

Supplementary Material

Facile synthesis of novel monocyclic *trans*- and *cis*-3-oxy/thio/seleno 4-pyrazolyl- β -lactams

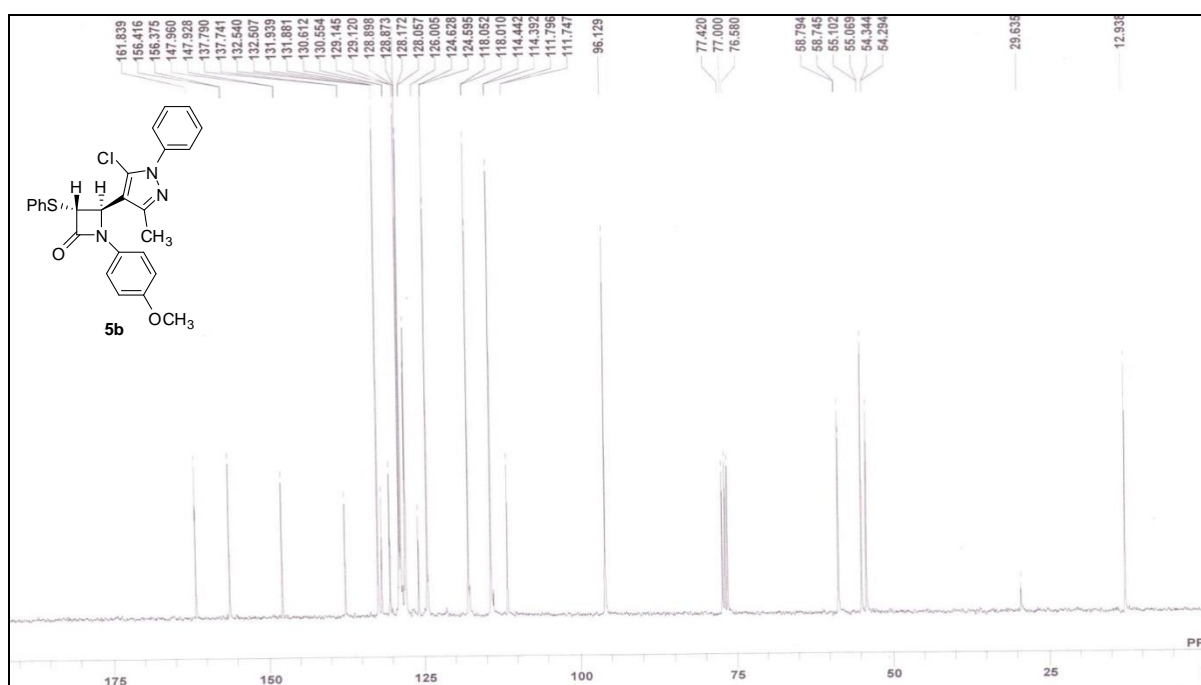
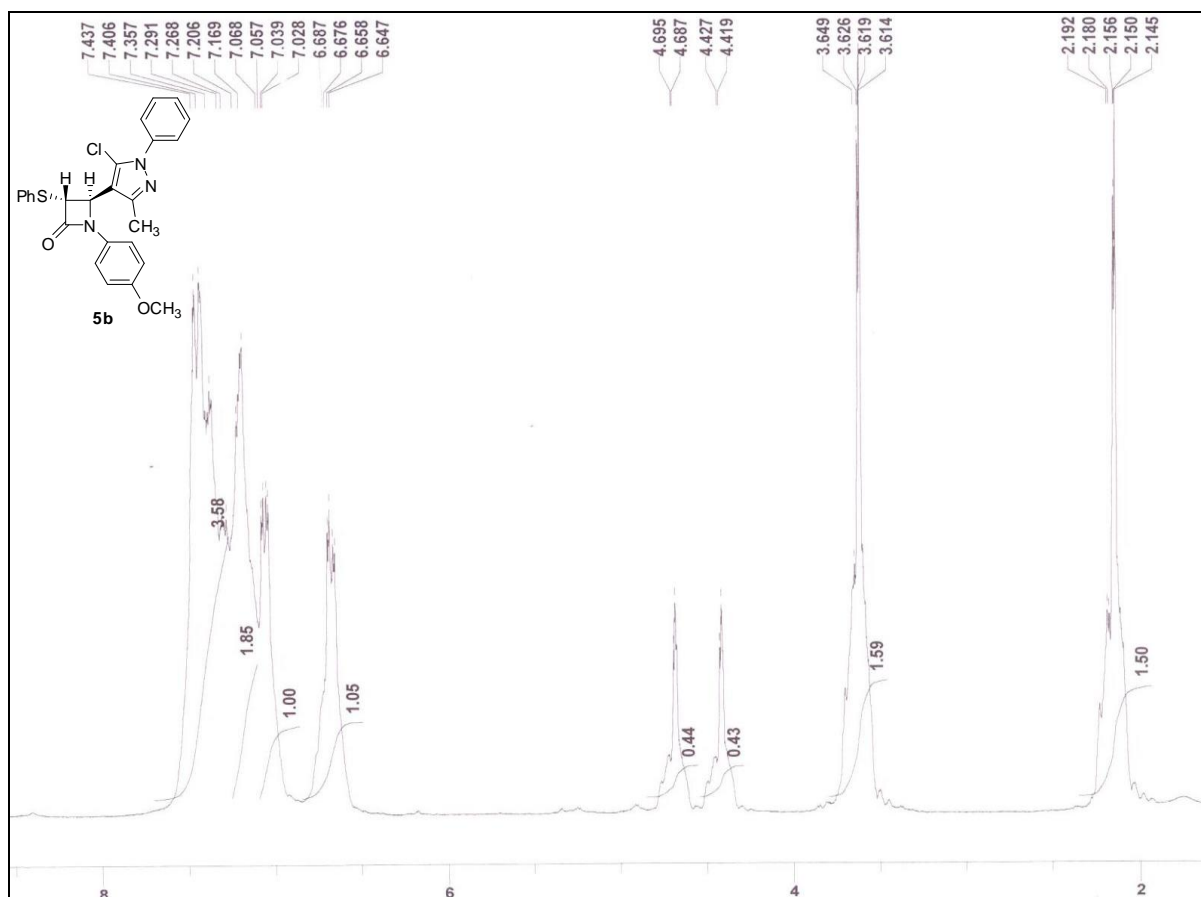
Aman Bhalla,^{a*} Shamsheer S. Bari,^a Shiwani Berry,^a Jitender Bhalla,^a Sunil Vats,^a
Sanjay Mandal^b, Sadhika Khullar^b

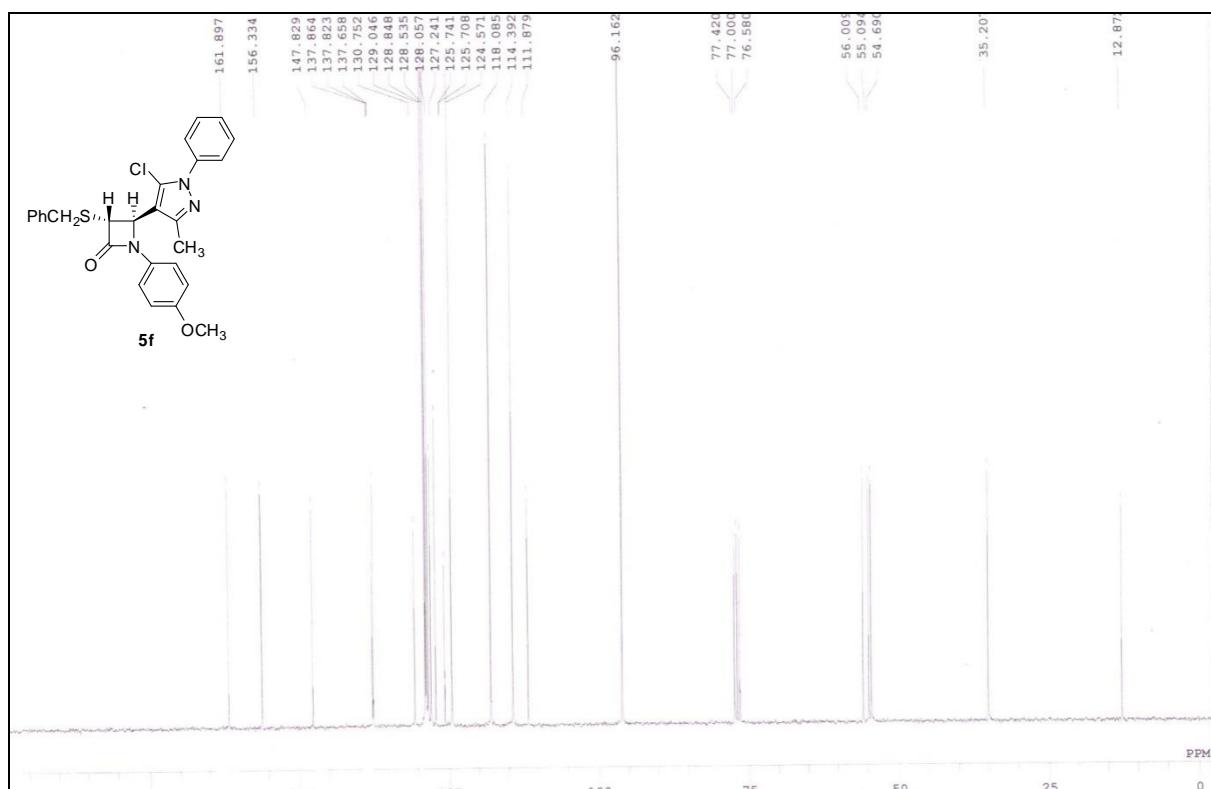
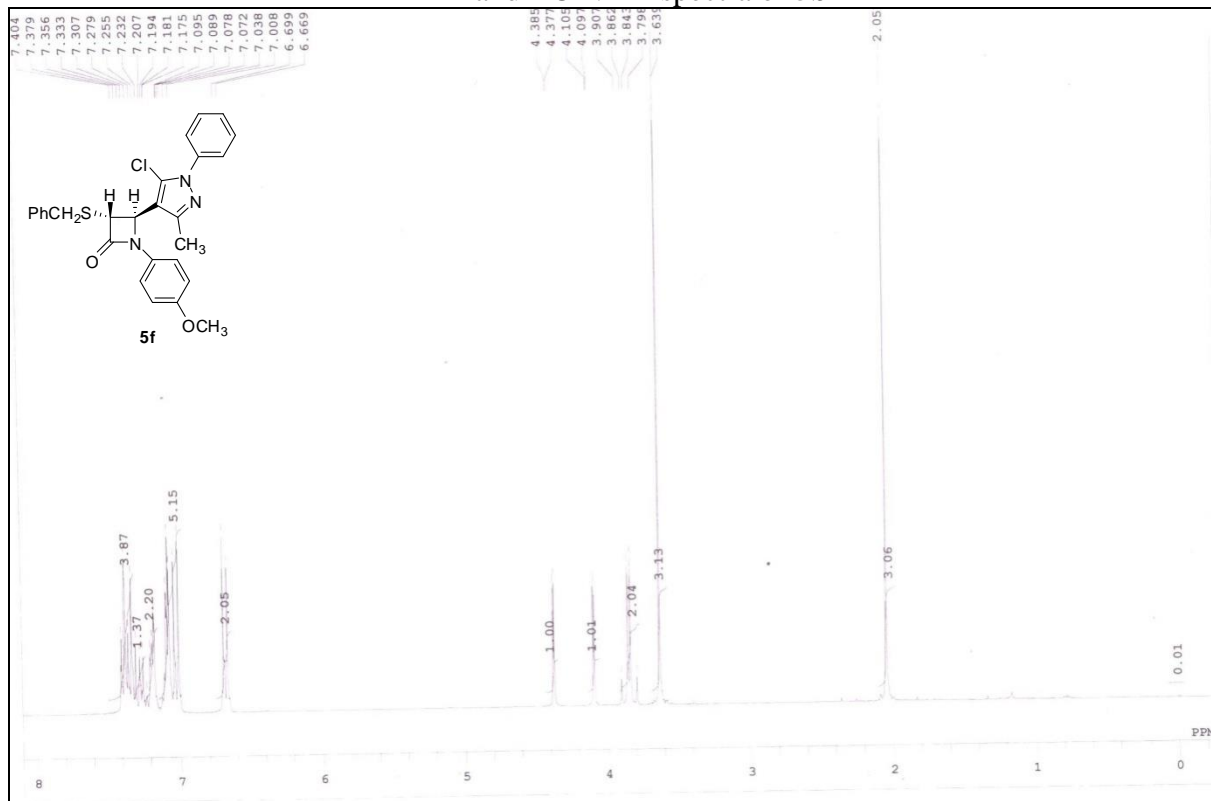
^a Department of Chemistry and Centre of Advanced Studies in Chemistry,
Panjab University, Chandigarh 160014, India

