

# CONTENTS

List of tables	
List of Figures	
Introduction and review of literature .....	1
Materials and Methods .....	37
1-Fish .....	37
2-Experimental Design .....	38
3-Diet Formulation .....	39
4-Blood and Tissue collection .....	40
5-Body Indices .....	40
6-Metal and nitrogen analysis.....	41
7-Chromosomal preparation .....	41
7.1.Slide preparation .....	41
7.2.Treatment with colchicine .....	42
7.3.Collecting the cells .....	42
7.4. Hypotonic treatment.....	42
7.5.Fixation .....	42
7.6. spreading the cells .....	43
7.7.staining .....	43
8-Total protein determination in muscle and plasma .....	43
8.1-Muscle homogenization .....	43
8.2.Principle and procedure of determination of total protein in muscle and plasma.....	44
9-Determination of plasma Albumin .....	45
10-Electrophoresis Technique .....	46
11-Molecular Technique .....	51
11.1. DNA Extraction .....	51
11.2.Preparation of agarose gel .....	52
11.3.Gene amplification and purification .....	52
11.4. Restriction fragment length polymorphism .....	52
Results .....	55
1-Body indices .....	55
2-Metal contents .....	57
3-Cytogenetic investigation .....	67
4-Total proteins and total nitrogen content .....	101
5-Total plasma proteins, albumin and globulin content .....	102
6-Muscle protein electrophoresis .....	112
6.1.Bands appearance.....	112
6.2.Relative mobility .....	114
7- Molecular result.....	121
Dissscusion .....	143

Summary .....	157
References .....	161
Arabic Summary .....	212