Synthesis Of Novel “Hybrid” Structures Based On Phosphorylacetic Acid Hydrazides And Sterically Hindered Phenols

S. V. Bukharov1, Yu. N. Oludina1, R. A. Khabibullina1, A. R. Burilov1,2,

E. L. Gavrilova1, I. A. Krutov1, R. G. Tagasheva1.

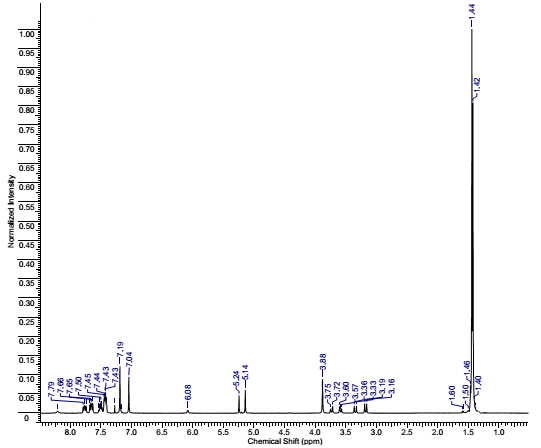
1Kazan National Research Technological University, Kazan, Russian Federation

2Arbuzov Institute of Organic and Physical Chemistry, FRC Kazan Scientific Center of RAS, Kazan, Russian Federation

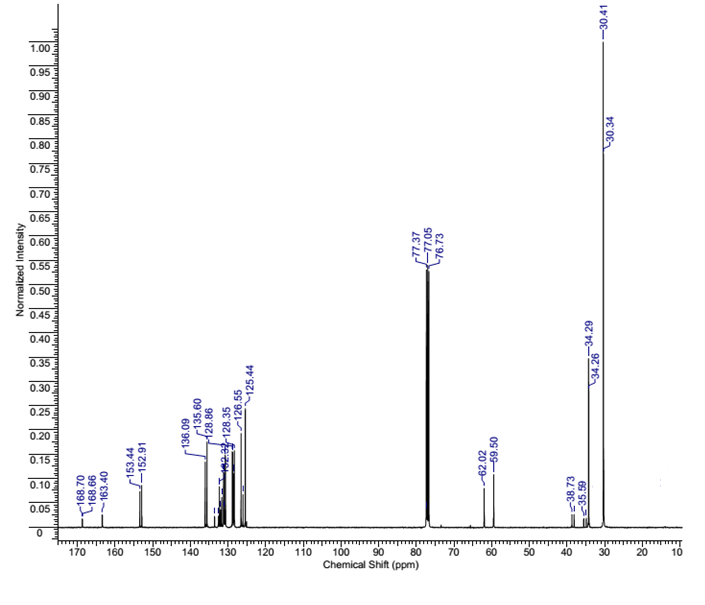
Email: cat\_the\_chemist@mail.ru

**Supplemental Materials**

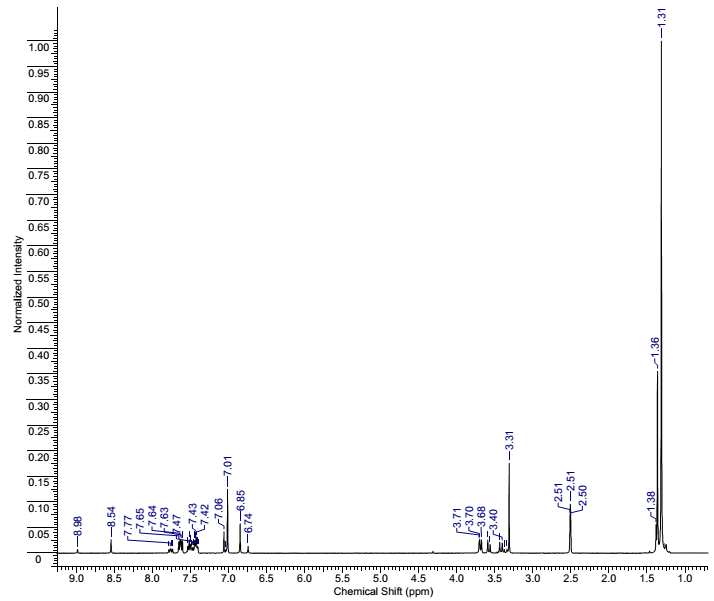
1H, 13C, and 31Р NMR spectra were recorded on Bruker Avance-400 (400, 100.6, and 162 MHz, respectively) and Bruker Avance-600 (600 and 150 MHz, respectively) instruments. Chemical shift values are reported relative to the residual signals of protons of deuterated solvent.



