REVIEW OF RESEARCH

CHEMICAL STUDIES ON VARYING CONSTITUENTS OF EGG SHELL MEMBRANE OF PASSER DOMESTICUS (HOUSE SPARROW)

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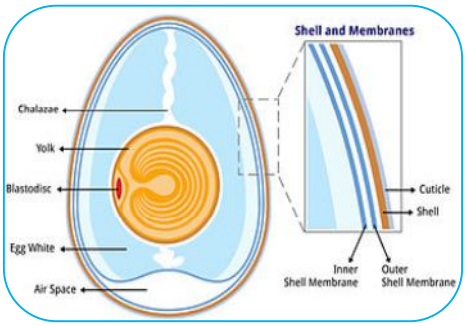


ABSTRACT:

This study covers the chemical investigation of egg shell membranes of Passer domesticus and to compare chemical composition among the inner and outer egg shell membrane. The organic matter of egg shell membranes contain protein as major constituents with small amounts of lipids and carbohydrates. Egg shell membranes are non-edible by products with little saleable value but they contain antimicrobial substances. Keeping this biochemical property in mind we have done comparative study of chemical composition of outer and inner shell membrane of Passer domesticus and reported amino acid, mineral composition, crude protein, crude fat and nitrogen of these both egg shell membrane.

KEYWORDS: *chemical investigation , lipids and carbohydrates.*

INTRODUCTION

The egg shell of Passer domesticus comprises calcified shell and shell membrane including outer and inner membrane.[1,2] These two membranes composed of a network of fibres several layers thick. Each fibre consists of a central core with a fine, fibrillar structure surrounded by fine granular sheath.[3] Between the core and sheath there were gaps spanned by delicate strands. Fibres from the inner and outer shell membrane were similar in structure but the former were thinner. Within both membranes some fibres were fused together in places by their sheaths. These membranes retain albumen and prevent penetration of bacteria.[4] Egg shell membranes are also essential for the formation of egg shell.[5] The organic matter of egg shell and egg shell membranes contain protein as major constituents with small amount of lipids and carbohydrates.[6-10]

Although the structure of the egg shell membranes is well established, there is no correspondingly detailed knowledge about the difference in concentration of organic constituents, minerals and fat between the outer and inner egg shell membrane.[11,12]

EXPERIMENTAL

The shell membrane that covers the conic layer of the egg shell can block the view of the inner part of the egg shell. The connection between the membrane and conic layer is very tight[13] and thus removal of membrane from the conic layer by mechanical method is impossible. Removal of organic membrane requires chemical methods. Use of acids in this case is not recommended since calcite reacts with various acids.[14] Therefore we used 5% NaOH to remove the membranes.[15] Samples were incubated in micro tubes with 5% NaOH placed in boiling water bath for 10 to 20 minutes. Moisture and ash content of egg shell membrane was determined following at 500^{0}C in a muffled furnace for four hours.

The amino acids were analysed using the HPLC method.[16] Minerals were analysed by the standard AOAC method.[17] Data were analysed according to a 3 (energy) × 3 (protein) factorial design with energy and protein levels featuring as main factors.[18]

RESULTS AND DISCUSSION

Total mineral, moisture and ash contents of Passer domesticus are given in table 1 and 2 respectively.

Calcium is the Chief Mineral element in the outer and inner shell membranes. Outer shell membrane contains slightly more calcium than the inner shell membrane and so their mineral oxide. Mineral magnesium, phosphorus, sodium and their corresponding oxides are found in traces in the outer and inner shell membranes. Minerals magnesium and sodium are found in more amount and phosphorus is in less amount in outer shell membrane than inner one and their corresponding oxides. Moisture content is found in less amount but ash content is greater amount in the outer shell membrane than the inner shell membrane.

Organic Constituents - Crude fat and crude protein contents of outer and inner shell membranes are given in table 3 and 4. Component amino acids are given in the table 5 and 6. Table 3 and 4 indicates that crude fat, crude protein and total nitrogen of outer shell membrane are found in greater amount than the inner shell membrane of egg. This can be attributed to the greater absorption of fat in the outer shell membrane.

