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A Worldwide, Annotated BIBLIOGRAPHY OF THE BLACK CUTWORM

Agrotis ipsilon (Hufnagel)

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A WORLDWIDE, ANNOTATED BIBLIOGRAPHY OF THE BLACK CUTWORM *Agrotis ipsilon* (Hufnagel)

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Introduction

The purpose of this circular is to consolidate the world literature pertaining to the black cutworm, *Agrotis ipsilon* (Hufnagel). This species is prevalent throughout agricultural areas of the world and becomes economically important during favorable climatic conditions.

The University of Missouri originally provided about 70 references on *Agrotis ipsilon* from a card file on lepidopterous morphology and rearing techniques. Additional references were added from a bibliography on soil insect control by Armon J. Keaster and L. M. English.

The balance of the bibliographical information was obtained by a thorough search of the libraries at The Ohio State University and the Ohio Agricultural Research and Development Center for the years 1869 to 1973. Scientists from cooperating institutions then reviewed the preliminary manuscript and added a number of references. We have established a profile on the black cutworm in cooperation with the Mechanized Information Center of The Ohio State University Libraries. This computerized system of retrieval will keep us current on bibliographical information. Supplementary bibliographical data on black cutworm will be summarized at yearly intervals and will be available on request to the Ohio Agricultural Research and Development Center.

The preparation of this bibliography is only a part of an extensive, in-depth research program generously supported by grants from the Cooperative State Research Service, U.S. Dept. of Agriculture, and the U.S. Environmental Protection Agency. This is a regional research project entitled "Bionomics and Management of Soil Arthropod Pests". The comprehensive research is being conducted by scientists from the University of Missouri, Illinois Natural History Survey, Iowa State University, Michigan State University, University of Nebraska, New York State Agricultural Experiment Station, Ohio Agricultural Research and Development Center, Purdue University, and University of Wisconsin.

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Bibliography

Entries are listed alphabetically by author except in cases where the publication is anonymous or more likely to be identified with a governmental agency under which it was published.

The black cutworm was formerly called the greasy cutworm or the overflow worm in North America. In the United States the moth has been called the ypsilon dart (Holland 1934) and the lance rustic (Harris 1862). In Great Britain, its approved common name is the dark sword grass (moth).

The current usage of the scientific name is *Agrotis ipsilon* (Hufnagel). Many references in this bibliography cite *Agrotis ypsilon* since it was S. A. von Rottenberg who described the species under the name *Noctua ypsilon* in 1776. Other synonyms include *Agrotis suffusa* (Schiffermiller), *Agrotis telifera* (Harris), *Exarnis ypsilon* (Hübner), *Peridroma suffusa* (Butler), *Phalaena ypsilon* (Cramer). *Rhyacia ypsilon* (Rottenburg), and *Scotia ypsilon* (Hufnagel).

The abbreviations in the citations follow the American standard for periodical title abbreviation which was published in Biological Abstracts, 45(13):4347-4361. All references in this publication deal with the black cutworm; however, the scientific name used in a given article is also used in the annotation so that there is no question as to the species being cited. Numbers in parentheses following an annotation represent the pages which include information on the black cutworm if these numbers are different than the citation page numbers.

Abdel-Gawaad, A. A. and A. Y. El-Shazli. 1971. Studies on the common cutworm *Agrotis ypsilon* Rot.: I. Life cycle and habits. Z. Angew. Entomol. 68 (4): 409-412. (German Sum.)

The life cycle of *Agrotis ypsilon* was studied at 21° C and 65-70% relative humidity.

Adbel-Gawaad, A. A. and A. Y. El-Shazli. 1971. Studies on the common cutworm, *Agrotis ypsilon* Rot.: II. Effect of some soil insecticides on controlling 3rd instar larvae under laboratory conditions. Z. Angew. Entomol. 68 (4): 413-419. (German Sum.)

Thimet, Di-syston, lindane, Trithion, DDT, and heptachlor were screened for their toxicity to 3rd instar larvae at two different conditions of temperature and relative humidity.

Abdel-Wahab, A. M. 1971. Free amino acids in the haemolymph of six lepidopterous larvae species. Bull. Soc. Entomol. Egypte 54: 81-85.

Free amino acids in the haemolymph of the larvae of *Agrotis ipsilon* were investigated by partition chromatography.

Abdinebekova, A. A. and R. M. Akhmedov. 1971. Effect of different food plants upon the development of certain noctuid moths in Azerbaijan. Zool. Zh. 50 (6): 943-945. (English Sum.)

Larval *Agrotis ypsilon* were reared on different food plants and at different day lengths. *Agrotis ypsilon* prefers mixed food (alfalfa, cabbage, plantain, and cinquefoil).

Adlung, K. G. 1964. Beobachtungen über das Auftreten von Luzerneschädlingen und ihrer Parasiten. (Observations on the occurrence of lucerne pests and their parasites.) Gesunde Pflanzen 16(7): 136-140. Frankfurt.

Agrotis ipsilon was numerous in autumn in South Baden and Rhineland Hesse.

Afify, A. M. and A. I. Merdan. 1968. Voluntary ingestion tests on the response of three species of Egyptian cotton worms to certain *Bacillus* preparations using three different types of foliage. Proc. 13th Int. Cong. Entomol. 13: 48.

Seven-day old larvae of *Agrotis ypsilon* were tested for their susceptibility to *Bacillus entomocidus* var. *subtoxicus*.

Afify, A. M. and A. I. Merdan. 1969. (Different reactions of three Noctuid species to distinct *Bacillus* preparations, according to the diet and the type of treatment.) Anz.Schädlingsk. Pflanzenschutz 42 (7): 102-104. Cairo.

Different preparations of *Bacillus thuringiensis* were tested against the larvae of *Agrotis ypsilon*. Ingestion was more effective than injection into the hemocoele.

Afify, A. M. and A. I. Merdan. 1969. On tracing the response of some Egyptian cotton worms in different larvel ages to *Bacillus thuringiensis* Berliner. Z. Angew Entomol. 63 (3): 263-267.

The larvae of *A. ypsilon* were most susceptible to *B. thuringensis* at a larval age of 8-9 days.

Affify, A. M., M. Hafez, and A. I. Merdan. 1969. Temperature and humidity factors influencing the response of some Egyptian cotton worms to "Biospore 2802". Z. Angew. Entomol. 63 (2): 180-185.

Laboratory tests were made on the effects of temperature and humidity on the susceptibility of 7-day-old larvae of *A. ypsilon* to a formulation of *B. thuringiensis*. *A. ypsilon* was not susceptible at 30° C and 80-90% R.H. and was the least susceptible of the species tested.

Afify, A. M., M. Hafez, and A. I. Merdan. 1969. (Preliminary investigations on the virulence of 13 *Bacillus* preparations on 3 Egyptian noctuids.) Anz. Schädlingsk. Pflanzenschutz 42 (4): 54-57. Cairo.

Tests for virulence of 13 *Bacillus* preparations on three Egyptian noctuids revealed that *Laphygma* is most susceptible in nine cases with marked differences between it and other species. In seven of these cases, *Laphygma* was followed by *Prodenia* and in two cases by *Agrotis*.

Ahmed, M. K. 1957. Life-history and feeding habits of *Paederus alfierii* Koch (Coleoptera: Staphylinidae). Bull. Soc. Entomol. Egypte 41: 129-143. Cairo.

P. alfierii adults fed on the eggs of *A. ypsilon*.

Akhemedov, R. M. 1969. The effects of different diets on the growth and development of cutworms of the genus *Agrotis*. Vest. Leningr. Univ. 24 (9): 7-11. (English Sum.)

Variations of natural and synthetic diets were used to rear *A. ypsilon* larvae. Mortality, larval weight, pupal weight, and duration of larval development were recorded for the different diets.

Akhmedov, R. M. 1971. Development of certain moths under various ecological conditions. Izvest. Akad. Nauk Azerb. SSR Ser. Biol. Nauk. 5-6: 91-94. Azerbaijan Sum.)

A study of Azerbaijan (37.8° N), Belgorod (50° N) and Leningrad (60° N) (USSR) populations of *Agrotis ypsilon* showed that the adaptive ability of insect species is important for their introduction and acclimatization.

Akhmedov, R. M. 1971. Diurnal rhythm of nutrition of caterpillars *Agrotis ypsilon* Rott. and *A. exclamationis* L. under laboratory and natural conditions. Vestn. Zool. 5(4): 72-76. (English Sum.)

The results of observations near Leningrad showed that in larvae of both species studied, the rhythm of diurnal activity was distinctly pronounced. Larvae left soil and began feeding when it became dark.

Akhmedov, R. M. and A. A. Abdinbekova. 1973. Phenology of *Agrotis ypsilon* and *Barathra brassicae* in Azerbaijan. Zool. Zh. 52 (3): 451-454. (English Sum.)

In Azerbaijan, *Agrotis ypsilon* has four complete generations. Wintering proceeds at the stage of last larval instar.

Aldrich, J. M. and R. T. Webber. 1924. The North American species of parasitic two-winged flies belonging to the genus *Phorocera* and allied genera. Proc. U. S. Nat. Mus., 63 (art. 17) (2486): 1-90. Washington, D. C.

