CHAPTER I

SESSION I  Introduction  1 – 7

1.1  Aim and objectives of the present study  5 – 7

SESSION II  Review of literature  8 – 55

1.2.1.  Lead  8
1.2.2.  Chemistry of Lead  8 – 9
1.2.3.  Naturally Occurring Ores of Lead  9
1.2.4.  Sources of Lead  9
1.2.5.  Metabolism of Lead  10
  1.2.5.1  Absorption of Lead  10
  1.2.5.2  Transport, Distribution and Storage of Lead  10 – 11
  1.2.5.3  Excretion of Lead  11
1.2.6  Health Effects of Lead  11
  1.2.6.1  Effects on Heme Biosynthesis  11 – 12
  1.2.6.2  Renal Effects of Lead  13
  1.2.6.3  Cardiovascular Effects of Lead  13
  1.2.6.4  Reproductive Effects of Lead  13 – 14
  1.2.6.5  Effects of Lead in Bone  14
  1.2.6.6  Effects of Lead on nervous system  14 – 15
1.2.7  Mechanism of Lead Toxicity  15
  1.2.7.1  Oxidative Stress  15 – 18
1.2.7.2 Ionic Mechanism of Lead Toxicity 18 – 19
1.2.8 Toxicology 19
1.2.8.1 Acute Toxicity 19
1.2.8.2 Chronic Toxicity 19
1.2.8.3 Toxic Dose of Lead 19
1.2.8.4 Lethal dose of lead acetate 20
1.2.9 Allium plants 20 - 22
1.2.9.1 Garlic (Allium Sativum L) 22
1.2.9.1.1 History of Garlic 23
1.2.9.1.2 Chemistry of garlic (Allium sativum L) 23 -25
1.2.9.2 Onion (Allium cepa L.) 26
1.2.9.2.1 History of Onion (Allium cepa L) 26 – 27
1.2.9.2.2 Chemistry of Onion (Allium cepa L) 27 – 29
1.2.9.3 Biological Roles of Allium Principles 30
1.2.9.3.1 Anti oxidant activity 30 – 33
1.2.9.3.2 Hepato protective effects 34
1.2.9.3.3 Anti diabetic effect 34 – 35
1.2.9.3.4 Cardio protective effects 35 – 36
1.2.9.3.5 Anti hypertensive effect 36 – 37
1.2.9.3.6 Fibrinolytic activity 38
1.2.9.3.7 Platelet aggregation 38 – 39
1.2.9.3.8 Wound healing potential of allium products 39 – 40
1.2.9.3.9 Effect on sickle cell anaemia 40
1.2.9.3.10 Neuro protective effect 40
1.2.9.3.11 Protection against radiation by allium products 40 – 41
1.2.9.3.12 Antibiotic activity 41 – 42
1.2.9.3.13 Immuno modulatory effect 42 – 43
1.2.9.3.14 Anti Inflammatory effect 43
1.2.9.3.15 Effect on Enzymes 43 – 44
1.2.9.3.16 Antimicrobial Effects 44
1.2.9.3.17 Antibacterial Effects 44 – 45
1.2.9.3.18 Antifungal Effects 45
1.2.9.3.19 Antiviral Effects 46
1.2.9.3.20 Anthelmentic and Anti protozoal Effects 46
1.2.9.3.21 Anti Aging Effect 46 – 47
1.2.9.3.22 Detoxification of Heavy Metal Poisoning and other toxins: (Alliums Prevent heavy metal toxicity) 47 – 48
1.2.9.3.23 Anticancer Effect 48 – 49
1.2.9.4 Toxicity of Allium Plants (Garlic and Onion) 49
1.2.9.4.1 Acute toxicity 49
1.2.10 Vitamin E 49 – 50
1.2.10.1 Absorption, Transport and Metabolism 50
1.2.10.2 Chemistry 50 – 51
1.2.10.3 Structure of Tocopherol (vitamin E) 51
1.2.10.4 Biological Role of Vitamin E 51
1.2.10.4.1 Antioxidant activity 51 – 52
1.2.10.4.1.1 Mechanism of prevention of lipid peroxidation 52 – 53
1.2.10.4.2 Reaction of Vitamin E for the Prevention of Free radicals 53
1.2.10.4.3 Prevention of Cardiovascular Disease 53
1.2.10.4.4 Prevention of Cancer 53 – 54
1.2.10.4.5 Prevention of alzheimer's Disease 54
1.2.10.4.6 Protection against xenobiotics 54
1.2.10.4.7 Other roles of vitamin E 54
1.2.10.5 Safe and effective use levels 55
1.2.10.6 Toxicology 55
1.2.10.6.1 Acute toxicity 55
1.2.10.6.2 Sub-chronic toxicity 55
1.2.10.6.3 Chronic toxicity 55

CHAPTER II Materials and Methods 56 – 75

2.1. Experimental animals 56
2.2 Plant materials 56
2.2.1. Preparation of garlic and onion oil 56 – 57
2.3. Chemicals 57
2.4. Instruments 57

2.5 METHODS 57 – 75

2.5.1. Assay of superoxide dismutase (SOD) (E.C.1.15.1.1) 58- 59
2.5.2. Assay of catalase (E.C.1.11.1) 59
2.5.3. Assay of Glutathione Reductase 59 – 60
2.5.4. Assay of Glutathione peroxidase (E.C.1.11.1.9) 60 – 61
2.5.5. Assay of activities of Aspartate transaminase (AST) and Alanine transaminase (ALT) (E.C.2.6.1.2) in serum 61 – 62
2.5.6. Estimation of lipid peroxides in tissues
    Estimation of Malondialdehyde 62 – 63
2.5.7. Estimation of serum vitamin E 63
2.5.8. Estimation of serum vitamin C 64
2.5.9. Estimation of serum cholesterol 64 – 65
2.5.10. Estimation of serum high density lipoprotein cholesterol 65 – 66
2.5.11. Estimation of serum low density lipoprotein cholesterol 66
2.5.12. Estimation of serum triacyl glycerol (TAG) 66
2.5.13. Estimation of lead level 67
2.5.14. Estimation of blood glutathione content 68
2.5.15. Estimation of Haemoglobin 68 – 69
2.5.16. Estimation of δ- amino levulinic acid dehydratase 69 – 70
2.5.17. Peripheral blood smear analysis 70
2.5.18. Hematological indices 70
2.5.19. Estimation of tissues Glutathione content 70 – 71
2.5.20. Extraction of tissue for lipid estimation 71
2.5.21. Estimation of cholesterol 71 – 72
2.5.22. Estimation of Triacyl glycerol 72 – 73
2.5.23. Estimation of Free fatty acids 74 – 75
2.5.24. Lethal Dose (LD50) 75
   Histopathological studies 75
2.5.25. Statistical Analysis 75

CHAPTER III PHASE I 76 - 107
   Studies on the biochemical effects of the polar
   and non polar fractions of garlic and onion
   oils and vitamin E in rats

CHAPTER IV PHASE II 108 – 156
   Studies on the curative effects of polar and non polar
   fractions of garlic and onion oils and vitamin E in
   lead acetate fed rats

CHAPTER V PHASE III 157 - 191
   Studies on the prophylactic effects of two active
   Polar fractions of allium oils in lead acetate fed rats for
one month as compared to that of vitamin E

**PHASE IV** 192 – 211

In vitro studies on the protective action of allium oils against lead acetate induced hemolysis of RBC in normal saline

**SUMMARY AND CONCLUSION** 212 - 219

**REFERENCES** 220 - 244

**ABBREVIATIONS**

**LIST OF PUBLICATIONS AND PRESENTATIONS**