University of Queensland

PAPERS

DEPARTMENT OF BIOLOGY

Volume 1 1939 Number 11

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Price: One Shilling

PUBLISHED AS AN ORIGINAL PAPER BY THE UNIVERSITY OF QUEENSLAND
DATE OF PUBLICATION
20th SEPTEMBER, 1939

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VOLUME 1. 1939. NUMBER 11.

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THOMAS GILBERT HOPE, Acting Government Printer, Brisbane.

PLANT VIRUSES IN QUEENSLAND I.

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GALINSOGA CURLY TOP.

(*Galinsoga Virus* 1.)

Galinsoga parviflora is a very common weed in Brisbane. In autumn and early winter plants are often found with the leaves rolled and distorted, the veins on the lower side producing papillate outgrowths; the stems are kinked and bent and bear small smooth lumps or outgrowths similar to those on the leaves. Sometimes the affected plants are only occasional, but in some patches almost every individual may be diseased. The aphis *Myzus persicae* is constantly associated with the condition.

No evidence has been found of the disease in weeds, ornamental plants, and vegetables growing in association with diseased *Galinsoga,* nor has it been transmitted to them experimentally. Common weeds often found tangled with affected plants are *Ageratum conyzoides, Stellaria media, Oxalis corymbosa, Portulaca oleracea, Rumex Brownii,* and *Rumex crispus.* The general appearance of *Galinsoga* with the disease recalls the symptoms produced by Beta Virus 1, the Sugar Beet Curly Top Virus, and on that account it may be mentioned that the following species susceptible to that virus are commonly cultivated in Brisbane, but have never been found affected:—*Brassica* spp, *Raphanus sativus, Viola tricolor, Beta vulgaris, Tropoeolum majus, Cucurbita pepo, Rheum rhaponticum, Dianthus caryophyllus, Phaseolus vulgaris, Vicia faba, Cosmos bipinnatus, Helichrysum bracteatum, Zinnia elegans, Capsicum frutescens,* and *Lycopersicum esculentum.* Various other potential hosts of Beta Virus 1 though grown in Brisbane have not been examined in sufficient numbers in association with diseased *Galinsoga* plants to make their recording of any value.

Symptoms.

A slight rugosity and distortion of the young leaves are early indications of the disease. As the leaves enlarge they roll upwards and inwards longitudinally, usually but by no means invariably from the base. The rolling may proceed until the leaf has the appearance of two parallel but distorted cylinders,

but not uncommonly the distal portion remains flat like a spatula. The veins become hypertrophied on the under surface and small papillae project from them, and because of the leaf rolling the projections are one of the striking symptoms of the disease. Similar outgrowths occur in rows on the stems following the lines of the vascular bundles. They may be merely small warts, sometimes long sharp longitudinal ridges or in extreme cases peg-like structures suggesting adventitious roots in general appearance. The stems are uneven in thickness and kinked, and sometimes bend sharply along the internodes. The internodes at the top are shortened and the bunching of the curled leaves at the top affords a marked contrast to adjacent healthy plants, hence the proposed common name.

Diseased plants produce flowers and fruits which are apparently normal in size, number and structure, though the inflorescence stalks have small protruberances and are not straight.

Histopathology.

The distortion of the veins on the under side of the leaves and the development of projections along them and along the stems is the result of hypertrophy and hyperplasia in the region of the phloem resulting in an abnormal development of sieve tubes, companion cells, and elongated parenchymatous cells, the latter forming the major part of the projections. No x-bodies are present.

Vector.

The aphid *Myzus persicae* is a common parasite of *Galinsoga parviflora* and is constantly associated with diseased plants.

On 24th April, 1939, aphids from affected plants were transferred to healthy aphid-free seedlings 4 inches high which had been raised under bell jars in a garden bed. Ants were particularly troublesome in Brisbane at this time and colonies had established themselves under two of the bell jars, each of which covered four seedlings. It was decided to use the ants in the experiments with these plants and accordingly a number of diseased branches were placed under the bell jars. Next morning, 25th April, it was found that the ants had transferred the aphids from the introduced twigs to the young leaves at the tops of the seedlings. Seven days later the young leaves on all plants on which the aphids had been pastured (including those where the ants had co-operated) showed definite symptoms and on the ninth day there was no doubt as to the identity of the disease, distortion of the leaves and hypertrophy of the veins being apparent. Two weeks later the plants had all the characteristics of curly top, and one was exhibited at a meeting of the Royal Society of Queensland on 29th May, 1939. Control plants remained healthy.

Classification of the Virus.

Experimental transmission by *Myzus persicae* and the general macroscopic and histological features establish the virus nature of this disease for which the name Galinsoga Curly Top is proposed. It is classified as Galinsoga Virus 1 following K. M. Smith's system.

To date experimental transmission to other plants has failed. The general resemblance of the symptoms to those of curly top of beet (Beta Virus 1) is of interest, but as has been demonstrated the vector is *Myzus persicae.* Mass transfers of infective aphids to beet failed to reproduce the symptoms. Beta Virus 1 has not yet been recorded from Queensland.

LILY MOSAIC.

(*Cucumis Virus* 1.)

For several years mosaic has been present in Queensland on *Lilium longiflorum,* the commonest lily cultivated in Brisbane. This is hardly surprising as large quantities of bulbs are imported annually and the disease is well known in the Southern States. I have obtained transmission with *Myzus persicae,* and following K. M. Smith's acceptance of Price's evidence, list the disease as being caused by Cucumis Virus 1. This virus, I am informed by Mr. J. E. C. Aberdeen, Tomato Pathologist of the Department of Agriculture and Stock, has appeared this season (autumn, 1939) in cucumbers and tomatoes in the Bowen district, North Queensland.

SPOTTED WILT.

(*Lycopersicum Virus* 3.)

This disease, common on a wide range of hosts, has caused heavy losses of Iceland poppies this year.

DAHLIA MOSAIC.

(*Dahlia Virus* 1.)

Dahlia mosaic has been present in Queensland for several years. The name Leaf Curl is in common use, but there is some confusion in that this term is also applied locally to hopper burn following *Empoasca* infestation. Chlorotic vein-banding is characteristic, but varies with the variety and stage of growth, and according to Brierley is of no diagnostic value for the dwarf type of the disease found in Robert Scott plants. Material obtained from the Brisbane Botanic Gardens in April, 1939, was found to contain x-bodies of the type reported by Miss Goldstein.

SUMMARY.

Curly Top of *Galinsoga parviflora* is a virus disease characterised by distortion and rolling of the leaves, irregular growth of stems, and the development of protruberances from the veins on the lower sides of the leaves and along the stems. No x-bodies are present. *Galinsoga parviflora* is the only host known at present. The vector is the aphid *Myzus persicae* and the first symptoms are observed on the new growth about a week after the pasturing of infective aphids. The virus is classified as Galinsoga Virus 1.

Two other viruses are recorded from Queensland; they are Lily Mosaic (Cucumis Virus 1) and Dahlia Mosaic (Dahlia Virus 1). A note is given on losses of Iceland Poppy plants from Spotted Wilt (Lycopersicum Virus 3) in Brisbane in winter 1939.

ILLUSTRATION.

PLATE I.—Plant of *Galinsoga parviflora* affected by Galinsoga Virus 1 Brisbane, May, 1939.

LITERATURE.

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[*Photograph by J. R. Bailey.*

PLATE I.

Curly Top of *Galinsoga parviflora*. Normal plant on the left, diseased on the right.