Green synthesis of copper oxide nanoparticles using leaf extract of *abutilon indicum* and its antimicrobial, antioxidant, photocatalytic dye degradation activities

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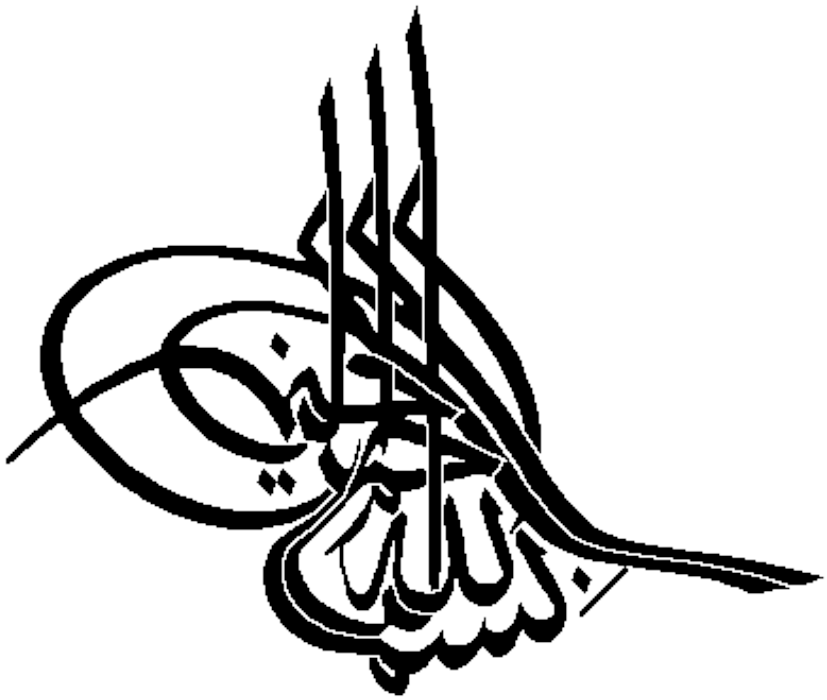

In the name of

Allah,

The most Compassionate,

The most merciful

RESEARCH COMPLETION CERTIFICATE

Certified that the research work contained in this thesis titled, "**Green Synthesis of Copper Oxide Nanoparticles Using Leaf Extract of *Abutilon indicum* and its Antimicrobial, Antioxidant, Photocatalytic Dye Degradation Activities**" has been carried out and completed by **FAHEEM IJAZ, ID: 14003140054.** The quantum and the quality of the work contained in this thesis is adequate for the award of Degree of MS/M.Phil.

_____	_____
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DECLARATION

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Session **2014-2016** hereby declare that the matter printed in the thesis titled **"Green Synthesis of Copper Oxide Nanoparticles Using Leaf Extract of *Abutilon indicum* and its Antimicrobial, Antioxidant, Photocatalytic Dye Degradation Activities"** is my own work and has not been printed, published and submitted as research work, thesis or publication in any form in any University, Research institution etc. in Pakistan or Abroad.

Dated: _____ _____

(Faheem Ijaz)

DEDICATION

To

The perfect symbol of humanity “Hazrat Muhammad” (Peace be Upon Him), all those who are struggling for the well being of mankind, my teachers who are a symbol of guidance in my life and induced a deep love to struggle, who are a source of strength, inspiration and proud for me, my family

&

My Sweet Parents

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All Praises for **ALLAH ALMIGHTY**, the Most Merciful and Most compassionate, the creator of the universe, who guides us to research what is mysterious in this universe and helps in difficulties, enabled me to complete this research work successfully. I offer my humblest and sincerest words of thanks to Holy prophet **HAZRAT MUHAMMAD (PBUH)** who is forever a torch of guidance and knowledge of humanity.

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ABSTRACT

The study reports a superficial method for the green synthesis of copper oxide nanoparticles by a solution combustion method using *Abutilon indicum* water extract. The Copper oxide Nanoparticles were characterized by XRD, SEM, TEM and UV–Visible studies. XRD data indicates the formation of pure monoclinic crystallite structures of CuO Nanoparticles. SEM images showed that the particles have sponge like structure with large surface area and the average crystallite sizes were found to be 60–120 nm. These observations were confirmed by TEM analysis. Photocatalytic activity studies of CuO Nanoparticles revealed that they act as very good catalyst for the effective degradation of acid black 210 in the presence of Sunlight. The CuO Nanoparticles found to inhibit the activity of 1,1-Diphenyl-2 picrylhydrazyl (DPPH) free radicals effectively. CuO Nanoparticles exhibited significant bactericidal activity against *E.coli,Staphyloccus aureus, Klebsiell* and *Bacillus subtilis*. This research revealed a simple, ecofriendly and robust method for the synthesis of multifunctional CuO nanoparticles employing under utilized medicinal plants.

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1. Introduction

1.1 Nanoscience

During the last few decades, the interests of scientists are increasing continuously day by day in the field of science and technology at the nanometer range. Institutions of Government, some research centers of public, different type of Government and private universities and some firms have investigated these significant resources throughout the world. This technology of nano science is still at an early stage of progress. Future scientific and technological results are not easy to estimate and chase. It has been agreed the extensive scope of the pasture concerned and the possible scientific progression.