One-hundred and twenty-six species of parasitic diptera are listed. Included are physical descriptions and keys to species. *Madremyia saundersii* Williston was reared from *A. ypsilon* (88).

Aliev, S. V. and R. M. Akhmedov. 1972. Role of soil conditions in the development of moths. Ekologiya 3(6): 81-84.

In 31 regions of Azerbaijan, larvae of *Agrotis ypsilon* were found most often on unirrigated chestnut, light-chestnut, and chernozem soils and in irrigated fields on friable chestnut and sandy and sandy-loam sierozem soils. Almost none were found in salinized, clay, calcareous, or meadow soils.

Allen, H. W. 1926. Observations upon the early maggot stage of *Linnaemyia comta* (Fall.) (Diptera: Tachinidae). Entomol. News 37 (9): 283-286.

Larviposition and larval behavior of *L. compta* (Fall) are described. This fly is parasitic on a number of cutworm larvae, including the black cutworm, the granulate cutworm, variegated cutworm, and fall armyworm.

Andres, A. 1913. Note sur un nouveau ravageur du mäis. *Pyrausta nubilalis* Hbn. (Lep.) (A new corn pest). Bull. Soc. Entomol. Egypte. Pt. 1: 20-22. Cairo.

Among the destructive pests of corn in Egypt were the cotton worm *(Prodenia littoralis)*, the black cutworm (*Agrotis ypsilon*), and the beet armyworm (*Spodoptera exigua*).

Anonymous. 1891. Official minutes of the meeting of the Entomological Club of the A.A.A.S. Can. Entomol. 23 (10): 220.

Larvae taken from an onion field near Canastota, N. Y., were reared and determined to be *Agrotis ypsilon* instead of *Agrotis (=Euxoa) messoria*, as they were first recorded.

Anonymous. 1907. The principal injurious insects of the year 1907. U. S. Dep. Agr. Yearbook 1907: 541-552.

Agrotis ypsilon was injurious near Norfolk, Va., especially to eggplant (545)

Anonymous. 1908. The principal injurious insects of the year 1908. U. S. Dep. Agr. Yearbook 1908: 567-580.

Agrotis ypsilon damaged tobacco to a slight extent in the dark tobacco region. A serious outbreak near Mt. Vernon, Indiana, and portions of Kentucky and Illinois on corn caused $200,000 damage and also caused serious damage near New Paris, Ohio. *A. ypsilon* was injurious to cabbage, onions, and other truck crops in southern Texas. (568, 569, 573)

Anonymous. 1915. Insect Notes. Mon. Bull. State Comm. Hort. Sacramento, 4 (7): 345.

Agrotis ypsilon was so destructive to garden crops in Sacramento, California, in the spring of 1915 that in many cases replanting was necessary.

Anonymous. 1921. Las cuncunillas. Serv. Policia Sanit. Vej., Santiago de Chile: 1-8.

Agrotis ypsilon was recorded as a pest of potatoes, beans (pulse), and chick-peas in Chile.

Anonymous. 1922. Cotton research board. 2nd Annu. Rep. 1921. Minist. Agr. Egypt, 16: 1-203. Cairo.

A new kind of light trap was erected to determine whether migrations occur in the case of the cutworm, *Agrotis ypsilon*, in Egypt.

Anonymous. 1936. Entomology - Insect pests. Agriculture and Animal Husbandry in India 1933-34 and 1934-35, Pt. I - Crop Production: 1-390. Delhi.

Agrotis ypsilon was a serious pest on potatoes and other vegetables in Assam. Damage was controlled by hand-picking. (201)

Anonymous. 1958. Cutworms in the garden - How to control them. U. S. Dep. Agr., Home and Garden Bull. 29: 1-4.

Appearance, habits and control measures for cutworms in general are given. The larva and adult of *Agrotis ypsilon* are illustrated.

Anonymous. 1961. Response of insects to induced light. U. S. Dep. Agr. ARS 20-10: 1-66.

Report of Pfrimmer's research in Louisiana - see Pfrimmer, 1957.

Anonymous. 1962. Investigations on the control of *Agrotis ypsilon*. Agr. Res. India 2(2): 99-100.

This is a progress report of an experiment designed to find the optimum dosage of heptachlor and aldrin for controlling *Agrotis ypsilon*. Heptachlor, applied with manure in furrows, gave the best results.

Anonymous. 1969. Distribution maps of pests. Series A (Agricultural), nos. 259-265 and nos. 9 & 43 (revised). Commonw. Inst. Entomol., London.

Map 261 deals with the worldwide, geographical distribution of *Agrotis ipsilon*.

Anonymous. 1970. Cutworms and flea beetles in corn. Purdue University, Coop. Ext. Serv. Pub. E-48: 102.

The black cutworm or "overflow worm" is commonly found on land subject to flooding or on land having low, poorly drained soils. It may cut off plants below the soil surface. Preplanting soil treatments of aldrin or heptachlor and post-planting sprays of toxaphene or carbaryl were suggested for control.

Apple, J. W. 1960. Granular insectides in the row for soil insect control on corn. Entomol. Soc. Amer., North Cent. Br. Proc. 15: 86-88.

Experimental results indicate a complete lack of protection against *Agrotis ipsilon* in muck soil by the use of aldrin and heptachlor granules in the row at a rate (2 lb./ acre) recommended for wireworm control. (88)

Apple, J. W. 1967. Insecticidal control of regulated populations of black cutworm on corn. J. Econ. Entomol. 60 (6): 1612-1615.

This was an evulation of potential cutworm (*Agrotis ypsilon*) insecticides, including diazinon, aldrin-parathion, carbaryl, and carbofuram (granular and sprays).

Apple, J. W. 1967. Phenology of black cutworm in southern Wisconsin. Entomol. Soc. Amer., North Cent. Br. Proc. 22: 86-89.

An attempt to overwinter *Agrotis ipsilon* under semi-natural conditions failed. In another experiment, laboratory reared pupae were placed outdoors at various times during March and were observed for dates of emergence.

Apple, J. W. 1968. Intensive screening of insecticides against the black cutworm (*Agrotis ipsilon* (Hfn.), Proc. 13th Int. Cong. Entomol.: 206.

Granular, bait and spray formulations of various insecticides were tested against *Agrotis ipsilon*. Among chemicals tested were Dasanit, Dyfonate, carbaryl, diazinon, chlordane, carbofuran, aldrin, disulfoton, trichlorfon, endosulfan, toxaphene, Bux-Ten, and Gardona.

Artigas, J. N. 1972. Population dynamics in Lepidoptera of agricultural importance in Chile. Bol. Soc. Biol. Concepcion 45: 5-93.

Five-year light trap records from Concepcion, Chillan, and Penco, Chile, are presented. Hosts, brief descriptions of larva and adult, larval habits, life cycle, and percentage of each sex (adults) are given for *Agrotis ypsilon*.

Ascher, K. R. S. and G. Rones. 1964. Fungicide has residual effect on larval feeding. Int. Pest Contr. 6 (3): 6-8. London.

Brestan, a fungicide, acts as a feeding deterrent for *Prodenia litura* and to a lesser extent for *Agrotis ypsilon*. The data compare concentration of Brestan fed to larval weight.

Ashmead, W. H. 1880. Orange insects. A treatise on the injurious and beneficial insects found on the orange trees of Florida. Ashmead Brothers. Jacksonville, Fla.

This is a description of injury to orange trees by the lance rustic moth, *Agrotis ypsilon*. (48)

Averin, V. G. 1913. (Review of the pests noticed in the Government of Charkov during 1913). The Zemstvo of the Govt. of Charkov: 10-65. Tables 1-6. Charkov, Russia.

Agrotis ypsilon damaged beet and cabbage.

Azaryn, G. Kh., A. S. Babayan, K. L. Mkrtumyan, and T. M. Melkonyan. 1969. (On the results of chemosterilants in Armenia). Acad. Sci. Armenian SSR 1969: 14-15.

In laboratory tests in 1963, adult *A. ipsilon* were fed solutions of five chemosterilants at different concentrations. Thiophosphamide was most effective against *A. ipsilon*.

Balás, G. 1948. Comparative experiments with contact poisons. Bull. Hort. and Vit. Univ. Agr. Sci. Budapest 12: 92-99.

The product "Agri-tox", containing a derivative of heptachloromethylcyclohexane, seemed to be effective against *A. ypsilon* on a golf course.

Ballard, E. 1913. Some cotton and tobacco pests of Nyasaland. Supplement to the Nyasaland Govt. Gazette, 30 April 1913: 1-9. Zomba.

The worst enemy of tobacco sets was *A. ypsilon*. Poison bait and hand picking larvae were suggested for control.

Barrett, J. R., F. W. Harwood, and H. O. Deay. 1972. Functional association of light trap catches to emission of blacklight fluorescent lamps. Environ. Entomol. 1(3): 285-290.

The relationship of light trap catches to the emission of single 4, 8, 15, 20 and 40-w blacklight fluorescent lamps was developed by using a catch index based on the number of individuals captured and the frequency of capture (including *Agrotis ipsilon)*.

Bastos Cruz, B. P. M. Barreto Figueiredo, and E. Almeida. 1962. The principal diseases and pests of groundnut in the State of São Paulo. Biologico 28 (7): 189-195. São Paulo. (In Portuguese)

A. ypsilon was a principal pest of groundnuts in Brazil.

Baver, L. D. 1950. Cane insect damage light in 1950. Hawaiian Sugar Planters' Assoc. Exp. Sta. Rep. 1949-50: 23.

