

DR. HARRY R. GROSS, JR.:  
CONTRIBUTIONS TO ARMYWORM RESEARCH

C. E. ROGERS  
USDA, Agricultural Research Service  
Insect Biology and Population Management Research Laboratory  
Tifton, GA 31793-0748

ABSTRACT

Dr. Harry R. Gross, Jr., USDA, ARS, IBPMRL (deceased) developed techniques and methodology for rearing and augmenting biological control agents to assist in the control of the fall armyworm, *Spodoptera frugiperda* (J. E. Smith), and the corn earworm, *Helicoverpa zea* (Boddie), in the southeastern USA. Dr. Gross' career with the USDA spanned 27 years, during which he published 75 scientific papers and presented 41 oral papers on the results of his research. Dr. Gross conducted pioneering research on white fringed beetles, kairomones, and semiochemicals of beneficial insects, and patented a hive-mounted device through which exiting honey bees autodisseminate *Heliothis* nuclear polyhedrosis virus to flowering plants for control of *H. zea* larvae. However, Dr. Gross' greatest contribution to entomology was his development of rearing and augmentation technology to enhance the use of beneficial insects for controlling *H. zea* and *S. frugiperda*. Dr. Gross firmly believed in, and researched innovative ways to, use biological control for managing armyworms and other pests.

Key Words: Population management, mass rearing, augmentation, biological control

RESUMEN

El doctor Harry R. Gross, Jr., USDA, ARS, IBPMRL (deceso) desarrolló técnicas y metodologías de cría de agentes de control biológico para favorecer el control de *Spodoptera frugiperda* (J. E. Smith) y *Helicoverpa zea* (Bodie) en el sureste de los Estados Unidos. La carrera del Dr. Gross en el USDA duró 27 años, durante los cuales publicó 75 artículos científicos y presentó 41 ponencias sobre los resultados de su investigación. El Dr. Gross condujo investigaciones pioneras sobre escarabajos, kairomonas y semioquímicos de insectos benéficos, y patentó un equipo para las colmenas que permitía a las abejas diseminar el virus de la polihedrosis de *Heliothis* a las plantas con flores para el control de larvas de *H. zea*. Sin embargo, la mayor contribución del Dr. Gross a la entomología fue su desarrollo de la tecnología de cría para aumentar el uso de insectos benéficos para el control de *H. zea* y *S. frugiperda*. El Dr. Gross firmemente creyó en el control biológico e investigó novedosas maneras de usarlo en el manejo de los gusanos trozadores y otras plagas.

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The Armyworm Symposium of the 70th Annual Meeting of the Southeastern Branch of the Entomological Society of America (ESA) is dedicated to the memory of Dr. Harry Gross, Jr. and his contributions to armyworm research. Dr. Gross was Supervisory Research Entomologist, USDA, Agricultural Research Service (ARS), Tifton, Georgia at the time of his death; his entire entomological career of 27 years was spent within the geographical boundary of the Southeastern Branch, ESA.

Dr. Gross was born in New Orleans, Louisiana, on 16 March, 1939, and died in Atlanta, Georgia, on 3 May, 1994, following a short illness. Dr. Gross obtained a passion



Fig. 1. Harry R. Gross, Jr., Supervisory Research Entomologist (1939-1994)

for entomology at an early age, as his father was a Pest Control Operator in the New Orleans area. After graduating from high school, Dr. Gross enrolled at Louisiana State University where he obtained the Bachelor of Science Degree (1960), Master of Science Degree (1964), and Doctor of Philosophy Degree in Entomology (1967).

Dr. Gross' graduate student research dealt with the effects of water emulsions on pesticidal control of wood-boring beetles; the role of the American cockroach, *Periplaneta americana* (L), and striped earwig, *Labidura riparia* (Pallas) in the degradation of household fabrics; flight habits of *L. riparia*; and the responses of *L. riparia* to heptachlor and mirex applied for controlling fire ants, *Solenopsis invicta* (Buren) and *S. molesta* (Say). His research with *L. riparia* was used by the Louisiana Pest Control Association to develop management recommendations for households in the early 1970s.

Dr. Gross' entire professional career was spent with the USDA, ARS. Dr. Gross joined ARS in Gulf Port, Mississippi, in 1967 and for the following four years concentrated research on developing systems for collecting, rearing, storing and controlling white fringed beetles, *Graphognathus* spp., which are devastating pests of seeds and seedling-stage corn, cotton, peanut, soybean, and other crops in the Southeast. Dr. Gross retained interest in white fringed beetles throughout his career, and served as an expert witness in hearings by the Environmental Protection Agency in 1977 and the State of California Department of Food and Agriculture Science Advisory Panel in 1988.

