

small loops to prevent them tearing out of the canvas into which they are sewn.

The outer walls of the pouches continue up as flaps, and are tied together over the animal's back. These canvas pockets are kept in place and are tightly compressed against the animal to which they are shaped by three webbing girdles, which are cinched around the belly. Each of these straps has an elastic insert on each side to accommodate the cow's size before and after feeding. The girdles are adjusted by double ring buckles. As the warbles emerge, they roll down from the

back and are caught in the pockets, from which they may be removed daily, and set aside for rearing.

Heavily infested, long-haired beef yearlings proved ideal for our use; as many as thirty-five grubs were collected from five animals in one day under these circumstances. Tame animals are a great asset to success, for under the best of conditions the harness receives rough treatment. For this reason it should be constructed strongly, and sewn with linen thread.

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THE EUROPEAN RED MITE IN THE OKANAGAN VALLEY OF BRITISH COLUMBIA (*Acarina*)¹

E. P. VENABLES

Dominion Entomological Laboratory, Vernon, B. C.

This paper records certain observations regarding the economic importance of the European red mite *Paratetranychus pilosus* (C. & F.) and the effect that control measures may have upon the development of infestations in the Okanagan Valley of southern central British Columbia.

The potential importance of the European red mite has frequently been stated in terms of devitalization of the foliage resulting in loss of leaves, reduction in size and colour of the fruit, and failure on the part of the tree to produce fruit buds. The extent to which the entomologist is justified in leading the orchardist to expect such cumulative injury, should depend upon observations made in his own particular district over a period of years, rather than upon reports from other parts of the country or from obsolete literature.

In infested irrigated orchards of the Okanagan Valley, it is very doubtful if defoliation ever occurs, although yellow-

ing and bronzing of the leaves is commonly observed where the mites are numerous. Trees in this condition may lose many of their leaves following the application of summer oil. In non-irrigated orchards on the other hand, defoliation may be of common occurrence as noted by Newcomer (1941) in Washington State. Infestations in Eastern Canada and the United States, where irrigation is not usual, are also accompanied by loss of leaves and other resulting symptoms. It is well known that the development of many orchard insects is profoundly influenced by cultural practices and there can be little doubt that irrigation has an important bearing upon injuries resulting from the attack of mites and scale insects.

The effect of foliage injury upon fruit bud formation would depend upon the stage of bud development when the mite population reaches its height. In the Okanagan Valley, the fruit buds are usually well developed by late June or early July. Heavy mite infestations during May and June would therefore be more liable to reduce bud vitality than later infestations

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which would rather affect the colour and size of the fruit. Irrigation during these critical periods would of course, do much to reduce such injuries.

The control of the pest has been the subject of many experiments and the literature dealing with the efficiency of various spray materials is extensive. In drawing conclusions from such experiments, consideration should be given to a number of factors the action of which often renders results conflicting and unreliable. Certain spray materials are known to have a repressive effect upon mite predators. Spray residues on the foliage in some cases, are believed to favour mite survival or render predatory forms inactive. In the Okanagan Valley, it has been observed that in certain orchards, where early sprays have been applied each season for mite control, the winter eggs frequently become sufficiently numerous in the fall to call for a repetition of control measures the following season, whereas in adjoining unsprayed orchards of the same variety, the mite population has remained at a uniformly low level from year to year.

Many years' observations in orchards throughout the Okanagan Valley have led to the following suggestions regarding the probable development of red mite infestations under local conditions. Dormant oil sprays may be relied upon to destroy most of the winter eggs, but infestations frequently develop on such trees later in the season and winter eggs may again become numerous. The application of summer sprays early in the season whilst controlling the mites for a comparatively short period are frequently followed by infestations in later summer. On trees where early sprays are used, the foliage remains green and affords an adequate food supply upon which the surviving mites increase and are able to deposit a normal complement of winter eggs. Sprays applied at midsummer, when the mite population is already declining may produce spectacular results but examination of unsprayed trees in such an orchard will often show that the mites have already disappeared. Ross and Robinson (1922) observed that depletion of the leaves may

be considered as a most important natural check. It by no means follows that a heavy deposition of winter eggs will result in a mite outbreak and it has been often noticed that infestations may become serious on trees with relatively few winter eggs.