Agrotis ypsilon was reported destroying germinating eyes and boring into cane seed pieces at Grove Farm. Damage was most severe in cloddy soil.

Baver, L. D. 1956. Insects. Hawaiian Sugar Planters' Assoc. Exp. Sta. Com. Rep. 1956: 32.

Agrotis ypsilon did serious damage to sugar cane on Kavai during 1956.

Baver, L. D., *et.al.* 1957. Insects. Hawaiian Sugar Planters' Assoc. Exp. Sta. Com. Rep. 1957: 35-37.

Apanteles marginiventris was a principal parasite of *Agrotis ypsilon* and has been effective in controlling *A. ypsilon* in Hawaii.

Bedford, H. W. 1923. The pests of cotton in the Anglo-Egyptian Sudan, Wellcome Trop. Res. Lab., Entomol. Sec. Bull. 19: 1-45. Khartoum.

The first part of the paper explains the types of injury to which cotton is susceptible. The second part is a brief account of the common pests of cotton in the Sudan. *A. ypsilon* was injurious to cotton foilage.

Beeson, C. F. C. 1935. Cockchafers and conifers. Indian For. 1935: 374-377. Calcutta.

A. ypsilon attacked young conifers early in the spring. However, no control measures were warranted.

Begg, J. A. and C. R. Harris. 1959. Preliminary report on control of the black cutworm, *Agrotis ypsilon* (Rott.), with aldrin incorporated into the soil in various ways. 89th Annu. Rep. Entomol. Soc. Ont.: 45-47.

Different forms of application of insecticide-fertilizer mixture were assessed for cutworm control. No treatment controlled cutworms the first 3 days after infestation. From the 4th to 6th day, the surface treatments harrowed or disced into the soil allowed less damage than the mixture drilled beneath the surface.

Begg, J. A., C. R. Harris, and G. F. Manson. 1963. Chemical control of artificial infestations of the black cutworm, *Agrotis ipsilon*, in flue-cured tobacco. Can. J. Pl. Sci. 43 (1): 30-37.

Broadcast spray treatments of eight insecticides (endrin, aldrin, dieldrin, heptachlor, DDT, Dylox, Guthion, and Sevin) were used to determine the relative effectiveness of control of the black cutworm, *Agrotis ipsilon* (Hufnagel).

Bessey, C. E. 1871. Notes on the cabbage, sorts and enemies. Pomologist. 2: 308.

This describes character of *Agrotis telifera (= ypsilon)*, its ravages on cabbage, and its control.

Bethune, C. J. S. 1888. Remedies for noxious insects. 18th Annu. Rep. Entomol. Soc. Ont: 51-59.

The author describes the character and habits of *Agrotis ypsilon,* its injuries, and methods of control.

Bethune, C. J. S. 1909. Injurious insects in Ontario in 1908. 39th Annu. Rep. Entomol. Soc. Ont.: 128-135.

Agrotis ypsilon severely attacked some fields of corn, cutting off the young plants at the surface of the ground and also attacking the roots. Paris green bait was suggested for control. (131)

Bianchi, F. A. *et al.* 1957. Notes and exhibitions. Hawaiian Entomol. Soc. Proc. 16: 187-188.

There was an unusual infestation of *Agrotis ypsilon* in an 88-acre sugar cane field on Kauai early in May.

Bigger, J. H. and R. A. Blanchard. 1959. Insecticidal control of underground insects of corn. A report of a 5-year study. Ill. Agr. Exp. Sta. Bull. 641: 1-28. Urbana.

Aldrin and heptachlor at 1 1/2 lb./acre sprayed broadcast and disced in gave fair to good control in the cooperative tests and in one experimental plot. Farmers' reliable observations have shown that 1 pound of aldrin sprayed in a band over the row at planting time gave excellent control. Fields treated in 1956 with 1-1/2 lb. of aldrin/acre were observed to be severely damaged by cutworms in 1957, indicating little or no carry-over control from one year to the next. *A. ypsilon* was not considered a potential pest for Illinois cornfields.

Birkett, N. L. 1957. Early immigrants at Kendal, Westmoreland. Entomol. Rec. & J. Variation 69 (5): 118.

A fresh *Agrotis ipsilon* was caught in a light trap at Kendal, Westmoreland, England, March 3, 1957. Whether it was an immigrant or had been hibernating was not determined.

Bishara, I. 1932. The greasy cutworm (*Agrotis ypsilon,* Rott.) in Egypt. Minist. Agr. Egypt Bull. 114: 1-55. Cairo.

An account is given, supplemented by references to the literature, of observations on all aspects of the bionomics and control of *A. ypsilon* in Egypt. All stages are described and its economic status and distribution throughout the world are briefly indicated.

Blair, B. W. 1968. Identification of cutworms of economic importance in Rhodesia (Lepidoptera: Noctuidae). J. Entomol. Soc. South Afr. 31 (1): 113-114.

A key to larvae of *Agrotis longidentifera, A. muscosa, A. segetum, A. spinifera* and *A. ypsilon* is given.

Bowles, G. J. 1880. Canadian cutworms. Annu. Rep. Entomol. Soc. Ont. for 1879: 37-46.

This article describes the character and habits of the greasy cutworm, *Agrotis telifera* (=*ipsilon*) and methods of control. The moth is figured and its food plants include corn, tomatoes, and tobacco. (40)

Brain, C. K. 1918. A preliminary report on the cotton pests of South Africa. Union S. Afri. Dep. Agr., Pretoria, Local Ser. 59: 1-29.

A. ypsilon was considered a pest of cotton. Control measures were suggested.

Bretherton, R. F. 1969. On rearing *Agrotis ipsilon* Hufnagel. (The Dark Sword-Grass) (Lepidoptera, Noctuidae). Entomol. Gaz. 20 (2): 83-85.

This paper gives notes on rearing *A. ipsilon* in an effort to determine whether it is almost (if not entirely) a migrant species or whether it hibernates in Britain in the larval stage.

Britton, W. E. 1907. Insect enemies of the tobacco crop in Connecticut. Conn. Agr. Exp. Sta. 30th Annu. Rep. 263-279.

Agrotis ypsilon caused severe damage to tobacco throughout Connecticut. A description is given of the larva and adult. Control measures include trapping, fall plowing, and the use of Paris green or white arsenic poison bait. (264-267)

Britton, W. E. and P. J. Anderson. 1926. Tobacco Insects observed in Connecticut in 1925. Conn. Agr. Exp. Sta., (Tobacco Sta.) Bull. 6: 74T-93T. New Haven, Conn.

One of the most common cutworms in tobacco fields and vegetable gardens in Connecticut is the black cutworm. The control of cutworms is described.

Britton, W. E. 1929. Twenty-eighth report of the state entomologist of Connecticut, 1928. Conn. Agr. Exp. Sta. Bull. 305: 666-768. New Haven, Conn.

The black cutworm was received August 28 from Cromwell, where it was feeding upon turf on the golf course.

Brooks, W. and L. D. Anderson. 1947. Toxicity tests of some new insecticides. J. Econ. Entomol. 40 (2): 220-228.

Bait tests were conducted in the laboratory with 3rd and 4th instar black cutworms obtained from the field. The larvae were placed in large glass jars containing soils and a single partially grown kale plant. Five larvae were placed in each jar in individual depressions and covered to prevent cannibalism. A ring bait was placed around the plant about 2 inches from the stem. It was necessary for cutworms to cross the ring of bait in order to feed on the plant. Each test was replicated three times. Mortality counts were made at the end of 48 hours.

Bulyginskaya, M. A. 1965. On the prospects of control of some injurious Lepidoptera by the chemical sterilization method. Entomol. Obozr. 44 (4): 738-749. English translations as Entomol. Rev. 44 (4): 433-440. Wash., D. C., & New York. (In Russian)

Tests were made with four aziridinyl alkylating agents of Russian manufacture to assess their value in sterilizing insects, including *A. ipsilon*.

Buresch, I. 1914. Notes on nocturnal Lepidoptera of Bulgaria. Mem. Bulgarian Naturalists Soc. 6: 39-98. Sophia

Agrotis ypsilon was recorded as a pasture pest in Bulgaria.

Burt, B. A. 1918. Report on the agricultural experiment stations in the Central Circle, United Provinces, for the year ending 30th June 1917: 1-89. Allahabad.

A. ypsilon was found in considerable numbers on potato and tobacco in March and April.

Buttler, A. G. 1882. Heterocerous Lepidoptera. Trans. Entomol. Soc. Lon. 1882: 113-139.

Agrotis suffusa (= *Noctua robusta* Blanch.) (= *Agrotis ipsilon)*. This common species does not vary from European examples in Chile. It would be difficult to say what could have induced M. Blanchard to rename it. (126)

Caesar, L. 1927. Insects attacking vegetables. Ont. Dep. Agr. Bull. 325: 1-63. Toronto.

Types of injury, life history, and control of *Agrotis ypsilon* are given. (6-8)

Calora, B., E. H. Glass, M. L. Pescador, and S. F. Barroga. 1968. Granular soil systemic insecticides (Thimet, Cyolane and Phosdrin foliar spray against the diamond-back moth, *Plutella maculipennis* (Curtis), and other pests of cabbage. Philipp. Entomol. 1 (1): 40-53. Laguna.

