CHEMICAL COMPOSITION OF SEPIA ORIENTALIS AND LOLIGO VULGARIS

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The chemical constituents of Sepia orientalis and Loligo vulgaris weighing between 200–300g have been studied. It has been found that these species could be classed as high protein and low fat food and that these are good sources of calcium, phosphorus, iron and moderate amounts of B-group vitamins.

Introduction

As there is very little data available on the proximate composition of Sepia and Squid, the present work was undertaken.

The two species of marine cephalopod molluscs collected from Bombay coast commonly known as Cuttlefish for Sepia-orientalis and Squid or Loligo for Loligo vulgaris, have been analysed for their proximate composition, minerals and vitamins. Digestibility of protein meal was also studied.

Airan and Joshi (1952-53) have reported the distribution of sulphur and nitrogen in Sepia.

Materials And Methods

Ten samples of each species weighing between 200-300 g were collected from Sasson Docks and brought to the Laboratory immediately. The samples were washed, cut open and the body muscle was removed and blended thoroughly. The homogenised sample was analysed for the different constituents as follows:

Moisture and ash by A.O.A.C. (1950) method and total protein content was determined by Kjeldhal's method (N x 6.25) (1950).

Fat was soxhlet extracted with diethylether and glycogen estimated by the method suggested by Montgomery (1957).

Calcium, phosphorus, iron contents were found out by the methods of A.O.A.C. (1945), Sterges et. al. (1950),Moss & Mellon (1952) respectively. Sodium and potassium were determined from ash solution directly on Dr. Lang's flame photometer.

Thiamine, riboflavin, niacin and ascorbic acid were determined respectively by the method of Jansen (1936), Scott et. al. (1946), Sweeny (1951) and Robinson and Stotz (1945).

The nitrogen distribution of the protein meal was determined by the Van Slyke's phosphotungstic acid comprehensive method (1911, 1912).

The rate of digestion of protein meal *in vitro* was measured with pepsin trypsin and pepsin followed by trypsin *in vitro*.

The rate of release of amino acids measured by Kunitz procedure (1947) was compared with that of casein. Results are given in Table I, II and III.

Results And Discussion

The values of moisture content of the fresh meat of both the species studied here are 80. 12 and 79. 73/100 g of wet muscle. The values for moisture and ash agree with those reported by Kinji Endo, Masao Hujita and Wataru Simidu (1962) and Ferreyra Risso (1953).

Lyso obtained 73. 4% as protein on dry weight basis for cuttlefish whereas Ferreyra (1953) for L. *Gahi* reported 15. 724% on wet basis. Their values are lower than those obtained in our experiments.

The fat content reported by Lyso (*1961*) was a little higher than what is reported here.

Glycogen values obtained here are little lesser than the values obtained by Nexci Alferrano (1954).

Values for Calcium, phosphorus are higher but the values for iron are lower compared to the values reported by Ferreyar R. L. (1953) for Squid L. *gahi* and for calcium aud phosphorus from cuttlefish by Lyso (1961). The values reported by Saavedra (1949) for phosphorus and iron are lower but the values for calcium are in good agreement with the results obtained here. The values for potassium content in both the species in this investigation are in the range with the values obtained by Aline Bernard (1931) for mantle muscle of Sepia officinalis and Octopus vulgaris (6. 23 and 4. 84 g/ 100 g fresh muscle). And sodium content in Sepia orientalis and Loligo vulgaris is 1.87 and 1.49% on dry weight basis.

Ascorbic acid values obtained here are in range with the values expressed by A. J. A. de Gouveia and Alfredo P. Gouveia 1951 in the meal of L. vulgaris.

As regards the nitrogen distribution the total nitrogen values and nonprotein nitrogen (NPN) values are ranging in between 2. 0 - 3. 5 g % and 715- 884 mg % respectively in different species of Squids by Kingi Endo, Masao Hujita and Wataru Simidu (1962) are comparable with the results obtained here.

Values for humin nitrogen, basic nitrogen and nonbasic nitrogen are in agreement with the results obtained for Sepia by Airan and Joshi (1952-53) while the amide nitrogen shows variations in the results but these results are comparable with the results obtained by Valanju and Sohonie (1956) in different varieties of fishes and also by Ambe and Shonie (1953) .

The results for the digestion *in vitro* showed that the rate of digestion of the protein meal was more or less comparable with that of casein. Machiyo Nomura (1956) found that fresh cuttlefish meat is digested better than that cooked with pepsin.

References

Airan. J. W. & Joshi J. V. (1952 - 53), J. of the Univ. Bombay, 21 .

A. J. A. de Gouveia and Alfredo P. Gouveia (1951) , Rev. faculdade ciene, Univ. Coimbra, 20, 5- 20.

Aline Bernard (1931), Compt. Rend. Soc. Biol. 108, 887-8.

Ambe and Shonie (1953), Ind. J. Fisheries, Vol .4, No.1 .

