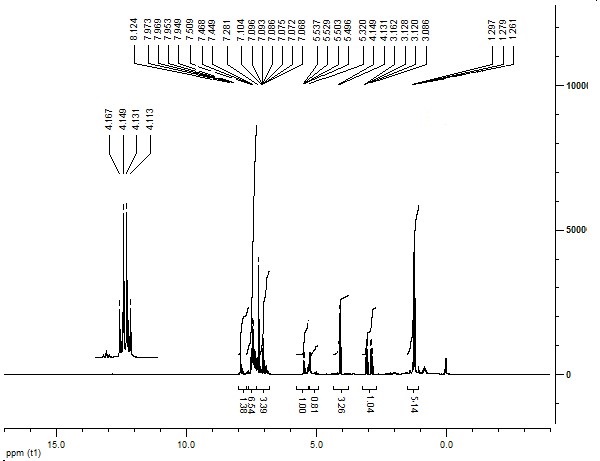
Nano catalytic synthesis of flavanone phosphonates using domino Knoevenagel-phospha-Michael route

**Maryam Zarei, Soheila Ghassamipour\***

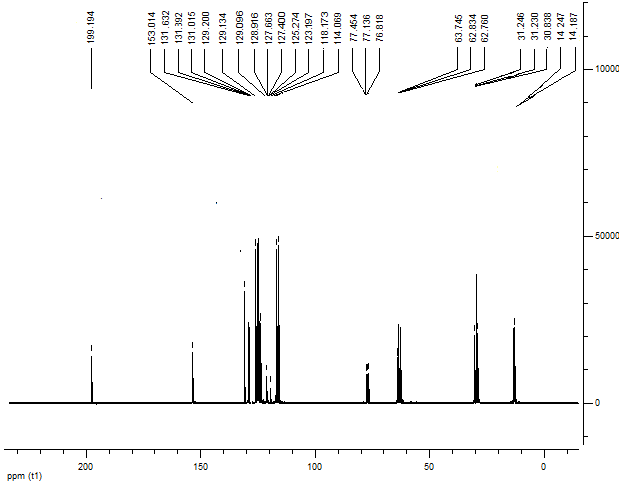
Department of Chemistry, Marvdasht Branch, Islamic Azad University, Marvdasht, Iran

Email: soheilaghassamipour@miau.ac.ir

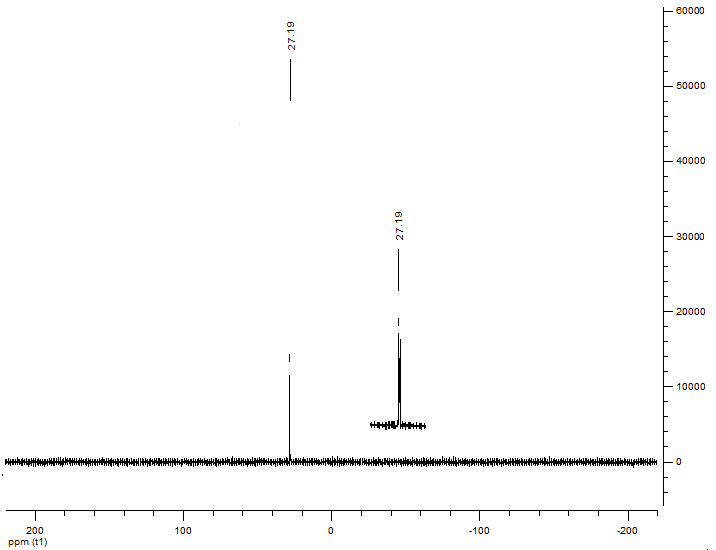
**Supplemental Materials**

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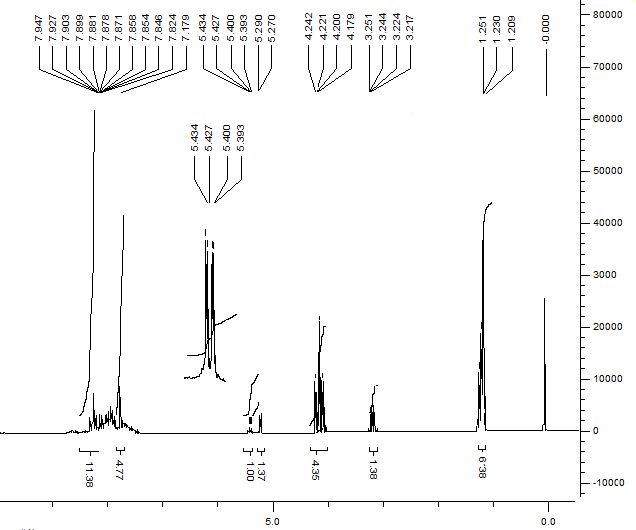
**Figure S 1:** 1H-NMR of Diethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl) (phenyl) methylphosphonate