The cutworms, *Agrotis ipsilon* and *Spodoptera (Prodenia) litura*, caused considerable damage to cabbage within the first 3 weeks after transplanting.

The Canadian Agricultural Insect Pest Review

This publication presents, in manuscript form, a periodical statement on current insect pest conditions. It presents data governing the seasonal appearance of weather on degrees of parasitism, notes on distribution and abundance of insect pests. It has been published by the Canada Department of Agriculture, Research Branch-Scientific Information Section, Ottawa, Ontario, from 1923 to present. From 1923 to 1967, this publication was known as The Canadian Insect Pest Review. Since these references are too numerous to list separately, they are listed by years.

1923 Can. Insect Pest Rev. 1:55.
1927 Can. Insect Pest Rev. 5:35.
1929 Can. Insect Pest Rev. 7:28, 38.
1930 Can. Insect Pest Rev. 8:3.
1932 Can. Insect Pest Rev. 10:69.
1933 Can. Insect Pest Rev. 11:4.
1935 Can. Insect Pest Rev. 13:33.
1939 Can. Insect Pest Rev. 17:239.
1940 Can. Insect Pest Rev. 18:58.
1941 Can. Insect Pest Rev. 19:250.
1943 Can. Insect Pest Rev. 21:247.
1944 Can. Insect Pest Rev. 22:168.
1946 Can. Insect Pest Rev. 24:207, 210, 347.
1947 Can. Insect Pest Rev. 25:150, 320.
1948 Can. Insect Pest Rev. 26:98, 140, 173.
1949 Can. Insect Pest Rev. 27:64, 101, 158.
1950 Can. Insect Pest Rev. 28:50, 88, 147.
1951 Can. Insect Pest Rev. 29:62, 119.
1952 Can. Insect Pest Rev. 30:3, 101, 189.
1953 Can. Insect Pest Rev. 31:103, 167.
1954 Can. Insect Pest Rev. 32:166, 234, 269.
1955 Can. Insect Pest Rev. 33:75, 114, opp. 171 (map), 243, 340.
1956 Can. Insect Pest Rev. 34:43, 273.
1957 Can. Insect Pest Rev. 35:63, 105, 193, 247, 268, 269, 271.
1958 Can. Insect Pest Rev. 36:9, 65, 66, 119, 125, 161, 192, 252.
1959 Can. Insect Pest Rev. 37:66, 67, 148, 237.
1960 Can. Insect Pest Rev. 38:53, 54, 105, 145, 170, 223, 224.
1961 Can. Insect Pest Rev. 39:53, 55, 102, 162, 209, 210, 340, 341, 342, 372. 384.
1962 Can. Insect Pest Rev. 40::36, 59, 92, 93, 229, 230, 232, 266.
1963 Can. Insect Pest Rev. 41:45, 72, 90, 220.
1964 Can. Insect Pest Rev. 42:61, 193, 194, 212.
1965 Can. Insect Pest Rev. 43:97, 98, 214.
1967 Can. Insect Pest Rev. 45:12.
1969 Can. Insect Pest Rev. 47:14.
1970 Can. Insect Pest Rev. 48:18.
1971 Can. Insect Pest Rev. 49:9, 14, 17, 18, 33.

Cayrol, R. 1962. Efficacité de différents appâts insecticides sur les larves d'*Agrotis ipsilon* Hfn. (Efficacy of different insecticide baits on the larvae of *A. ipsilon*.) Phytiat-Phytopharm. 11: 35-39. Paris.

Chemicals which gave 90-100% kill at lowest concentrations were dieldrin, aldrin, lindane, and dimethoate.

Chamberlin, F. S. and A. H. Madden. 1942. Insect pests of cigar-type tobaccos in the southern districts. U.S. Dep. Agr. Circ. 639: 1-54. Washington, D. C.

This gives descriptions of various insects and the type of damage they produce in tobacco in plant beds and in the field. Pests include cutworms and climbing cutworms. Life history, habits, and control measures are given for granulate cutworm (*Feltia subterranea*), black cutworm (*Agrotis ypsilon*), and pale-sided cutworm (*Agrotis malefida*). (31-36)

Chamberlin, F. S. and N. Allen. 1957. Tobacco cutworms, how to control them. U.S. Dep. Agr. Leaflet 417: 1-8.

Life history and control measures for various cutworms which attack tobacco are discussed. Included are variegated cutworm, black cutworm, yellow-striped armyworm, clay-backed cutworm, spotted cutworm, dingy cutworm, and granulate cutworm.

Chaudhuri, R. P. 1953. Control of cutworms in potato fields. Indian J. Entomol. 15 (3): 203-206. New Delhi.

The most common species of cutworm in Indian potato fields was *A. ypsilon*. Handpicking and poison baits were not effective. Toxaphene and a DDT-pyrethrins mixture were discussed as controls.

Chittenden, F. H. 1898. Insects that affect asparagus. U. S. Dep. Agr., Div. Entomol. Bull. 10, n.s.: 54-62.

Agrotis ypsilon damaged asparagus beds in Canada. (61)

Chittenden, F. H. 1903. A brief account of the principal insect enemies of the sugar beet. U. S. Dep. Agr., Div. Entomol., Bull. 43: 1-71.

Agrotis ypsilon was commonly found in fields of sugar beets in the United States. It was especially troublesome to newly set tomato plants and to potato, corn, lettuce, and tobacco.

Chittenden, F. H. 1907. Insects injurious to vegetables. Orange Judd Co., London, 262 pp.

This book describes the larva of the black cutworm and lists its food plants as potato, corn, lettuce, and tobacco. (52-53)

Chopra, R. L. 1928. Annual report of the entomologist to the Government, Punjab, Lyallpur, for the year 1925-26. Rep. Dep. Agr. Punjab, 1925-26, 1 (2): 67-125. Lahore.

A. ypsilon damaged gram (legume) crop. Various baits gave fairly good results. Laboratory experiments suggested that flooding the fields would be an effective control measure.

Chu, Ju-shih. 1965. A study of the control of the Y-moth (*Agrotis ypsilon*) infesting spring-sown maize (*Zea mays*), by means of weed destruction. Acta Phytophyl. Sin. 4 (3): 225-230. Peking. (In Chinese)

Eradication of *Cirsium setosum* from cornfields in China was an important measure for the control of *A. ipsilon* since the larvae were attracted to this weed. Destruction of the weed gave 60% reduction in larval populations.

Chung, H. L. 1923. The sweet potato in Hawaii. Hawaii. Agr. Exp. Sta., Bull. 50: 1-20. Honolulu.

Cutworms (*A. ypsilon*) attacked the sweet-potato vine at night during the early growing period. The recommended bait consisted of 1 pound of molasses, 1/2 pound of lead arsenate, and 10 pounds of bran.

Common, I. F. B. 1958. The Australian cutworms of the genus *Agrotis* (Lepidoptera: Noctuidae). Austral. J. Zool. 6: 69-88. Melbourne.

Specimens of *Agrotis ypsilon* from the southwest Pacific area, including Australia, differ consistently from typical palaearctic specimens. This includes a description of the subspecies *A. ypsilon aneituma* (Walker). (73-75)

Cook, W. C. 1920. Cutworm and armyworms. Office State Entomol. Minn. Cir. 52: 8.

A key is given for identifying the more common cutworms of Minnesota with an account of life history and habits, including *A. ypsilon*. Various control methods are discussed.

Cook, W. C. 1921. Studies on the flight of nocturnal Lepidoptera. 18th Rep. Minn. State Entomol. Agr. Exp. Sta: 43-56.

The seasonal and meteorological relations of adult *Agrotis* species were discussed. Humidity was the most important factor studied. *Agrotis ipsilon* was two-brooded in Minnesota.

Cook, W. C. 1934. Cutworms and armyworms. Minn. Agr. Exp. Sta. Circ. 48: 1-8 St. Paul.

A. ypsilon may have two generations a year in Minnesota. Cultural methods for control and poison baits are discussed.

Cooley, R. A. 1906. Preliminary report on sugar beet insect pests. Mont. Agr. Exp. Sta. Annu. Rep 12: 257-273

Agrotis ypsilon was commonly found in beet fields. It was the most abundant and injurious of the cutworms. Larva and adult are illustrated. (269)

Coquillett, D. W. 1892. Predaceous habit of Histeridae. U. S. Dep. Agr., Div. Entomol., Insect Life 4:76.

An adult *Hister sexstriatus* Lec. attacked a nearly full-grown larva of *Agrotis ypsilon*. (76)

Coquillet, D. W. 1897. Revision of the Tachinidae of America north of Mexico. U. S. Dep. Agr., Div. Entomol. Tech. Ser. 7: 1-156.

Parasites bred from *Agrotis ypsilon* larvae were identified as *Zenillia eudryae* Town., *Bonnettia compata* Fall., *Tachinomyia robusta* Town., and *Frontina archippivora* Will.

Corbett, G. H. 1926. Annual report of the entomological division for 1925. Malay. Agr. J. 14 (6): 171-174. Kuala Lumpur.

Agrotis ypsilon was recorded as a pest of grasses, especially on golf greens, in Malaya.

