Effect Of Ageing On Connective Tissue Mainly Tendons Of The Fish Barilius vagra

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Abstract **:** This study was undertaken to evaluate the effect of ageing on tendons of fish **Barilius vagra** at different stages of growth. Ash contents are very high at all the stages. Water content or moisture decreases, maturation of collagen in tendons increases as crude fat, total Nitrogen and crude Protein shows continuous decrease with increasing age. Likewise amino acids also decrease in their content with increasing age

Tables : 03 Figure : 0.0 References :20

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I. INTRODUCTION

On account of effect of ageing, set of interrelated physical and chemical changes occur in the tissue cells of living beings. Collagen, the supple protein that makes up most of the body's tissue becomes more rigid and bond forms between molecules.

There are three major molecular components of the connective tissues, the two fibrous proteins collagens and elastin, and proteoglycons. Collagen fibrils do not stretch whereas elastin fibrils are elastic.

The connective tissues of animals mainly teeth, bones and tendons cartilage etc. undergo obvious changes with growing age with regard to the chemical constituents and physical states. Gerontologists have reported their findings with special reference to variation in mineral composition, crude fat, crude protein and component amino acids and their sequence in these proteins in different connective tissues. Arthritis is a common disease of connective tissue in the aged living beings. On ageing, collagen becomes more rigid as lipofuscin begins to accumulate in cells and the tissues become stiffer. As a result, joint motion decreases.

Connective tissues are of mesodermal origin and develop from the mesenchyme. The principle function of connective tissue is to bind other tissues together and to give support to various structures in the body. Chibnall *et al* carried out precise quantitative investigation on the composition of component proteins of connective tissues. A realization of the importance and ubiquity of the connective tissues in the animal body of their structural variety is built on a unified basis of collagen, and laterally, of the low but significant metabolic turnover of this protein.

The problems of ageing, wound healing, uterine desorption, rheumatism and other diseases of connective tissues (tendons) are now being widely investigated. Therefore, chemical investigation of tendons will decide merits, the attention of technologists and chemists associated with it. This study deals chemical investigation of tendons of fish Barilius vagra at different stages of growth.

II. MATERIALS AND METHODS

Ten fishes **Barilius vagra** of each growth group were taken out. The tendons of the fishes were taken out by dissection. Tendons were washed thoroughly with distilled water in separate petri dishes. They were dried at room temperature for 36 hours and then grind to fine powder separately in electrical grinder. Determined the moisture content by transferring a suitable quantity (0.50 – 1.00 g) of the material in an aluminum cup, which has been previously weighed and put it in thermostatically controlled oven at 105˚C (± 2˚C) for a convenient period (18 – 24 hours) and the weighing cup is transferred to a desiccator and allow to cool for 30 minutes before weighing. The moisture content is generally expressed in terms of loss of weight as a percentage of original weight.

A suitable portion of material (0.10 – 1.00 g) is placed in a dry weighed silica disc (7.5 cm diameter). The disc supported by a silica triangle is heated with a small non-luminous Bunsen flame protected from droughts by an iron cone. Some proteins swell bubble and evolve large volume of gas. When all the material is dull black, the dish is transferred to an electric muffle furnace controlled at 550˚C. Heating is continued until no black patches are bledded in the ash. The ash and the material is transferred to a desiccator which may conveniently contain self-indicating silica gel. Total Nitrogen was determined by Kjeldhal methods. Crude protein was determined with the help of total N. Crude fat is extracted in a Soxhlet extractor using petroleum ether (40˚C - 60˚C).

Amino acids were determined with the help of paper chromatography. Calcium was precipitated as calcium oxalate and then determined volumetrically using standard $KMnO_4$, after liberating free oxalic acid by dissolving the precipitate in dil H_2SO_4. Magnesium was determined calorimetrically after removing calcium as calcium sulphate precipitate using the reagent Eriochrome black T. Sodium was determined by flame photometer.

Table 1: Mineral composition of tendons of Fish Barilius vagra at three different stages of growth (Values are expressed as g/100g of the dry material)

Stages of Growth	Average age of 10 fishes			Moisture	Ash	Mineral in ash	Values	Mineral Oxides	Values	Ash Unaccounted for
	Length (cm)	Girth (cm)	Weight (g)							
I	05	04	140	9.98	0.84	Ca Mg Na P F_2	0.30966 0.00551 0.000078 0.15624 NIL	CaO MgO Na_2O P_2O_5	0.4353 0.00915 0.000107 0.35778	0.0396
								Total	**0.8005**	
II	09	06	250	9.43	1.03	Ca Mg Na P F_2	0.38017 0.006674 0.000087 0.19472 NIL	CaO MgO Na_2O P_2O_5	0.5322 0.0110 0.0001 0.4459	0.0408
								Total	**0.9892**	
III	12	08	400	9.11	1.12	Ca Mg Na P F_2	0.42745 0.00820 0.00009 0.20958 NIL	CaO MgO Na_2O P_2O_5	0.5991 0.013 0.0001 0.48	0.0478
								Total	**1.0922**	

