Electronic Supplementary Material (ESI) for RSC Advances.
This journal is © The Royal Society of Chemistry 2017

Electronic Supplementary Information (ESI) to:

Synthesis and ecotoxicological impact of ferrocene-derived amino-phosphonates using bioassays battery

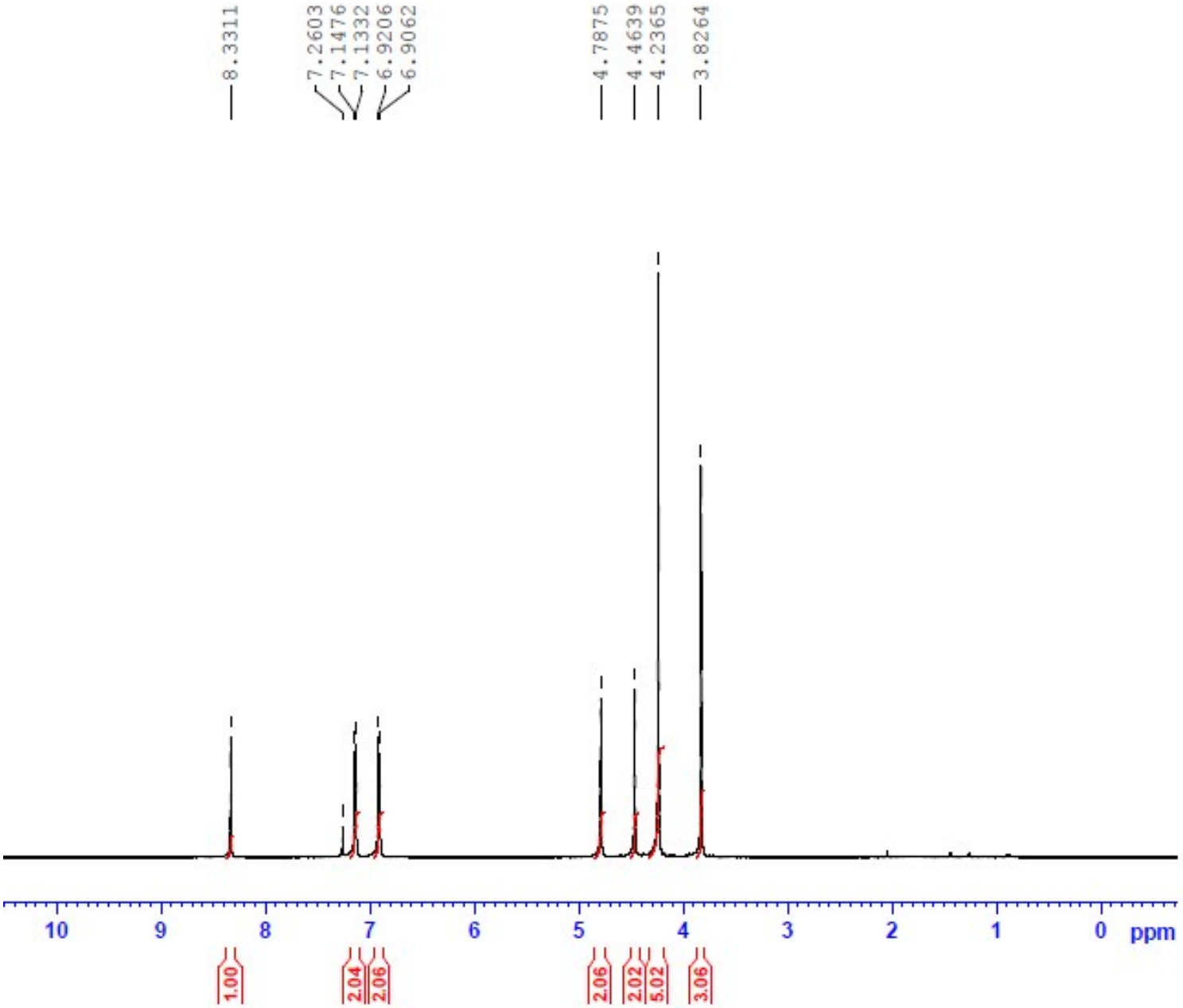
Jarosław Lewkowski*,[a] Rafał Karpowicz,[a] Marta Morawska,[a] Piotr Rychter*,[b] Diana Rogacz,[b] Kamila Lewicka,[b] Piotr Dobrzyński,[b,c]

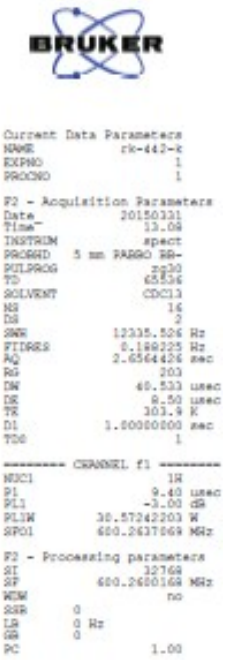
[a]*Department of Organic Chemistry, Faculty of Chemistry, University of Łódź, Tamka 12, 91-403 Łódź, Poland*

[b]*Institute of Chemistry, Environmental Protection and Biotechnology, Jan Długosz University in Częstochowa, 42-200 Częstochowa, 13/15 Armii Krajowej Av., Poland*

[c]*Centre of Polymer and Carbon Materials, Polish Academy of Sciences, M. Curie-Skłodowskiej 34, 41-819 Zabrze, Poland*

Fig. S1. ^{1}H NMR of *N*-Ferrocenylidene-*p*-anisidine **(1a)**





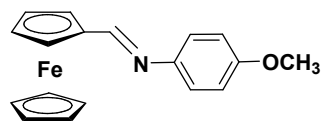
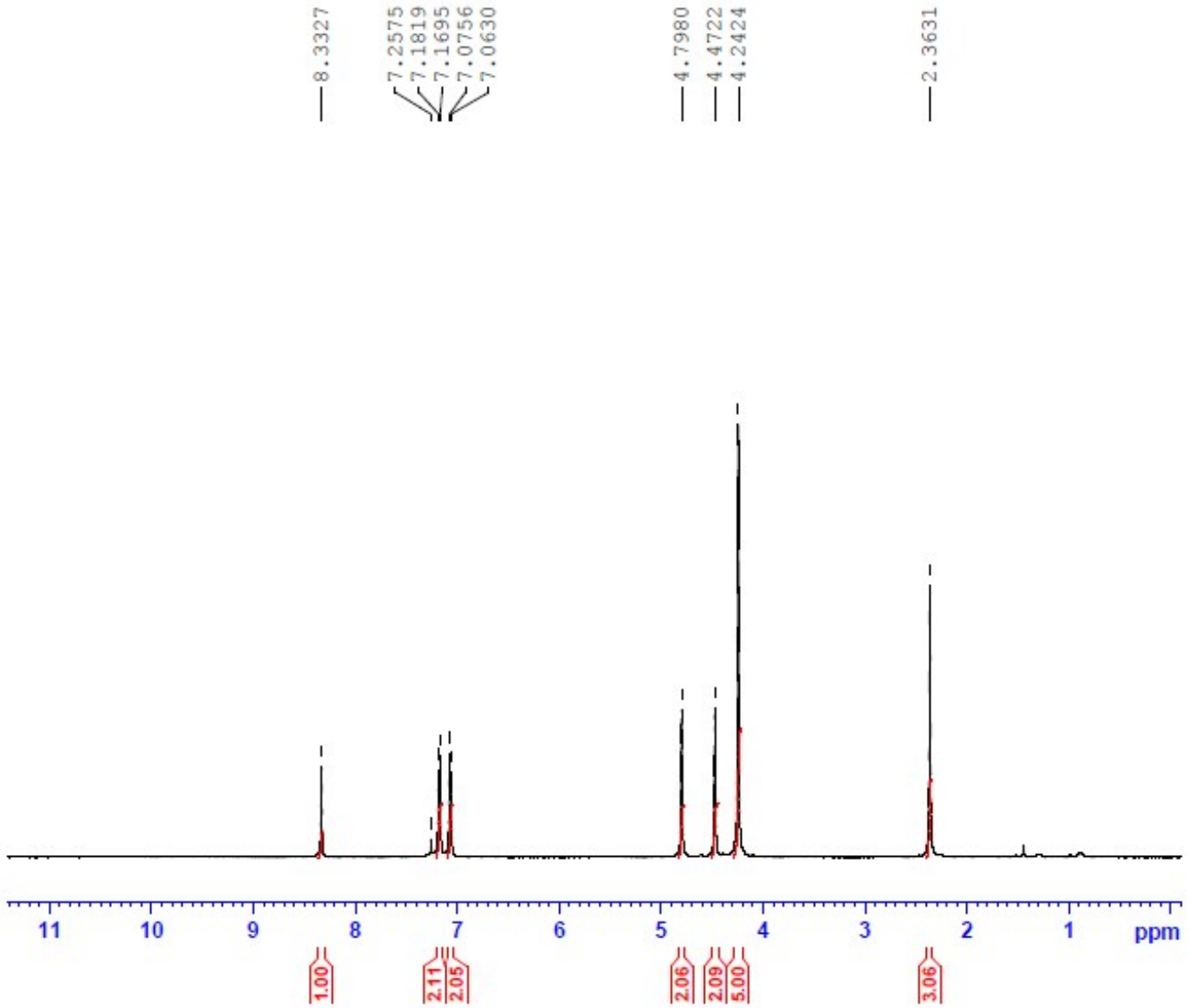
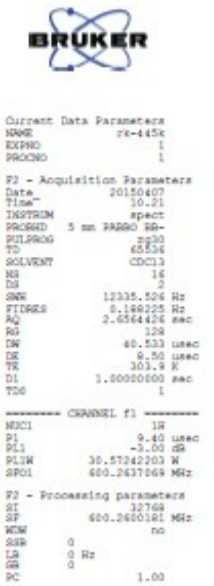