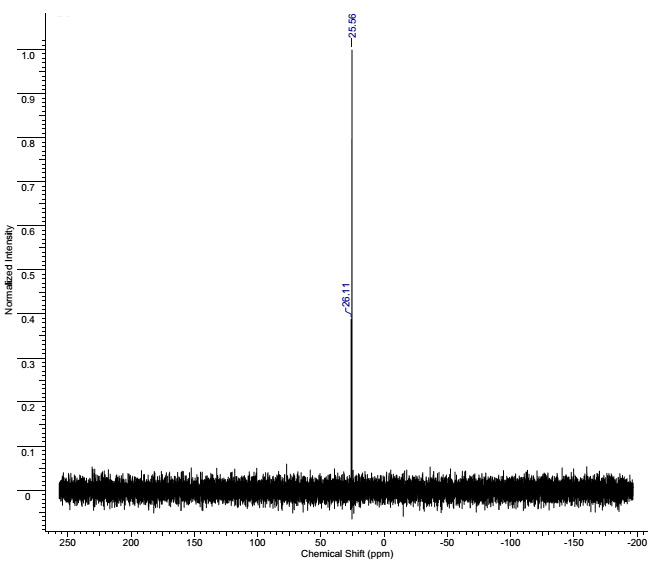
**Figure S 1:** The 1H NMR spectrum of the N,N-bis-(3,5-di-tert-butyl-4-hydroxybenzyl)-(diphenylphosphoryl)-ethanehydrazide (**6**) (CDCl3)



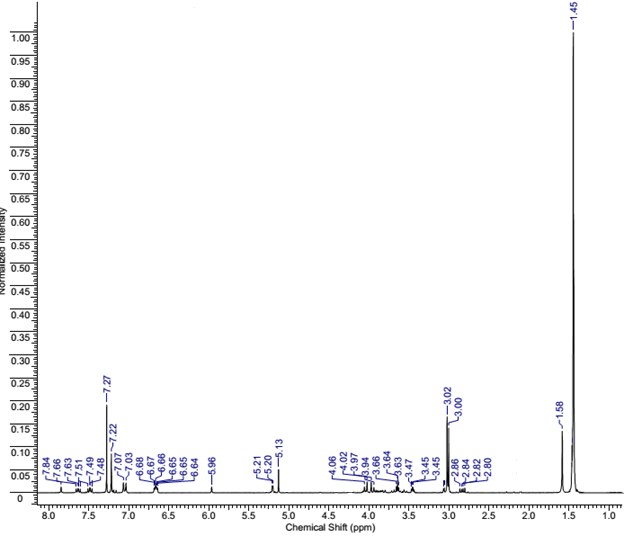
**Figure S 2:** The 13C NMR spectrum of the N,N-bis-(3,5-di-tert-butyl-4-hydroxybenzyl)-(diphenylphosphoryl)-ethanehydrazide (**6**) (CDCl3)



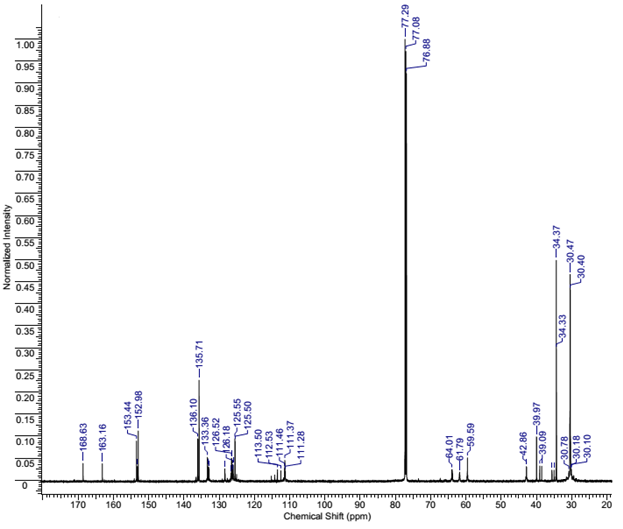
**Figure S 3:** The 1H NMR spectrum of the N,N-bis-(3,5-di-tert-butyl-4-hydroxybenzyl)-(diphenylphosphoryl)-ethanehydrazide (**6**) (DMSO-d6)



**Figure S 4:** The 31P NMR spectrum of the N,N-bis-(3,5-di-tert-butyl-4-hydroxybenzyl)-(diphenylphosphoryl)-ethanehydrazide (**6**) (DMSO-d6)



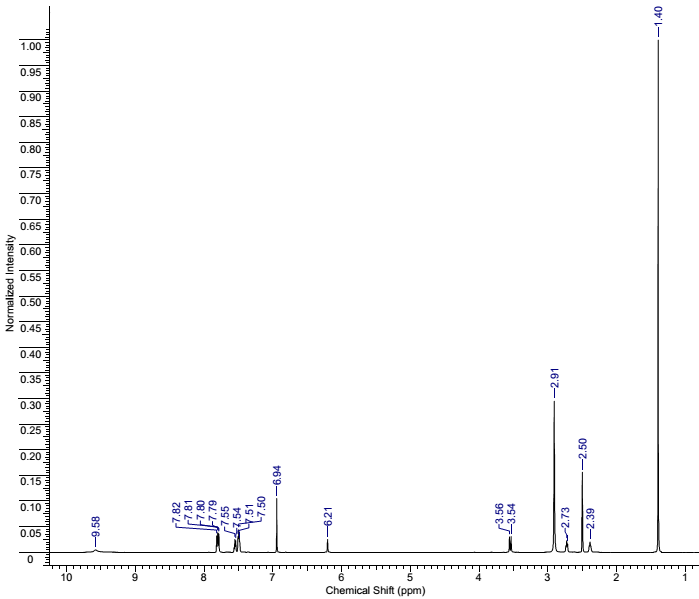
**Figure S 5:** The 1H NMR spectrum of the N,N-bis-(3,5-di-tert-butyl-4-hydroxybenzyl)-{[4-(dimethylamino)phenyl]-(2-chloroethoxy)phosphoryl}ethanehydrazide(**7**) (CDCl3).