Corbett, G. H. 1930. Entomological notes. First quarter, 1930. Malay. Agr. J. 18 (4): 212-214. Kuala Lumpur.

Agrotis ypsilon attacked tea seedlings in Malaya.

Corbett, G. H. 1935. Division of Entomology; Annual report of the year 1934. Gen. Ser. Dep. Agr. S. S. and F. M. S. No. 21: 43-56. Kuala Lumpur.

Controlled experiments with poisoned bait against the cutworm, *A. ypsilon*, were satisfactory. Amyl acetate and ethyl acetate did not attract the adults.

Corbett, G. H. and H. T. Pagden. 1941. A review of some recent entomological investigations and observations. Malay. Agr. J. 29 (9): 347-375. Kuala Lumpur.

A. ypsilon was controlled by broadcasting a bait composed of 1 lb. Paris green and 20 lb. bran at the rate of 130 lb. per acre 4 days before planting out vegetable seedlings.

Coventry, B. 1913. Report of the Director. Rep. Agr. Res. Inst. and Coll., Pusa, 1911-1912: 9-10. Calcutta.

At Mokameh, a campaign was organized against *Agrotis ypsilon*, which had been destroying crops. Hand picking of the first-brood larvae and use of Andrés-Mairés traps held damage to 10%.

Creighton, C. S., T. L. McFadden, and E. R. Cuthbert. 1973. Supplementary data on phenylacetaldehyde: an attractant for Lepidoptera. J. Econ. Entomol. 66 (1): 114-115.

Phenylacetaldehyde was tested by itself in 1965 and with the female cabbage looper sex pheromone in 1971 to obtain additional data on its attractance to *Trichoplusia ni* (Hübner). The 1971 tests showed extreme variation in its attractiveness to females, and its attractiveness to males could not be ascertained precisely because of the presence of captured, live females in the traps. Five black cutworm moths were attracted to the traps baited with phenylacetaldehyde.

Crumb, S. E. 1915. A key to the cutworms affecting tobacco. J. Econ. Entomol. 8 (4): 392-396.

This key includes only the cutworms known to affect tobacco in the United States. The majority of the common species, including *Agrotis ypsilon* Rott., also affect other crops.

Crumb, S. E. 1926. Tobacco cutworms and their control. U. S. Dep. Agr., Farmers' Bull. 1494: 1-14. Washington, D. C.

This bulletin gives life histories of various cutworms, including *A. ipsilon*, which attack tobacco. It discusses several control measures, including natural, chemical, and cultural methods.

Crumb, S. E. 1929. Tobacco cutworms. U. S. Dep. Agr. Tech. Bull. 88, 1-180.

This is a very complete account of cutworms, including *A. ypsilon* Rott., which attack tobacco. It includes larval and pupal anatomy and keys to species for eggs, larvae, and pupae. Distribution, hosts, seasonal history, and description of stages are given for important species. Control measures include natural (such as pathogens and predators), chemical, and cultural.

Crumb, S. E. 1956. The larvae of the Phalaenidae. U. S. Dep. Agr. Tech. Bull. 1135: 1-356.

A complete description of the last instar of the larva of *Agrotis ypsilon* is given. The winter is passed in the pupal stage, probably as an adult within the pupal shell. There are four broods in northern Tennessee.

Curran C. H. 1927. A new Tachinid parasitic on armyworms in Mexico. Proc. Hawaii. Entomol. Soc. 1926, 6 (3): 497-498. Honolulu.

Archytas piliventris (Van der Wulp) (Family Tachinidae) were reared from pupae, probably of *Agrotis ypsilon*, collected in alfalfa fields in Mexico.

Davidson, R. H. and L. M. Peairs. 1966. Insect pests of farm, garden and orchard. John Wiley & Sons., N. Y. 675 pp.

The black cutworm overwinters as a larva or pupa. Control measures include weed control, fall plowing, crop rotation, and chemicals, including carbaryl, chlordane, diazinon, DDT, Dylox, TDE, malathion, naled, parathion, Phosdrin, Strobane, and toxaphene. (150-153)

Davis, J. J. 1918. Present day problems in entomology. Rep. Entomol Soc. Ontario 49: 47-59.

It is unusual for cutworms to lay eggs on wet soil, but this appears to be the habit of *Agrotis ypsilon*, commonly termed "overflow worms". Crop rotation may help control, but poison baits are probably better. (56)

Davis, J. J. and C. F. Turner. 1918. Popular and practical entomology; experiments with cutworm baits. Can. Entomol. 1 (6): 187-192.

This gives a comparison of effectiveness of various arsenical compounds in controlling *Agrotis ypsilon*. Different formulations of baits were also tested, using bran and sawdust as fillers.

Davis, J. J. 1930. Insects of Indiana for 1929. Indiana Acad. Sci. Proc. 39: 295.

Overflow worm *(A. ypsilon)* destroyed early plantings of corn on several hundred acres following late overflows on the Wabash River bottom lands.

Davis J. J. 1933. Insects of Indiana for 1933. Indiana Acad. Sci. Proc. 43: 196-197.

A. ypsilon was unusually abundant and destructive to corn in many sections of the state. Thousands of acres were destroyed during June 1933. The earliest reports were received June 1 and the last reports before the end of the month.

Davis, J. J. 1953. Insects of Indiana for 1952. Indiana Acad. Sci. Proc. 62: 176-177.

Agrotis ypsilon migrated north in Indiana and destroyed thousands of acres of corn. Soybeans were also severely damaged.

Dimetry, N. Z. and M. H. Mansour. 1971. Effect of some inorganic salts as a deterrent agent against the greasy cutworm *Agrotis ipsilon* Hfn. and the spiny bollworm *Earias insulana* Boisd. Z. Angew Entomol. 69 (3): 315-317. (German Sum.)

Different molarities of certain inorganic salts were applied to the natural food of *Agrotis ipsilon* and *E. insulana* and food consumption was measured. In order of decreasing deterrency were $Al_2(SO_4)_3$, $(NH_4)_2SO_4$, NH_4Cl, NaCl, and $CaCl_2$.

Dochkova, B. 1968. (The possibilities of studying the flight of injurious moths of the family Noctuidae to sugar-beet.) Rastenievudni Nauki (1968) 5 (9): 93-98. Nauchnoizledovatelski Inst. za Zakharno Tsveklo, Krai Shumen, Bulgaria.

Tests were conducted to determine the relative effectiveness of fermented molasses baits and ultraviolet-light traps for trapping Noctuids, including *Agrotis ipsilon.*

Donald, D. A. 1939. Annual report for 1938. Annu. Bull. Div. Rep. Dep. Agr. Fiji 1938: 77-93. Suva, Fiji Islands.

A. ypsilon attacked tobacco, cauliflower, cabbage, tomato, and other vegetables. It was controlled by frequent cultivation, poison baits, and hand-collection of eggs and larvae.

Dudgeon, G. A. 1915. Egyptian agricultural products. *Sorghum vulgare,* Pers. (*Andropogon sorghum,* Brot.), the great millet (*Durra baladi* in Egypt), also *Sorghum halepense,* Pers. (Garawao). Minist. of Agr., Egypt, (la): 1-32. Cairo.

When first sprouting, sorghum plants may be attacked by *A. ypsilon.* Control measures include rolling the ground and mixing napthalene with the seed at sowing time for reducing the number of cutworms.

Duport, L. 1913. Notes sur quelques maladies et ennemis des plantes cultivees en extrême Orient. (Notes on certain diseases and enemies of cultivated plants in the Far East.) (Extrait du) Bull. Economique de l'Indochine, Hanoi-Haiphong, Nouvelle Série, (99), Nov.-Dec, 1912, et nos. 102, 105, May-June, Nov.-Dec. 1913: 147.

A. ypsilon is recorded as a tobacco pest.

Dutt, H. L. 1915. The campaign against surface caterpillar at Mokameh in 1914-15 (Fifth Report). Agr. J. Dep. Agr., Bihar and Orissa, Patna. 3 (1): 1-24. India.

Andrés-Mairés traps, containing a liquid attractant, were used in a control program to trap gravid female *A. ypsilon* before they oviposited. From trap catches, it was theorized that *Agrotis* is a local pest and not a migrant.

Dutt, H. L. 1915. *Agrotis* at Colgong and Ghogha. Agr. J. Dep. Agr. Bihar and Orissa, Patna. 3 (2): 33-40.

Andrés-Mairés traps were used to control *A. ypsilon* attacking rabi crops in the Bhagalpur district, India. In 1913, 45,465 moths were trapped.

Dutt, H. L. 1916. *Agrotis* at Colgong and Ghogha in 1915-16. Agr. J. Dep. Agr. Bihar and Orissa, Patna. 4 (2): 15-23.

This describes various methods of control of *A. ypsilon*, including hand-picking, Andrés-Mairés traps, and heavy irrigation. It also describes the insect parasite situation for this period.

Dutt, H. L. 1917. The greasy surface caterpillar: its life-history and seasonal history. Agr. J. Dep. Agr. Bihar and Orissa, Patna. 5 (1): 1-14.

The life cycle of *A. ypsilon* is described, as well as the seasonal history. Andrés-Mairés traps and hand picking of larvae were suggested as controls.

