

U. S. RANKS NEXT TO MANCHURIA IN SOYBEAN PRODUCTION

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The soybean (*Glycine max*), an erect, annual plant is native to southeastern Asia. Also known as "soja" or "soyabean," it belongs to the bean or pulse family. It has been cultivated since ancient times in China, Korea, and Manchuria, where it still forms a substantial part of the natives' diet, as well as the source of an edible oil. Despite its antiquity and high nutritive value for man and beast, it seems to have spread slowly into countries outside of the Far East. It was brought to Europe towards the end of the eighteenth century and planted in botanical gardens, but it did not at that time attract much attention as a plant of economic importance.

In recent years the soybean has been the subject of considerable experimentation in the United States, particularly in the middle west and the eastern states. Due to the ease with which it can be grown as a fodder plant, its large yield and, more recently, the application of the oil and meal from the seed for varied industrial uses as well as for food, this legume now forms an agricultural crop of importance in this country. The United States ranks second only to Manchuria in world production. The bulk of the soybean crop produced here is used for fodder; the rest for the extraction of oil and meal for use as ingredients in the preparation of feed and food-stuffs, and for industrial purposes.

800 VARIETIES; MANY USES

The number of varieties and types of soybeans is said to exceed eight hundred, distinguished largely according to the color, size, and shape of the seed, and the time required to attain maturity. The early varieties are preferred for seed crops, and the medium or late varieties for hay, forage and ensilage. For the production of oil the yellow varieties are considered the best, but when meal is desired the green or black beans are used.

The oil extracted from the soybean belongs to the semi-drying class, that is, having properties intermediate between drying oils such as linseed, and non-drying oils exemplified by olive oil. Three methods are employed to remove the oil from the seed. The most primitive system is that in use in the native mills of Manchuria, and involves the crushing of the beans into flakes beneath a granite millstone. The wafers are then placed in gunny bags and steamed, and pressure is applied to the resultant mass to express the oil, the meal remaining as a round, flat cake. In modern American mills the oil is extracted by passing the crushed beans, in the form of flakes, through a solvent (benzine or gasoline), or by the expeller method, involving the application of hydraulic pressure preceded by steam.

In the crude state the oil is used in the manufacture of soap and insecticides.

When refined, by washing the crude oil with a weak alkali solution to separate certain undesired constituents, it is employed for a wide variety of purposes, such as in margarine and as a cooking oil; also in paints, varnishes, enamels, waterproofing compounds, and lithographic inks. One important soybean product, separated from the extracted oil by centrifugal action, is lecithin, a complex fatty, viscid, brown substance. It finds application as an addition to cocoa butter in the chocolate coating of candy, and is used also in the preparation of emulsions, and, more recently, for painting gasoline tanks of airplanes to prevent oxidation. The soybean is unusually rich in protein, which serves, like casein, in the manufacture of washable wallpaper, cold water paints, leather finishes, paper sizings, paper and wallboard coatings, textile finishes, and plastics.

The soybean differs from the usual cultivated legumes, such as lentils, peas, and beans, by its low starch content. Its unusually high percentage of protein and oil



A PLANT MUCH IN THE NEWS

City dwellers have heard and read a great deal about manufactured products of soybean origin, often without having seen the plant. Hence, this exhibit in Hall 28.

explains its nutritive value. What is true of beans in general is true also of soybean. In order that the nutrients contained in it may be digestible, the soybean must be cooked or treated in some way that breaks down the cell walls—then its contents are readily acted upon by the digestive juices.

SOURCE OF CHOP SUEY SAUCE

The soybean is used more extensively as food in China and Japan than in other countries. There it is usually prepared in conjunction with other materials. One of these Oriental foods is "natto," prepared by boiling the seeds in water for several hours to render them soft. The hot mass is then wrapped in small portions in straw and the bundles are placed in a cellar in

which fire has been kindled. There the cooked beans are allowed to ferment in a warm, moist atmosphere. The resulting, thick mass has a peculiar, not unpleasant odor. Bean cheese, or "tofu," is obtained by soaking the beans in water for about twelve hours, and crushing them between millstones. The ground material is then boiled with water for about an hour and filtered. The liquid is white, opaque, and has the general appearance of cow's milk. Another food product prepared in the Orient is "shoyu," a sauce prepared from a mixture of cooked, ground soybeans, roasted wheat flour, salt and water. The mass is allowed to ferment in rice wine in casks for one to several years. The resulting product is a thick, brown liquid, commonly known to us as soy sauce, and widely used in this country with chop suey.

For use as human food in the United States the soybeans are heated to remove the bitter taste characteristic of the untreated seed. Finely ground soybean meal is employed in admixture with wheat-flour for bread. The white, fat-containing flour is employed in the baking and packing industries, while the meal is made into pellets of convenient size for feeding cattle and sheep on the open range.

An exhibit of soybean was recently installed in Case 30, in the northeast corner of Hall 25 (Hall of Food Plants).

FOURTH GUATEMALA EXPEDITION DISPATCHED BY MUSEUM

Field Museum's fourth botanical expedition to Guatemala will depart from New Orleans on December 3. It will be conducted by Dr. Julian A. Steyermark, Assistant Curator of the Herbarium, who led a similar expedition to that country in 1939-40. Dr. Steyermark will be accompanied by Mr. Albert Vatter, of Glenview, Illinois. Mr. Vatter has had considerable experience in wild flower photography, and one of the results of the expedition should be the acquisition of a large series of photographs of the Guatemalan flora to serve as records and to supplement the dried specimens collected for study purposes.

This expedition is expected to conclude the field work in Guatemala carried on since 1928 in preparation for a flora of that country by Curator Paul C. Standley and Assistant Curator Steyermark. Dr. Steyermark plans to remain in Guatemala about ten months, and devote his time to the exploration of those areas which have not been investigated by previous expeditions, as well as areas whose wealth of flora demand greater attention. Since none of the previous expeditions had been in Guatemala throughout the rainy season, one of the principal objectives of the present expedition will be to make collections during that season from the many areas which then attain their maximum of floral development.



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