****

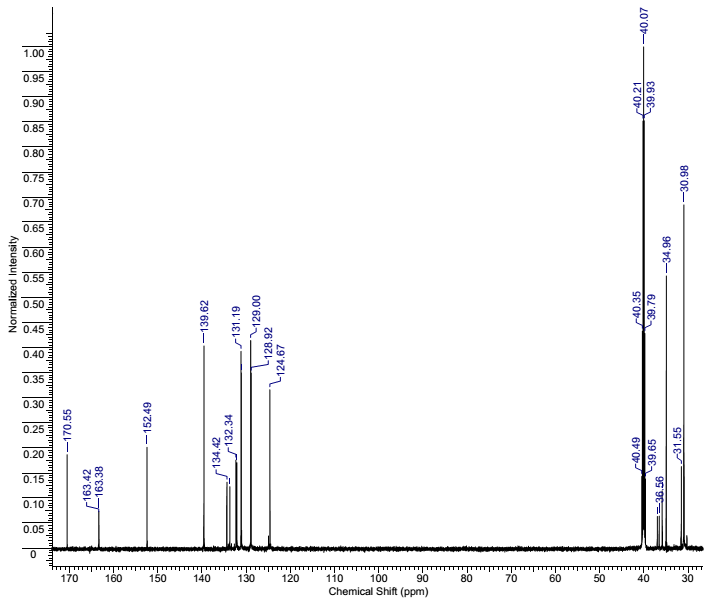
**Figure S 6:** The 13C NMR spectrum of the N,N-bis-(3,5-di-tert-butyl-4-hydroxybenzyl)-{[4-(dimethylamino)phenyl]-(2-chloroethoxy)phosphoryl}ethanehydrazide(**7**) (CDCl3).



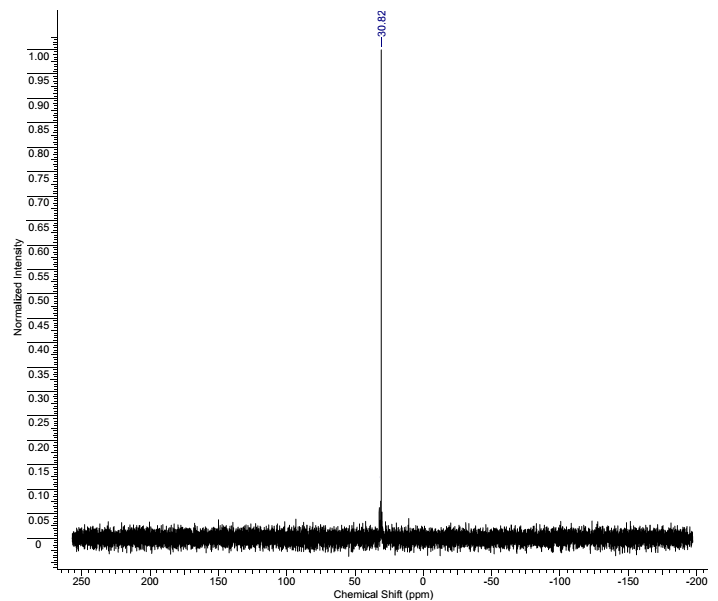
**Figure S 7:** The 31P NMR spectrum of the N,N-bis-(3,5-di-tert-butyl-4-hydroxybenzyl)-{[4-(dimethylamino)phenyl]-(2-chloroethoxy)phosphoryl}ethanehydrazide(**7**) (CDCl3).



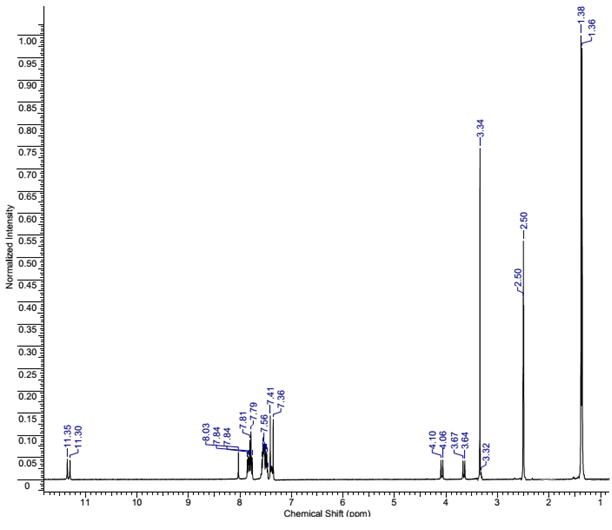
**Figure S 8:** The 1H NMR spectrum of the 3- (3,5-di-tert-butyl-4-hydroxyphenyl) N- [2- (diphenylphosphino) acetyl ]–propanehydrazide (**8**) (DMSO-d6, 100oC).



