

MATERIALS USED AS CANKER PAINTS IN WOOLLY APHIS CONTROL

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In 1929, the Vernon Dominion Entomological Laboratory was given the problem of finding a suitable way of controlling the woolly aphids of apple. The main idea was to find some material which would keep the aphids out of cankers and pruning wounds, thus preventing further extension or formation of these cankers. Control of the woolly aphids upon other parts of the trees can be secured by the addition of nicotine sulphate to one or more of the usual orchard sprays.

In Washington State many hundreds of materials had been used to control woolly aphids and perennial canker without much success, except by using high and expensive concentrations of nicotine.

Materials used in British Columbia by pathologists, before we took up the work, had been chiefly confined to vegetable oils such as castor oil, rape seed oil, etc. These oils kept out aphids by their physical oily properties for a short time, but failed to be really toxic to the insects.

During the past four years we have tested one hundred materials and mixtures in order to find one which would be 100 per cent. effective without injuring the tissues of the tree.

I would not like to weary you with the complete list of the many and varied materials that were used, but it is sufficient to mention a few, such as: vegetable oils, zinc chloride, mercuric chloride, derris compounds, pyrethrum, yeast solutions, quassia, pine oils, glues, nicotine compounds, mineral oils, tree tanglefoot, etc.

Some of these, more especially some of the vegetable oils, were promising, but their cost was against them.

It was in 1931 that we found that an emulsion of Castor machine oil 50 per cent. with water, plus 5 per cent. of nicotine sulphate, gave us 100 per cent. control of aphids. Cankers and wounds painted in July, 1931, were free of woolly aphids all that season, and even until June of the following (1932) season, in spite of heavy surrounding infestation during 1931.

However, it was found that some injury had occurred to the lower portions of the margins of some cankers painted with the 50 per cent. castor machine oil paint. This injury was not apparent until the spring following its application. It was, no doubt, caused by too great a concentration of oil at the bottom of the wounds.

An interesting point to mention, here, is that the increasing of the nicotine sulphate from 5 to 10 per cent. in this 50 per cent. emulsion in 1931 caused a large amount of injury to the callus, showing

that nicotine sulphate cannot be used with safety at much over 5 per cent. by volume.

Best Formula for General Recommendations

During 1932, many more experiments showed us that the mixture to be recommended, and one that would give excellent control of woolly aphids in wounds with no injury to the margins, was 25 per cent. Castor machine oil (heavy) plus $2\frac{1}{2}$ per cent. nicotine sulphate, emulsified in water by means of wheat flour (5 per cent. by weight).

Emulsifiers

A word should be said about the emulsifiers. Several materials were tried out. We found that the best one for this heavy elastic-like Castor machine oil was ordinary wheat flour. Again, we found, although the flour did good work used raw, that by boiling it into a paste with the water, a very much more stable emulsion was formed. With the oil at only 25 per cent. in the emulsion it had a tendency to "cream" on standing when casein was used as a spreader, thus necessitating continuous agitation whilst using the paint. When the boiled flour paste is used as an emulsifier, the paint can stand at least 15 hours without "creaming."

Castor Machine Oil

This brief paper would not be complete without a word or two about this oil. It is **not**, as its name would seem to imply, connected in any way with the vegetable castor oil. It is in reality a solution of an aluminium soap in a mineral lubricating oil.

Each oil company has a slightly different formula, but in general the principal is the same. One brand of Castor machine oil used, contains $2\frac{1}{2}$ per cent. of aluminium naphthenate soap. The addition of this soap (which is insoluble in water) is made to an ordinary brown neutral oil. The consistency of the oil is thus changed from a free-flowing mineral oil to a peculiar elastic type of heavy oil, possessing a curious texture between a rubbery liquid and a jelly. It is used in commerce for slow-moving machinery, shafting, etc., and can be purchased at hardware stores.

What Gives the Castor Machine Oil-Nicotine Paint Its Toxic Qualities?

In order to test this out, experiments were made in 1932 with the component parts of the oil—that is the brown neutral mineral oil, and the aluminium naphthenate soap. As the soap "pulp" was insoluble in water a solution in gasoline was used: it proved non-toxic to both woolly aphids and the tree tissues. The brown neutral oil seemed

slightly toxic to the aphids for a short period of the season, but also gave some severe injury to the tree tissues at 50 per cent. with water. It was shown definitely that the nicotine sulphate addition to the paint give it its toxic properties to woolly aphids. It is my opinion that the nicotine sulphate may form an oil soluble aluminium-nicotine-napthenate compound with the Castor machine oil, which makes its duration of toxicity considerably greater than that of the nicotine sulphate alone.

Before closing this paper it might be interesting to explain what led to the use of Castor machine oil in the first place. It is very often the case that some insignificant detail will bring out something of value; in this case, we heard of a grower buying pure castor oil for 60 cents per gallon. As the wholesale price is around \$2.00, I proceeded to the store in question and purchased one quart of their so-called "castor oil." Upon asking if this bluish oil with a distinct mineral oil smell was really supposed to be vegetable castor oil, I was assured that it wasn't the pure article but contained quite a lot of it nevertheless! How far wrong this statement was has already been shown. Not wishing to pass by any possible materials, this oil was duly given a trial, with the result that we now have a canker and wound paint at a cost of approximately 40 cents per gallon which, if properly applied, can completely control the woolly aphids in wounds and cankers, and thus at the same time provide a satisfactory means of stopping the enlargement of cankers and wounds upon tender varieties of apples in the Okanagan.

