DEDICATION OF 1994 ARMYWORM SYMPOSIUM TO DR. ROBERT L. BURTON AND MR. E. A. HARRELL: EXPERTS IN INSECT REARING

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ABSTRACT

The 1994 Symposium on Armyworms (previously Fall Armyworm Symposium) at the Southeastern Branch of the Entomological Society of America is dedicated to "Dr. Robert L. Burton and Mr. E. A. Harrell: Experts in Insect Rearing." Dr. Burton, an entomologist (1964-1970), and Mr. E. A. Harrell, an agricultural engineer (1961-1980), were employed by the U. S. Department of Agriculture, Agricultural Research Service at the Southern Grains Insects Research Laboratory at Tifton, GA. The systems they developed provided the means by which the fall armyworm, *Spodoptera frugiperda* (J. E. Smith), could be reared in mass numbers on a meridic diet that resulted in quality eggs, larvae, pupae, and adult insects.

Key Words: Fall armyworm, rearing, mechanization, diet.

RESUMEN

El Simposio de 1994 sobre los Gusanos Trozadores (previamente Simposio sobre los Gusanos Trozadores de Otoño) en la Rama Sureste de la Sociedad Entomológica de América estuvo dedicado al tema "Dr. Robert L. Burton y Sr. E. A. Harrel: Expertos en Cría de Insectos". El Dr. Burton, entomólogo (1964-1970), y el Sr. E. A. Harrel, ingeniero agrónomo (1961-1980), fueron empleados del Servicio de Investigación Agrícola del Departamento de Agricultura de los Estados Unidos, en el Laboratorio Sur de Investigación de Insectos de los Granos en Tifton, Georgia. Los sistemas que ellos desarrollaron posibilitaron la cría masiva del gusano trozador, *Spodoptera frugiperda* (J. E. Smith), en una dieta merídica que tuvo como resultado la producción de huevos, larvas, pupas e insectos adultos de calidad.

The 1994 "Symposium on Armyworms" (previously "Fall Armyworm Symposium") presented at the Southeastern Branch Meeting of the Entomological Society of America is hereby dedicated to "Dr. Robert L. Burton and Mr. E. A. Harrell: Experts in Insect Rearing."

BIOGRAPHIES

Dr. Robert L. Burton (Fig. 1) of Stillwater, OK, was born on August 23, 1936 in Antlers, OK, to Charles and Sally (Holton) Burton. He married Sylvia J. Gentry September 1, 1960 in Durant, OK. They have two sons, Robert L. Burton Jr. of Dana Point, CA, and Brian Gentry Burton of Stillwater. Dr. Burton died February 3, 1993 in the St. Francis Medical Center in Tulsa at the age of 56.

Dr. Burton became interested in Entomology early in his education. He attended Eastern Oklahoma College, Southeastern State College, the University of Oklahoma,

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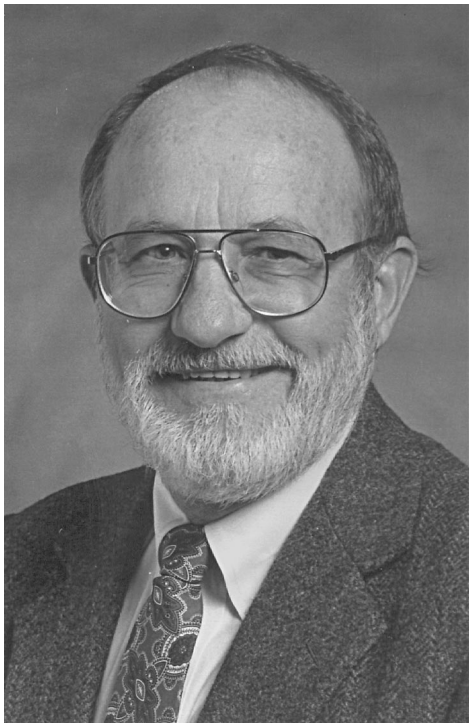

Fig. 1. Dr. Robert L. Burton, USDA, ARS Supervisory Entomologist (1936-1993).

and Oklahoma State University. Dr. Burton received his B. S. and M. S. degrees in entomology from Oklahoma State University in 1963 and 1964, respectively. He was first employed as an entomologist in 1961 with Standford-Vaddar Entomology Service of Plainview, TX, and then as a Research Assistant with Oklahoma State in 1963. Dr. Burton joined the U. S. Department of Agriculture, Agricultural Research Service in 1964 with his first assignment at the Southern Grain Insects Research Laboratory in Tifton, GA. He quickly assumed a leadership role as the entomologist in charge of insect rearing. In 1970, Dr. Burton was transferred to Stillwater where he continued both his work and studies. He completed his Ph. D. degree in 1974. Dr. Burton continued his work at Stillwater until his death, at which time he had attained the position of Supervisory Entomologist, Research Leader and Director of the USDA-ARS Plant Science and Water Conservation Laboratory as well as adjunct Professor of Entomology at Oklahoma State University.

Dr. Burton authored and co-authored 126 scientific publications during his 28 years of dedicated service to agriculture. He also presented more than 114 scientific presentations during his tenure with ARS. Dr. Burton was recognized as a world authority in the areas of insect diets and the laboratory production of insects.

