Practical Control of Wireworm with 'Gammexane'

FROM the beginning of the War a considerable programme of work on the control of wireworm by chemical means was prosecuted by these laboratories. Following the discovery of the insecticidal properties of the gamma isomer of 1.2.3.4.5.6-hexachlorocyclohexane ('Gammexane') in 1942[1], it seemed likely that the new agent might control wireworm attack.

After laboratory and small-plot work had established dosage rates that would not damage cereal crops, two small field trials were laid down in the autumn of 1943 and spring of 1944. Of these, the latter was most encouraging; the treated strips showed improved stands in relation to those of the controls, and the wireworm populations were definitely reduced. The autumn trial showed little wireworm attack in any strip.

The small field trials were sufficiently promising to warrant extended trials in 1944–45, and accordingly sixteen trials, all on winter wheat, were laid down in the autumn of 1944 and thirty-one trials, mainly on oats, in the spring of 1945. Very considerable help in selecting the sites was given by the war agricultural executive committees and the provincial advisory entomologists, particularly those of Reading. The fields selected for trials were those with the highest wireworm populations, ranging from half to one and a half million larvæ (more than 5 mm. in length) per acre. Most of the fields were first year after grass.

Without exception, wherever the new insecticide was used, the treated strips showed excellent stands. As expected, in the case of the untreated strips, the observed wireworm injury in general mounted with increase in observed wireworm population. Some of the untreated strips, in the worst cases, were practically bare.

The chemical was applied in various ways, from which two may be selected on the grounds of immediate practical interest: (1) Preparation broadcast as a dust and harrowed in just before or after sowing. (2) Preparation in the form of a dust combine-drilled with the seed. In both cases the content of the gamma isomer in the dust was about 0·25 per cent. The rates of application of dust fell in the range of 1–6 cwt. per acre in the various trials.

In general, it was found that a 65 per cent reduction in wireworm population followed the broadcast application of dust at the rate of 3 cwt./acre (that is, 0·84 lb. of 'Gammexane' per acre), while as much as 50 per cent reduction followed the combine drilling of dust at the rate of 1 cwt./acre (that is, 0·28 lb. of 'Gammexane' per acre).

The bulk of the trials were on cereals, as already mentioned, but three trials with Brassicæ showed equally promising results.

It is hoped to publish a full account of these trials elsewhere when all crop yield figures are available. Further trials are in hand to amplify the work; but it is already clear, on the evidence available, that preparations based on this new insecticide provide, for the first time, practical and economic means for the control of attack by wireworm.

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Cobalt as a Preventive of 'Pining' in Cornwall and Devon

UNTIL recently, all evidence of the use of cobalt as a preventive or cure of 'pining' in sheep has been confined to Scotland[1,2] and the north of England[3], although attention was directed in 1937[4] and 1938[5] to 'pining' and its possible connexion with low cobalt content of soils and pastures in Devon. During the past eighteen months, further study has shown that the condition is fairly widespread on soils derived from granite and Old Red Sandstone grits in both Devon and Cornwall.

In some parts of Cornwall, it is customary for farmers on the granite areas to own or rent a 'change' farm on soils derived from Middle Devonian shales to which the stock are sent for overwintering as a preventive of 'pining'. Analysis of the soils and pastures from such a pair of farms gave the accompanying results:

COBALT IN PARTS PER MILLION.

	Soils		Pasture	
	Mean	Range	Mean	Range
'Pining' Farm	0·033	nil–0·060	0·05	0·01–0·07
'Change' Farm	1·211	0·575–2·105	0·14	0·11–0·16

In soils, this refers to cobalt soluble in 2·5 per cent acetic acid; in pastures, to total cobalt. These figures are not comparable with those given in refs. 4 and 5, which referred to 'total cobalt', but are comparable with those given in refs. 1 and 2 and by Mitchell (ref. 6).

