Recent Developments in the Utilization of Soybean Oil in Paint

By W. L. Burlison
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FIFTEEN YEARS ago the soybean was only a substitute crop in American Agriculture.¹ Today there are few, if any crops, that outrank it in interest and in future possibilities.

The need in 1920 was for more legumes in the rotation; more home-grown, high-protein feeds in the feed bin; and substitutes in the rotation for red clover and oats. For these purposes the soybean was then promising. This early promise has been more than fulfilled. The real pre-eminence of the soybean, however, was to come later, with the trend toward the development of industrial uses for agricultural products, the finding of new uses for old crops, and the creation of new markets for the farmer. It is with this new outlook for agriculture that the soybean has advanced beyond a substitute crop and has become the "wonder" bean.

For many years the utilization of the increasing acreage of soybeans did not worry the producer, for there was a steady demand for seed with which to plant the expanding acreage. As the harvest of beans doubled and trebled, however, the demand for seed alone was not great enough to provide an outlet for all threshed beans.

Marked progress has been made in developing industrial uses for the soybean during the past few years. It was not until 1929 that absorption by soybean crushing mills began to be a potent factor influencing production of the crop. There is a record that soybean oil was first produced in North Carolina in 1910 and later, in 1920, at Chicago Heights, Illinois. However, the quantity produced in this country at that time was not sufficient to be noted in the U. S. Census. By 1934, however, such marked advances had been made that 20,907,000 pounds of soybean oil went into food products and industrial uses.

Only the remarkable versatility of the soybean crop can explain this far-reaching development in its utilization. As far back as 1931 a list of something like 100 soybean products which were actually being placed on the market in the United States and Canada was compiled

¹This was the year (1920) when the American Soybean Association was founded on the Fouts Brothers' Farm, Camden, Indiana.
from letters received by the Department of Agronomy of the College of Agriculture, University of Illinois, from more than a hundred manufacturing concerns of soybeans and soybean products. This list is even longer now. Today the soybean crop is being used for "everything from hay to hairpins."

No phase in the utilization of soybeans has been more striking than the perfection of methods for using the oil in paints and varnishes. Since Illinois was the leading soybean producing state in 1924 it was only natural for the Illinois Agricultural Experiment Station to do what it could to promote the wider industrial utilization of soybean products. An aggressive program was launched when Dean H. W. Mumford, Director of the Station, asked to have the utilization of soybean oil studied with a view to setting up an investigation on this subject.

It was just five years ago, in 1930, that the Experiment Station launched this project. Today it is estimated that in Illinois one out of every ten farmers has one or more buildings painted with "soybean oil paint."

This achievement is remarkable in view of the obstacles that had to be overcome. At the outset of the work it was found that paint companies were cautious in matters pertaining to the use of soybean oil. In fact, as Maximilian Toch reported, soybean oil as a paint oil was practically unknown as recently as 1909. "Since that time," Toch stated in 1921, "many investigators have published more or less conflicting articles concerning soya bean oil, and even the physical and chemical constants of soya bean oil vary to some extent. Owing to the fact that discordant results were continually obtained, it is only within the last year that it has been possible to state with some degree of certainty whether soya bean oil is a substitute for linseed oil, an adjunct to it, or neither."

The above statement, written less than twenty-five years ago, was one of the earlier ones in this country on the question of the use of soybean oil in paints and varnishes. Between that time and the start of the Illinois experiments, successes and failures as this new development progressed were reported and discussed in a number of papers.¹

¹The term "soybean oil paint" is used when the paint contains any soybean oil.
³Gardner, H. A. In circulars issued by the Paint Manufacturers' Association of the United States: Circ. 50, June, 1917, Soya oil in paints. Circ. 67, (footnote is concluded on the following page)
With this record as a background, the first of the Illinois Station studies on the use of soybean oil for paint purposes was begun in August, 1930. Paints were tested in which soybean oil constituted varying proportions up to 50 percent of the total vehicle (liquids) used in the paint. Direct comparisons were made with standard linseed oil paints. After five years of exposure, the paints made with soybean formulas are very satisfactory.

The first test panel exposures were made during the spring of 1931, when a large number of panels were put out (see illustration). The purpose was to study, first, the behavior of paints differing primarily in their content of raw and treated soybean oil, and in addition to compare the effectiveness of different driers.

After the panels had been exposed for two years on the rack (set at a 45° angle) it was evident, for one thing, that the type of exposure was exceedingly severe. It was an accelerated test which was probably twice as rapid in getting results as the side of a building or panels exposed upright would have been. It was clear, also, that the pigment has much to do with the durability of the paints, as might be expected.

Interior paints, as well as exterior ones, were studied in the Illinois experiments. The first of the panels coated with interior paints containing soybean oil were put up in the spring of 1931. The results of

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**References**

this set of panels are highly pleasing, and the work has been extended even farther. Rooms in the agricultural buildings on the University of Illinois campus have been painted with soybean oil paint. Today after three years, the paint in these rooms is holding up in excellent shape.

Work has not stopped with tests of panels and rooms. A number of buildings on the campus were painted with soybean oil paints two years ago. These were inspected in July, 1935, and found to be in good condition. The University of Illinois is now making liberal use of soybean paint.

