

Synthesis and Characterization of 1,2,4-Triazolylthiocarbamates as Antifungal Agent against Phytopathogenic Fungi

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Abstract—Dithiocarbamates are an important class of aza-thio compounds that are most heavily used organic fungicides, play pivotal role as bioactive agents. Owing to multiple advantages of dithiocarbamates viz low mammalian toxicity, high efficiency against plant pathogenic fungi, water solubility of their salts, ease of preparation, more and more studies are made towards modifying dithiocarbamates. We synthesized sodium salts of 1,2,4-triazolylthiocarbamates from 1,2,4-triazole and 4-amino-1,2,4-triazole with carbon disulfide under strong alkaline medium of a sodium hydroxide solution, which were further used for preparing the derivatives of 1,2,4-triazolylthiocarbamates in excellent yield. ¹H-NMR and FT-IR spectroscopic analysis were recorded on a BrukerAvance II 400 NMR with DMSO-d₆ as solvents using Tetramethylsilane (TMS) as internal reference and BRUKER ALPHA-2 (range 4000-600 cm⁻¹) respectively. The synthesized 1,2,4-triazolylthiocarbamates (TDTC-1 to TDTC-10) were screened *in vitro* for their antifungal potential against four phytopathogenic fungi viz. *Fusarium moniliforme*, *Bipolaris oryzae*, *Rhizoctonia solani* and *Phytophthora infestans* by poisoned food technique and spore germination inhibition technique respectively. The results were expressed in ED₅₀ value i.e. the effective dose at which 50 percent inhibition has occurred. Some of the compounds inflicted significant antifungal potential with ED₅₀ less than standard fungicide (Tilt 25 EC) at 5% level of significance.

Keywords: 1,2,4-triazole, 4-amino-1,2,4-triazole, 1,2,4-triazolylthiocarbamates, Antifungal potential, poisoned food technique, spore germination inhibition technique.