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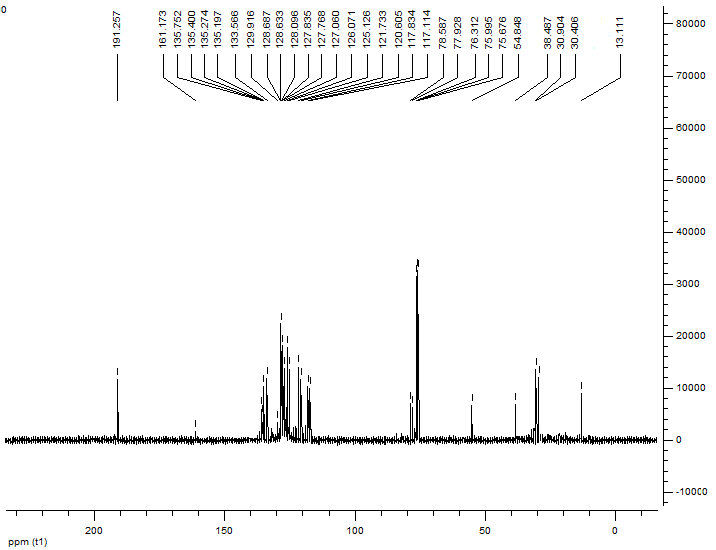
**Figure S 2:** 13C-NMR of Diethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl) (phenyl)methylphosphonate

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**Figure S 3:** 31P-NMR of Diethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl) (phenyl)methylphosphonate

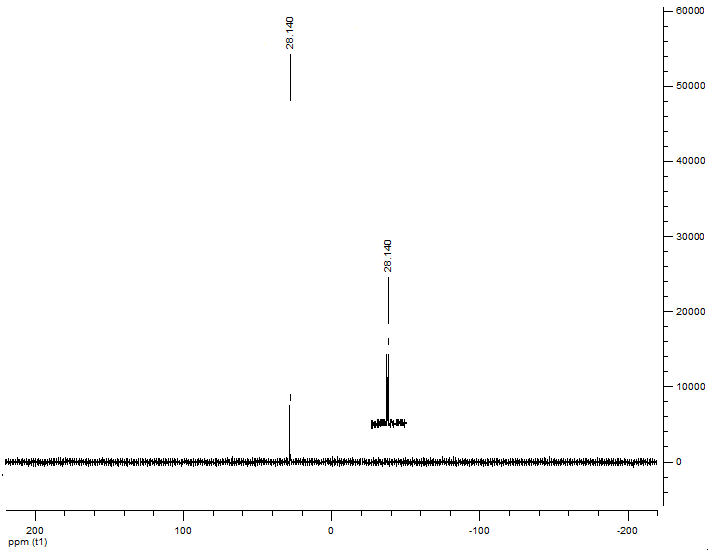
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**Figure S 4:** 1H-NMR of Diethyl (naphthalen-1-yl)(4-oxo-2-phenylchroman-3-yl) methylphosphonate