From the exposure and other tests which have been made, we are convinced that soybean oil has a permanent place in the manufacture of paint. The results on the panels support the findings of other workers to the effect that 30 percent and more of the oil used in the paint can be made up of soybean oil when properly treated and when driers suited to this kind of oil are used.

This conviction is supported by results that are being obtained in the field. Many farm buildings in Illinois that have been painted with soybean oil paint have been inspected recently by the writer. This paint is giving satisfaction when properly handled and applied.

Of prime importance in this new development is the fact that soybean oil paint has the backing of farmers. They are loyal to and enthusiastic about this newer phase of the paint industry, and paint manufacturers may expect support from soybean producers so long as this product is properly prepared and used. It is significant that in 1934 about 10,450,000 pounds of soybean oil were used in the manufacture of paint in the United States. This is striking evidence of the growing confidence in the practicability of its use by manufacturers.

A number of organizations and paint manufacturers are interested in soybean oil for paint purposes and are doing much to promote its use. One of these organizations is the Illinois Farm Supply Company, a subsidiary of the Illinois Agricultural Association, which began actively to promote the use of soybean oil paint in 1932. After studying the work at the University of Illinois, the above organization asked for bids for paint made according to certain formulas containing soybean oil, and it has been active in this field since that date.

L. R. Marchant, Manager of the Illinois Farm Supply Company, said in correspondence July 10, 1935:

"Several factors are responsible for the 70 percent increase in sales of soybean oil paint this year. Nevertheless, we are led to believe that foremost among them comes customers' satisfaction with soybean oil paint and public acceptance of the use of soybean oil in high-grade paints. . . . Today, we estimate that at
least 20,000 rural people have used more than one-quarter million gallons of soybean oil paint and that one out of every ten farmers in the state has one or more buildings painted with soybean oil paint.

"The vehicle of our house paint contains not less than 331/2 percent especially refined soybean oil produced by the solvent process, and the vehicle of the red barn paint, 50 percent of the same quality oil.

"Soybean oil paint is not infallible. It is subject to the usual troubles and failures common to any high-grade paint if improperly applied or used under adverse conditions. Soybean oil paints applied three to four years ago are holding up well. We can truthfully state that we do not have a record of a single failure caused by the use of our type of refined soybean oil, which we believe has been largely the secret of our success."

Finally, what does the paint industry itself think of the possibilities for the use of soybean oil in paints?

Adrian D. Joyce, a leading manufacturer and president of The Glidden Company, stated: 1

"I am glad to tell you that as a result of our experimental work and long experience, we have found that by carefully refining and treating soybean oil we can make an oil which is very desirable for use in paints and in enamels. This oil is not only flexible, but it also dries properly and retains its elasticity when combined with special driers. One of the fine characteristics of this oil is the fact that it is non-yellowing.

"I am of the opinion that soybean oil can be still further employed and that progressive manufacturers will soon realize the tremendous opportunities there are for the use of soybean oil in a long list of products."

W. H. Gerke of The Sargent-Gerke Company, believes that: 2

"Soybean oil is undoubtedly a strong fortifying oil combined with linseed oil to increase the durability of the film and increase the gloss retention and flexibility of the film . . . .

"We are beginning to find increased uses for it in enamels where a high luster is desired. I feel sure, however, that some day a strain of bean will be found that will produce an oil that is safe to use in much larger amounts in paints than is now the case."

C. D. Holley, Director of Research, of The Sherwin-Williams Company, has stated: 3

"If in order to obtain paints having the best all around performance, we find it necessary to use a mixture of pigments, it would be logical to expect that the best soybean oil paints would contain a mixture of oils. This appears to be the case, and we have found that a mixture of 8 parts linseed oil, 4 parts soybean oil, and 1 part processed tung oil dries about as well as linseed alone . . .

"Paints containing up to 25 percent soybean oil (vehicle basis) which has its drying qualities properly balanced by a mixed oil combination, when used with leaded zinc, white lead and titanium pigment mixtures, dries similarly to a straight linseed oil paint, and as far as we can determine, with equal durability."

All of you, of course, are already familiar with what the Ford

1Joyce, Adrian D. Correspondence, July 10, 1935.
Motor Company is doing in the development of industrial uses for the soybean. The Ford Company plans to increase the amount of soybean oil used in enamel for motor cars.¹

Space does not permit recording the results of many other research workers and manufacturers who have been studying the use of soybean oil for paint purposes.

Remarkable, romantic, and rapid as the rise of the soybean crop has been up to this time, the brilliance of that record has not in the least dimmed the future of the crop. As far back as 1929 authorities like Otto Eisenschiml² and many others were predicting unusual developments for the soybean industry. Fifteen years ago I dare say that not one of the many soybean growers and enthusiasts who attended that meeting of the founding of the American Soybean Association on the Fouts’ farm even so much as dreamed that farmers today would be painting their houses and barns with soybean products. Who can predict what we will be doing with soybeans when this association holds its meeting fifteen years hence?

Success in the industrial manufacture of soybean products has been fully demonstrated, but it is not too much to expect that future advances may be safely anticipated by further research and experience even in the field of the use of soybean oil in paints.

²Eisenschiml, Otto. Domestic soya bean oil. Oil and Fat Indus. 6, 15-19. April, 1929.