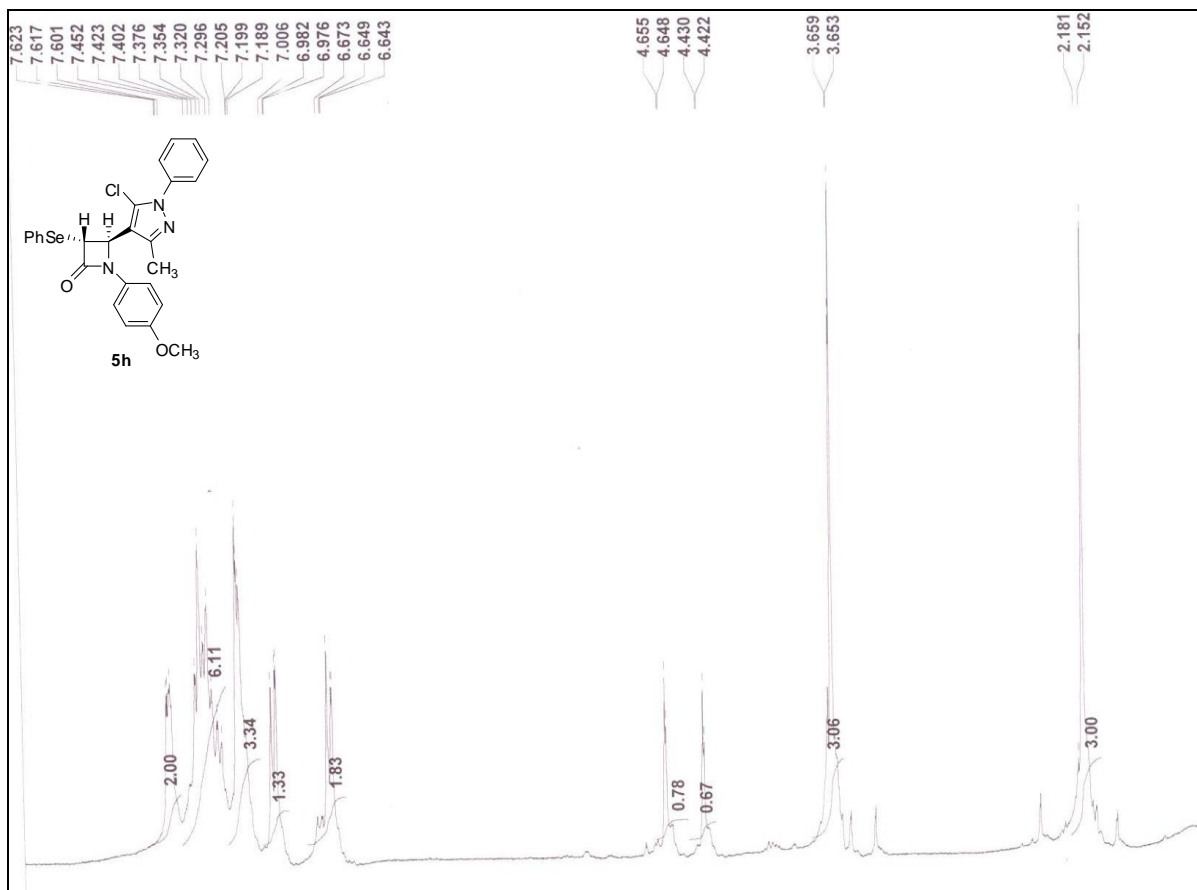
^b Indian Institute of Science Education and Research (IISER), Mohali 160 062, India
E-mail: amanbhalla@pu.ac.in

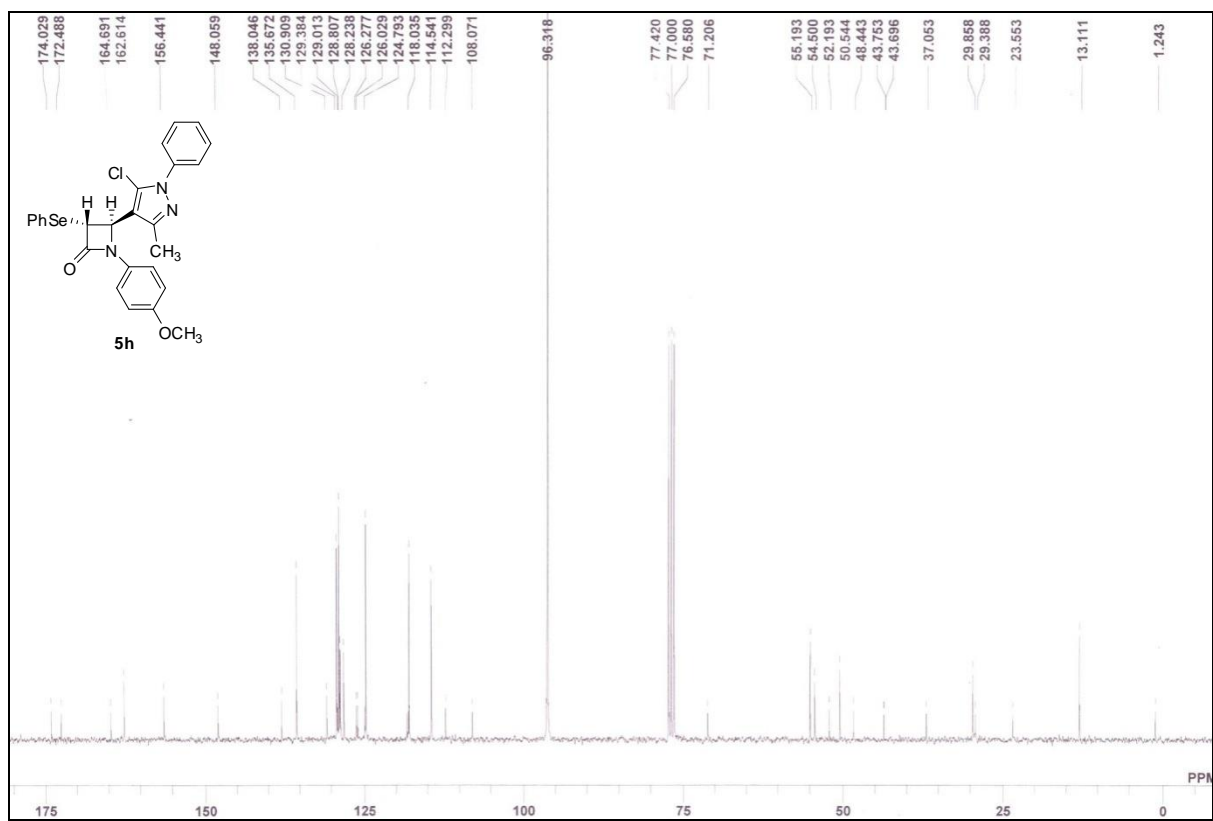
Table of Contents

Figure S1. ¹ H and ¹³ C NMR of some representative compounds (5b , 5f , 5h , 5k , 5p , 5r , 6p)	S2
Figure S2. ¹³ C NMR spectrum of compound 4a	S9
Figure S3. HRMS spectra of β -lactams (5a , 5b , 5c , 5e , 5g , 5h , 5i , 5j , 5k , 5o , 5q , 5r)	S10