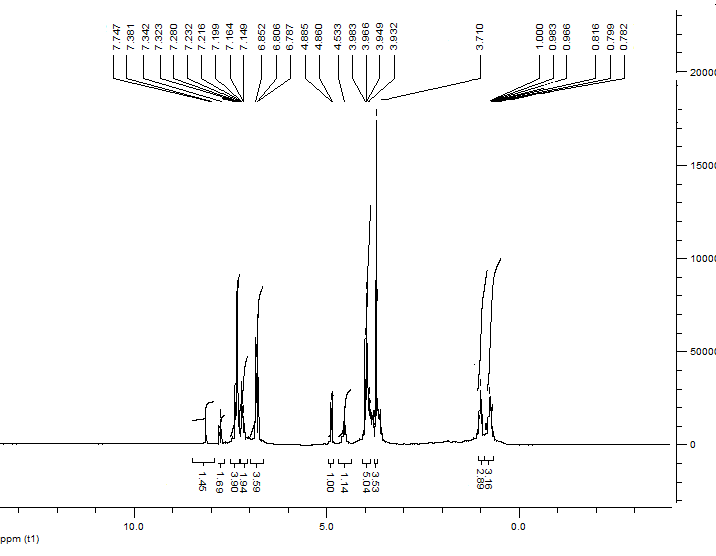




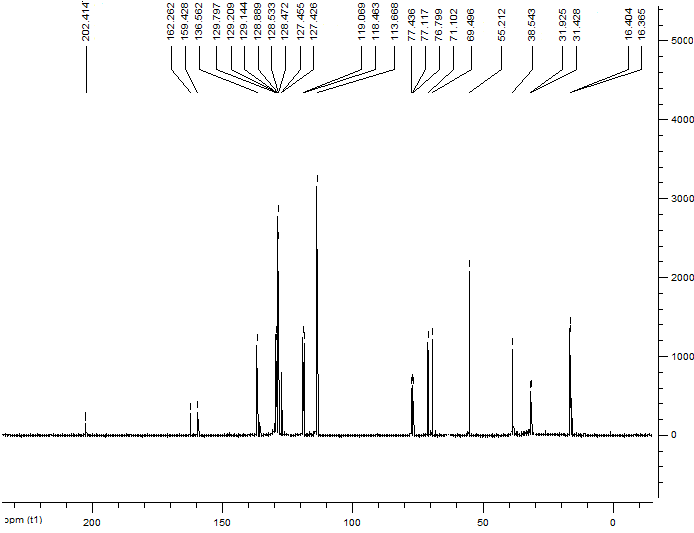
**Figure S 5:** 13C-NMR of Diethyl (naphthalen-1-yl)(4-oxo-2-phenylchroman-3-yl) methylphosphonate

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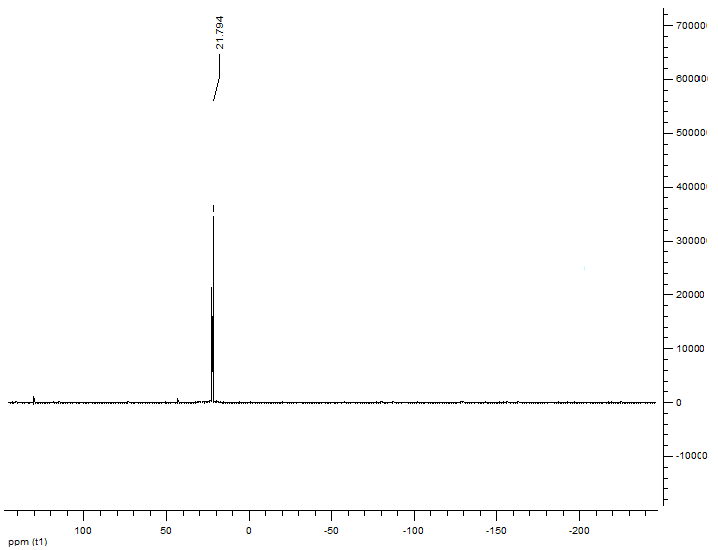
**Figure S 6:** 31P-NMR of Diethyl (naphthalen-1-yl)(4-oxo-2-phenylchroman-3-yl) methylphosphonate

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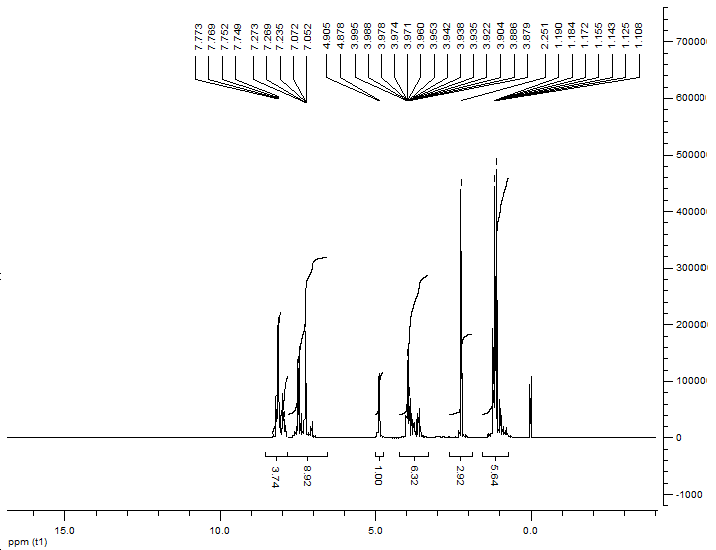
**Figure S 7:** 1H-NMR of Diethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)(4-methoxyphenyl)methyl phosphonate

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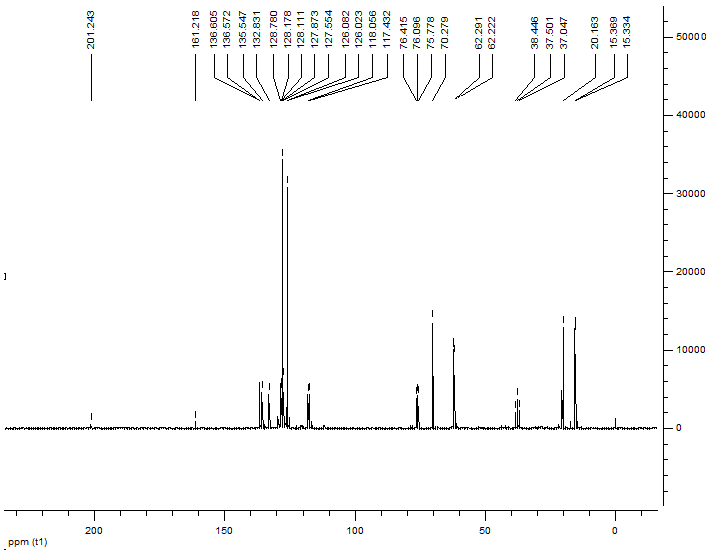
**Figure S 8:** 13C-NMR of Diethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)(4-methoxyphenyl)methyl phosphonate

