

Flukes can be kept alive for 60 hours at 36° C. in the following solution : NaCl 150 mM., KCl 10 mM., CaCl<sub>2</sub> 1 mM., borax 6 mM., glucose 30 mM., pH 8.6. Survival times can be further increased by using fructose instead of glucose, and by the addition of 1/5,000 trypan blue<sup>1</sup>, but the medium as stated is simpler and cheaper, and thus more suitable for large-scale work. A survival time of 60 hours, although disappointing, is a considerable advance upon previous records, and is adequate for preliminary tests of the effects of anthelmintics *in vitro*. Certain of these tests have been carried out, and it has been shown that carbon tetrachloride, probably the most effective anthelmintic *in vivo*, is innocuous *in vitro*.

WILLIAM STEPHENSON.

Department of Zoology,  
University of Bristol. Jan. 13.

<sup>1</sup> Müller, *Zool. Anz.*, 57, 273 (1923).

<sup>2</sup> Weinland and von Brand, *Z. vergl. Physiol.*, 4, 212 (1926).

<sup>3</sup> Flury and Léeb, *Klin. Woch.*, 5, 2054 (1926).

<sup>4</sup> Harnish, *Z. vergl. Physiol.*, 17, 365 (1932).

<sup>5</sup> Chu, *Chin. Med. J.*, 54, 409 (1938).

## Control of Red Spider Mites

SINCE the discovery in 1936 of its insecticidal properties, 2:4 dinitro-6-cyclohexylphenol<sup>1</sup> has been widely used in the United States for the control of tetranychid mites. Successful control has been obtained of *Paratetranychus citri* (McG.)<sup>2,3</sup> and of *Tetranychus telarius* (L.) on citrus, cotton<sup>4</sup> and hops<sup>5</sup>; on all these crops damage by red spider is of considerable economic importance, and this substance is the only synthetic compound which has been successfully applied to control on a large scale. It is of interest that 4:4' dichloro-diphenyl-βββ-trichloroethane (D.D.T.) is of no use as an acaricide. Later work has established that the phytocidal effect of dinitro-ortho-cyclohexylphenol can be diminished by use of its dicyclohexylamine salt without impairing its properties as an insecticide or acaricide.

Experiments recently carried out in the field from this laboratory have established that control of *T. telarius* can be obtained on hops and on greenhouse tomatoes in Great Britain.

The experiments on hops were carried out in Kent in September. Two proprietary dusts and one dust using kaolin as filler were used; all three dusts contained 1 per cent of 2:4 dinitro-6-cyclohexylphenol as the dicyclohexylamine salt, and ½ lb. was applied to each plant. Both were also applied as aqueous suspensions, and the compatibilities with cuprous oxide and copper oxychloride, and of the salt with nicotine were tested.

Treatment	Mites counted	% killed
Proprietary dust A	2100	94.8
Proprietary dust B	1630	94.3
Dicyclohexylamine salt with dinitro-cyclohexylphenol with kaolin	1600	82.3
Flowers of sulphur	1730	26.6
Aqueous Suspensions		
0.05% dinitro-cyclohexylphenol	2920	98.4
0.025% "	4500	97.0
0.025% "	1100	96.6
0.025% "	685	97.2
0.025% dinitro-cyclohexylphenol + 0.5% proprietary cuprous oxide	1600	91.1
0.025% " + 0.5% copper oxychloride	1950	95.2
0.025% dicyclohexylamine salt with dinitro-cyclohexylphenol	1140	97.9
0.025% " + 0.037% nicotine	780	93.3
1% Lime sulphur	2130	95.5
Control untreated	1605	9.8

0.025 per cent of the salt as a suspension gave a 96 per cent kill against 65 per cent with a standard lime sulphur used widely by the growers. With the dusts, a 94-95 per cent kill was obtained against 27 per cent with flowers of sulphur.

The mortality was only slightly reduced by the addition of cuprous oxide, copper oxychloride and nicotine.

It was further found that 60-70 per cent of the eggs were killed by application of 0.025 per cent suspensions of the dinitro compound and of its mixture with the dicyclohexylamine salt.

Experiments to compare the use of dinitro-cyclohexylphenol and of its mixture with the dicyclohexylamine salt and the ammonium salt of 2:4 dinitro-ortho-cresol in killing *T. telarius* on greenhouse tomatoes in October, showed up markedly the superior properties of the dicyclohexylamine salt under conditions where plants are liable to be easily damaged. It was found that on tomatoes, satisfactory cover of the foliage could not be obtained without the addition of a wetting agent.

Treatment	Mites counted	% kill	Damage to plants
0.03% dinitro-cyclohexylphenyl	109	77.1	Very slight
0.006% "	194	87.6	Slight
0.012% "	795	88.0	Some severe damage
0.025% "	—	—	Plants killed
0.006% " with the dicyclohexylamine salt	561	66.3	Slight
0.012% " " "	725	90.1	Slight
0.025% " " "	524	91.0	Slight
0.018% dinitro-ortho-cresol	—	—	Plants killed
0.036% " " "	—	20	Plants killed

Ammonium dinitro-ortho-cresylate killed the plants completely at dosages too small to be lethal to the red spider mite. 0.025 per cent of dinitro-cyclohexylphenol as the salt gave a 91 per cent kill and caused insignificant damage, while the same concentration of the free phenol killed the plants.

Preliminary experiments with *Oligonychus ulmi* Koch on damsons have given similar promising results.

A. C. SIMPSON.

Pest Control, Ltd.,  
Harston, Cambridge. Dec. 12.

<sup>1</sup> Kagy, T. B., and Richardson, C. H., *J. Econ. Ent.*, 29, (1), 52 (1936).

<sup>2</sup> Boyce, A. M., et al., *J. Econ. Ent.*, 32, 432 (1939).

<sup>3</sup> Kagy, J. F., and McCall, G. L., *J. Econ. Ent.*, 34, 119 (1941).

<sup>4</sup> Isely, D., *J. Econ. Ent.*, 34, 323 (1941).

<sup>5</sup> Morrison, H. E., and Moté, D. C., *J. Econ. Ent.*, 33, 614 (1940).

## Control of White Rot in Onions

WHITE rot in onions and other *Allium* species has been recorded in many countries and has increased in severity in England during recent years. The disease is caused by the fungus *Sclerotium cepivorum* Berk., which survives for several years as sclerotia in the soil, and is therefore difficult to control by cultural methods. Ogilvie and Hickman<sup>1</sup> obtained satisfactory control by broadcast applications of a proprietary fungicide containing hydroxymercurychlorophenol; but this treatment did not come into general use, possibly on account of the high cost. Apart from this, no direct control method has been recommended.

In trials made during 1943 and 1944, mercurous chloride (calomel) showed promise as a means of controlling white rot in spring-sown onions, var. James' Keeping. The best results were obtained by the