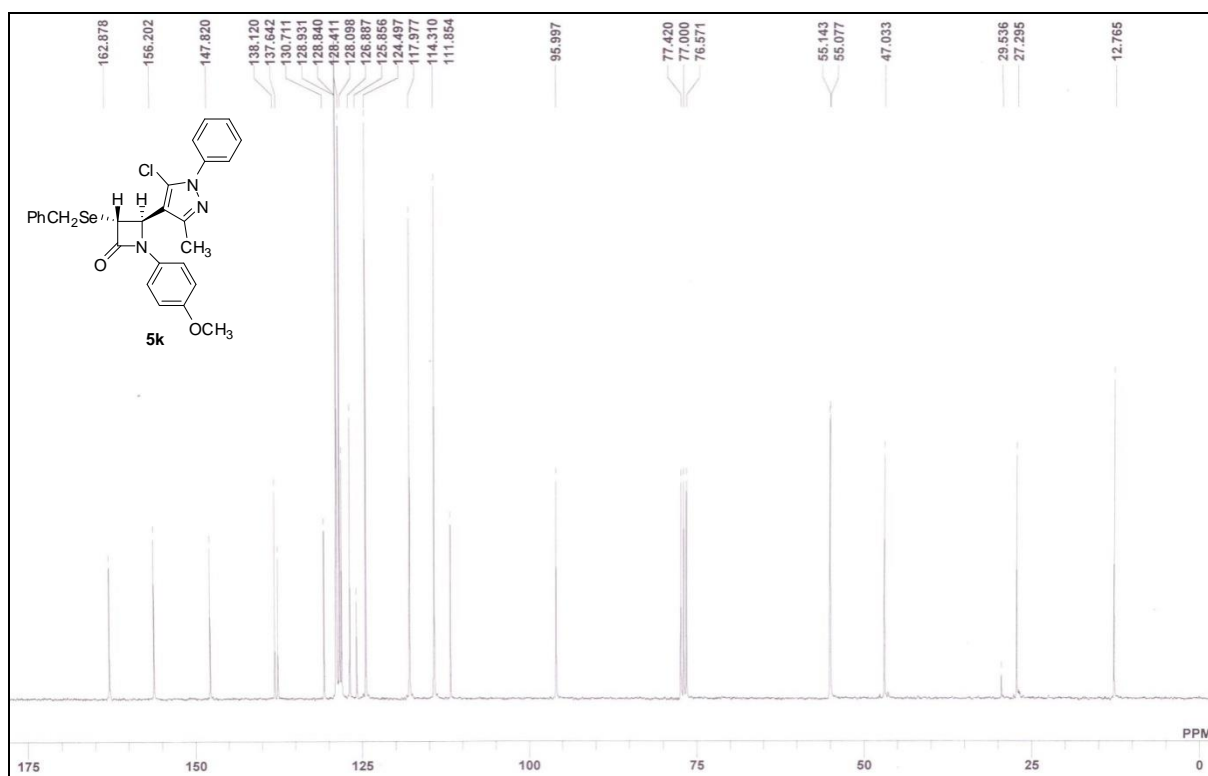
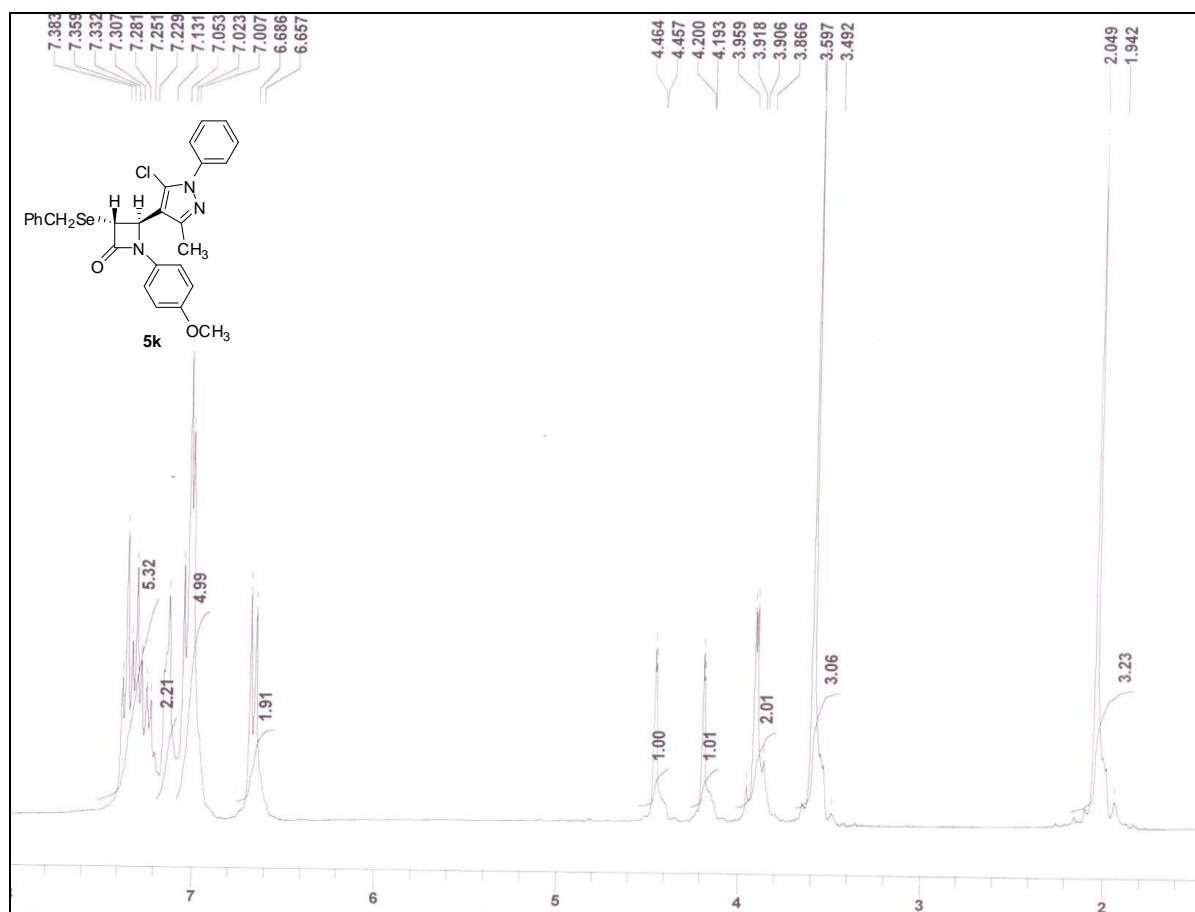
1. ^1H and ^{13}C NMR of some representative compounds (5b, 5f, 5h, 5k, 5p, 5r, 6p)

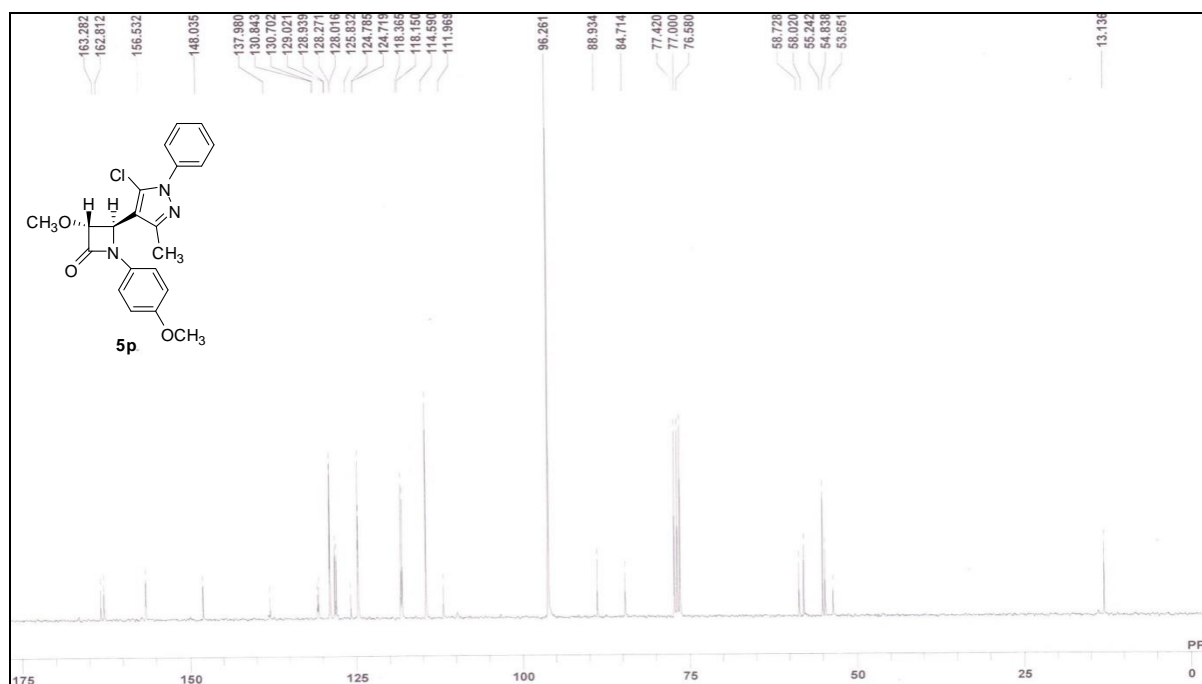
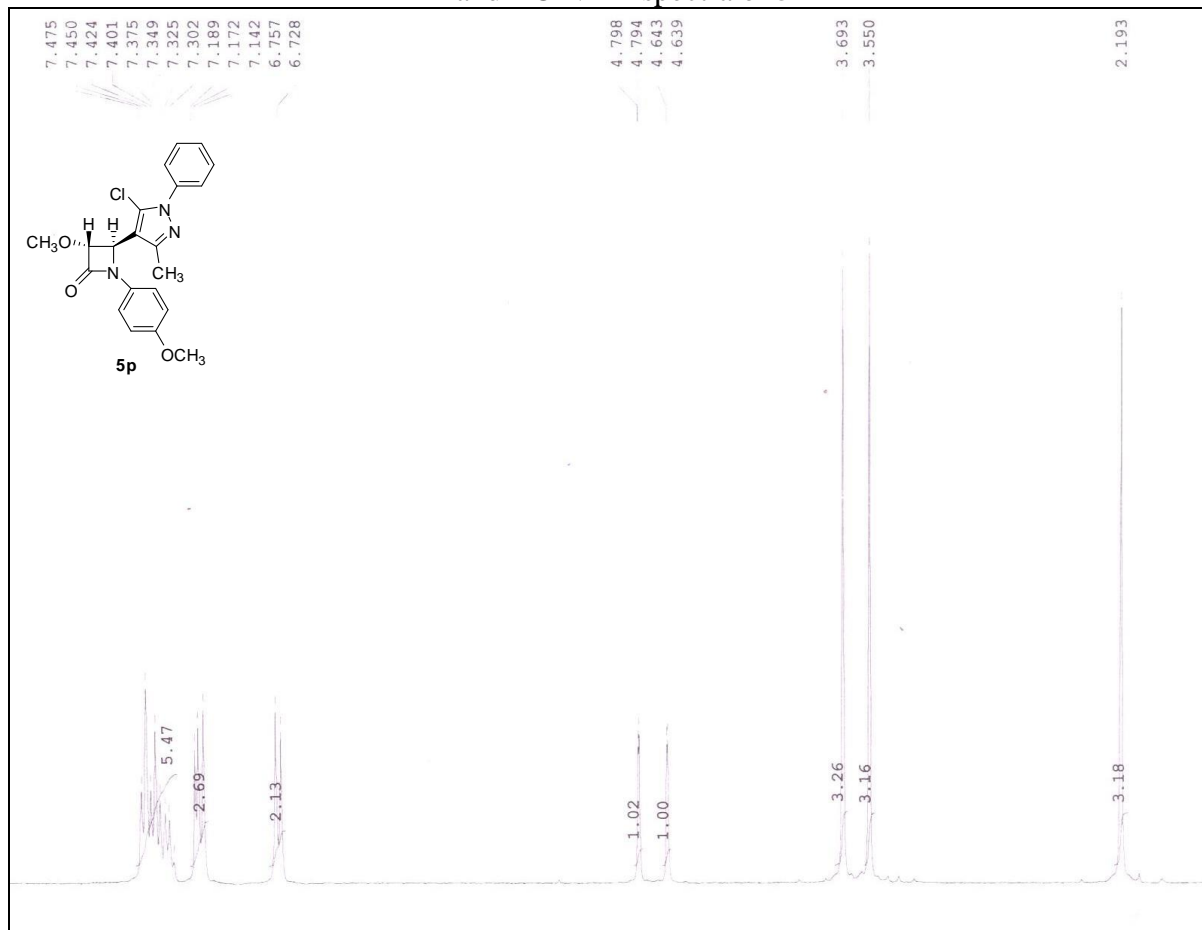
^1H and ^{13}C NMR spectra of **5b** ^1H and ^{13}C NMR spectra of **5f**

