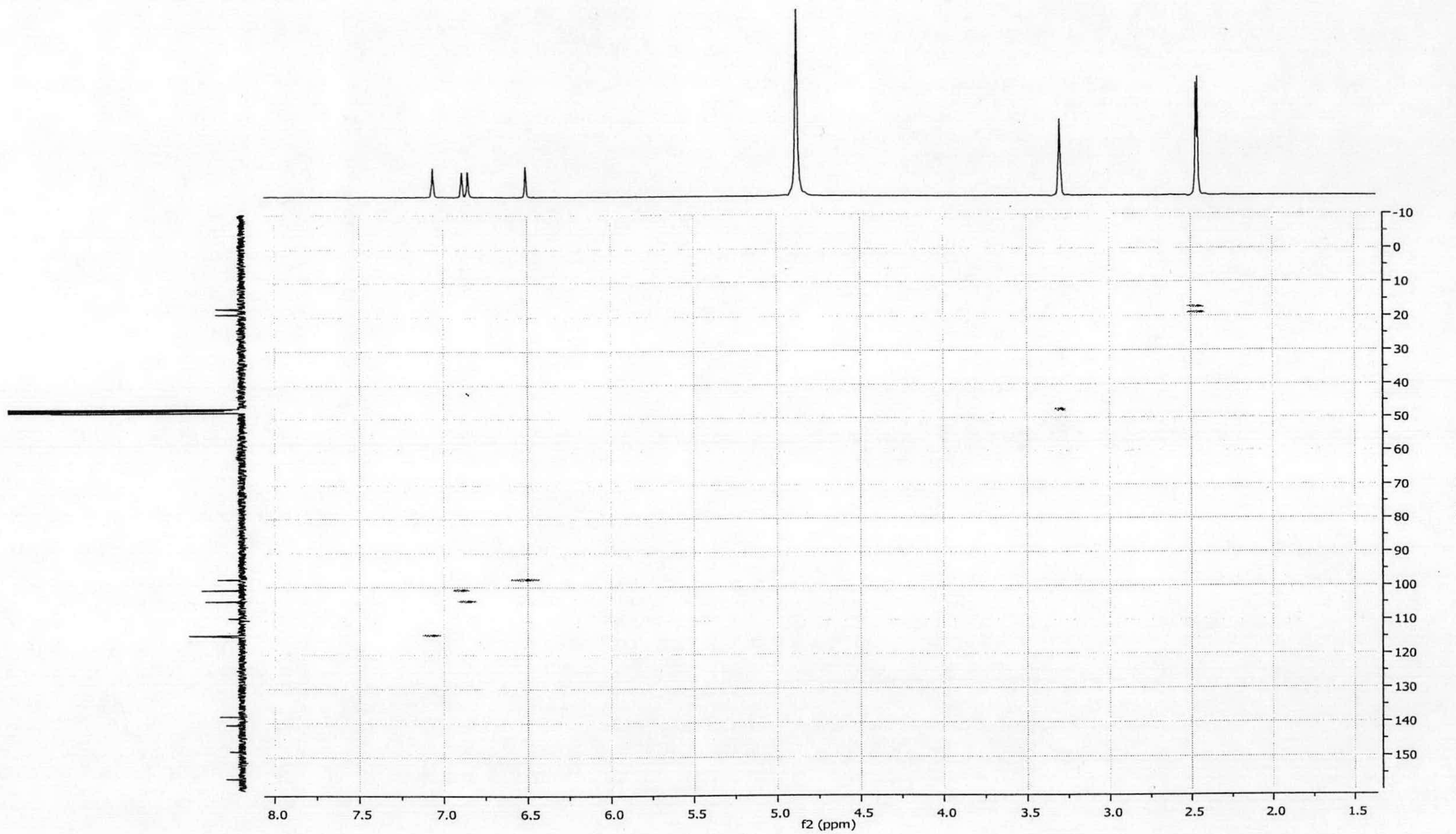


**Figure A-8** HSQC spectrum of cassiarin A hydrochloride obtained in $CD_3OD$ (Compound **4a**)

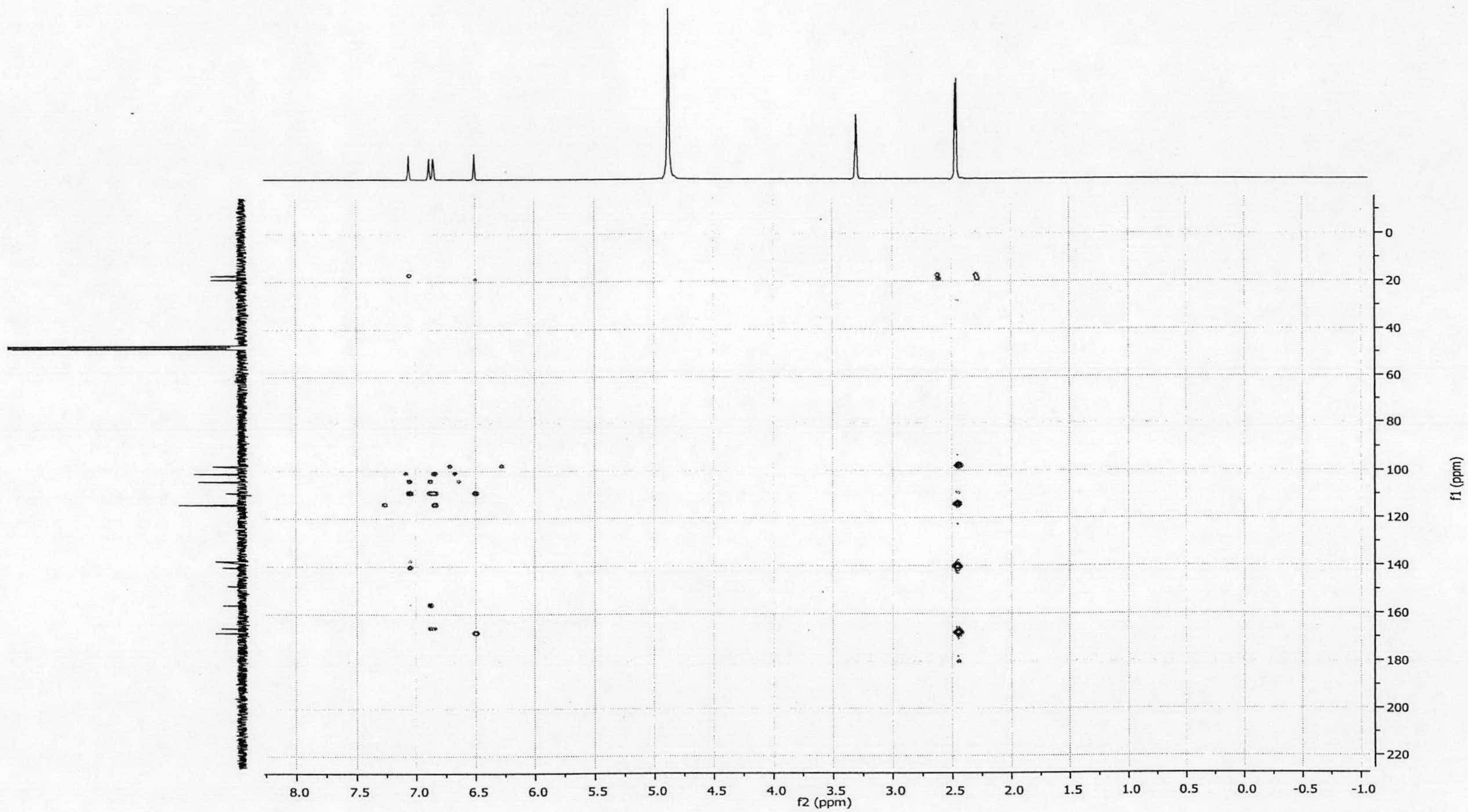


**Figure A-9** HMBC spectrum of cassiarin A hydrochloride obtained in $CD_3OD$ (Compound **4a**)

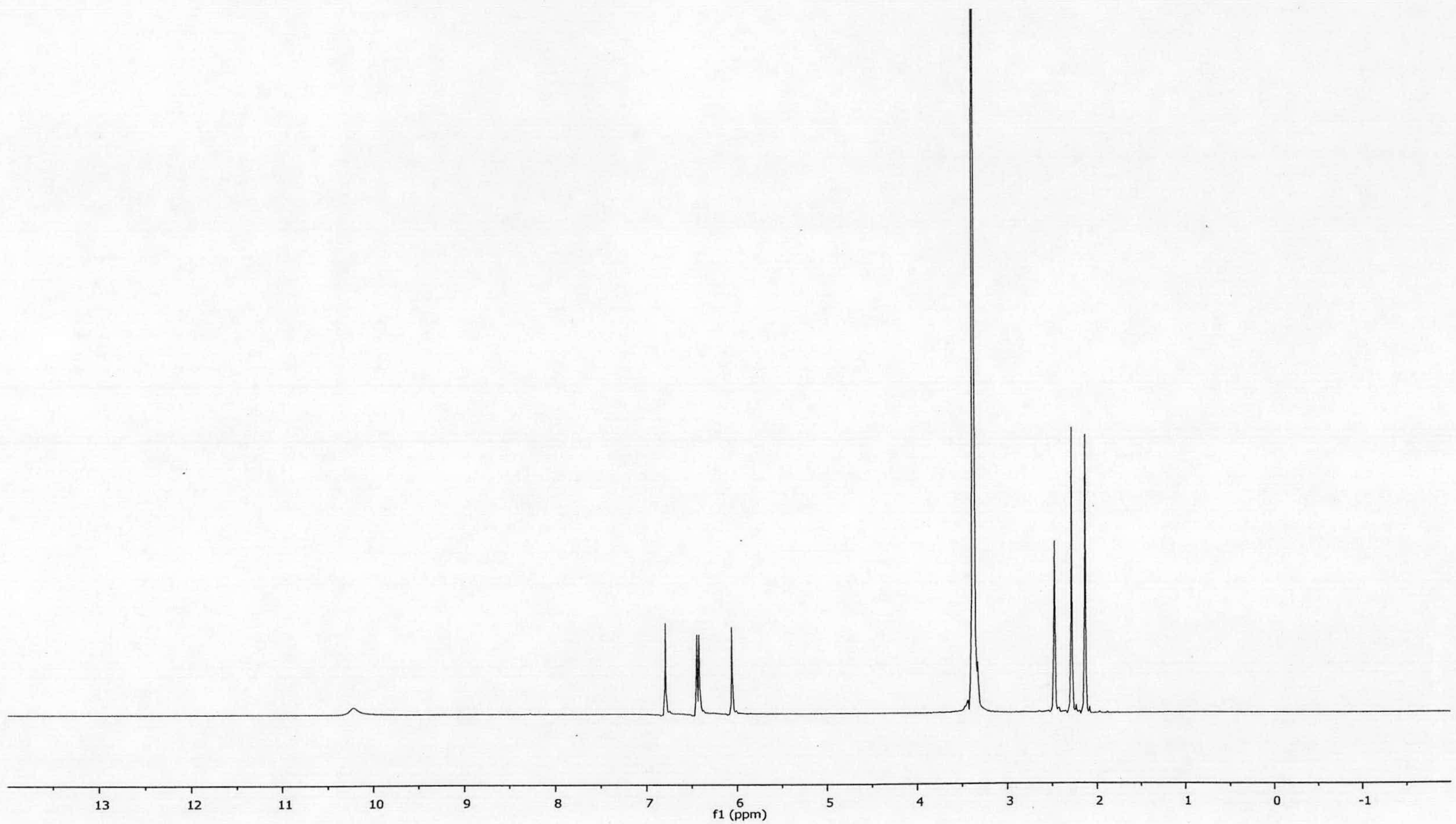


**Figure A-10** $^{1}$H-NMR spectrum of cassiarin A obtained in DMSO-$d_6$ (Compound **4**)

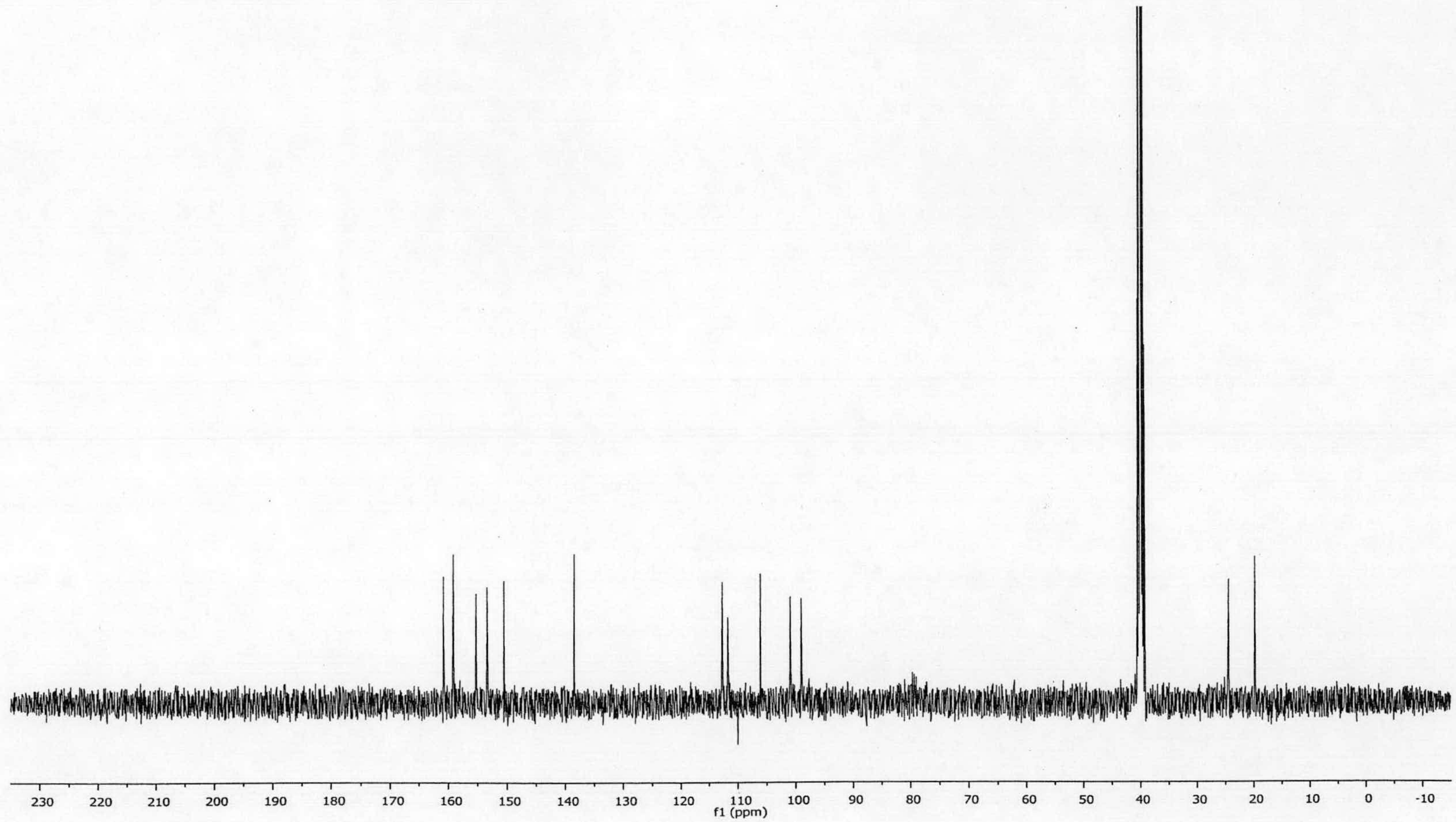


**Figure A-11** $^{13}$C-NMR spectrum of cassiarin A obtained in DMSO-$d_6$ (Compound **4**)

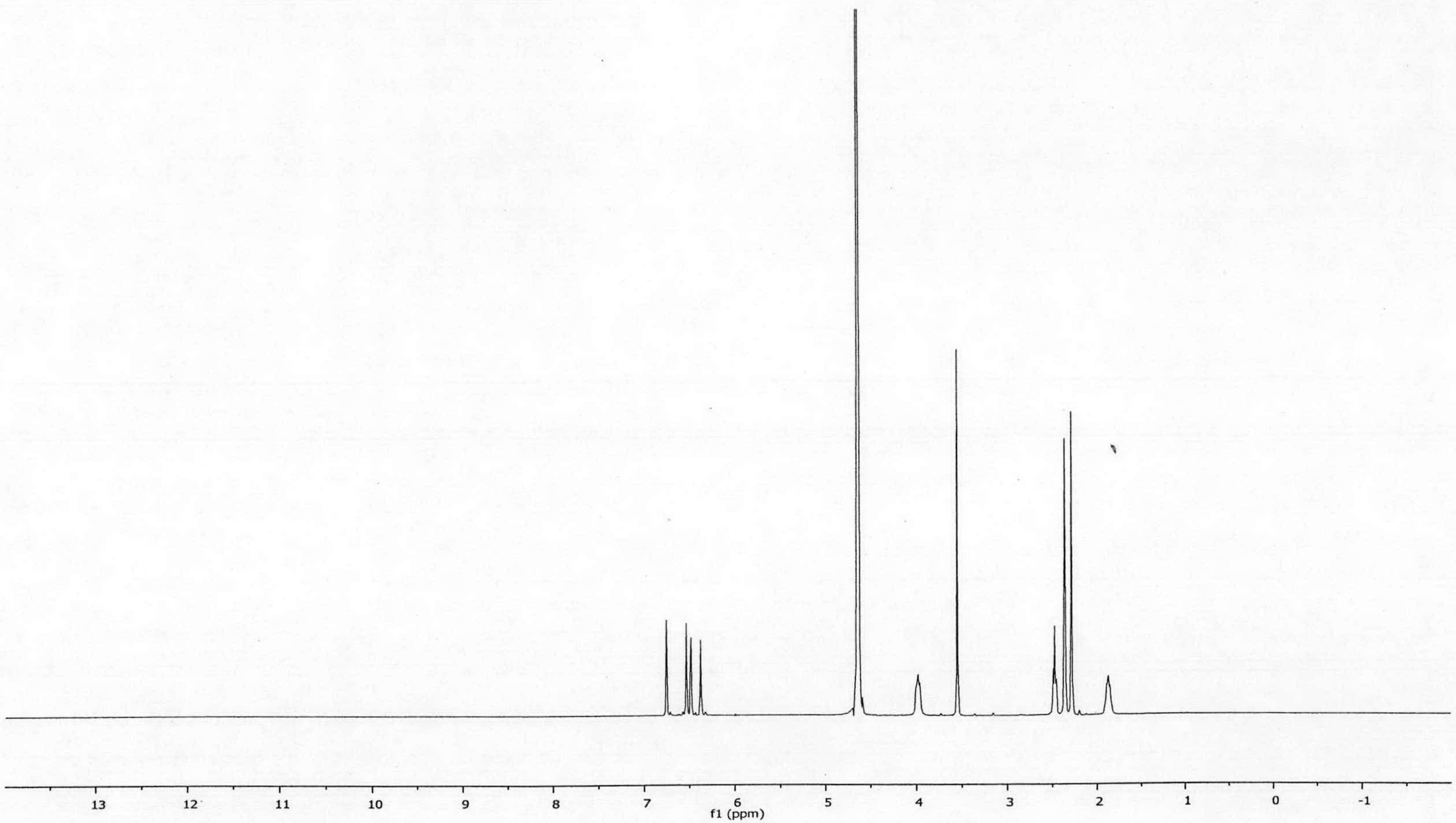


**Figure A-12** $^{1}$H-NMR spectrum of *N*-4-methoxy-4-oxobutyl cassiarin A chloride obtained in $D_2O$/DMSO-$d_6$ (9.5:0.5) (Compound **5a**)

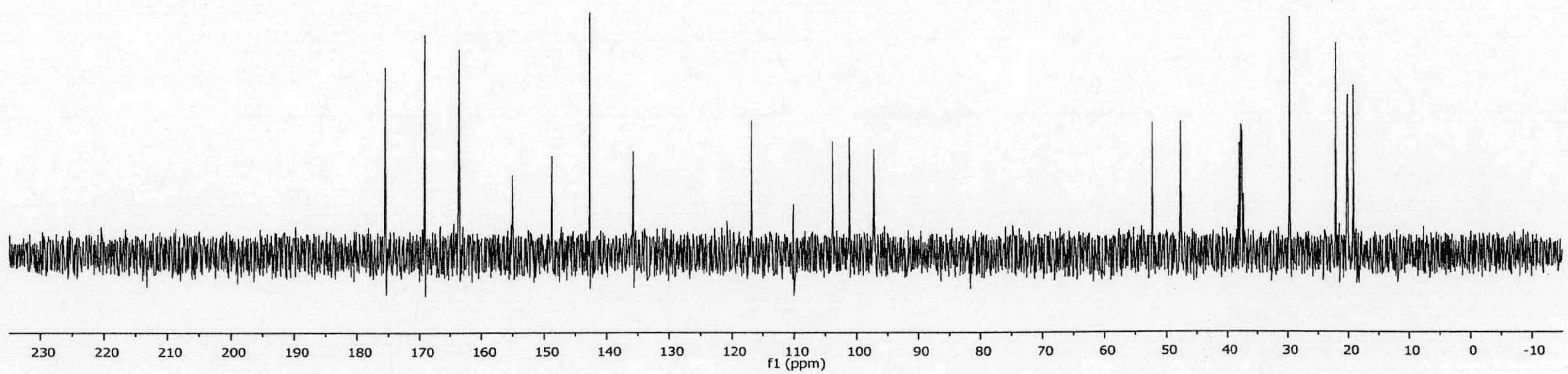


**Figure A-13** $^{13}$C-NMR spectrum of *N*-4-methoxy-4-oxobutyl cassiarin A chloride obtained in $D_2O$/DMSO-$d_6$ (9.5:0.5) (Compound **5a**)

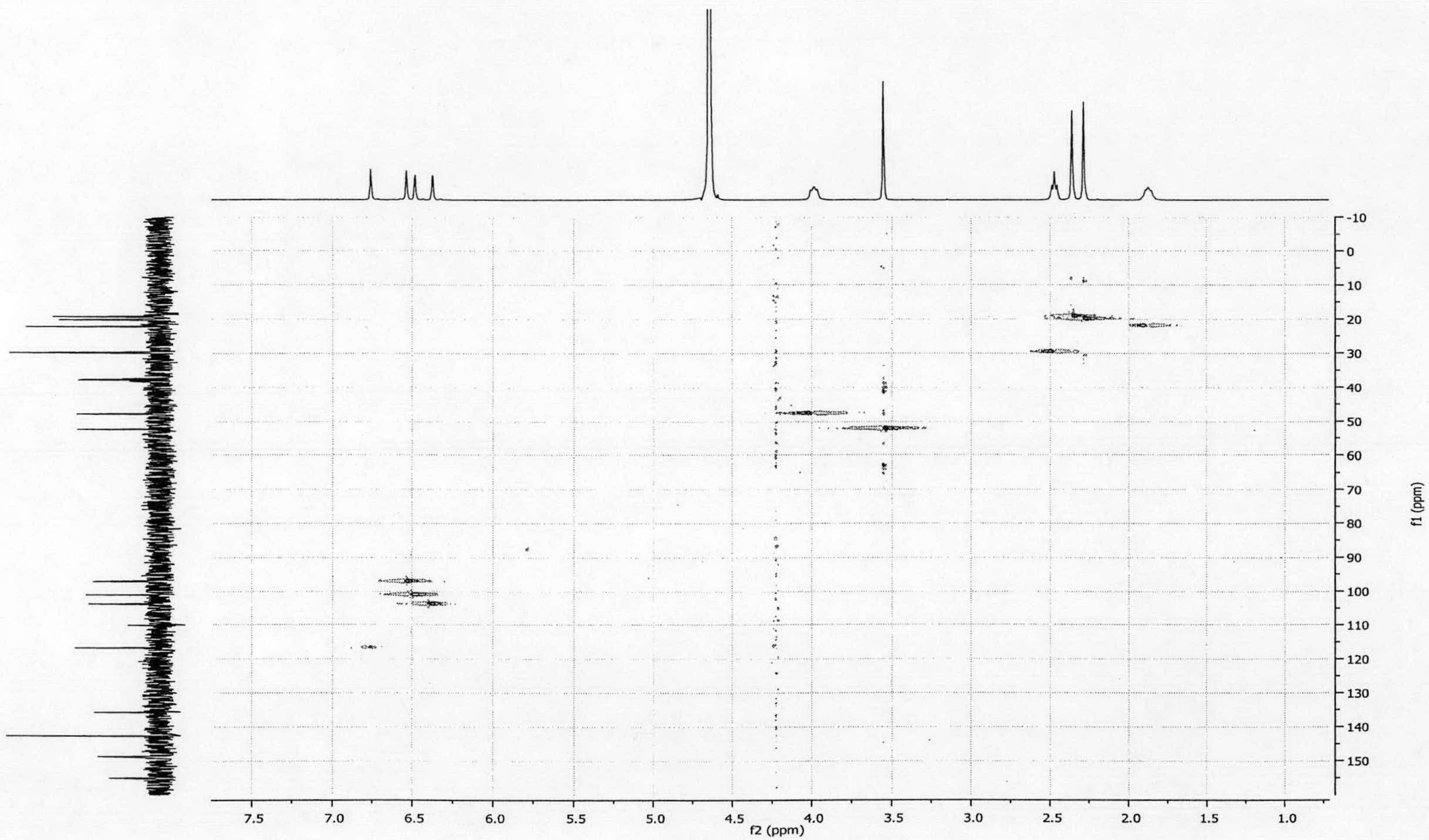


**Figure A-14** HSQC spectrum of *N*-4-methoxy-4-oxobutyl cassiarin A chloride obtained in $D_2O$/DMSO-$d_6$ (9.5:0.5) (Compound **5a**)

