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History, Distribution and Pest Status of the Mexican bean beetle

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Fig. 1: Mexican bean beetle eggs, adult and larva (from left to right)

Mexican Bean Beetle (MBB), *Epilachna varivestis* Mulsant, (Fig 1) is an herbivorous ladybeetle (Coccinellidae) that feeds on legumes in North America. It is closely related to the squash ladybeetle, *Epilachna borealis*, which feeds primarily on cucurbits. MBB can cause significant defoliation damage to bean crops, particularly those in the genus *Phaseolus* (snap beans, lima beans, pole beans, etc.). For more information on general biology and pest management of MBB, see VCE Fact Sheet No. ENTO-51.

Distribution and Spread in North America

MBB is native to the region of Mexico known as "The Plateau", referring to its high elevation of 4000-8000 feet (Fig 2). Unlike the typical hot and dry climate of Mexico, this region experiences summer high temperatures of only 65-75°F, and summer rainfall averaging 16 in. The earliest record of MBB in the United States dates back to 1864, but the beetle was not recognized as a serious pest until 1883, when severe damage to wax beans was reported in Colorado.

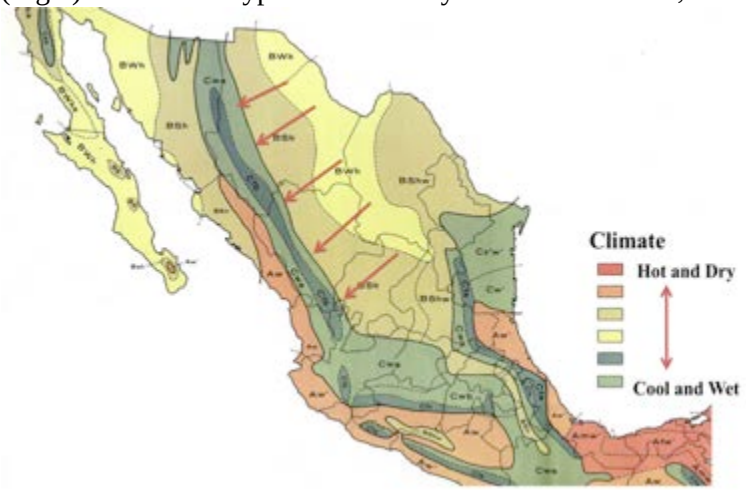

Fig. 2: Native Range of MBB in Mexico

In 1918, MBB was first discovered in the eastern US, in Alabama. It is assumed that beetles were transported via shipments of alfalfa. By the late 1920's, the beetle spread as far north as Canada, and west to Michigan.

Historical Pest Status. Though MBB is not currently a major pest of U.S. agriculture, there were two periods when this beetle gained notable recognition. In the 1920's, MBB was a major pest of snap bean, *Phaseolus vulgaris*, and lima bean, *P. lunatus* in the eastern U.S., which resulted in several publications on this insect (Fig 3). In the late 1930's, severity of MBB waned until the early 1970's, when MBB made resurgence on a new host: soybeans, *Glycine Max*. MBB had not previously caused widespread damage on soybean; so an extensive effort to understand and control MBB ensued. By the late 1980's, MBB severity again declined for undetermined reasons. Today, MBB is rarely a problem for soybean growers. Possible reasons for the decline may involve climate change, resistant soybean varieties, biological control efforts, and/or lack of host crops in regions with most suitable climates. It is still a mystery why this insect dropped off in status as a major pest of soybean.

Current Pest Status of MBB

Using listserv, e-mail and in person surveys, we contacted snap bean growers in 2012 and 2013 to answer the following questions about MBB: *Where is MBB's current range? What management practices are used to control it? What crops are most heavily damaged? How common and severe are outbreaks?*

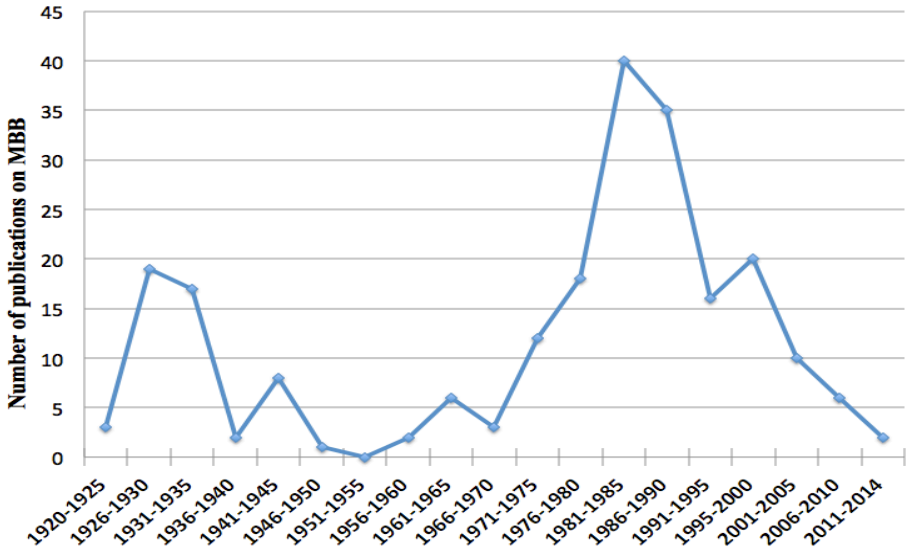

Fig 3: Scientific publications per five-year timeframe with "Mexican bean beetle"

Grower responses indicated that MBB is most commonly found in the Appalachian Mountain regions in mid-Atlantic states. These regions seldom experience numerous consecutive days where temperatures exceed 90°F, or long periods of time without rainfall (Fig 4). Conventional growers who use synthetic insecticides rarely have significant outbreaks of MBB. However, organic growers in susceptible regions can experience complete crop loss in heavy infestation years, which are typically when spring temperatures rise early, there is above average summer rainfall, and/or when summer temperatures are below average.

