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Sources of Carotene and Vitamin A in Lake Province, Tanganyika.

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Vitamin A deficiency is still one of the most prevalent and devastating nutritional diseases in certain parts of the world (Kinney & Follis, 1958). It is made all the more important by the facts that the eye is the part of the body most frequently affected, and that the most severe changes which are known as xerophthalmia and keratomalacia, frequently leading to blindness, occur usually in very young children.

Whilst the condition is most severe and widespread amongst the rice-eating populations of South-East Asia, it has become evident from surveys carried out in recent years that it also occurs in parts of Africa, especially where the red palm *(Eloesis guineensis)* does not grow. Such areas are the whole of North Africa, Northern Nigeria, Ruanda Urundi, and the drier parts of East Africa. McKenzie (1939) recognised the problem of night blindness in Central Tanganyika 20 years ago, and surveys carried out recently from this Institute in the same area have shown that the whole spectrum of vitamin A deficiency, from keratomalacia in young children to xerosis conjunctivae, Bitot's spots, and night blindness in older children and young adults, still constitutes an important problem. Plasma carotenoid and vitamin A values are generally low in Mwanza (McLaren, 1959).

Experience gained in recent years in the field of feeding programmes in under-developed countries has shown the importance of developing locally available foodstuffs, and the present work has been undertaken with a view to combatting the vitamin A deficiency problem in the Lake and Central Provinces of Tanganyika.

1. The vitamin A content of the livers of Lake Victoria fish.

The fish were obtained within an hour or two of being caught, and in many instances were still breathing when brought to the laboratory. Each fish was weighed and measured from tip of head to commencement of tail. The whole liver was dissected out and weighed, and then weighed fractions were taken

TABLE 1.

Vitamin A content of livers of fish commonly found at the southern end of Lake Victoria.

Scientific name	Local name	No. of observations	Mean length (cm)	Mean body weight (g)	Mean weight liver (g)	Mean concentrat. vitamin A (i.u./g)	Standard Deviation
Schilbe mystus	nembe	7	14.0	54.3	0.49	1659	893
Labeo victorianus	ningu	5	18.8	110.0	1.18	1197	669
Haplochromis spp.	furu	8	10.4	55.0	0.85	2846	2141
Tilapia esculenta	ngege	6	17.5	147.5	1.70	1689	770
Synodontis victorianus	gogogo	6	11.5	48.0	1.30	4375	6999
Alestes nurse	soga	6	13.6	76.0	0.82	5446	3090
Tilapia variabilis	mbiru	6	18.0	260.0	2.38	2070	1134
Mormyrus kannume	mbete	4	22.2	300.0	4.38	3902	3205
Bagrus docmac	mbofu	7	27.2	1110.0	6.23	4363	1152
Clarias spp.	mumi	6	27.9	621.1	5.40	5686	3362
Protopterus aethiopicus	kambari mamba	1	42.0	2500.0	34.60	725	—

TABLE 2. *Carotene content of green leaves.*

Scientific name	Local name	No. of observations	State	Mean carotene fresh leaves (i.u./100 g)	Standard Deviation
Manihot utilissima Pohl.	muhogo	8	old: uncooked	12,800	368
Manihot utilissima Pohl.	muhogo	8	old: cooked 1 hr.	6,550	147
Manihot utilissima Pohl.	muhogo	8	young: uncooked	7,530	188
Manihot utilissima Pohl.	muhogo	8	young: cooked ½ hr.	7,010	206
Cucumis sativa L.	matango	8	uncooked	8,150	423
Cucumis sativa L.	matango	8	cooked 1 hour	4,540	182
Cucurbita spp.	nyamwanga	8	uncooked	10,050	463
Cucurbita spp.	nyamwanga	6	cooked 1 hour	9,050	512
Vigna unguiculata Walp.	kunde	8	uncooked	9,510	403
Vigna unguiculata Walp.	kunde	6	cooked 1 hour	5,010	91
Amaranthus dubius Mart.	mchicha (native)	8	uncooked	10,690	552
Amaranthus dubius Mart.	mchicha (native)	8	cooked ½ hour	8,000	290
Amaranthus cruentus L. var. *paniculatus* (L.) Thellg.	mchicha (foreign)	7	uncooked	6,170	345
Amaranthus cruentus L. var. *paniculatus* (L.) Thellg.	mchicha (foreign)	9	cooked ½ hour	5,080	259
Phaseolus vulgaris L.	maharage	6	uncooked	8,070	197
Phaseolus vulgaris L.	maharage	6	cooked 1 hour	6,270	152
Ipomoea batatas (Linn.) Lam.	matembele	6	uncooked	5,830	164
Ipomoea batatas (Linn.) Lam.	matembele	6	cooked ½ hour	3,970	156
Gynandropsis gynandra (L.) Briq.	mgagani	8	uncooked	7,550	293
Gynandropsis gynandra (L.) Briq.	mgagani	8	cooked 1 hour	8,090	576
Gisekia pharnaceoides L.	imbala	4	uncooked	4,600	83
Gisekia pharnaceoides L.	imbala	4	cooked ½ hour	2,800	111
Corchorus trilocularis L.	lunani	6	uncooked	5,000	238
Corchorus trilocularis L.	lunani	6	cooked ½ hour	4,150	91
Sesamum angustifolium Engl. forma	mlenda	2	uncooked	11,600	0
Sesamum angustifolium Engl. forma	mlenda	2	cooked ½ hour	5,500	56

for duplicate determination of the vitamin A content by the antimony trichloride method.

Table 1 shows the details of the 11 species of fish which are commonly found at the southern end of Lake Victoria. The extreme variability of liver concentration of vitamin A is shown by the very large standard deviations. Different tribes have different preferences for these fish. The Wasukuma and other tribes of Lake Province eat most of them, but do not like *Mormyrus*, *Synodontis*, or *Protopterus*.

2. *The carotene content of certain green leaves.*

The 12 kinds of green leaves examined are all readily available most of the year near the lake. Fresh samples of the leaves weighing 1 gram were used, and the carotene was separated on an alumina adsorption column, following the method described by Booth in Moore (1957).

Table 2 gives details of the carotene content of the leaves both fresh and after cooking for various periods. The leaves were cooked in the laboratory with amounts of water and for lengths of time similar to those commonly used by the people of this area, although these will naturally vary considerably in practice. In all instances except one, there was from slight to considerable loss of carotene after cooking. In the case of *Gynandropsis gynandra* (L.) Briq. there appeared to be a very slight increase in the mean value after cooking, and it may be that carotene was made available by cooking for of all the leaves examined, this one requires the most cooking according to local experience.

Summary.

1. The vitamin A content of the livers of Lake Victoria fish, and the carotene content of certain green leaves have been determined.
2. These are shown to be excellent sources of vitamin A readily available to the people of Lake and Central Provinces of Tanganyika, where vitamin A deficiency is common.

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