A. O. A. C. (1950), 7 th Ed. 296.

A. O. A. C. (Kjeldhal's Method) (1950) 7th Ed., 13.

Ferreyra R.L. (1953), Anales. Fac. Farm. y. bioquim; Univ. nacl mayor San Marcos (Lima paru), 4, 85-9.

Jansen (1936), Rec. Triv. Chim payo Bas, 66, 1046.

Kinji Endo, Masao Hujita and Wataru Simidu (1962), Bull. Jap. Soc. of Sci. Fish. Vol. 28, No. 8.

Kunitz M,. (1947), J. Gen. Physiol. 30, 291.

Lyso A., (1961), Landbrukshgsk inst. Husdyrnoer, Foringsoer. Soerterykk No. 206, 65, 508-5o9.

Machiyo Nomura (1956), J. Home. Econ (Japan), 6, 160-4.

Montgomery (1957), Arch. Biophy· 67, 378.

Moss and Mellon, (1952),Ind. Eng. Chem. Anal. Ed. 14, 862.

Nexci Alferrano H. (1954), An. Fac. Farm. Bioquim. Lima, 5, 194 - 196.

Rehman A. A (1955), proc. Ind. Acad Sci. 62, (B), 188 - 194 .

Robbinson and Stotz (1945), J. Biol. Chem. 160 - 217.

Saavedra S. J. (1949), Rev. Fac. Farm. Bioquim, Lima, 10, 142- 145.

Scott et. al. (1946), J. Biol. Chem. 16E, 65.

Sterges et al. (1950), J. A. O. A. C. 33, 114.

Sweeny (1951) J. A. O. A. C. 34, 380.

Valanju and Sohonie (1957), Ind. J. Med. Res. 45, 1,

Van Slyke D. D. (1911), Biol. Chem 10, 15.

Idem (1912), Ibid, 12, 295.

TABLE I. CHEMICAL COMOPOSITION OF SEPIA ORIENTALIS AND LOLIGO VULGARIS

Name of Species	Sepia orientalis	Loligo vulgaris	Values Reported by other workers in different species					
g / 100 g fresh muscle)			1	2	3	4	5	6
Moisture (on dry weight basis)	80.12	79.73	76.5-80.0	80.93	–	80.0	–	–
Protein Crude (N×6.25)	80.21	81.50	–	15.724	73.4	18.0	–	14.94-19.25
Fat	3.90	4.00	–	0.858	4.5	0.75	–	0.19-3.76
Glycogen	3.96	3.71	–	–	–	–	–	–
Ash	8.41	7.4	–	1.431	7.8	1.15	–	–
Calcium	0.66	0.83	–	99	0.11	0.17	–	–
Phosphorus	2.92	2.71	–	219	0.41	0.38	–	–
Iron	0.057	0.074	–	33.7	–	13.0	-	-
Sodium	1.87	1.49	-	-	-	-	-	-
Potassium	2.56	2.02	-	-	-	-	6.23-4.86	-
Thiamine ug%	46.8	39.5	-	-	-	-	-	-
Riboflavin mg%	4.58	3.93	-	-	-	-	-	-
Niacin mg%	6.12	5.71	-	-	-	-	-	-
Ascorbic acid mg%	26.41	23.02	-	-	-	-	-	1.94-5.07

1. Kinji Endo, Masao Hujita, Wataru Simidu, (1962), Jap. Soc. of Sci. Fish. Vol.28, No. 8.
2. Ferreyra R. L. (1953), Anales. Fac. Farm. y. bioquim; Univ. nacl mayor San Marcos (Lima Peru), 4, 85-9.
3. Lyso A. (1961), Landbrukshgsk Inst. Husdyrnoer, Foriagsloer. Soerterykk No. 206, 65, 508-509.
4. Saavedra S. J. (1949), Rev. Fac. Farm. Bioquim., Lima. 10, 142-145.
5. Aline Bernard (1931), Compt. Rend. Soc. Biol. 108, 887-8.
6. A. J. A. de Gouveia and Alfredo P. Gouveia (1951), Rev. faculdade Ciene Univ. Coimbra, 20, 5-20.

TABLE II NITROGEN DISTRIBUTION IN PROTEIN MEAL

Name of Species	Sepia orientalis	Loligo vulgaris
Total N_2	15.41	15.51
Humin N_2 (as % of T. N.)	1.55	1.33
Amide N_2 (do)	9.16	11.41
Basic N_2 (do)	32.60	34.50
Nonbasic N_2 (do)	56.71	53.65

The values represent the mean of analyses of three different samples.

TABLE III NITROGEN DISTRIBUTION FROM CUTTLEFISH AND SQUID MUSCLE

(g/100 g on fresh weight muscle)

Name of Species	Sepia Orientalis	Loligo Vulgaris
Non-protein N_2	0.839	0.824
Water-soluble N_2	1.490	1.630