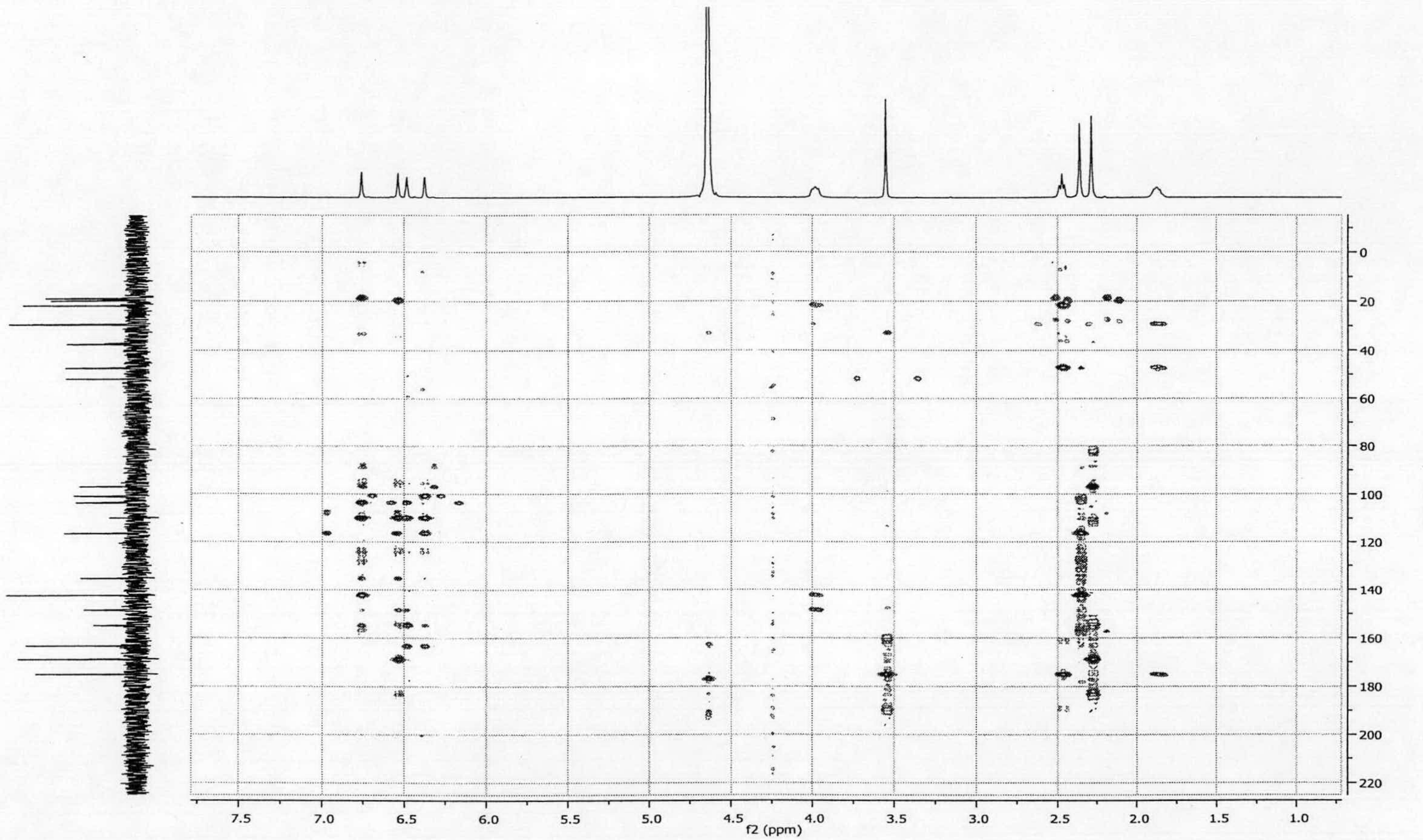


**Figure A-15** HMBC spectrum of *N*-4-methoxy-4-oxobutyl cassiarin A chloride obtained in $D_2O$/DMSO-$d_6$ (9.5:0.5) (Compound **5a**)