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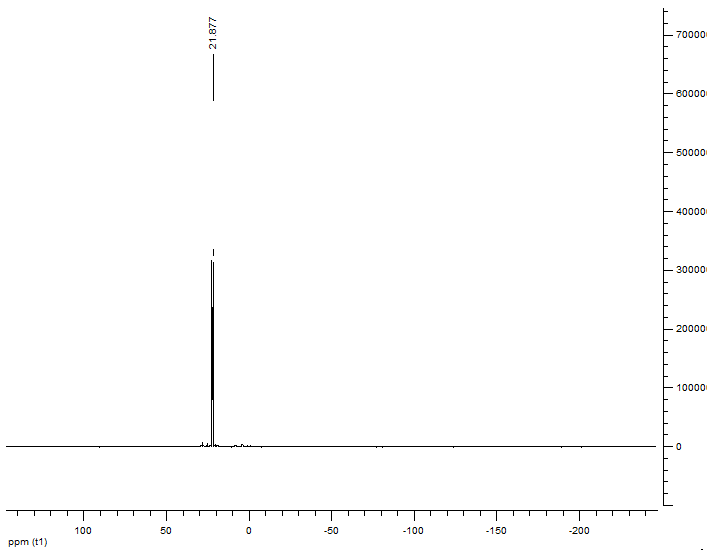
**Figure S 9:** 31P-NMR of Diethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)(4-methoxyphenyl)methyl phosphonate



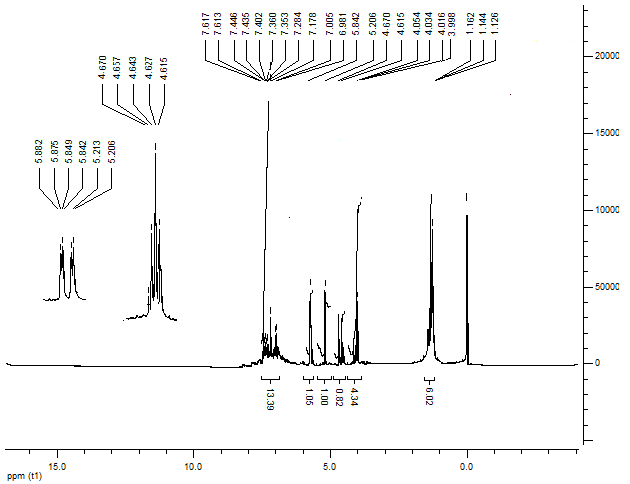
**Figure S 10:** 1H-NMR of Diethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)(p-tolyl)methylphosphonate

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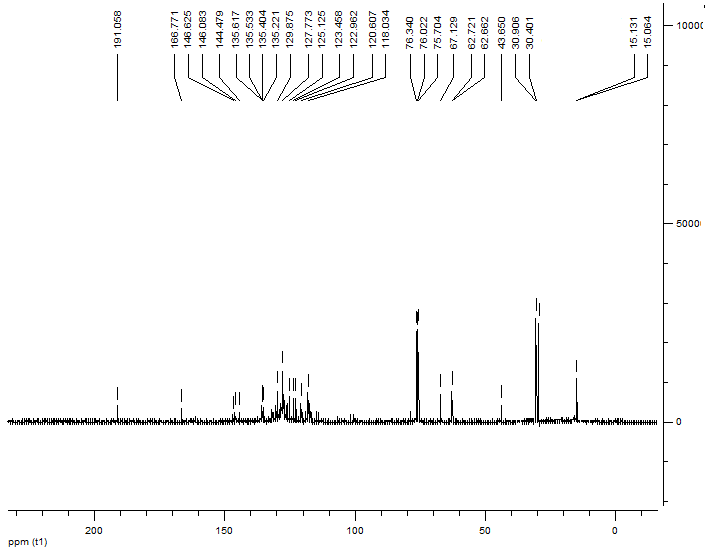
**Figure S 11**: 13C-NMR of Diethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)(p-tolyl)methylphosphonate

