JAMES EDWARD SMITH - TAXONOMIC AUTHOR OF THE FALL ARMYWORM

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ABSTRACT

Sir James Edward Smith (born 2 December 1759, died 17 March 1828) made many valuable contributions to the field of science, notably on taxonomy of plants and insects. Sir James is the sole taxonomic author of the fall armyworm, Spodoptera frugiperda (J. E. Smith), and numerous other American insects. Many 20th century and earlier writers have erroneously attributed the taxonomic authorship of the fall armyworm and other insects to Smith and Abbot because they are co-authors of a 1797 publication describing those insects. However, the preface of that publication, as well as notes by Abbot, indicates that Smith was responsible for the systematic names therein. James Smith was the first president of the Linnean Society of London. During his long active life, Smith published over 3,000 articles. The 1992 Fall Armyworm Symposium is dedicated to Sir James Edward Smith.

RESUMEN

El caballero James Edward Smith (nacido el 2 de Diciembre de 1759, murió el 17 de Marzo de 1828) hizo muchas contribuciones valiosas a la ciencia, sobresaliendo su aporte a la taxonomía de plantas e insectos. Sir James es el taxonómico de el cogollero del Maíz, Spodoptera frugiperda (J. E. Smith) y otros insectos Americanos. Muchos escritores del siglo 20 han atribuido la taxonomía del cogollero y otros insectos a Smith y Abbott porque ellos son coautores de una publicación en 1797 en la cual describen estos insectos. Sin embargo, tanto el prefacio de esta publicación, como las notas de Abbott, indican que Smith fue responsable por estos nombres sistemáticos. James Smith fue el primer presidente de la Linnean Society de Londres. Durante su vida activa, Smith publicó más de 3,000 artículos. El simposio de 1992 del cogollero del maíz es dedicado a Sir James Edward Smith.

Sir James Edward Smith
2 December 1759 - 17 March 1828

James Edward Smith, the sole taxonomic author of the fall armyworm, Spodoptera frugiperda (J. E. Smith), had an active scientific life. Most of his time and many of his contributions dealt with the taxonomy of plants. However, his contributions to the taxonomy of insects were significant. Smith and John Abbot published the first extensive illustrated monograph devoted solely to American insects. Much of the information in the following four paragraphs was summarized from Simpkins (1975).

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James Edward Smith was born in Norwich, England, and was the oldest of seven children by James Smith and Frances Kimberly. During his childhood, the younger Smith had much interest in botany. He had wanted to formally study botany; nevertheless, his father, a textile merchant, wanted the younger Smith to also study medicine. In 1781, he entered the University of Edinburgh to study under John Hope who espoused the Linnaean system of plant classification (also called sexual system). Then in 1783, he moved to London to study anatomy under John Hunter. Following the death of Carolus Linnaeus in 1788, Smith purchased the Linnaean collection (library, manuscripts, herbarium, and specimens) for about £1,000. James Smith married Pleasance Reeve in 1796 and moved with her back to Norwich. They also took the Linnaean collection with them.

The Linnaean collection was a vehicle by which Smith gained much recognition within the scientific community in London. He studied the specimens and rearranged and relabeled some of them. Smith published several works based on the manuscripts of Linnaeus. One of the most important effects of the purchase of the Linnaean collection was the founding of the Linnaean Society in 1788. Smith was the first president of this society and remained president for the remainder of his life. Some members resented that Smith did not leave the collection to the Linnaean Society upon his death. However, the Society later purchased the collection for £3,000.

Sir James was elected fellow of the Royal Society of London in 1785, and over the next two years, he traveled in Europe visiting many famous sites, gardens, libraries, botanical gardens, and famous botanists. Moreover, he earned an M.D. degree in 1786. Most of his work was on plant taxonomy. Smith instructed the queen and princesses in botany and in 1814, he was knighted. Sir James regularly lectured at the Royal Institution and, for a short while, at Cambridge. He was a popular teacher.