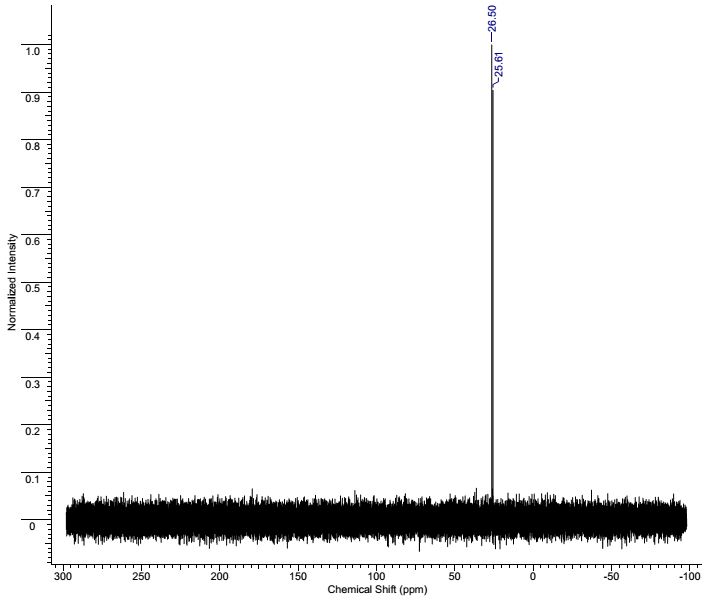
**Figure S 9:** The 13C NMR spectrum of the 3- (3,5-di-tert-butyl-4-hydroxyphenyl) N- [2- (diphenylphosphino) acetyl ]–propanehydrazide (**8**) (DMSO-d6).



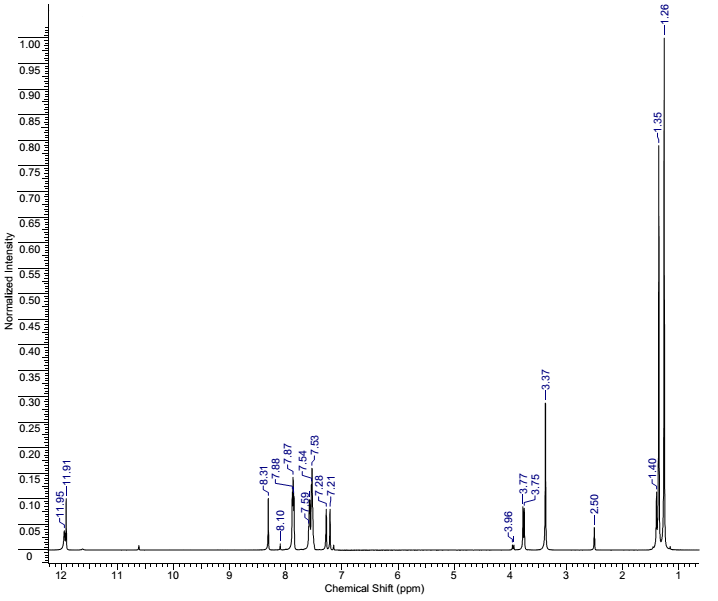
**Figure S 10**: The 31P NMR spectrum of the 3- (3,5-di-tert-butyl-4-hydroxyphenyl) N- [2- (diphenylphosphino) acetyl ]–propanehydrazide (**8**) (CDCl3).



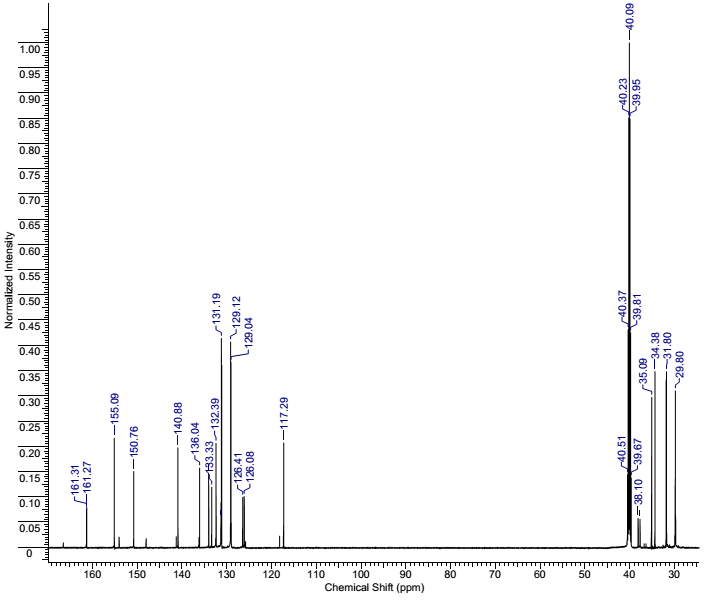
**Figure S 11**: The 1H NMR spectrum of the N,N-3,5-di-tert-butyl-4-hydroxybenzylidene(diphenylphosphoryl)-ethanehydrazide (**14**) (DMSO-d6).



