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### Studies on the Synthesis and Properties of Ethyl-N-Alkylphosphoro(Thioureido)Thioates

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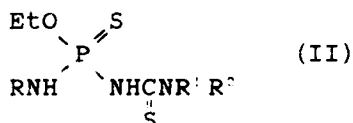
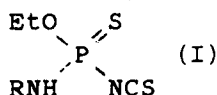
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## STUDIES ON THE SYNTHESIS AND PERPORTIES OF ETHYL-N-ALKYLPHOSPHORO (THIOUREIDO) THIOATES

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O-Ethyl-N-alkylphosphoro(thioureido)thioates (II) were synthesized by the addition of O-ethyl-N-alkylphosphor-isothiocyanatidothioates (I) with corresponding alkyl or aryl amines,



in which  $\text{R}=\text{C}_1-\text{C}_3$ ,  $\text{R}^1, \text{R}^2=\text{H}$ , alkyl or aryl. Their structures were confirmed by IR,  $^1\text{H}$  NMR, MS and elemental analysis. The results of bioassay showed that they had fairly good fungicidal and herbicidal activities. When II ( $\text{R}^1=\text{H}, \text{R}^2=\text{i-Pr, Ph, aryl}$  etc.) reacted with chloroacetyl chloride, the compounds III were given.

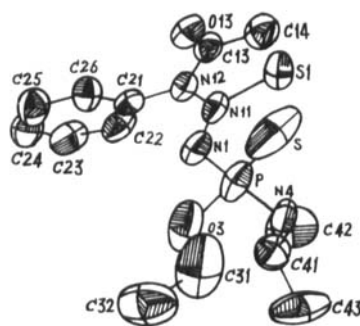
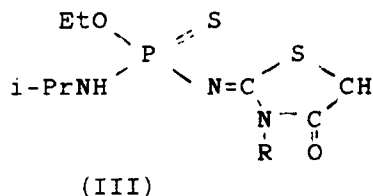


figure 1 The structure of III ( $\text{R}=\text{Ph}$ )

The structure was confirmed by elemental analysis, IR and  $^{13}\text{C}$  NMR. The IR absorption peak of  $-\text{C}=\text{N}-$  appeared at  $1580\text{ cm}^{-1}$  and the  $^{13}\text{C}$  NMR spectra indicated that the chemical shift was  $164.80\text{ ppm}$ . However,  $^{13}\text{C}$  shift ( $139.63\text{ ppm}$ ) of the starting  $\text{C}=\text{S}$  of thiourea derivative was disappeared. The X Ray diffraction analysis ( $\text{R}=\text{Ph}$ ) confirmed that the carbonyl group of compound III was connected with nitrogen atom and the five number ring was nearly a plan which has an angle  $64.17^\circ + 0.23$  with benzene ring (figure 1). The fungicidal activity of compound III was lower than II.