Smith grew many of the plants he studied and was in contact with many gardeners who grew plants from America. He had much pride in that whenever possible, he personally checked all descriptions that he issued. Important historical contributions of Smith to the history of botany were his ability to popularize the subject, and his meticulous accuracy and comprehensiveness in describing the flora of Great Britain and other countries about which was little known.

According to Simpkins (1975), a complete bibliography of Smith’s publications has never been assembled. She, however, refers to 3,045 articles by Sir James Edward Smith.

Entomological Work

The most important work of James Edward Smith in entomology was made in collaboration with John Abbot. As already noted, they provided the first illustrated, extensive monograph devoted entirely to North American insects. Moreover, this monograph gives the taxonomic description of the fall armyworm. The complete title of Smith & Abbot’s 1797 publication is as follows:

"The natural history of the rarer lepidopterous insects of Georgia. Including their systematic characters, the particulars of their several metamorphoses, and the plants on which they feed. Collected from the observation of Mr. John Abbot, many years resident in that country."

Although Abbot had interest in, and painted pictures of different families of insects, “The work contains only what relates to some of the curious Lepidoptera” (Smith & Abbot 1797) of North America. It was published in two volumes, both in English and
French. The work was published in London in 1797. It is bound in red with leather, stamped in gold with a marble envelope, and has 104 color plates.

There has been some confusion by earlier as well as recent authors about the nomenclature and taxonomic authorship of the fall armyworm. The fall armyworm was originally classified as *Phalaena frugiperda* by Smith (Smith & Abbot 1797). It was subsequently placed in the genus *Laphyagma*. Todd (1964) published a notification on "A change in the scientific name of the fall armyworm." The entire note is as follows:

The fall armyworm, previously known as *Laphyagma frugiperda* (J. E. Smith), must now be called *Spodoptera frugiperda* (J. E. Smith). The genus *Laphyagma* Guenee has been synonymized with *Spodoptera* Guenee by Zimmerman (Insects of Hawaii, vol. 7, p. 331, 1958). He included only the species occurring in Hawaii - *mauritia* (Bdv.) (the type of *Spodoptera*), *exempta* (Wlk.), and *exigua* (Hbn.) (formerly placed in *Laphyagma*). He did not specifically include or exclude other species formerly placed in *Laphyagma*. The new combination, *Spodoptera frugiperda* (J. E. Smith), has not appeared in the literature subsequent to 1958. Therefore notification of the combination is made so that the name will be available for identification purposes and for use in future biological and ecological reports."

The above note was the first time the combination *Spodoptera frugiperda* appeared in the literature. In related work on the taxonomic classification of *Laphyagma*, Bayer (1960) compared the valvae of the male genitalia in the genera *Prodenia*, *Laphyagma*, and *Spodoptera* and concluded that they probably belong to the same genus. Before the fall armyworm was placed in the genus *Spodoptera*, most researchers designated in their publications the taxonomic authors as either Abbot & Smith or Smith & Abbot. Subsequently, researchers have primarily designated the taxonomic author correctly as (J. E. Smith). Some incorrect variations include Smith, (Smith), and (J. E. Smith, 1797). Nevertheless, researchers as late as the late 1980's continued to use two taxonomic authors, i.e., (Abbot and Smith). Moreover, a few papers continued to use the former genus, *Laphyagma*.

