"Wildlife" should certainly be thought of as including marine and fresh-water fisheries as well as the terrestrial vertebrates; but some do not so understand it. In any case, the leadership of the brilliant group of technical and administrative men who have accomplished so much in the field of the commercial fisheries is appreciated. They deserve much credit from the public. The Fisheries Coordination Office, in placing a large number of trained men in the field and in Washington, dealing directly with the commercial production of fish and fish products, is entitled to the utmost support and cooperation.

Even the fresh-water ponds which are so conspicuous a feature of the work of some of the state conservation departments, extension services, the Soil Conservation Service and Agricultural Adjustment Agency activities in many parts of the United States are not to be depreciated. The figures are large as to potential production of a supplemental food supply from these farm ponds. Whether or not actual advance is made along these lines depends to a considerable extent upon the activities and leadership of technical men who are interested in inland fisheries and upon the provision of funds with which they can work. Their success in this field, supported by an intelligent government and an enlightened public opinion, may mean an appreciable contribution to the nation's food.

MILITARY NATURAL HISTORY

E. L. Palmer and others have emphasized the place of the military naturalist at this particular period—the man who knows something about the birds, mammals, reptiles, amphibians, fishes, worms and insects, as well as the plants of the numerous war fronts on which United Nations' soldiers are fighting. Some of the wildlife specialists are unusually well qualified to assist the Army, Navy and other branches in the preparation of manuals, instructions and directions for protection from inimical plants and animals and utilization of those which can be put to use.

In this connection it is of interest that nature is not unfriendly to those who know something about her. Even the arctic environment was pleasurable and livable to Stefansson. The terrible winter climate of continental Europe was friendly to the Russians, who understood it and used it, but inimical to the Germans, who did not understand it so well. The Japanese, by adapting themselves to their environment, were able to survive and conquer in the Malayan Peninsula. The war work of biologists is already extensive. The Special Services Branches of Army and Navy, the Desert, Arctic and Tropical Services of the Army Air Corps, the Sanitary Corps of the Army, the Quartermaster Corps, the Signal Corps, the Naval Research Laboratories and many others are using biologically trained men. But the work done and human resources in use are only a beginning.

POST-WAR ADJUSTMENTS

Truly, among the wildlife and conservation problems which will arise after the war will be many dealing with fish and game, but others also will require attention and specialized information. Wildlife specialists should cooperate in the outlining of post-war plans. Among these are included collaboration, through appropriate governmental departments and otherwise, in the authorship and administration of treaties for the protection and proper management of international wildlife and fisheries resources, including the products of the sea (whales, marine fishes, fur seals, etc.), wild birds and mammals.

In these considerations there is no thought of encroachment by this society on the work of others but rather the need for expansion of our understanding of what is meant by conservation, and for more thoroughgoing cooperation between biologists.

Paraphrasing, in general conservation terms, a recent statement by Shirley,[4] it may be confidently asserted that the basic production resources, including minerals, soils, waters, range forage, forests, fisheries, wildlife and human life, are indispensable, whether in peace or war. Sustained yield management of all the renewable natural resources to meet not only our own needs but those of other countries is one of the essentials for the establishment of an enduring people's peace. This will require some measure of public control (in which local communities as well as higher levels of government should participate), technical skill and recognition of the economic and ecological interdependence of the nations of the world. An immense field of service lies before conservation specialists, including wildlife workers and many others, who will be available and trained for leadership in organizing and manning the division of natural resources of a great world economic federation.

VITAMINS IN EDIBLE SOYBEANS

By Dr. PAUL R. BURKHOLDER

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PRESENT world events forebode a general scarcity sooner or later of foods of animal origin, such as milk, cheese, eggs and meat, which are important in our diet because of their proteins and vitamins. In the future it may become necessary for us to rely

[4] *Journal of Forestry*, 41: 83, February, 1943.

more and more upon plant foods as substitutes for animal proteins. The cereals and legumes lend themselves in this role because they possess a high protein content and can be made to yield large crops within a single year.