In experiments carried out at the above 'pining' farm in Cornwall on the effect of cobalt administered as a drench giving 1 mgm. cobalt a day on preventing 'pining', the average live-weight increase of members of the control group over a period of three months (April 25–August 1) was 8·9 lb., and of those receiving cobalt was 37·6 lb., giving a difference of 28·7 lb. in favour of those receiving cobalt. The most striking fact was that during the last month of the trial, eighteen of the twenty control animals died while showing all the usual symptoms of 'pining', while all but one of the treated sheep remained healthy. This constitutes the first authenticated instance of cobalt as a preventive of 'pining' in Cornwall.

On Dartmoor, in a similar trial in which both groups of animals were dosed with phenothiazine, animals in the control group gained an average of 0·3 lb. over a period of six weeks, while those receiving cobalt in addition to phenothiazine gained a statistically significant average of 8·2 lb. a head. Further work has been and will be done, and will be published more fully elsewhere.

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A Climatic Index

IT is generally recognized that one of the most satisfactory single-value climatic indices in estimating the efficiency of rainfall for the purposes of agriculture and plant ecology is the Transeau ratio of precipitation to evaporation from a free water surface[1], or the Meyer ratio of precipitation to atmospheric saturation deficit[2].

It has been increasingly obvious to those making frequent use of these indices that a constant ratio rarely holds over a wide range of climate extending from the temperate regions to the tropics. The ratios appropriate to tropical conditions are generally lower than corresponding ratios for temperate conditions.

A recent examination of a variety of data has made it possible to suggest a new index, namely, the ratio of precipitation to some power of evaporation. That is, for constant edaphic conditions so far as soil moisture relationships are concerned:

$$\frac{P}{E^m} = I.$$

Two examples may be given. The index has been found to hold for the climatic boundaries separating the four major soil zones of Australia as delineated in my map of 1944[3], when both rainfall and evaporation are taken as mean annual values.

Soil boundaries	m	I
Between desert formations and grey and brown soils	0·70	0·47
Between grey and brown soils and black and red-brown soils	0·70	0·92
Between black and red-brown soils and podsols	0·70	1·70

The second example is derived from the mean monthly records of the Rothamsted drain gauges as discussed by Crowther[4]. An equation with significant regression coefficients has the form

$$D = 3{\cdot}84 \log P - 1{\cdot}81 \log E - 0{\cdot}05,$$

where D is the drainage, P the rainfall and E the evaporation from a free water surface as estimated from the saturation deficit. The regression can be expressed in the form

$$\log \frac{P}{E^{0{\cdot}47}} = \frac{D + 0{\cdot}05}{3{\cdot}84}.$$

When drainage is nil, the value of the index is 1·03.

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Adelaide. Jan. 21.

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Establishment of Beneficial Insects in Trinidad, B.W.I.

TRINIDAD is a continental island and, in contrast with oceanic islands like Fiji, Hawaii and Mauritius, affords an unfavourable biological environment for the establishment of introduced insect parasites and predators. The only beneficial species, apart from the honey-bee, which have become successfully established appear to be the thrips parasite, *Dasyscapus parvipennis* Gahan, and the Javanese beetle, *Plæsius javanus* Erichson.

Dasyscapus parvipennis is a minute parasitic wasp which attacks various species of thrips, including the cacao thrips, *Selenothrips rubrocinctus* (Giard), an important pest of cacao in the West Indies, West Africa and Brazil. This parasite was introduced into Trinidad from the Gold Coast in 1935 by Adamson[1], who gives an account of breeding in the laboratory and liberation in the field. Although it has been successfully established in Trinidad, no economic control of the cacao thrips has unfortunately resulted[2].

Plæsius javanus is a beetle which is predaceous on the banana weevil borer, *Cosmopolites sordidus* Germar, an important pest in almost all banana-growing countries. Originally found in Java, this predator was introduced many years ago into Fiji, where it became established. Subsequent introductions into numerous other countries have been made, but so far as I am aware it has only been established in Fiji, Queensland, Tahiti, Jamaica and Trinidad. The introduction into Queensland was made from Java several years ago, while that into Tahiti was made from Fiji in 1937 and appears to have been conspicuously successful[3,4]. The establishment in Jamaica was achieved by introductions from Fiji in 1937, 1938 and 1939[3,4], and that in