Mr. Edsel A. Harrell (Fig.2) began his life on a little farm in South Georgia about four miles north of Whigham. He was born on October 17, 1924, the son of C. Braxton and Mabel (Moore) Harrell. Edsel believed that there was a better life somewhere

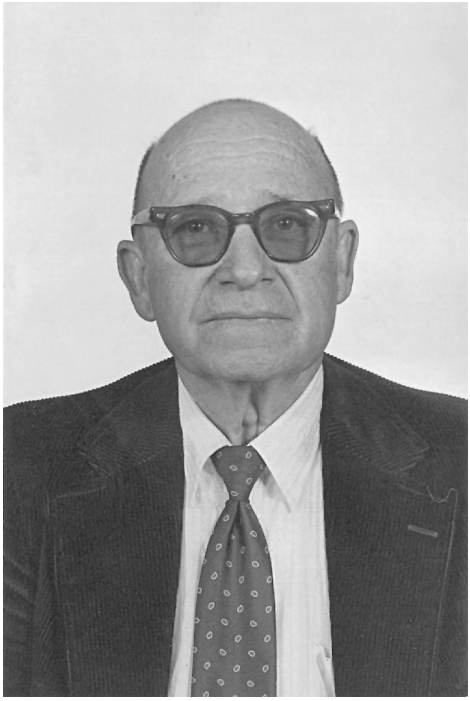

Fig. 2. Mr. Edsel A. Harrell, USDA, ARS Agricultural Engineer (1924--).

other than shaking peanuts and picking cotton by hand. Upon graduation from high school in Whigham, he left the farm for Alexandria, VA, where he began an apprenticeship as a machinist in a torpedo plant. During World War II, Edsel served his country honorably in the Army Signal Corps on isolated islands in the Pacific. His specific assignment was cryptography. He was discharged in January of 1946.

Edsel then enrolled in Abraham Baldwin Agricultural College in Tifton, GA, to pursue a degree in Agricultural Engineering. He obtained his BSAE in 1950 and his MSAE in 1951 from the University of Georgia. (An interesting note: Edsel taught eighth and ninth grade math and coached the boys and girls basketball teams at Whigham high school while he was obtaining his BS degree). During this time he met and married Martha E. Elkins. They have three children: Edsel Jr. of Dallas, TX, Debbie of Nashville, TN, and Karen of Watkinsville, GA, and five grandchildren.

Mr. Harrell began his research career as an Agricultural Engineer with the U. S. Department of Agriculture at the U. S. Cotton Ginning Laboratory at Stoneville, MS, in 1951. He transferred in 1961 to the Southern Grain Insects Research Laboratory (SGIRL) in Tifton, GA, where he was in charge of the Pest Control Research Project until his retirement in 1980. It was during this period of time that Edsel and Dr. Burton teamed up to solve some of the most difficult problems encountered in the mass rearing of *Helicoverpa zea* (Boddie) and *Spodoptera frugiperda* (J. E. Smith).

Mr. Harrell authored or co-authored more than 60 scientific publications during his 30 years of productive service and he presented more than 40 scientific presenta-

tions during his tenure with ARS. Mr. Harrell is the senior scientist on six separate patents. Mr. Harrell is recognized as an expert in the mechanization of insect rearing and insect control.

RESEARCH ACHIEVEMENTS

The fall armyworm has been reared in the laboratory with a variety of techniques. The first cultures were maintained on foliage of corn, millet, bean and bean pods. Because of the demands for larger numbers of insects it was inevitable that meridic diets and mass-production rearing equipment be developed. Dr. Burton (Burton 1967) developed an artificial diet for fall armyworm and was probably among the first to rear it continuously on a meridic diet. Dr. Burton also developed a detailed description of the rearing procedures that included diet preparations, egg incubation, diet dispensing and manipulation of the larvae as well as some of the first estimates of mass rearing costs. About this same time Burton and Harrell began to develop original devices (Burton et al. 1966) for speeding up the procedures of mass rearing. The first two devices developed were the diet-dispensing and larvae-isolating systems. Then came the development of an automated packaging system (Burton & Cox 1966). The machine dispensed 1-oz plastic cups, each filled with a selected amount of artificial diet, dispensed larvae onto the diet and then, in one continuous process, capped the cup. Burton & Harrell (1966) then modified the larval dispensing machine to provide more stability, thus providing a much smoother operation. In 1968, Mr. Harrell and co-workers (Harrell et al. 1968) developed equipment and a mechanized system of collecting pupae of the fall armyworm from rearing containers. This entire system of rearing the fall armyworm, and various modifications thereof (Burton & Perkins 1989), has been used at the Southern Grain Insects Research Laboratory, which is now the Insect Biology and Population Management Research (IBPMRL) since about 1966.

Mr. Harrell was instrumental in the erection of a 40 x 100 ft building which now houses the rearing section of at IBPMRL. The building was originally built for the purpose of housing a mass rearing system for the boll weevil (Harrell & Griffin 1981). A side note to this is that Mr. Harrell developed equipment for use on a form-fill-seal machine that was used in the mass production of insects. Harrell et al. (1973) developed an insect diet filler to be used on the form-fill-seal machine which could fill 32 cavities with diet in less than 2 sec. Mr. Harrell and co-workers (1974a) also built equipment that could mix and sterilize economically large amounts (up to 68 gallons per hour) of insect diet. Then, Mr. Harrell developed equipment for use on the form-fill-seal machine (Harrell et al. 1974b) to infest cavities (cells) with insect eggs at rates up to 544 cavities per minute. Mr. Harrell later built two environmental rooms within the building to study environmental effects on growth of insects (Harrell et al. 1979). The rooms had separate air-distribution systems designed to maintain a uniform and constant temperature within ±1.1 C.

HONORARIUM

The scientists that have spent time in research at the IBPMRL, and others that have used the fall armyworm reared there, are deeply indebted to Dr. Robert L. Burton and Mr. E. A. Harrell for their tireless efforts in the development of a complete rearing system that has provided adequate numbers of quality fall armyworm eggs, larvae, pupae and adults.

Therefore, it is with high regard and great pleasure that we dedicate this Armyworm Symposium to Dr. Robert L. Burton and Mr. E. A. Harrell in honor of their contributions to insect rearing.

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