Dutt, H. L. 1920. The methods of control of *Agrotis ypsilon* in Bihar. Rep. Proc. 3rd Entomol. Meet., Pusa, Feb. 1919: 622-625. Calcutta.

This describes different methods of controlling *A. ypsilon*, and plowing and planting techniques. It also describes the life history of a braconid parasite which may be used in biological control.

Dutt, H. L. 1920. Report on the Administration of the Entomological Section for 1919-20. Rep. Agr. Dep. Bihar and Orissa, 1919-20: 13. Patna.

The work with a parasite *(Microgaster)* of *A. ypsilon* is discussed and life cycle of the parasite is given.

Dutt, H. L. 1921. Note on a braconid parasite of *Agrotis ypsilon*. Rep. Proc. 4th Entomol. Meet.: 157-163. Pusa, Calcutta.

The seasonal life cycle and habits of an unnamed (in article) braconid parasite of *A. ypsilon* is given.

Dutt, N. 1946. On a simple method of controlling *Agrotis ypsilon* Rott. in tobacco plants. Sci. and Culture 12 (6): 292-294.

Poison baits do not give immediate kill, allowing *A. ipsilon* larvae to cause some damage. The author suggests a "paper-wrapping" method to protect the plant. A small piece of paper is wrapped around the basal portion of the stem, extending 1 inch above and 1 inch below the soil surface.

Eff, Ibrahim. 1932. Greasy cutworm in Egypt. Bishara. Labr. Egypt Ag. Min. Bull. 114: 1-55.

Eguchi, M. 1926. Noctuidae infesting sugar-beet. Korea Agr. Exp. Sta., Bull. 3: 257-263. Suigen, Korea. (In Japanese)

Agrotis ypsilon was recorded as a pest of sugar beets in Korea.

El-Minshawy, A. M. 1971. Preliminary notes on the biology of *Meteorus laeviventris* Wsm., an internal larval parasite of *Agrotis ipsilon* Rot. (Hymenoptera: Braconidae). Bull. Soc. Entomol. Egypte 54: 361-364.

Meteorus laeviventris is an endoparasitic wasp preying on the larvae of *Agrotis ipsilon*. Its life cycle is briefly treated.

Endo, K. 1940. Outbreaks of *Agrotis ypsilon* Rott. in Sakhalin in 1939. Oyo-Kontyu. 2(5): 219-221. Tokyo. (In Japanese)

Agrotis ypsilon was very injurious to sugar-beet in Sakhalin in 1939. The larvae were killed by poison baits of 100 lb. rice bran, 1.5 lb. calcium arsenate, and 2 lb. brown sugar.

Engel'hardt, V. M. and A. Mishchenko. 1931. Pests of soybeans in the Far East. Diseases and pests of soybeans in the Far East. Reprint 85-112. (Valdivostock, Izd. dal,nevost. Kraev. zem. Upravl. (Pub. Reg. Land Admini. Far East. (In Russian)

This includes brief notes on bionomics of more than 40 insect pests of soybeans. *A. ypsilon* is considered a secondary pest. It attacks sprouting soybeans in late June.

Enns, W. R. 1951. Cotton insects and their control in Missouri. Mo. Agr. Exp. Sta. Bull. 545: 1-15.

Agrotis ypsilon may attack cotton. Individuals usually spend the winter as small worms in weedy fence rows or sod but may also overwinter as adults or eggs. Toxaphene, Paris green, sodium fluosilicate, and cryolite are suggested for control.

Essig, E. O. 1911. Injurious and beneficial insects of California. Calif. State Comm. Hort., Mon. Bull. 541: 393-394.

Descriptions of larva and adult *Agrotis ypsilon* are given. It is a common species in California where it attacks cabbage, cotton, and tomato. (393)

Fenton, F. A. 1952. Field crop insects. The MacMillian Co., N. Y. 405 pp.

Includes a general description of cutworms and their control. *Agrotis ypsilon* is mentioned as a common and injurious species. (184-187)

Fernando, H. E. and P. Manickavasagar. 1959. Investigations on potato insects and their control with special reference to *Dorylus orientalis*. Trop. Agriculturist 114 (2): 127-139. Colombo.

Agrotis ypsilon was especially destructive to potato at Ambewela, Bopatalawa, and Nuwara Eliya, Ceylon.

Endrin, aldrin, and chlordane gave very good control of *A. ypsilon*. (127-29)

Ficht, G. A. 1940. Notes on Indiana Noctuidae. Proc. Indiana Acad. Sci. 49: 243-253.

"Greasy cutworm, black cutworm and overflow worm. One of the most numerous and destructive cutworms, particularly in muck soils and in poorly drained areas. Numerous from May to October. Many county records."

Flaschenträger, B. and E. S. Amin. 1950. Chemical attractants for insects: sex- and food-odours of the cotton leaf worm and the cutworm. Nature 165: 394.

A sex pheromone was extracted from abdominal segments with purified ether and proved attractive to male *Agrotis ypsilon*.

Fletcher, T. B. 1913. Report of the government entomologist. 24th April 1912 to 31st March 1913. Oper. Dep. of Agr., Madras Presidency, 1912-1913: 36-41. Madras.

Agrotis ypsilon caused great damage to potatoes in Yucaud, India. Sprays, hand picking of larvae, trapping adults and larvae, and poison baits were used as controls, but 80% of potato plants were damaged.

Fletcher, T. B. 1914. Report of the Imperial Entomologist. Rep. Agr. Res. Inst. and Coll., Pusa 1913-14: 62-75. Calcutta.

In this report an attempt to trace *A. ypsilon* through the hot weather and rains is mentioned, as it is not known what stage the insect passes through this period. Also, it was found that the larvae are preyed upon extensively by a Carabid beetle *(Broscus punctatus)*. (68-69)

Fletcher, T. B. 1916. Agricultural entomology. Reprint from Annu. Rep. Bd. Sci. Advice for India, 1914-1915, Calcutta. Econ. Zool: 1-15.

It is not known how *A. ypsilon* passes through the hot weather and rainy season in the plains of India. Under insectary conditions, continuous broods have been obtained, which suggests it may breed somewhere in the vicinity of the areas attacked from September to December.

Fletcher, T. B. 1916. Report of the Imperial Entomologist. Rep. Agr. Res. Inst. and Coll. Pusa, 1915-16: 58-77. Calcutta.

Experiments suggest *A. ypsilon* does not pass through the hot weather in a resting stage, although there is no trace of the insect between April and August. The possibility of migration is suggested. (66)

Fletcher, T. B. 1916. One hundred notes on Indian insects. Agr. Res. Inst., and Coll. Pusa, Calcutta. Bull. 59: 1-39.

This bulletin contains a useful summary of the life histories and habits of a number of Indian insects and gives records of their distribution in new localities or on new food plants. *Liogryllus bimaculatus* fed on gram (chick pea) weeds and on larvae of *Agrotis ypsilon.* (39)

Fletcher, T. B. 1918. Report of the Imperial Entomologist. Sci. Agr. Res. Inst. Pusa, 1917-18: 84-116. Calcutta.

A. ypsilon was capable of breeding in the plains during the rains. The question of migration is still uncertain. (100)

Fletcher, T. B. *et al.* 1919. Second hundred notes on Indian insects. Agr. Res. Inst. and Coll. Pusa, Bull. 89: 1-102.

Adult carabids *Broscus punctatus* Klug. were predaceous on the larvae of *Agrotis ypsilon.*

Fletcher, T. B. 1920. Report of the Imperial Entomologist. Sci. Rep. Agr. Res. Inst. 1919-1920: 68-94. Calcutta.

Agrotis ypsilon was reared and its life history and habits were observed. Results are not given in this publication. (82)

Fletcher, T. B. 1925. Migration as a factor in pest outbreaks. Bull. Entomol. Res., 16 (1): 177-181. London.

Migration seems to be the cause of the annual outbreak of *A. ypsilon* on the tal lands at Mokameh. "Newly uncovered mud" possesses some peculiar attraction for the female moths and they oviposit on it.

Fletcher, T. B. 1928. Report of the Imperial Entomologist. Sci. Rep. Agr. Res. Inst. Pusa 1926-27: 56-67. Calcutta.

Agrotis ypsilon was noticed for the first time cutting shoots of growing carrots. (62)

Forbes, S. A. 1890. Notes on cutworms. Ill. State Entomol. Sixteenth Rep: 84-97.

Agrotis ypsilon was recorded as being active in corn fields June 3, 1889. Most specimens were full grown, and some were shortening for pupation. Most reared larvae were parasitized by tachinids and braconids.

Forbes, S. A. 1900. The cutworms. 21st. Rep. State Entomol., State of Ill: 100-105.

Agrotis ypsilon was a pest of sugar beets. It usually hibernates as a larva, pupating about June 1, yielding a moth in late June and July. Pupae have also been found in winter. (104)

Forbes, S. A. and C. A. Hart. 1900. The economic entomology of the sugar beet. Ill. Agr. Exp. Sta. Bull. 69: 397-536.

Food plants damaged by the greasy cutworm, *Agrotis ypsilon*, include strawberry, grape, apple, and sugar beets. This species seems usually to hibernate as a larva, pupating about the first of June. (452)

Forbes, S. A. 1904. The more important insect injuries to Indian corn. Ill. Agr. Exp. Sta. Bull. 95: 331-399.

