

CONCERNING CANAIGRE.

San Francisco Chronicle.

Considerable attention is being paid by the press to canaigre as a plant, the cultivation of which may become profitable in this State, and it seems probable that it may become one of the valuable minor industries. The facts, however, do not justify such statements as the following, which are taken almost at random from the country exchanges of one day:

"The wild plant produces ten to twenty tons per acre, which can be increased by cultivation to twenty to sixty tons." The fact is that its yield in the wild state is unknown, and it has not yet been cultivated on a commercial scale, but the root is smaller than the sugar beet and the yield will be less; probably in good, fresh soil ten or twelve tons per acre.

"The market for the root is practically unlimited." As a matter of fact it has no market to speak of, is not quoted in any price current, and has yet to fight its way into use in the face of other tanning material now holding the trade. Nor is there any "practically unlimited" market for any agricultural product.

"Millions of acres will soon be devoted to canaigre." The annual product of even 1,000,000 acres would be 10,000,000 tons, which would make over 900,000 tons, or 77,000 carloads, of the dried extract, a quantity which could not even be given away.

"Any farmer can raise it and be independent of any near-by factory." This is entirely untrue, as will be shown later. The root must be cultivated, like sugar beets, in connection with a factory.

False or foolish statements like the foregoing can only injure any proposed industry. The culture of Canaigre may prove profitable to those favorably situated, and the matter is of sufficient interest to justify the publication of the facts. There are three points to be considered—cost, market and competition. This article will be devoted to cost, and the facts upon which it is based have been obtained from Professor E. W. Hilgard of the University of California and Dr. Julius Koebig, consulting chemist of San Francisco, who was among the first to call attention to the value of the plant, and who has followed with interest the efforts to utilize it. Dr. Koebig has revised this article.

Canaigre is a winter-growing dock, indigenous to arid America. Like other docks, it is a vigorous fighter for food, which it rapidly exhausts, and its continued cultivation would involve early fertilization, which, however, its own refuse would largely supply. Its winter-growing habit shows its preference for a cool climate, with moderate moisture, and renders its success in the hot summer growing time of our Eastern States very doubtful. It is, however, being tried there, and we shall soon know. It thrives at Berkeley, and an analysis of the root grown there shows a higher percentage of tannin than that produced in Arizona. Professor Hilgard can account for this by the cooler climate. One or two experiments, however, do not settle such things, and further analyses will be required. This is very important, as within a few years more canaigre will probably be produced than can be readily sold, and the price will be fixed by its cost of production in the districts showing the greatest yield.

The extract, when properly prepared, contains, if liquid, about sixty-five per cent of tannic acid, and if dried about seventy-five per cent, and in that form contains no substances deleterious to the tanning process, and makes excellent leather. Canaigre can be used for tanning only in the form of an extract because of the presence of starch in the dried root, which makes a paste on the hides and prevents the tannin from reaching the pores. The extract must be made either at the place of production or place of consumption.

There has as yet been no cultivation of the plant on a commercial scale. The people of Arizona have been digging the wild root, slicing, drying and making some market for it, mostly in Glasgow, where there are appliances for making the extract. There is an extract factory at Deming which is finding a market for its product in Eastern cities, with, doubtless, some exports of experimental lots. The officials of the Southern Pacific company state that there has been quite a movement of the product, but no such amount as the papers report. The freight from Eastern Arizona is \$8 per ton to Eastern cities and \$15 to Glasgow, and must always be lower from there than from California. The supply of the wild root within gathering distance of the railroad is becoming exhausted, and the problem of its profitable production now presents itself.

Presumably the green root can be raised in suitable soils, which would be the light, but good land suitable for other root crops, for about \$4 per ton. This is about the average price of sugar beets, and this is probably what the farmer may expect delivered. As the beet raiser is paid more or less for his beets according to their sugar test, so in this case the grower would be paid more or less according to the tannin contained. If at the beginning the price were high, increase acreage would rapidly bring it down. The cost to the producer would be similar to the cost of other root crops, and would depend on the character of the soil and the cost of delivery to the factory. As compared with sugar beets, the cost might be less, as there is no thinning, although the hand planting of the canaigre roots would be more expensive than the machine sowing of the beets.

To begin with canaigre never should be dried, and it never will be when the business assumes commercial proportions. It is true that wild canaigre roots have been sliced, dried and sold in limited quantities, but that practice will disappear whenever its culture is seriously entered upon. Nobody wants the stuff except for experimental purposes, since it has no reliable percentage of tannin. It dried by the producer it would have to be soaked at the point of consumption in order to extract the tannin. The dried article would never stand the cost of transportation. It has been claimed that the dried root is worth \$40 per ton at Glasgow. Perhaps it is. Assume it any way, and suppose the freight to be the same as upon dried fruit, which is \$24 to New York, and probably about \$28 to Glasgow, leaving \$12 to the grower if no middleman intervened, which is a practically impossible condition.

It takes three tons of green root to make one of dried, so that \$40 per dry ton at Glasgow, would yield \$4 per green

ton to the grower, but to slice 100 tons of green root and dry out therefrom sixty-six tons of water and sack the dried product will certainly cost more than to take from 100 tons of fresh prunes sixty tons of water without slicing and sack the dried product. The latter we know cannot be done for less than \$4 per ton, so that with dried canaigre at \$40 per ton in Glasgow the California producer, with no middleman, might get paid for his sacks and labor in drying, but would get nothing for the roots. As the traffic evidently would not bear this rate of transportation, doubtless a lower rate would be forthcoming, but if divided in half the net result would be but about \$4 per green ton to the grower, less middleman's charges which could not be less than 5 per cent, and might be more.

We now reach a proposition involving a reasonable expectation of fair profits to those favorably situated, and perhaps an important source of wealth to the State, but nothing justifying extravagant prophecies. The process of extracting the tannin from canaigre is the same as that of extracting the sugar from beets, minus the expensive and delicate chemical process for refining. This process includes:

First—Slicing the roots by machinery.

Second—Placing them, usually by gravity, in wooden tanks called "diffusing batteries," through which water is passed at a temperature not exceeding 100 degrees Fahrenheit, until the tannin is extracted, while the starch remains.

Third—Boiling the tannin-charged water in a copper vacuum pan to the consistency of a syrup containing about 66 per cent of tannic acid, with a residue not injurious to the tanning process.

In this condition transportation has to be paid on only one ton of useless matter for every two tons of tannin. So far as we now know, this is cheaper than to extract the pure tannin, but the weight may be still further decreased by exposing the thick syrup in a dryer at a moderate temperature and making the extract solid, in which state it would contain about 75 per cent tannin, and the transportation of waste matter would be only about one ton in four.

Throughout the process comparatively low temperatures must be preserved, as heat tends to decompose the tannin, especially when exposed to the air. This necessitates the use of the vacuum pan, in which evaporation takes place at low temperature. This fact also indicates the probability of the most successful results in the equable and not too wet climates of our central and southern coasts.

The cost of a plant for extracting the tannin from canaigre is reduced by the fact that there is no special harvest time for the root, which keeps perfectly in the ground for years, and can be gathered at any time after fall growth, so that the harvest can go on throughout the year. The cost of a plant to take care of the product of, say 4,000 acres, to be run, say 250 days in the year, at the rate of 160 tons of root per day, would be about as follows:

Slicing machine, say.....	\$ 300
Diffusing battery of four tanks, with piping and fillings.....	2,500
Copper vacuum pan, with air pump and fittings.....	2,500
Carrier and appliances for conveying sliced roots to tanks.....	250