

**U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS;
BULLETIN NO. 68: A DESCRIPTION OF
SOME CHINESE VEGETABLE FOOD
MATERIALS AND THEIR NUTRITIVE AND
ECONOMIC VALUE, PP. 5-47**

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WALTER C. BLASDALE

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BULLETIN No. 88.

301

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS.

A. C. TRUE, Director.

A DESCRIPTION

OF

SOME CHINESE VEGETABLE FOOD MATERIALS

AND

THEIR NUTRITIVE AND ECONOMIC VALUE

BY

WALTER C. BLASDALE,

Instructor in Chemistry, University of California.



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LETTER OF TRANSMITTAL

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
Washington, D. C., July 15, 1899.

SIR: I have the honor to transmit herewith a report by Walter C. Blasdale, instructor in chemistry at the University of California, describing some Chinese vegetable food materials and their nutritive and economic value.

These foods are used to a considerable extent by the Chinese population in San Francisco and other cities in the United States, and most, if not all, of them are staple articles of diet in China and the Orient. It seems probable that some of the vegetables may become generally and favorably known in the United States.

Very little information has been hitherto available concerning many of these materials, and it is believed the report is a useful contribution to the knowledge of the food of mankind.

The report is respectfully submitted, with the recommendation that it be published as Bulletin No. 68 of this Office.

Respectfully,

A. C. TRUE,
Director.

Hon. JAMES WILSON,
Secretary of Agriculture.

CONTENTS.

	Page.
Introduction.....	5
Experimental methods.....	6
Roots and tubers.....	8
Sagittaria, or arrowhead.....	8
Taro.....	13
Water chestnut.....	15
Sacred lotus.....	17
Lily bulbs.....	18
Chinese sweet potatoes.....	22
Yam bean.....	23
Cassava, or manioc.....	25
Green vegetables and cucurbits.....	27
Green vegetables.....	27
Cucurbits.....	30
Seeds and grains.....	32
Soy beans.....	32
Phaseolus.....	36
Dolichos.....	37
Various water plants.....	39
Chinese millet.....	41
Fruits, nuts, and flowers.....	42
Fungi and algae.....	45
Miscellaneous substances.....	47

ILLUSTRATIONS.

	Page
PLATE I. Plant from an imperisid tuber of <i>Sagittaria sinensis</i>	8
II. Drawings of roots, seeds, etc	10
III. Drawings of starch grains	12
IV. Drawings of various roots	14
V. Plant from a corm of <i>Eleocharis tuberosa</i>	16
VI. Upper portion of a plant of the black soy bean	33
VII. Mature plant of yellow soy bean	34
VIII. Plant of <i>Phaseolus mungo</i>	36

SOME CHINESE VEGETABLE FOOD MATERIALS.

INTRODUCTION.

A visit to the Chinese quarter of San Francisco or any of the larger Pacific Coast cities will reveal to the eyes of a nonresident much that is both strange and interesting. Most of the curious roots, green vegetables, seeds, and other articles of food making up the stock in trade of the Chinese merchant would be totally unknown and unsalable outside of the narrow limits of the Chinese quarter. These articles are for the most part of Asiatic origin, many of them being directly imported from Canton, while others, though grown on American soil, are distinctly Asiatic in character. Their presence here can be accounted for only on the supposition that they are of considerable importance in the domestic life of the Chinese. Evidently they are the equivalent of the materials that make up our own vegetable dietary and presumably possess an intrinsic value for such a purpose. The thought then naturally arises, Might not some of these materials be turned to good account in the American household?

Tradition assigns to the Chinese the highest attainment in the art of producing from a given area the greatest amount of food material. The latter result has been reached both by intensive cultivation and by the utilization of a great variety of food plants, so that all classes of soil and climate are made to yield their quota of food. It would not be unreasonable to suppose, therefore, that the little-known regions of the Chinese Empire from which we have already obtained many useful plants might yield still others of real economic value. It can not be taken for granted, however, that all such materials, even though they do form an important part of the Chinese dietary, would be desirable introductions into our own. Of the numerous factors which must be considered in determining this question the composition of the vegetables themselves is the most important. The amount of nutrients which they contain may be readily determined by submitting them to a chemical investigation. Such questions as digestibility, adaptation to American tastes, means of utilization, and cultural features of the plants themselves are all important elements in the problem.

