

SENECIO JACOBAEA AND CALLIMORPHA JACOBAEA (*the Cattle Killing Ragwort and the Cinnabar Moth*) BY HENRY S. POOLE, D. Sc., Guildford, Surrey, England.

(Read 10th November 1913.)

Some sixty or more years ago a plant strange to Nova Scotia, known as St. James Ragwort, Ragwort, Baughlan, Staggerwort, and Stinking Willie, was noticed growing at Merigomish and to be spreading over the neighborhood. Its seeds were supposed to have come in the ballast of timber ships. The speculations as to its origin when first noticed gave place in the course of time to invidious references more and more pronounced as the plant spread and invaded pastures and hayfields, scattering its seed freely in the Fall in total disregard of the spasmodic endeavors of farmers to extirpate it. It is included in the "Farm Weeds of Canada" by G. H. Clark and James Fletcher of Ottawa, 1902, and is spoken of as a noxious weed imported into Pictou county, Nova Scotia, whence it has spread in the course of years to other parts of the Province. Dr. A. H. MacKay in the *Journal of Education for Nova Scotia*, 1908, dwelt at length in his earnest endeavors to incite through the public schools, the farmers and their children in the infested districts, to a crusade against the plant. Prizes were given and he says millions of the seed were destroyed. The effort to exterminate it by this means, was, however, found ineffectual and consequently abandoned. Any steps that have since been taken to check the spread of the plant have been those of individuals on their own lands only. The roadsides, the burnt lands and the unenclosed woodlands have been left to the undisturbed possession of Stinking Willie.

In England, Ragwort is referred to in "Common Weeds of the Farm and Garden" by Harold C. Long, and in "Weeds of the Farm and Garden" by Pommel. In these works and in ordinary life any reference to the plant is in mild terms. It is spoken of merely as one of the many weeds of the roadside, as a common weed and nothing more. It has been left to Nova Scotia to single it out for notoriety by a specially opprobrious name and for reference to its noxious character on the floors of the local parliament.

To botanists it is an interesting member of the *Compositae* with discal florets of thirteen rays.

To me, a native and long a resident of Pictou county, thoroughly familiar with its luxuriant growth and its objectionable characteristics, it came as a surprise to meet with Ragwort comporting itself as a modest weed on the commons and heaths of Surrey in small communities and often solitary. I met it first in company of a botanist, Mr. H. E. Lee, and to him I contrasted its unobtrusive deportment in England with its assertiveness in Nova Scotia where it takes more than its fair share of place in the sun and in the waste places of Pictou county.

I aroused Mr. Lee's interest by telling him of the burnt lands and the fence rows yellow with its golden blossom in Autumn and of the ineffectual attempts through the public school teachers to root it out and exterminate it, or at least to check its spread to other parts of the Province. I mentioned also, that, however effective might be a rotation of crops in the cultivated ground and the indiscriminate grazing of sheep in the pastures, the unenclosed deforested land was so large that all hope of extirpation by the hand of man and the teeth of sheep had to be abandoned. It was then he told me Ragwort had a natural and special enemy in the Cinnabar moth whose showy colouring had previously attracted my attention. This information at once suggested that if the fact as stated to me was sustained on further inquiry and the

knowledge proved to be as new to the Canadian agricultural authorities as it was to myself, then it would be worthy of further investigation.

To this end I spoke to the Director of the Royal Botanic Gardens at Kew, Sir. E. D. Prain, and to officials in rooms four and eight of the Department of Agriculture and Fisheries, Whitehall Place, and also to Mr. R. South, F. E. S. of the Natural History Museum, South Kensington. In the meantime I had made acquaintance with Mr. I. W. Walton, the botanist, at Folkestone, who confirmed from local observation the statement made by Mr. Lee. Any lingering doubt I may have had was removed on visiting the Natural History Museum and reading the slip attached to the specimens of *Callimorpha Jacobaea*, the Cinnabar moth of the order Heterocera.

Seeing that none of the works on weeds already quoted made reference to the Cinnabar moth, attention was turned to Barret's Lepidoptera of the British Isles, a standard work, and on page 246 the moth is spoken of as common in England and as having been taken as far North as Perth. It was also mentioned that while the moth is generally met with on Ragwort, it has occasionally been found feeding on the Coltsfoot.

At this stage of my inquiry several questions presented themselves: among them first, was the Cinnabar moth known in any part of North America?

Inquiry of the Bureau of Entomology, Department of Agriculture, Washington, U. S. A., brought a courteous reply from Dr. F. H. Chittenden to the effect that he has never found *Callimorpha Jacobaea* to occur in the United States at all; and he further wrote that on referring the matter to Dr. H. D. Dyar a specialist on Lepidoptera in that group, he stated that he has never known of its being taken in the United States.

This reply suggested in turn a second question—might the Cinnabar moth if introduced into Canada become as disastrous an importation as the gypsy and brown-tailed moths had proved to be? I referred this question to Mr. South of the Natural History Museum, and he had no hesitation in saying he saw no reason to dread the introduction of the Cinnabar moth. It was not of a class to become a pest as the narcissus fly or the larch saw-fly. He further permits me to quote him and to refer to him if need be.