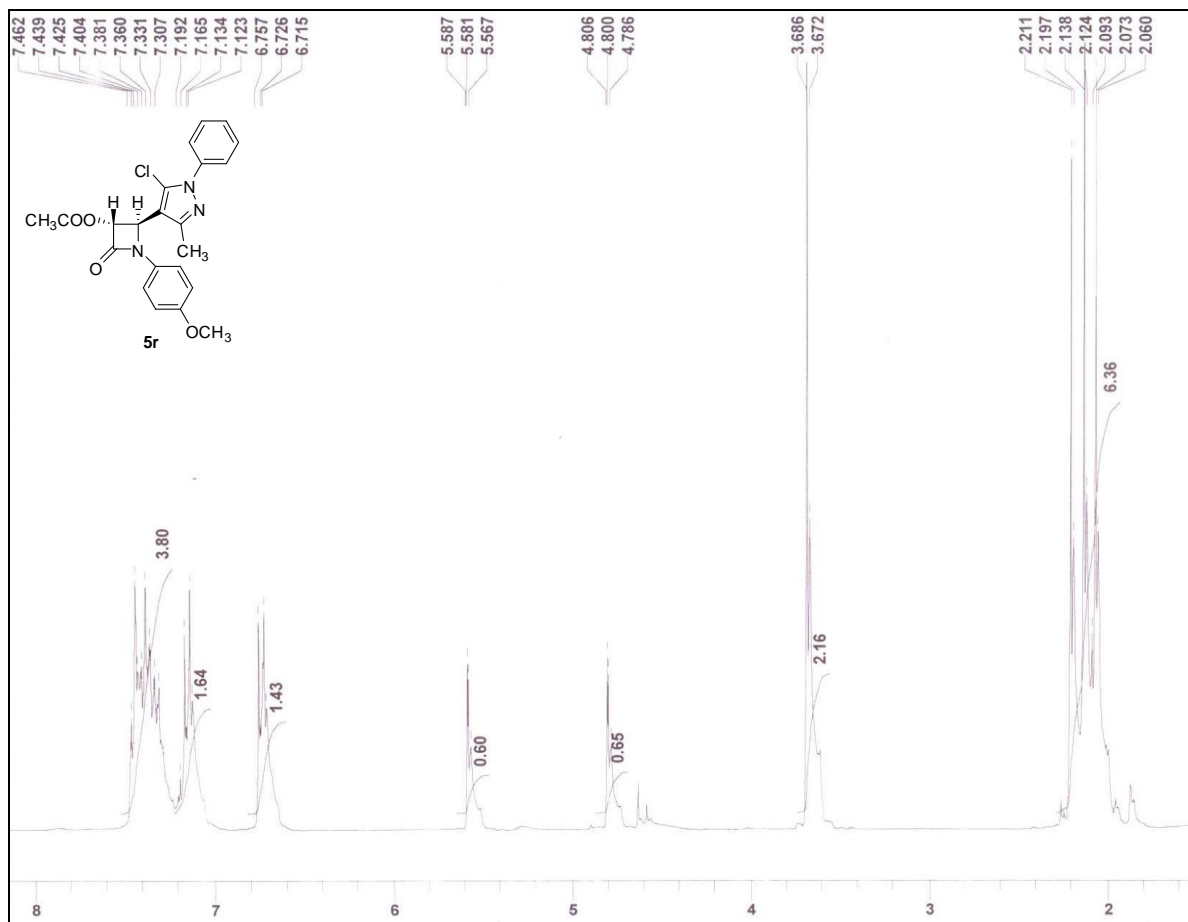


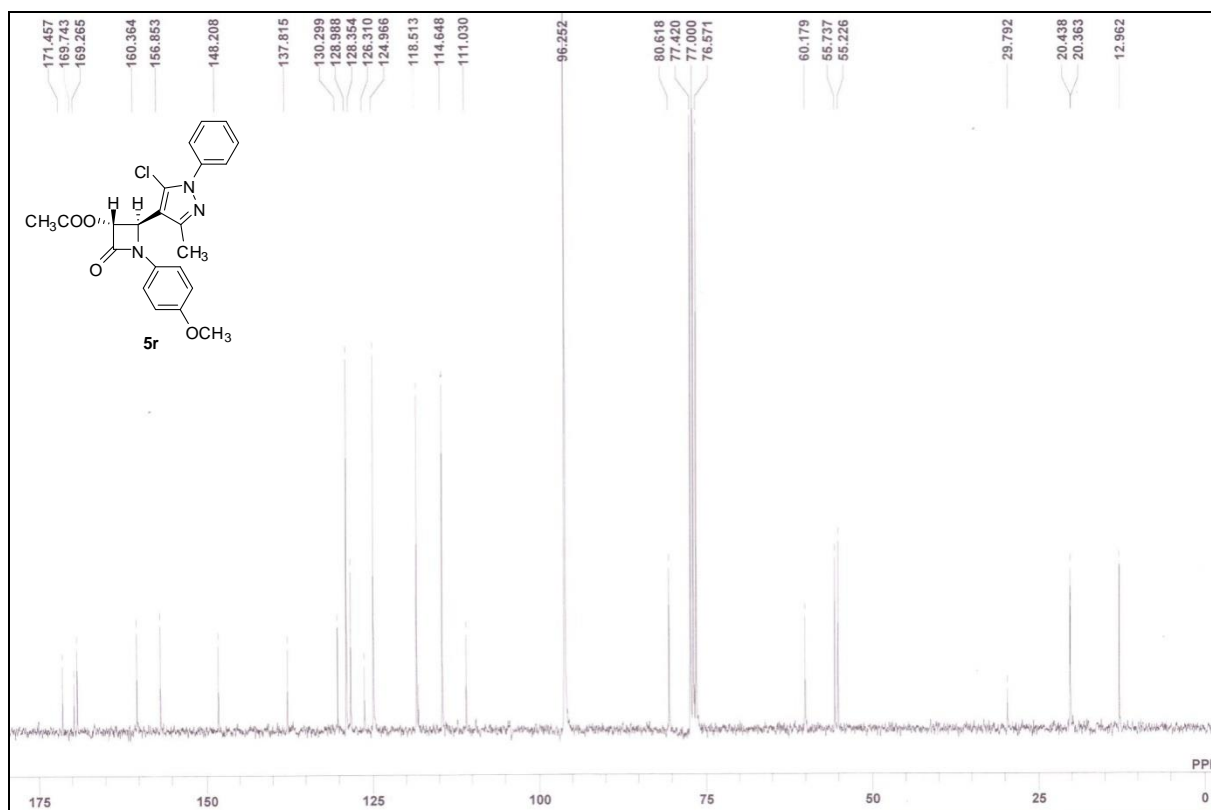


^1H and ^{13}C NMR spectra of **5h**

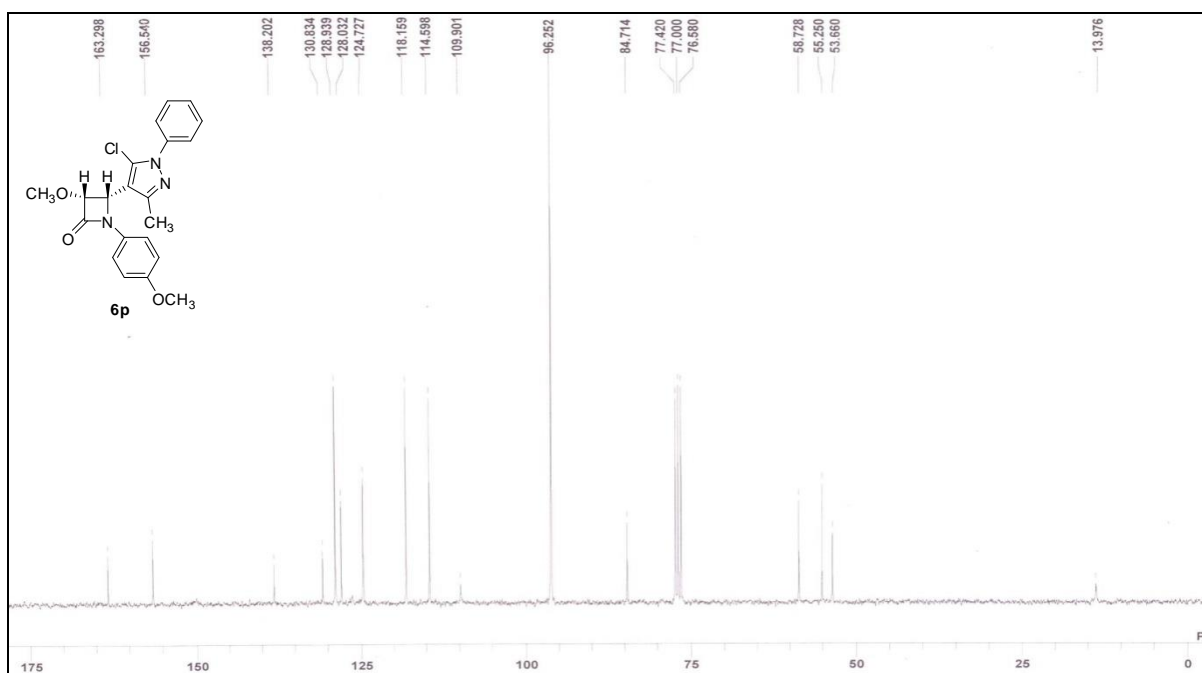
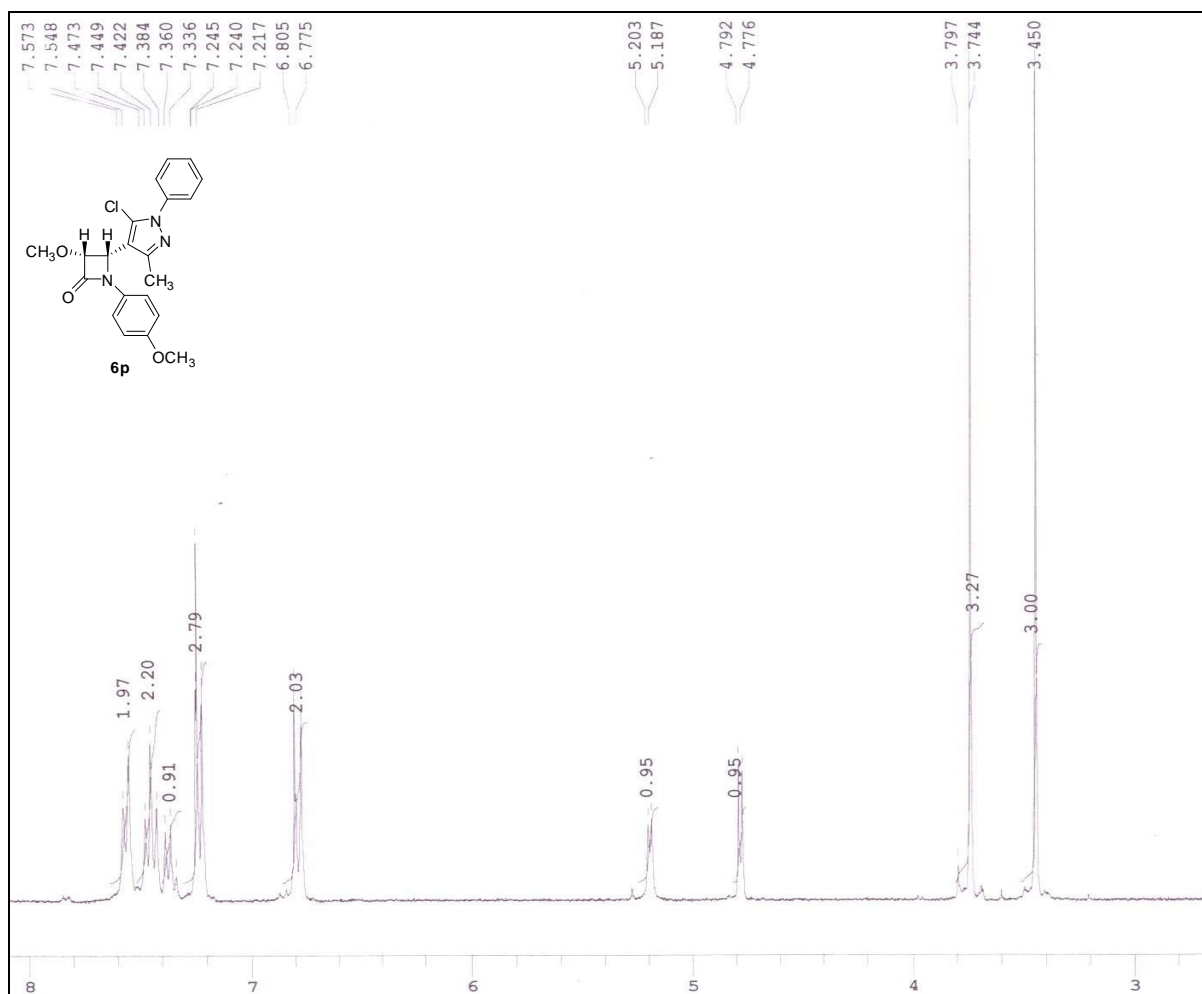