Fig. S2. ^{1}H NMR of *N*- Ferrocenylidene-*p*-toluidine **(1b)**





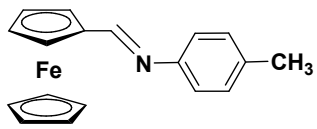
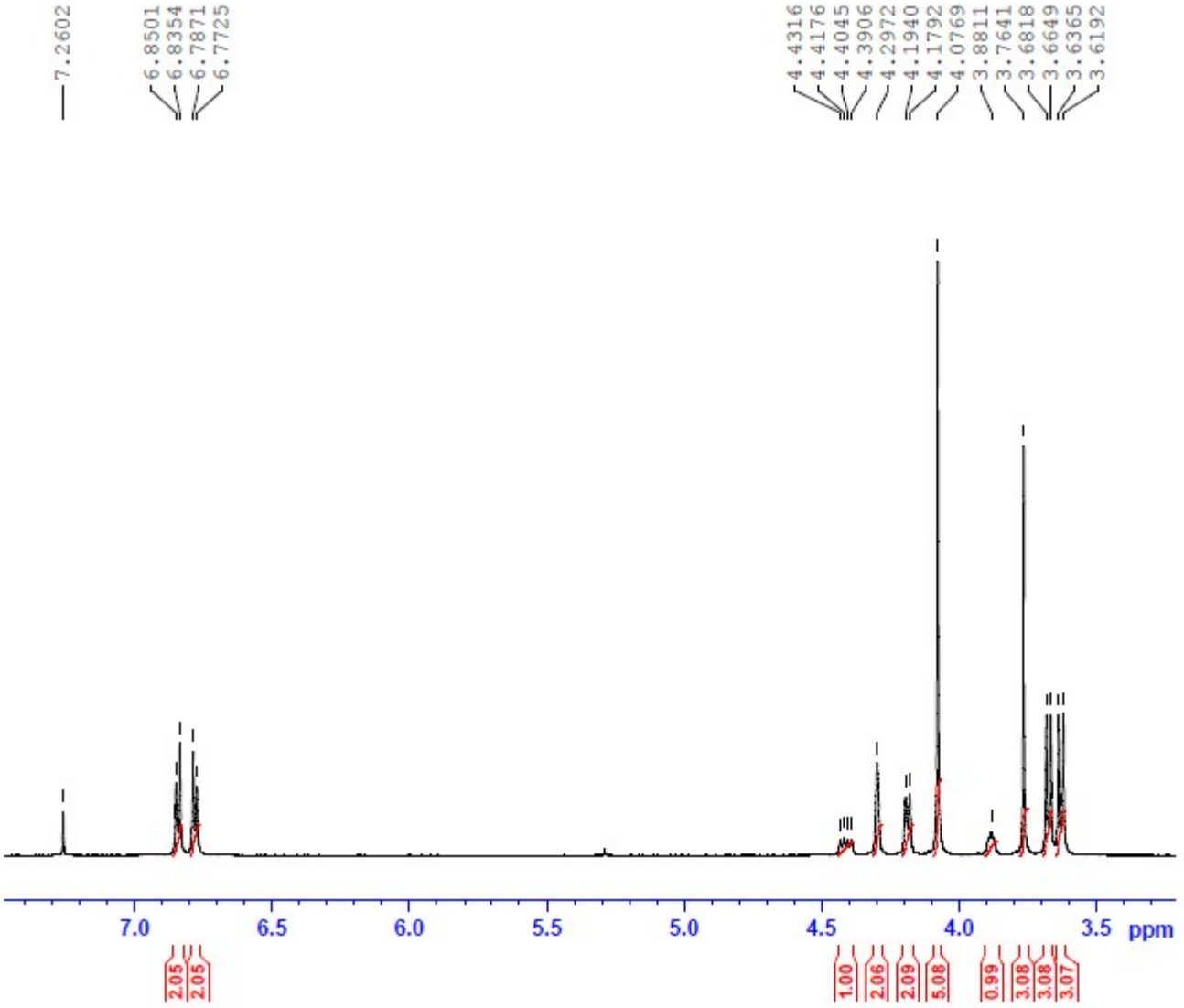
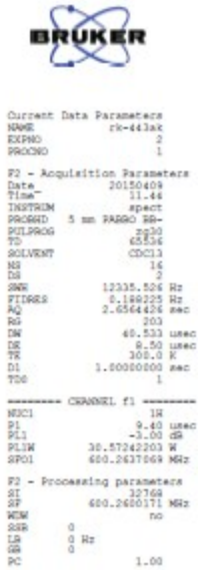


Fig. S3. ^{1}H NMR of dimethyl *N*-(4-methoxyphenyl)amino(ferrocenyl)methylphosphonate **(2a)**





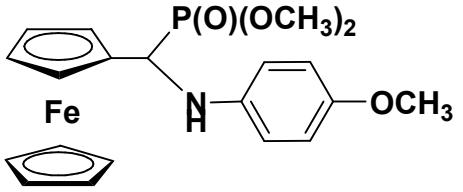
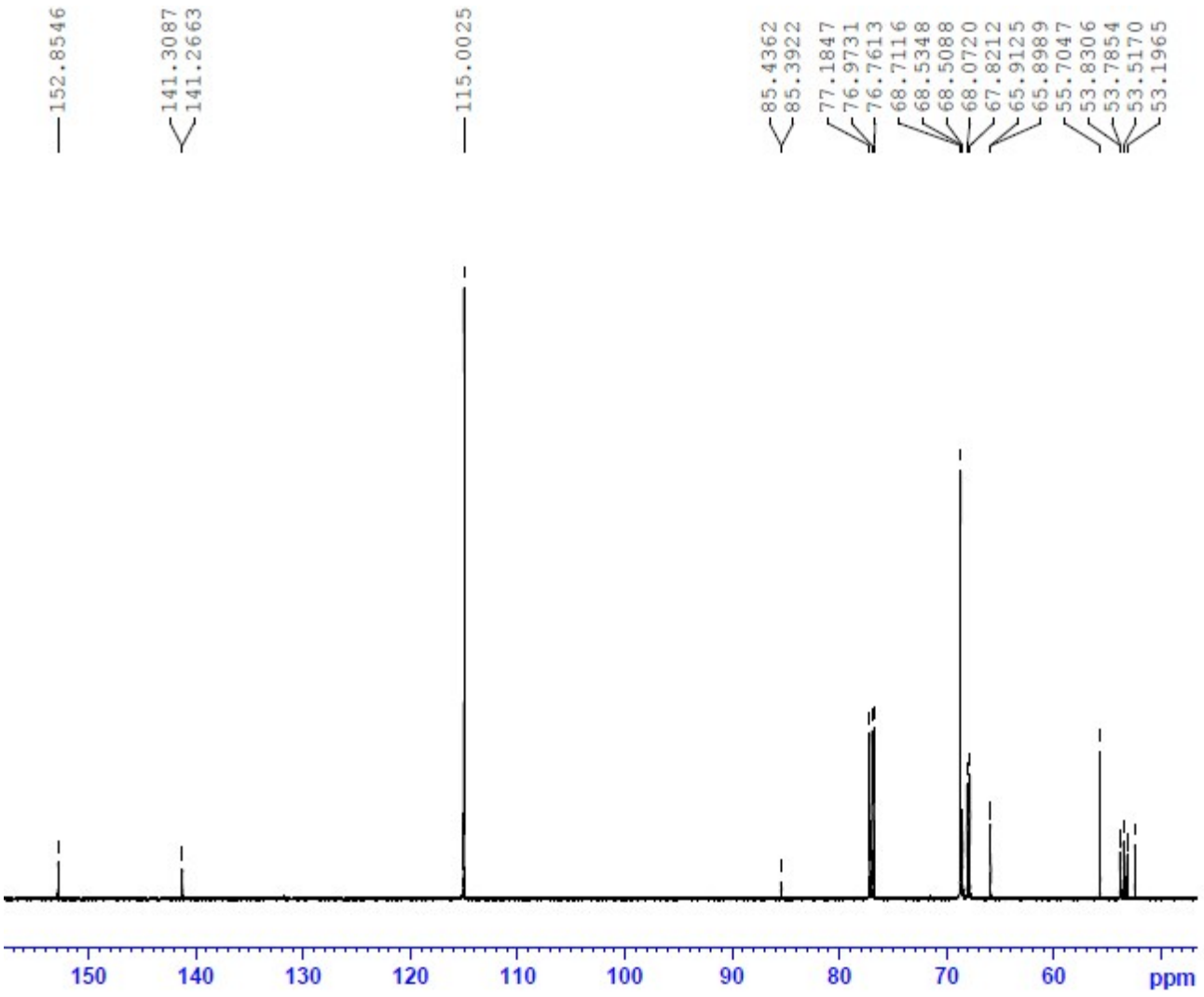
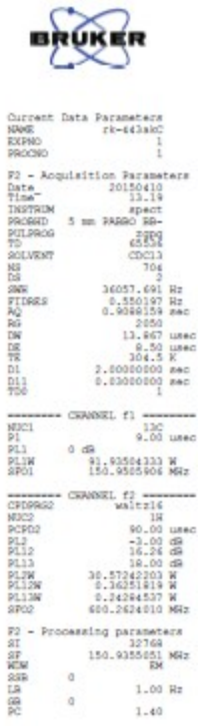


Fig. S4. ^{13}C NMR of dimethyl *N*-(4-methoxyphenyl)amino(ferrocenyl)methylphosphonate **(2a)**





