Assessing the Distribution and Impact of *Bean pod mottle virus* (BPMV) as a Re-emerging Virus, and *Soybean mosaic virus* (SMV) in Soybean Grown in Virginia

by

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Lucas A. M. Mackasmiel

(Committee Chair: Sue A. Tolin, PhD)

Abstract

Bean pod mottle virus (BPMV, Genus *Comovirus*, Family: *Comoviridae*) is an important virus in soybean (*Glycine max* (L.) Merrill), causing quality and yield loss due to seed coat mottling and seed weight reduction. Although BPMV has been known in Virginia since 1958 and has always been regarded as causing negligible losses, its impact is changing as BPMV incidence has increased in many soybean growing areas of Virginia and the USA in general. From 1997 to 2001, a total of five BPMV isolates (V-W1, V-W2, V-S98-1, V-S98-15 and V-S01-10) were collected in Virginia and characterized. In this study, the effects of these isolates were studied, alone or with *Soybean mosaic virus* (SMV, Genus *Potyvirus*, Family *Potyviridae*) strain SMV G1, and isolates S98-51 and S98-52, on selected soybean cultivars. Individual isolates of BPMV showed variable symptom severity, and resulted in yield loss of between 40.4 to 58.1%, while SMV caused 23.7% in the most severe interactions. Up to 100% yield loss was realized from double inoculations of selected BPMV and SMV isolates, BPMV V-S98-1 + SMV S98-52 and BPMV S98-15 + SMV S98-52 on Hutcheson and Hutcheson Roundup Ready® (BC5) soybeans, respectively. Time of inoculation, a critical factor in the impact of many virus diseases, affected seed coat mottling in four cultivars and seed weight in two cultivars, in tests with four BPMV isolates and three stages of soybean development. All BPMV isolates inoculated to plants at vegetative stage V1-V3 severely increased seed coat mottling and reduced seed weight than those inoculated at V4-V6 and reproductive stage R1-R3. Seedlings grown from non-mottled seeds germinated more uniformly had fewer thin-stemmed seedlings and grew faster than those grown from mottled seeds. Inoculation of various cultivars and breeding lines showed that there was no correlation between the severity of virus-induced foliar symptoms, relative accumulation of SMV, and extent of seed coat mottling. Thus, by avoiding the presence

of BPMV at an early growth stage through proper timing of planting to avoid vectors, proper cultural practices like weed control, use of SMV free seeds, and chemical control, it is possible to greatly improve seed quality and reduce yield losses in soybean.

Dedication

I dedicate this work to my late mother Francisca, who instilled in me the spirit to weather all things, good or bad, through dedication and perseverance. You will miss it all mom! I also remember my late children Henry, Matthew and Carol who died at the start of their lives.

My father Joseph K. Okora, who first waited then decided to go to heaven, will also receive recognition and dedication for paying the heavy price of childhood molding and making resources available for early education.

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