SUMMARY
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The continued interest and quest in designing and synthesis of new fatty acid derivatives mainly for a wide range of applications particularly from biological point of view. The idea conceived to work for Ph.D. thesis in this area aims to synthesize new biologically important heterocyclic fatty acid derivatives from cheap and readily available reagents and fatty acids as starting material. Results of the explanatory research are recorded in this thesis. The research work described in thesis is divided into five chapters. The chapter wise organization of the thesis is as follows:

**Chapter 1: Synthesis of Pyrazoline derivatives**

**Chapter 2: Synthesis of benzoazadiazepine and naphthoxadiazepine**

**Chapter 3: 2,5-Disubstituted-1,3,4-Oxadiazole**

**Chapter 4: Synthesis and biological evaluation of undecyl-chitosan nano-bioconjugate**

**Chapter 5: Synthesis of fatty acid derivatives of phenethylamine and formylfuran**

All the synthesized compounds were characterized by FT-IR, $^1$H-NMR, $^{13}$C-NMR and mass spectral analysis.

**CHAPTER 1: SYNTHESIS OF PYRAZOLINE DERIVATIVES**

The synthesis of novel fatty acid chain substituted pyrazoline derivatives has been reported. Products (25a-c and 26a-c) were obtained via formation of different effectively used chalcones (23a, 23b) through Claisen-Schmidt condensation followed by cyclization through various fatty acid hydrazides (24a-c), (Scheme 11). The synthetic approach typically entails the easily affordable reactions under mild conditions ($< 90 \degree$C) with cheaply available reagents. The products obtained in good yield and are purified by column chromatography.
Scheme 11: Synthesis of novel series of fatty acid chain substituted pyrazoline derivatives
CHAPTER 2: SYNTHESIS OF BENZOXADIAZEPINE AND NAPHTHOXADIAZEPINE

The synthesis of novel fatty acid substituted benzoxadiazepine and naphthoxadiazepine derivatives (45a-c, 46a,b and 47a-c, 48a,b) were performed by nucleophilic aromatic substitution of the chlorine atoms in 2,3,5,6-tetrachloro-1,4-benzoquinone (43) and 2,3-dichloro-1,4-naphthoquinone (44) by different fatty acid hydrazides (24a-c and 42a,b), (Scheme 21). All the newly synthesized compounds were purified by column chromatography and characterized by spectral data.
CHAPTER 3: 2,5-DISUBSTITUTED-1,3,4-OXADIAZOLE

This chapter is based on the synthesis of 1,3,4-oxadiazole containing fatty acid chains via efficient and easy protocol as a part of drug development programme. The synthetic strategy involves formation of 2,5-disubstituted 1,3,4-oxadiazoles (62a-c, 63a,b, 64) using fatty acid hydrazides (24a-c, 42a,b, 60) and triethyl orthacetate (61) as starting material, (Scheme 32). The newly synthesized compounds (62a-c, 63a,b, 64) were characterized by FT-IR, $^1$H NMR, $^{13}$C NMR and mass spectral data. As, there has been growing interest in the application of microwave irradiation in chemical reaction enhancement, due to improved reaction rates and increased yields, so a comparative study of conventional to that of microwave synthesis also described. Further, the binding study of a newly synthesized compound (Z)-2-(heptadec-8′-enyl)-5-methyl-1,3,4-oxadiazole (62b) with human serum albumin (HSA) has been evaluated by multi-spectroscopic techniques such as UV, fluorescence, circular dichroism (CD) and molecular docking studies. It has been found that compound 62b

Scheme 21: Synthesis of novel series of fatty acid chain substituted benzoxadiazepine and naphthoxadiazepine derivatives
interacts with HSA through static quenching mechanism and molecular docking revealed that compound 62b binds at subdomain III A at binding site II of HSA through hydrophobic interaction forming HSA-62b complex.

\[
\text{RCONHNH}_2 + \overset{\text{procedure A and B}}{\overset{\text{AcOH}}{\longrightarrow}} \overset{\text{(R)}}{\text{(62a-c), (63a,b), 64}}
\]

Compounds

- 42a, 63a
- 42b, 63b
- 24b, 62b
- 24a, 62a
- 60, 64
- 24c, 62c

Scheme 32: Synthesis of 2,5-disubstituted 1,3,4-oxadiazoles

**CHAPTER 4: SYNTHEISIS AND BIOLOGICAL EVALUATION OF UNDECYL-CHITOSAN NANO-BIOCONJUGATE**

The synthesis of novel undecyl-chitosan (U-CS) (77) nano-bioconjugate has been done through the coupling of carboxyl group of undec-10-enoic acid (76) with the amine group of chitosan (75) occurred in presence of DCC (Scheme 42). The U-CS
conjugate formed was confirmed by FTIR, $^1$H-NMR and then characterized by TGA, XRD, SEM and TEM analysis.

Further, U-CS nano-bioconjugate was evaluated for in-vitro anti-bacterial and anti-cancer potential against human pathogenic bacterial strains (E. coli and Listeria monocytogenes) and human cancer cell lines (HeLa, MDA-MB-231 and Hep3B). The results obtained clearly revealed that U-CS nano-bioconjugate showed enhance anti-bacterial, anti-biofilm as well as anti-cancer efficacy as compared to pure and free form of the chitosan. Our in-vitro results showed that U-CS nano-conjugate has a potential to be used for the treatment of cancer and other bacterial infections.

**Scheme 42**: Synthesis of undecyl-chitosan
CHAPTER 5: SYNTHESIS OF FATTY ACID DERIVATIVES OF PHENETHYLAMINE AND FORMYLURAN

This chapter deals with the synthesis of fatty acid derivatives of phenethylamine (92a-c, 93a) and fatty acid derivatives of formylfuran (94a-c, 95a), (Scheme 53) through coupling reaction between fatty acid (24a-c, 42a) and phenethylamine (90) and 5-hydroxymethylfurfural (91) in presence of N, N'-dicyclohexylcarbodiimide (DCC). The synthetic approach typically entails the easily affordable coupling reactions resulting formation of fatty-ester and amides at room temperature with cheaply available reagents. All products were purified by column chromatography and characterized by FT-IR, ^1^H NMR, ^1^3^C NMR and mass spectral data.
Scheme 53: Synthesis of fatty acid esters and amides of hydroxymethyl furfural and phenethylamine