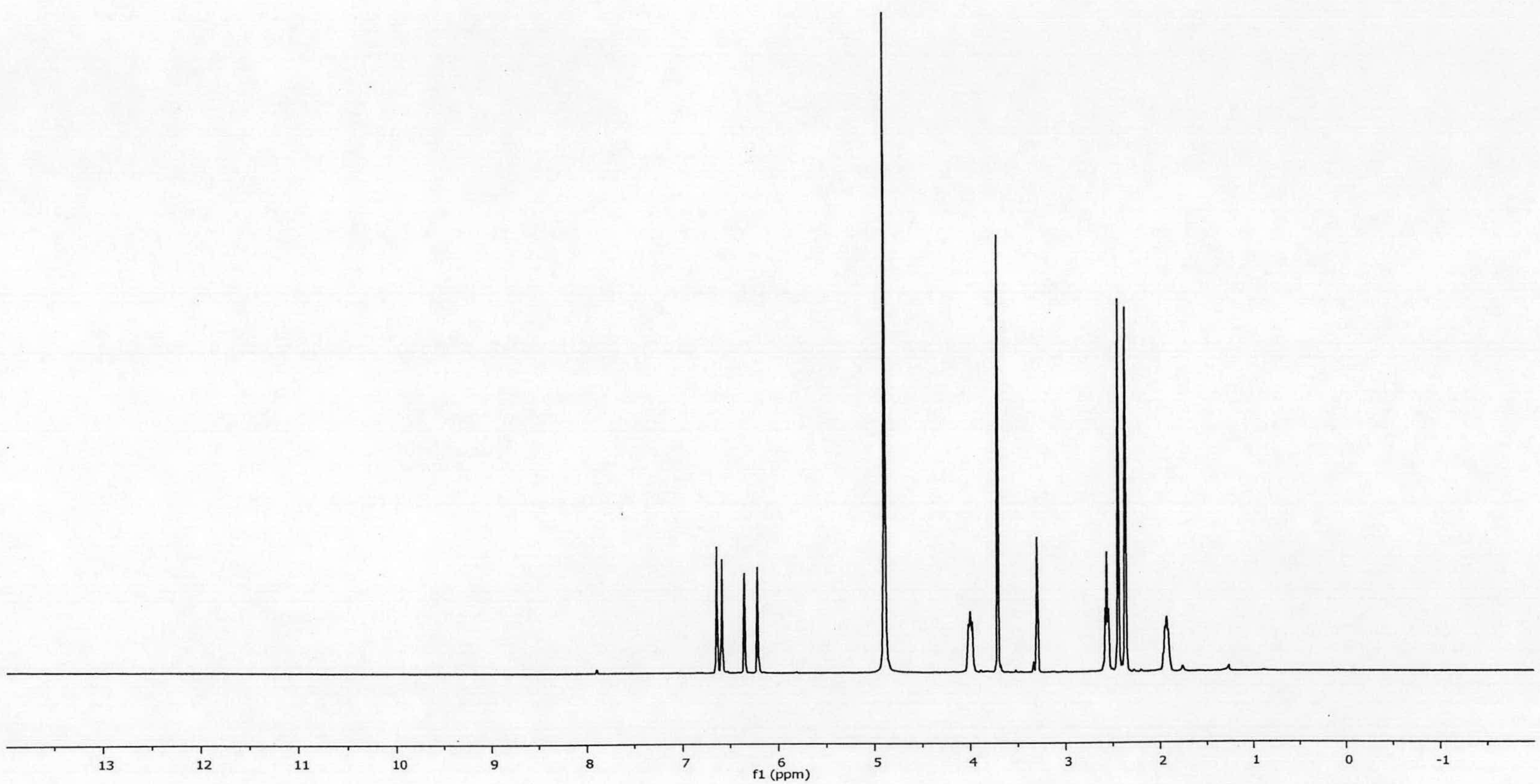


**Figure A-16** $^{1}$H-NMR spectrum of cassairin B obtained in $CD_3OD$ (Compound **5**)

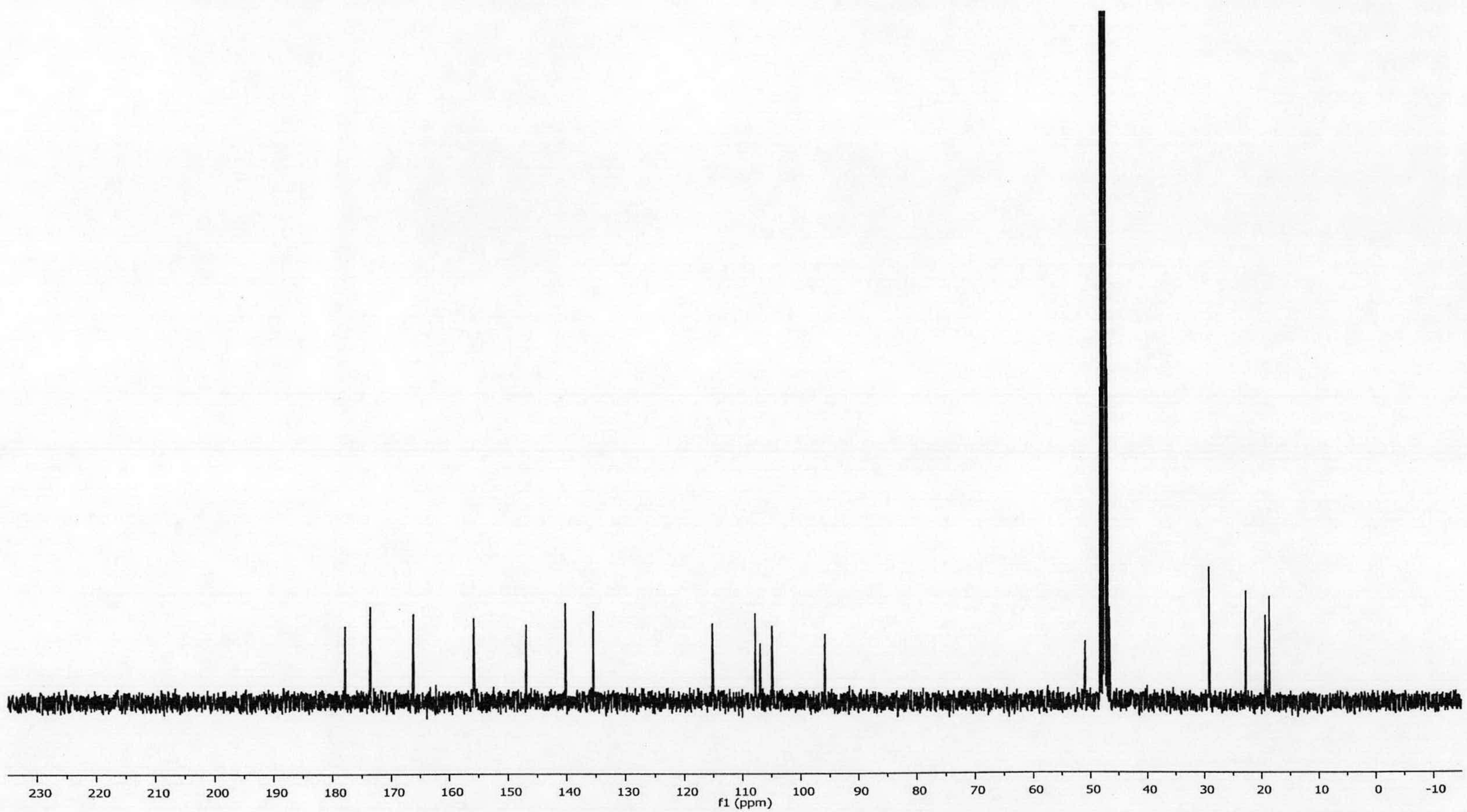


**Figure A-17** $^{13}$C-NMR spectrum of cassairin B obtained in $CD_3OD$ (Compound **5**)

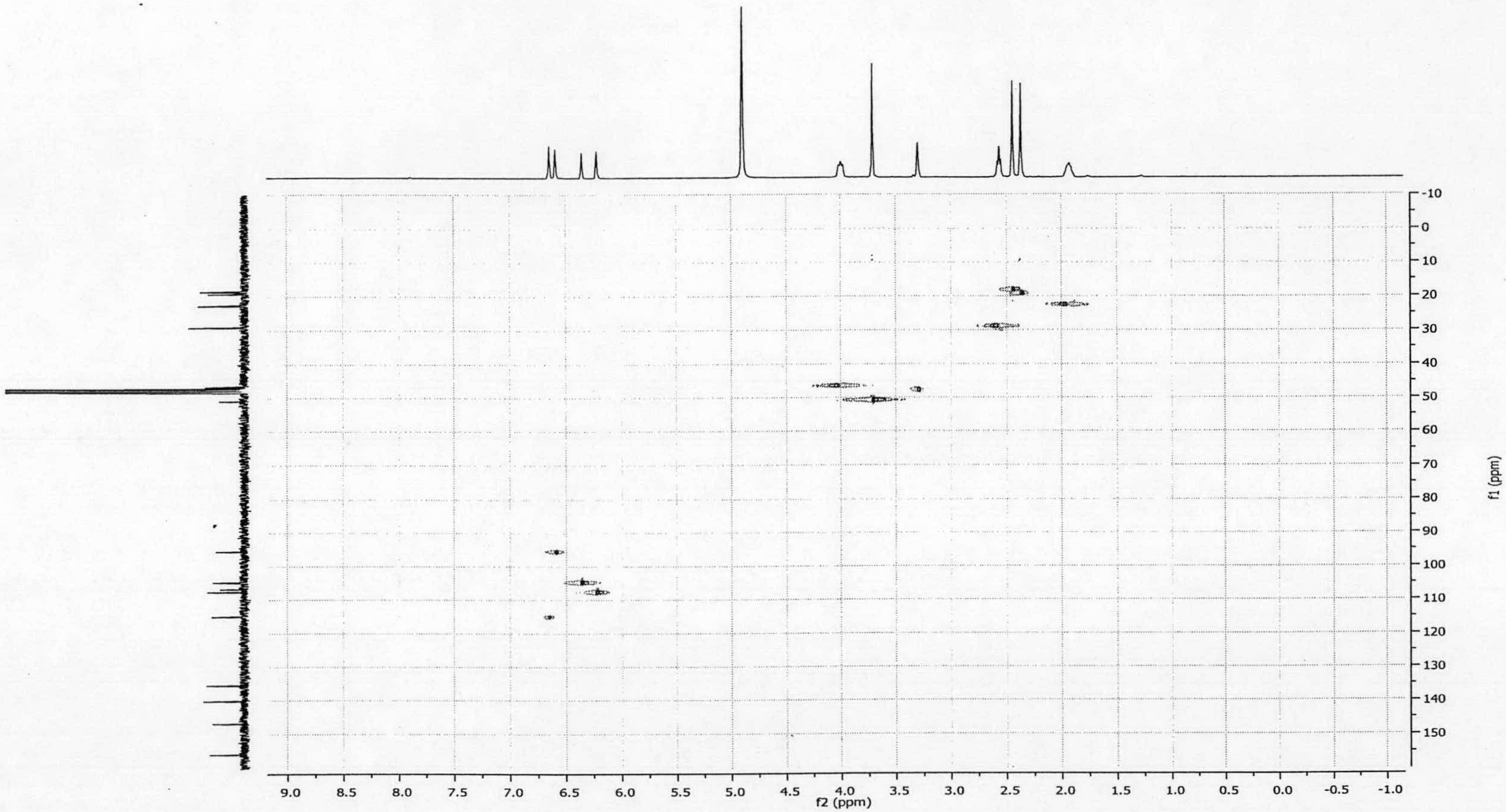


**Figure A-18** HSQC spectrum of cassairin B obtained in $CD_3OD$ (Compound **5**)

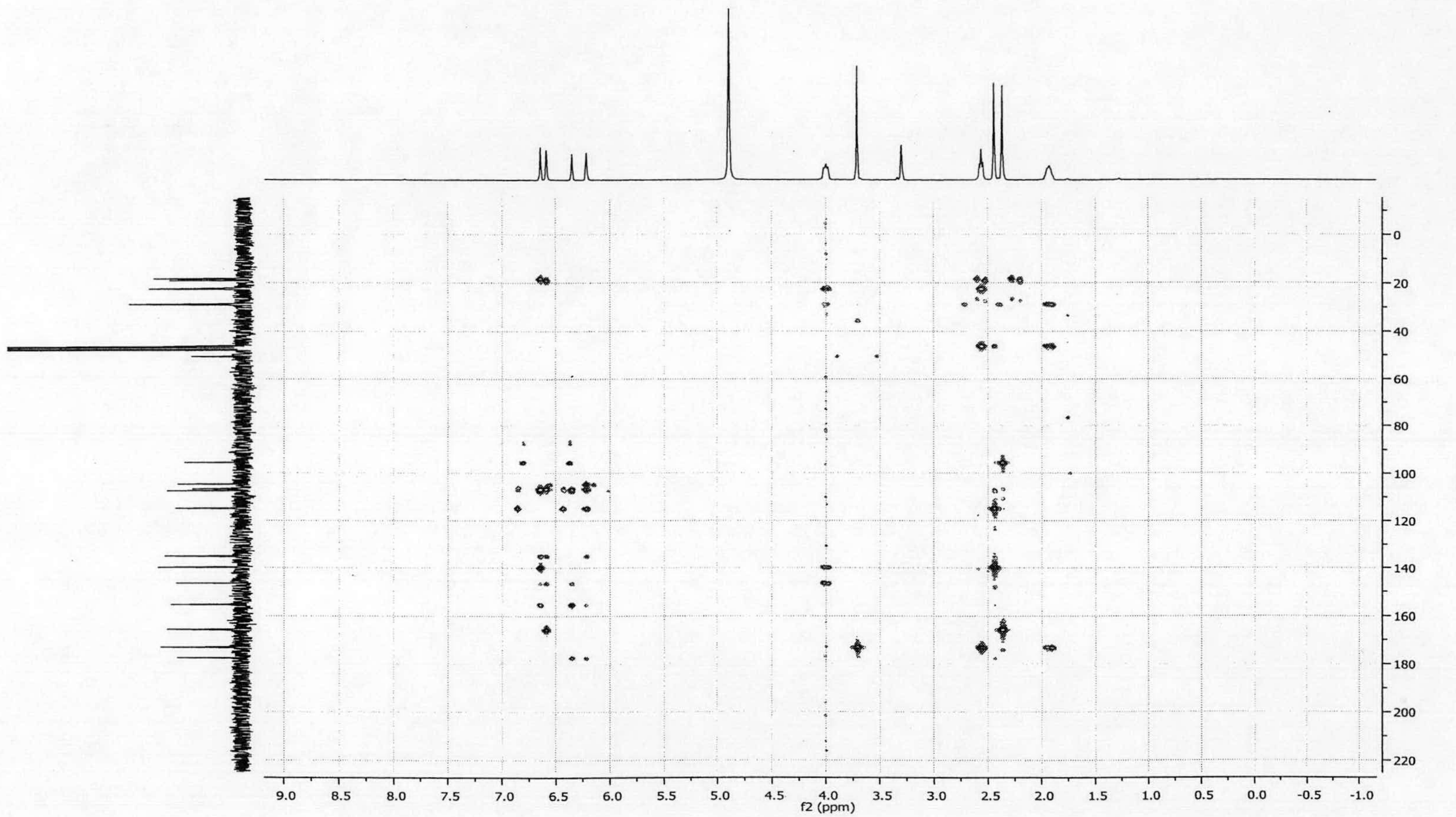


**Figure A-19** HMBC spectrum of cassairin B obtained in $CD_3OD$ (Compound **5**)

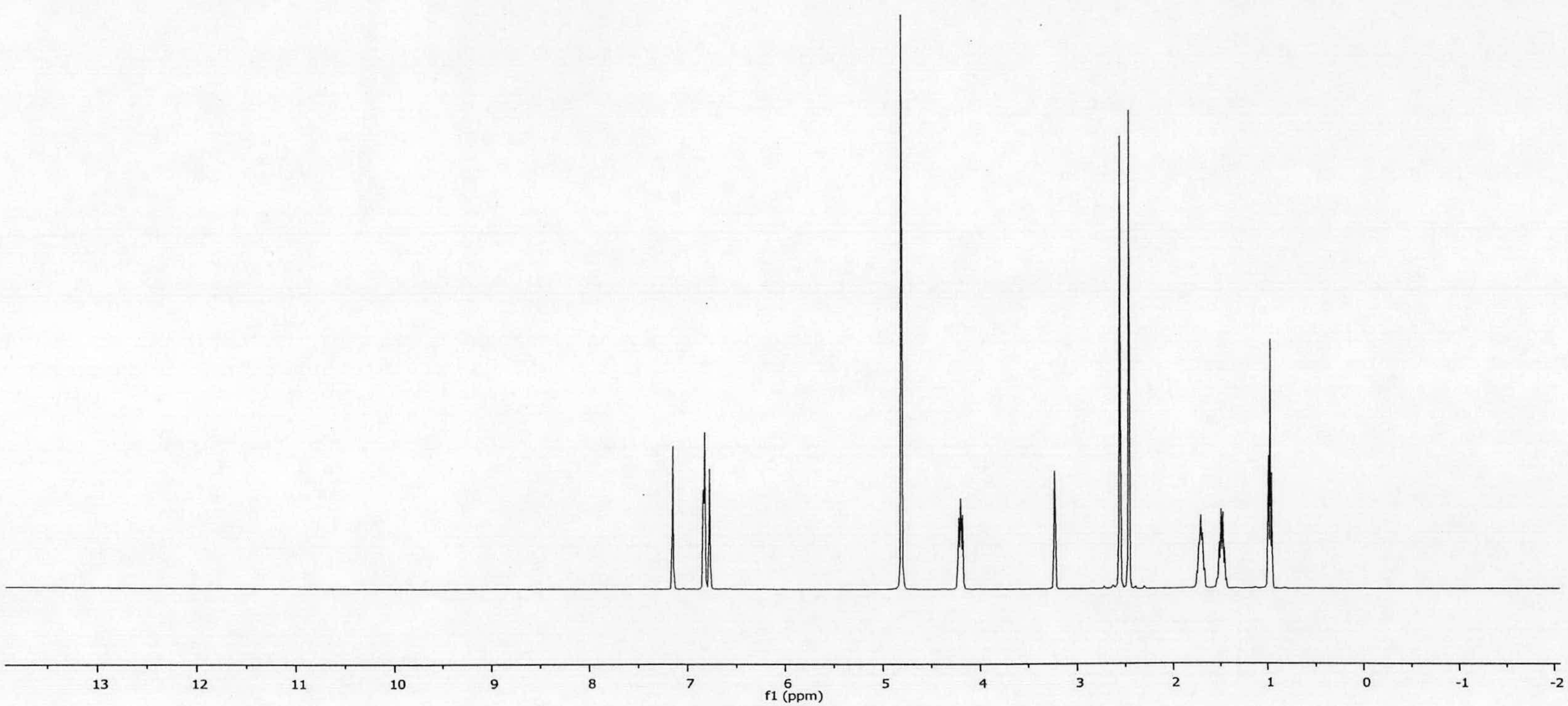


**Figure A-20** $^{1}$H-NMR spectrum of *N*-butyl cassiarin A chloride obtained in $CD_3OD$ (Compound **28a**)

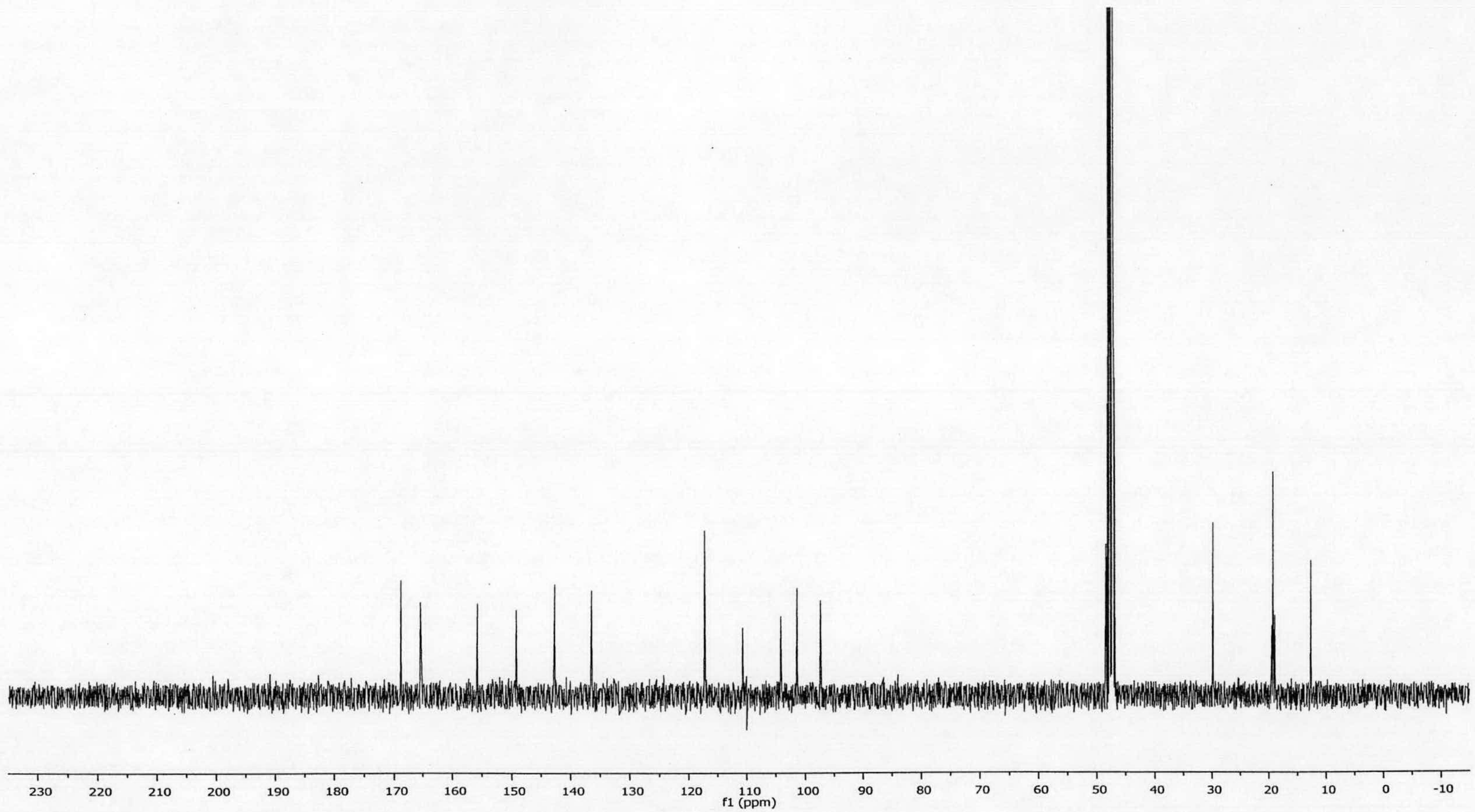


**Figure A-21** $^{13}$C-NMR spectrum of *N*-butyl cassiarin A chloride obtained in $CD_3OD$ (Compound **28a**)

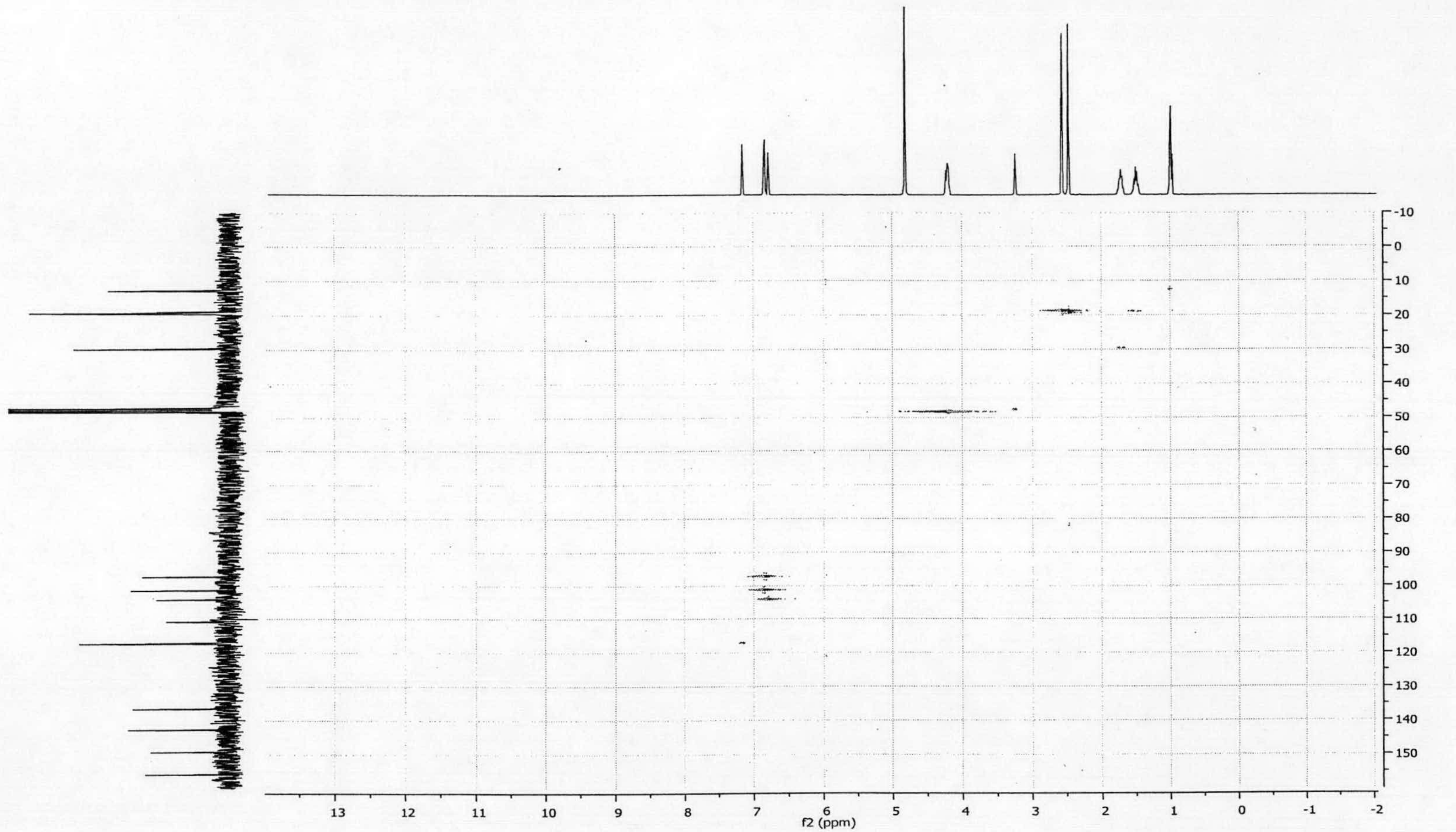


**Figure A-22** HSQC spectrum of *N*-butyl cassiarin A chloride obtained in $CD_3OD$ (Compound **28a**)

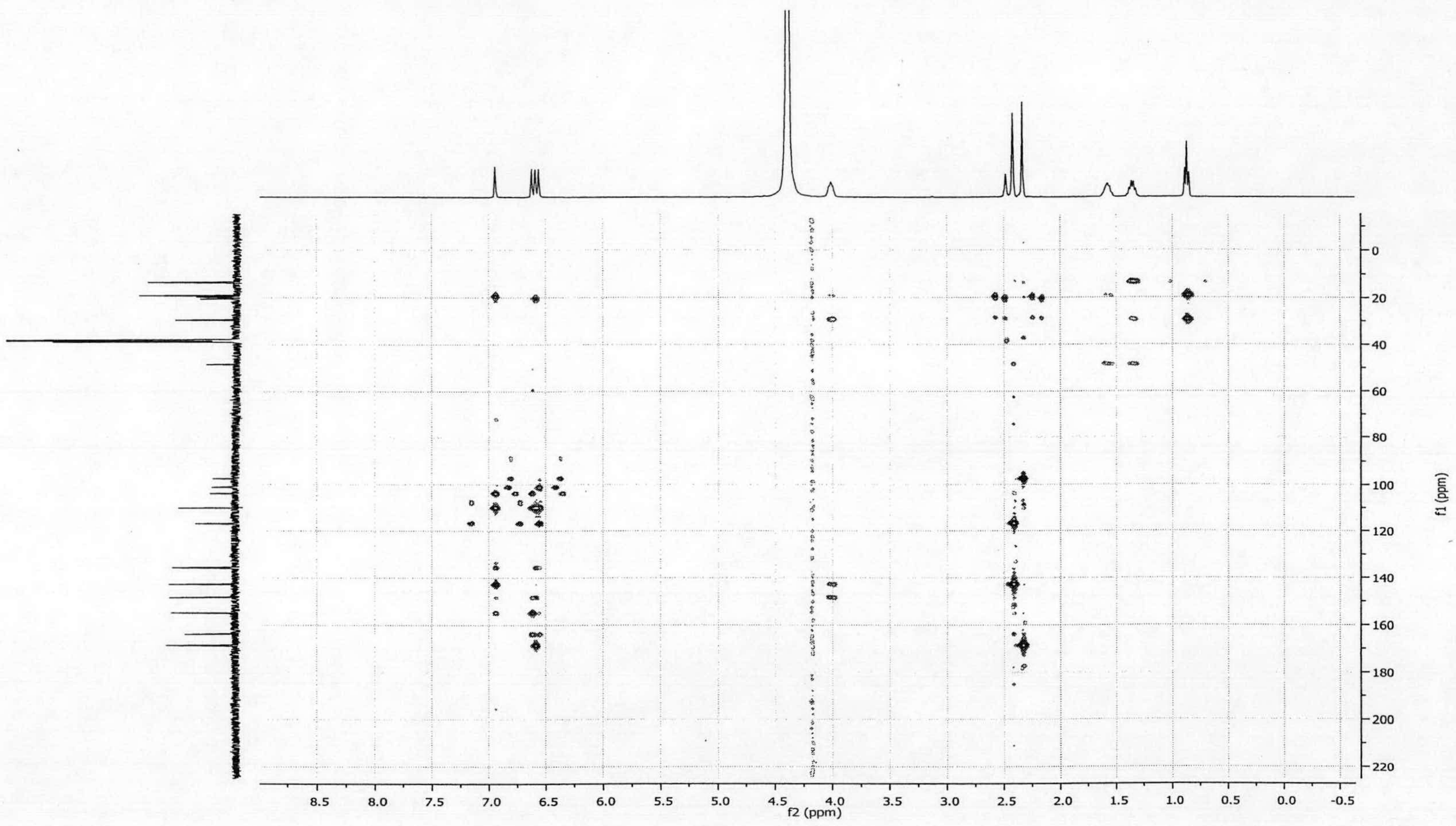


**Figure A-23** HMBC spectrum of *N*-butyl cassiarin A chloride obtained in DMSO-$d_6$ (Compound **28a**)

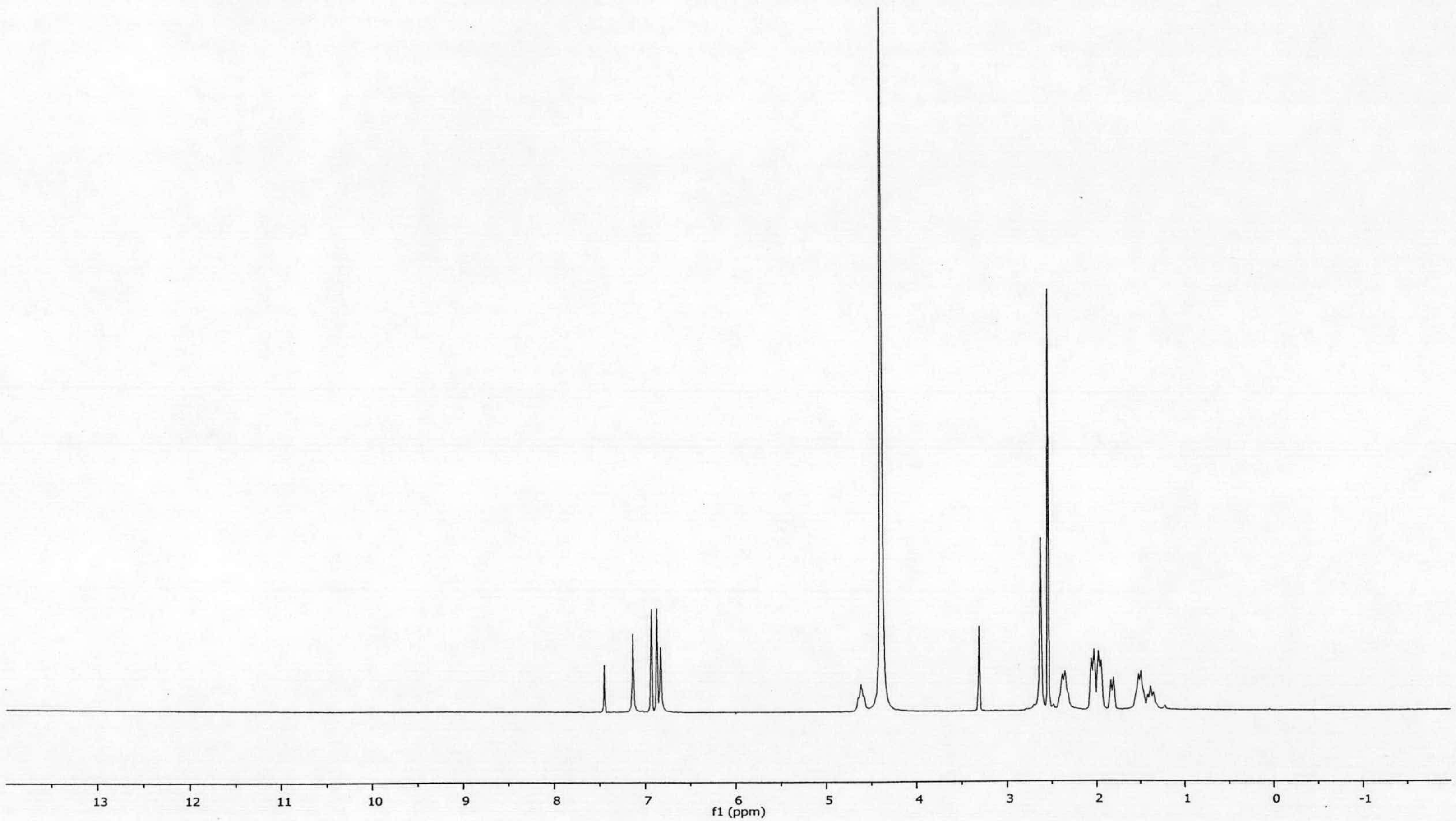


**Figure A-24** $^{1}$H-NMR spectrum of *N*-cyclohexyl cassiarin A chloride obtained in $CD_3OD/CDCl_3$ (1:4) (Compound **29a**)

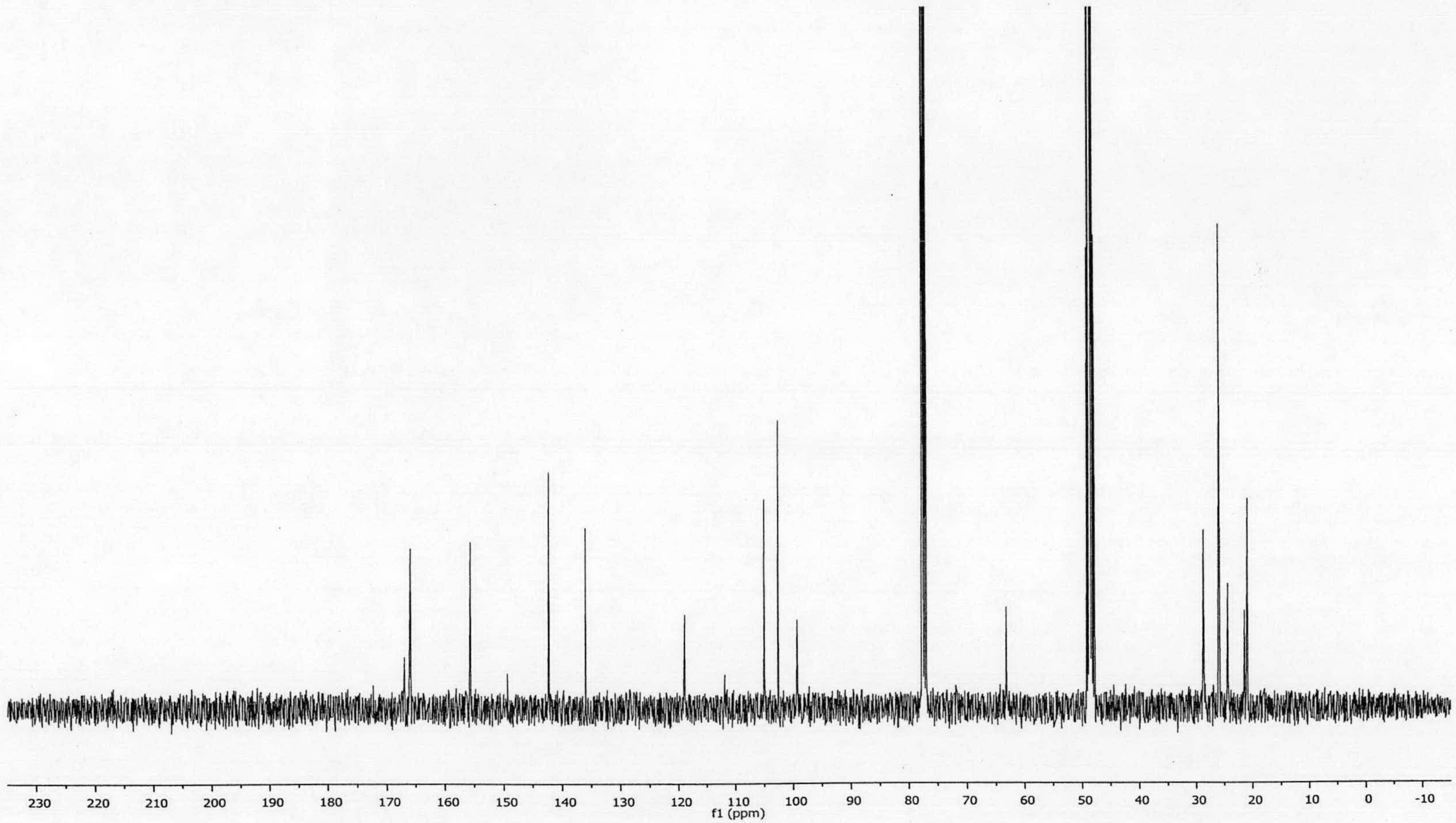


**Figure A-25** $^{13}C$-NMR spectrum of *N*-cyclohexyl cassiarin A chloride obtained in $CD_3OD/CDCl_3$ (1:4) (Compound **29a**)

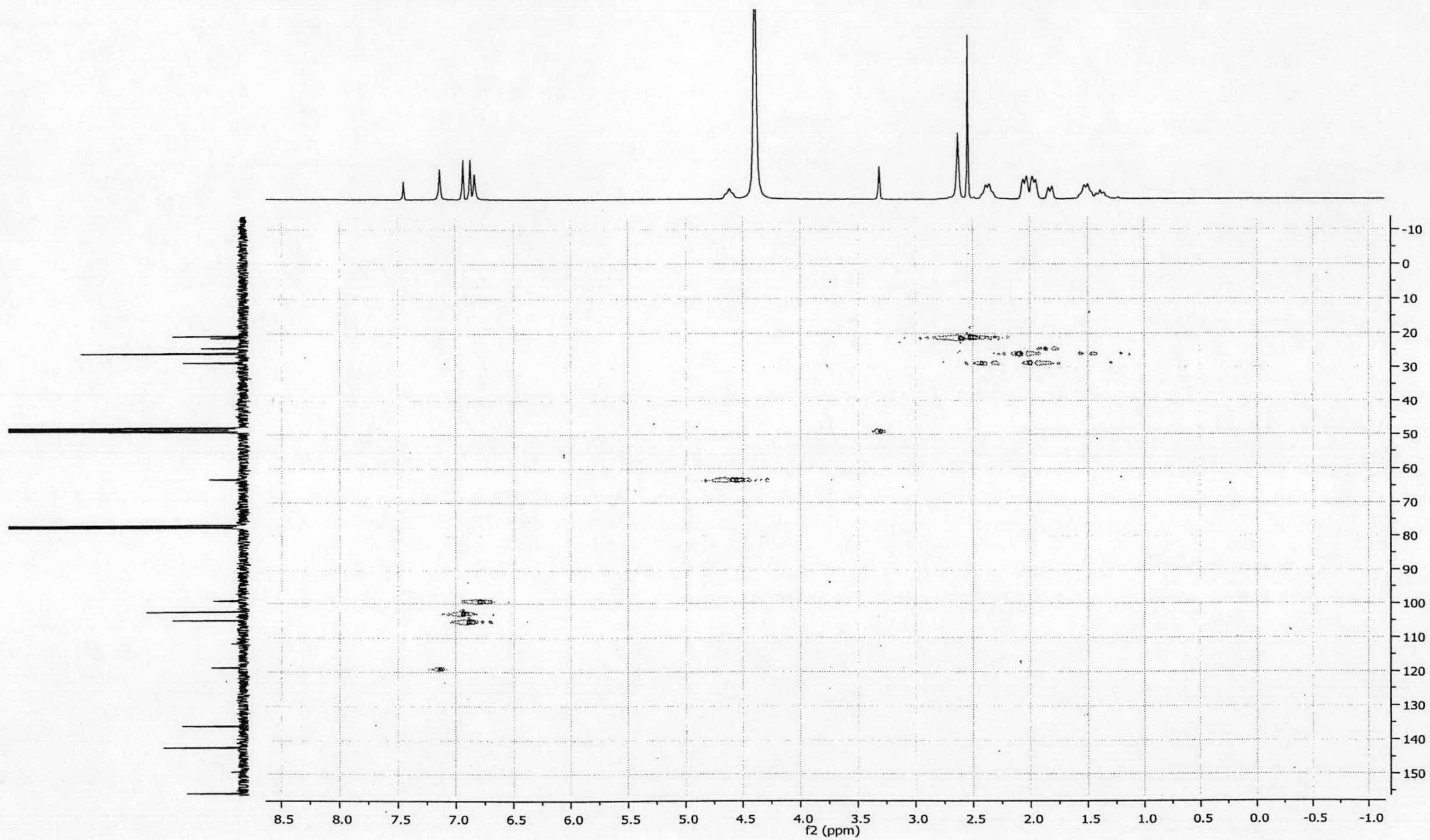


**Figure A-26** HSQC NMR spectrum of *N*-cyclohexyl cassiarin A chloride obtained in $CD_3OD/CDCl_3$ (1:4) (Compound **29a**)

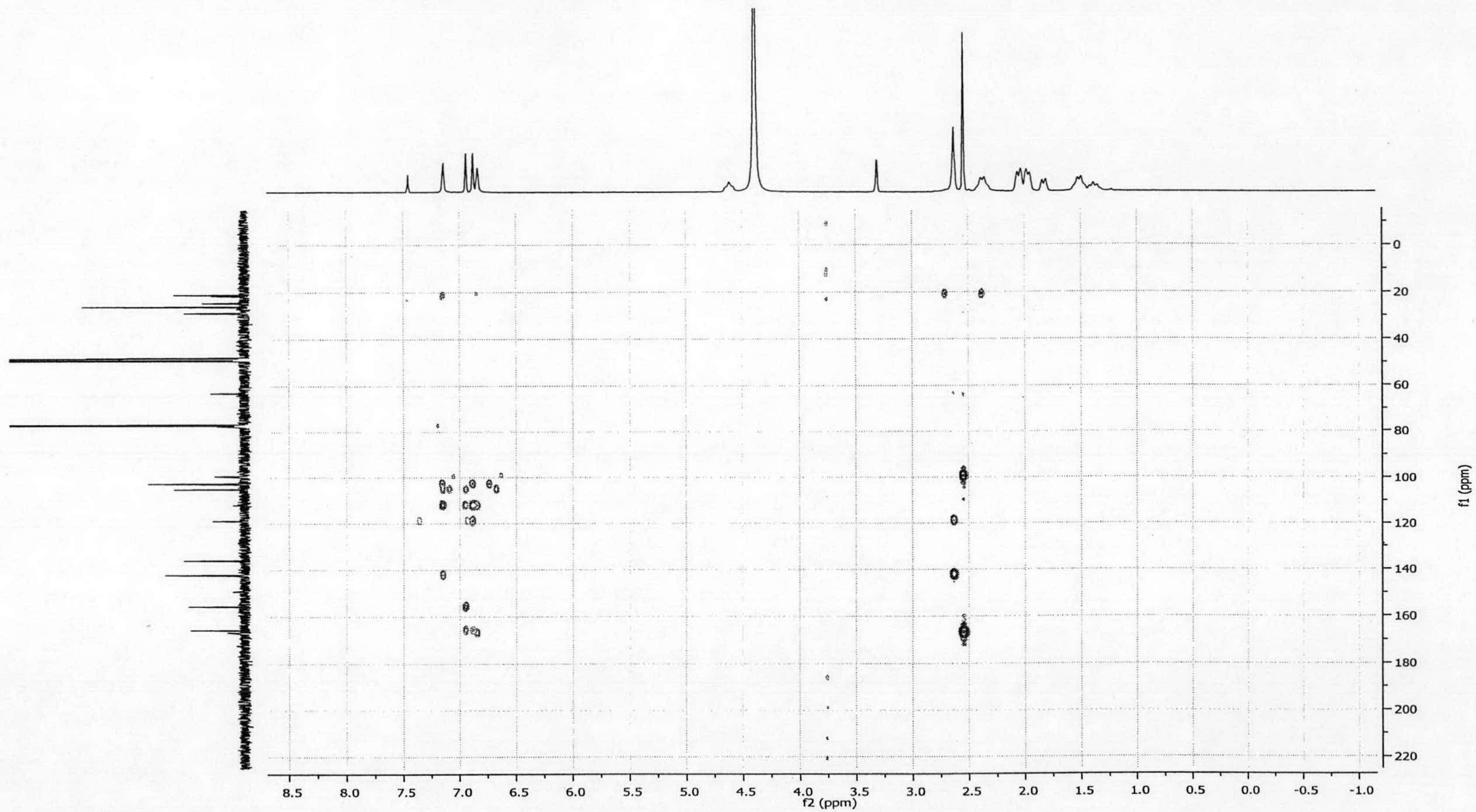


**Figure A-27** HMBC NMR spectrum of *N*-cyclohexyl cassiarin A chloride obtained in $CD_3OD/CDCl_3$ (1:4) (Compound **29a**)