^1H and ^{13}C NMR spectra of **5k** ^1H and ^{13}C NMR spectra of **5p**



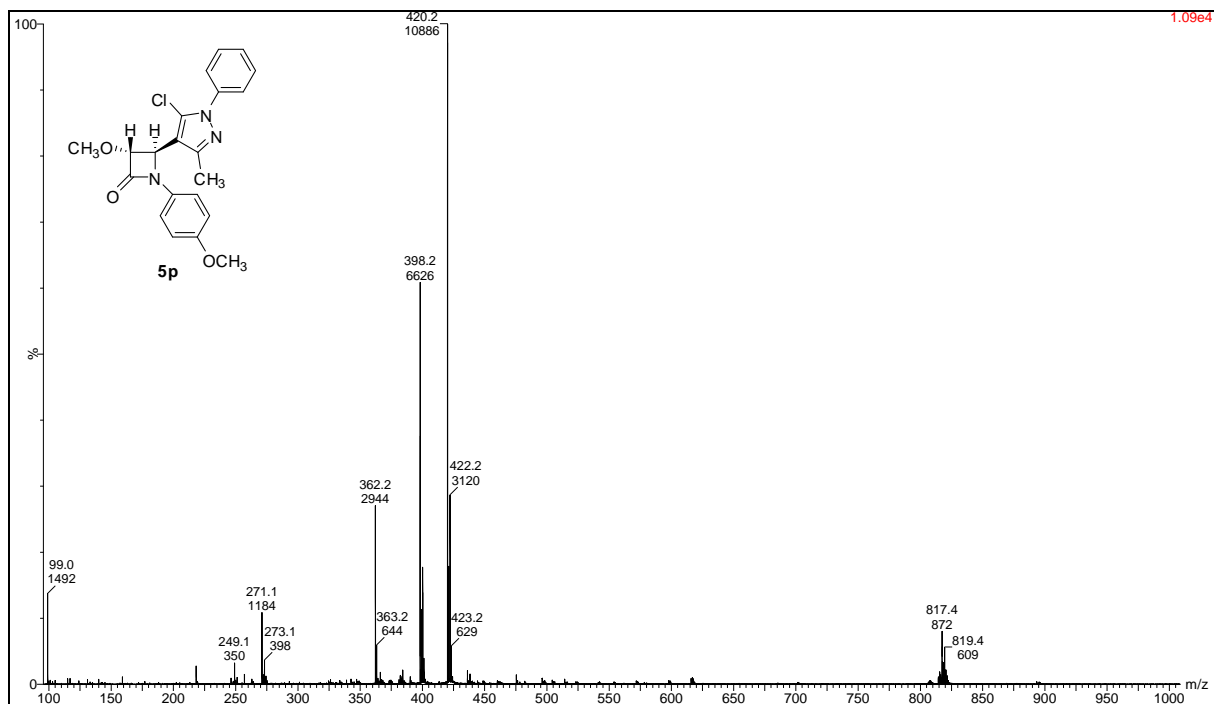


^1H and ^{13}C NMR spectra of **5r**

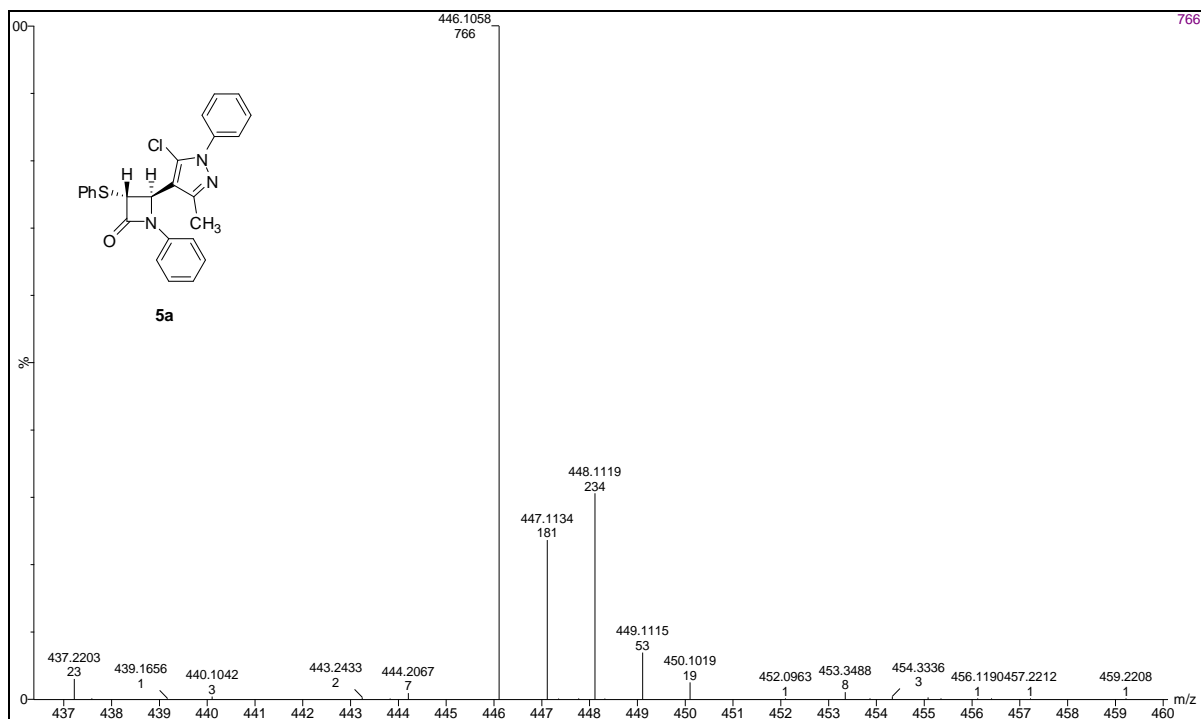
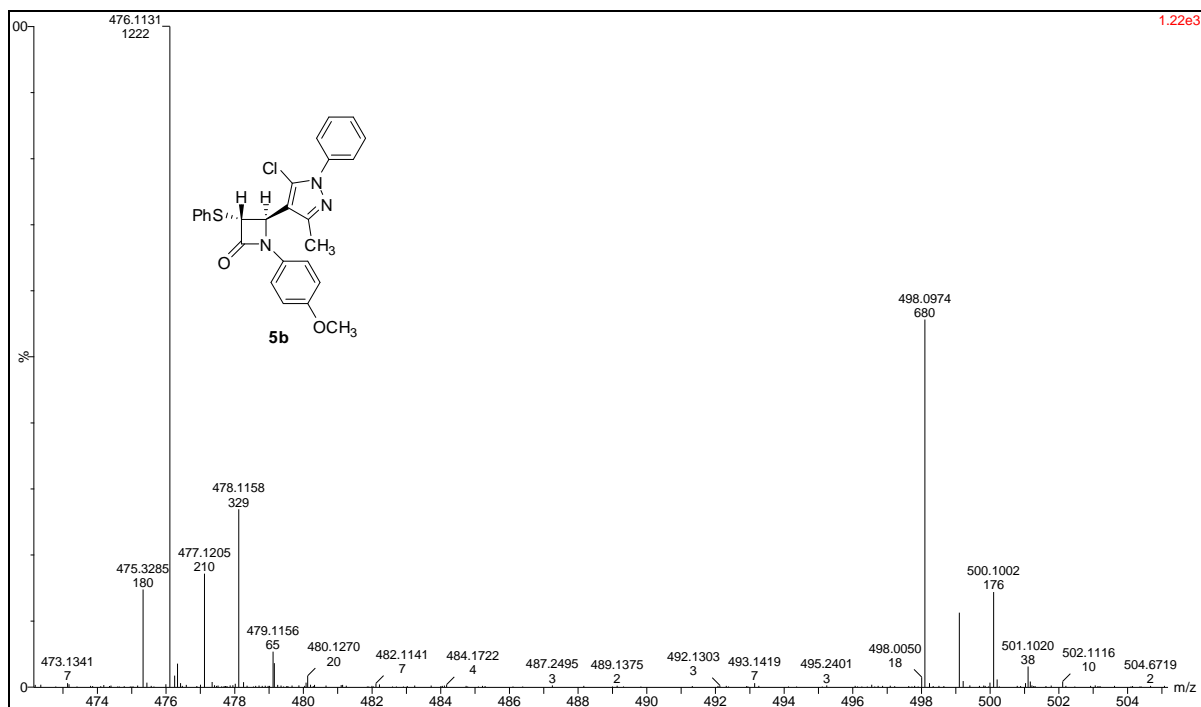