Component amino acids - Table 5 and 6 clearly shows that the total amino acids present are eighteen. Total amino acid contents of the outer shell membrane of egg is higher than the inner shell membrane of egg. That is why outer shell membrane appear to be strong developed than the inner shell membrane.

Amino acids cystine, histidine, orginine, serine, glycine, glutamic acid, proline, methionine and laucine are present in greater amount whereas lysine, hydroxy proline, aspartic acid, threonine, alanine, tyrosine, valine and phemylalanine are present in less amount in the outer and inner shell membranes of egg. Amino acids isoleucine is found in very small quantity. Amino acide cysteine and tryptophan are absent in the outer and inner shell membranes.

Amino acids cystine, histidine, serine, glycine, valine, proline, methionine, isoleucine, and leucine are present in greater amount whereas arginine, aspartic acid, glutamic acid and alanine are present in less amount in outer shell membrane than the inner shell membrane. Amino acids lysine, hydroxyproline, threonine, tyrosine and phenylalanine are present in equal amount in both shell membranes.

Table 1
Mineral Composition of outer shell membrane of egg of Passer domesticus
(Values are expressed as gram/100 gram of the dry matter)

Moisture	Ash	Minerals	Values	Mineral Oxide	Values	Ash Unaccounted for
15.58	1.43	Ca Mg P Na	0.5380678 0.0053322 0.0050898 0.0003151	CaO MgO P_2O_5 Na_2O	0.753290 0.008887 0.0116573 0.0004247	0.655741
				Total	**0.774259**	

Table 2
Mineral Composition of inner shell membrane of egg of Passer domesticus
(Values are expressed as gram/100 gram of the dry matter)

Moisture	Ash	Minerals	Values	Mineral Oxide	Values	Ash Unaccounted for
16.20	1.40	Ca Mg P Na	0.5220339 0.0049831 0.0052203 0.0002847	CaO MgO P_2O_5 Na_2O	0.7308475 0.0083052 0.0119562 0.0003837	0.6485074
				Total	**0.7514926**	

Table 3
Crude fat, total nitrogen content and crude protein of outer shell membrane of egg of Passer domesticus
(Values are expressed as gram/100 gram of the dry matter)

Crude Fat	Total Nitrogen	Crude Protein (N×6.25)
0.65	15.60	97.50

Total of Ash + Crude fat + Crude protein = 99.58

Table 4
Crude fat, total nitrogen content and crude protein of inner shell membrane of egg of Passer domesticus
(Values are expressed as gram/100 gram of the dry matter)

Crude Fat	Total Nitrogen	Crude Protein (N×6.25)
0.63	15.58	97.375

Total of Ash + Crude fat + Crude protein = 99.405

Table 5

Components amino acids of outer shell membrane of egg of Passer domesticus

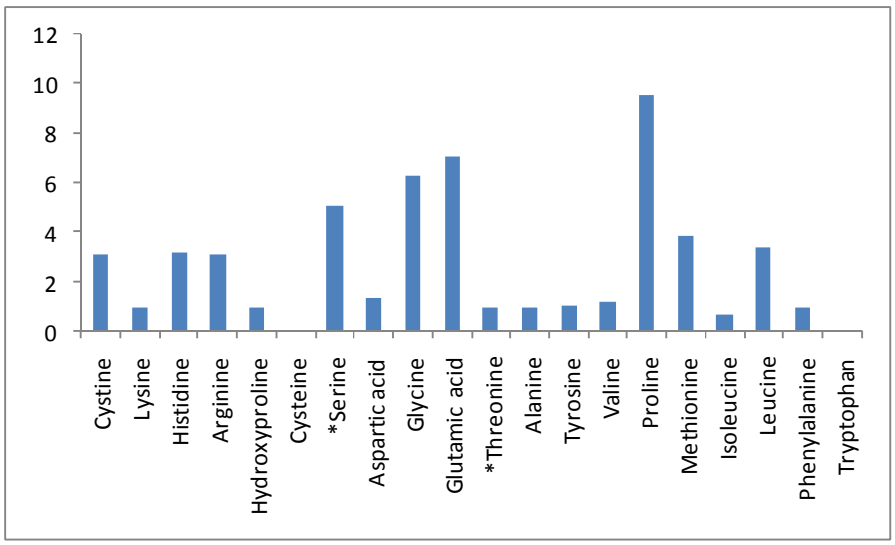
(Values are expressed as gram/100 gram of the dry matter)

