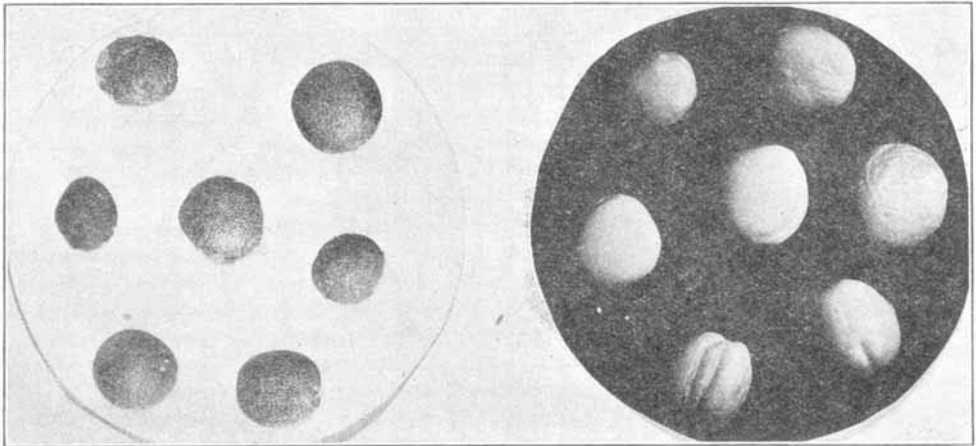


## CHINESE COLZA—AN ADULTERANT OF MUSTARD SEED.\*

BY ARNO VIEHOEVER.

One of the interesting developments coming out of the war has been the shifting of centers of supplies from European countries to other lands, not immediately engaged in intensive, all-absorbing warfare. Most noticeable, perhaps, has this been with regard to seed supplies formerly obtained from Europe, but soon after the war started from Oriental countries. I have especial reference to oil seeds and mustards. True, the Oriental countries, India, China, Japan, have grown these products before the war, and one, India, has even exported considerable amounts of seeds. However, their importance on our markets was probably negligible in comparison with the European supplies of rape seed, mustards and the like; and the Chinese and Japanese seeds were practically unknown here. The



Chinese Colza Seeds  $\times 6$ .  
Brown.

Yellow.

European nations, we hear, are short now of almost everything, even of seeds needed for their home use—not to speak of seeds which they might have to spare for export—and this fact will tend to keep the Oriental supplies on our markets. In so far as the new products are valuable to our industries, agriculture, etc., their continued importation and, preferably, even their cultivation in this country, are hoped for.

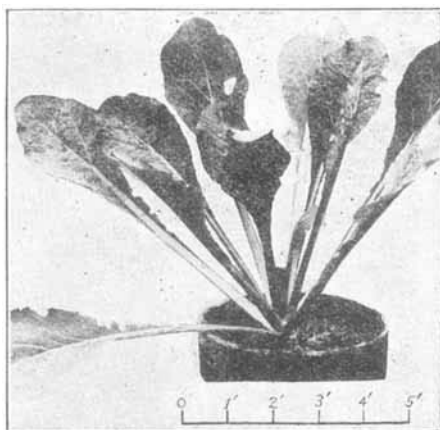
One of the products which appear valuable in this sense is Chinese Colza, a yellow oil seed, imported within the last year or two from China and Japan. Since the first shipments entered this country through the port of San Francisco they were called "Golden Gate." Mustard seed being scarce and high in price, and white mustard not available at all, the Golden Gate seeds, having a striking

\* Revised reprint from the *Oil, Paint and Drug Reporter*. A monograph on the subject entitled, "Studies in Mustard Seeds and Substitutes: I. Chinese Colza (*Brassica campestris chinoleifera* Viehovever)," by Arno Viehovever, Joseph F. Clevenger, and Clare Olin Ewing, has been published in the *Journal of Agricultural Research*, Vol. XX, No. 2, October 15, 1920, pages 117-39.