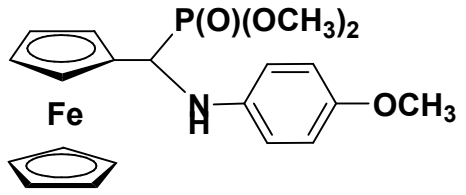
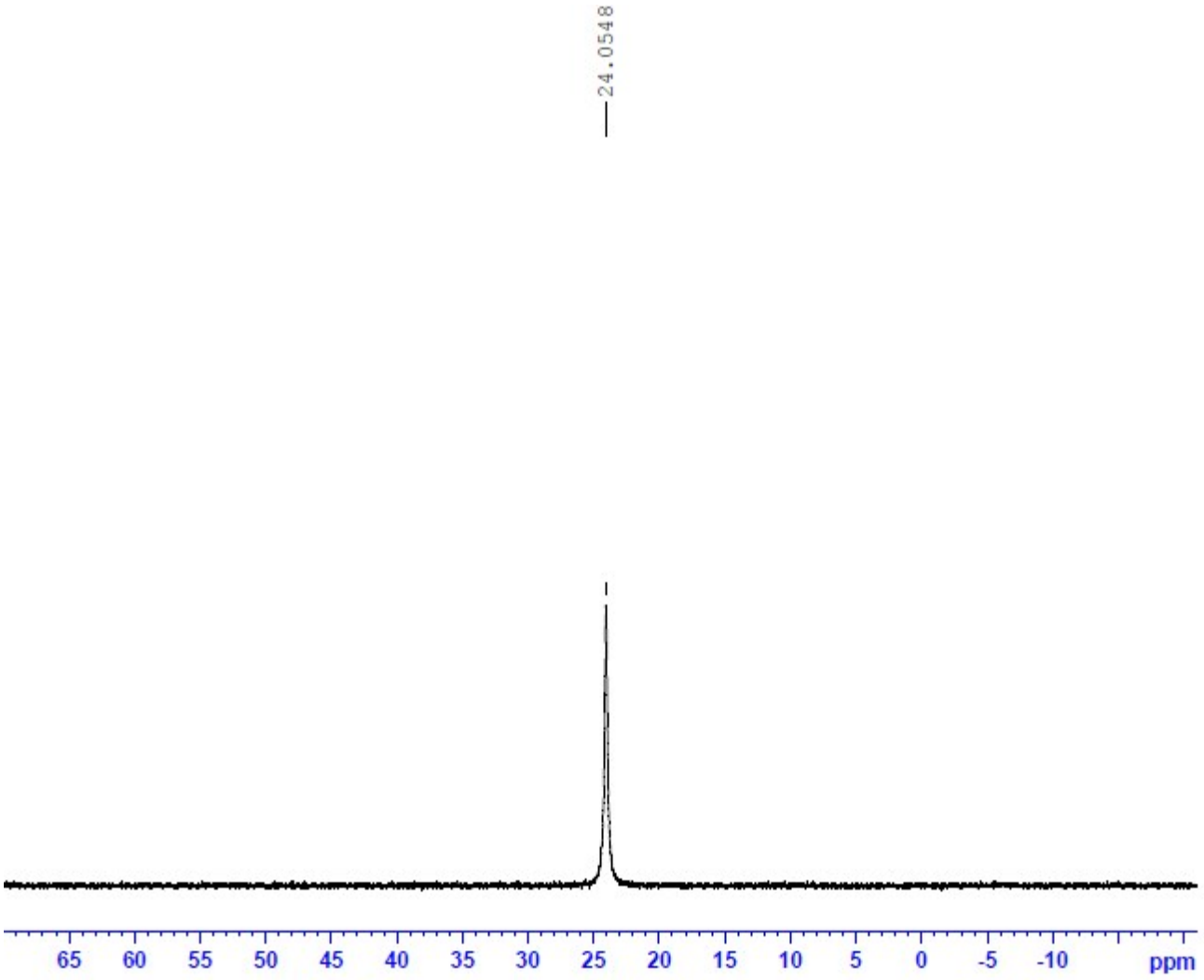
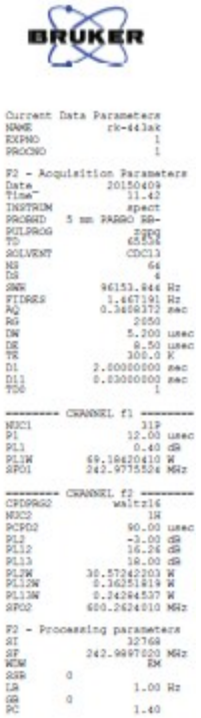


Fig. S5. ^{31}P NMR of dimethyl *N*-(4-methoxyphenyl)amino(ferrocenyl)methylphosphonate **(2a)**





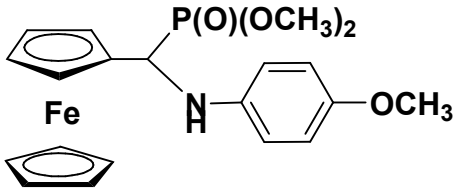
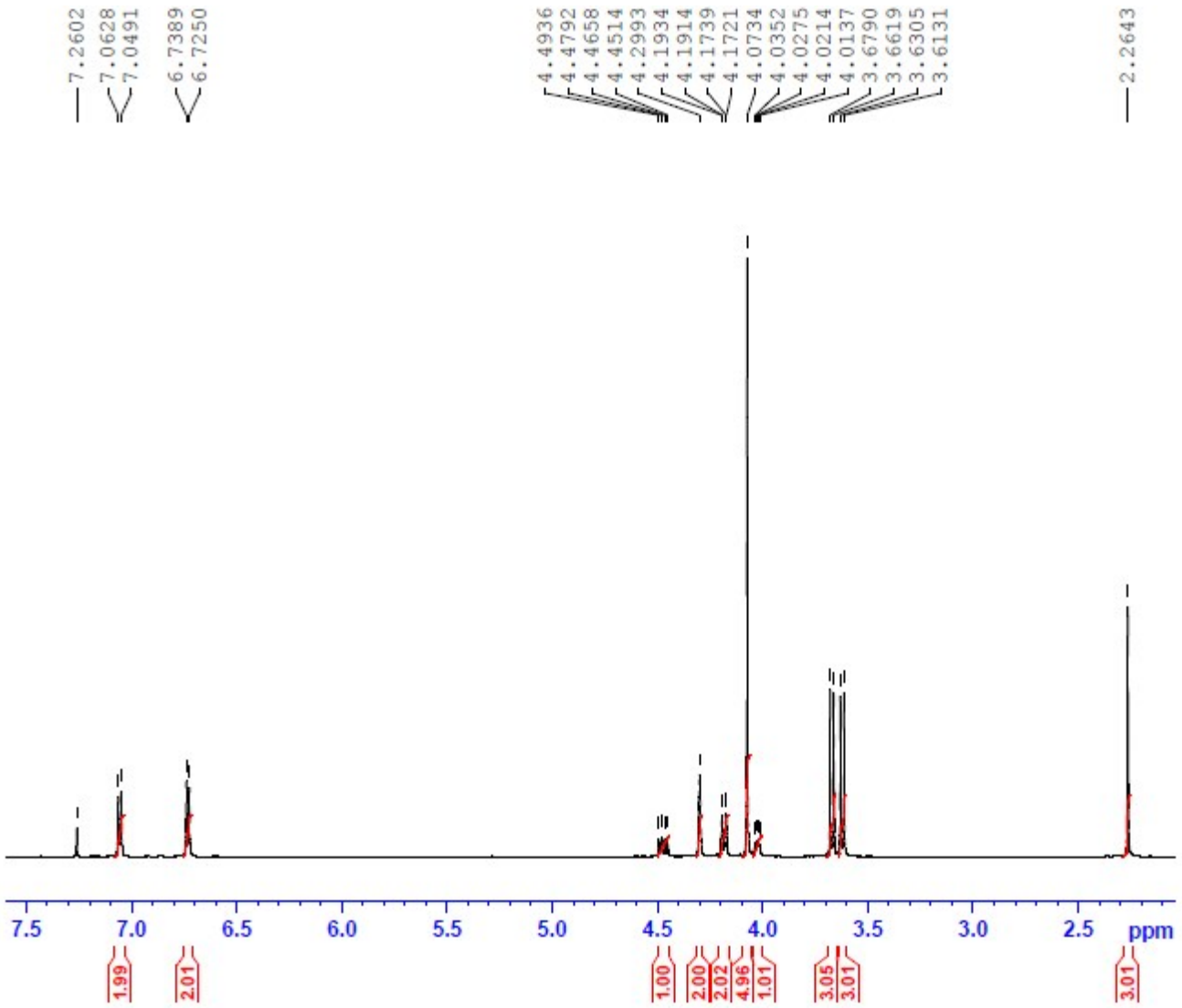


Fig. S6. ^{1}H NMR of dimethyl *N*-(4-methylphenyl)amino(ferrocenyl)methylphosphonate **(2b)**




```
Current Data Parameters
NAME                  rk-635-36
EXPNO                         1
PROCNO                        1

F2 - Acquisition Parameters
Date_              20150401
Time               13.58
INSTRUM              spect
PROBHD    5 mm PABBO BB-
PULPROG              zg30
TD                  65536
SOLVENT              CDCl3
NS                      16
DS                       2
SWH              12335.526 Hz
FIDRES            0.188225 Hz
AQ                2.6564424 sec
RG                     101
DW                60.533 usec
DE                 6.50 usec
TE                 303.9 K
D1                1.00000000 sec
TD0                      1

======== CHANNEL f1 ========
NUC1                    1H
P1                   9.40 usec
PL1                 -3.00 dB
PLW1            30.57242203 W
SFO1            600.2617069 MHz

F2 - Processing parameters
SI                   32768
SF              600.2600170 MHz
WDW                     no
SSB                      0
LB                    0 Hz
GB                       0
PC                    1.00
```