S.No.	Amino Acid	Values
1	Cystine	3.1
2	Lysine	1.0
3	Histidine	3.2
4	Arginine	3.1
5	Hydroxyproline	1.0
6	Cysteine	0.0
7	*Serine	5.1
8	Aspartic acid	1.4
9	Glycine	6.3
10	Glutamic acid	7.1
11	*Threonine	1.0
12	Alanine	1.0
13	Tyrosine	1.1
14	Valine	1.2
15	Proline	9.6
16	Methionine	3.9
17	Isoleucine	0.65
18	Leucine	3.38
19	Phenylalanine	1.0
20	Tryptophan	0.0
	Total	**54.13**

N – Terminal residue not determined

$-CONH_2$ Not determined

* Corrected for the loss during hydrolysis.



Component amino acids of outer shell membrane of egg of Passer domesticus

Table 6

Components amino acids of inner shell membrane of egg of Passer domesticus

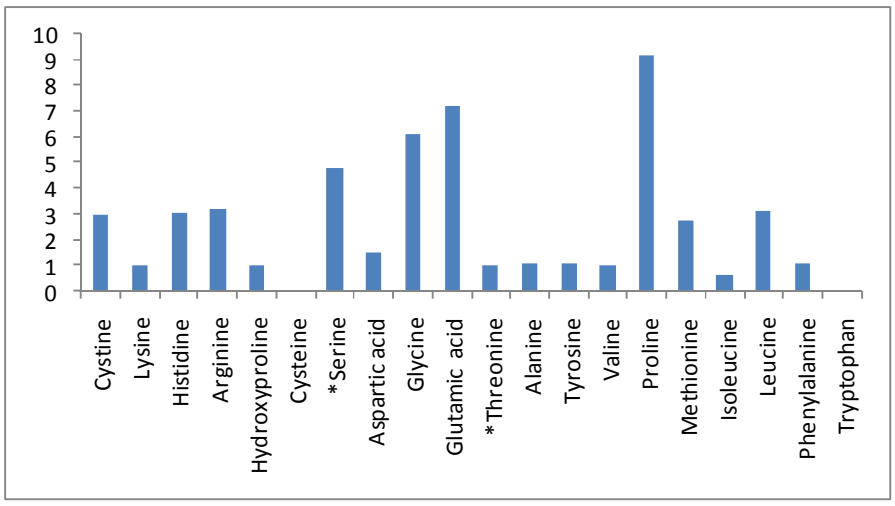
(Values are expressed as gram/100 gram of the dry matter)

S.No.	Amino Acid	Values
1	Cystine	3.0
2	Lysine	1.0
3	Histidine	3.1
4	Arginine	3.2
5	Hydroxyproline	1.0
6	Cysteine	0.0
7	*Serine	4.8
8	Aspartic acid	1.5
9	Glycine	6.1
10	Glutamic acid	7.2
11	*Threonine	1.0
12	Alanine	1.1
13	Tyrosine	1.1
14	Valine	1.0
15	Proline	9.2
16	Methionine	2.8
17	Isoleucine	0.63
18	Leucine	3.12
19	Phenylalanine	1.10
20	Tryptophan	0.0
	Total	**51.85**

N – Terminal residue not determined

$-CONH_2$ Not determined

* Corrected for the loss during hydrolysis.



Component amino acids of inner shell membrane of egg of Passer domesticus

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