resemblance to the latter, were offered for sale as mustard. Their taste, however, being that of cabbage rather than mustard, made them unfit for use in prepared mustard, and their lack in the necessary physiological characters made them unfit for use in mustard plasters and other medicinal mustard preparations. To prove definitely that the seed was not a mustard and to determine its identity and real value, an extended investigation was undertaken, of which the following results might be of general interest:

#### IDENTITY AND DESCRIPTION OF SEED.

The seed belongs to the colza group and is derived from an oil-yielding form (*Brassica campestris chinoleifera* Viehoffer), a plant related to the so-called "China Cabbage" and "Celery Cabbage," now grown in this country. The seeds are somewhat smaller than white mustard, which they otherwise, as pointed out, strikingly resemble in color. They are smooth, with the exception of the brown slightly reticulated seeds, which are generally present only in small amounts. The seeds are oval, more or less flat and show rather generally a distinct groove or ridge on the ventral side. Their size varies from 1.4 to 2.6 mm. in the long axis, their weight varies from 1.4 to 6.4 mg. and averages 2.86 mg. (based on 1,000 seeds). The volume weight of 500 Cc. measured in a graduated cylinder amounted to 352 Gm.



Leaves of Chinese Colza.

The microscopic characteristics of the seed, and especially those of the seed-coat, were not markedly different from those of the common rapeseeds or colzas.

#### AMOUNT AND CHARACTER OF FATTY OIL.

Upon extraction with petrol ether or ether 40-50 percent and more of fatty oil was obtained. According to an analysis (Analyst L. B. Burnett), the oil expressed from the seeds, and certain constituents of the oil, showed the following characteristics:

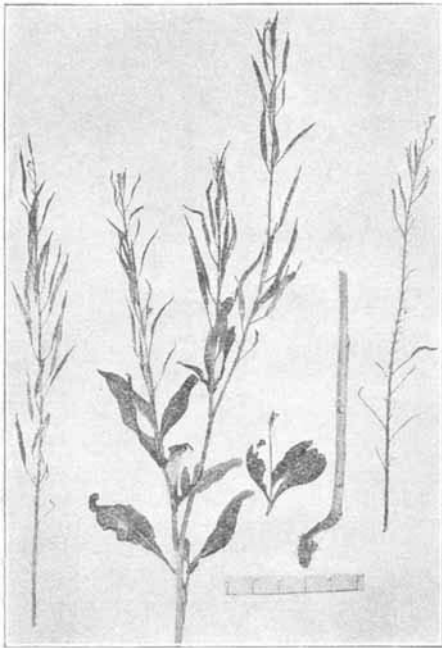
##### Characteristics of Chinese Colza oil and certain of its constituents:

Density, 25° C.....	0.9097
Iodine No. (Hanus).....	100.3
Saponification No.....	173.8
Insol. acids and unsaponifiable.....	96.1%
Soluble acids.....	0.07%
Neutralization value of insol. acids.....	172.6
Mean molecular weights of insol. acids.....	325.0
Refractive index, 25° C.....	1.4695
Iodine No. insoluble acids.....	104.0
Solid acids.....	19.52%
Liquid acids.....	75.82
Iodine No. solid acids.....	65.21

While these data are more comprehensive than those usually given for rape oil and its constituents in textbooks, our data, as far as can be judged, fall well within the limits found for rape—or colza oils. The similarity to these is thus clearly evident. Chinese Colza oil has a light yellow color, and can, if cold pressed or refined, undoubtedly be used for edible purposes. Its use for technical purposes appears already assured from reports which have reached us.