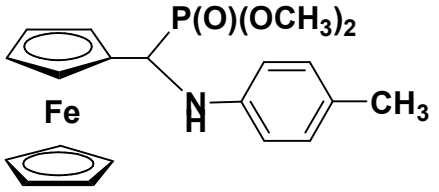
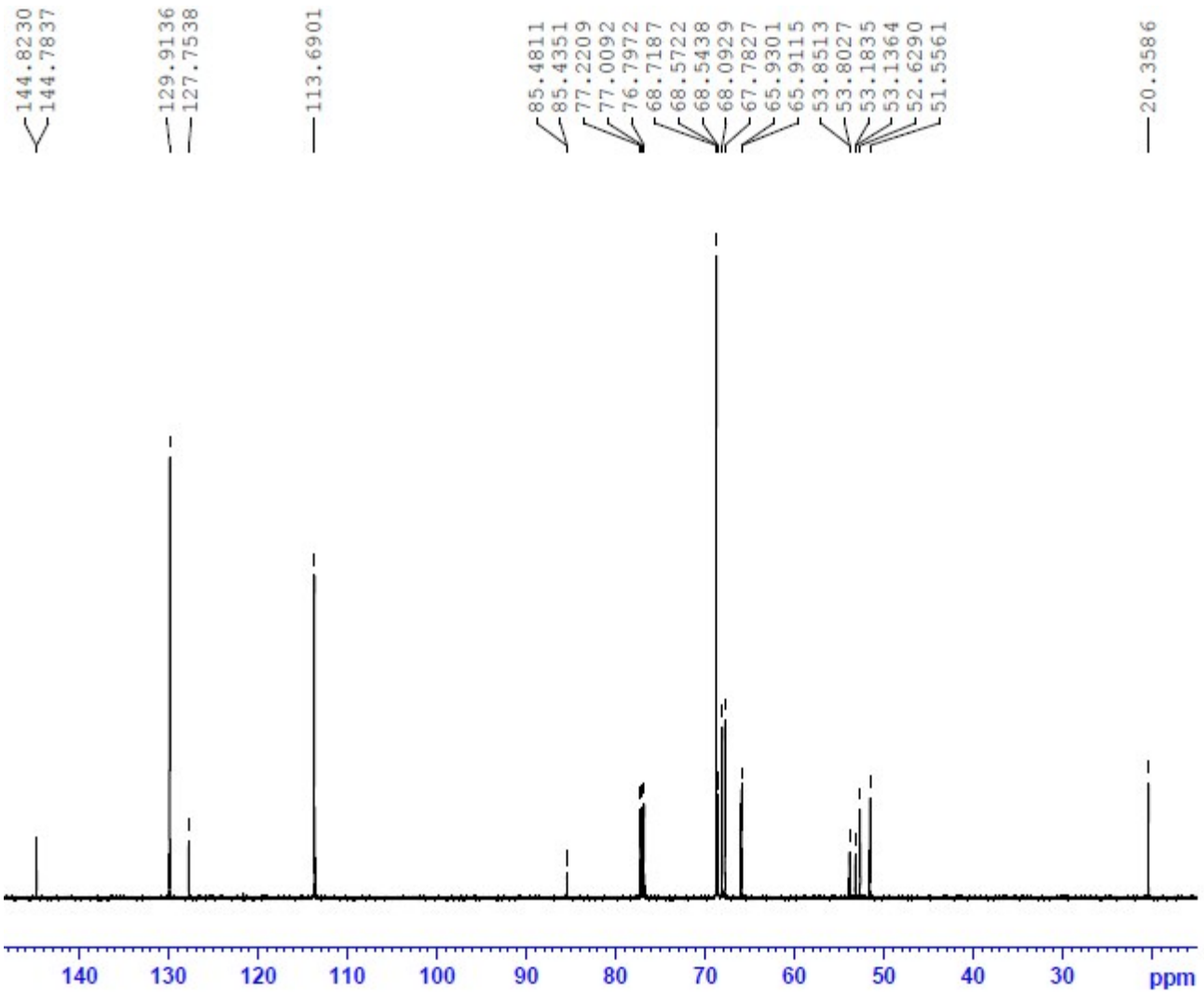
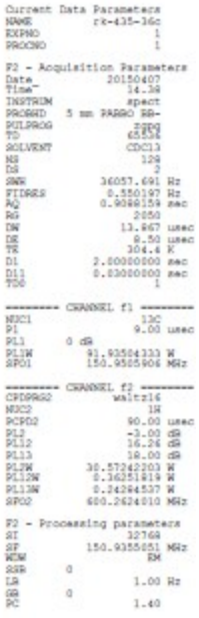


Fig. S7. ^{13}C NMR of dimethyl *N*-(4-methylphenyl)amino(ferrocenyl)methylphosphonate **(2b)**





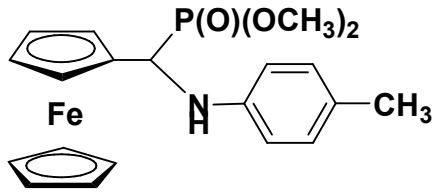
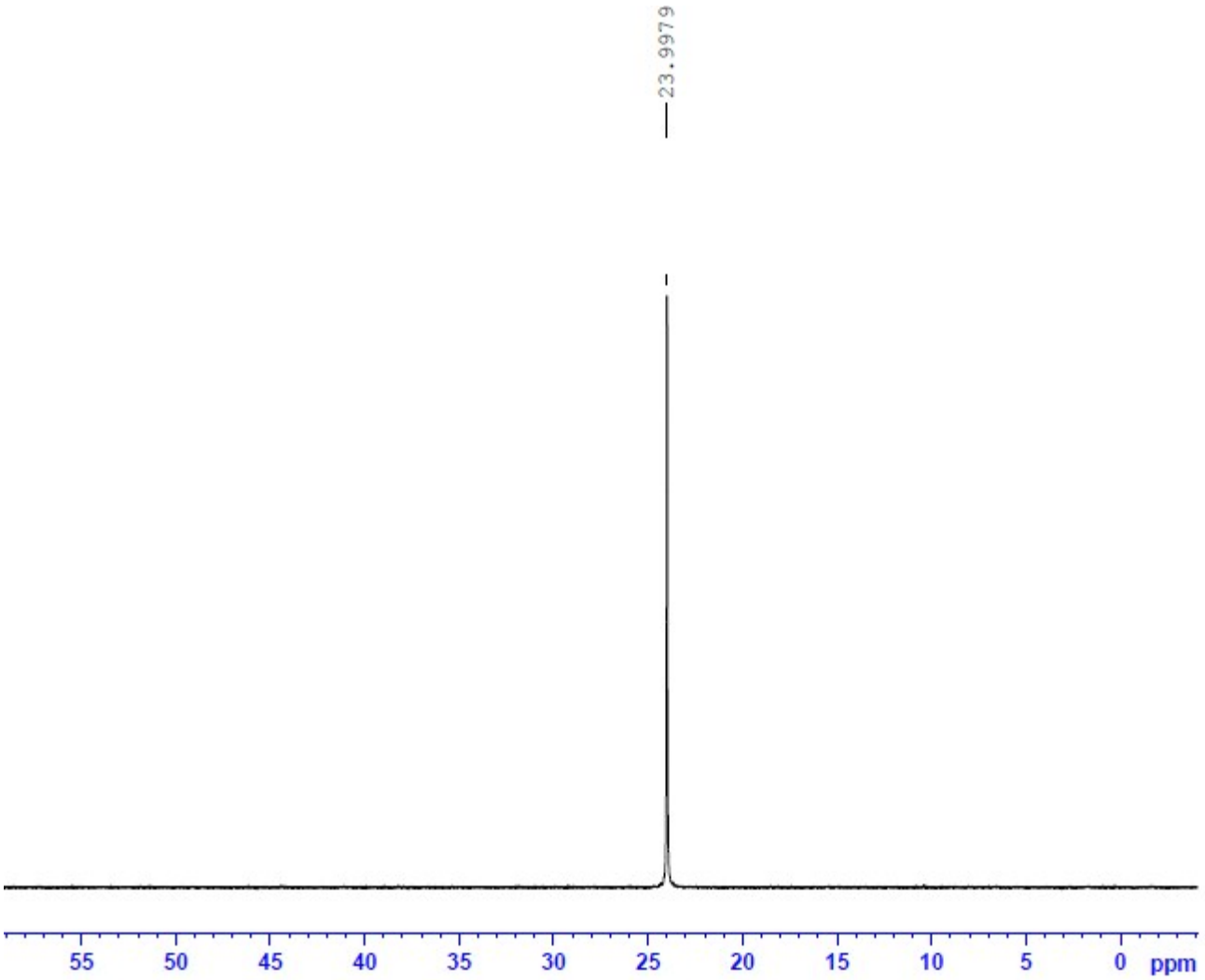
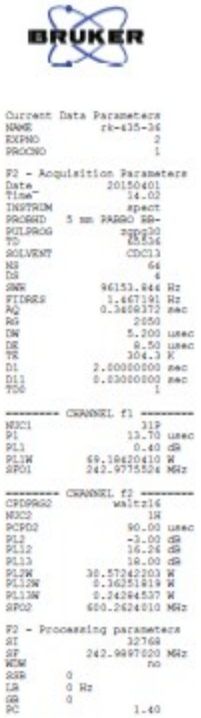


Fig. S8. ^{31}P NMR of dimethyl *N*-(4-methylphenyl)amino(ferrocenyl)methylphosphonate **(2b)**