The greasy cutworm was a common, widespread, and destructive cutworm, injurious to garden vegetables and to fruits as well as to corn. It also fed on grass, asparagus, cotton, tobacco, tomato, cabbage, potato, spinach, squash, beans, beets, apple, grape, and strawberries, but was not reported as injurious to clover. It passes the winter mainly as a caterpillar in various stages of growth. Larva and adult are illustrated. (351-353)

Forbes, W. T. M. 1934. A note on Dyar's law (Lepidoptera: Larvae). Bull. Brooklyn Entomol. Soc. 29 (4): 146-149.

"In the caterpillar the most convenient part to measure is the width of the head, and the ratio between head widths at successive molts is known as Dyar's ratio. The black cutworm has a variable number of stages, 6 or 7, rarely 8. Specimens with the larger number of molts grow hardly larger, though Satterthwait's tables 6 and 7 indicate that ones with 7 stages consume 7-10% more food, sex for sex, than those with 6."

Foscolo, E. and P. C. Lefèvre. 1939. Culture et parasites de la patate douce dans l'Ituri. Bull. Agr. Congo Belge 30 (3): 404-420. Brussels.

A. ypsilon was recorded as a pest of sweet potatoes in the Belgian Congo.

Franklin, H. J. 1919. Seventh report of the Cranberry Substation from 1917 to 1919. Mass. Agr. Exp. Sta. Bull. 192: 105-141.

"This season a similar visitation by the greasy cutworm occurred in August on a large part of the Wankinco bog, the bog having been flowed from early June to July 10; the blackish worms in their feeding dropped a litter of uneaten leaf fragments onto the sand under the vines. They were first seen about Aug.10, many being then considerably grown, and they disappeared on the bog about Aug. 24. They pupated in confinement in late August and early September, and the moths emerged from Sept. 18 to Oct. 2." (133)

Franklin, H. J. and D. S. Lacroix. 1924. The spotted cutworm, *Agrotis c-nigrum* (L.), a cranberry pest. J. Econ. Entomol. 17 (3): 406-408.

Larvae of *Agrotis ypsilon* were found occasionally with those of *Agrotis* (=*Amathes*) *c-nigrum*, but when confined they devoured the latter.

Franklin, H. J. 1928. Cape Cod cranberry insects. Mass. Agr. Exp. Sta., Bull. 239: 1-67.

Agrotis ypsilon attacked cranberry bogs seriously only when winter flooding was postponed until the last of May or later. Distribution, food plants, type of injury, description (including color illustration of larva and adult), seasonal history, and control measures are given.(31-32, Plates 1 & 2)

Franklin, H. J. 1945. The Cranberry Station, East Wareham, Mass. Annu. Rep. Mass. Agr. Exp. Sta., Bull. 428: 28-30.

Black cutworms (*Euxoa ypsilon*) were very abundant in cranberry bogs after summer flooding to control grubs.(29)

Franklin, H. J. 1946. The Cranberry Station East Wareham, Mass. Mass. Agr. Exp. Sta., Bull. 36: 29-30.

Black cutworm (*Euxoa*) infestation was medium, mostly on bogs flooded for control of root grubs.(29)

Franklin, H. J. 1948. Cranberry insects in Massachusetts. Mass. Agr. Exp. Sta. Bull. 445 (1): 1-64.

The black cutworm was a pest of cranberry. This report describes distribution, food plants, type of injury, physical description, seasonal history, and control measures (23, 31-32, plates 1 and 2)

Franklin, H. J. 1949. A new cutworm on cranberry. J. Econ. Entomol. 42 (6): 986.

Black cutworms were found working on an area of the big Wankinco bog in Carver, Mass., on June 24, 1949.

Franssen, C. J. H. 1935. De biologie van de zwartbruine aardrups (*Rhyacia ipsilon* Hufn.) en haar biologische bestrijding in het Sengkangsche merengebied (*Zuid-Celebes*). (The biology of the cutworm, *Agrotis ipsilon*, and its biological control in the Sengkang Lake District, South Celebes). Landbouw 10: 109-137. Buitenzorg. (Sum. in English)

This report describes all stages and gives the complete life history of *A. ipsilon*. Several parasites of *A. ipsilon* are discussed including the tachinids *Goniophana heterocera*, Macq. and *Acuphocera varia* F. and the braconid *Apanteles ruficrus*, Hal.

Franssen, C. J. H. 1936. Insecten schadelijk aan het maisgewas op Java. (Insect pests of the corn crop in Java.) Landbouw 12: 57-105. Buitenzorg.

This report describes the bionomics of 41 insects attacking corn and gives suggestions for their control. *A. ypsilon* was considered a serious pest and may be controlled with bait consisting of slices of sweet potato poisoned with a suspension of 6% sodium fluosilicate.

French, G. H. 1878. Insects injurious to the vegetable garden. Lepidoptera. Trans. Ill. State Hort. Soc. for 1877, 11: 179-203.

This report describes the habits and damage caused cutworms, including *Agrotis suffusa* (=*ypsilon*).

French, G. H. 1878. Moths-Lepidoptera. 7th Annu. Rep. State Entomol. of Ill. for 1877.

This report describes the characters, habits, ravages, and remedies for cutworms, including *Agrotis suffusa* (=*ypsilon*).

Froggatt, W. W. 1923. Insect pests of the cultivated cotton plant, No. 4. Cutworms and leaf-eating beetles. Agr. Gaz. New South Wales, 34 (5): 343-348. Sydney.

Agrotis ypsilon in its larval stage damaged many different field crops in Australia. This report gives a brief account of cosmopolitan insects which attack many different plants.

Frost, S. W. 1955. Cutworms of Pennsylvania. Penn. Agr. Exp. Sta. Bull. 596: 1-29.

Agrotis ypsilon larvae feed at the surface of the ground attacking many vegetable crops as well as corn, grasses, tobacco and cotton. In the Northern U. S., hibernation occurs in larval or pupal stage. Pupation occurs or is completed in the spring. A brief description and illustration of larva and adult are given. (19-20) The field key to the cutworms of Pennsylvania includes 47 species.

Fullaway, D. T. 1915. Report of the entomologist. Rep. Hawaiian Agr. Exp. Sta. 1914: 43-50.

Agrotis ypsilon was reported attacking succulent plants. They are usually controlled by parasites, but otherwise can be checked by arsenical sprays.

Gaines, J. C. and F. L. Campbell. 1935. Dyar's rule as related to the number of instars of the corn earworm, *Heliothis obsoleta* (Fab.), collected in the field. Ann. Entomol. Soc. Amer. 28 (4): 445-461.

Agrotis ypsilon was used as an example of a species having six and seven instars in both sexes as indicated by head capsule measurement. When both six and seven head capsules are combined, results are erroneous.

Gardner, A. K. 1925. Control of cutworms. Maine Agr. Ext. Circ. 89: 1-4.

Cutworms which attack garden crops such as beets, carrots, beans, and most vegetables are not difficult to control. Control measures include traps, banding, and

poison mash. General description of appearance, habits, and life history are given for cutworms in general. Larva and adult *Agrotis ipsilon* are illustrated.

Garman, H. 1895. Cutworms in Kentucky. Ky. Agr. Exp. Sta. Bull. 58: 87-109.

The greasy cutworm (*Agrotis ypsilon*) was especially destructive to newly set tobacco plants and to corn. This article contains a larval description and figures of the adult. (97)

Garman, H. 1904. Insects injurious to cabbage. Ky. Agr. Exp. Sta. Bull. 114: 13-47.

Moths of *A. ypsilon* occurred at Lexington. In Kentucky it was particularly injurious to cabbage, turnips, radishes, and mustard. (35-36)

Gauthier, G. and G. Rioux. 1944. Notes préliminaries sur la biologie des espéces de vers gris attaquant le tabac jaune. Quebec Soc. Protect. Plants Annu. Rep. 29: 88.

Agrotis ypsilon was noted as a secondary pest of tobacco.

Genung, W. G. 1955. Biology and control of insects attacking cruciferous crops in Florida. Fla. Agr. Exp. Sta., Annu. Rep. 1955: 240-242.

The best of nine materials for control of subterranean cutworms, including *Agrotis ypsilon,* was endrin emulsion at 1/2 pound technical per acre. Dieldrin WP and dieldrin emulsion at 1/2 pound technical per acre also gave good control, as did toxaphene emulsifiable.

Genung, W. G. 1957. Rice bran for control of cutworms. Rice J. 69 (1): 34-35.

Rice bran was shown to be as effective as wheat bran when used in poison baits against *A. ypsilon.*

Genung, W. G. 1959. Ecological and cultural factors affecting chemical control of subterranean cutworms in the Everglades. Fla. State Hort. Soc. Proc. 72: 163-167.

Various factors affecting control of *Agrotis ypsilon* include weed management, population density, age composition of population, starvation, diseases, rainfall, parasites and predators, and effects of volatility of the chemical.

George, B. W., E. S. Raun, D. C. Peters, and C. Mendoza. 1960. Artificial medium for rearing some lepidopterous corn insects. J. Econ. Entomol. 53 (2): 318-319.

This article lists components of an artificial diet suitable for rearing European corn borer, corn earworm, and the black cutworm. *Agrotis ipsilon* requires 31 days from egg to pupation on this medium.