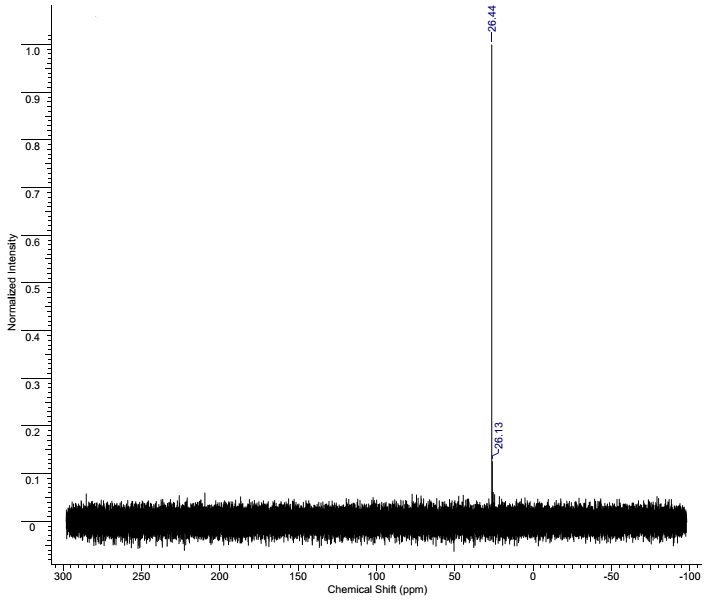
**Figure S 12**: The 31P NMR spectrum of the N,N-3,5-di-tert-butyl-4-hydroxybenzylidene(diphenylphosphoryl)-ethanehydrazide (**14**) (DMSO-d6).



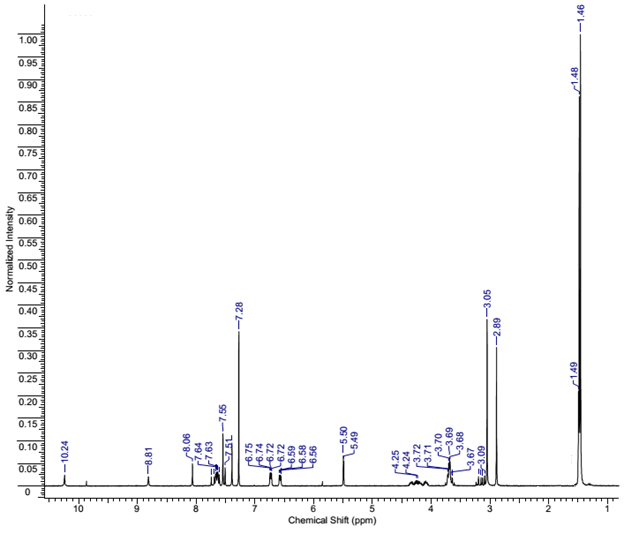
**Figure S 13**: The 1H NMR spectrum of the N,N-3,5-di-tert-butyl-2-hydroxybenzylidene(diphenylphosphoryl)-ethanehydrazide (**15**) (DMSO-d6).



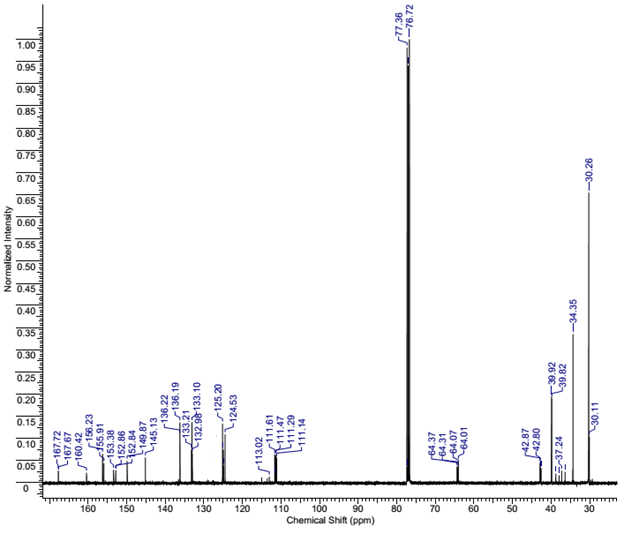
**Figure S 14**: The 13C NMR spectrum of the N,N-3,5-di-tert-butyl-2-hydroxybenzylidene(diphenylphosphoryl)-ethanehydrazide (**15**) (DMSO-d6).



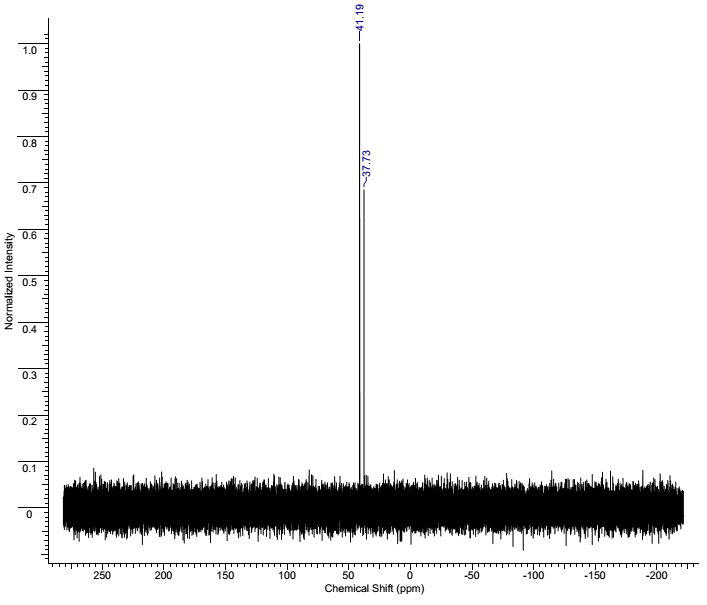
**Figure S 15**: The 31P NMR spectrum of the N,N-3,5-di-tert-butyl-2-hydroxybenzylidene(diphenylphosphoryl)-ethanehydrazide (**15**) (DMSO-d6).