Cereals, such as wheat, are already supplying a significant amount of protein in our diet. Among the legumes, soybeans constitute a rich source of proteins which by chemical analysis have been shown to contain in near optimum proportions the amino acids essential for the nutrition of animals and man. The excellence of soybean flour has been demonstrated recently in extensive feeding experiments with animals.[1] It has been known for a long time that cooking greatly improves the nutritional value of leguminous protein, and recent researches on soybeans amply confirm this fact.[2] Although soybeans and the numerous food products which can be made from them are eminently desirable from the nutritional view-point, their use as food thus far in America and Europe has been limited almost entirely to specialty items. That millions of Chinese have lived on a diet of rice and soybeans for thousands of years constitutes a great natural experiment from which much can be learned. In the future when large quantities of edible soybeans become available, and when food producers and the general public are educated to appreciate the qualities of desirable kinds of *Soja,* the various products made from them may play a more prominent role in the food supplies of Occidental peoples as they have for centuries past in the diets of Orientals.

It is now recognized that soybeans possess desirable qualities not alone by their contribution of amino acids for nourishing the body, but also through their stores of fatty materials and accessory growth factors —the vitamins. In studies on the choline content of many kinds of animal and plant products, Engel[3] found that soybeans rank higher than leafy vegetables, root crops or cereal grains in this important methyl compound. Hafner[4] has recently reported favorably upon the vitamin B complex and protein in soybean flour. Although several studies[5, 6, 7] have provided isolated bits of information about the vitamin content of soybeans, the subject has received less attention than it deserves.

The present paper constitutes a brief report on the analyses obtained for seven vitamins in six varieties of edible soybeans harvested as fresh green beans and also as dry mature beans. The soybeans supplied through the kindness of the grower, Everett Clark, of the Associated Seed Growers, Milford, Conn., were harvested in the autumn of 1942. Tests for ascorbic acid were made promptly on materials ground in metaphosphoric acid. Samples of the green beans were dried rapidly at 70° C. The dehydrated fresh material and mature seeds were stored in the laboratory until assays for the B vitamins were performed in April, 1943.

TABLE 1

VITAMINS IN EDIBLE VARIETIES OF SOYBEANS. DATA FOR B VITAMINS ARE GIVEN AS MICROGRAMS PER GRAM OF DRY MATTER. ASCORBIC ACID IS EXPRESSED AS MILLIGRAMS PER GRAM OF GREEN RAW BEANS

Variety	Thiamine		Riboflavin		Pyridoxine		Biotin		Niacin		Pantothen		Ascorbic acid
	G*	M†	G	M	G	M	G	M	G	M	G	M	G
Aoda	5.6	9.6	4.1	2.3	2.9	6.3	0.66	0.63	46	20	11	11	0.24
Bansei	6.6	8.4	3.5	2.4	3.3	6.2	0.42	0.62	44	23	12	12	0.21
Giant Green	7.6	8.5	3.6	2.1	4.2	7.4	0.52	0.69	26	19	11	14	...
Hokkaido	6.6	9.5	3.0	2.3	3.2	6.6	0.54	0.51	37	20	12	11	0.18
Toku	5.6	9.0	3.1	2.1	3.5	5.4	0.66	0.72	40	19	12	12	0.19
Willomi	6.2	9.2	4.5	2.4	3.9	6.3	0.43	0.49	48	20	13	12	0.23
Means for six varieties	6.4	9.0	3.5	2.3	3.5	6.4	0.54	0.61	40	20	12	12	0.21

* G = Green or immature.
† M = Mature.

Both the green and the mature beans were ground in a small Wiley mill to facilitate extraction of the water-soluble vitamins. For the purpose of obtaining extracts, 0.5 gm of the ground material was placed in 30 ml of buffer solution at pH 4.5. The buffer solution contained 3.75 gm glacial acetic acid and 5.0 gm anhydrous sodium acetate per liter. Twenty milligrams of papain and 20 mg of Takadiastase were added to each half gram sample, and the mixture was incubated at 37° C. for 24 hours. A few drops of benzene were used to inhibit growth of microorganisms. The digested material was heated in steam at 100° C. for 30 minutes, made up to a volume of 50 ml, filtered with supercel in a Büchner funnel and subsequently extracted with ether to re-

[1] D. Breese Jones and J. P. Divine, *Soybean Digest,* September, 1942.
[2] J. W. Hayward and F. H. Hafner, *Poultry Sci.,* 20: 139, 1941.
[3] R. W. Engel, *Jour. Nutr.,* 25: 441, 1943.
[4] F. Hafner, *Bakers Digest,* 16: 247, 1942.
[5] Lela E. Booher *et al.,* U.S.D.A. Circular No. 638, 1942.
[6] J. O. Lampen *et al., Jour. Nutr.,* 23: 11, 1942.
[7] R. W. McVicar and G. H. Berryman, *Jour. Nutr.,* 24: 235, 1942.

