HOME MADE SOAP FOR SPRAYING

F. H. HALL, L. L. VAN SLYKE AND F. A. URNER.

PUBLISHED BY THE STATION.
BOARD OF CONTROL.

GOVERNOR BENJAMIN B. ODELL, JR., Albany.
COMMISSIONER CHARLES A. WIRTING, Albany.
STEPHEN H. HAMMOND, Geneva.
FREDERICK C. SCRAUB, Lowville.
LYMAN P. HAVILAND, Camden.
EDGAR G. DUSENBURY, Portville.
JENS JENSEN, Binghamton.
THOMAS B. WILSON, Halls Corners.
MILO H. OLIN, Perry.
IRVING ROUSE, Rochester.
CHARLES W. WARD, Queens.

OFFICERS OF THE BOARD.

STEPHEN H. HAMMOND, President.
WILLIAM O’HANLON, Secretary and Treasurer.

EXECUTIVE COMMITTEE.

STEPHEN H. HAMMOND,
FREDERICK C. SCRAUB,
LYMAN P. HAVILAND,
THOMAS B. WILSON.

STATION STAFF.

GEORGE W. CHURCHILL, Agricultural and Superinten-
dent of Labor.
WILLIAM P. WHEELER, First Assistant (Animal
Industry).
FRED C. STEWART, M.S., Botanist.
HARRY J. EUSTACE, B.S., Assistant Botanist.
HENRY J. RAMSEY, M.A., Student Assistant in Botany.
LUCIUS L. VAN SYLVE, PH.D., Chemist.
EDWIN B. HART, B.S., Associate Chemist.
*WILLIAM H. ANDREWS, B.S.,
FREDERICK D. FULLER, B.S.,
*CHARLES W. MUDGE, B.S.,
ANDREW J. PATTEN, B.S.,
*FRANK A. URNER, A.B.,
ASSISTANT CHEMISTS.
HARRY A. HARDING, M.S., Dairy Bacteriologist.
MARTIN J. PRUCHA, PH.B., Assistant Bacteriologist.
GEORGE A. SMITH, Dairy Expert.
FRANK H. HALL, B.S., Editor and Librarian.
PERCIVAL J. PARROTT, M.A., Entomologist.
HAROLD E. HODGKISS, B.S., Assistant Entomologist.
SPENCER A. BEACH, M.S., Horticulturist.
NATHANIEL O. BOOTH, B.AGR., Assistant Horticulturist.
ORRIN M. TAYLOR, Foreman in Horticulture.
†F. ATWOOD SIRRKINE, M.S., Special Agent.
FRANK E. NEWTON, JENNIE TERWILLIGER, Clerks and Stenographers.
ADIN H. HORTON, Computer.

Address all correspondence, not to individual members of the staff, but to the NEW YORK AGRICULTURAL EXPERIMENT STATION, GENEVA, N.Y.

The Bulletins published by the Station will be sent free to any farmer applying for them.

* Connected with Fertilizer Control.
† In Second Judicial Department.
Popular Edition*

Of

Bulletin No. 257.

Home Made Soaps for Spraying.

F. H. Hall.

For sucking insects upon some kinds of trees, commercial soaps vary. Fish-oil preparations—they are not now commonly made from whale oil—are no more valuable as insecticides, notwithstanding the very offensive odor, than other soaps; but because of their cheapness they are more frequently used. Soap is one of the best insecticides, as it forms with water a very uniform mixture that "holds up" permanently, is easily applied, distributes evenly, and covers perfectly. The solution dries quickly and closes the breathing pores of the insects it touches with an impervious film that causes suffocation and death.

But in practice the solutions made from whale-oil, or fish-oil, soaps have been variable. Though made after the same formula and applied in the same way to kill insects of the same kind on plants of the same species, one lot of solution might destroy all the insects upon the sprayed plant; while another lot made from a different brand of soap or even from a second package of the same brand would show but little insecticidal power. Repeated

* This is a brief review of Bulletin No. 257 of this Station, on The Composition of Commercial Soaps in Relation to Spraying, by L. L. Van Slyke and F. A. Urner. Any one specially interested in the detailed account of the investigation will be furnished, on application, with a copy of the complete bulletin. The names of those who so request will be placed on the Station mailing list to receive future bulletins, popular or complete as desired. Bulletins are issued at irregular intervals, as investigations are completed, not monthly.
complaints of this nature led to suspicion of the soaps themselves. The Station collected and examined nine samples of such soaps and found great variations in quality.

Soap is a complex material. Its basis is a true Composition of soaps. chemical compound formed by the union of fatty acids with an alkali, as potash or soda. Mixed with this true soap are various incidental, accidental or adulterant materials like water, free alkali, free fatty acids, resin, perfume, etc. For spraying purposes, the actual soap, the chemical compound formed by the combination of the acids of fats with potash or soda of the "lye" is the essential constituent; for upon the amount of this depends the adhesive and film-forming quality of the solution. It is also important that there be only a small amount of alkali that has not entered into chemical combination, for this "free" alkali is caustic and, if in considerable quantity, will cause injury to foliage.