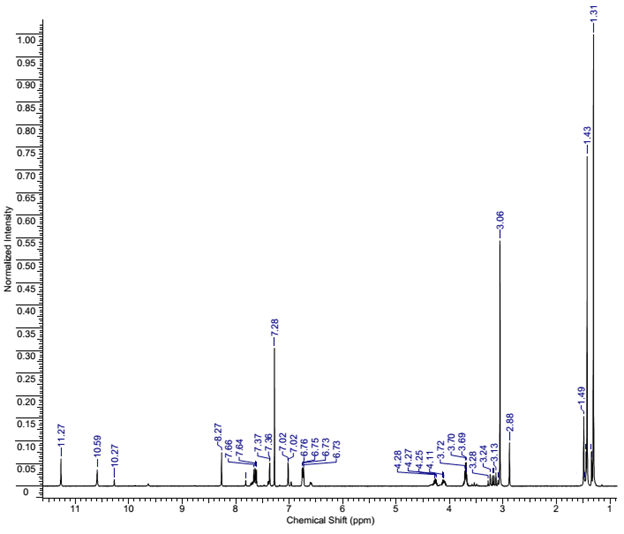
**Figure S 16**: The 1H NMR spectrum of the N,N-3,5-di-tert-butyl-4-hydroxybenzylidene{[4-(dimethylamino)phenyl]-2-(chloroethoxy)phosphoryl}ethanehydrazide (**16**) (CDCl3)



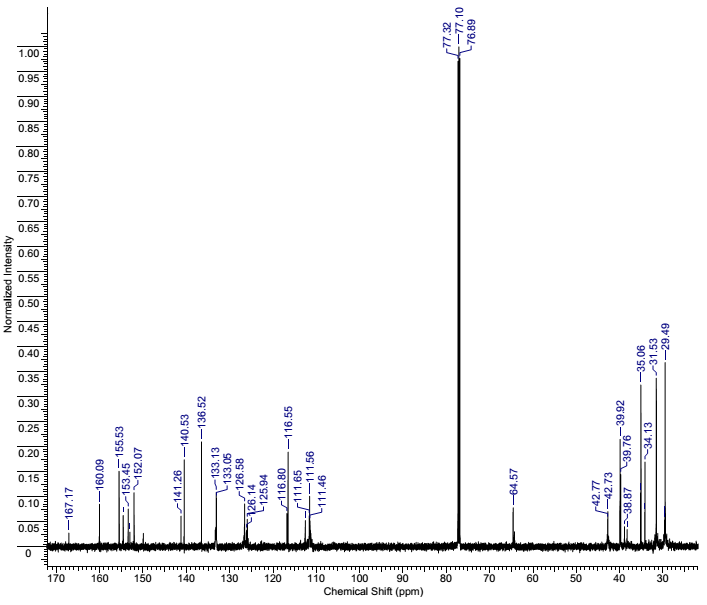
**Figure S 17**: The 13C NMR spectrum of the N,N-3,5-di-tert-butyl-4-hydroxybenzylidene{[4-(dimethylamino)phenyl]-2-(chloroethoxy)phosphoryl}ethanehydrazide (**16**) (CDCl3)



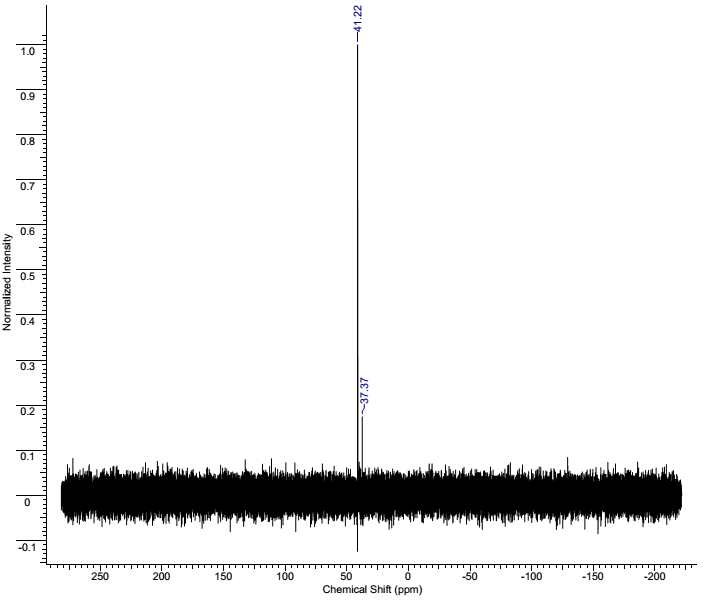
**Figure S 18**: The 31P NMR spectrum of the N,N-3,5-di-tert-butyl-4-hydroxybenzylidene{[4-(dimethylamino)phenyl]-2-(chloroethoxy)phosphoryl}ethanehydrazide (**16**) (CDCl3)



