

**SUBMISSION FOR EVALUATION
FINAL YEAR PROJECT 2 - RESEARCH PROJECT**

**ASSESSING THE ANTI-INFLAMMATORY POTENTIAL OF
Kyllinga nemoralis EXTRACT AND DEVELOPMENT OF
HYDROGEL DERMAL PATCH**

Name : Nuha Afiqah Binti Fisol
Student ID : 2023393347
Program : AS245
Course code : FSG671
Mobile Phone :
E-mail : nuhafisol@gmail.com

Approval by Main Supervisor:

I certify that the work conducted by the above student is completed and approve this report to be submitted for evaluation.

Supervisor's name : Noor Hafizah Binti Uyup
Date : 01/08/2025
Turnitin Similarity % : 17%
Signature :

**ASSESSING THE ANTI-INFLAMMATORY POTENTIAL
OF *Kyllinga nemoralis* EXTRACT AND DEVELOPMENT
OF HYDROGEL DERMAL PATCH**

NUHA AFIQAH FISOL

**BACHELOR OF SCIENCE (Hons.)
APPLIED CHEMISTRY
FACULTY OF APPLIED SCIENCES
UNIVERSITY TEKNOLOGI MARA**

JULY 2025

ABSTRACT

ASSESSING THE ANTI-INFLAMMATORY POTENTIAL OF *Kyllinga nemoralis* EXTRACT AND DEVELOPMENT OF HYDROGEL DERMAL PATCH

Skin inflammation is a common condition that affects individuals across all age groups, often leading to discomfort and a diminished quality of life. There remains a pressing need for alternative treatments that are both effective and associated with fewer side effects. In this research, the development of topical non-steroidal anti-inflammatory drugs (NSAIDs) derived from natural products offers a promising avenue, particularly for resource-limited settings such as Malaysia. This study investigates the anti-inflammatory potential of *Kyllinga nemoralis* extract and its incorporation into a hydrogel-based dermal patch. Anti-inflammatory activity was evaluated using a heat-induced egg albumin denaturation assay. The extract exhibited 19.76% inhibition at a concentration of 31.25 µg/mL, with an IC₅₀ value of 194.63 µg/mL. While showing moderate efficacy compared to diclofenac, the extract demonstrated a saturation-like response at higher concentrations. GC-MS phytochemical profiling confirmed the presence of bioactive derivatives, including terpenoids, phenylpropanoids, and flavonoids. The extract was successfully formulated into a pectin-based hydrogel dermal patch. Among the tested formulations, FPC2 (1% extract) exhibited a smoother texture and demonstrated a higher release rate, reaching a concentration of 12 µg/mL at physiological pH. These findings indicate that *Kyllinga nemoralis* extract has significant potential as a natural topical NSAID for managing skin inflammation.

TABLE OF CONTENTS

	Page
ABSTRACT	iii
ABSTRAK	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF SYMBOLS	x
LIST OF ABBREVIATIONS	xi
 CHAPTER 1 INTRODUCTION	
1.1 Background of Study	1
1.2 Problem statement	5
1.3 Objectives of Study	6
1.4 Significance of study	6
 CHAPTER 2 LITERATURE REVIEW	
2.1 Background of <i>Kyllinga nemoralis</i>	9
2.2 Phytochemicals profile of <i>Kyllinga nemoralis</i>	10
2.2.1 Flavonoids	11
2.2.2 Alkaloids	13
2.2.3 Terpenoids	15
2.3 Ethnomedicinal applications of <i>Kyllinga nemoralis</i>	18
2.4 Anti-inflammatory activity	23
 CHAPTER 3 RESEARCH METHODOLOGY	
3.1 Materials and chemicals	25
3.1.1 Plant	25
3.1.2 Materials	25
3.1.3 Chemicals	25
3.2 Equipment and instrument	26
3.2.1 Equipment	26
3.2.2 Instrument	26
3.3 Preparation of <i>Kyllinga nemoralis</i> extract	26
3.3.1 Preparation of plant sample	26
3.3.2 Extraction of plant sample	27
3.4 Characterization of <i>Kyllinga nemoralis</i> extract	27
3.4.1 Gas Chromatography – Mass Spectrometry (GC-MS) analysis	27
3.4.2 Identification of phytochemicals present	28
3.4.3 Albumin denaturation assay	28

3.5	Formulation of hydrogel dermal patch	30
3.6	Evaluation on physicochemical properties of the hydrogel	31
3.6.1	Organoleptic test	31
3.6.2	In vitro release test	31
3.7	Experimental designs	33
CHAPTER 4 RESULTS AND DISCUSSION		
4.1	Extraction yield of <i>Kyllinga nemoralis</i>	34
4.2	Identification of phytochemicals in <i>Kyllinga nemoralis</i> extract through GC-MS analysis	37
4.3	Inhibition of egg albumin denaturation	40
4.4	Assessment of the developed pectin-based hydrogel dermal patch	44
4.4.1	Organoleptic properties	45
4.4.2	In vitro release pattern	49
CHAPTER 5 CONCLUSION AND RECOMMENDATION		
5.1	Conclusion	52
5.2	Recommendations	53
REFERENCES		55
APPENDICES		62
CURRICULUM VITAE		68