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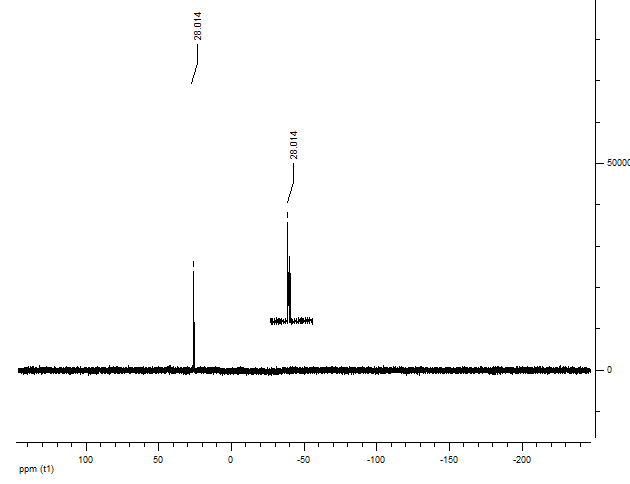
**Figure S 12:** 31P-NMR of Diethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)(p-tolyl)methylphosphonate



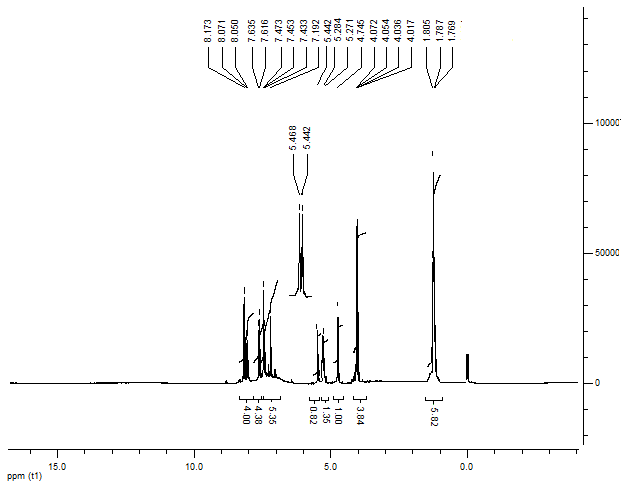
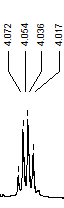
**Figure S 13:** 1H-NMR of Diethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)(4-nitrophenyl)methylphosphonate



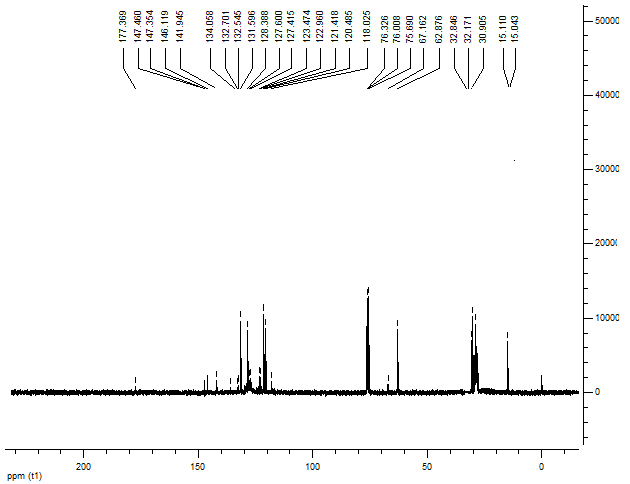
**Figure S 14**: 13C-NMR of Diethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)(4-nitrophenyl)methyl phosphonate



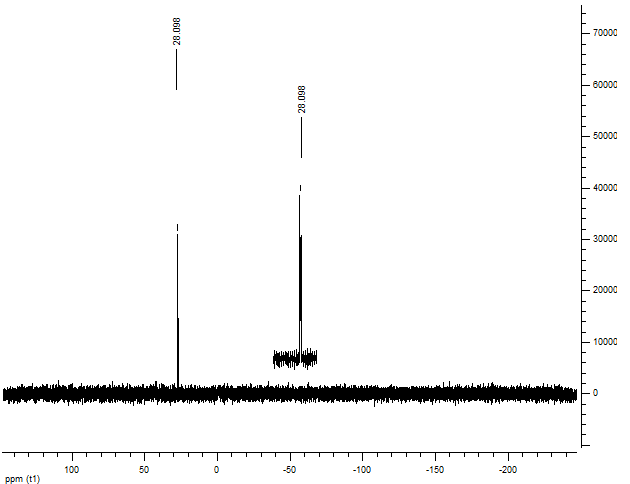
**Figure S 15:** 31P-NMR ofDiethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)(4-nitrophenyl)methyl phosphonate