Because of the confusion by numerous 20th century researchers on the taxonomic authorship of the fall armyworm, Wilkinson (1981) published an article explaining why James Edward Smith should be listed as the sole author. Abbot, a London naturalist with proficiency in art, entomology, and ornithology, emigrated to the American colonies in 1773. Smith is the editor of their 1797 work. The nature of the collaboration between Smith and Abbot is described in the preface of Smith & Abbot (1797): "The materials of the following work have been collected on the spot by a faithful observer, Mr. John Abbot, many years resident in Georgia, who, after having previously studied the metamorphoses of English insects, pursued his enquiries among those of Georgia and neighboring parts of North America. The result of his observations he has delineated in a style of beauty and accuracy which can scarcely be excelled, and has accompanied his figures with an account, as well as a representation, of the plants on which each insect chiefly feeds, together with many circumstances of its manners, times of the different metamorphoses, and other interesting particulars. For all such facts recorded in these pages the public are entirely obliged to Mr. Abbot. His memorandums, not methodized by himself for publication, have merely been digested into, some sort of style and order by the editor, who has generally added remarks of his own, in a separate paragraph and different type from the rest; and who has entirely to answer for the systematic names and definitions; that department having been left altogether unattempted by Mr. Abbot." Wilkinson (1981) examined Abbot's notes which provide solid evidence that Abbot did not attempt taxonomic identifications. According to Wil-
kinson (1981), Abbot's introductory statements to Smith is the key: "As I intended the following, I think you may still publish it as a separate Work from any other you are at present engaged in. However if you think otherwise you may only mention my Name now & then . . . You may therefore prune and trim what you please of the following rude Notes, I shall therefore not marshall them in any Order, take them as they occur. I have not pretended to describe them in any scientific manner, leaving that for you [r] superior Abilities." As he stated in the preface (Smith & Abbot 1797), Smith certainly is responsible for the systematic names in their publication.

John Abbot, a son of a lawyer, came to the colonies in North America because of his interest in nature, notably insects (Mallis 1971). Abbot's non-interest in the systematics of insects may be further indicated by the fact that insect taxonomists J. A. Reisduval and J. E. Le Conte published similar volumes as Smith & Abbot (1779) but did not give credit to Abbot (Mallis 1971). John Franéillon, Abbot's agent in London sold many of Abbot's drawings and insect specimens. Abbot's avocation was nature as exemplified in the preface of Smith & Abbot (1797): "Many American caterpillars sting like a nettle, raising little white blisters in the skin, especially when accidentally or slightly touched; hence they are in general held in great abhorrence. Mr. Abbot however observes, that he never yet found any caterpillar that it was really dangerous to handle; and he has often permitted the most stinging kinds to fall upon his hand, or into his bosom, to the great admiration of the negroes, as well as of the white inhabitants."

The publication of Smith & Abbot (1797) was restricted to Lepidoptera, even though "North America, according to Mr. Abbot's observations, produced a number of curious species of insects, very different from those of England, most of them dispersed through the whole country." The following is an excerpt from Smith & Abbot (1797), volume 2, page 191, which is the complete English text of information on the fall armyworm therein.

"TAB. XCVI.

PHALÆNA FRUCIPERDA

Corn-Dud-Worm Moth


Black and White Guinea Corn.

Ph. Noctua spirilinguis cristata, alis deflexis:
primoribus fusco nebulousis punctis duobus
ocellaribus fuscis litura intermedia
maeulaque ad apicem alba

The food of this species is the Guinea corn, as well as other kinds of grain, to
which the caterpillar is very destructive, feeding on the bud or main shoot of the
plant, within which it lives. They may sometimes be destroyed in hot weather
by throwing into the bud a handful of hot sand or dirt.
The caterpillar went into the ground July 15th, and the moth came out the 27th. It is not a very frequent occurrence in the winged state.

An evident affinity between this and the last runs through all their three states.

It is worth the consideration of the husbandman whether, by studying the natural history of this formidable depredator, he could not get the better of it. This is most probably to be accomplished while it remains in the egg; for unfortunately it appears to continue so short a time underground in the pupa, and at a season when the corn is growing, that plowing it up is impracticable. Would any kind of fowls feed upon the pupae, and could they get at them while in the

On the opposite page of the text is a drawing of a corn plant, and the pupa, larvae, and adult female and male of the fall armyworm. The English translation of the Latin description is "Noctuid, spiral-tongued, crested, with bent wings: fore-wings clouded with dark color, with two eye-like dark points, with a smear/rubbed effect between and with a white spot at the tip of the wing." The text on page 191 appears in French on page 192.

