plants are morphologically akin to the apple with respect to their seed coats.

A search through the literature upon the function and chemistry of the seed coats of various plants shows that no work has been done on this subject, and that botanists have thus far been unable to attribute any important function to this membrane in its relation to the embryo. From the above data, in connection with the researches of Bertrand and others, it is evident that a close relation exists between manganese and oxidases in plants. May we not also assume that the accumulation of manganese in the seed coat sustains a very important relation to the oxidizing enzymes in this part of the seeds? It is very probable that these enzymes have much to do with the selection, compounding and storing away of the reserve material in the kernels of seeds.

It has also been shown that fatty seeds absorb large quantities of oxygen during germination. De Ray-Pailhade[1] has shown that there was an increase in the presence of oxidases as the germination progressed. He further noted that, in the presence of laccase and free oxygen, philothion is converted into carbon dioxide, and thereby contributes to the respiration of the embryo plant.

It is therefore probable that the manganese in the seed coat also assists in stimulating the enzymes which split up the fats, sugars, starches, etc., and render them more readily available for the young seedling during the early stages of its growth.

If such be the function of manganese in plants, we must conclude that it bears a very important relation to the vital processes in seed formation and germination.

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THE BITTER PRINCIPLE OF COMMON RAGWEED.

BY BURT E. NELSON AND GEORGE W. CRAWFORD.

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As part of a pharmacological study of ragweed, *Ambrosia artemisifolia*, Linn., Order *Compositae*, with a view to learning something of its supposed therapeutic value in the treatment of certain types of hay fever, it became desirable to isolate the bitter principle.

This was accomplished by extracting ten kilos of the partially air-dried drug with alcohol, distilling off the latter at a gentle heat, mixing the soft aqueous residue with more water and some aluminium hydroxide cream for separating the "resinoids," and, after removing the latter by filtration, clearing and defecating the aqueous filtrate by a slight excess of lead acetate. The remaining liquid was repeatedly extracted by ether

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[1] J. De Ray-Pailhade, *Compt. rend.*, 121, 1162 (1895).

until the bitter taste was but slightly apparent (about twenty-five times in all) and the ether recovered by distillation.

As the remaining residue was still quite highly colored, an attempt was made to still further purify it by solution in alcohol, addition of water and boneblack, and filtration after some hours' digestion with the latter. On evaporation and careful drying, the remaining residue was quite deep amber colored, and on long standing in a desiccator formed a mass of fine white needle-shaped or prismatic crystals, distributed through a much larger quantity of the amber colored amorphous body.

The two were finally separated by fractional solution with ether, in which the amorphous body is the more readily soluble. Repeated separations are necessary in order to effect purification by this means. As finally obtained, the amorphous amber-colored body was distinctly bitter in a one to ten thousand solution, while the white crystals were tasteless and, aside from being somewhat sternutatory when inhaled, inert physiologically as far as we were able to determine from the small amount on hand. These crystals melted sharply at 208° (uncor.), and gave on analysis:

Carbon, 69.13, 69.25; hydrogen, 7.77, 7.78; oxygen, 23.10, 22.97%

With strong sulfuric acid they give an orange color which becomes bright crimson, especially on warming. Yield, 0.02%.

The bitter, amorphous, amber-colored body finally becomes indistinctly crystalline on long standing in a desiccator. It melted indefinitely at from 65–70° (uncor.), and gave on analysis:

Carbon, 68.89, 68.38; hydrogen, 7.78, 7.60; oxygen, 23.33, 24.02%

We did not have sufficient material purified to allow of repeating this analysis a third time.

A molecular weight determination by the freezing point method, in acetic acid, gave 523. With strong sulfuric acid, the material gives a brownish color becoming brownish purple, and with Froehde's reagent, greenish. Fehling's solution is slowly reduced by the body after hydrolysis. Yield, 0.10%.

As the above results agree with the data given in the literature for absinthin, the bitter principle of wormwood (*Artemesia absinthium*, Linn., Order *Compositae*), we have also separated some of the latter according to the above method. The appearance of this absinthin was entirely similar to that of our amorphous bitter principle from ragweed. It was not, however, accompanied by any white crystalline body. It melted indefinitely at from 65–68° (uncor.), and gave on analysis:

Carbon, 68.13, 68.19; hydrogen, 7.59, 7.62; oxygen, 24.28, 24.19%
Molecular weight by the freezing point method, 523

It also gave the brownish color, becoming purplish with strong sulfuric acid, and greenish with Froehde's reagent. Like the bitter principle from ragweed, it also slowly becomes indistinctly crystalline on long standing in the desiccator, and slowly reduces Fehling's solution.

Conclusions.

In view of the uncertainty attending the accurate analysis of an amorphous body of this kind, we believe that the results obtained from the analysis of the bitter principle of common ragweed and of absinthin from wormwood justify us in concluding that the two bodies are probably identical. Other pharmacological studies tend to show that the use of preparations of ragweed in the treatment of hay fever is based on irrational grounds.

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THE VOLATILE OILS OF THE GENUS SOLIDAGO.

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The genus Solidago is represented in the United States by about seventy-five species. Some of these occur quite abundantly but can, as yet, scarcely be considered of any economic importance. A few have been used medicinally, particularly *Solidago virgaurea* Linn., which is common to Europe and North America, and *solidago odora* Ait., which was at one time recognized by the United States Pharmacopoeia. The root of *Solidago canadensis* L. is said to contain a coloring matter once used in Canada as a valuable dye.

Very little is known about the chemistry of the plants of this genus. Volatile oils have been obtained from four species, but with the exception of the oil of *Solidago canadensis* L. nothing is known about their chemical composition. According to Schimmel & Co.,[1] the constituents of the last named oil are *pinene* (85%), *phellandrene*, *dipentene*, *limonene*, *borneol* (9.2%), *bornyl acetate* (3.4%), and *cadinene*.

The Volatile Oil of Solidago Nemoralis.

Solidago nemoralis Ait. is one of the smaller species of the genus, growing from Quebec to the North West Territory, south to Florida, and west to Texas and Arizona.

In their report of April–May, 1906, page 63, Schimmel & Co. give the following description of a sample of oil of *Solidago nemoralis* which they received from America: "The bright olive-green oil had a peculiar odor, reminding somewhat of cypress oil. The constants were: $d_{15°}$ 0.8799, α_D —23° 10′, ester number 14.4, ester number after acetylation 38.2. The oil formed a cloudy solution in about seven and more volumes of 95% alcohol."

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[1] *Report*, April, 1894, p. 57.