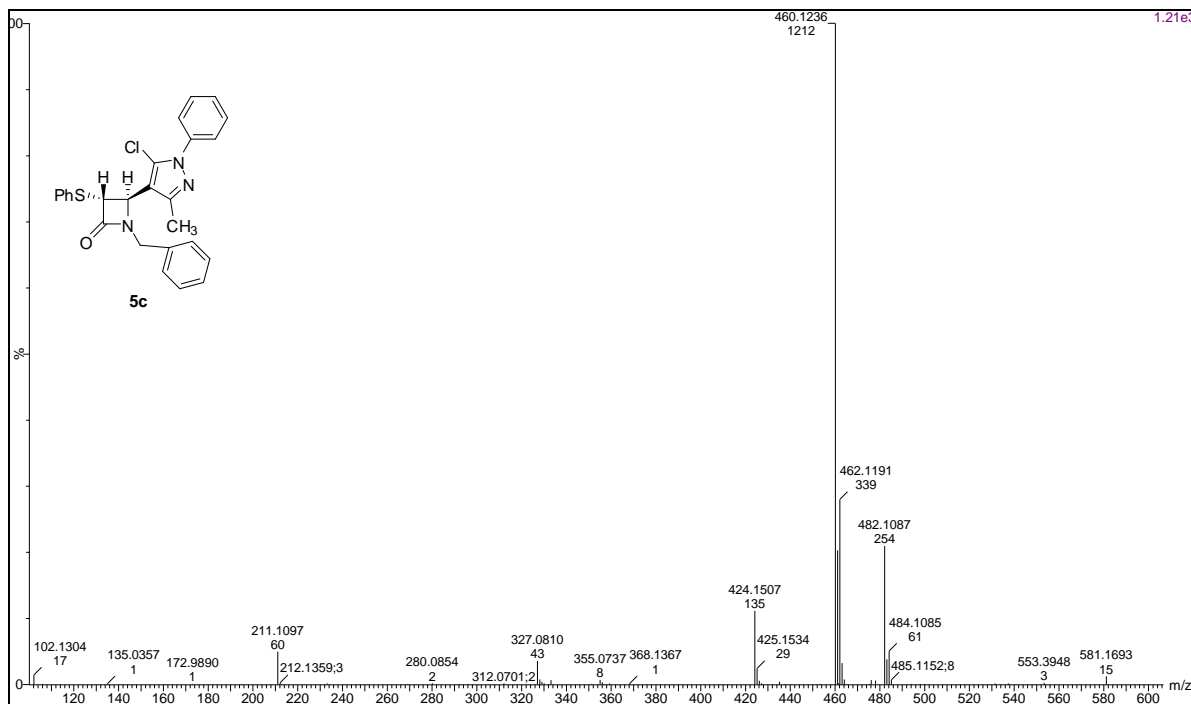
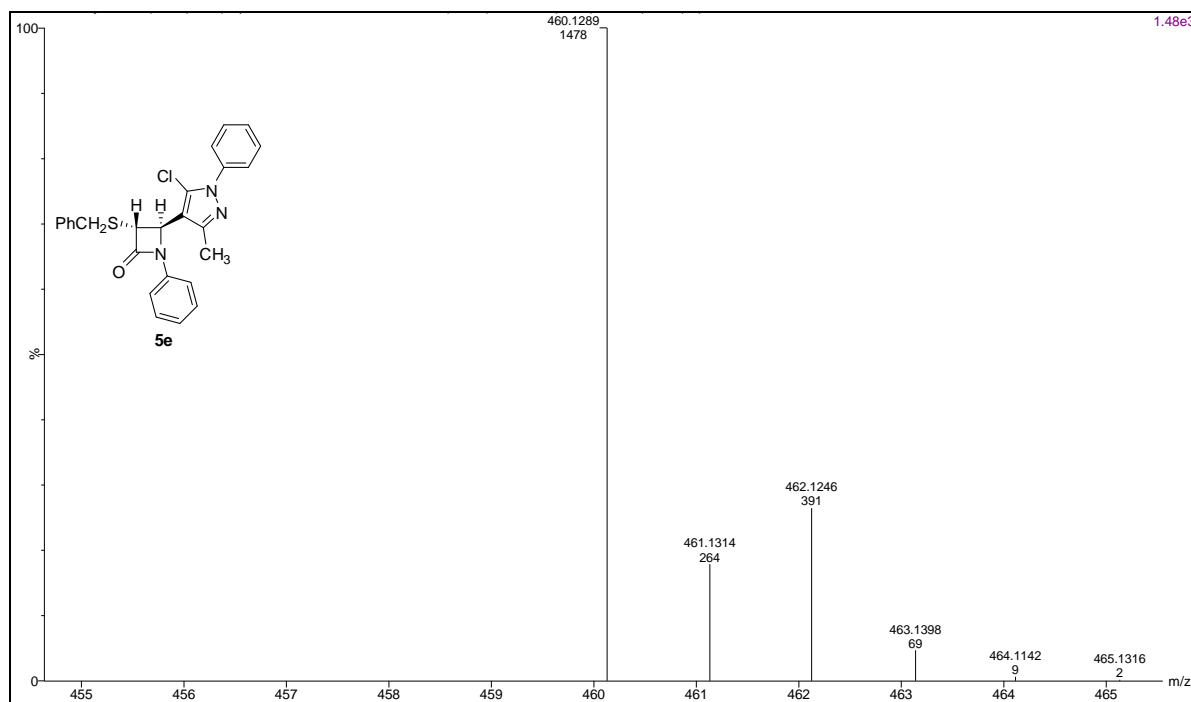
^1H and ^{13}C NMR spectra of **6p**