move fatty substances which might have interfered with the microbiological assays. A separate series of analyses, in which the ether extraction was omitted, yielded a similar set of results. Pyridoxine was assayed with a yeast growth method.[8] Riboflavin, biotin, niacin and pantothenic acid were tested in accordance with methods published by R. J. Williams *et al.*[9] Thiamine was determined by the yeast fermentation method.[10] Ascorbic acid was measured by the technique of Evelyn *et al.*[11]

TABLE 2

COMPARISON OF VITAMINS IN MEAT,[12] WHEAT AND MATURE SOYBEANS. DATA ARE EXPRESSED AS μGM PER GRAM OF DRY MATTER

Food	Thiamine	Riboflavin	Pyridoxine	Biotin	Niacin	Pantothen
Beef round	2.1	7.5	2.6	.08	160	17.0
Pork ham	19.0	4.8	0.4	.12	63	6.5
Tenmarq wheat	7.0	1.3	2.6	.17	62	7.6
Soybean (average) ..	9.0	2.3	6.4	.61	20	12.0

[12] Data on meat taken from V. H. Cheldelin and R. J. Williams, Univ. Texas Publ. No. 4237, 105, 1942.

A summary of the averaged data obtained in two separate sets of determinations is shown in Table 1. It is apparent that both immature and mature beans of all the varieties tested contain appreciable stores of B vitamins. Comparison of the averaged data for green and mature beans of the six varieties shows with maturation an increase in thiamine and pyridoxine and a decrease in nicotinic acid. Data are presented in Table 2 for the purpose of indicating the comparative vitamin values of meat, whole wheat and mature soybeans. The vitamin values of soybeans compare favorably with wheat and with meats except that riboflavin and nicotinic acid in the beans are lower than in meat. It should be noted, however, that the niacin in immature *Soja* occurs in double the concentration found in the mature beans.

Although it is beyond the scope of this brief account to deal adequately with the evaluation of various plant materials as substitutes for foods of animal origin, it is hoped that the data offered herewith may be of aid in solving some new food problems.[13]

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OBITUARY

HAMILTON PERKINS CADY

1874–1943

PROFESSOR HAMILTON PERKINS CADY, a member of the chemistry faculty at the University of Kansas for forty-four years and chairman of the department for more than twenty years, died at his home in Lawrence, Kans., on May 26. His many years of research and teaching brought great credit to the university and much satisfaction to himself.

Dr. Cady was born on May 2, 1874, near Council Grove, Kans., but his family moved further east and his secondary education was secured at the Oberlin, Ohio, high school and the Carleton College Academy at Northfield, Minn. Early in his youth Dr. Cady became greatly interested in the subject of chemistry and made many inorganic and organic preparations in his home laboratory. Since he was unable to buy an analytical balance, he made one which was accurate to less than a milligram and made numerous quantitative analyses by its use.

Upon entering the University of Kansas as a freshman in 1894 young Cady soon became impressed with the similarity of water and ammonia. He read everything available upon this subject, and, during his senior year, laid his collection of information before E. C. Franklin—then associate professor of chemistry at the University of Kansas—with the suggestion that liquid ammonia might reasonably be expected to be an ionizing solvent. Franklin was highly enthusiastic over the idea and persuaded Professor Bailey, chairman of the department, to order a cylinder of liquid ammonia. In preparation for this investigation, Franklin and Cady constructed some vacuum-jacketed test-tubes, for such vessels were not on the market in those days. Franklin had previously agreed to go to Central America for a gold-mining company and departed before the ammonia arrived; so Cady was left to do the experiments alone. His joy was almost unbounded when he found that, although ammonia itself had a high resistance, the addition of a few crystals of potassium iodide produced a highly conducting solution. Thus, this young man who had been fearful that all chemical knowledge would be gained before he could have a part in its discovery had, as an undergraduate student, found something which the world did not know and had given chemists a second ionizing solvent.

After obtaining the bachelor's degree at Kansas in

[8] P. R. Burkholder, *Am. Jour. Bot.*, 30: 206, 1943.

[9] R. J. Williams, Univ. Texas Publ. No. 4237, 7, 1942.

[10] A. S. Schultz *et al.*, *Ind. Eng. Chem. Anal. Ed.*, 14: 35, 1942.

[11] K. A. Evelyn *et al.*, *Jour. Biol. Chem.*, 126: 645, 1938.

[13] Grateful acknowledgment is made to the Nutrition Foundation for financial assistance.