In addition to describing the fall armyworm, Smith is also the taxonomic author of the following lepidopterans: walnut sphinx (Loathoe juglandis), orangestriped oakworm (Anisota senatoria), redumped caterpillar (Schizura concinna), unicorn caterpillar (Schizura unicorns), smeared dagger moth (Acronicta obliquana), puss caterpillar (Megalopyge opercularis), whitelined tussock moth (Orgyia leucostigma), hag moth (Phobetron pithecium), and banded wollybear (Pyrrhactia isabella) (Smith & Abbot 1977).

**SUMMARY**

Sir James Edward Smith, who was born and died in Norwich England, made many valuable contributions to science, namely on taxonomy of plants and insects. He published over 3,000 articles. His purchase of the Linnaean collection was valuable in his taxonomic studies. He became the first president of the Linnaean Society of London and held that position until he died 40 years later. Sir James' collaboration with John Abbot resulted in a publication on numerous North American insects. Therein are the fall armyworm, Spodoptera frugiperda (J. E. Smith), and numerous other species of insects of which Smith is the sole taxonomic author (Smith & Abbot 1977). A scientist who is indeed worthy of this honor of the Fall Armyworm Symposium Dedicatee is Sir James Edward Smith.

**REFERENCES CITED**

**Smith, J. E., and J. Abbot. 1977.** The Natural history of the rarer lepidopterous insects of Georgia. Including their systematic characters, the particulars of their several metamorphoses, and the plants on which they feed. Collected from the observation of Mr. John Abbot, many years resident in that country. London, printed by T. Bensley, 2 V.
Hazard for Fall Armyworm (Lepidoptera: Noctuidae) Infestation of Maize in Double-Cropping Systems Using Sustainable Agricultural Practices

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Abstract

Field tests demonstrated that selected sustainable agricultural practices influence intensity of fall armyworm (FAW), Spodoptera frugiperda (J. E. Smith), infestations of late planted maize, Zea mays, in double cropping systems. Reduced FAW infestations of seedling maize were associated with no-tillage as compared with plow-tillage practice. Maize in no-tillage plots required one less chlorpyrifos (0.66 kg AI/ha) spray than in plow-tillage based on a 50% action threshold. Surface debris of winter cover crops influenced lags of FAW infestation on no-tillage maize. Surface residues from previous cover crops may account for the reduced infestations in no-tillage areas. Infestations among plots became similar as plants grew from within the mulch cover. Use of poultry manure as a soil amendment had no effect on FAW damage, but a tendency for increased yields was observed in poultry manure plots. Chlorpyrifos significantly reduced FAW feeding resulting in increased whole plant dry weight yield in treated plots.

Resumen

Mediante experimentos realizados en el campo se demostró que algunas practicas de agricultura sostenible influencian la intensidad de las infestaciones del cogollero del maíz (FAW), Spodoptera frugiperda (J. E. Smith) en maíz plantado al final de la estación en sistema de cultivo doble. Se asoció la reducción de infestaciones de FAW en plantulas de maíz cuando no se labró comparado cuando hubo labranza. Al utilizar un nivel económico de daño del 50%, el maíz en las parcelas sin labranza necesitó una asperción menos de chlorpyrifos (0.56 kg ia/ha) que las parcelas con labranza. Los residuos de otros cultivos de cobertura pueden ser responsables por la reducción de las infestaciones en las parcelas sin labranza. Las infestaciones fueron similares entre parcelas cuando las plantas crecieron fuera de la cobertura. El uso de gallinaza como una emmienda al suelo no tuvo mayor efecto en la infestación de FAW, pero se observó un mayor rendimiento en aquellas parcelas que recibieron la emmienda. El chlorpyrifos redujo el daño de FAW, lo cual resultó en un incremento en el peso seco de toda la planta en las parcelas tratadas.