A third question that presents itself is—what are the prospects that the Cinnabar moth will, if introduced into Nova Scotia, to establish itself there? To this, all that can be said without actual trial is, that the moth survives in the climate of Perth in a latitude far to the north of Pictou. Then it may be asked if the moth should be found to stand the climate of Nova Scotia, is there a probability of its abandoning its European predilection for Ragwort and taking to feeding on other allied species of plants?

About the time that Ragwort established itself at Merigomish, cases of hepatic cirrhosis occurred among cattle of the same district. This was a new disease, entirely local, that yielded to no known treatment. Current belief imputed the disease to the weed but up to the end of the last century investigations had failed to establish a connexion. As the weed spread and flourished in new ground so did the disease range over a widening area from new centres of virulence.

These new centres were in some cases places where the weed had been growing for very many years without an occurrence of the disease, or if there was a case, it was a solitary one, which inquiry showed had lately come from an infected locality. Since the present century came in the spread of the disease seems to have been more rapid, and in remote districts beyond the height of land that isolated, as it might be said, the primarily infected area.

Ragwort being a biennial has no chance of flowering and seeding in the pastures grazed over by sheep which are close

croppers, and are in consequence a check on the spread of the weed in enclosed lands. Horses too, are not known to be affected by it for they not only avoid it in the field but also where they find it in the hay. Cattle, on the other hand, while more discriminating in their feeding than sheep, are careful to avoid eating it in the open but they have not the same opportunity for rejecting it when it is dried and mixed with hay in the byre. It is then they suffer, and it is now stated on page 161 of "The Farm Weeds of Canada" that Dr. Pethick of Antigonish has proved that Ragwort is the cause of the Pictou County Cattle Disease. This being so it is all the more apparent that trial should be made of any means that may reasonably be expected to further check the spread of so noxious a weed in Canada.

When commenting to me on the relation of Ragwort with the Pictou County cattle disease Sir. E. D. Prain related an Indian experience that was apposite to the matter. Speaking of the use of sorghum as forage when the plant was fully grown and cut down, he remarked that care was necessary to keep cattle from the fields while the plant was still young as it then contained hydrocyanic acid in poisonous quantity. Not so when the sorghum was well grown, but it sometimes happened that the season was wet after the harvest and then instead of drying, the plant sent up fresh shoots which were as poisonous to cattle as the young plant.

It would have been superfluous and presumptuous on my part to dwell on the relation between the Cinnabar moth and Senecio when so great an authority as the Natural History Department of the British Museum accepts it without reservation.

Mr. C. W. Brachen, B. A., F. E. S., of Plymouth writes me as follows:

"I have met the larvae of the Cinnabar moth, when sweeping, for years, but only on Ragwort and Groundsel (*S. vulgaris*). I have never seen it on Coltsfoot. It can be

found in hundreds in Turnchapel Quarries, Plymouth, at Newton Ferrars, Hessenford, everywhere round here probably. I have found it more common near Ragwort though I have made no special comparisons."

Larvae of Cinnabar Moth (*Callimorpha Jacobaea*).

Food Plant: Commonly, the Ragwort (*Senecio Jacobaea*).

The larvae usually attack the lower leaves first and work upwards towards the flower. They frequently strip the lower portion of the plant completely, and in a very short time. Large colonies are often seen on one plant; and the striking colouring of the larvae make them conspicuous even at a little distance.

REMARKS BY DR. A. H. MACKAY.

Senecio Jacobaea L. (St. James Ragwort), was probably introduced into Pictou, Nova Scotia, not far from 1850. Shortly after, the Cattle Disease appeared. But it did not follow the presence of the weed until after it became well established in the pastures and hayfields. About 1882 there was an attempt made by the Dominion Government to ascertain the character, cause and best method of dealing with the disease which was recognized as a peculiar and almost specific cirrhosis of the liver. It was, however, suspected to be contagious; and the policy of slaughter and compensation was adopted. Drs. William Osler, Adami, Wyatt Johnson, McEachran and other pathologists took part in the earlier investigations.

In 1906 Dr. J. G. Rutherford as Veterinary Director General, reports Dr. W. H. Pethick's experiments on a 200 acre farm at Cloverville in Antigonish county. He also notes that Dr. Gilruth of New Zealand devoted considerable attention to a peculiar hepatic cirrhosis known as the Winton Disease, from which horses as well as cattle and sheep suffered due to the ingestion of Ragwort. In Cape Colony, South

Africa, *Senecio Burchelli* appeared to produce similar effects. Last year another species, *Senecio latifolius*, in South Africa appeared to have poisonous properties according to the kind of soil in which it grew. Dr. Pethick's experiments appeared to prove that the disease is not contagious, and is due to the ingestion of the Ragwort with hay eaten.