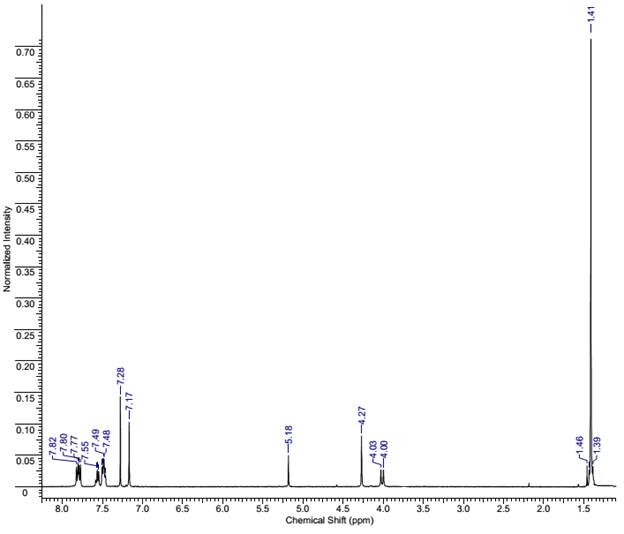
**Figure S 19**: The 1H NMR spectrum of the N,N-3,5-di-tert-butyl-2-hydroxybenzylidene{[4-(dimethylamino)phenyl]-2-(chloroethoxy)phosphoryl}ethanehydrazide (**17**) (CDCl3)



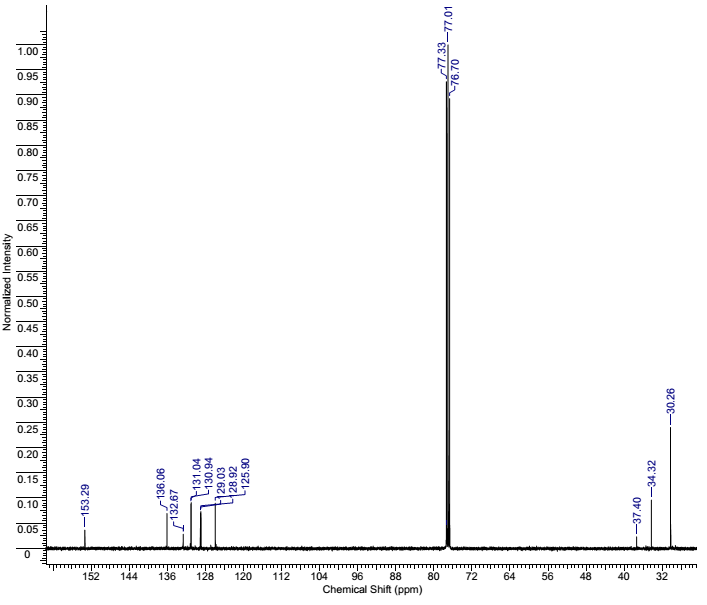
**Figure S 20**: The 13C NMR spectrum of the N,N-3,5-di-tert-butyl-2-hydroxybenzylidene{[4-(dimethylamino)phenyl]-2-(chloroethoxy)phosphoryl}ethanehydrazide (**17**) (CDCl3)



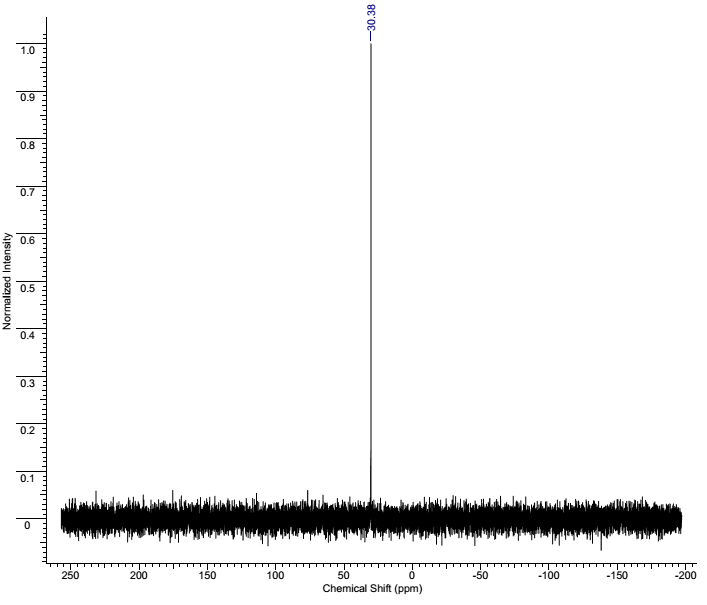
**Figure S 21**: The 31P NMR spectrum of the N,N-3,5-di-tert-butyl-2-hydroxybenzylidene{[4-(dimethylamino)phenyl]-2-(chloroethoxy)phosphoryl}ethanehydrazide (**17**) (CDCl3)