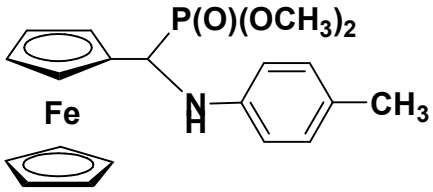
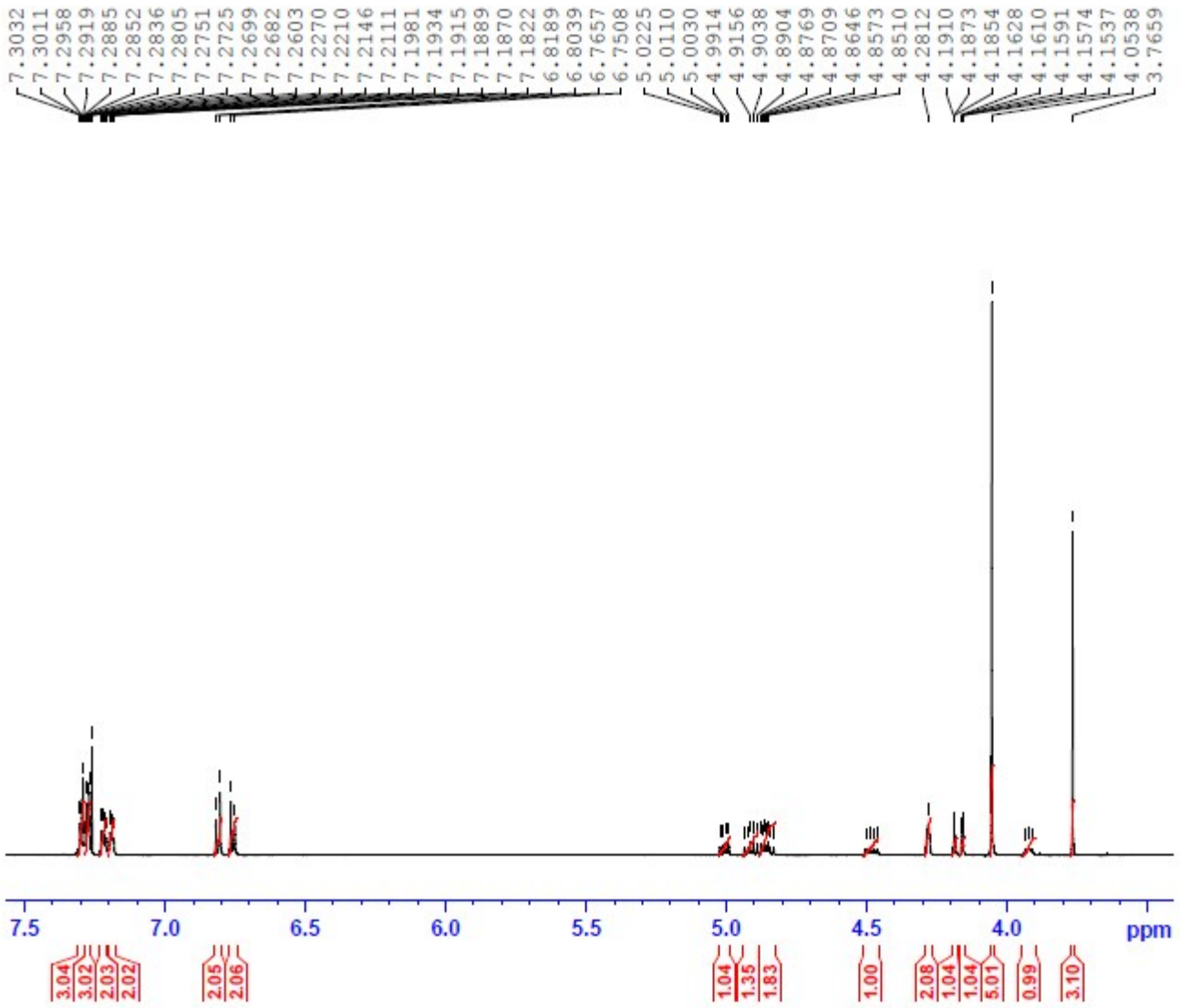


Fig. S9. ^{1}H NMR of dibenzyl *N*-(4-Methoxyphenyl)amino(ferrocenyl)methylphosphonate **(2c)**



Current Data Parameters
NAME rk-452ax
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
Date 20150430
Time 14.38
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 12335.526 Hz
FIDRES 0.188225 Hz
AQ 2.6564426 sec
RG 228
DW 40.533 usec
DE 6.50 usec
TE 303.9 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
NUC1 1H
P1 9.40 usec
PL1 -3.00 dB
PLW 30.57242203 W
SFO1 600.2637069 MHz

F2 - Processing parameters
SI 32768
SF 600.2600171 MHz
WDW no
SSB 0
LB 0 Hz
GB 0
PC 1.00

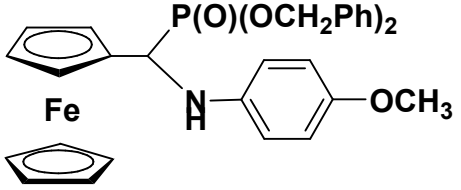
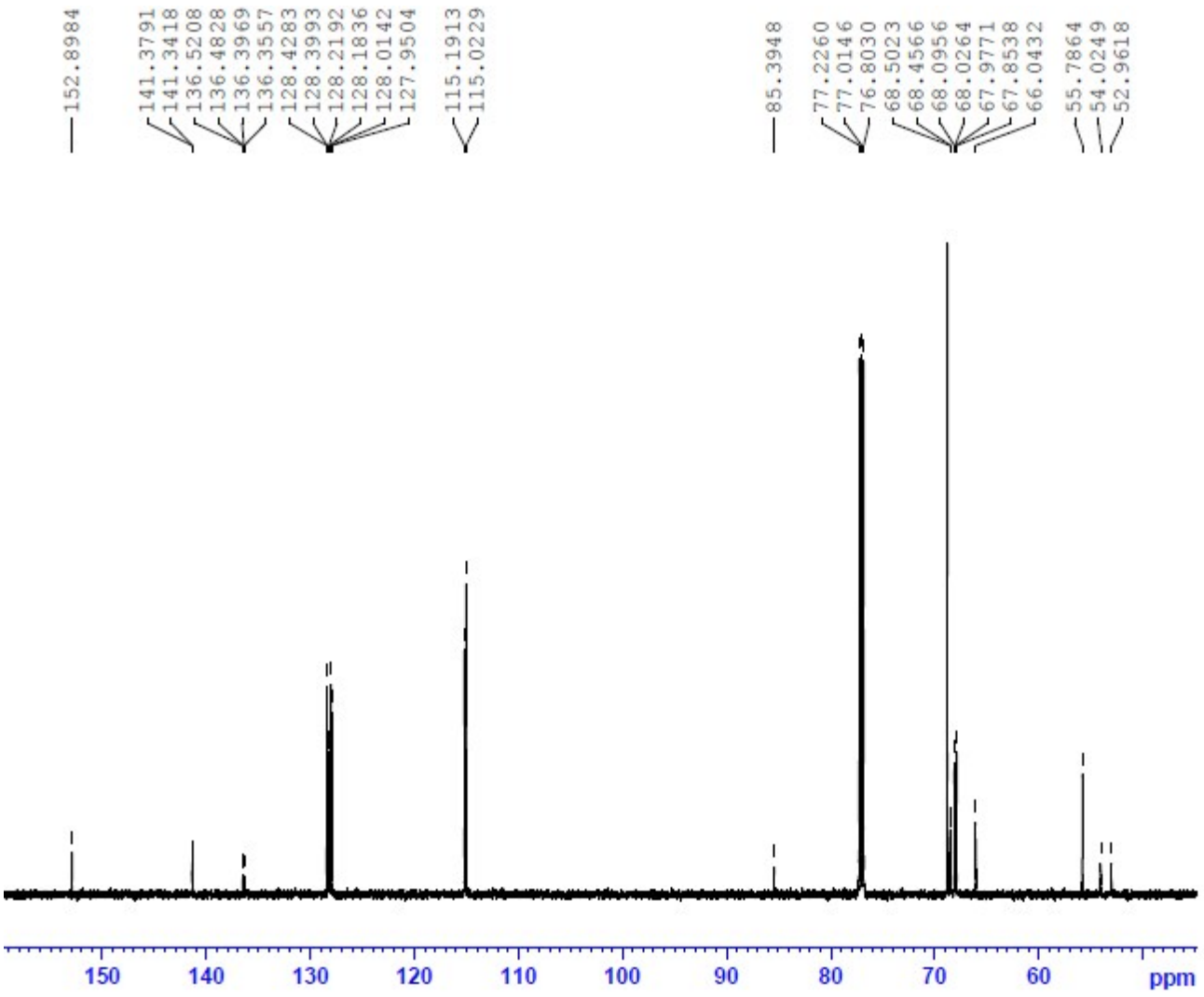
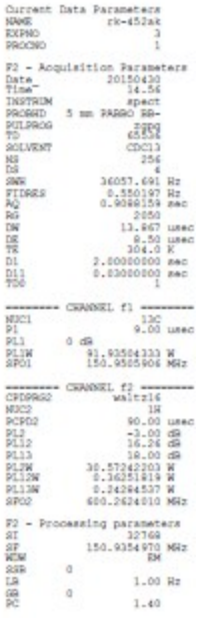


Fig. S10. ^{13}C NMR of dibenzyl *N*-(4-Methoxyphenyl)amino(ferrocenyl)methylphosphonate **(2c)**





