International Journal of Chemical and Physical Sciences, ISSN:2319-6602
IJCPS Vol. 4 Special Issue – NCSC Jan-2015
www.ijcps.org

Synthesis and Characterization of Some New Chlorosubstituted Thiazoles and Thiazolo-Imidazoles and their Impact on Pathogens Damaging Oyster Mushroom Cultivation

N. G. GHODILE AND P. R. RAJPUT

Department of Chemistry, S.S.S.K.R. Innani Mahavidyalaya, Karanja (Lad), Washim.
Department of Chemistry, Vidya Bharati Mahavidyalaya, Amravati, India. 444 602
Corresponding author**:** nitinghodile@gmail.com

Abstract

The mushroom growers in and around Vidarbha region of Central India have been engaged in the cultivation of one of the edible and highly profiTable varieties of mushroom crop ie. Oyster mushroom spp. But now a days farmers of this region facing the most alarming problem related to the susceptibility of this variety that easily falls prey to the pathogenic attack. As a result of this the efforts and investment that farmers put in the cultivation of this crop would not commensurate with the yield. Literature survey reveals that the paucity of data in the field of protection of mushroom cultivation from the attack of causative organism, creates a considerable amount of scope to undertake a systematic research of synthesis of some eco-friendly heterocycles and study of their curative impact on edible mushroom varieties with special reference to Oyster mushroom spp. In this context, in the present study, we have synthesized some new chlorosubstituted thiazoles and thiazolo-imidazole from chlorosubstituted diketones, chromones and chromanones in benign solvents.

The newly synthesized titled compounds were screened for their antipathogenic activities against the causative organisms responsible for the damage of mushroom cultivation in the tropical belt of Vidarbha region. It was encouraging to note that the titled compounds not only inhibit the growth of all the pathogens under examination (C. verticillatum, G. deliquescene, Cladobotryum apiculatum, Velricillium fungicola, Gliocladium vireus, Sibirina fungicola, P. agarici, Arthrobotrys pleuroli and Pseudomonas stulzeri.) to a considerable extent but also exerted a positive impact on the phytotic growth of the test variety of mushroom.

Key words: chlorosubstituted thiazoles, thiazolo-imidazoles, diketones, chromones and chromanones, *Oyster mushroom* crop pathogens like *C. verticillatum, G. deliquescene, C. apiculatum, V. fungicola, G. vireus, S. fungicola, P. agarici. A. pleuroli, P. stulzeri.*

Introduction:

Pleurotus commonly called as *Oyster mushroom* is one of the most widely eaten mushrooms[1] appreciated for its culinary properties[2]. *Oyster spp.* can be successfully cultivated at temperatures of around 30°C and hence it is becoming increasingly popular in both tropical and sub-tropical countries. Being a tropical country, India has been bestowed with bountiful crops. In India, the cultivation of this variety of mushroom is picking up at an alarmingly high rate due to ease of its cultivation.

After *Agaricus spp.* (Button mushrooms), *Pleurotus species* are the second most populer mushrooms growing in India. Though cultivation of *Oyster mushroom* in Vidarbha region is increasing gradualy but the major constraint in its speedy popularization is the susceptibility of this crop towards pathogenic attack. As a consequence, initial investment incurred on the cultivation of *Oyster mushroom* crop could not be recovered. The pathogens inhibit the growth of mushrooms and hinders the production of fruiting bodies. The disease and pasts happen to be devastating and perpeturate easily from one season to another. Shah and Nasreen reported[3] that some growers hardly use the fungicides for the treatment of this havoc of disease. They often found fungicidal treatment as non-economical. Chitra[4] *et al* reported that the 60% concentration of potassium humate influence the mushroom growth as well as nutritional value and recommended to use this for the increase of production.

Literature survey reveals that, nitrogen and oxygen containing chlorosubstituted heterocycles such as pyrazolines, pyrazoles, isoxazolines, and isoxazoles were found to be very useful in controlling the diseases in the field of agriculture. This series of compounds reported to have antibacterial[5], antifungal[6], analgesic[7], anesthetic[8] and antinflammatory activities.

The present study has been carried out to develop ecofriendly and economically viable management of mushroom crop disease by synthesizing some new chlorosubstituted thiazoles and thiazolo-imidazoles from chlorosubstituted diketones, chromones and chromanones and applying them to inhibit the growth of causative organisms.