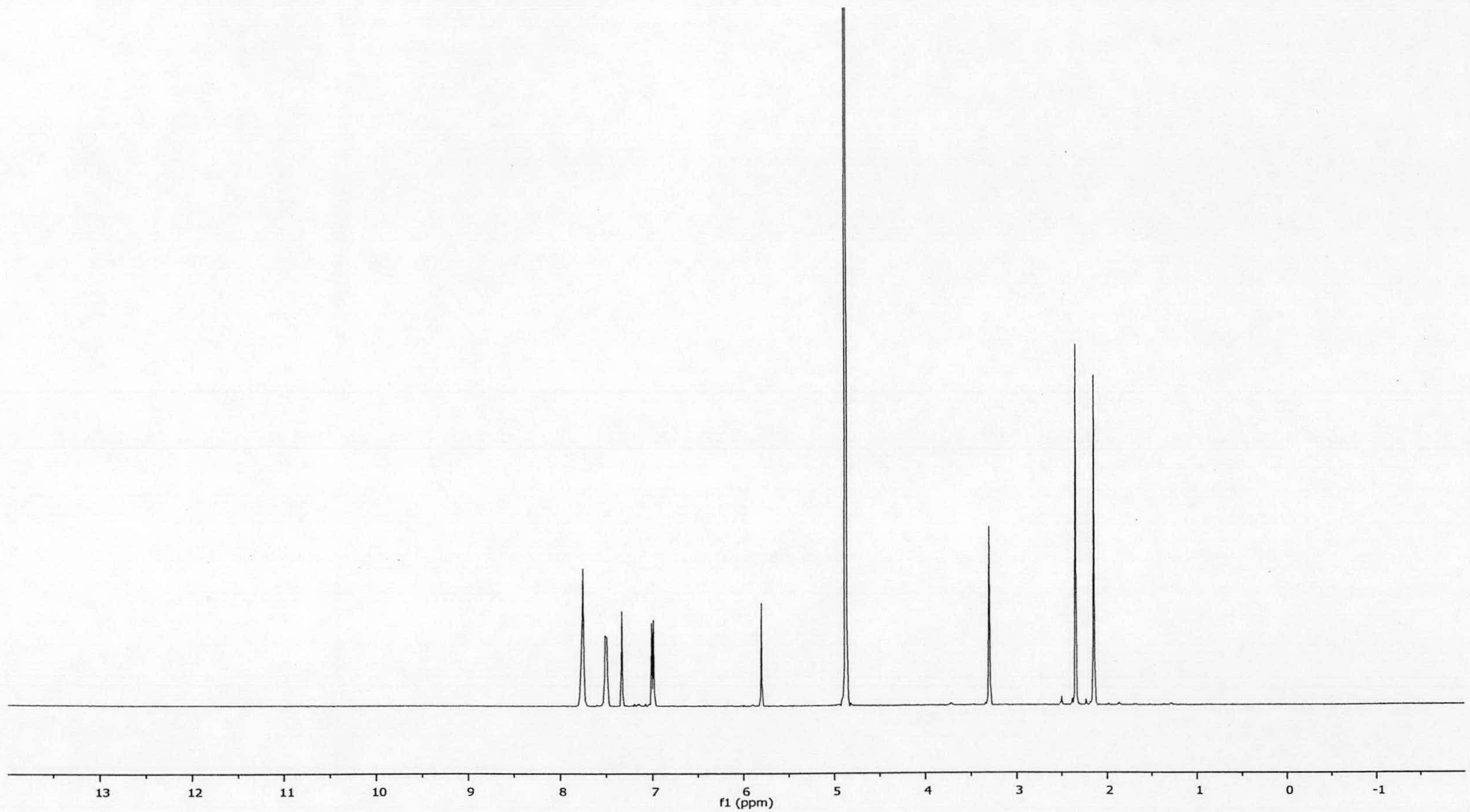


**Figure A-28** $^{1}$H-NMR spectrum of *N*-phenyl cassiarin A chloride obtained in $CD_3OD$ (Compound **30a**)

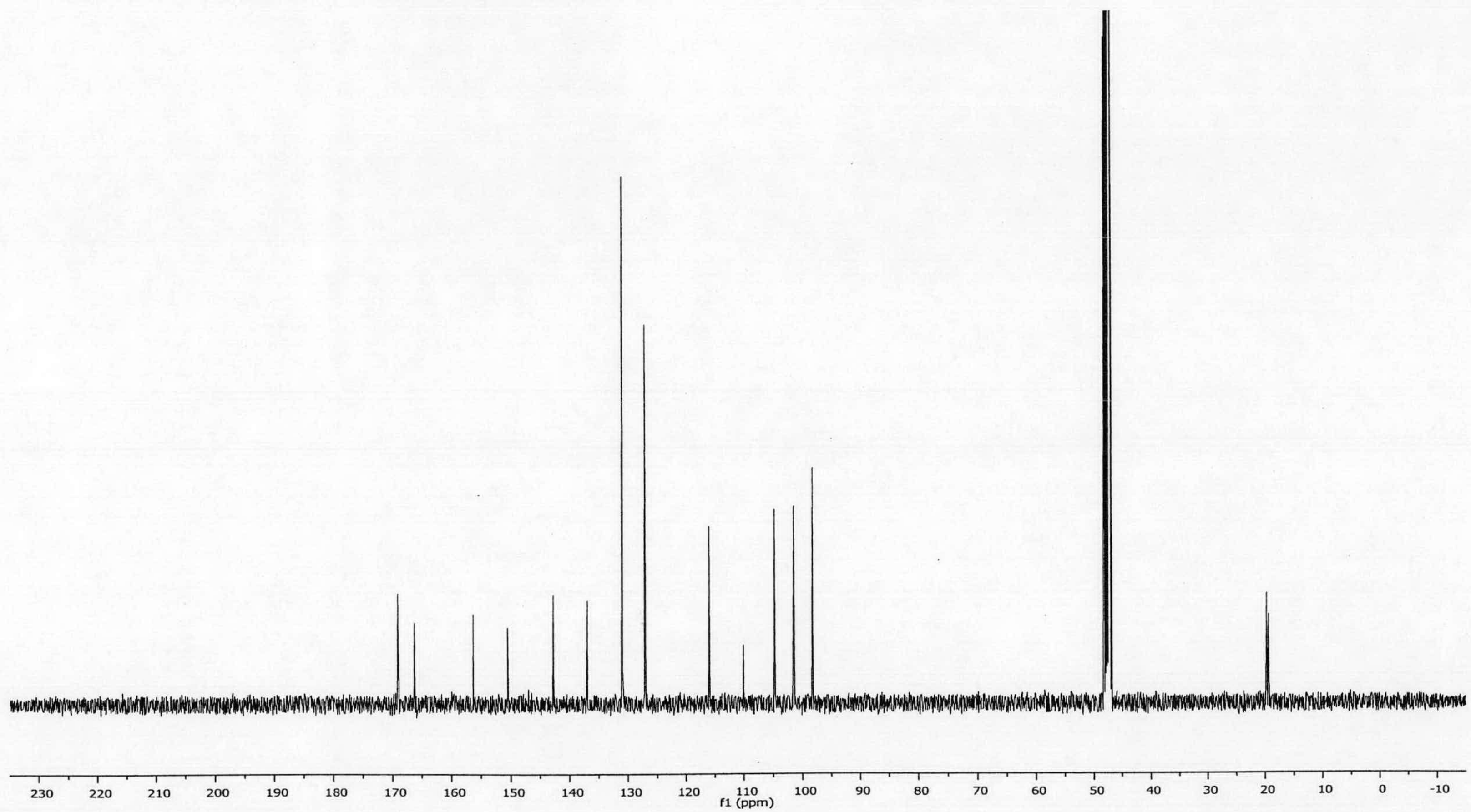


**Figure A-29** $^{13}C$-NMR spectrum of *N*-phenyl cassiarin A chloride obtained in $CD_3OD$ (Compound **30a**)

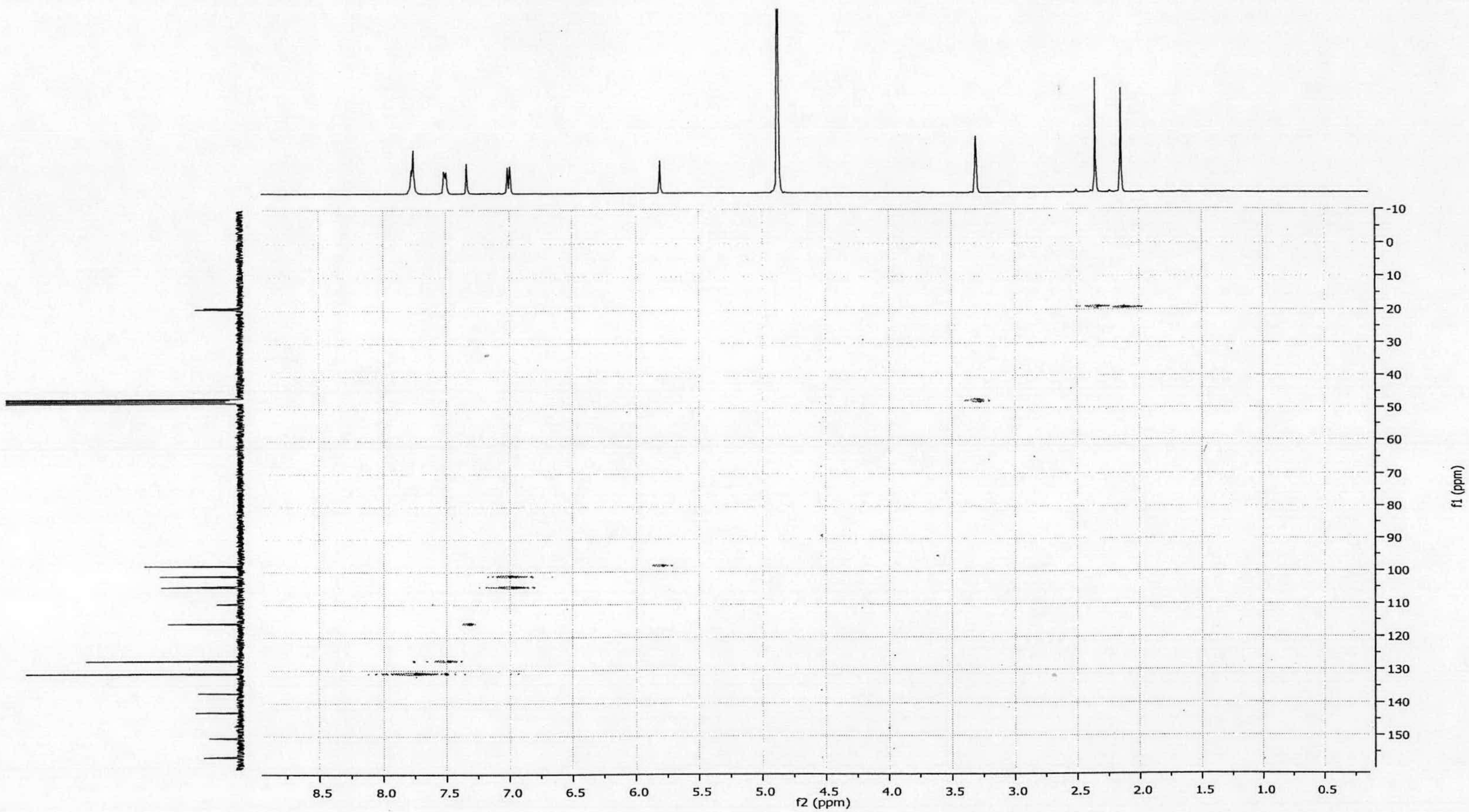


**Figure A-30** HSQC spectrum of *N*-phenyl cassiarin A chloride obtained in $CD_3OD$ (Compound **30a**)

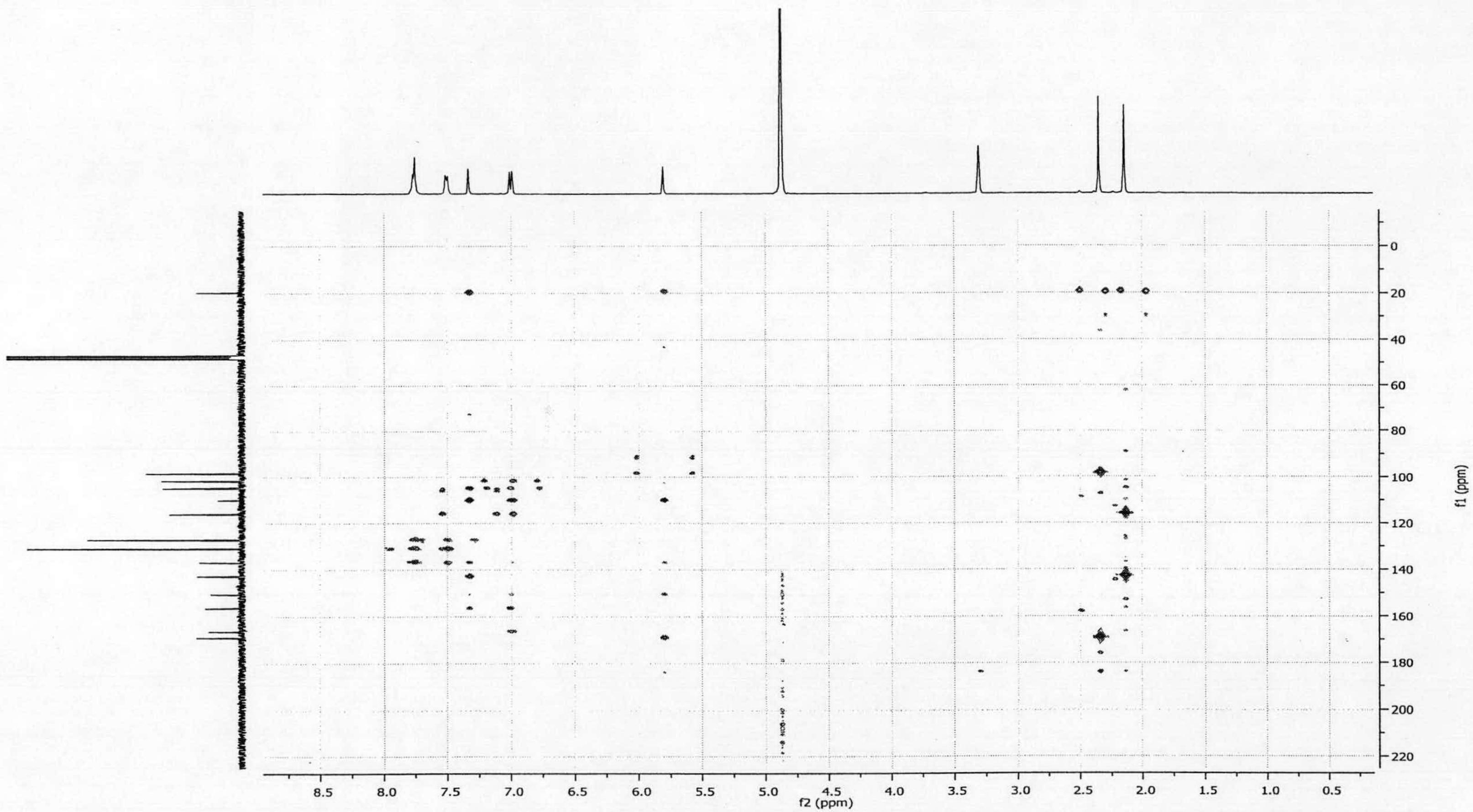


**Figure A-31** HMBC spectrum of *N*-phenyl cassiarin A chloride obtained in $CD_3OD$ (Compound **30a**)

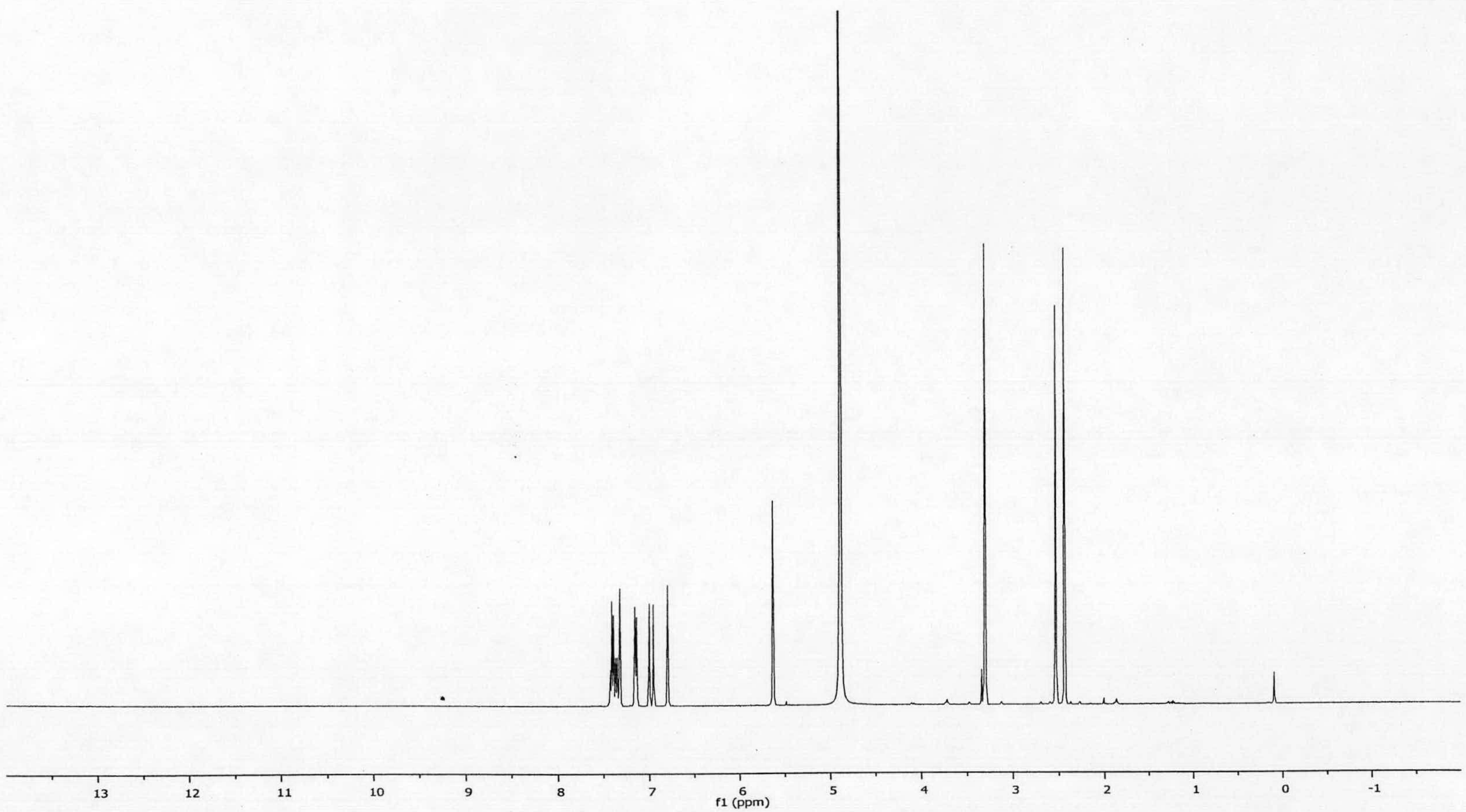


**Figure A-32** $^1$H-NMR spectrum of *N*-benzyl cassiarin A chloride obtained in $CD_3OD$ (Compound **31a**)

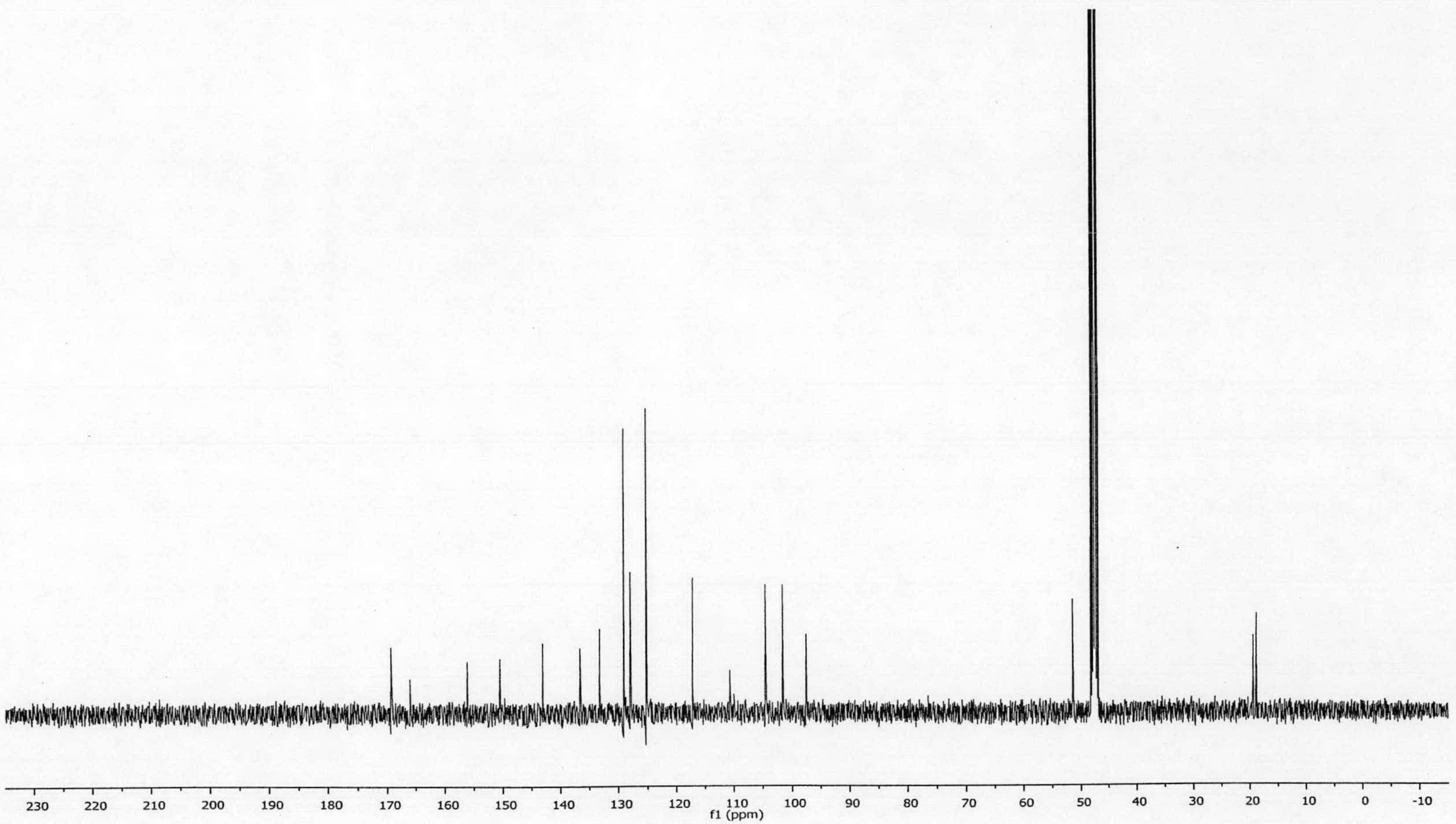


**Figure A-33** $^{13}$C-NMR spectrum of *N*-benzyl cassiarin A chloride obtained in $CD_3OD$ (Compound **31a**)

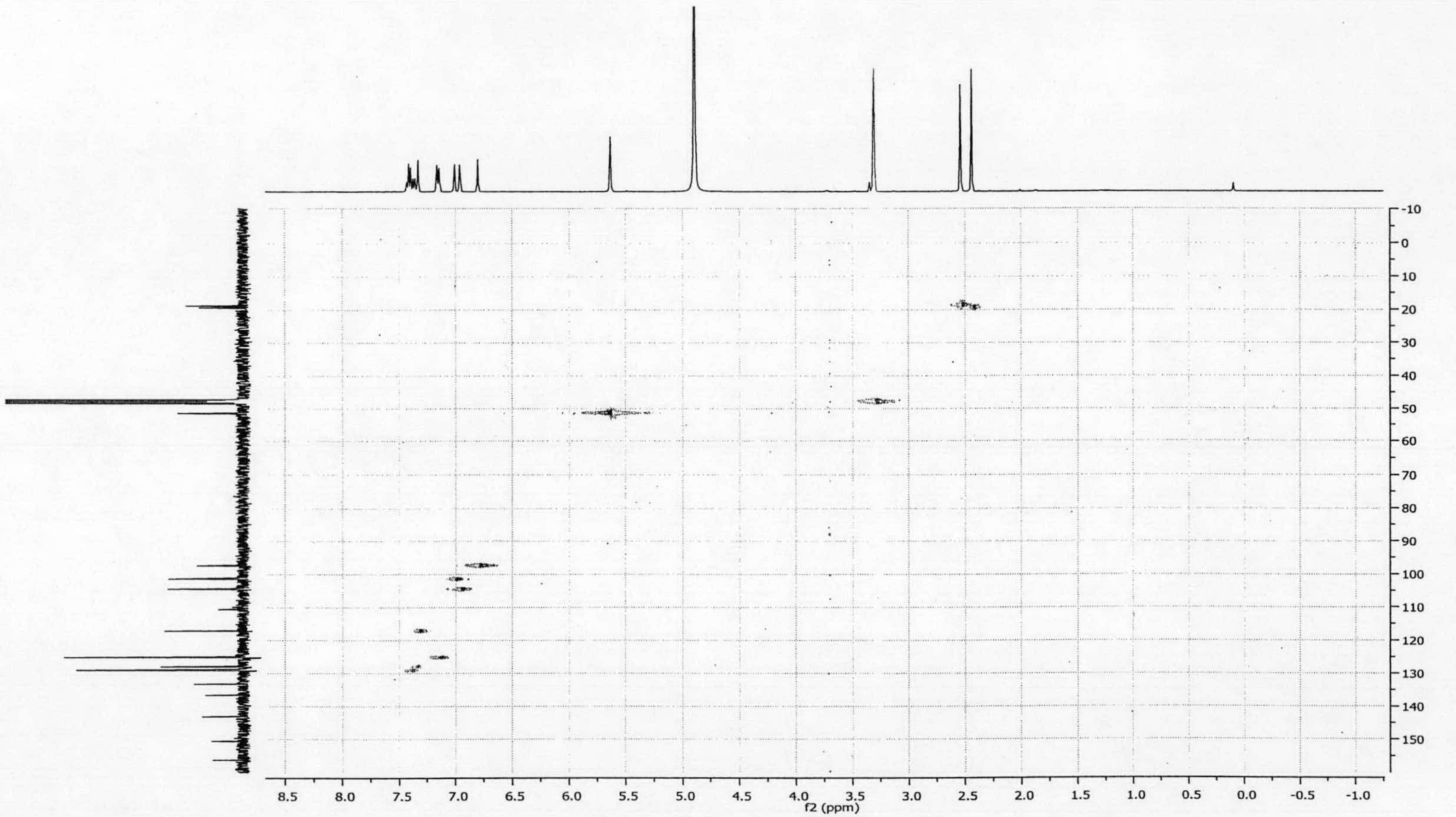


**Figure A-34** HSQC spectrum of *N*-benzyl cassiarin A chloride obtained in $CD_3OD$ (Compound **31a**)

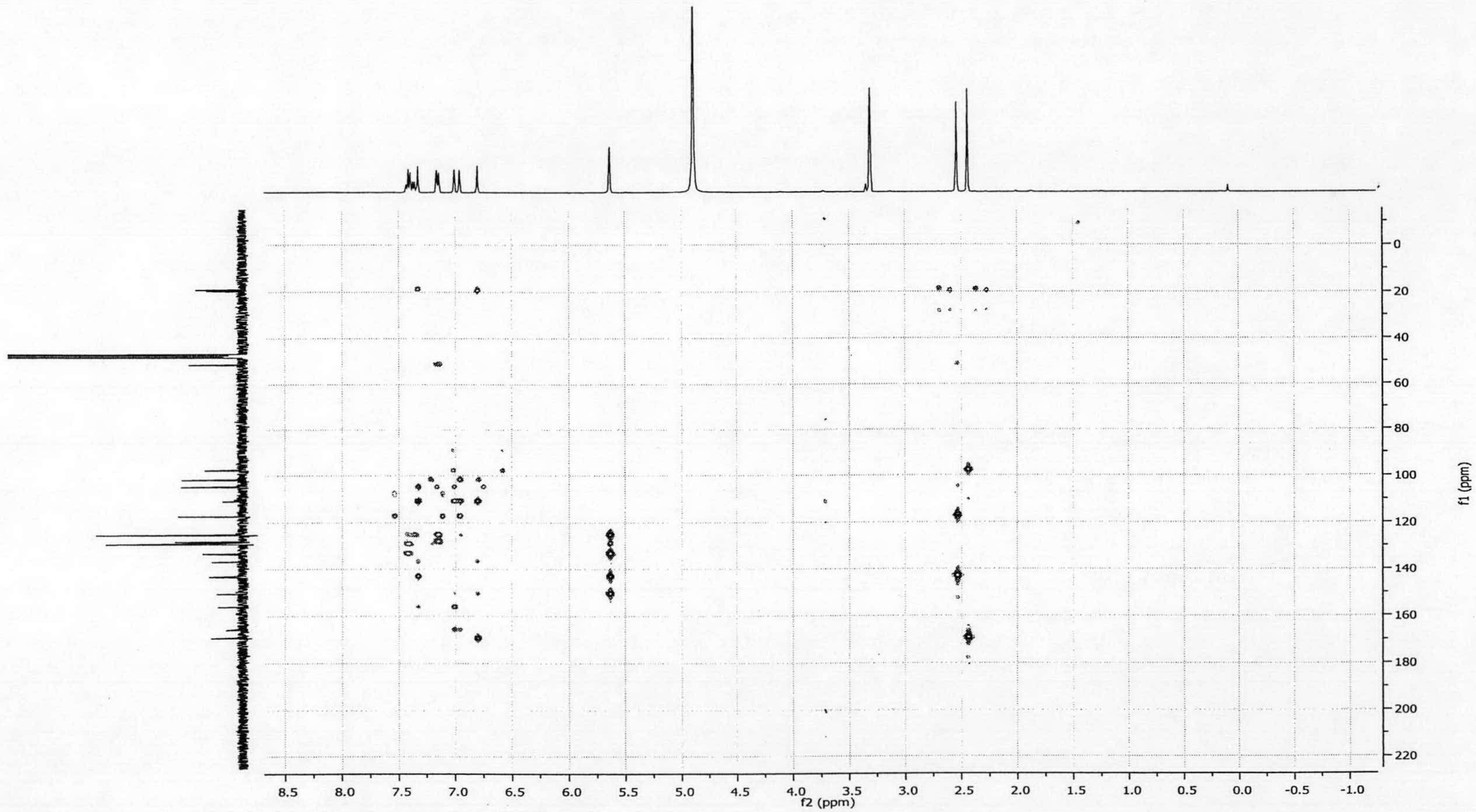


**Figure A-35** HMBC spectrum of *N*-benzyl cassiarin A chloride obtained in $CD_3OD$ (Compound **31a**)

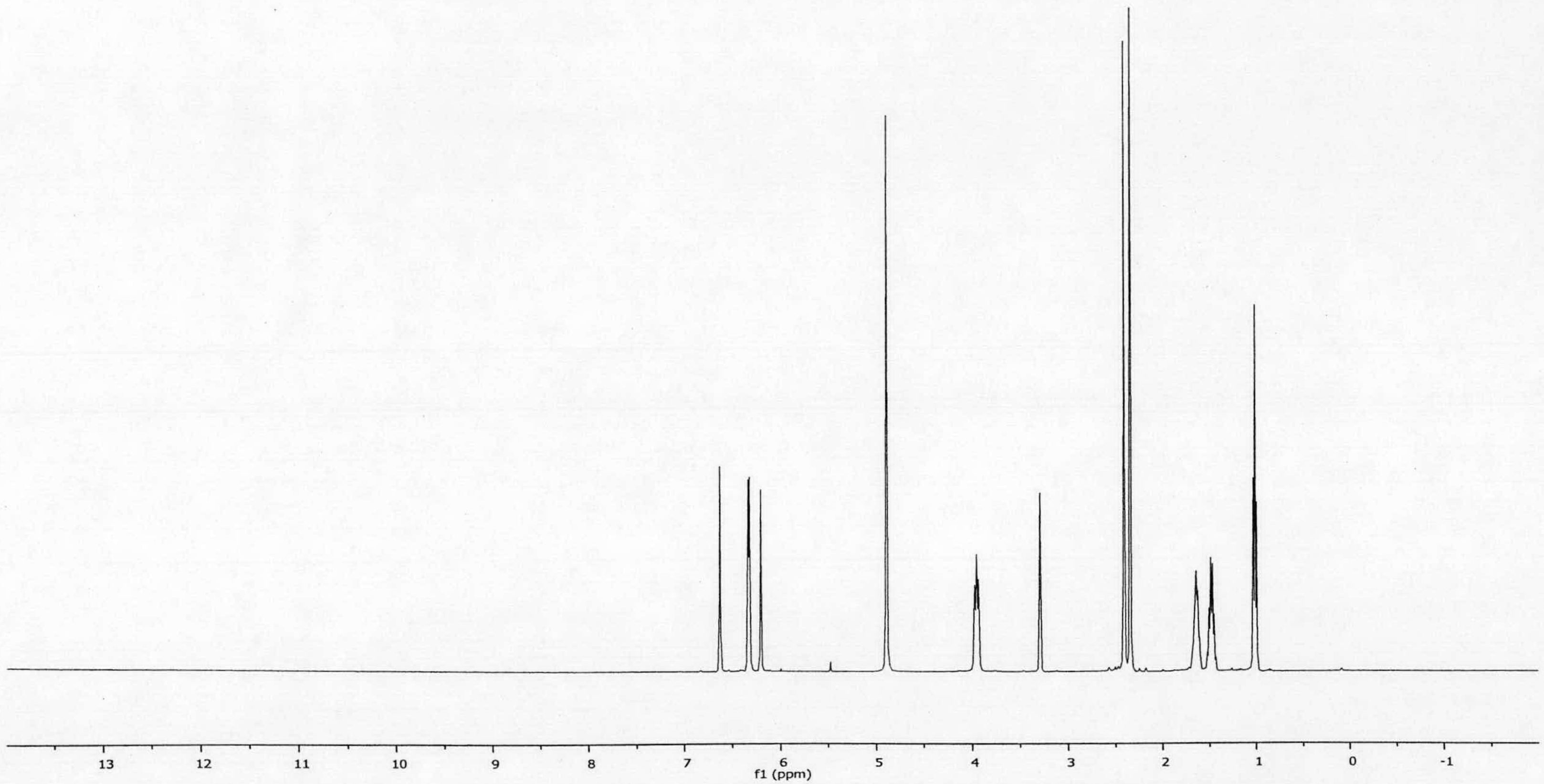


**Figure A-36** $^{1}$H-NMR spectrum of *N*-butyl cassiarin B (Compound **28b**)

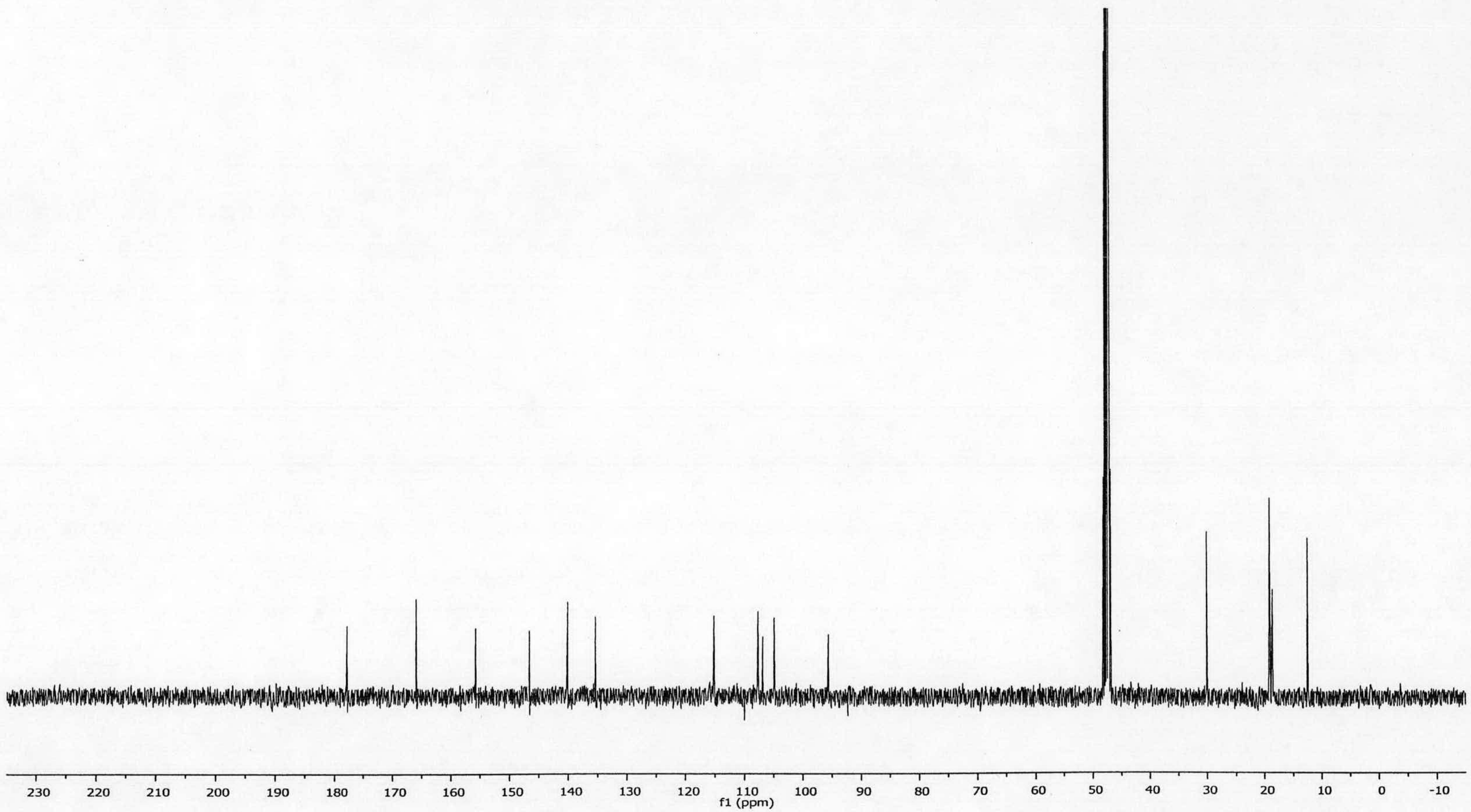