Powerful incentives which might induce one to look for new varieties of food plants are not lacking. An increase in the number of vegetables which are in cultivation might admit of the utilization of a greater diversity of soil and climate, or of a more profitable use of the regions

already in cultivation, or again might be desirable from a strictly dietetic standpoint.

It has long been accepted as true that the Chinese are largely vegetarian in their diet, and this apparently without serious detriment to their physical development. This statement, however, is not based on accurately compiled data, and, even if true, would be of no special significance until we know more about the composition of the Chinese vegetables. Apparently few analyses of Chinese food materials have been published, though Kellner, Nagai, Murai, and others have published a large number of analyses of Japanese food stuffs, many of which are produced by plants in common use among the Chinese. The incomplete character of some of these analyses and indeed of many others is likely to lead to erroneous conclusions. It is especially desirable to discriminate between crude protein and digestible nitrogenous compounds when dealing with vegetable substances, since often as much as two-thirds of the total nitrogen content consists of amido¹ compounds or other substances of little or no nutritive value.

EXPERIMENTAL METHODS.

It was through the consideration of such facts as the above that the work described in this article was undertaken. It has been confined to a study of the most important of the vegetable food materials found in the Chinese markets of San Francisco, though many substances of animal origin found there might profitably be submitted to similar investigation.

The work naturally divides itself into two distinct lines of research: First, the botanical and horticultural features of the materials studied, and, second, the extent to which these materials are used, the method of preparing and serving them, and the food value as shown by their chemical composition.

As a starting point for both lines of work it was necessary in each case to identify the plant from which the product under investigation was derived.² The identification proved in some instances a more difficult matter than might have been anticipated, for, though many notes on the economic plants of China are available, a large number of them contain conflicting statements and several different Chinese characters are often used to designate the same plant. In those instances in which the plants themselves could be grown by the author little difficulty was

¹In confirmation of this statement see Böhmér, Landw. Vers. Stat., 28 (1883), p. 247.

²An especial acknowledgment is due Prof. John R. Fryer, of the department of oriental languages of the University of California, and to Mr. W. N. Fong, a student in the same institution, for assistance in this part of the work and for other courtesies; also to Mr. Charles Ford, director of the botanic garden at Hong Kong, for identification of the roots of *Pachyrhizus angulatus* and for references to works on the botany of China; and to Prof. W. A. Setchell, of the department of botany of the University of California, for the identification of species of algae.

experienced, but this was in some instances an impossibility. As an assistance in this part of the work and also for the benefit of future workers in the same field, the name and Chinese character for each article were obtained when purchased, and these have been recorded in the body of the report. It is to be noted, however, that the names used in San Francisco are all in the Cantonese dialect, and both names and characters often represent commercial designations rather than the terms used in Chinese literature. In many instances the literary or classical terms have been added. Often the names obtained from the Chinese merchants gave but an uncertain clue to the name of the plant producing the article, and frequently different names were used for the same article. Aside from names and characters it was very difficult, either from their actual ignorance or lack of interest in the subject, to obtain authentic information from the Chinese consulted by the authorities in San Francisco regarding the source and method of use of many of the substances examined.

On the chemical side of the work the chief difficulty encountered was in the choice of the method of analysis to be employed. The uncertainties involved in many of our present methods of food analysis are too well known to need any extended mention here. In order to make the results comparable with other investigations of a similar nature, the methods outlined by the Association of Official Agricultural Chemists¹ have, for the most part, been adhered to and only such minor modifications have been introduced as the nature of the work seemed to demand.

The substances as purchased in the markets were weighed as soon as possible, and, in the case of fleshy vegetables, the water content reduced by drying in an air bath whose temperature did not exceed 70° C. The residue was allowed to absorb what moisture it would, was then weighed again, and the percentage of loss calculated. This partially dried material was then ground either in a coffee mill or by means of an agate mortar until it all passed through a sieve with 50 meshes to the linear inch and was immediately placed in a tightly stoppered bottle and used for the various determinations. The residual water was carefully determined both at the beginning and at the end of the analysis by drying in a water bath until the sample ceased to lose weight. In many instances the time occupied in making the entire analysis extended over a period of eighteen months, and some samples showed differences of as much as 2 per cent in the two determinations. In such cases the average of the two determinations was obtained and this average factor was used in reducing the results of the analysis to the figures corresponding to a water-free basis. A few exceptions to this method of procedure are noted in the account of the results of the individual analyses.

¹ U. S. Dept. Agr., Division of Chemistry Bul. 46.