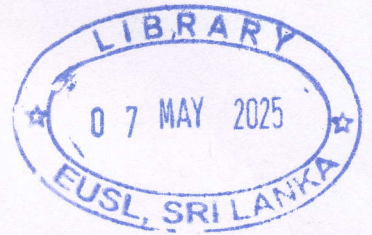


MAPPING OF THE ANT SCAPING AND ECO-FRIENDLY SOLUTIONS FOR *Solonopsis geminata* AT THE UNIVERSITY PREMISES OF EASTERN UNIVERSITY SRI LANKA



S.M.DISHANI PRAMODHYA GUNARATHNA



**DEPARTMENT OF ZOOLOGY,
FACULTY OF SCINCE,
EASTERN UNIVERSITY, SRI
LANAKA**

ABSTRACT

The scarcity of ant diversity identification in the Eastern region of Sri Lanka required a systematic survey around the eastern university premises. The study aimed to collect a comprehensive range of ant specimens for taxonomic identification. The survey Utilized a combination of belt transect and quadrant, bait placement, and leaf-lifting sampling methods. This ant diversity identification survey revealed potential new records for the Eastern region including *Crematogaster* sp1 and *Crematogaster* sp2, *Pheidole* sp1 (major worker), *Monomorium parasonis*, *Trychomyrmex destructor* (major worker), *Nylendria yerburi*, *Tetramorium cf obesum*, *Tetramonium sp1*, *Camponotus sp2* and *Camponotus cf reticularis*, *Nylendria* sp, *Tetramonium obesum*, *Longiforsatus anochitus* and high morphological diversity of *Solenopsis geminata*. *Solenopsis geminata*, an invasive species, poses health and environmental risks due to its harmful effects on humans, animals, and the environment. This study explored the development of eco-friendly fire ant management by formulating baits using organic plant materials as sustainable rather than Conventional chemical insecticides. The preliminary survey was conducted during July of 2023 and February of 2024 through face-to-face interviews with 78 stakeholders. Findings revealed promising results 56% of indoor cases and 44% of outdoor cases, recorded with major impacts to humans. The bait formulation was developed with high mortality counts of 5% concentration for *Azadirachta indica* (neem), *Citrus aurantiifolia* (citrus), *Cymbopogon citratus* (lemongrass), *Chrysanthemum* sp, and 10% concentration from *Derris trifoliata*. The developed bait exhibits high killing effects when formulated as organic baits by using serial chemical experiments. The selected bait dose was 0.05g for the effective killing of fire ants within one day by using effective food attractants soybean oil, corn grit and honey which served as attractive feeding stimulants within the bait formulations. The median lethal dose (LD₅₀) was 1.088 mg/kg. The Observations served as a springboard for future research on developing safer and more effective organic ant control methods. By addressing the limitations identified currently and continuing to explore ant diversity, researchers can develop environmentally conscious solutions to combat *Solenopsis geminata* and other pest ant species.

TABLE OF CONTENT

ABSTRACT.....	i
ACKNOWLEDGMENT.....	ii
DECLARATION.....	iii
TABLE OF CONTENT.....	iv
LIST OF TABLE.....	vii
LIST OF TABLE.....	viii
LIST OF PLATES.....	ix
LIST OF ABBREVIATION.....	xi
CHAPTER 1.....	1
INTRODUCTION.....	1
1.1 <i>Solonopsis geminata</i> (tropical fire ant).....	1
1.2 Ants in Sri Lanka.....	3
1.3 Ants in the Eastern Region.....	4
1.4 Tropical fire ant distribution over the world.....	4
1.4 Classification of fire ant.....	5
1.5 Morphometric studies of fire ant (<i>Solonopsis geminata</i>).....	5
1.6 Basic Biology and Ecology of Fire ant <i>Solonopsis geminata</i>	7
1.7 Mode of transportation.....	9
1.8 General life cycle of the tropical fire ants.....	9
1.9 Reproduction.....	11
1.9.1. Queen.....	11
1.9.2. Soldiers.....	12
1.9.3. Males.....	12
1.9.4. Worker.....	12
1.10. Foods of <i>Solonopsis geminata</i>	13
1.11. Habitats and the Rearing of fire ant.....	13
1.12. Ant trail.....	14

1.13. Significance of the tropical fire ant	15
1.14. Management of the fire ant	15
1.14.1. Chemical control.....	16
1.14.2. Mechanical control	16
1.14.3. Cultural control.....	16
1.14.4. Biological control	17
1.15. The comparison of Bio pesticide with the chemical pesticide	17
1.16. Botanicals used against tropical fire ants	17
1.16.1. Diversity of pesticides	18
1.17. The development of the bait.....	20
1.18. Product Efficacy Analysis	21
1.18.1. Screening studies for direct application or general surface treatments	21
1.18.1.4. Simulated use studies.....	22
1.19. Rationale of the study.....	25
1.20. Research objectives	25
1.20.1 General objectives	25
1.20.2 Specific objectives.....	26
CHAPTER 2	27
MATERIALS AND METHODS	27
2.1 Work plan	27
2.2 Study area and sampling locality.....	28
2.2.1 Eastern university.....	28
2.2.2 Sampling and survey areas	29
2.3 Ant species identification	31
2.3.1. Ant preservation	33
2.3.2. Ant species identification	33
2.4. Victim Perception of <i>Solonopsis geminata</i>	34
2.5. Laboratory studies	35
2.5.1. In vitro rearing of <i>Solonopsis geminata</i>	35
2.6. Ant bait development	37
2.6.1. Collection, preparation, and selection of suitable Botanicals.....	37
2.6.2. The identification of appropriate botanicals for the bait composition based on fire ant mortality performances	41
2.6.3. Determination of the best concentration for each botanical	44

2.6.6. Determination the food attractant of the fire ant for the bait preparation...	46
2.7. Bait preparation	47
2.8. Dose Determination of Formulated Bait.	48
2.9. Product efficacy determination	48
2.10. Statistical analysis	49
CHAPTER 3	50
RESULTS AND DISCUSSION	50
3.1. Ant species identification	50
3.2. Preliminary survey	53
3.3: Victim Perception of <i>Solonopsis geminata</i>	57
3.4. Ant bait development	60
3.4.1. A review of the <i>Solonopsis geminita</i> 's food preferences to develop ant bait	60
3.4.2. Selection of the right plant extract to create ant bait	62
3.4.3. Analyze the ant bait's effective dosage.....	63
3.4.4. Toxicity testing	65
CHAPTER 4	67
CONCLUSION	67
CHAPTER 5	69
LIMITATIONS AND SUGGESTIONS	69
CHAPTER 4	70
REFERANCES	70
APPENDIX I	76
APPENDIX II	79
APPENDIX – III	80
APPENDIX - IV	82