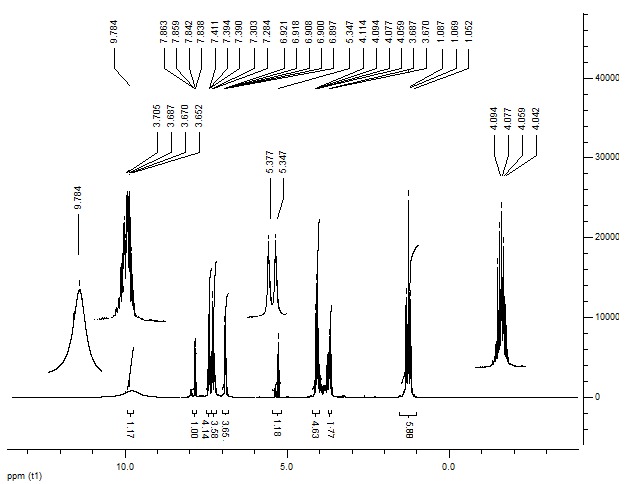
**Figure S 16:** 1H-NMR of Diethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)(3-nitrophenyl)methylphosphonate

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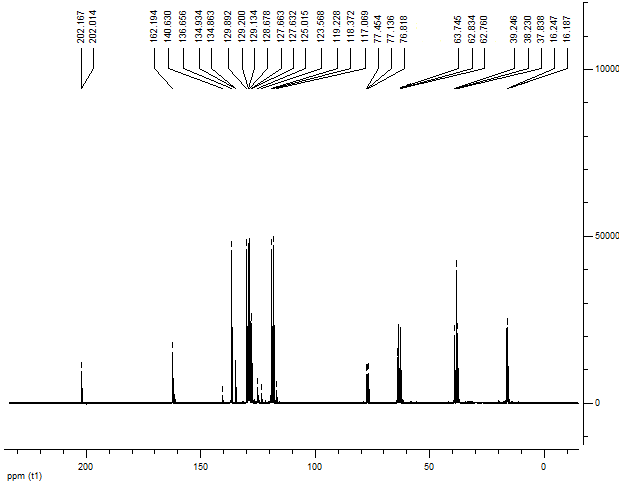
**Figure S 17:** 13C-NMR of Diethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)(3-nitrophenyl)methyl phosphonate

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**Figure S 18**: 31P-NMR ofDiethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)(3-nitrophenyl)methyl phosphonate



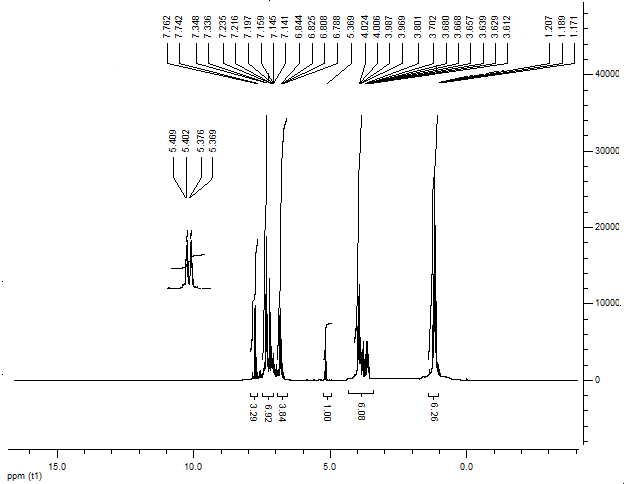
**Figure S 19:** 1H-NMR of Diethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)(2-hydroxy-5-nitrophenyl)methylphosphonate



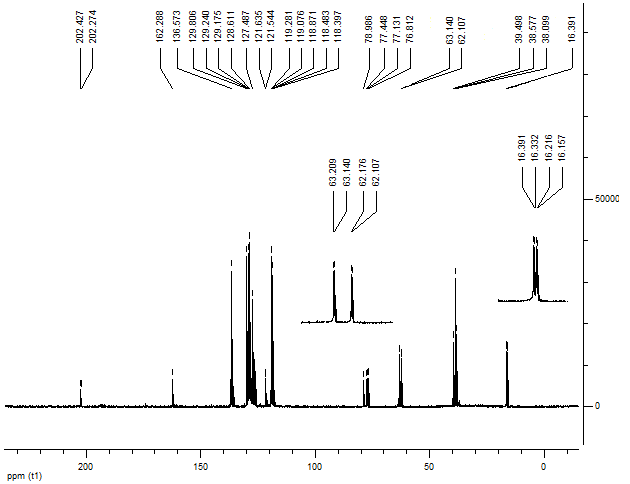
**Figure S 20**: 13C-NMR of Diethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)(2-hydroxy-5-nitrophenyl)methylphosphonate



**Figure S 21:** 31P-NMR ofDiethyl (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)(2-hydroxy-5-nitrophenyl) methylphosphonate