Table 2: Organic composition of tendons of Fish Barilius vagra at three different stages of growth. (Values are expressed as g/100g of the dry material)

Stages of Growth	Average age of 10 fishes			Crude fat	Total N	Crude Protein (N x 6.25)
	Length (cm)	Girth (cm)	Weight (g)			
I	05	04	140	0.42	15.79	98.69
II	09	06	250	0.42	15.76	98.51
III	12	08	400	0.46	15.74	98.38

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Table 2.0-a: Tendons

Stages of Growth	Total of ash, crude fat and crude protein
I	99.95
II	99.96
III	99.96

Table 3: Amino acid composition of tendons of Fish Barilius vagra at three different stages of growth. (Values are expressed as g/100g of the dry material)

Sl. No.	Amino Acid	Stage I	Stage II	Stage III
1.	Alanine	1.17	1.28	1.68
2.	Arginine	4.14	4.05	3.92
3.	Aspartic Acid	0.64	-	-
4.	Cystine	2.20	3.30	3.48
5.	Glutamic Acid	2.45	2.30	1.94
6.	Glycine	5.26	6.94	6.67
7.	Histidine	1.59	1.60	1.69
8.	Isoleucine	1.30	1.46	1.50
9.	Leucine	1.46	1.88	1.60
10.	Lysine	1.12	1.21	0.80
11.	Methionine	0.90	0.98	0.89
12.	Phenyl alanine	1.22	1.45	1.79
13.	Proline	-	-	0.48
14.	Serine*	8.84	6.62	6.27
15.	Threonine*	1.66	3.72	3.56
16.	Tryptophan	1.20	1.03	0.90
17.	Tyrosine	-	-	0.92
18.	Valine	1.01	1.03	1.10
19.	Hydroxyproline	7.26	5.28	5.22
20.	Cysteine	1.09	1.09	1.05
21.	Hydroxylysine	7.68	6.95	6.21
	Total	**52.19**	**52.17**	**51.67**

.N – Terminal residue not determined.
- $CONH_2$ group not determined.
*- Corrected for the loss during hydrolysis.

III. RESULTS AND DISCUSSIONS

Table 1 indicates that the ash content increases with age. Amount of all the minerals increases with age. Amount of Calcium and Phosphorus are found in major quantity. Content of Magnesium is minute at all the stages. The amount of Sodium is found in traces at all the stages. Fluorine is absent at all the stages. 'Ash unaccounted for' decreases with age. Moisture content also decreases from Stage I to Stage III.

Table 2 shows that the value of crude fat increases from Stage I to Stage III. Total Nitrogen hence crude protein decreases from Stage I to Stage III of ageing.

Table 3 indicates that 19 amino acids are present at the Stage I, 18 amino acids are present at the Stage II but 20 amino acids are present at the Stage III. At the Stage I and Stage II, proline and tyrosine are absent. At the Stage II, aspartic acid is also absent. While at the Stage III, only aspartic acid is absent. The total value of amino acids at the Stage I, II and III are 52.19, 52.17 and 51.67 respectively. Value of amino acids decrease from Stage I to Stage III.

Serine has maximum value, hydroxylysine comes next to it at the Stage I. At the Stage II, hydroxylsine has the maximum value followed by glycine while at the Stage III, glycine has the maximum value and serine comes next to it. Alanine, cysteine, histidine, isoleusine, phenyl alanine and valine are present in increasing order from Stage I to Stage III. Arginine, glutamic acid, tryptophan, hydroxyl proline, serine and hydroxy lysine are present in decreasing order from Stage I to Stage III.

Value of glycine, leucine, lysine, methionine threonine increases from Stage I to Stage II and then decreases from Stage II to Stage III. Value of cysteine at the Stage I and Stage II are equal. Value of methionine at Stage I is equal to the value of tryptophan at the Stage III. There is very little difference in the value of methionine at Stage I and III i.e., of 0.01. Difference in the value of histidine at Stage I and II is of 0.01. Value of histidine at Stge II is equal to the value of leucine at the Stage III. Difference in the value of valine at Stage I and II is of 0.03. Leucine content at the Stage I is equal to isoleucine content at the Stage II. Tryptophan and valine content are same at the Stage II. Lysine content at the Stage I and phenylalanine content at the Stage I have very slight difference of 0.01. Mostly all the amino acids in tendon are present in appreciable amount at all the Stages.

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