Professor Arthur R. Cushney of the Pharmacological Laboratory, University College, London, England, lately experimented with the Senecio alkaloids and makes the following statements in two papers published in 1911.

1. "On the Action of Senecio Alkaloids and the causation of *Hepatic Cirrhosis* in Cattle (Preliminary Note)" Read 15 June, Proceedings Royal Society B. Vol. 84; and

2. "On the Action of Senecio Alkaloids and the causation of the *Hepatic Cirrhosis* of Cattle (Pictou, Moltano, or Winton Disease), published 10 June, in the Jour. of Pharmacology and experimental Thearapeutics, Vol. II, No. 6. July, 1911.

(1). "The various species of Senecio in this country are generally regarded as harmless, the chief of them being the common ragwort and the common groundsel. In Nova Scotia, New Zealand, and South Africa they have, however, been associated with hepatic cirrhosis in cattle, which is known as respectively Pictou, Winton, and Moltano disease in these countries. The species which induces this condition in Canada and New Zealand is apparently identical botanically with the common ragwort of this country, *Senecio Jacobea*, while in South Africa the Moltano disease is associated with the *Senecio Burchellii* and the *Senecio latifolius*. The symptoms of the disease are practically identical in these locations."

(2). "With regard to the chemistry of the *Senecio* genus, Grandval and Sejour found two alkaloids in the common groundsel which they term senecionine and senecine, and Watt found two others in the *Senecio latifolius* of Cape Colony,

and has named them *senecifoline* and *senecifolidine*. These alkaloids amounted to 1.72 per cent. of the plants in the crude state before flowering, and 0.76 per cent after flowering. These two bases were sent to me for pharmacological examination by Prof. W. R. Dunstan, and I have done a number of experiments with them, chiefly upon cats."

(3). "The symptoms and post mortem findings in animals poisoned with these alkaloids resemble so closely those described by Gilruth, Chase, Pethick and others, in cattle and horses, that there can be no question that the cause is the same in each and that the Pictou, Winton or Molteno disease is really more or less chronic poisoning with the *Senecio* alkaloids."

(4). "The experiments hitherto detailed were performed with the alkaloids of *Senecio latifolius*, which, as has been said, is held responsible for some of the epidemics in South Africa; and my results indicate that these alkaloids are capable of inducing the symptoms and lesions characteristic of the disease. The *Senecio Jacobæa* which has been shown to be responsible for the disease in New Zealand and Canada, grows in profusion in England and Scotland, but inquiries made in various parts of the country indicate that poisoning with this plant and hepatic cirrhosis are unknown here."

(5). "These results would therefore seem to indicate that the *S. jacobæa* is devoid of the toxic properties of *S. latifolius*, whether the plant is grown in England or in Canada. This is however incompatible with the results of Gilruth and Pethick, who showed definitely that the disease in Canada and New Zealand is due to this species. The discrepancy between these results and mine may probably arise either from the plant from which my preparations were made having been collected at the wrong season, or possibly from the poisonous principle having undergone change into some inert form in the course of preparation or drying."

(6). "*Senecio sylvaticus* collected in Yorkshire in August proved equally inactive. *Senecio vulgaris* or common groundsel collected in England and prepared in the same way proved poisonous."

(7). "I hope to investigate further the toxicity of *S. jacobaea* with the hope of elucidating the curious discrepancies between my results and those of Gilruth and Pethick."

(8). The following statement has just been made by Professor Cushney in an autograph note on one of the said printed papers in October, 1913. "Later experiments with the alkaloids derived from the *S. Jacobaea* grown in Canada have shown that they are quite as poisonous as those obtained from *S. latifolius*" (Oct. 1913).

The weed is rapidly spreading throughout the Province, and the appeals to municipal councillors have not yet incited any effective action. Sheep are not so seriously affected by the plant; but there is evidence that it is injurious to them. The plant grows luxuriantly and, although it is popularly known as "Stinking Willie", it is one of the most beautiful of our weeds, the abundant pretty green foliage being surmounted by a brilliantly yellow flat-topped cluster of compound flowers.

If the Cinnabar moth could repress the luxurious growth of *S. Jacobaea* in Nova Scotia, it would require to multiply rapidly and feed ravenously.

But, what if the larvae of *Callimorpha Jacoboea* should take to feeding upon the plants of economic value? What if they should develop here as the Gypsy Moth and the Brown Tail? The English Sparrow first introduced about 1850 has long become too vigorous for America. The European rabbit introduced into Australia in 1864 for sport, increased so rapidly as to require legislation in 1879 for its destruction. The Mongoose of India introduced into Jamaica in 1872,

by 1890 became a pest. The European Starling introduced into New Zealand in 1867 in a few years began to show itself as an undesirable. The skylark, the linnæ and the blackbird of England, have in the antipodes developed new food habits, and instead of being insect destroyers as at home, are becoming fruit pests.

Can we therefore venture to invite the Cinnabar Moth to Nova Scotia? Test the new conditions might develop a taste for something more than the succulent foliage of St. James Ragwort.