**Figure A-37** $^{13}$C-NMR spectrum of *N*-butyl cassiarin B (Compound **28b**)

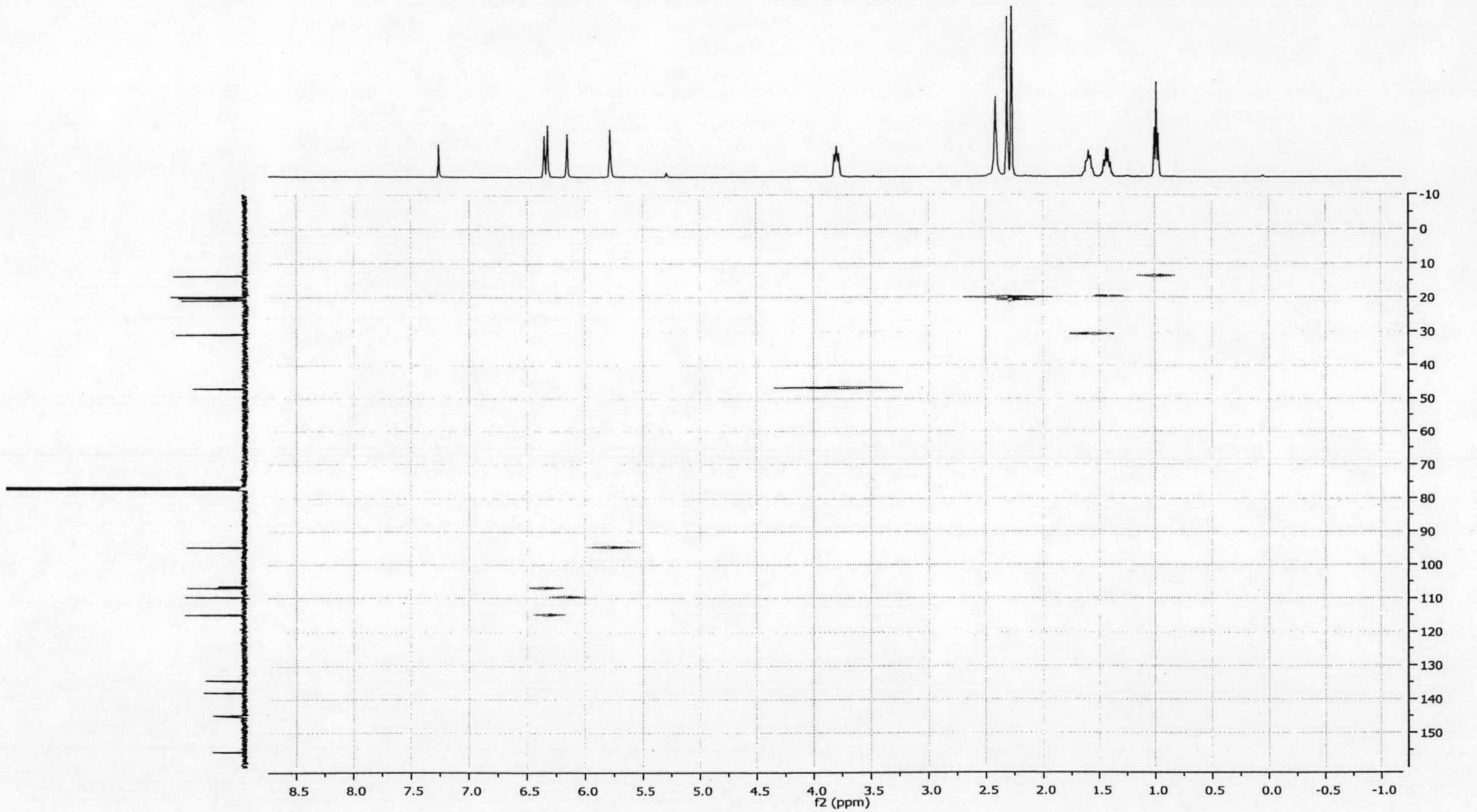


**Figure A-38** HSQC spectrum of *N*-butyl cassiarin B (Compound **28b**)

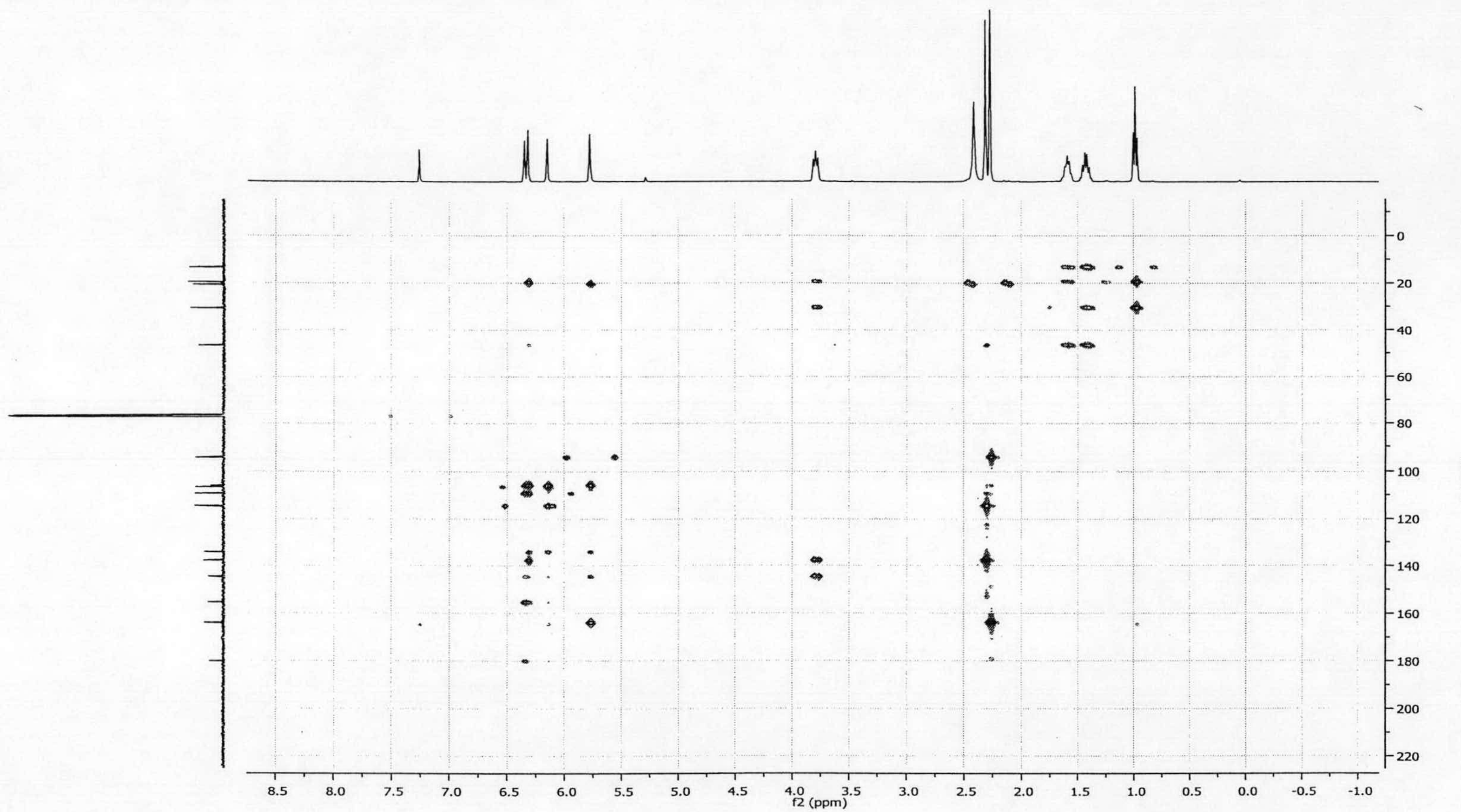


**Figure A-39** HMBC spectrum of *N*-butyl cassiarin B (Compound **28b**)

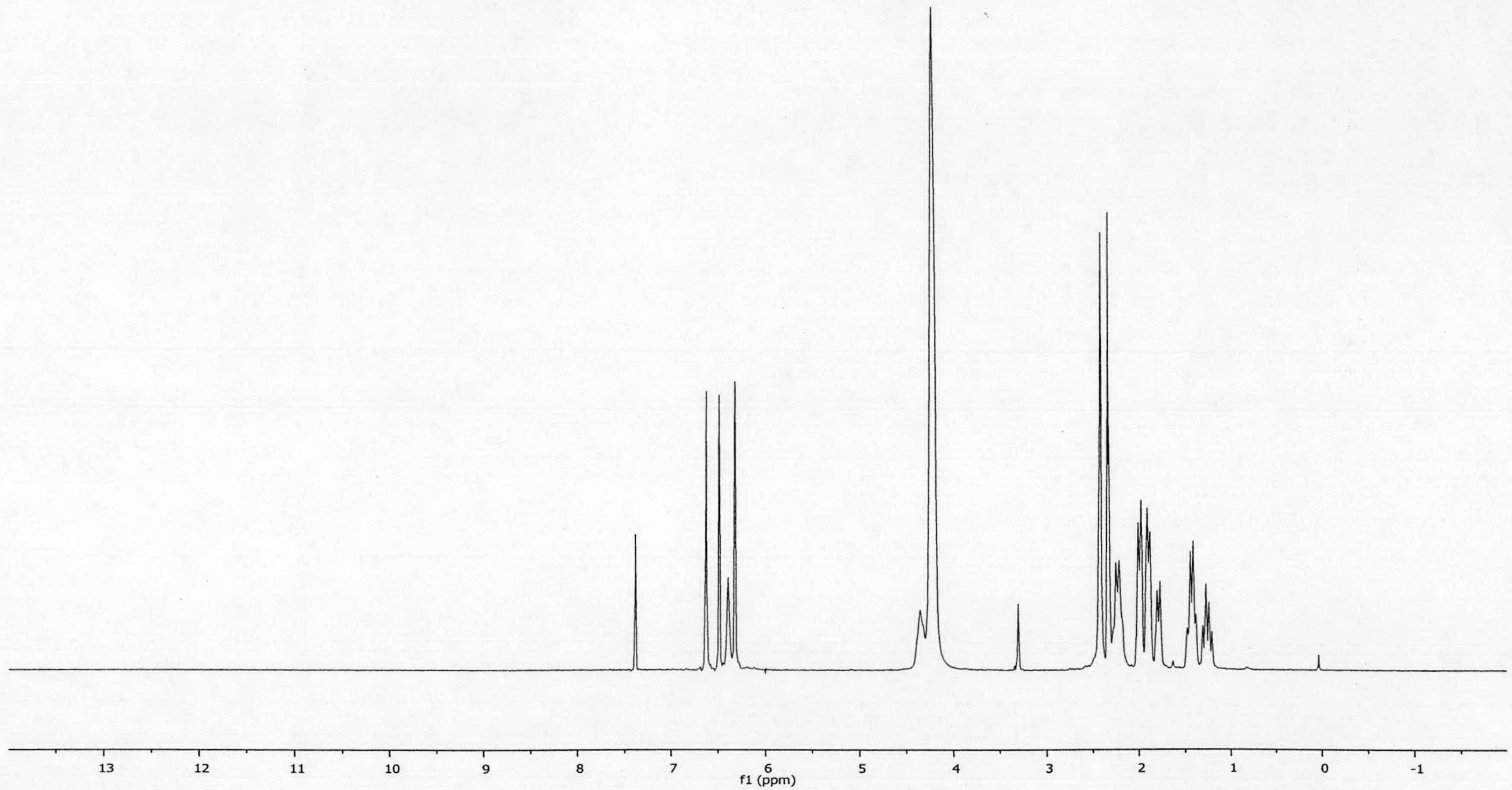


**Figure A-40** $^{1}$H-NMR spectrum of *N*-cyclohexyl cassiarin B (Compound **29b**)

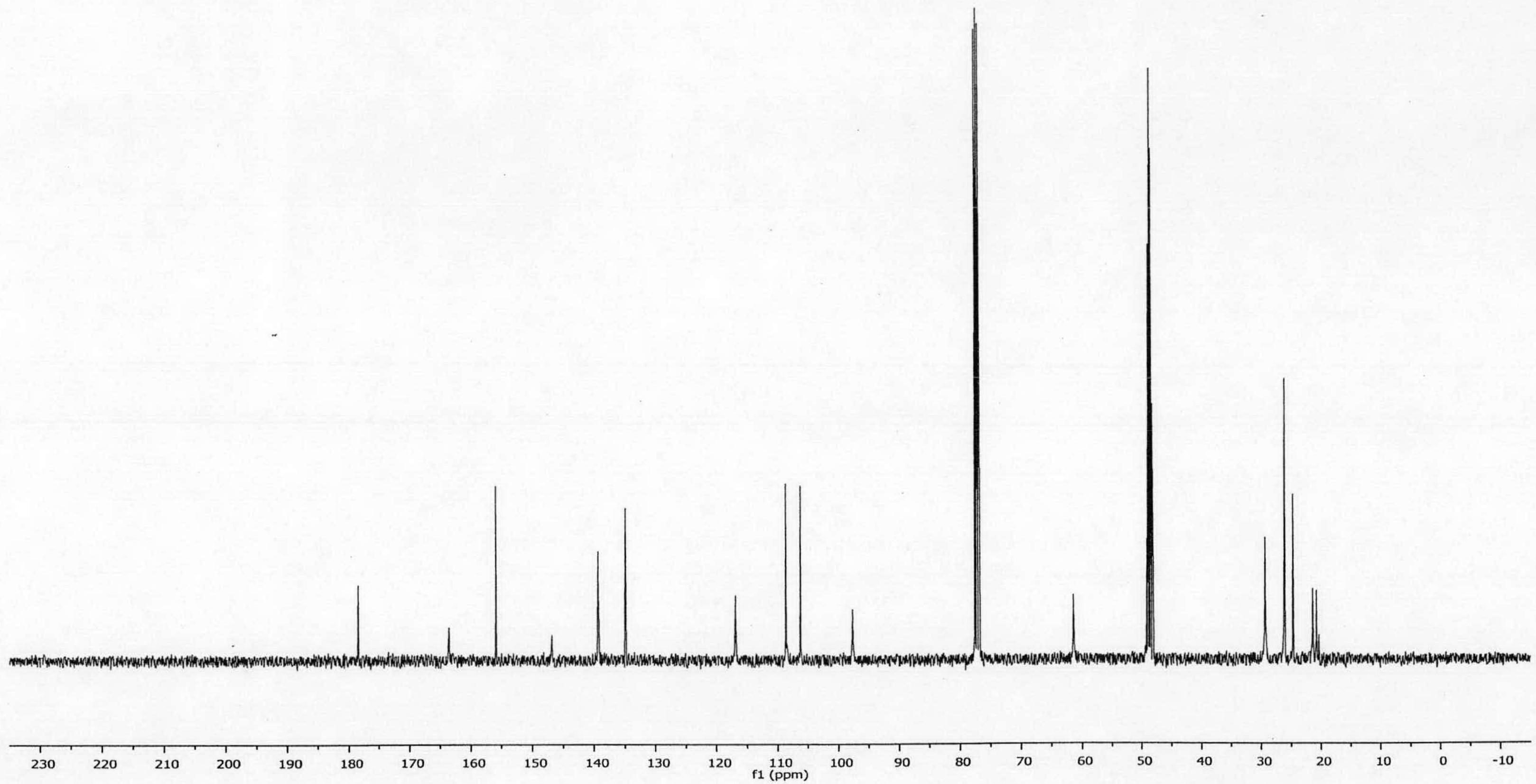


**Figure A-41** $^{13}$C-NMR spectrum of *N*-cyclohexyl cassiarin B (Compound **29b**)

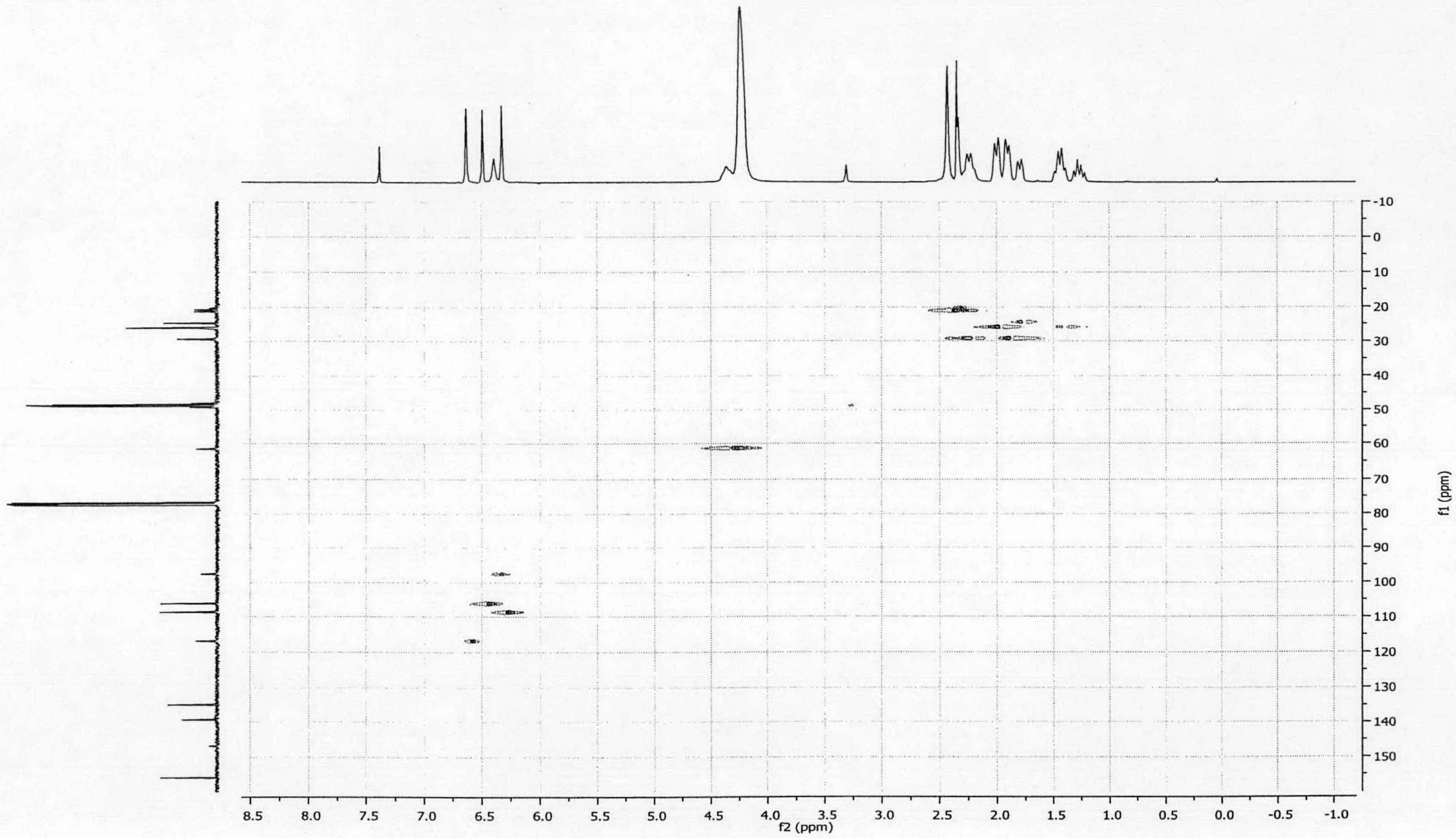


**Figure A-42** HSQC spectrum of *N*-cyclohexyl cassiarin B (Compound **29b**)

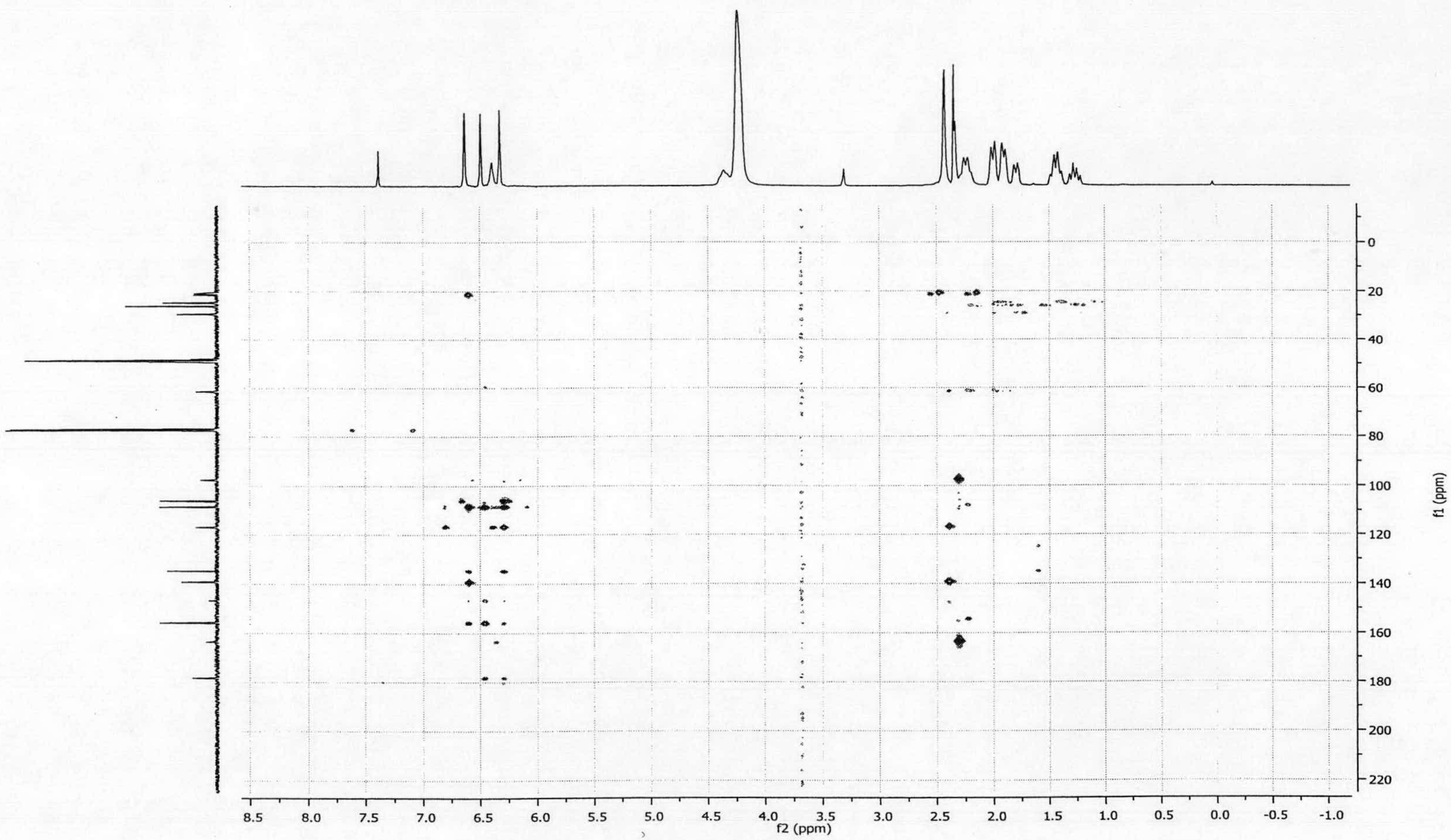


**Figure A-43** HMBC spectrum of *N*-cyclohexyl cassiarin B (Compound **29b**)

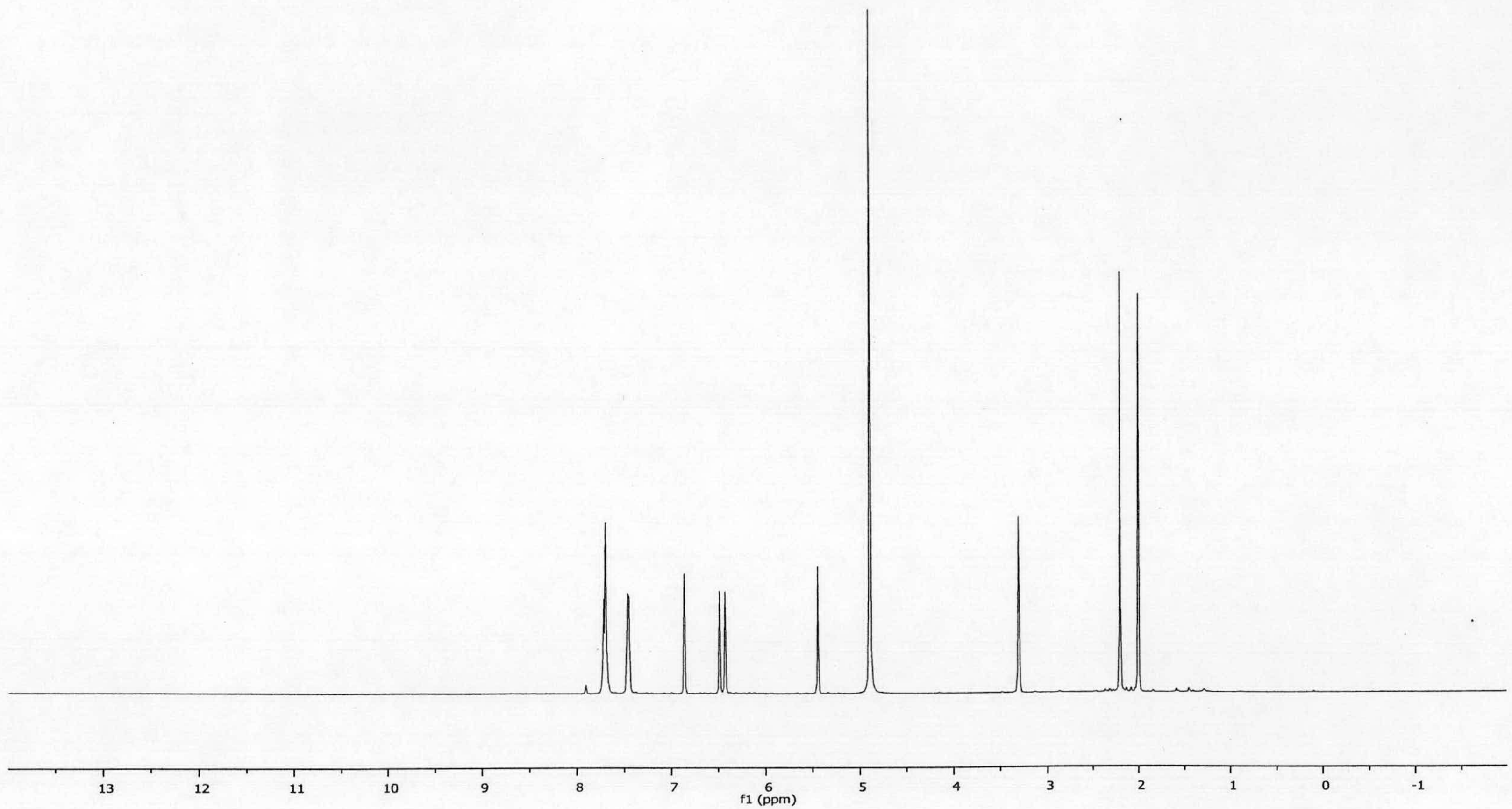


**Figure A-44** $^{1}$H-NMR spectrum of *N*-phenyl cassiarin B (Compound **30b**)

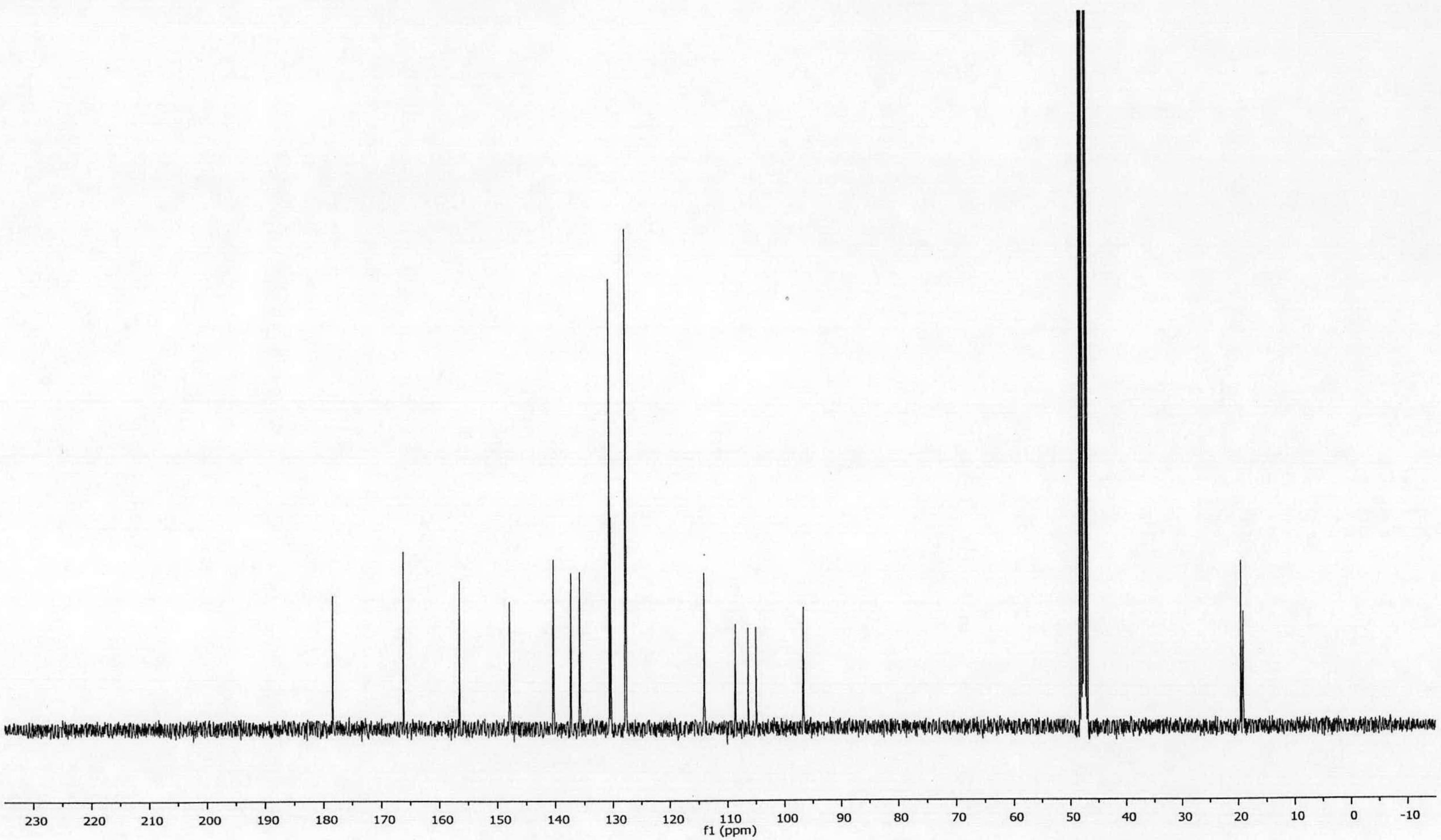


**Figure A-45** $^{13}$C-NMR spectrum of *N*-phenyl cassiarin B (Compound **30b**)

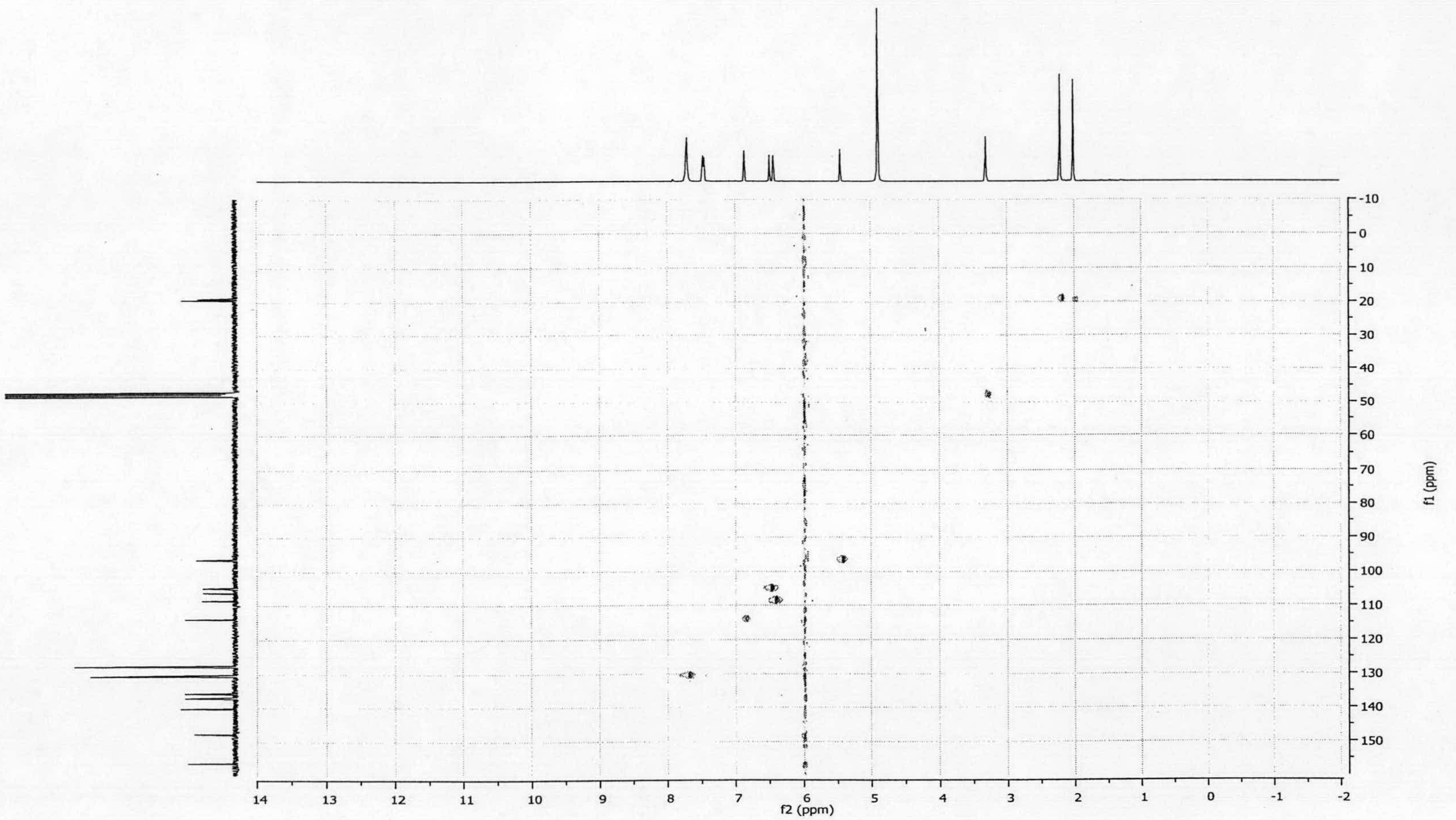


**Figure A-46** HSQC spectrum of *N*-phenyl cassiarin B (Compound **30b**)

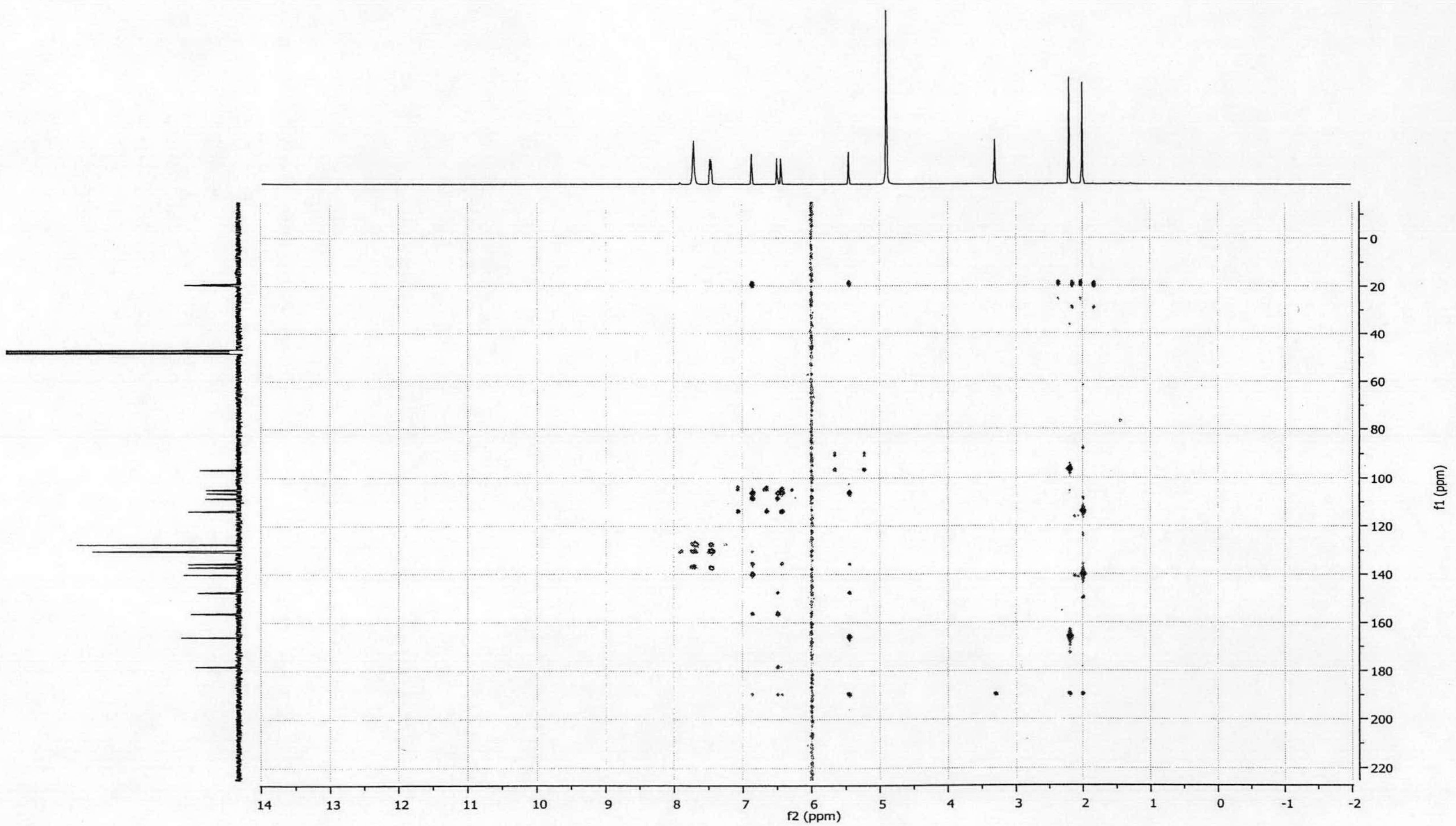


**Figure A-47** HMBC spectrum of *N*-phenyl cassiarin B (Compound **30b**)

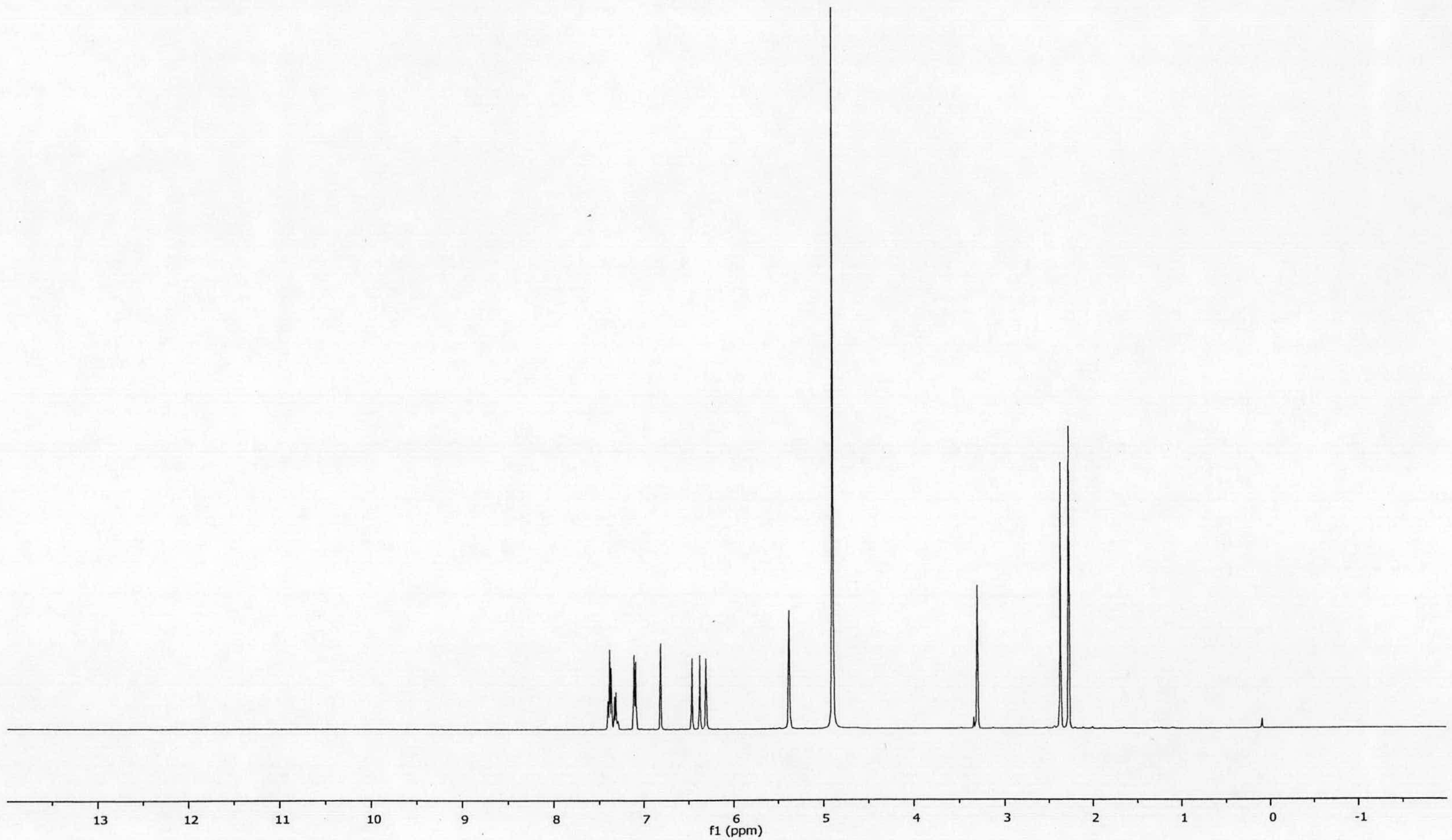


