INTRODUCTION

Tobacco mosaic virus (TMV) has been both a scourge to agriculturists and a boon for molecular biologists. TMV is a particularly intriguing reciprocal object—it has been used to investigate fundamental questions about the biology of viruses and to develop scientific solutions for crop improvement.

Holmes completed his D.Sc. at Johns Hopkins in 1924 as a protozoologist and was hired by L. O. Kunkel at the newly opened Boyce Thompson Institute for Plant Research (Yonkers, NY) to investigate "the nature of the virus." In 1932 Kunkel moved his virology group to the Rockefeller Institute for Medical Research (Princeton, NJ) where Holmes continued his TMV research.

In 1939, Holmes had developed a bioassay that allowed him to quantify and observe the development of TMV infection in tobacco. Holmes had an idea that the necrotic local lesion response by tobacco plants to TMV was evidence of a dominant gene for resistance. By extension, introgression of the necrotic gene (N) into susceptible plants could be used to control TMV disease.

By 1936, Holmes had identified another dominant resistance gene (L) in Tabasco peppers and showed it could protect commercial varieties of bell pepper. The TMV-necrotic lesion response in pepper was used as a unit of assay for the L-gene. Soon thereafter Holmes succeeded in moving genes L and N, which were responsible for the local necrotic lesion response in Capsicum frutescens (Tabasco pepper) and Nicotiana glutinosa (tobacco), respectively, to commercial plant varieties. The TMV resistance genes identified by Holmes continue to be used to this day to control TMV disease in crop plants.

Critical questions proposed within this research are to determine: i) how Holmes developed the idea that a necrotic local lesion was the outcome of a host resistance gene product acting on virus infection and ii) how Holmes tested his idea that this necrotic-type response could gain utility through moving the N-gene from the lab into the field.

REFERENCES