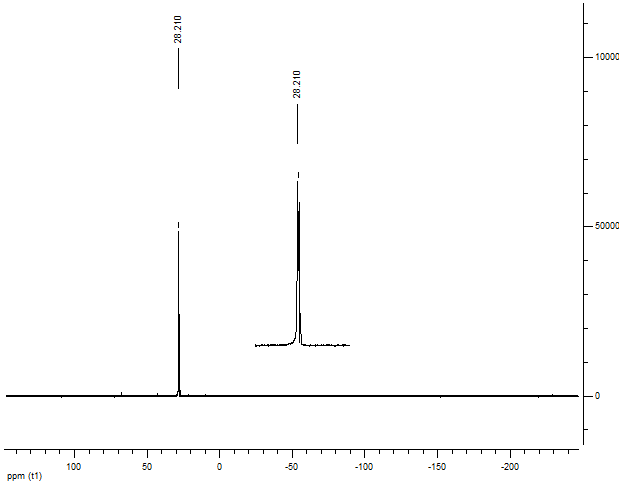
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**Figure S 22:** 1H-NMR of Diethyl (4-fluorophenyl) (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)methyl phosphonate

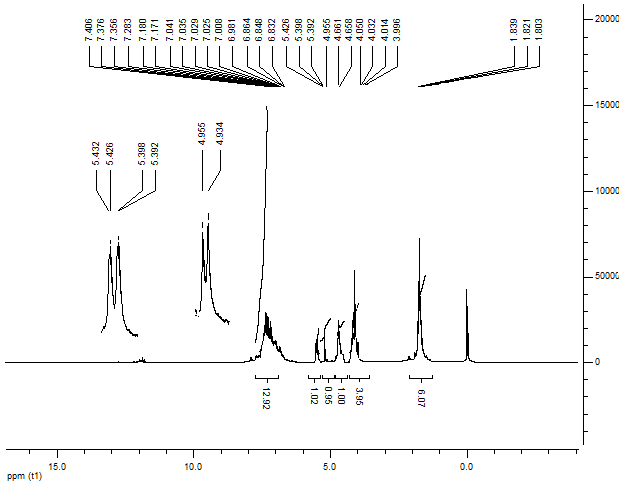
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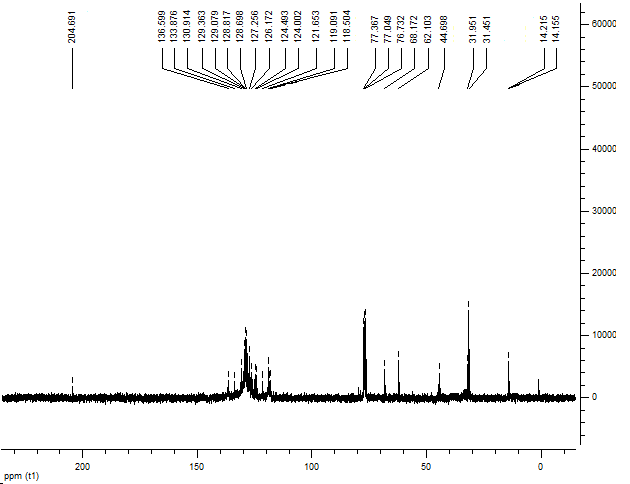
**Figure S 23**: 13C-NMR of Diethyl (4-fluorophenyl) (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)methyl phosphonate



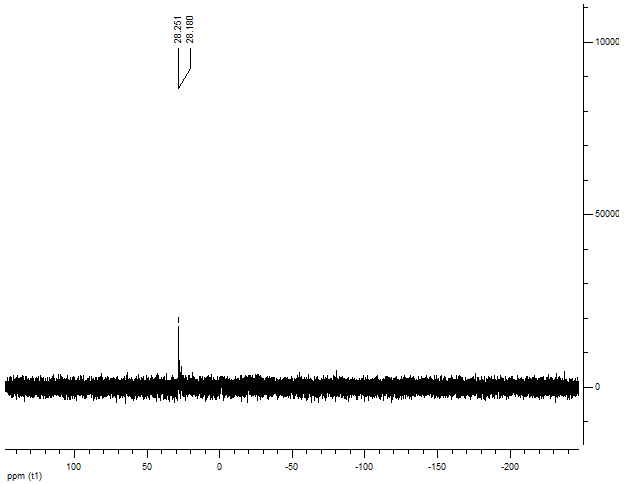
**Figure S 24:** 31P-NMR ofDiethyl (4-fluorophenyl) (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)methyl phosphonate