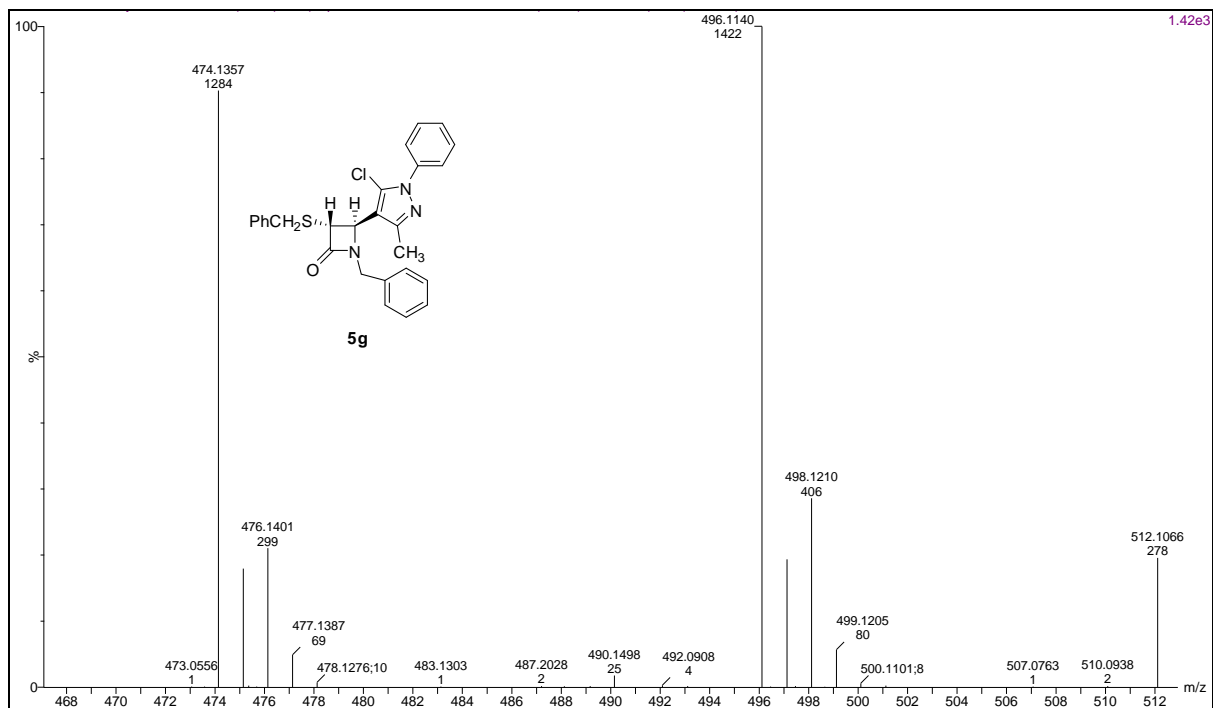
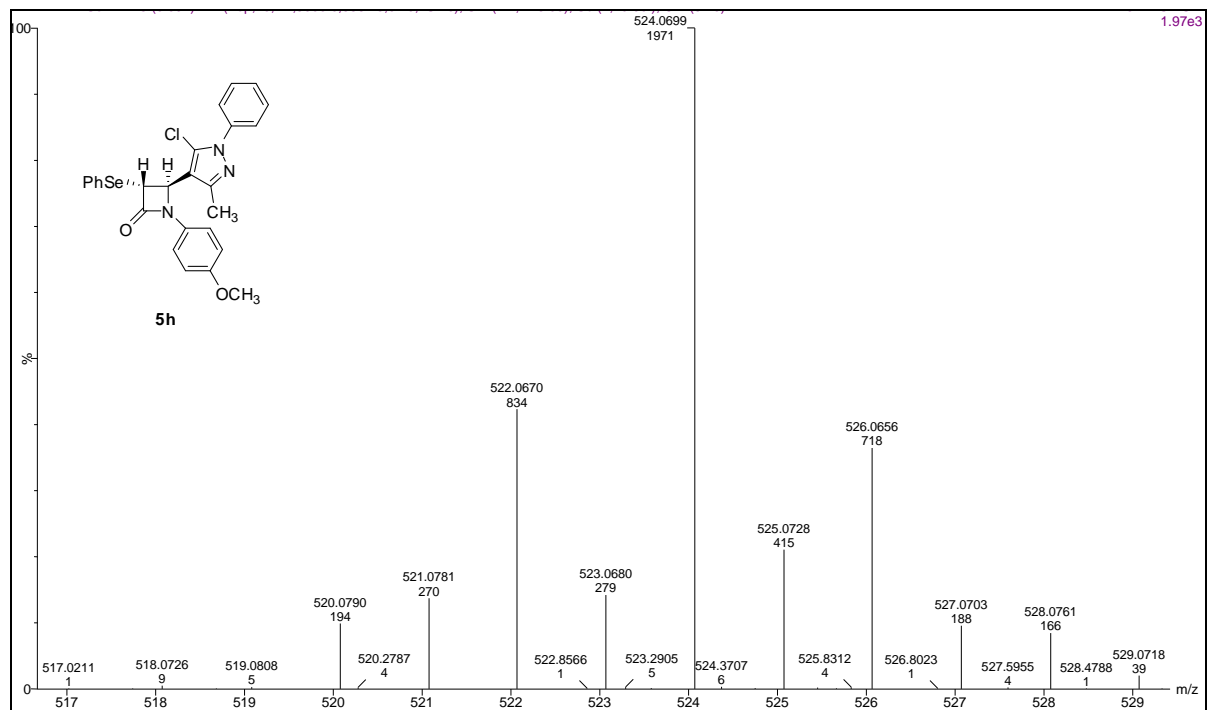
2. EIMS spectra of β -lactam **5q**

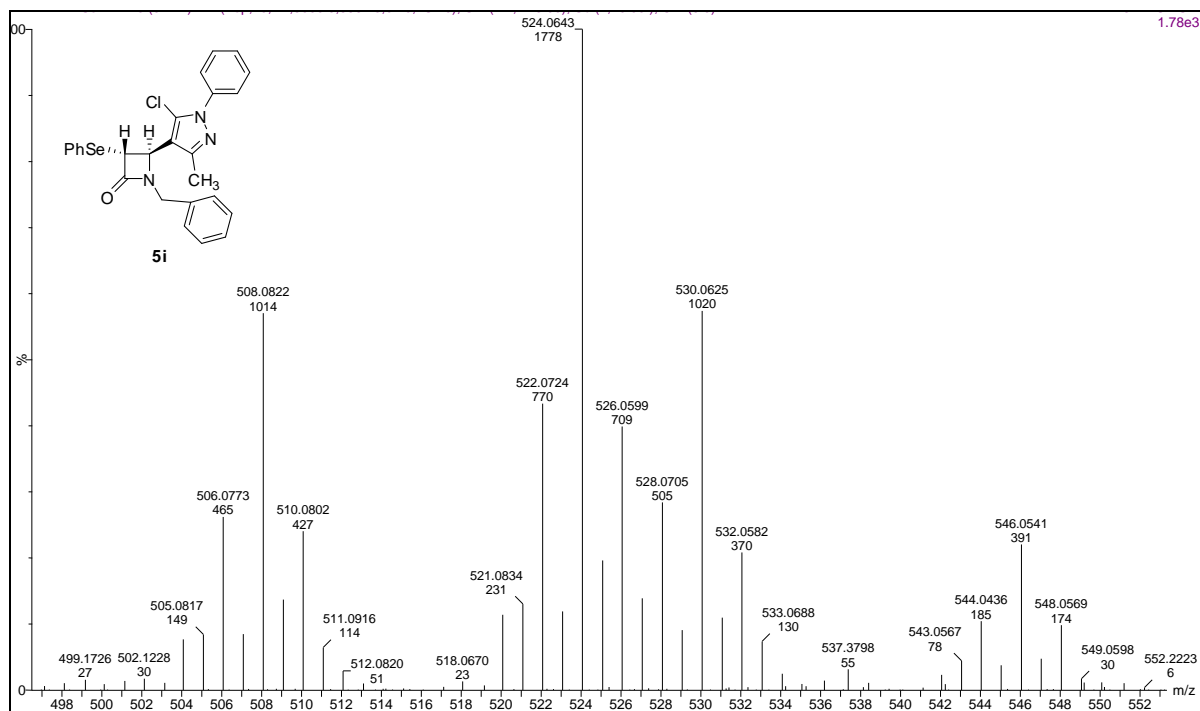


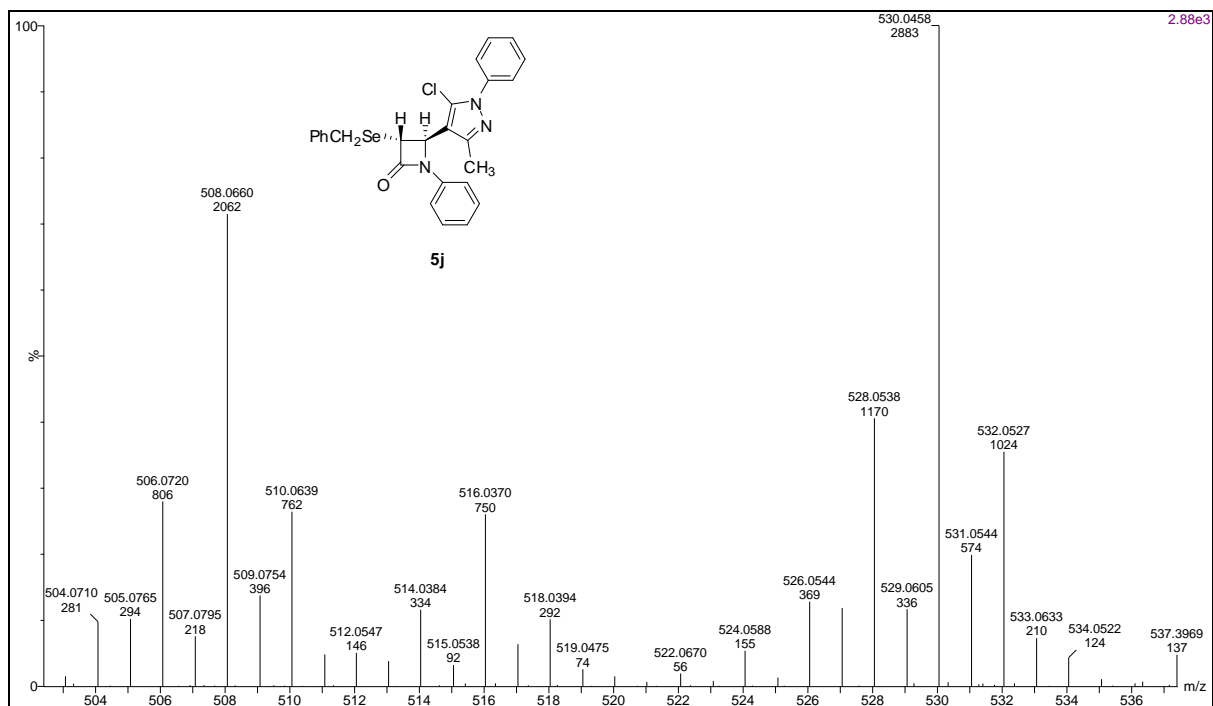
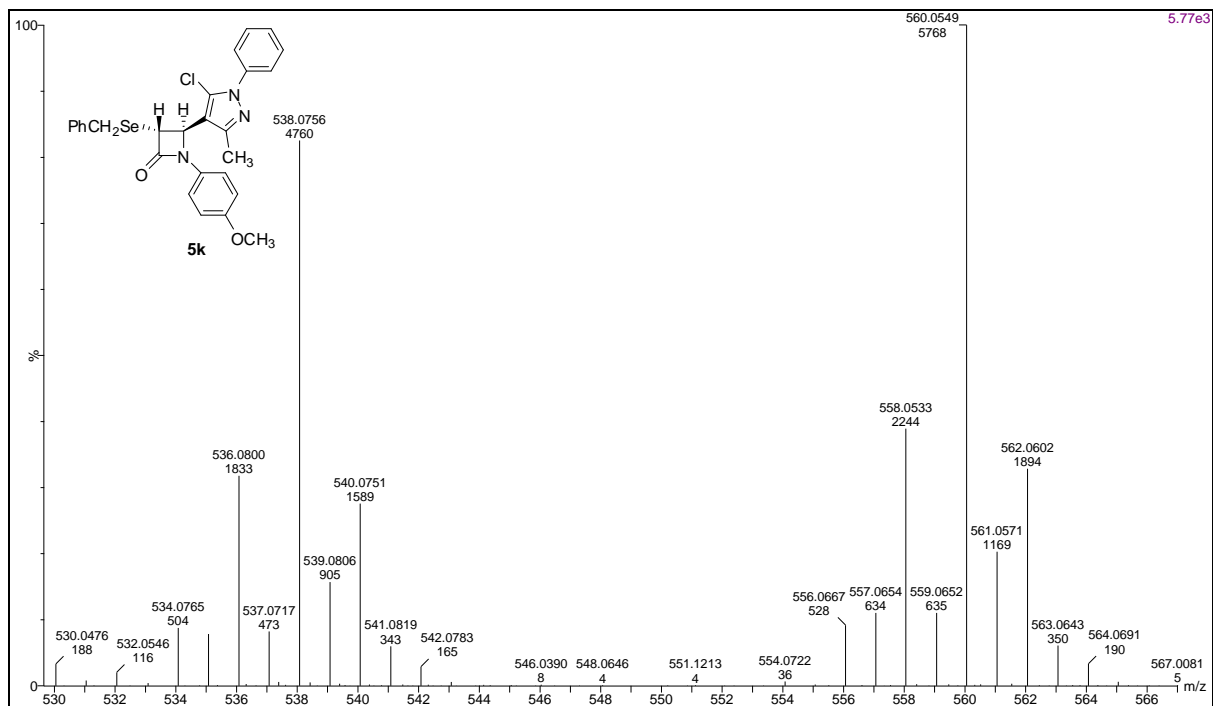
3. HRMS SPECTRA:

