WAR AND ITS EFFECT ON THE INSECTICIDE INDUSTRY

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Since the insecticide and fungicide industry must share chemicals with the all-out war effort, the future as to the supply of such chemicals is not readily predictable. Comparatively large supplies of most of the necessary chemicals are either available in the United States or available to the United States; but since we have no idea as to the length of the war, we have no idea as to the chemical supplies necessary for carrying on the war to a successful conclusion.

In April 1942, Dr. R. C. Roark, of the Department of Chemistry, United States Department of Agriculture, published in the Journal of Economic Entomology an estimated list of the major chemicals consumed annually as insecticides and fungicides. This was as follows:

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Lead Arsenate</td>
<td>50,000,000 pounds</td>
</tr>
<tr>
<td>Calcium Arsenate</td>
<td>35,000,000 pounds</td>
</tr>
<tr>
<td>Paris Green</td>
<td>2,000,000 pounds</td>
</tr>
<tr>
<td>Nicotine Sulphate</td>
<td>2,500,000 pounds</td>
</tr>
<tr>
<td>Rotenone containing</td>
<td>6,500,000 pounds</td>
</tr>
<tr>
<td>Pyrethrum</td>
<td>12,000,000 pounds</td>
</tr>
<tr>
<td>Sulphur</td>
<td>100,000,000 pounds</td>
</tr>
<tr>
<td>Copper Sulphate</td>
<td>70,000,000 pounds</td>
</tr>
</tbody>
</table>

One can readily see that, although supplies in the quantities mentioned above are available, the problem of containers and
transportation for such supplies is a considerable one, since these supplies must compete also with the war effort.

It is necessary to prepare for any eventuality and it behooves all users of insecticide and fungicide chemicals to be as conservative as possible; and all manufacturers and distributors, as well as all research workers to find, test, prepare, and distribute substitute chemical insecticides and fungicides that can be used in the event the well-established chemical disappears from the market.

The available supply of chemicals is probably the most significant; and a listing of the major items will be given, with a short explanation of the probable supply of each. It should be understood, however, that no individual is in a position to tell definitely just what may happen to the insecticide and fungicide supply.

ANTIMONY, the toxic ingredient of Tartar Emetic, which has come into prominent use in some insecticide fields during the past years, is and probably will be scarce. The major world production of Antimony comes from China; a considerably smaller amount from Mexico; and a small amount from Bolivia.

A very interesting development regarding the use of Antimony as an insecticide has been reported from California recently. The apparent resistance to Tartar Emetic of the Citrus Thrips there and its ineffectiveness against that pest has greatly reduced the amount necessary for that purpose in California. This has made available considerably larger supplies for insecticide purposes in other places, so for the time being, at least, there should be plenty of Tartar Emetic.

ARSENICAL COMPOUNDS, which are by far the most generally used insecticides for controlling chewing insects and probably the most widely used poison in the world, will doubtless be scarce during some period of the year; but since the major demand for arsenical chemicals, both Lead and Calcium, in northern United States occurs in summer and our major demand occurs usually in the winter, it is quite likely that supplies will be available for use in Florida during the next season.

About half of the arsenic used in this country comes, in normal times, from abroad—mainly from Sweden, Belgium, and Japan. These sources are lost for the present.

At the same time other industries are demanding larger shares of the arsenic still available. Great quantities are needed for the manufacture of khaki cloth, blankets, etc. It is demanded
in increased quantities for glass making. And it is also needed for the production of chemical weed killers to replace chlorine now absorbed by the powder mills.

Many compounds have been suggested as arsenical substitutes and among these are Phenothiazine, Genicide, Dinitrocresol, Phthalonitrile, Basic Copper Arsenate, Tetra Methyl Thiuram Disulphide. Most of these compounds are comparatively new and have been tested very little. Some of them have specific toxicity for some insects and are not very toxic to others. All of these points must be investigated thoroughly before recommendations can be made as to their use.

BORAX is supplied largely from domestic sources and will probably be available, with the usual limited supply of containers and transportation as a handicap.

COPPER COMPOUNDS of various kinds are used extensively in the war effort but, fortunately, over fifty per cent of the supplies of copper in 1937 came from the United States; and Chile and Canada produced one third as much as the United States. Several forms of copper are necessary in agriculture but by far that most commonly used is copper sulphate or bluestone. Recently, however, many combinations of copper compounds have been used instead of bluestone as fungicides. Although there have been temporary shortages of copper compounds in a few instances, it is not likely that the supply will be cut off.

It would not be possible to substitute any other compound for copper as a nutritional material although many substitutes have been mentioned as a fungicide instead of copper compounds. Among these are several silver compounds, sulphur and lime sulphur, spergon, and ferric dimethyl dithiocarbamate. One instance of a successful substitution of lime sulphur for copper compounds is that of dormant spraying for Citrus Scab. A comparatively good control can be obtained by fairly high concentrations of lime sulphur solution.

Since copper sprays are known to be effective for nutritional purposes and smaller amounts are needed for such applications than for soil application, it is most likely that there will be less used in soil and more used for nutritional sprays for our conservation effort.

Although several substitutes for copper compounds were mentioned, none are very well established and all should be tested considerably more before recommendations can be made.


**FLUORINE COMPOUNDS**, although common in the insecticide field for many years, have never been extensively used for agricultural purposes. It is possible, however, to use these compounds instead of arsenicals in some instances. A considerable quantity of these materials has been thrown away in phosphate manufacture and it may be desirable and necessary now to recover these.

Changes made in the normal shipping lanes have apparently made available more space for importing natural Greenland Cryolite so larger quantities of this product are now available in the United States than it was possible to get before the war started. This is at least one bright spot when material shortages are discussed.

**MANGANESE COMPOUNDS** have come into general use, both as sprays and for soil application. Of all the metallic elements, American supplies or American production during the past few years have been smallest on this item. Only 1.3 per cent of the world’s supply was produced in the United States in 1927, while Russia produced 60 per cent. Cuba at the same time produced 3 per cent. It will, apparently, be necessary for us to develop some of the lower grade ore which has not been worked in the United States and at the same time conserve manganese as much as possible. Nutritional sprays of this material are effective and should probably be used more generally in view of the scarcity of this product.

**PETROLEUM OILS**, while very plentiful in the United States, particularly in the Texas area, are restricted considerably in their movement because of limited transportation facilities. All of the handicaps to which the movement of gasoline and fuel oil are subjected apply on spray oil stocks also. Although considerable quantity of petroleum oil is available, it will most likely be necessary to distribute the shipping or selling season over a longer period, in order to get enough transportation and containers. We are in a fortunate position, however, in that the greatest demand for oil spray products occurs during the summer or early fall when the demands for fuel oil are least.

A most desirable chemical would be a substitute for oil sprays for scale control. Such a product is available for Purple Mite control at present. Very spectacular kills can be obtained by the dinitro compound on mites and spiders, but it is still necessary to use oil sprays for the control of scale insects and white flies.

(To be continued)