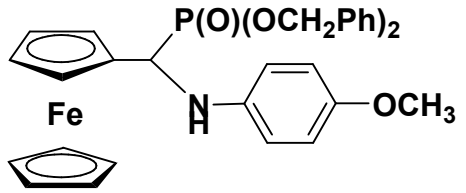
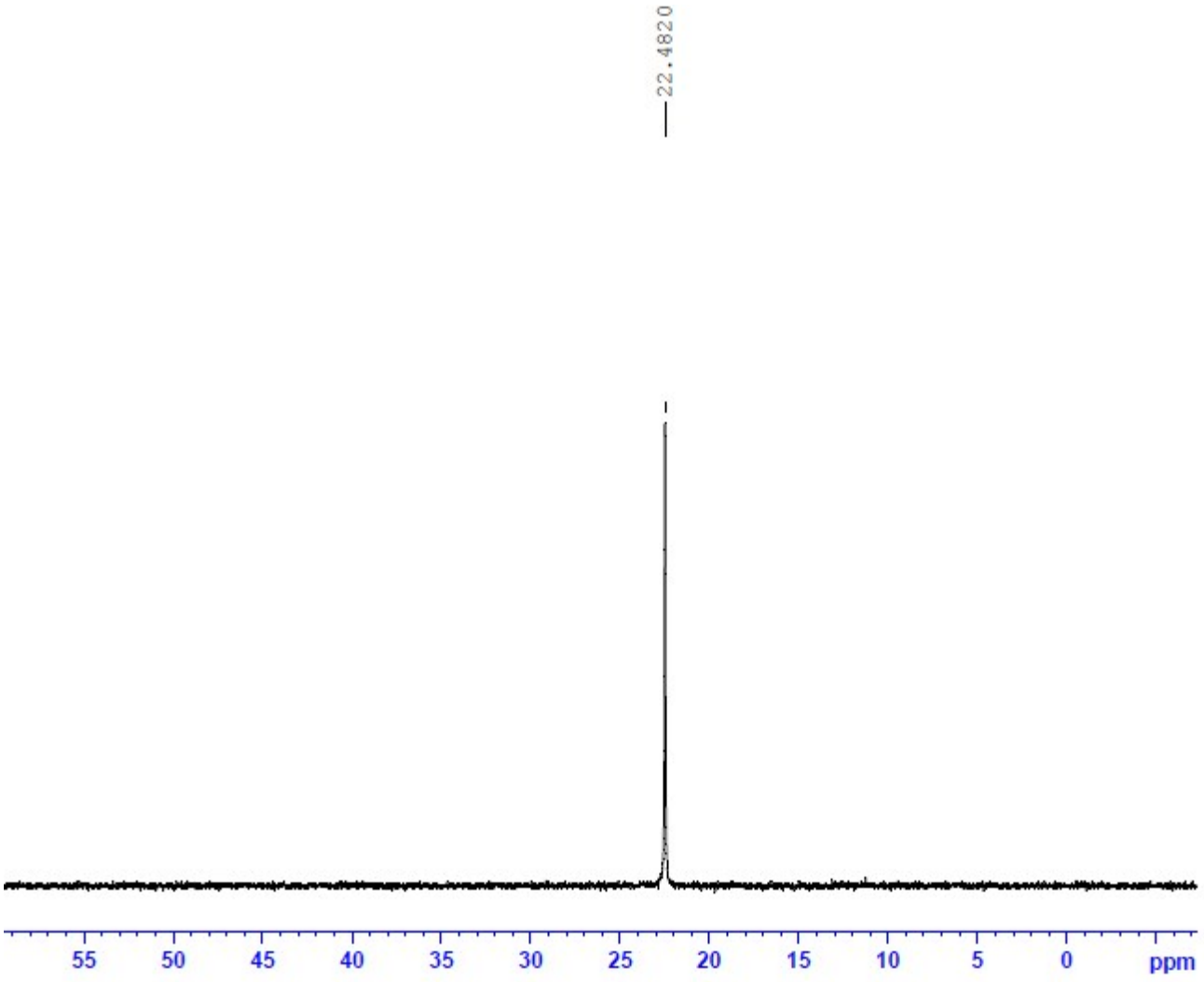
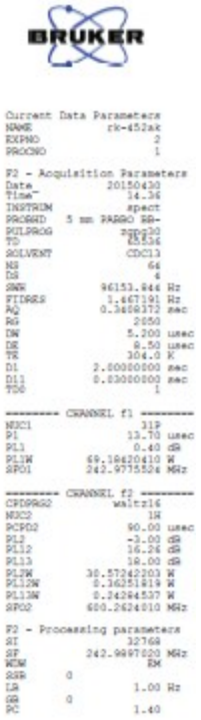


Fig. S11. ^{31}P NMR of dibenzyl *N*-(4-Methoxyphenyl)amino(ferrocenyl)methylphosphonate **(2c)**





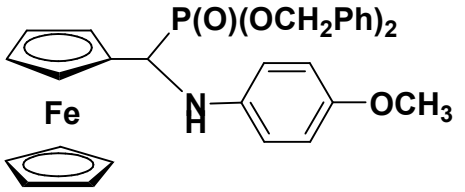
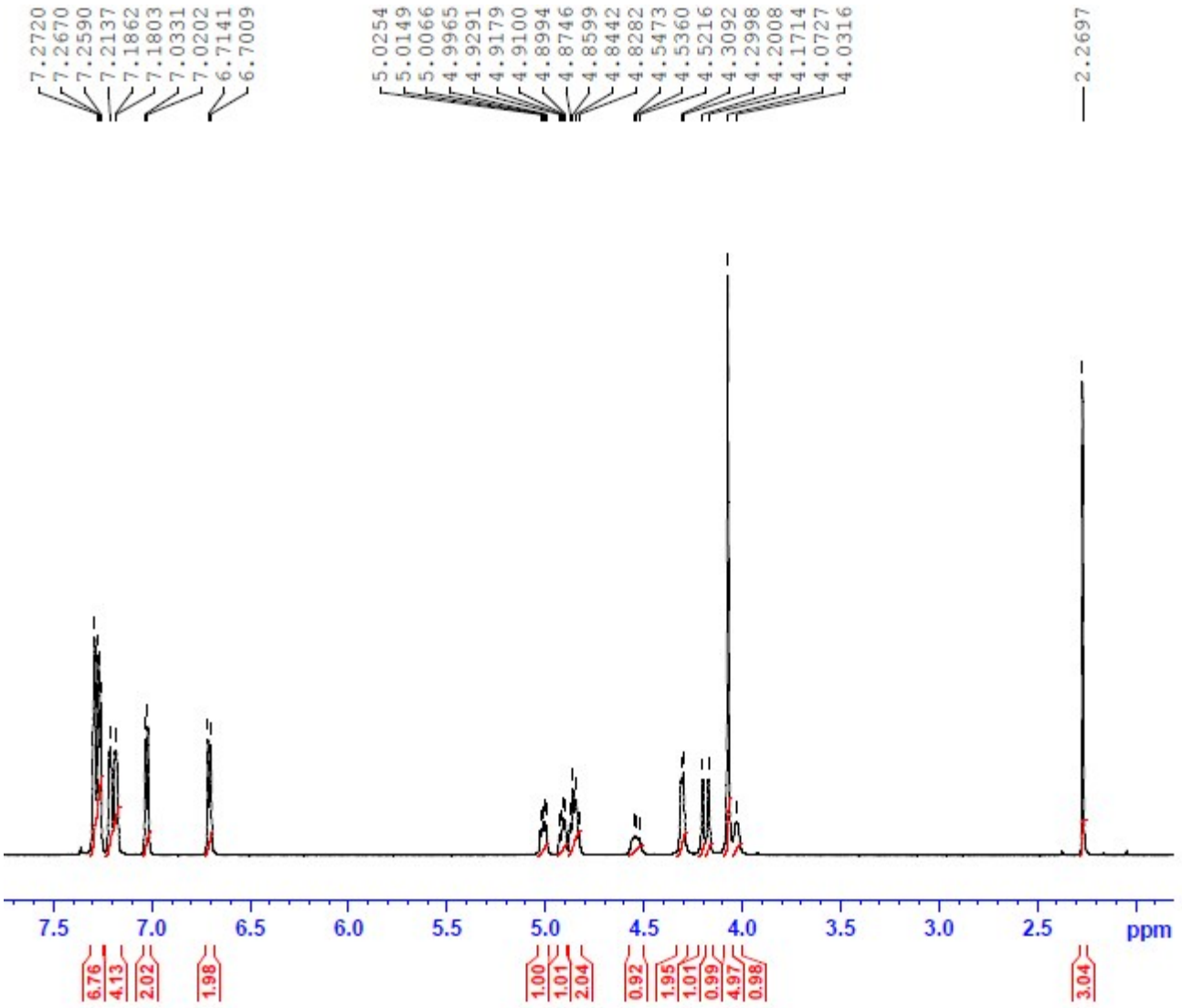


Fig. S12. ^{1}H NMR of dibenzyl *N*-(4-Methylphenyl)amino(ferrocenyl)methylphosphonate **(2d)**




```
Current Data Parameters
NAME          rx-454a-48
EXPNO                 11
PROCNO                 1

F2 - Acquisition Parameters
Date_          20150424
Time_            13.04
INSTRUM           spect
PROBHD   5 mm PABBO BB-
PULPROG           zg30
TD               65536
SOLVENT          CDCl3
NS                  16
DS                   2
SWH          12335.526 Hz
FIDRES        0.188225 Hz
AQ            2.6564434 sec
RG                 256
DW              40.533 usec
DE               6.50 usec
TE              303.9 K
D1           1.00000000 sec
TD0                  1

======== CHANNEL f1 ========
NUC1                1H
P1               9.40 usec
PL1             -3.00 dB
PLW1       30.57243203 W
SFO1      600.2637069 MHz

F2 - Processing parameters
SI                32768
SF         600.2600182 MHz
WDW                  no
SSB       0
LB        0 Hz
GB        0
PC              1.00
```