In the nine samples examined, the amount of actual soap varied from 14.9 per ct. to 59.3 per ct. The average of the figures obtained from these analyses would not be a safe guide to the amount of soap to use in making up solutions, as would be the case with paris green, copper sulphate or other materials used in spraying; for only one sample came within 3 per ct. of the average of all in actual soap. In two lots of the same manufacturers' material the real soap in one was 35.8 per ct., in the other only 19.1 per ct.

In none of the samples, however, was there enough free alkali to injure foliage.

Better soap at home. This marked variation in the soaps found on the market, the liability to the plant grower of great waste in time and labor, as well as money, in applying such unreliable insecticides as some of these samples would be, and the fact that soap manufacturers will not usually guarantee their goods, made it desirable to see if a good fish-oil soap could not be made by the user.

A very few trials proved that the process of making these soaps is exceedingly simple; and several lots were made at the Station with uniform success. No elaborate equipment is required, not even a soap kettle or a fire, since boiling is not necessary. The
quality of the product is easily controlled and the cost is less than that of the poorer, or at least less reliable, soaps on the market. 

The formula to be used in making 40 lbs. of soap, containing 60 per ct. of actual soap, is this:

**Formula for 40 lbs. Fish-oil Soap.**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caustic soda</td>
<td>6 lbs.</td>
</tr>
<tr>
<td>Water</td>
<td>1 1/2 gals.</td>
</tr>
<tr>
<td>Fish oil</td>
<td>22 lbs.</td>
</tr>
</tbody>
</table>

In making the soap, the caustic soda is completely dissolved in the given amount of water and the fish-oil is then added gradually under constant and vigorous stirring. The combination occurs readily at ordinary summer temperatures and the operation is soon completed. The mixing may be done in any receptacle sufficiently large to contain the whole amount of material. It would probably not be desirable to attempt to make more than 20 to 40 pounds at a time, since the difficulty of thoroughly stirring a larger mass would tend to make a complete combination less sure, thus rendering liable the presence of too much free alkali. *Complete and thorough stirring is essential to success.* Caustic soda should be handled with precaution, since in concentrated form it easily injures the skin.

In experiments on willow foliage, badly affected with plant lice, this soap was used in a strength of 1 pound to 7 gallons of water, and completely destroyed the insects.

Tests with *home-made* soap. There could, therefore, be no question as to insecticidal power; but was it sufficiently free from uncombined alkali to be safe for use on tender foliage? In making two lots of soap by this formula, the soda used was taken from a package that had been on hand some time; and the soaps showed, on analysis, less than 1 per ct. of free alkali. In making another lot of soap, using soda from a freshly opened package, the percentage of free alkali ran considerably higher, approaching 5 per ct.; and in still another lot, made after a second formula, more soda and less fish oil were used, giving a soap with 11 1/2 per ct. of free alkali. Solutions were made from soaps of this character and also from soap made by the first formula with free
alkali added in varying amounts up to as high as 20 per cent. Each solution was made by dissolving one pound of soap in seven gallons of water. These solutions were tested upon apple, pear, plum and cherry foliage, by dipping the leaves into the solutions; and no injury resulted except when the percentage of free alkali in the soap was 10 per cent. or more.

It is clear that the home-made soap is both reliable and safe. It is also somewhat less expensive than the purchased article.

Caustic soda of good commercial quality can be obtained from the Penn Chemical Co., 1322 Washington Ave., Philadelphia, Pa., at about 4 cents a pound, f.o.b., put up in 50 lb. cans; which with freight to New York state points should make the soda cost not more than 4½ cents a pound. It can be obtained from druggists at 6 cents a pound.

Fish oil will be sold in barrel lots by Nehemiah B. Cook, 148 Front St., New York City, or by Swan and Finch Co., 151 Maiden Lane, New York City. The refined oil costs 29 cents a gallon (about 7½ lbs.) by the barrel, the crude oil, which answers the purpose very satisfactorily, 25 cents a gallon.

The wholesale price for soda, then, is about 4½ cents a pound, and for fish oil 4 cents a pound; from which we can easily compute the cost of soap, as follows:

6 pounds caustic soda at 4½ cents a pound .............. $0.27
22 pounds fish oil at 4 cents a pound .................... 0.88
Total cost of materials used in making 40 pounds of soap. 1.15
Cost of one pound of soap ..................... 2.9 cents.

Commercial whale oil soap costs at retail, in small quantities, 10 cents a pound; in larger quantities, 6 cents a pound; or in barrel-lots in New York City, 4½ cents a pound, with fish oil soap 3½ cents a pound.

It would, therefore, appear that some saving may be effected in the home-manufacture of fish-oil soap for spraying purposes. Even if no saving could be made by home-manufacture, an article of greater uniformity and reliability could be secured and this would generally result in marked economy in comparison with using commercial soaps of uncertain and very variable composition.
Notice regarding Bulletin No. 256.

The complete edition of above bulletin—Seed Selection according to Specific Gravity, by V. A. Clark—is technical in character. No popular edition will be issued at present.