Coldwater Fish as Health Food

Coldwater fishes as healthy food believed to have greater nutritional significance due to their richness in proteins, essential amino acids, fatty acids, vitamins and minerals. This would play a pivotal role in mitigating protein deficiency/ malnutrition in upland region.

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Fish in human nutrition

Fish plays a major role n human nutrition. Importance of fish as a source of high quality, balanced and easily digestible protein is now well understood. Besides, it is also a well-known source of polyunsaturated fatty acids specially, omega-3 fatty acids such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) which play a central role in the physiology of living system. Regular consumption of omega-3 fatty acids significantly lowers triglycerides and often raises high density lipoproteins levels, thereby diminishing the risk of heart/cardiovascular diseases. Fish is also known to be a good source of several other nutrients like macro and micro minerals and vitamins and hence, it is being accepted as a healthy food. Fish is a rich source of calcium and phosphorus and calcium deficiency in children produces decreased growth rate, negative calcium balance of calcium from bones. Phosphorus is very essential for the formation of bone and teeth. Other micro mineral like coppers, iodine, manganese, cobalt, zinc, fluorine, selenium etc are vital for maintaining the physiological functions of the body. Vitamin A, D and E as well as thiamin, riboflavin and niacin are abundantly found in fish and are important in normal vision, skeletal growth and many other physiological functions including immunity and disease resistance.

Nutritional significance of coldwater fishes

Coldwater fishes namely rainbow trout, snow trout, golden mahseer, chocolate mahseer and common carp etc are important food in the rural and urban upland population in India. Most of the population residing in hilly areas are fish eaters. They are widely accepted as healthy food because of their richness in amino acid, fatty acids, vitamins and minerals. Coldwater fishes like trout and mahseer contain high PUFA compared to other fresh water fishes. The DHA and selenium content are also higher in them.

Nutrient composition of coldwater fishes

Proximate composition of coldwater fishes

Species	Crude protein	Crude ash	Crude fat	Moisture
Golden mahseer	20.00^{c}± 1.000	1.45^{b}± 0.045	6.15^{d}±0.006	72.38^{b}±0.024
Rainbow trout	19.44^{bc}± 0.07	1.37^{b}±0.08	5.18^{c}±0.22	74.00^{c}±0.30
Snow trout	17.05^{a}±0.72	2.88^{d}± 0.59	6.15^{d}± 0.74	70.12^{a}±0.98
Chocolate mahseer	18.75^{b}± 0.11	1.21^{a}± 0.09	3.33^{a}± 0.27	76.20^{e}±0.56
Common carp	17.5^{a}± 0.48	2.33^{c}± 0.21	4.54^{b}± 0.56	75.05^{d}±0.32
P value	0.01	0.01	0.01	0.01

Mineral composition of coldwater fishes

Species	Sodium	Potassium	Calcium	Iron	Manganese	Zinc	Selenium
Golden mahseer	234.33^{d}± 4.04	1252.0^{e}±8. 54	405.66^{b}±16 .26	1.28^{b}±0 .04	0.16^{b}±0 .02	1.19^{a}±0 .03	0.74^{b}±0 .05
Rainbow trout	208.00^{c}± 9.00	1447.00^{e}± 7.55	359.33^{a}±12 .01	5.17^{e}±0 .02	0.19^{d}±0 .01	1.79^{c}±0 .02	1.66^{d}±0 .03
Snow trout	146.00^{b}± 2.06	1159.00^{b}± 5.99	413.00^{c}±6. 43	0.68^{a}±0 .34	0.35^{e}±0 .09	2.71^{d}±0 .23	1.03^{c}±0 .31
Chocolate mahseer	105.00^{a}± 5.02	808.00^{a}±7. 47	1172.00^{e}±2 1.26	1.87^{d}±0 .02	0.09^{a}±0 .02	1.59^{b}±0 .05	1.87^{e}±0 .05
Common carp	404.00^{e}± 5.02	1266.00^{d}± 8.37	508.00^{d}±4. 65	1.37^{c}±0 .01	0.18^{c}±0 .02	4.77^{e}±0 .03	0.43^{a}±0 .05
P value	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Fatty acid composition of coldwater fishes

Species	SSFA	SMUFA	SPUFA	Sn-3	Sn-6	Sn-3/ Sn-6
Golden mahseer	52.91 ^{d}±0.16	28.05 ^{b}±0.08	18.35 ^{a}±0.06	8.68 ^{a}±0.03	9 .67^{b}±0.05	0.90 ^{b}±0.01
Rainbow trout	34.51 ^{a}±0.09	35.88 ^{d}±0.15	31.39 ^{d}±0.17	13.62 ^{c}±0.08	17.77 ^{d}±0.12	0.77 ^{a}±0.01
Snow trout	42.73 ^{b}±0.12	37.14 ^{d}±0.18	19.43 ^{b}±0.09	16.18 ^{d}±0.06	3.25 ^{a}±0.02	4.98 ^{d}±0.03
Chocolate mahseer	44.25 ^{b}±0.20	23.90 ^{a}±0.07	31.22 ^{d}±0.14	21.49 ^{e}±0.14	9.73 ^{b}±0.04	2.21 ^{c}±0.01
Common carp	46.13 ^{c}±0.09	31.22 ^{c}±0.12	25.00 ^{c}±0.16	11.13 ^{b}±0.06	13.87 ^{c}±0.08	0.80 ^{ab}±0.01
P value	0.01	0.01	0.01	0.01	0.01	0.01

Coldwater fish species manifest as high quality nutrient source in terms of well balanced essential amino acids, n-3 & n-6 PUFA, micro and micro minerals and vitamins. Being a rich source of n-3 PUFA and other nutrients, coldwater fish consumption could ensure nutritional security and reduce the risk of cardiovascular as well as nutritional deficiency diseases among Indian upland population.

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