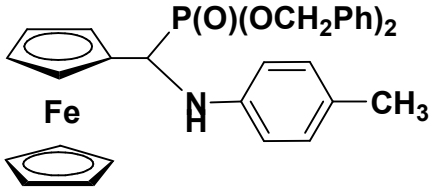
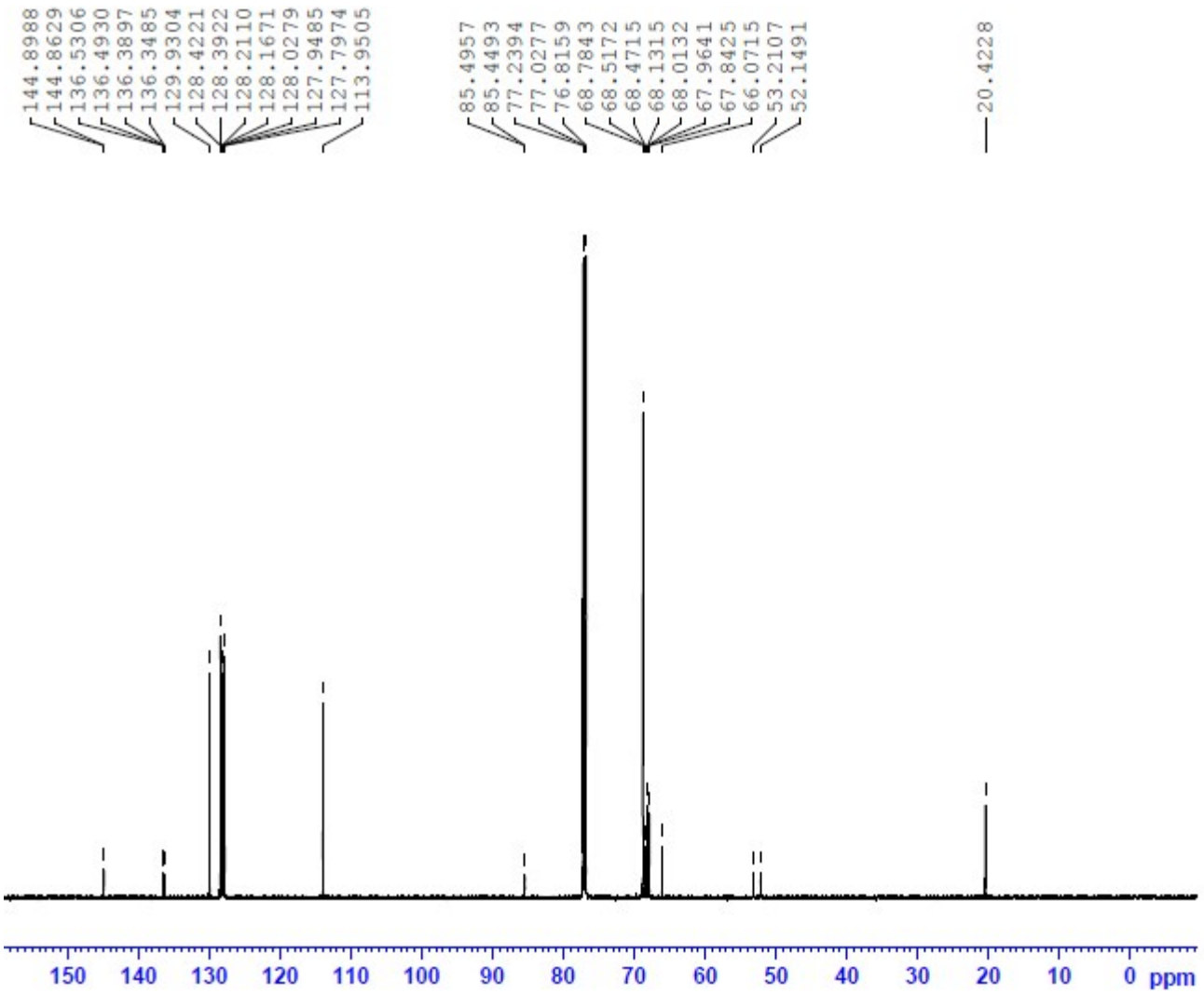
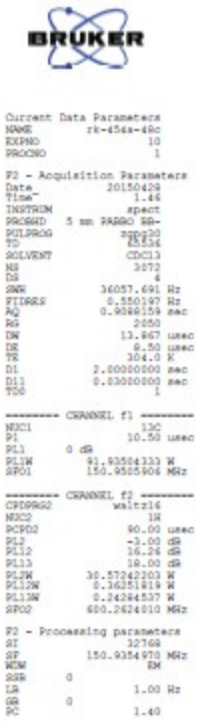


Fig. S13. ^{13}C NMR of dibenzyl *N*-(4-Methylphenyl)amino(ferrocenyl)methylphosphonate **(2d)**





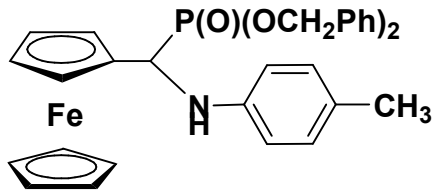
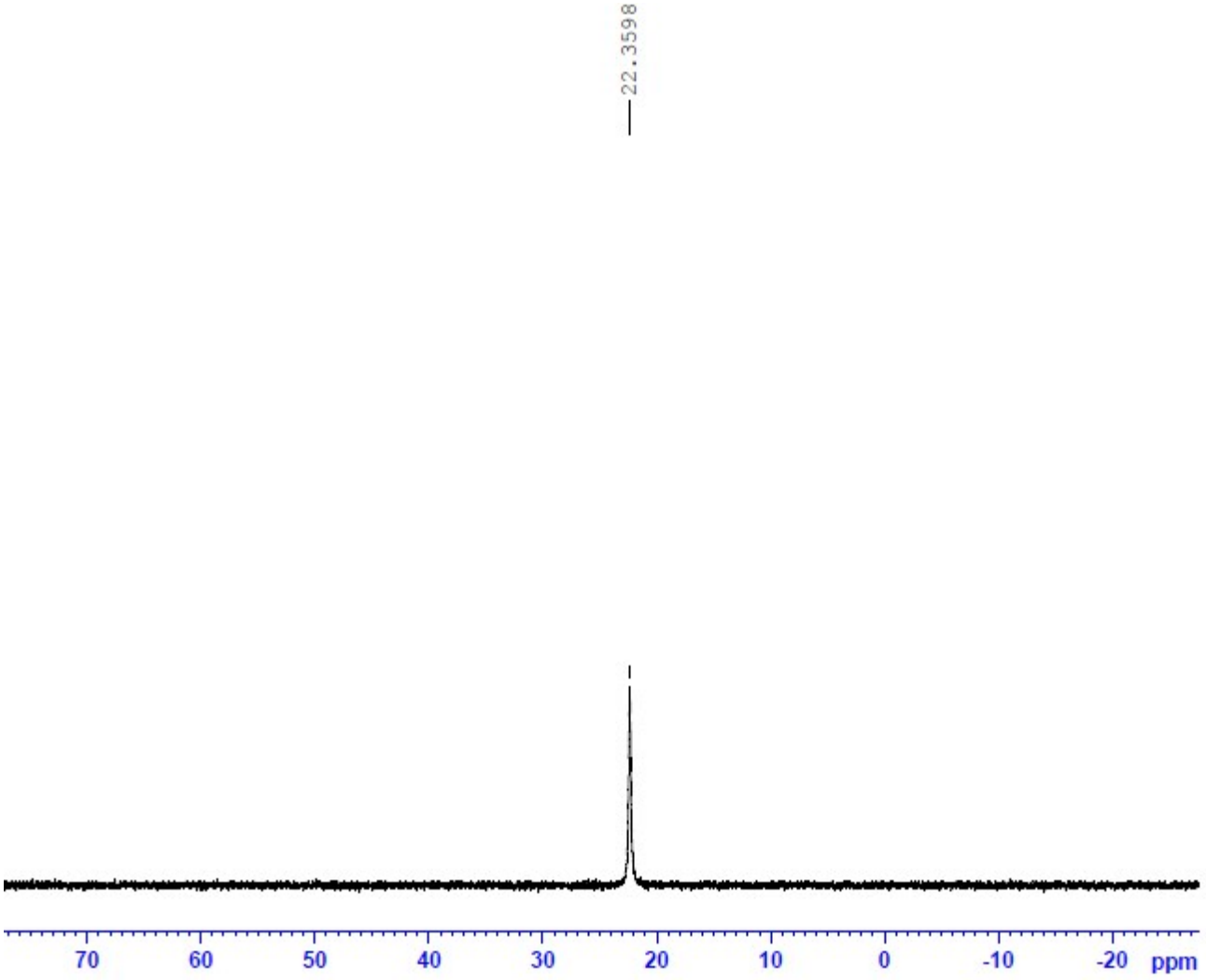
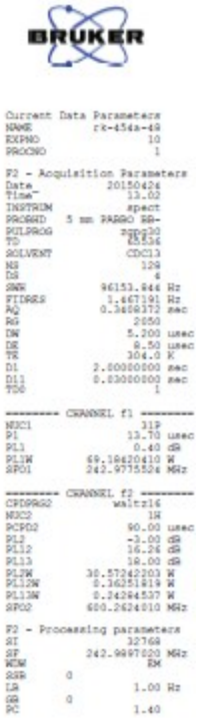
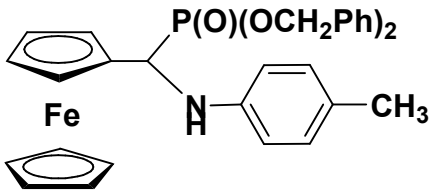


Fig. S14. ^{31}P NMR of dibenzyl *N*-(4-Methylphenyl)amino(ferrocenyl)methylphosphonate **(2d)**