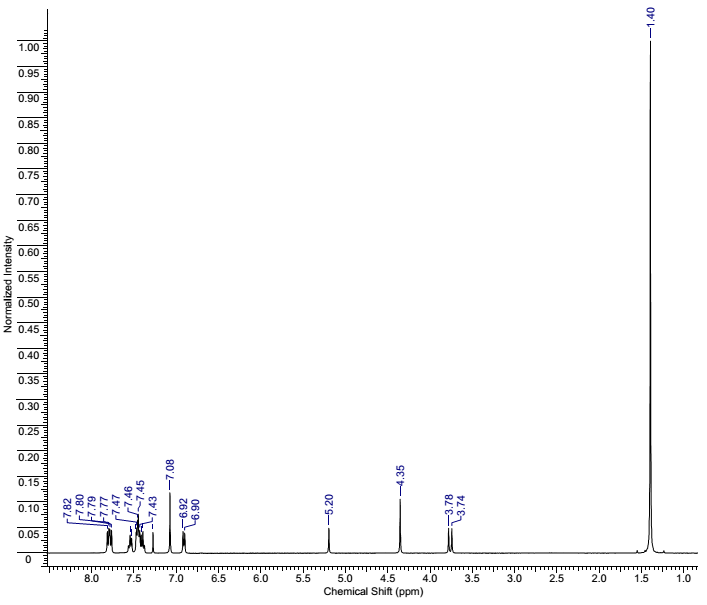
**Figure S 22**: The 1H NMR spectrum of the 5-[(Diphenylphosphoryl)methyl]-3(3′,5′-di-tert-butyl-4′-hydroxybenzyl)thio-2,4-dihydro-3*H*-1,2,4-triazole (**18**) (CDCl3)



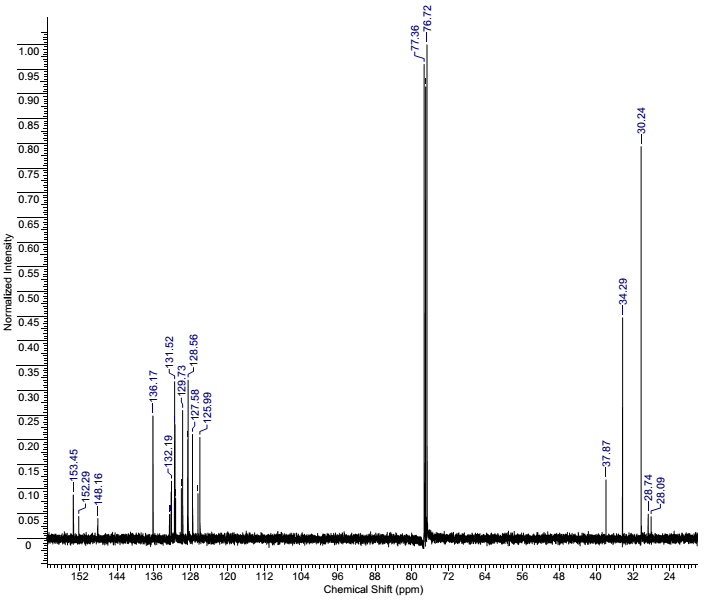
**Figure S 23**: The 13C NMR spectrum of the 5-[(Diphenylphosphoryl)methyl]-3(3′,5′-di-tert-butyl-4′-hydroxybenzyl)thio-2,4-dihydro-3*H*-1,2,4-triazole (**18**) (CDCl3)



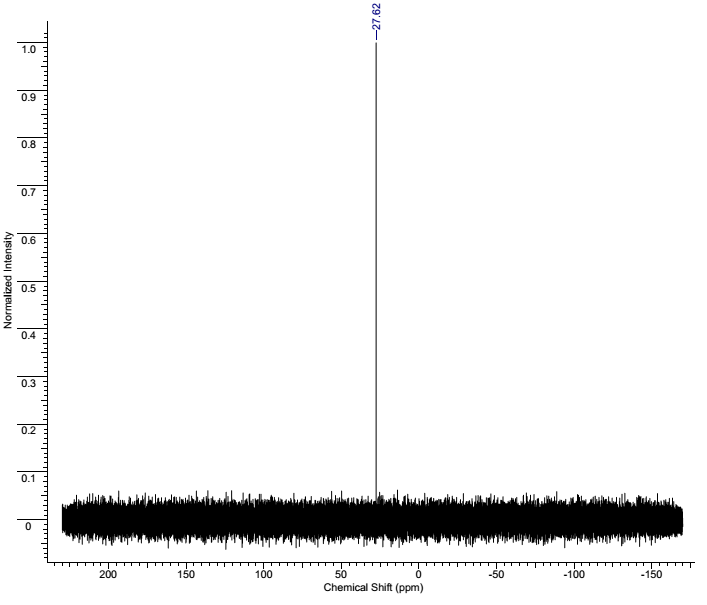
**Figure S 24**: The 31P NMR spectrum of the 5-[(Diphenylphosphoryl)methyl]-3(3′,5′-di-tert-butyl-4′-hydroxybenzyl)thio-2,4-dihydro-3*H*-1,2,4-triazole (**18**) (CDCl3)



**Figure S 25**: The 1H NMR spectrum of the 5-[(Diphenylphosphoryl)methyl]-4-phenyl-3(3′,5′-di-tert-butyl-4′-hydroxybenzyl)thio-2,4-dihydro-3*H*-1,2,4-triazole (**19**) (CDCl3)



**Figure S 26**: The 13C NMR spectrum of the 5-[(Diphenylphosphoryl)methyl]-4-phenyl-3(3′,5′-di-tert-butyl-4′-hydroxybenzyl)thio-2,4-dihydro-3*H*-1,2,4-triazole (**19**) (CDCl3)



**Figure S 27**: The 31P NMR spectrum of the 5-[(Diphenylphosphoryl)methyl]-4-phenyl-3(3′,5′-di-tert-butyl-4′-hydroxybenzyl)thio-2,4-dihydro-3*H*-1,2,4-triazole (**19**) (CDCl3)