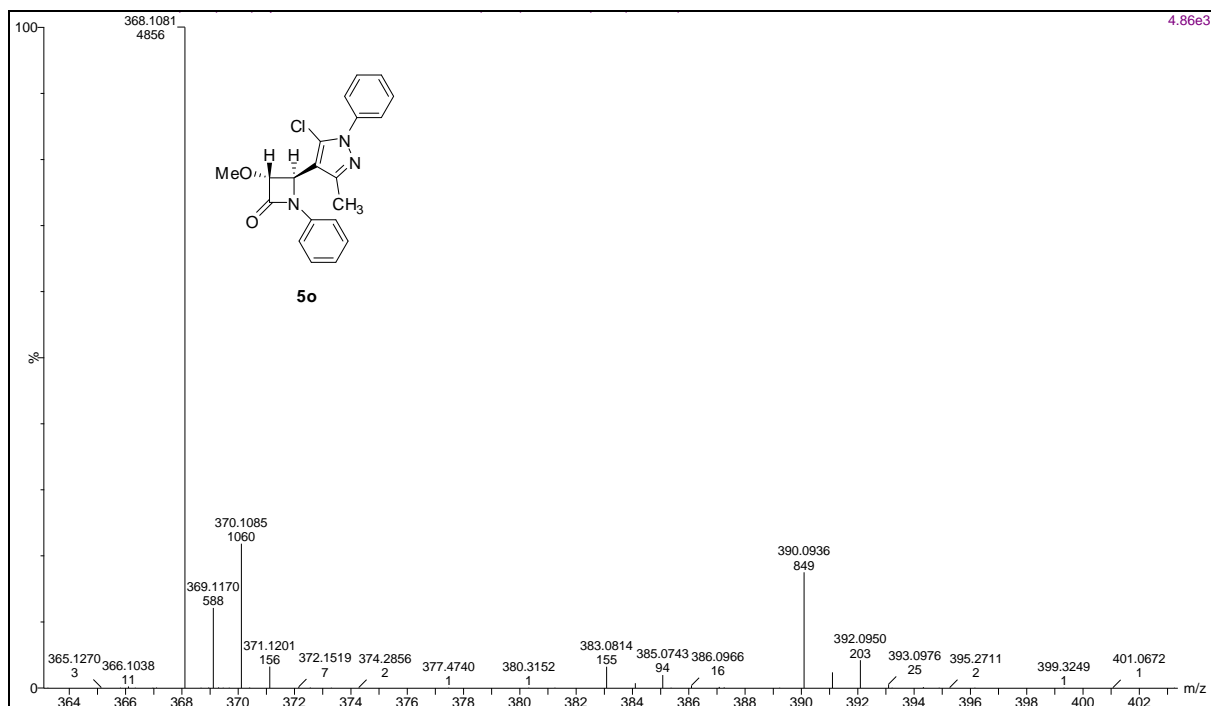
HRMS spectra of **5a**HRMS spectra of **5b**

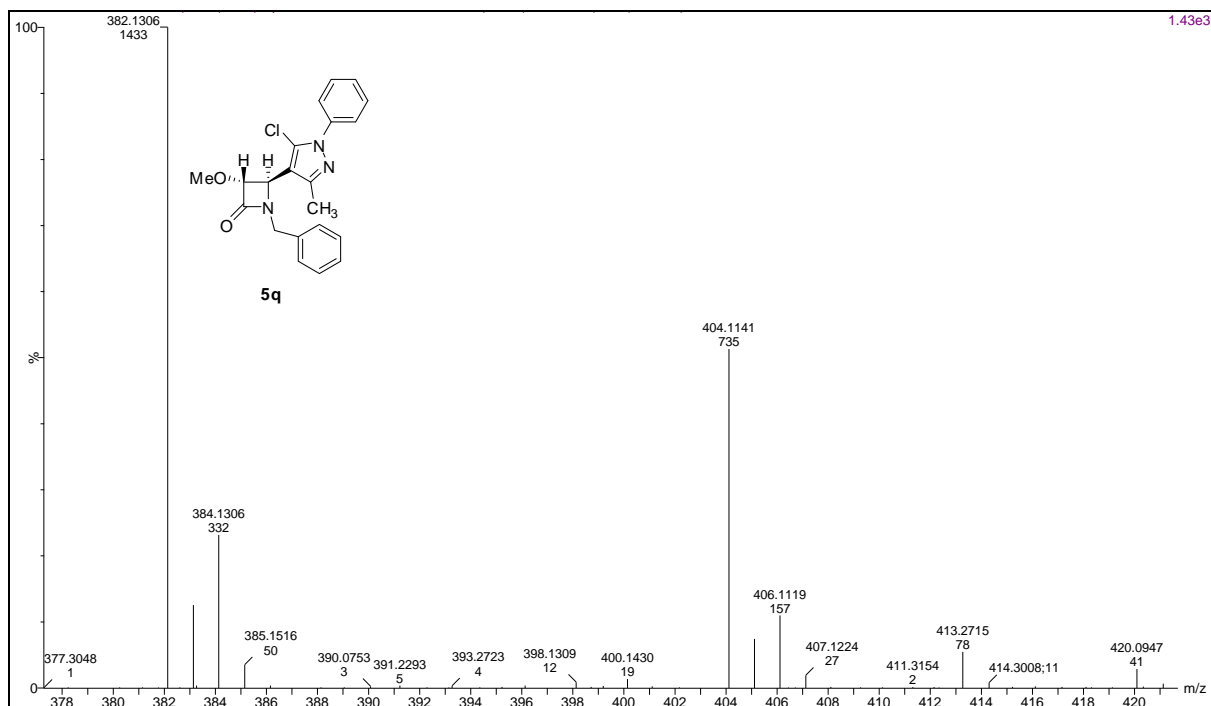
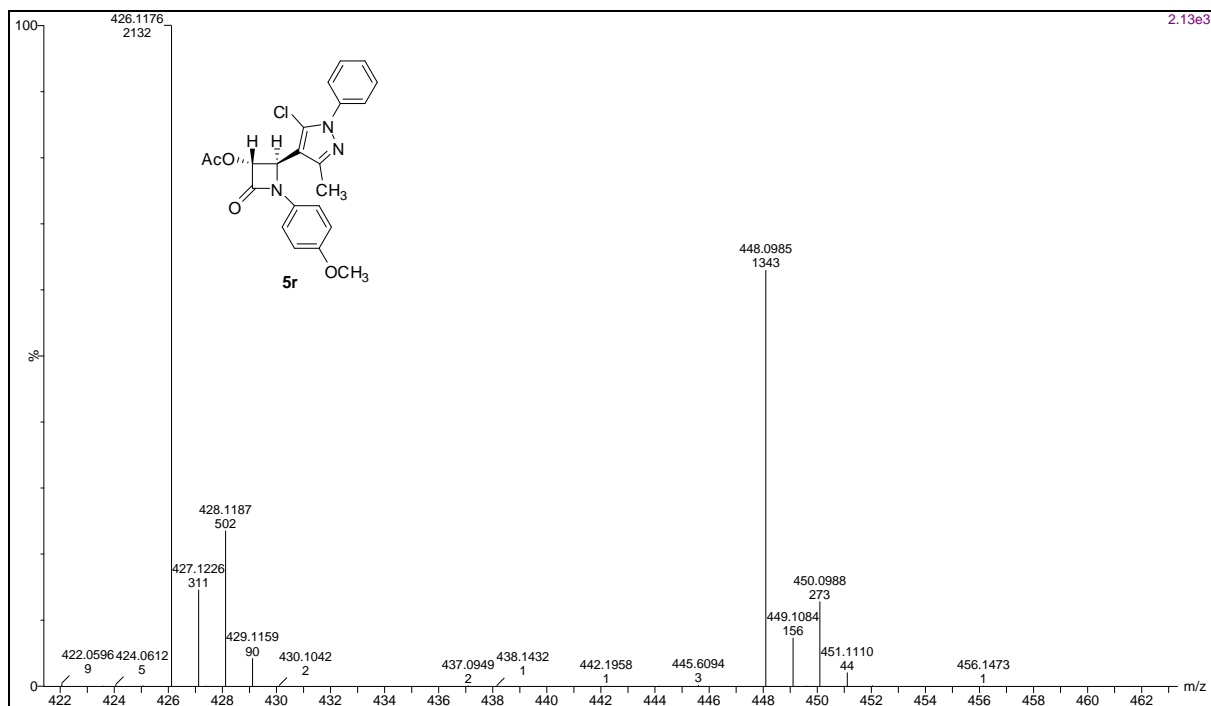
HRMS spectra of **5c**HRMS spectra of **5e**

HRMS spectra of **5g**

HRMS spectra of **5h**HRMS spectra of **5i**

HRMS spectra of **5j**HRMS spectra of **5k**

HRMS spectra of **5o**

HRMS spectra of **5q**HRMS spectra of **5r**