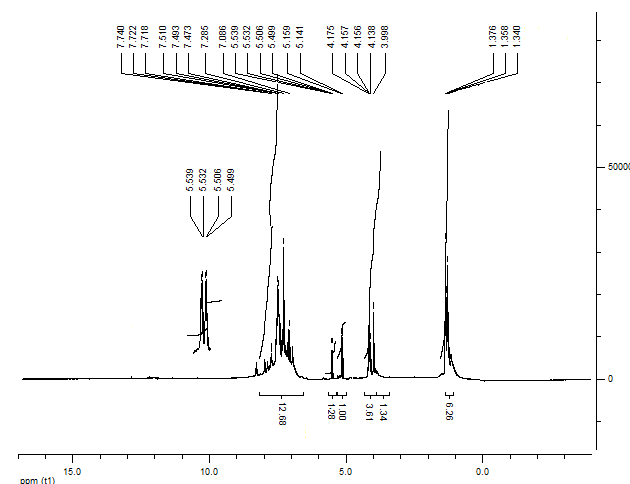
**Figure S 25:** 1H-NMR of Diethyl (4-chlorophenyl) (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)methylphosphonate

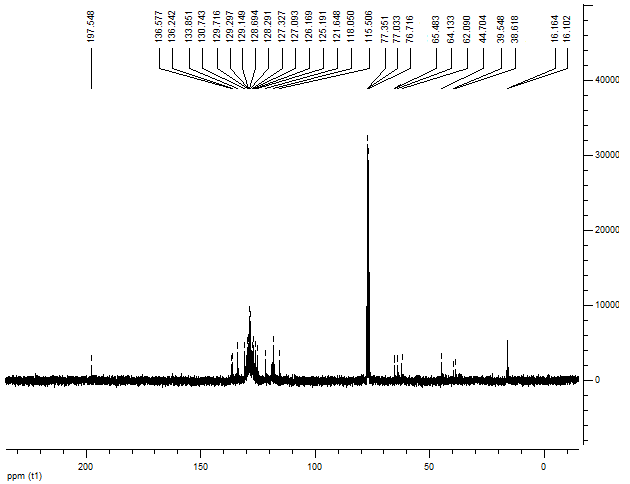
**Figure S 26:** 13C-NMR of Diethyl (4-chlorophenyl) (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)methyl phosphonate

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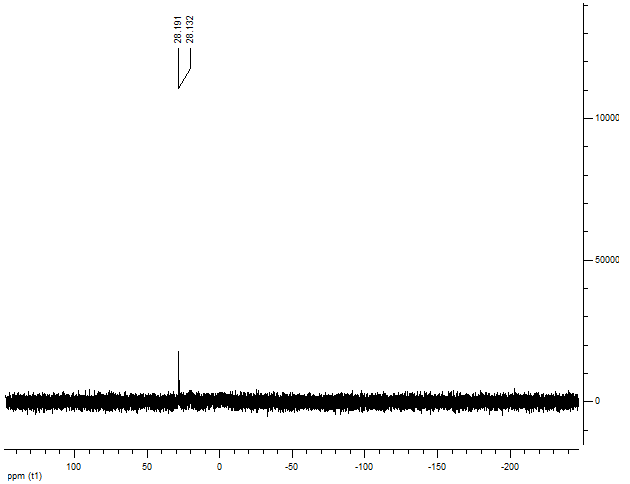
**Figure S 27:** 31P-NMR ofDiethyl (4-chlorophenyl) (3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl)methyl phosphonate



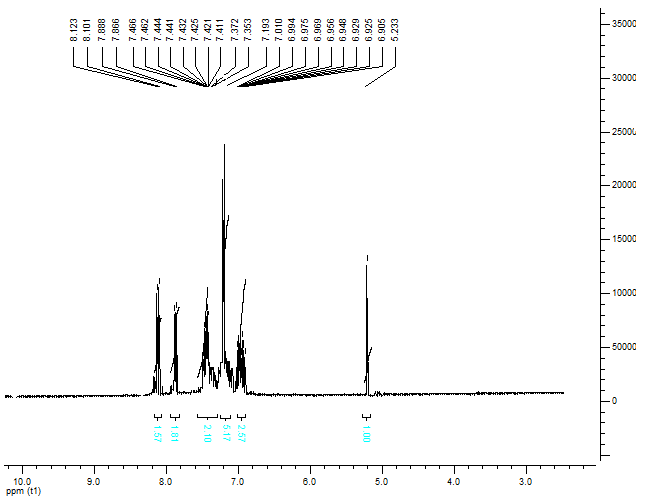
**Figure S 28**: 1H-NMR of Diethyl (2,4-dichlorophenyl)(3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl) methylphosphonate



**Figure S 29**: 13C-NMR of Diethyl (2,4-dichlorophenyl)(3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl) methylphosphonate

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**Figure S 30**: 31P-NMR ofDiethyl (2,4-dichlorophenyl)(3,4-dihydro-4-oxo-2-phenyl-2H-chromen-3-yl) methylphosphonate



**Figure S 31**: 1H-NMR of3-(4-Nitrobenzylidene)-2,3-dihydro-2-phenylchromen-4-one