#### AMOUNT AND CHARACTER OF VOLATILE OIL.

Maceration of the seeds with water resulted in the breaking up (enzymatic hydrolysis) of a complex, probably glucosidic, compound and the formation of a volatile oil in amounts varying from about 0.4 to 0.6 percent. This oil was identified as "crotonyl mustard oil" formerly found also in rape. Its physiological characters are distinctly different from the "allyl mustard oil," the volatile oil found in all true mustards with the exception of white mustard. This, as is well known, contains a physiologically active, but non-volatile mustard oil. Crotonyl mustard oil, while slightly pungent, has a flavor of cabbage or turnip rather than that characteristic of mustard. Even in its concentrated form it hardly irritates the membranes of nose or eye, nor does it blister the skin. Fed to rabbits it did not prove poisonous where the true "allyl mustard oil" had even caused death, if fed in the same amounts and under comparable conditions. Crotonyl mustard oil lacks also the pronounced bactericidal qualities of true volatile mustard oil.



Fruiting Plant of Chinese Colza.

#### VALUE OF PRESS CAKE.

While no analysis of the press cake was made, the composition of the seeds was determined. (Analysts J. H. Bornmann and P. L. Gowen.) It showed that in the air-dried seed containing about four percent of moisture, in the average 23 percent of protein (N 6.25) were present in addition to 11.5 percent reducing substances, over 40 percent of ether extract (fatty oil) and about 0.5 percent of volatile oil.

Judging that always some of the fatty oil is left in the cake, say, up to 10 percent and more, depending upon the method of extraction, the press cake should prove a very valuable feed product. Unlike the Indian Colza, which often contains Indian mustard seeds in varying amounts, and has therefore in certain instances been found injurious when fed to cattle, no notable amounts, if any, of mustards were found in the many shipments which we have examined of Chinese

Colza. The press cake, therefore, even if containing some crotonyl mustard oil, will probably prove to be harmless, the more so since it is the general practice not to feed such cakes alone but to mix them with other feeds.

The complex compound, yielding the volatile oil, may also be broken up in the cake, as in the maceration with water, provided the enzyme, causing the hydrolysis, is not destroyed by organic solvents or too high temperature used in the extraction of the fatty oil. Moist heat or steam at temperature below the boiling point of water and preferably not exceeding 70° C. (158° F.) is one of the means which will in a number of hours effect a speedy hydrolysis. Subsequent heating and drying at higher temperatures will then remove the volatile oil, thus freed. Prolonged storage of cake containing more than about seven percent of moisture will have a similarly destructive effect. This, however, is a very slow process, especially since the moisture and temperature must be kept low enough during the storage to prevent decomposition of the cake by molds or bacteria.

#### USE OF FOLIAGE FOR GREENS AND FORAGE.

The basal leaves of the young plant, forming a rosette of many members, are smooth, succulent and have a mildly pungent taste, not greatly unlike that of cabbage. They should prove valuable as greens for salad, etc. The plants which we planted in different locations did very well, grew fast and vigorous. They appeared to be quite hardy and may also prove to be a desirable forage crop.

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### ROSE GERANIUM.

#### THE RESULTS OF EXPERIMENTS IN ITS CULTURE IN FLORIDA.

BY G. A. RUSSELL.\*

Since the year 1914 the Office of Drug, Poisonous and Oil-Plant Investigations of the Bureau of Plant Industry, United States Department of Agriculture, has experimented with the growing of Rose Geranium in Florida. These experiments were conducted at the Field Station maintained at Orlando, in Orange County. During the period 1914 to 1917 several varieties of Rose Geranium (*Pelargonium odoratissimum*) were grown in small lots and the distilled oils examined for yield and quality. From the varieties under consideration one was selected which yielded an oil comparable to authentic commercial samples. It is with this variety that the experiments recorded here have to deal.

The original stock used in propagating when received at Orlando consisted of 100 plants which on receipt were put into the greenhouse and later transferred to a slat shade where they remained during the summer. In the early winter of 1915-16 cuttings were started in the greenhouse and in early May 1916 the plants were set in the field. Owing to forced growth in the greenhouse the plants were large and succulent, and on transferring them to the field 50 percent failed to live. Those plants that survived put on an excellent growth during the summer

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\* Office of Drug, Poisonous and Oil-Plant Investigations, Bureau of Plant Industry, United States Department of Agriculture.