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MEDICINAL CHEMISTRY RESEARCH

ORIGINAL RESEARCH

# Synthesis of 1,3,5-trisubstituted pyrazoline nucleus containing compounds and screening for antimicrobial activity

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**Abstract** In this study, a novel series of heterocyclic compounds containing pyrazoline nucleus has been synthesized. The compounds were synthesized in two steps. Chalcone was synthesized in the first step by Claisen-Schmidt reaction, using 1-acetylnaphthalene and p-nitro benzaldehyde as reactants. In the second step, the chalcone was cyclized in an acidic medium with some hydrazine derivatives to form pyrazolines. All the compounds were characterized by physical, chromatographic, spectroscopic, and elemental analysis and evaluated in vitro for antimicrobial activity against nine microorganisms by cup-plate method. The minimum inhibitory concentration of all the compounds was determined by tube dilution method. All the compounds exhibited higher antibacterial activity as compared to the antifungal activity. Compound **5g** (3-Naphthalen-1-yl-1-(2-nitro-phenyl)-5-(4-nitro-phenyl)-4,5-dihydro-1H-pyrazole) exhibited maximum antibacterial and antifungal activity and may be designated as the most potent member of the series, with 2-nitrophenyl group at N-1 position of the 2-pyrazoline ring.

**Keywords** Pyrazoline · Chalcone · Antimicrobial activity · Claisen-Schmidt reaction

## Introduction

Heterocyclic compounds are well known for their wide range of biological applications and pyrazolines occupy a unique position due to dominant applications. Pyrazolines have played a crucial role in the development of theory in heterocyclic chemistry and are also used extensively as agents in organic synthesis. A classical synthesis of these compounds involves the base-catalyzed aldol condensation reaction of aromatic ketones and aldehydes to give $\alpha$, $\beta$-unsaturated ketones (chalcones), which undergo a subsequent cyclization reaction with hydrazines affording 2-pyrazolines. In this reaction, hydrazones are formed as intermediates which can be subsequently cyclized to 2-pyrazolines in the presence of a suitable cyclizing reagent like acetic acid (Azarifar and Ghasemnejad, 2003). Electron-rich nitrogen heterocyclics play an important role in diverse biological activities. Pyrazoline nucleus is a privileged pharmacophore for various pharmacological activities, such as antimicrobial (Ozdemir *et al.*, 2007a; Azarifar and Shaebanzadeh, 2002; Ashok and Holla, 2006; Kumar *et al.*, 2005; Abunada *et al.*, 2008; Abdel-Wahab *et al.*, 2009; Rai *et al.*, 2009; Prakash *et al.*, 2009), analgesic and anti-inflammatory (Sahu *et al.*, 2008; Venkataraman *et al.*, 2010; Girisha *et al.*, 2010; Bashir *et al.*, 2011), antinociceptive (Kaplancikli *et al.*, 2009), antidepressant and anticonvulsant (Ozdemir *et al.*, 2007b; Palaska *et al.*, 2001) and anti-amoebic (Bhat *et al.*, 2009). Recently, 5-(substituted) aryl-3-(3-coumarinyl)-1-phenyl-2-pyrazolines have been utilized as versatile templates for synthesizing compounds that act as potential anti-inflammatory and analgesic agents (Khode *et al.*, 2009). Some pyrazoline derivatives have shown anticancer activity against leukemia, melanoma, lung, colon, CNS, ovarian, renal, prostate, and breast cancer cell lines (Havrylyuk *et al.*, 2009; Rostom *et al.*, 2011; Havrylyuk *et al.*, 2011). Thus, pyrazoline moiety has attracted considerable interest in the development of biologically active compounds.

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