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Antibacterial and Antifungal Evaluation of 5-Aryl-4-(*1H*-pyrazol-1-yl)pyrazolidin-3-one Derivatives

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SUMMARY. Pyrazole derivatives have attracted considerable attention because of their diverse chemotherapeutic potential. In the present research work, some 5-phenyl-4-(*1H*-pyrazol-1-yl)pyrazolidin-3-one derivatives (4a-f) were synthesized and evaluated for their *in vitro* antibacterial activities against Gram-positive *Staphylococcus aureus, Bacillus subtilis,* and Gram-negative *Escherichia coli, Pseudomonas aeruginosa* strains and antifungal activities against *Aspergillus niger* and *Candida albicans*strains. The synthesized derivatives were characterized by infrared, nuclear magnetic resonance (^{1}H-NMR and ^{13}C-NMR), and mass spectrometry. The result showed that the compounds 5-(4-methoxyphenyl)-4-(*1H*-pyrazol-1-yl)pyrazolidin-3-one (**4d**), 5-(4-chlorophenyl)-4-(*1H*-pyrazol-1-yl)pyrazolidin-3-one (**4e**), and 5-(4-nitrophenyl)-4-(*1H*-pyrazol-1-yl)pyrazolidin-3-one (**4f**) showed significant antimicrobial activities when compared to standard drugs (streptomycin as antibacterial drug and amphotericin-B as antifungal drug). Compound **4d** was the most effective against both Gram-positive and Gram-negative bacteria while compounds **4e** and **4f** showed the most effective antifungal activity.

RESUMEN. Los derivados de pirazol han atraído una atención considerable debido a su diverso potencial quimioterapéutico. En el presente trabajo de investigación, algunos derivados de 5-fenil-4-(*1H*-pirazol-1-il)pirazolidin-3-ona (**4a-f**) fueron sintetizados y evaluados por sus actividades antibacterianas *in vitro* contra *Staphylococcus aureus* Gram-positivo, *Bacillus subtilis*, y cepas Gram-negativas *de Escherichia coli* y *Pseudomonas aeruginosa*, y actividades antifúngicas contra cepas de *Aspergillus niger* y *Candida albicans*. Los derivados sintetizados se caracterizaron por especroscopía infrarroja, resonancia magnética nuclear (^{1}H-NMR y ^{13}C-NMR) y espectrometría de masas. El resultado mostró que los compuestos 5-(4-metoxifenil)-4-(*1H*-pirazol-1-il)pirazolidin-3-ona (**4d**), 5-(4-clorofenil)-4-(*1H*-pirazol-1 -il) pirazolidin-3-ona (**4e**) y 5-(4-nitrofenil)-4-(*1H*-pirazol-1-il) pirazolidin-3-ona (**4f**) mostraron actividades antimicrobianas significativas en comparación con los medicamentos estándar (estreptomicina como fármaco antibacteriano y anfotericina-B como fármaco antifúngico). El compuesto **4d** fue el más efectivo contra bacterias Gram-positivas y Gram-negativas, mientras que los compuestos **4e** y **4f** mostraron la actividad antifúngica más efectiva.

KEY WORDS: antibacterial, antifungal, pyrazole, pyrazolidin-3-one, synthesis.

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