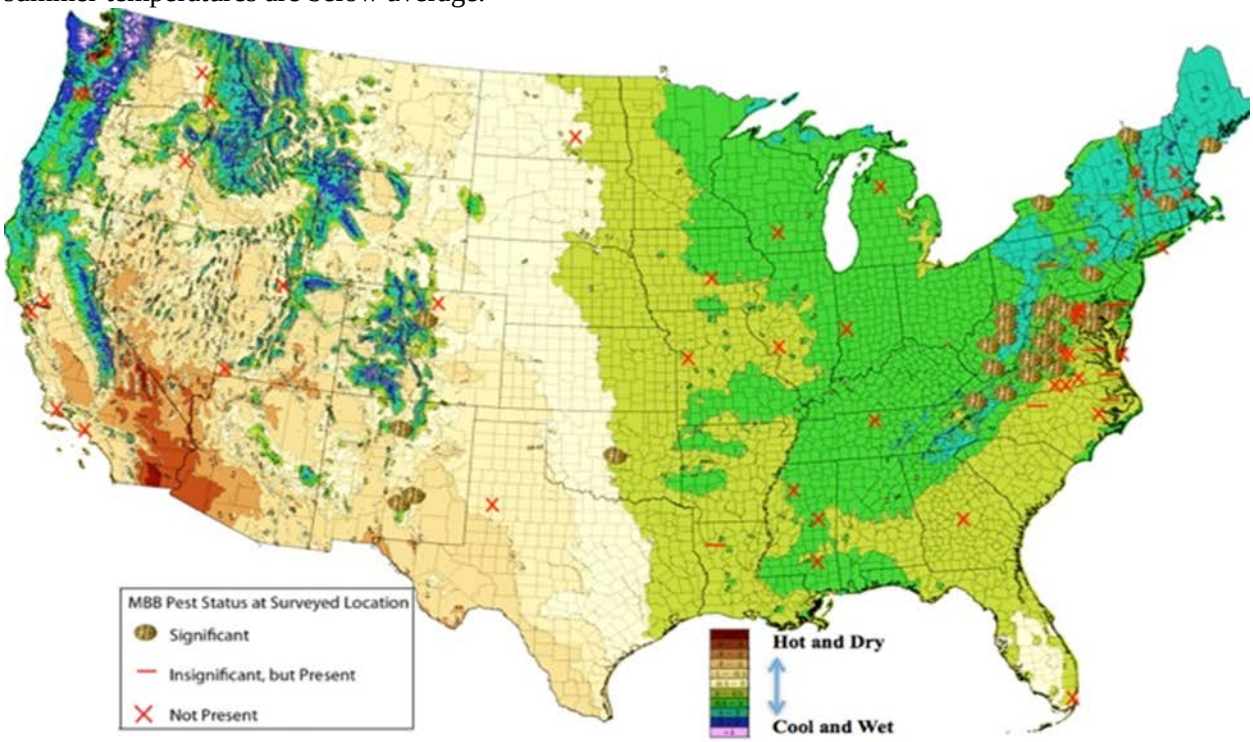

Fig 4: MBB locations (bean grower survey data from 2013-2014) on US temperature/moisture index map adapted from Schmidt, G., M. Nishino, and J. Kartesz. (2011) http://www.bonap.org/Climate%20Maps/ClimateMaps.html. Accessed Feb. 2013.

Growers generally agree that MBB infestations are most severe in snap bean varieties (including wax beans); however, some claim to experience equally damaging effects in lima beans. MBB can also be found in soybeans, alfalfa and kudzu, although significant injury rarely occurs. Bean growers living in areas with optimal climates seem to experience annual outbreaks of MBB; however, the severity of the damage may vary. Some growers in Piedmont or Tidewater regions of the mid-Atlantic reported occasional outbreaks of MBB on unusually cool and/or wet years. However, outbreaks in these locations were rarely significant.

Discussion and Future Work

Although no longer a significant threat to soybeans as it was in the 1970's and 1980's, MBB remains a major pest of snap bean varieties grown in Appalachia, particularly on farms without synthetic insecticides. As the demands for organic produce rise, the need to develop more sustainable management practices will follow. In order to develop these strategies, we are performing field trials to better understand the ecology of MBB (Fig. 5). The goal of our research is to determine the potential for novel management strategies, such as trap cropping, varied planting dates, reflective mulch, and strategic planting of different varieties.

Entomologists still do not know why MBB pest severity has changed throughout the years, and cannot rule out the possibility that MBB may become a major pest again in the future. More research is needed to understand what factors impact MBB populations and damage to snap beans and soybeans. Such knowledge may help predict, and even prevent future outbreaks.

Fig 5: MBB adult marked with paint used for mark-release-recapture (Left); reflective mulch raises ambient temperature and light intensity, which may reduce MBB reproduction and survivorship.

Grow beans? Got MBB pest problems (or not)?

Please contact us at the Virginia Tech vegetable entomology lab via email (louisn@vt.edu), or visit out Facebook page (https://www.facebook.com/pages/Virginia-Tech-Vegetable-Entomology/195639230587492). We always appreciate input from growers, and these data allow us to track the pest status of this insect in different areas. For more information on MBB, see our other fact sheet at http://pubs.ext.vt.edu/ENTO/ENTO-51/ENTO-51.html.

References Cited:

Marcovitch, S. and W. Stanley (1930). "Climatic Limitations of the Mexican Bean Beetle." Annals of the Entomological Society of America. 23(4):666-686

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