**Figure A-48** $^{1}$H-NMR spectrum of *N*-benzyl cassiarin B (Compound **31b**)

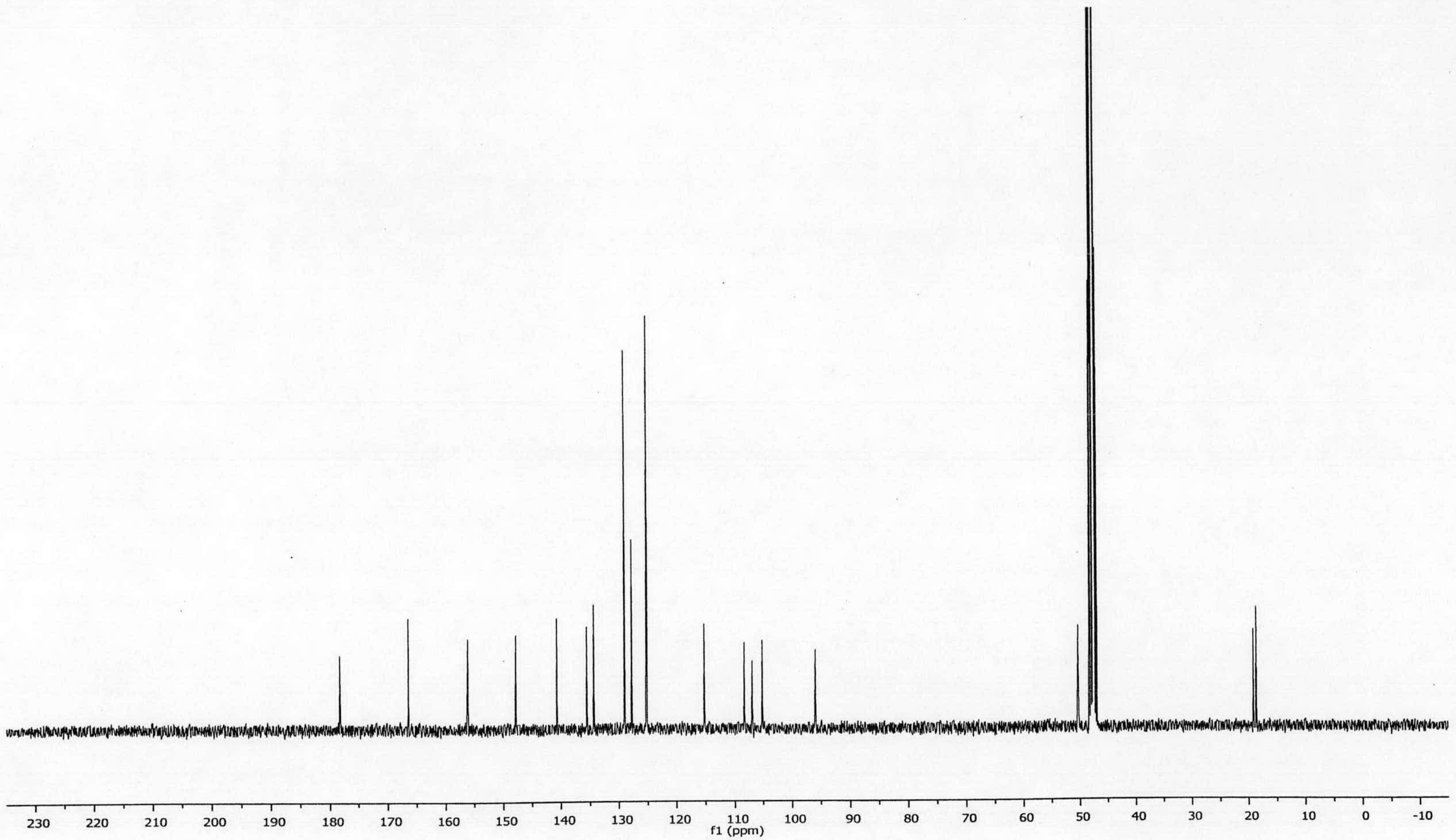


**Figure A-49** $^{13}$C-NMR spectrum of *N*-benzyl cassiarin B (Compound **31b**)

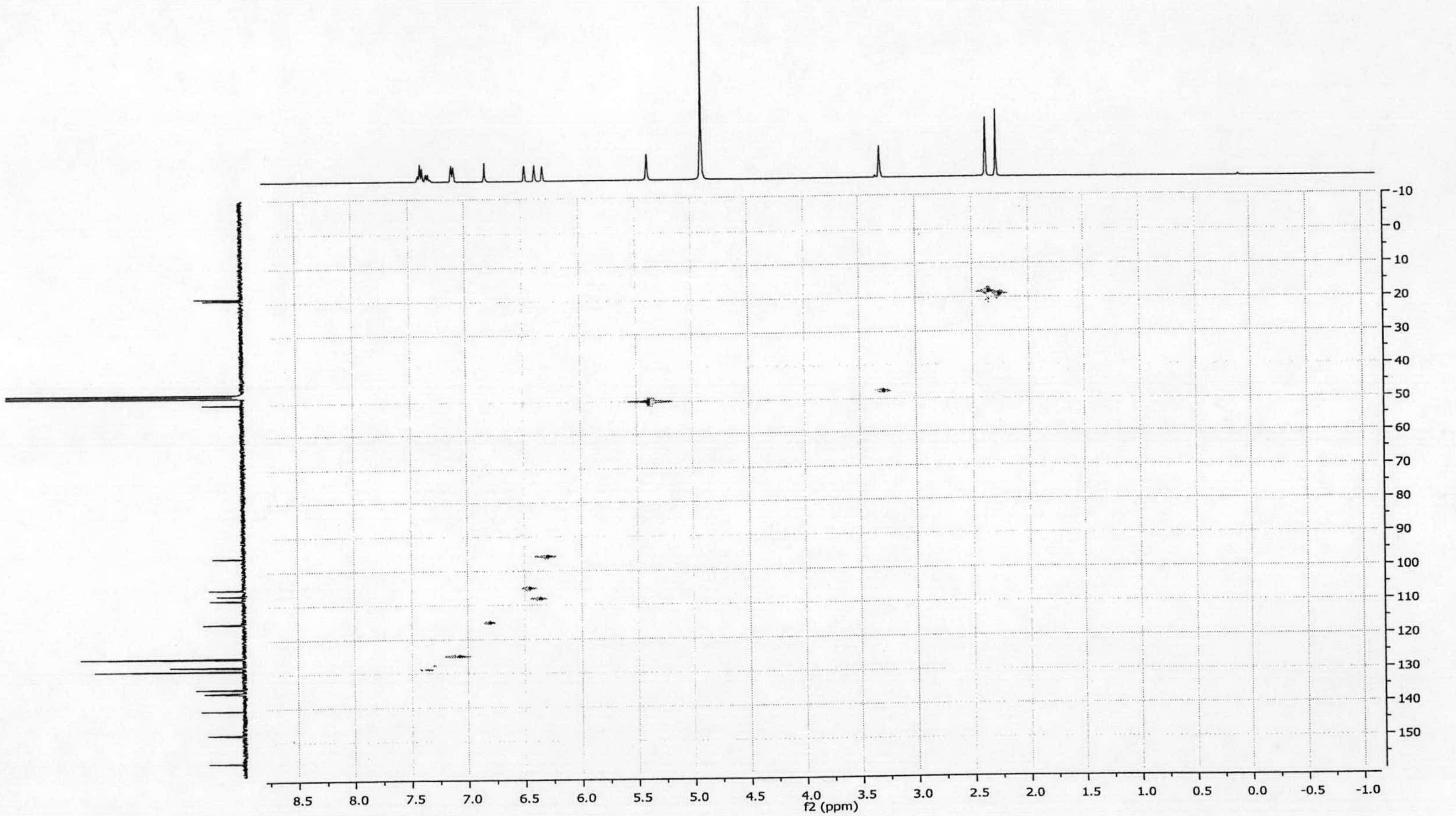


**Figure A-50** HSQC spectrum of *N*-benzyl cassiarin B (Compound **31b**)

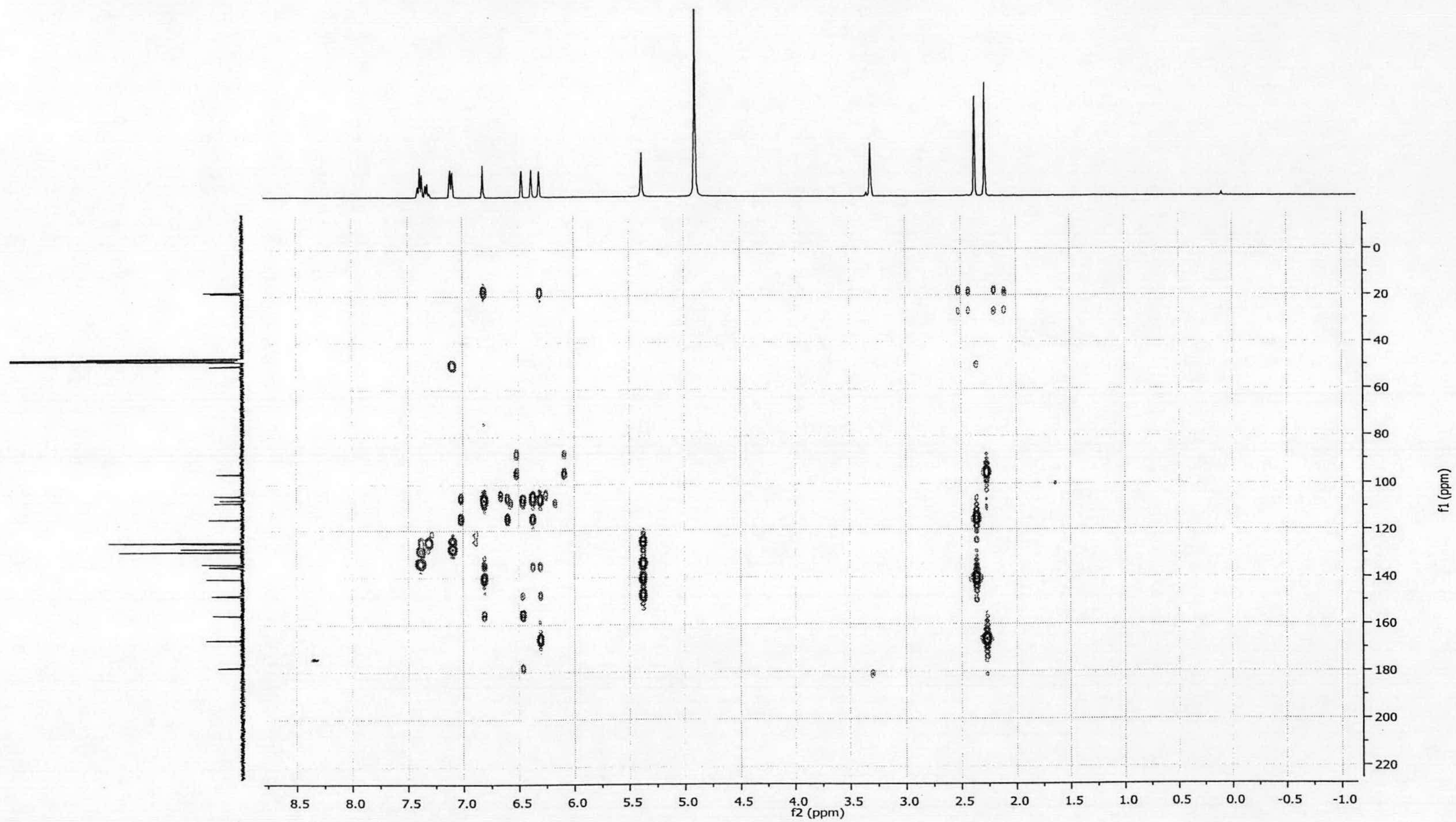


**Figure A-51** HMBC spectrum of *N*-benzyl cassiarin B (Compound **31b**)

# APPENDIX B

**Acquisition Parameter**

| | | | | | |
|---|---|---|---|---|---|
| Source Type | ESI | Ion Polarity | Positive | Set Corrector Fill | 47 V |
| Scan Range | n/a | Capillary Exit | 140.0 V | Set Pulsar Pull | 394 V |
| Scan Begin | 50 m/z | Hexapole RF | 150.0 V | Set Pulsar Push | 394 V |
| Scan End | 3000 m/z | Skimmer 1 | 30.0 V | Set Reflector | 1300 V |
| | | Hexapole 1 | 23.0 V | Set Flight Tube | 9000 V |
| | | | | Set Detector TOF | 2150 V |

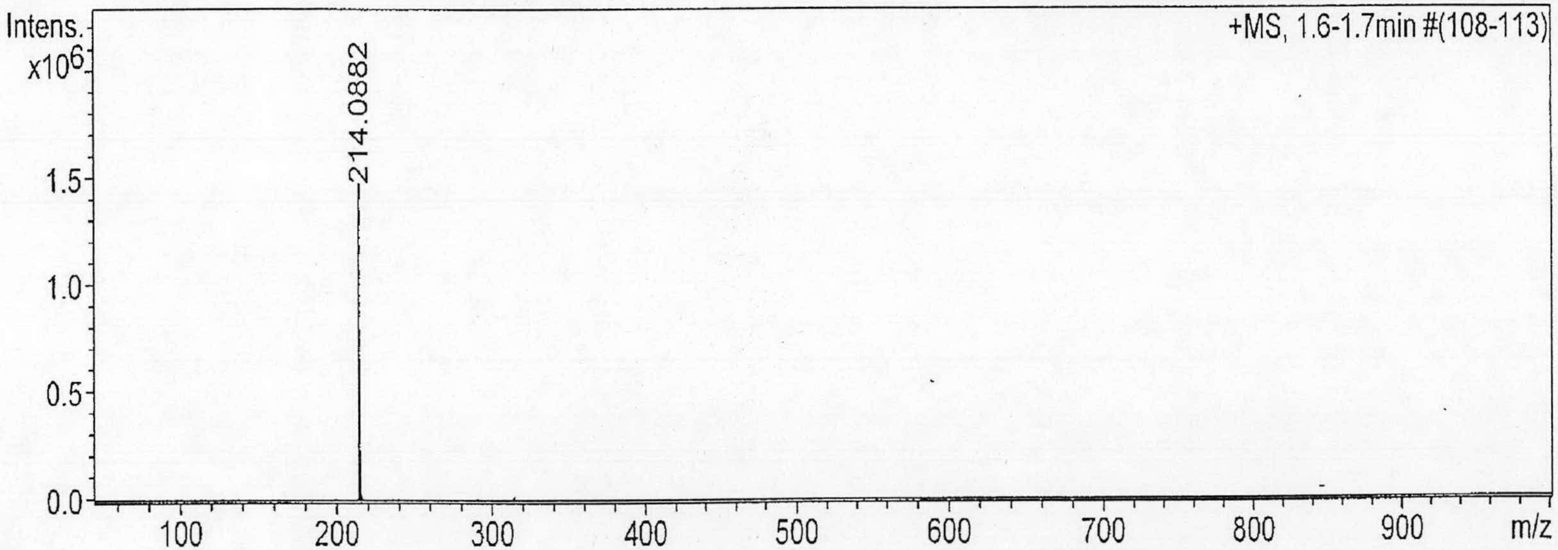


**Figure B-1** Mass spectrum of cassiarin A hydrochloride (Compound **4a**)

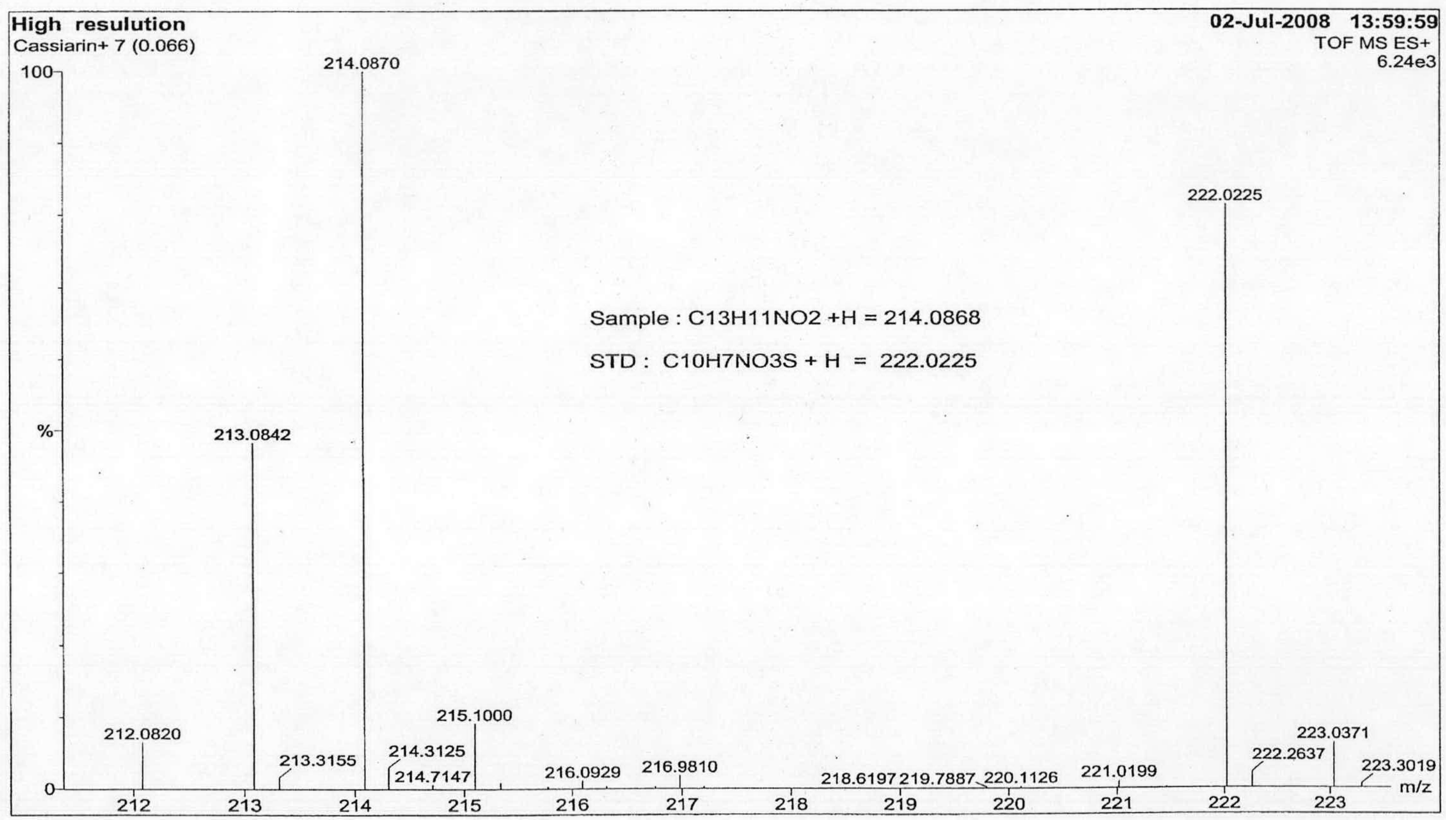


**Figure B-2** Mass spectrum of cassiarin A (Compound **4**)

**Acquisition Parameter**

| | | | | | |
|---|---|---|---|---|---|
| | | | | Set Corrector Fill | 47 V |
| Source Type | ESI | Ion Polarity | Positive | Set Pulsar Pull | 394 V |
| Scan Range | n/a | Capillary Exit | 140.0 V | Set Pulsar Push | 394 V |