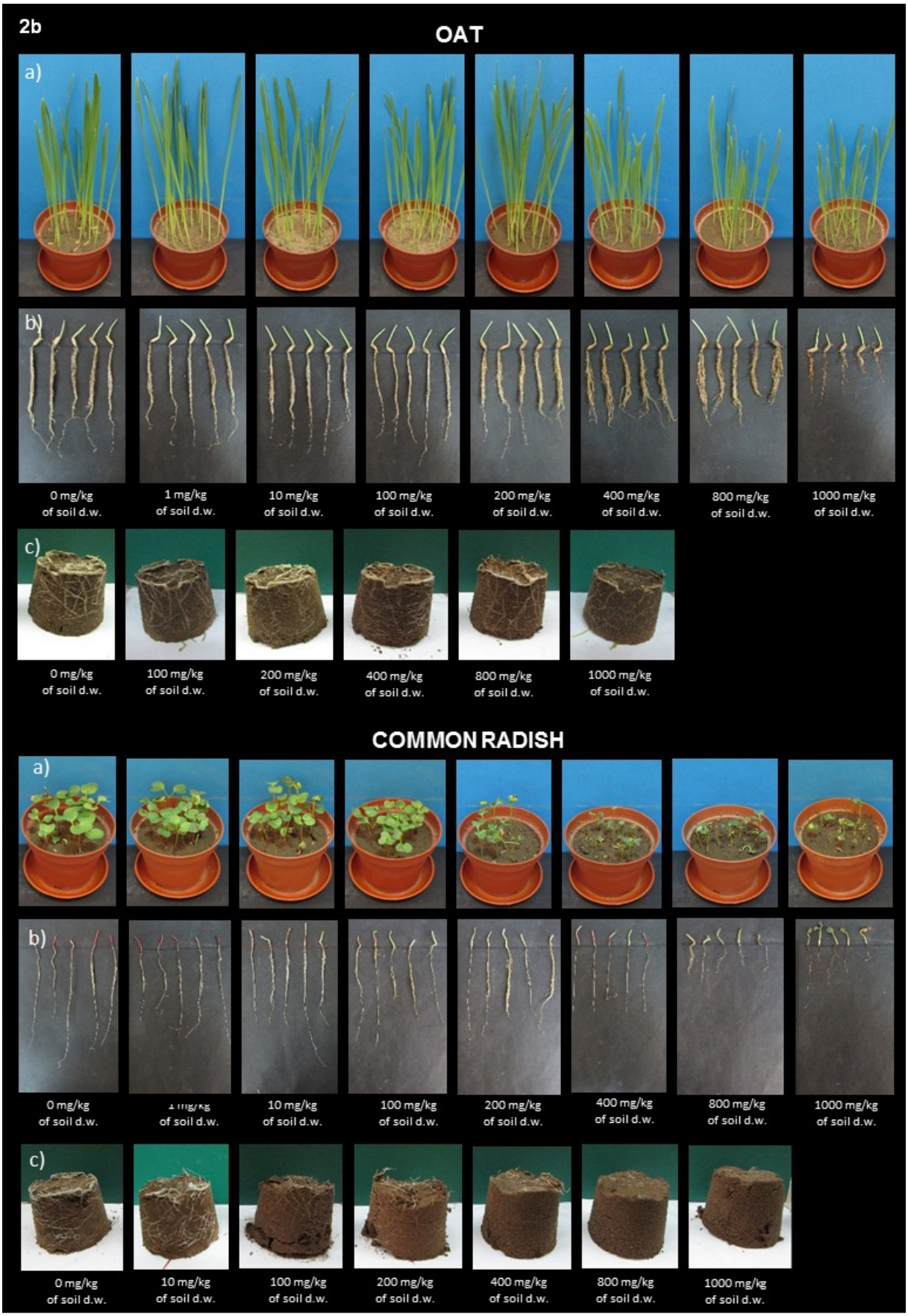


Fig. S15. Digital photographs oat and radish seedlings treated with sample **2b**. a) green part of plants (shoots), b) roots and c) extent of branching of roots in soil

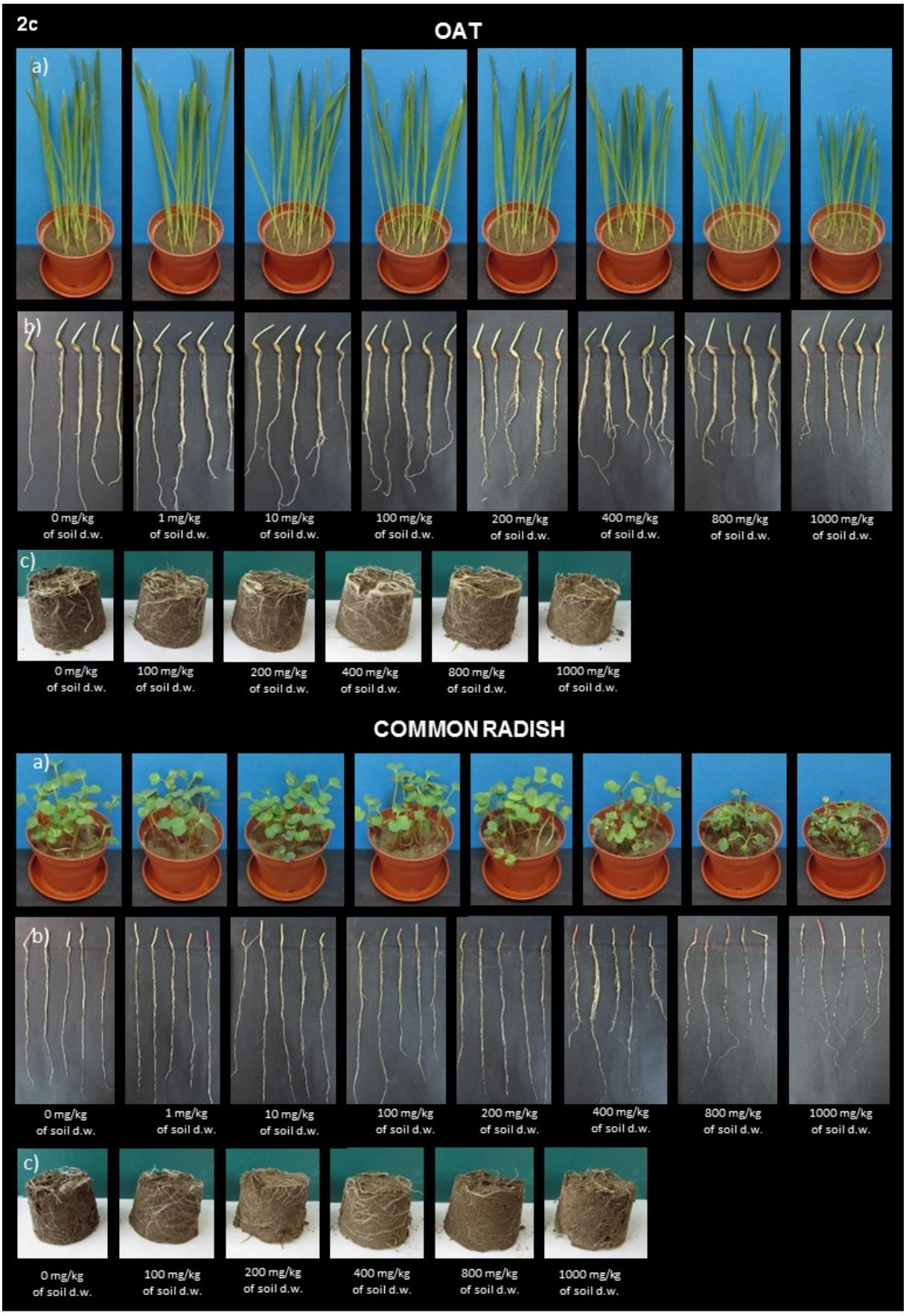


Fig. S16. Digital photographs oat and radish seedlings treated with sample **2c.** a) green part of plants (shoots), b) roots and c) extent of branching of roots in soil

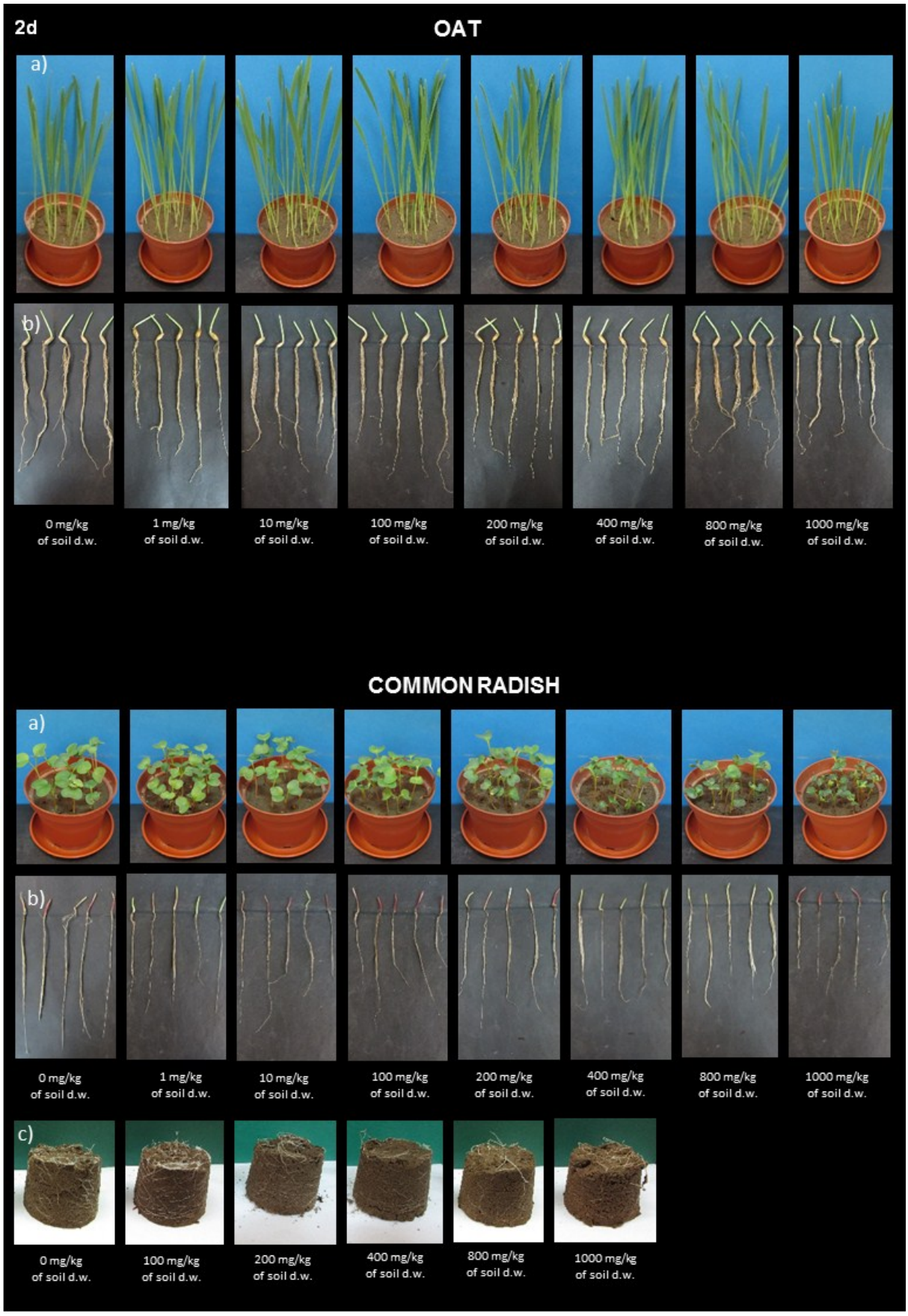


Fig. S17. Digital photographs oat and radish seedlings treated with sample **2d.** a) green part of plants (shoots), b) roots and c) extent of branching of roots in soil