Dr. Gross transferred to the Insect Biology and Population Management Research Laboratory (IBPMRL) (formerly Southern Grain Insects Research Laboratory) in Tifton, Georgia, in 1971. At the IBPMRL, Dr. Gross pursued several research areas., e.g., double-cropping and host resistance in managing populations of the fall armyworm, *Spodoptera frugiperda* (J. E. Smith); overwintering and spring emergence chronology of the corn earworm, *Helicoverpa zea* (Boddie), and tobacco budworm, *Heliothis virescens* (Fabricius); methods for separating individual eggs of *S. frugiperda* from egg masses; developing an oviposition chamber for mass production of *H. zea*; devising flotation techniques for separating mature and immature pupae of *H. zea* and *H. virescens* for irradiation in large-scale sterility programs; assessing the importance of visual stimuli in enhancing trapping efficiency of *H. zea*; the effects of homogenates of *H. zea* and *S. frugiperda* larvae on inhibiting their oviposition in corn and aggregating the predators *Coleomagilla maculata* Timberlake and *Geocoris punctipes* Say; and identifying and studying the bionomics of the first known pupal parasitoid of *S. frugiperda* [*Dipetimorpha intreota* (Cresson)] and of *H. virescens* [*Cryptus albitarsas* (Cresson)] that he discovered. Other researchers are now actively pursuing research on the biology and efficacy of the pupal parasitoids as an addendum to biological control organisms which may be used to reduce field populations of noctuid pests of southeastern agriculture.

Dr. Gross was one of the pioneer researchers demonstrating the role of kairomones in enhancing foraging behavior of parasitoids. He formulated the concept and demonstrated that pre-release exposure of *Trichogramma pretiosum* (Riley) to host kairomones and parasitization experiences increased its efficacy against *H. zea* eggs in the field. In spite of the progress that Dr. Gross and his colleagues made in this area of research in the early to mid-1970s, he became convinced that its use as an economical pest management strategy was not likely in the near future. Hence, Dr. Gross reverted to researching a more conventional approach for biological control of *H. zea* and *S. frugiperda*.

During the last 10 years of his career, Dr. Gross concentrated his research efforts on mass rearing and augmentation techniques for field evaluation of the tachinid *Archytas marmoratus* (Townsend) as a biological control agent for *H. zea* and *S. frugiperda*. Dr. Gross developed an efficient mechanical extraction technique for removing *A. marmoratus* larvae from gravid females and an efficient method for applying them to whorl-stage corn. He also developed an efficient and economical mass-rearing procedure for *A. marmoratus* using larvae of the greater wax moth, *Galleria*

*mellonella* (L.), as a factitious host, and demonstrated that laboratory-reared flies efficiently seek and parasitize *H. zea* larvae in the field independent of host density. At the time of his death, Dr. Gross was in the second year of a large 3-year pilot program evaluating field augmentation of *A. marmoratus* to control *H. zea* larvae in whorl-stage corn.

An innovative accomplishment by Dr. Gross shortly before his death was the designing and testing of a hive-mounted device by which the honey bee, *Apis mellifera* (L.), automatically contaminates itself with a talc formulation of *Heliothis* nuclear polyhedrosis virus (HNPV). As contaminated bees forage among flowers for pollen and honey, they distribute the HNPV. *Helicoverpa zea* larvae feeding on crimson clover, *Trifolium incarnatum* (L.), exposed to HNPV-contaminated honey bees experienced a significantly higher mortality due to virus than larvae feeding on non-contaminated clover. This development resulted in a patent and has generated considerable international interest and further current testing.

Dr. Gross published his research results in 75 scientific papers and orally presented papers at 41 scientific meetings. In addition to his scientific accomplishments, Dr. Gross assumed several leadership roles in ARS as well as in professional societies. At the time of his death, Dr. Gross was Research Leader of the Insect Biology/Management Systems Research unit at Tifton, GA, and had served as a Laboratory Director and Assistant to the Southeast Area Director (ARS). Dr. Gross served on several committees of the Entomological Society of America and the Georgia Entomological Society and served as Chair of this Symposium in 1982. Dr. Gross was President of the Southeastern Biological Control Working Group in 1990. In 1980, Dr. Gross represented the USDA in Argentina, Brazil, Paraguay, and Uruguay on an exploration trip to collect biological control agents for *S. frugiperda* and other pest species. Dr. Gross worked with a core group in 1987 to develop the ARS National Biological Control Program. In addition to his active participation in the Entomological Society of America, Dr. Gross also was active in the Georgia Entomological Society, Florida Entomological Society, Sigma Xi, American Registry of Professional Entomologists, Southeastern Biological Control Working Group, and Southern Regional Projects.

The void left by the sudden passing of Dr. Gross in May 1994 remains in the Insect Biology and Population Management Research Laboratory, the University of Georgia Coastal Plain Experiment Station, and the Tifton community. Dr. Gross' dedication to his profession, his great empathy, his interpersonal communication skills, his willingness to assist subordinates, peers, and superiors in solving problems, and his positive outlook and jovial countenance are just a few of the characteristics of Dr. Gross that will not be forgotten and will be long-appreciated by his many associates and friends.

Dr. Gross is survived by his wife, Marlene, Tifton, GA, and their daughter, Lisa, Atlanta, GA.