| Scan Begin | 50 m/z | Hexapole RF | 150.0 V | Set Reflector | 1300 V |
| Scan End | 3000 m/z | Skimmer 1 | 30.0 V | Set Flight Tube | 9000 V |
| | | Hexapole 1 | 23.0 V | Set Detector TOF | 2150 V |

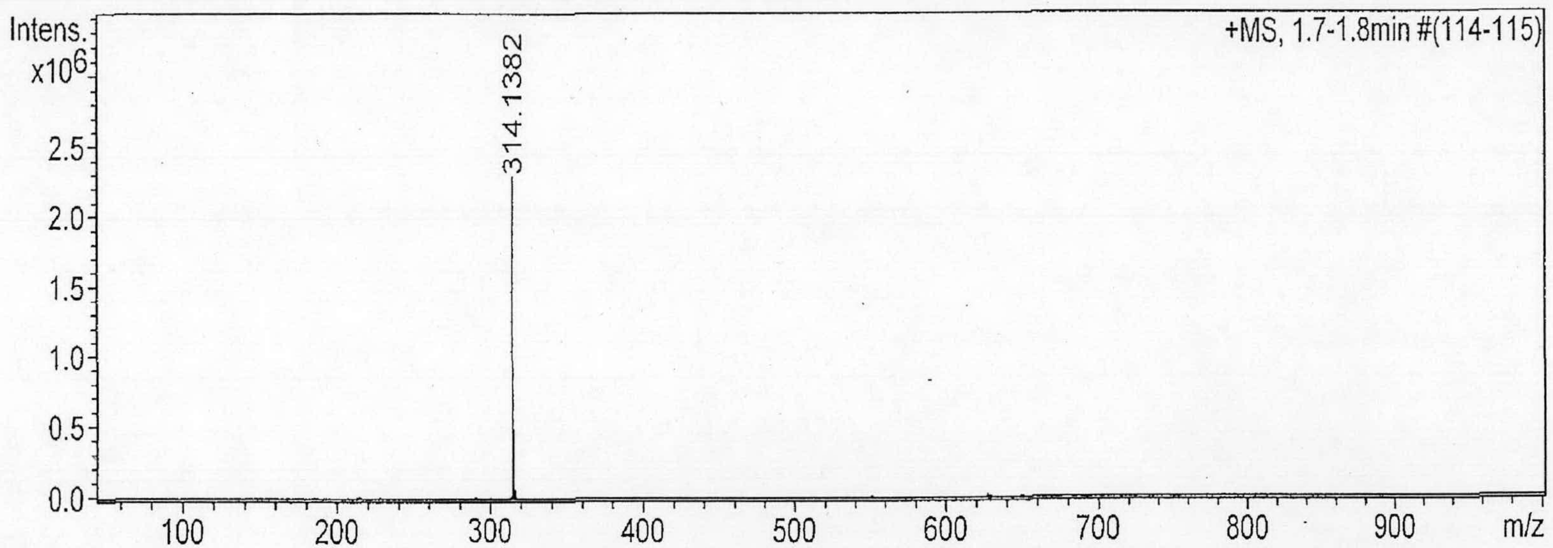


**Figure B-3** Mass spectrum of *N*-4-methoxy-4-oxobutyl cassiarin A chloride (Compound **5a**)

**Acquisition Parameter**

| | | | | | |
|---|---|---|---|---|---|
| | | | | Set Corrector Fill | 47 V |
| Source Type | ESI | Ion Polarity | Positive | Set Pulsar Pull | 394 V |
| Scan Range | n/a | Capillary Exit | 120.0 V | Set Pulsar Push | 394 V |
| Scan Begin | 50 m/z | Hexapole RF | 160.0 V | Set Reflector | 1300 V |
| Scan End | 3000 m/z | Skimmer 1 | 40.0 V | Set Flight Tube | 9000 V |
| | | Hexapole 1 | 23.0 V | Set Detector TOF | 2150 V |

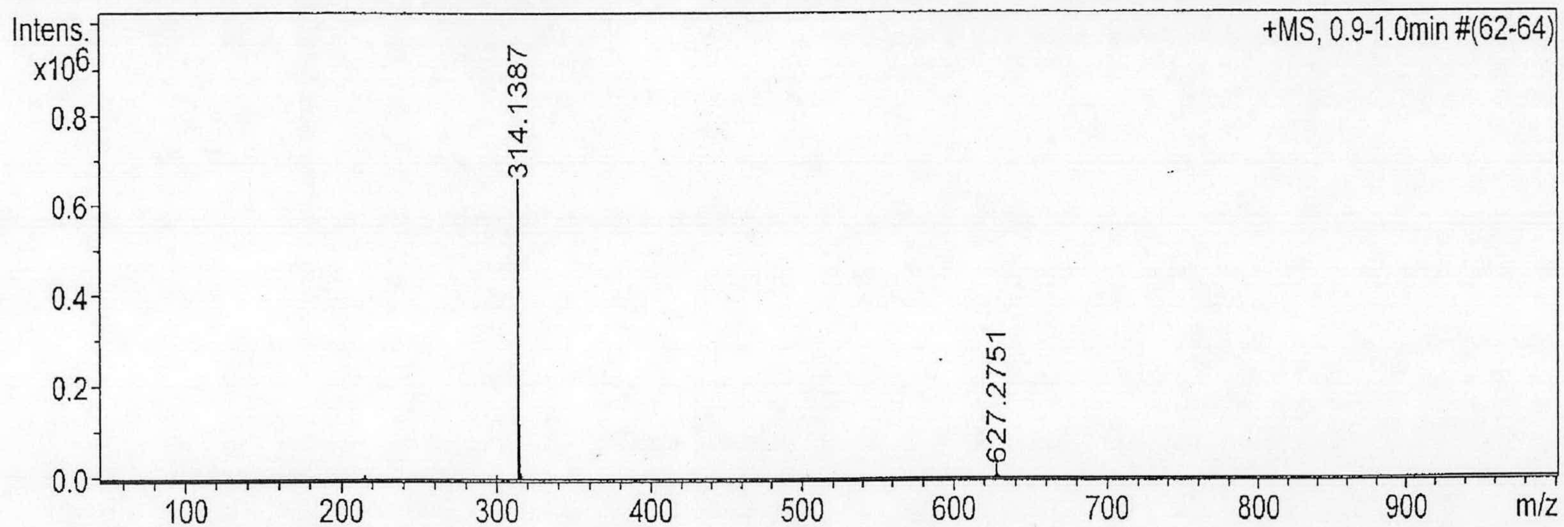


**Figure B-4** Mass spectrum of cassairin B (Compound **5**)

**Acquisition Parameter**

| | | | | | |
|---|---|---|---|---|---|
| | | | | Set Corrector Fill | 47 V |
| Source Type | ESI | Ion Polarity | Positive | Set Pulsar Pull | 394 V |
| Scan Range | n/a | Capillary Exit | 140.0 V | Set Pulsar Push | 394 V |
| Scan Begin | 50 m/z | Hexapole RF | 250.0 V | Set Reflector | 1300 V |
| Scan End | 3000 m/z | Skimmer 1 | 40.0 V | Set Flight Tube | 9000 V |
| | | Hexapole 1 | 23.0 V | Set Detector TOF | 2150 V |