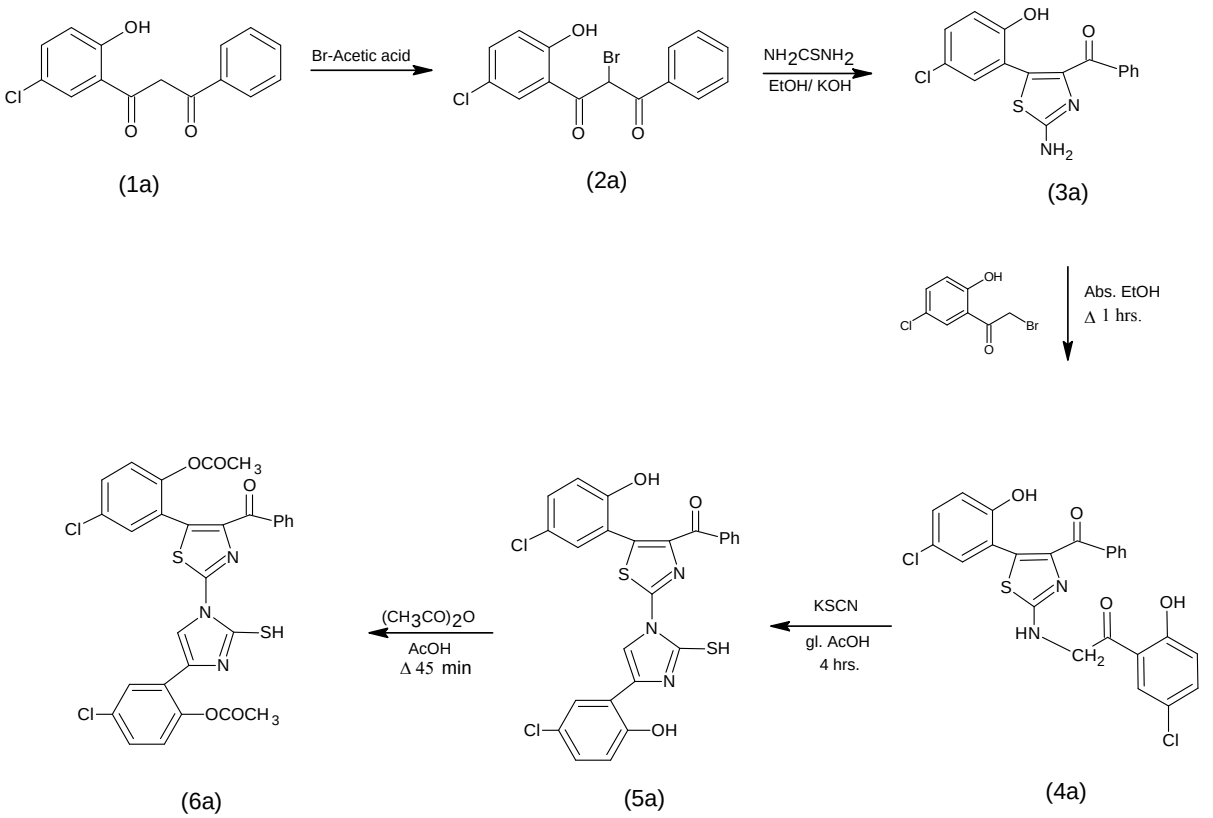
Experimental:

The synthetic route for obtaining the final products is presented in scheme I. 1-(2-Hydroxy-5-chlorophenyl)-3-phenyl-1,3-propanedione (1a) was suspended in bromine-glacial acetic acid reagent to get the compound 1-(2-hydroxy-5-chlorophenyl)-2-bromo-3-phenyl-1,3-propanedione (2a). The bromosubstituted-1,3-propanedione (2a) refluxed with thiourea for about 2.5 hrs. using aqueous KOH solution and ethanol as a solvent. Finally on acidification with conc. HCl yield the product substituted thiazole (3a).

The reaction of substituted thiazole(3a) with 2-bromo-1-(2-chloro-5-hydroxy phenyl) ethanone in absolute ethanol lead to the formation of substituted α- amino ketone (4a) which on treatment with KSCN in glacial acetic acid for 4 hrs. gave substituted thiazolo-imidazole (5a). which on acetylation give its acetyl derivative (6a).

Melting points of all the synthesized compounds were determined in open capillaries and are uncorrected. The homogeneity of all compounds was checked by TLC using benzene-CCl_4 as developing solvent. IR spectra were recorded on Perkin-Elmer 1000 spectrophotometer in KBr. The ^{1}H NMR spectra were recorded on Bruker advance II 400 NMR spectrophotometer using TMS as an internal standard and chemical shifts are expressed in δ (ppm).

Scheme-I:



Antifungal and antibacterial assays of the newly synthesized compounds (3a, 4a, 5a, and 6a):

The titled compounds were assayed for their antifungal and antibacterial activities against the pathogens responsible for *Oyster mushroom* diseases.

DMF was used as a solvent control using agar-agar plate techniques. The zones of inhibition formed were measured in mm and are shown in the following Table:

Entry	***C. verticillatum***	***G. deliquescene***	***C. apiculatum***	***V. fungicola***	***G. vireus***	***S. fungicola***	***P. agarici***	***A. pleuroli***	***P. stulzeri***
3a	10	05	08	07	08	08	08	07	06
4a	10	09	10	09	08	09	10	08	09
5a	11	11	12	10	10	11	12	11	10
6a	12	09	14	12	11	13	13	11	12

The compounds synthesized were found to be detrimental to the growth of the pathogens. From the Table it can be noticed that antifungal and antibacterial properties gradually increase as the complexity of the molecular structures increases.

References:

[1]. Shah S., Nasreen S. and Munshi N.A., *International Journal of botany*, 7(3), **2011**, 209-215.

[2]. Baysal, E., Peker H., Yalinkilic M.K. and Temiz A., *Bioresour. Technol.,* 89, **2003**, 95-97.

[3]. Shah S. and S. Nasreen, *Int. J. Plant Pathol.,* 2, **2011,** 81-88.

[4]. Prakash. P, Samundeeswari. R, Vivek. C and Chitra D.A, *World Journal of Science and Technology* 1(7), **2011**, 28-31.

[5]. Hans N. Swiss Patent, 592103, 1977, *Chem. Abstra.,* 88, **1978**, 22886.

[6]. Borthakur S. K., Boruah P. and Goswami B. N., *J. Chemical Research*, 128, ***2007***, 127.

[7]. Narayan B., Raj Vijaya K.K., Ashalata, B.V. and Sucheta N.K., *Indian J. Chem.* 45B, **2006**, 1704.

[8]. Altintes H, and Birteksoz S., *Indian J. Chem*. 44B, **2005**, 585.