On unsprayed trees, foliage injury begins early and gradually increases in severity. The leaves on such trees become depleted and the food supply reduced, which is no doubt the cause of the progressive reduction of the mite population so commonly seen in such orchards. This condition may also result in the deposition of winter eggs which, as suggested by Cottier (1934) may be laid by a brood suffering from the scarcity of food. Lack of nourishment may also cause such eggs to be infertile and they are also exposed to the attack of predators for a considerably longer period than those on trees protected by early sprays.

Observations in three orchards in which the intensive mite control program, which had been in force for several seasons, was abandoned in 1941, have shown that whilst the population in 1941 and 1942 was negligible, a very heavy infestation of winter eggs developed in the fall of 1943 and dormant oil was resorted to the following year. The season of 1944 was evidently favorable to the mite and several orchards in different parts of the valley were heavily infested, most of these had suffered from mite attack in 1940 and 1941.

A more careful study of mite activity on unsprayed check trees over a period of years may be of more ultimate value than laborious counts to show the comparative killing qualities of various spray materials. Much information could be gained by arranging with growers who apply mite control sprays to leave a few trees unsprayed. Such trees would represent conditions in a variety of localities and should include different varieties of apples. Systematic examinations in a number of such orchards might be of greater value than the present method of confining observations to single experimental blocks in one locality and would also provide the grower with a direct comparison by which to judge the effect of his own control measures.

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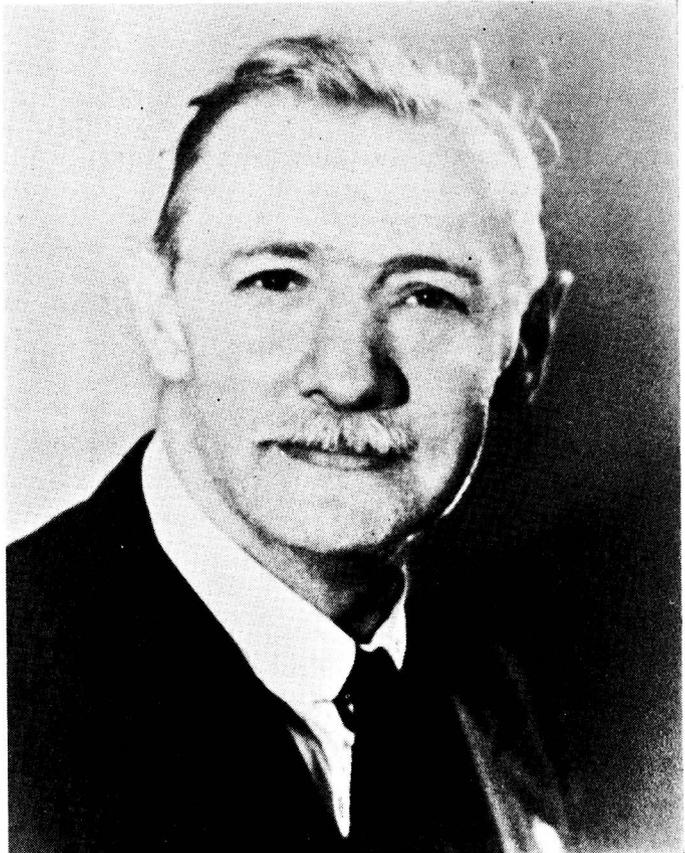
In Memoriam

MAX HERMANN RUHMANN, 1880-1943

It is with deep regret that I record the death of Max Hermann Ruhmann, Provincial Entomologist of British Columbia, which occurred on December 4, 1943 at Tranquille, B.C. Having known him from the time of his arrival in the Okanagan until his death, I may claim the privilege of a long and valued friendship with one whose attainments and knowledge in the field of our own particular science was quite unique.

Max Ruhmann was born on September 9, 1880 at Hzehoe, Holstein, Germany. His early years were spent in Holland and in 1886 his family moved to England where he attended Claremont House School, Wateringbury, Kent. Subsequently moving to Ireland, he attended the Harcourt Street High School, and later studied medicine at Trinity College, both in Dublin. On the outbreak of the South African War he enlisted in the British Army and saw active service with a noted cavalry regiment. In 1902 he returned to Ireland but owing to severe attacks of malaria, contracted abroad, decided to abandon medicine and devote himself to horticulture and it was at Glas-

nevin Botanical Gardens, then under the direction of his friend Dr. W. Moore, that he laid the foundation of the wide knowledge in pathology and entomology



which became his life's work. By that time he had made plans to become a fruit grower in British Columbia, and was already seriously interested in economic entomology.