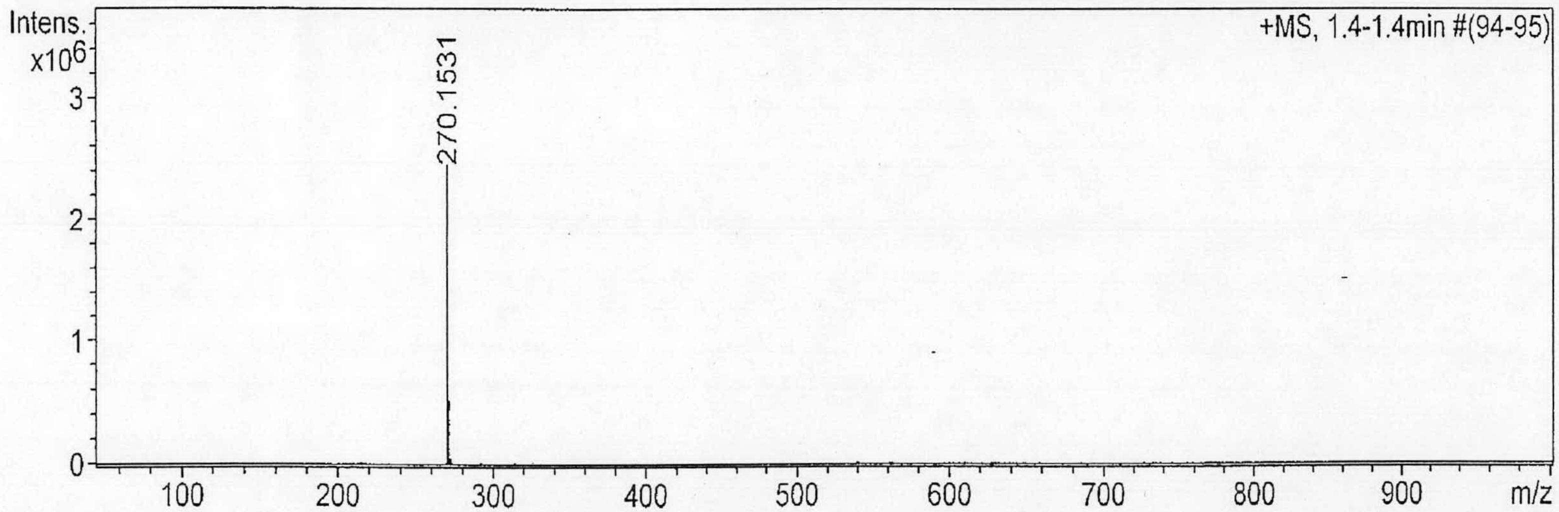


**Figure B-5** Mass spectrum of *N*-butyl cassiarin A chloride (Compound **28a**)

**Acquisition Parameter**

| | | | | | |
|---|---|---|---|---|---|
| | | | | Set Corrector Fill | 47 V |
| Source Type | ESI | Ion Polarity | Positive | Set Pulsar Pull | 394 V |
| Scan Range | n/a | Capillary Exit | 140.0 V | Set Pulsar Push | 394 V |
| Scan Begin | 50 m/z | Hexapole RF | 250.0 V | Set Reflector | 1300 V |
| Scan End | 3000 m/z | Skimmer 1 | 40.0 V | Set Flight Tube | 9000 V |
| | | Hexapole 1 | 23.0 V | Set Detector TOF | 2150 V |

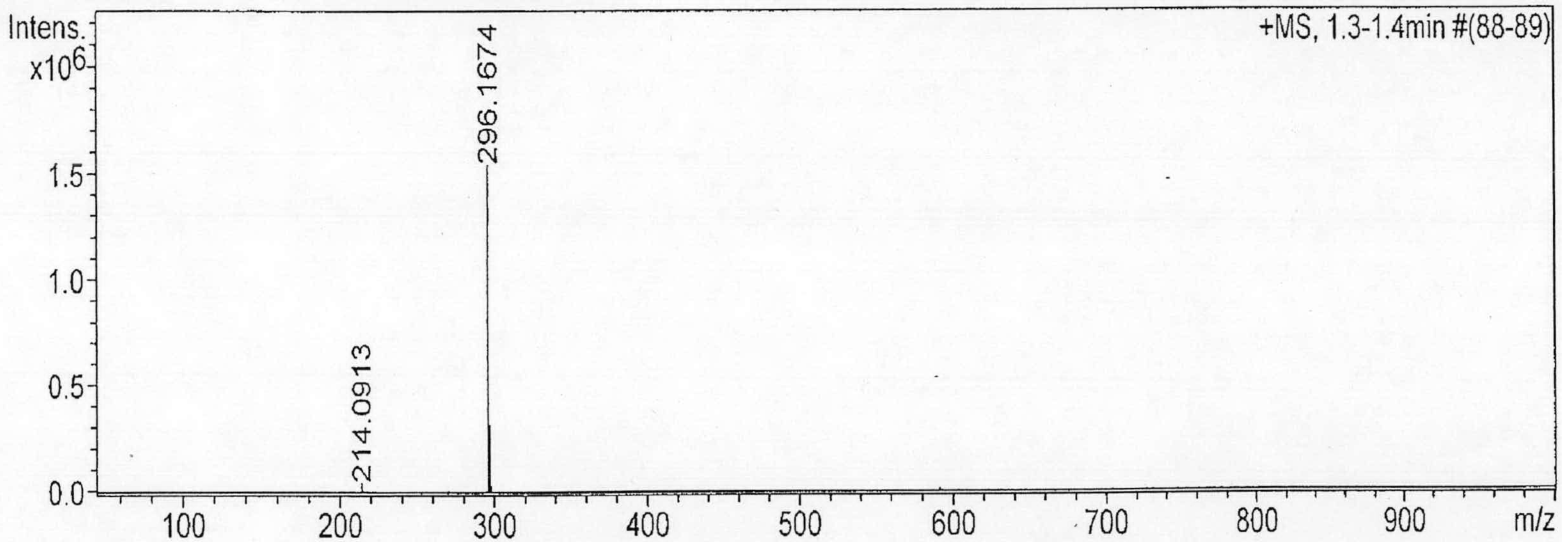


**Figure B-6** Mass spectrum of *N*-cyclohexyl cassiarin A chloride (Compound **29a**)

## Acquisition Parameter

| | | | | | |
|---|---|---|---|---|---|
| Source Type | ESI | Ion Polarity | Positive | Set Corrector Fill | 47 V |
| Scan Range | n/a | Capillary Exit | 150.0 V | Set Pulsar Pull | 394 V |
| Scan Begin | 50 m/z | Hexapole RF | 200.0 V | Set Pulsar Push | 394 V |
| Scan End | 3000 m/z | Skimmer 1 | 40.0 V | Set Reflector | 1300 V |
| | | Hexapole 1 | 23.0 V | Set Flight Tube | 9000 V |
| | | | | Set Detector TOF | 2150 V |

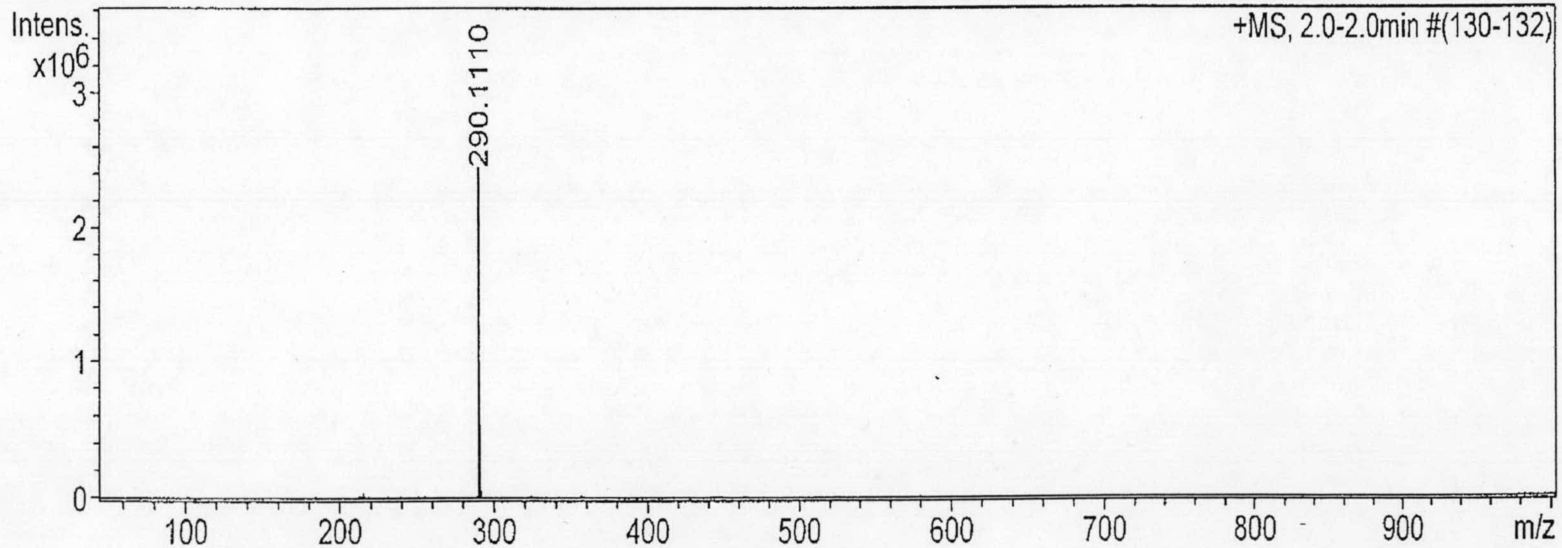


**Figure B-7** Mass spectrum of *N*-phenyl cassiarin A chloride (Compound **30a**)

**Acquisition Parameter**

| | | | | | |
|---|---|---|---|---|---|
| | | | | Set Corrector Fill | 47 V |
| Source Type | ESI | Ion Polarity | Positive | Set Pulsar Pull | 394 V |
| Scan Range | n/a | Capillary Exit | 160.0 V | Set Pulsar Push | 394 V |
| Scan Begin | 50 m/z | Hexapole RF | 200.0 V | Set Reflector | 1300 V |
| Scan End | 2000 m/z | Skimmer 1 | 60.0 V | Set Flight Tube | 9000 V |
| | | Hexapole 1 | 23.0 V | Set Detector TOF | 2150 V |

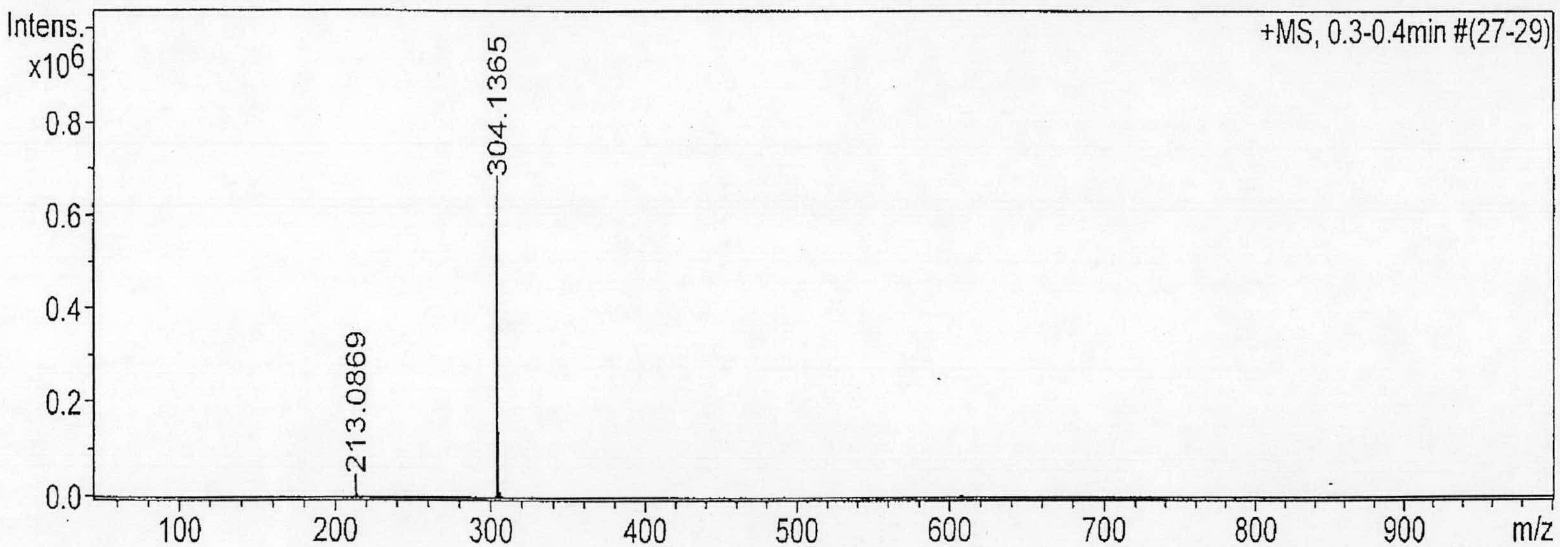


**Figure B-8** Mass spectrum of *N*-benzyl cassiarin A chloride (Compound **31a**)

**Acquisition Parameter**

| | | | | | |
|---|---|---|---|---|---|
| Source Type | ESI | Ion Polarity | Positive | Set Corrector Fill | 47 V |
| Scan Range | n/a | Capillary Exit | 140.0 V | Set Pulsar Pull | 394 V |
| Scan Begin | 50 m/z | Hexapole RF | 150.0 V | Set Pulsar Push | 394 V |
| Scan End | 3000 m/z | Skimmer 1 | 30.0 V | Set Reflector | 1300 V |
| | | Hexapole 1 | 23.0 V | Set Flight Tube | 9000 V |
| | | | | Set Detector TOF | 2150 V |

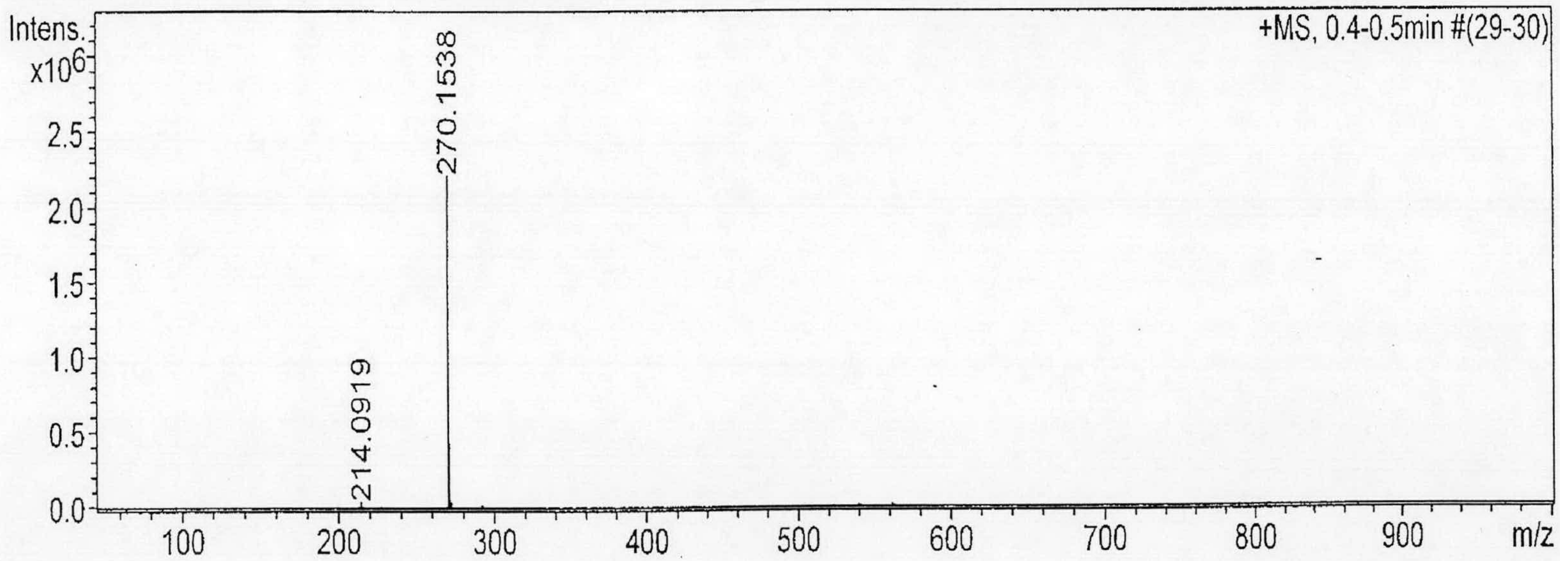


**Figure B-9** Mass spectrum of *N*-butyl cassiarin B (Compound **28b**)

## Acquisition Parameter

| | | | | | |
|---|---|---|---|---|---|
| Source Type | ESI | Ion Polarity | Positive | Set Corrector Fill | 47 V |
| Scan Range | n/a | Capillary Exit | 140.0 V | Set Pulsar Pull | 394 V |
| Scan Begin | 50 m/z | Hexapole RF | 250.0 V | Set Pulsar Push | 394 V |
| Scan End | 3000 m/z | Skimmer 1 | 40.0 V | Set Reflector | 1300 V |
| | | Hexapole 1 | 23.0 V | Set Flight Tube | 9000 V |
| | | | | Set Detector TOF | 2150 V |

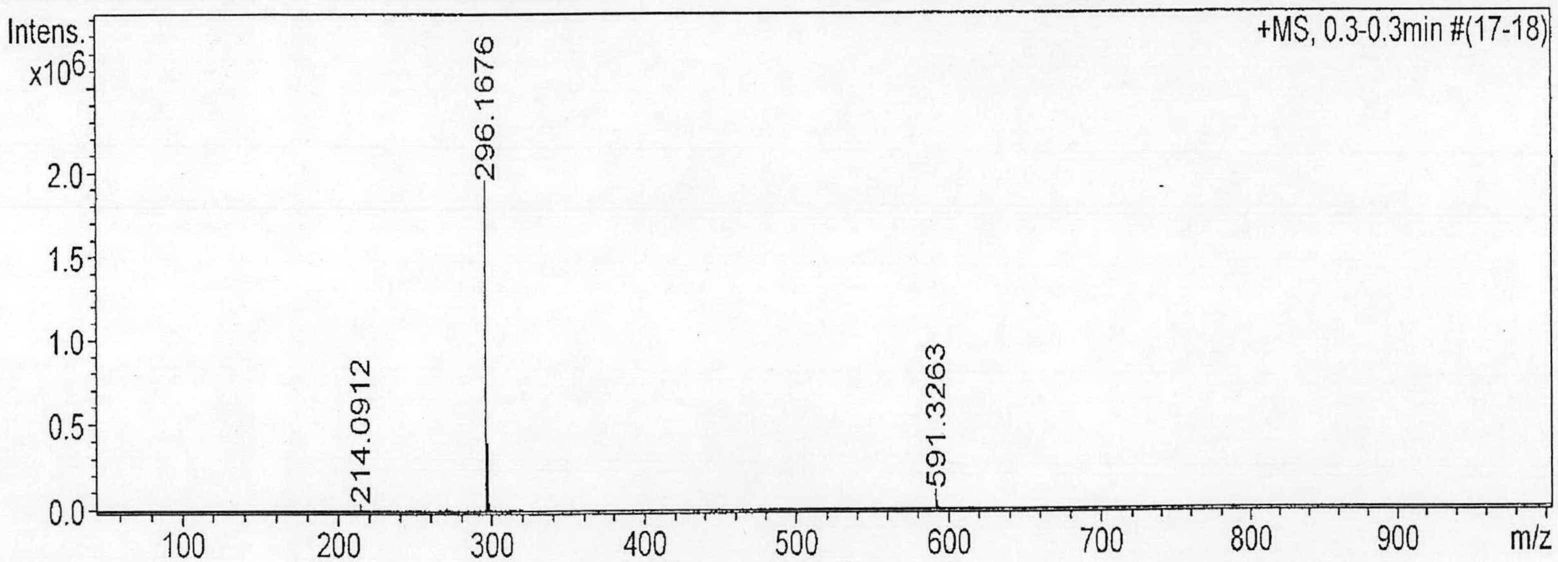


**Figure B-10** Mass spectrum of *N*-cyclohexyl cassiarin B (Compound **29b**)

| Acquisition Parameter | | | | | |
|---|---|---|---|---|---|
| Source Type | ESI | Ion Polarity | Positive | Set Corrector Fill | 47 V |
| Scan Range | n/a | Capillary Exit | 150.0 V | Set Pulsar Pull | 394 V |
| Scan Begin | 50 m/z | Hexapole RF | 200.0 V | Set Pulsar Push | 394 V |
| Scan End | 3000 m/z | Skimmer 1 | 40.0 V | Set Reflector | 1300 V |
| | | Hexapole 1 | 23.0 V | Set Flight Tube | 9000 V |
| | | | | Set Detector TOF | 2150 V |

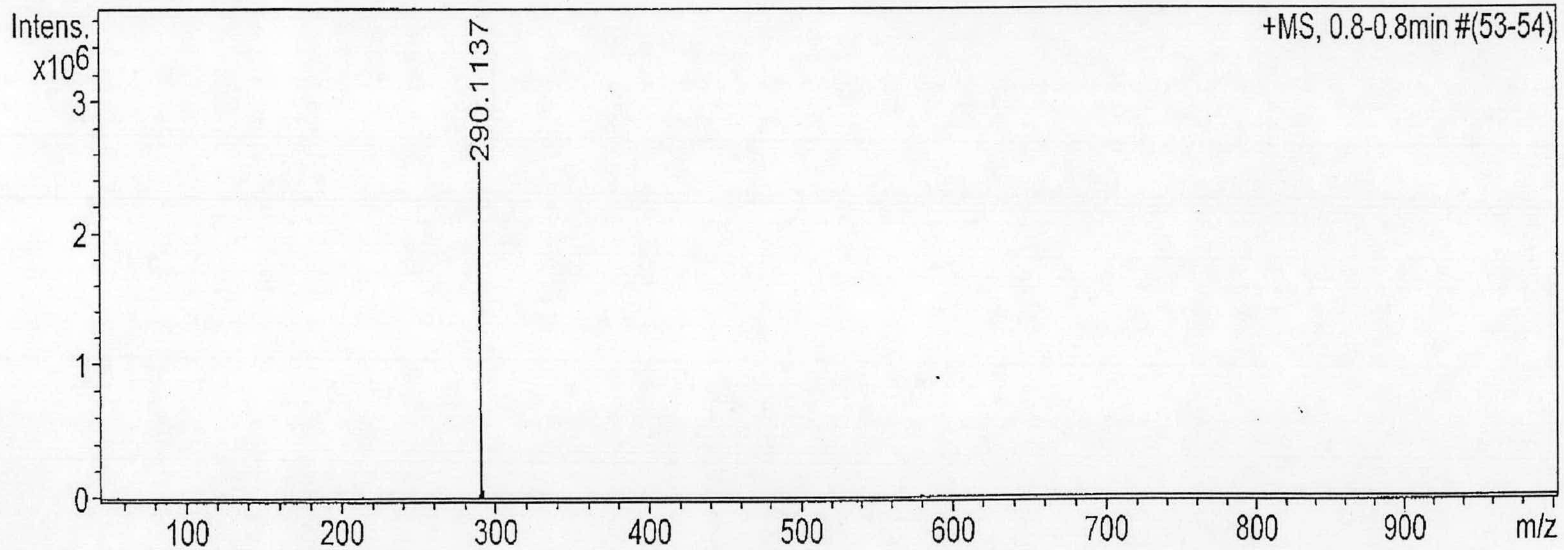


**Figure B-11** Mass spectrum of *N*-phenyl cassiarin B (Compound **30b**)

**Acquisition Parameter**

| | | | | | |
|---|---|---|---|---|---|
| | | | | Set Corrector Fill | 47 V |
| Source Type | ESI | Ion Polarity | Positive | Set Pulsar Pull | 394 V |
| Scan Range | n/a | Capillary Exit | 160.0 V | Set Pulsar Push | 394 V |
| Scan Begin | 50 m/z | Hexapole RF | 200.0 V | Set Reflector | 1300 V |
| Scan End | 2000 m/z | Skimmer 1 | 60.0 V | Set Flight Tube | 9000 V |
| | | Hexapole 1 | 23.0 V | Set Detector TOF | 2150 V |

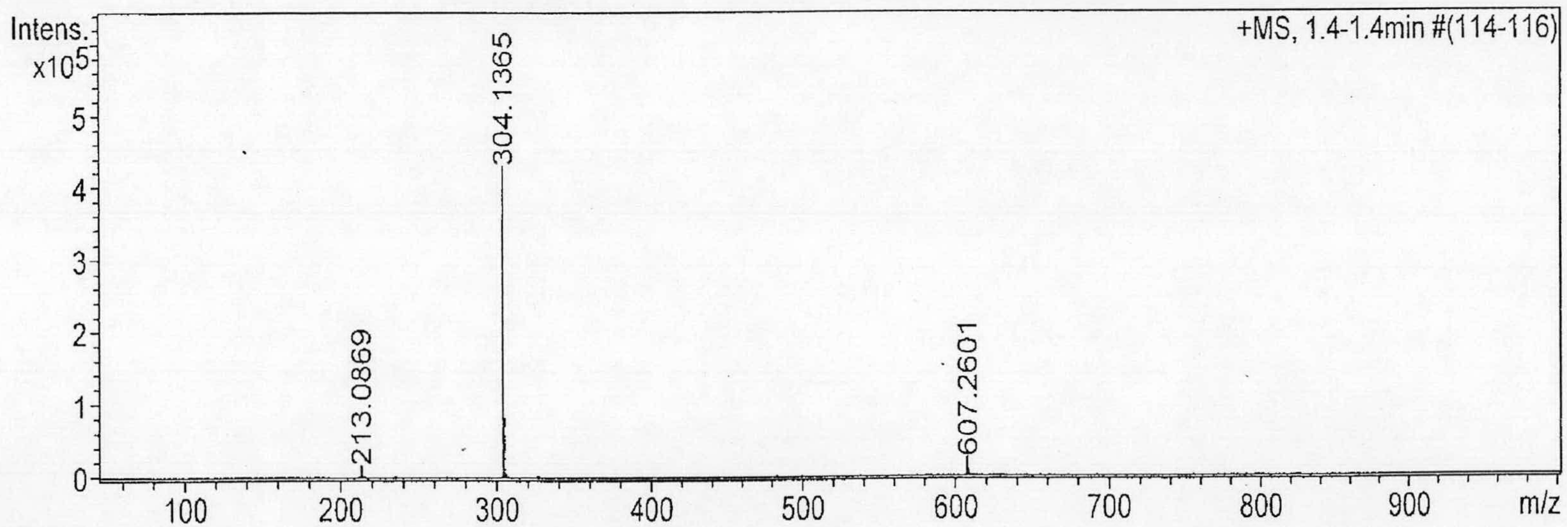


**Figure B-12** Mass spectrum of *N*-benzyl cassiarin B (Compound **31b**)

# VITA

Mr. Sarawut Kanputhorn was born on March 8, 1981 in Bangkok, Thailand. He got a Diploma in Analytical Chemistry from Institute of Analytical Chemistry Training, which affiliated institute of Chulalongkorn University in 2003 and continued a Bachelor Degree of Science in Chemistry at Chulalongkorn University in 2005. Then, he started experienced work in Research and Development Staff at Max Development International Co., Ltd. for 12 months. After that, he admitted into a Master Degree of Science program in Chemistry at Chulalongkorn University in 2006 and completed the program in 2008.