Gessner, A. 1929. Erdraupen als rebenschadlinge. (Cutworms as vine pests.) Weinbau u. Kellerw., 1928, No. 23: 185. (Abstract in Heubeiten PflSchutzes, 1929, No. 3: 82.) Vienna.

Agrotis ipsilon caused severe injury in July 1928 to vines in a nursery in Baden, Germany.

Ghosh, C. C. 1924. Reports by the entomologist, Mandalay, for years ended 30th June 1922 and 1923: 1-14 and 1-19. Rangoon.

Agrotis ypsilon was recorded as a pest of tobacco in Mandalay, Burma.

Ghosh, C. C. 1929. Entomology. Rep. Dep. Agr. Burma 1928-29: 21-22. Rangoon.

Agrotis ypsilon was recorded as a pest on tobacco and potatoes.

Ghosh, C. C. 1931. Entomology. Rep. Dep. Agr. Burma 1929-30: 12. Rangoon.

Agrotis ypsilon was recorded as a pest on potatoes.

Gibson, A. 1911. Reports on insects of the year. Entomol. Soc. Ontario. 41st Annu. Rep.: 12.

Agrotis ypsilon was responsible for much damage throughout the Ottawa district. Beets, radishes, cabbage, and cauliflower were attacked.

Gibson, A. 1912. Cutworms and armyworms. Can. Dep. Agr., Exp. Farms, Div. Entomol. Bull. 3: 1-29. Ottawa.

Agrotis ypsilon damaged cabbages, cauliflowers, cucumbers, potatoes, tomatoes, tobacco, corn, beets, and radishes in Ontario. The appearance, habits and life history are given. (16-17)

Gibson, A. 1915. Cutworms and their control. Can. Dept. Agr., Entomol. Br. Bull. 10: 1-31. Ottawa.

Identical to Gibson, A. 1912. Cutworms and Armyworms. (16-17)

Gibson, A. 1917. Cabbage insects. Ninth Annu. Rep. Quebec Soc. Protection Plants from Insects and Fungous Dis., 1916-1917: 30-41. Quebec.

This paper assembles a quantity of information for cabbage growers concerning insects attacking this crop, including *A. ypsilon*.

Gillette, C. P. 1891. Notes and experiments with injurious insects and insecticides. Iowa Agr. Exp. Sta. Bull. 12: 535-549.

The author reared adult *Agrotis ypsilon* from larvae collected near squashes and potatoes. It is quite certain that few or no eggs are deposited in the fall, but that the females hibernate and deposit eggs in the spring. (540)

Goncales, C. R. 1964. Outbreaks and new records. FAO Plant Prot. Bull. 12 (4): 92-93. Rome.

Cutworms, largely black cutworms, *Agrotis ipsilon*, were of major importance in the spring of 1964 to young corn plants in the midwestern U. S., especially in Iowa.

Gorham, G. P., G. P. Walker and L. J. Simpson. 1929. Insects of the season 1929 in New Brunswick. 60th Annu. Rep. Entomol. Soc. Ont.: 11-14.

Potatoes, turnips, and sunflowers were injured by the greasy cutworm in July. Several fields of turnips and sunflowers were completely destroyed. (11)

Gorham, R. P. 1929. Injury to potatoes by larvae of *Agrotis ypsilon* Rott. 60th Annu. Rep. Entomol. Soc., Ontario 1929: 63-65.

During the first 2 weeks of July 1929, *A. ypsilon* attacked potato plants, turnips, and sunflowers in the Federicton District, Ontario. Injury to potatoes at such a late date was unusual.

Goryshin, N. I. and R. M. Akhmedov. 1971. Photoperiod and temperature as factors of development of *Agrotis ypsilon*. Zool. Zh. 50 (1): 56-66.

"The photoperiodic reaction (PhPR) of *Agrotis ypsilon* is described. It is well pronounced at the temperature of 15-18° C, but becomes weak at 25° C. The photoperiod controls the growth rate of larvae. The PhPR curve plotted in the coordinates: (photoperiods) and (percentage of slow-developing larvae) has two peaks. The first one is observed at very short photoperiods (0 to 4 hrs.), the second one--at 12 to 18 hrs.; their position depends on temperature. These photoperiods induced a sort of inhibition of growth at younger larval instars which reminded the diapause. The lower was the temperature, the longer was the inhibition of growth. After the larval growth being resumed, its specific rate was 2-3 times higher (fig. 5) than in larvae having developed without inhibition. The ecological role of the described PhPR is discussed."

Gossard, H. A. 1917. Cutworms; their habits, characteristics and means of control. Ohio Agr. Exp. Sta. Mon. Bull. 2 (3): 85-90.

The greasy cutworm (*Agrotis ypsilon*) is a common species in Ohio. It is uniformly dark, greasy gray in color, with a faint line of dull, dirty yellow along the back. Predators mentioned include robins, blackbirds, bluebirds, crows, chickens, pigs, toads, skunks, and shrews. Insect predators include ground beetles, tiger beetles, digger wasps, and stink bugs.

Gould, G. E. 1953. Control of cutworms, especially subterranean forms. Entomol. Soc. Amer., North Cent. Br. Proc. 8: 74-75.

Heavy infestations of *Agrotis ypsilon* in corn and soybeans in Indiana in 1952 were due to heavy early rains. Best protection was afforded by heptachlor, DDT, chlordane, and toxaphene.

Gould, G. E. 1954. Soil insects attacking corn in Indiana. Entomol. Soc. Amer., North Cent. Br. Proc. 9:25.

Agrotis ypsilon was the most destructive cutworm on corn and was a serious pest most seasons in the Ohio and lower Wabash river bottoms.

Gould, G. E. 1960. Problems in the control of mint insects. J. Econ. Entomol. 53 (4): 526-531.

Agrotis ypsilon appears in a list of insect pests of peppermint, spearmint, and wild mint in Indiana and neighboring states. (527)

Granovsky, A. A. 1949. New methods of cutworm control. Proc. Annu. Meet., North Cent. Sta. Br., Amer. Assoc. Econ. Entomol. 4: 109-110.

DDT was effective against young black cutworms in Iowa. Older worms were not killed by chlordane, lindane or poisoned baits because they feed underground and cannot be controlled by surface treatment.

Gressitt, J. L. 1959. Notes and exhibitions. Hawaiian Entomol. Soc. Proc. 17: 4.

One specimen of *Salmacia longipulvilli* (Diptera: Larvaevoridae) was reared from a pupa of *Agrotis ipsilon*. This fly had not been reported in Hawaii previously.

Guenée, A. 1852. Species Géneral des Lepidopterés. Noctuelites. 1: 268-269. (In French)

The author lists synonyms of *Agrotis suffusa (Agrotis ipsilon)* as *spinula* and *spinifera*. The geographical distribution was described as common throughout Europe, the East Indies, and most of the Americas from June to September.

Guest, E. 1931. Annual report on cotton (1929). Mem. Dep. Agr. Iraq, No. 15: 1-36. Baghdad.

"The larvae of *Agrotis ypsilon*, which destroyed a considerable number of young seedlings about the middle of April, were hand collected."

Gupta, S. R. 1926. Entomology. Annu. Rep. Dep. Agr. Assam, 1925-26: 26-27. Shillong.

Agrotis ypsilon was recorded as a serious pest of cold-weather vegetable seedlings.

Gurney, W. B. 1924. Insect pests of cotton in New South Wales. Agr. Gaz. New South Wales 34 (12): 887-893.

The most serious damage to cotton seedlings is caused by cutworms (*Agrotis ypsilon*). Physical descriptions of all stages, life history, and control recommendations (Paris green bait) are given. (890-891)

Haenggi, A. 1965. Effectiveness of a mixture of *Bacillus thuringiensis* Berl. and DDT against *Agrotis ypsilon* Rott. (Noctuidae). Entomophaga 10 (4): 343-348. (In French with German summary)

Methods and results are given for experiments designed to clarify the biological effect of a mixture of *B. thuringiensis* and DDT. The combination can "activate" *B. thuringiensis* when DDT is used in very weak concentrations. This was observed only with fourth instar *A. ypsilon*.

Hafez, M. 1947. The biology and life-history of *Apanteles ruficrus* Hal. (Hymenoptera - Braconidae). Bull. Soc. Fouad Ier. Entomol. 31: 225-249. Cairo.

This article describes the bionomics of *A. ruficrus*, a parasite of *Agrotis ypsilon*. Larvae of *A. ypsilon* were attacked in all instars except the sixth. The seasonal history of the parasite is given.

Hafez, M. 1951. Notes on the introduction and biology of *Microplites demolitor* Wilk. (Hymenoptera-Braconidae). Bull. Soc. Fouad Ier. Entomol. 35: 107-121. Cairo.

The larvae of *Agrotis ypsilon* were not successfully parasitized in the laboratory by *M. demolitor*.

Hafez, M. 1953. Studies on *Tachina larvarum* L. (Diptera-Tachinidae). I. Preliminary notes. Bull. Soc. Fouad Ier. Entomol. 37: 255-266. Cairo. II. Morphology of the adult and of its early stages. Ibid.: 267-304. III. Biology and life-history. Ibid: 305-335.

Eggs of *T. larvarum* were deposited on the larvae of *A. ypsilon* in cages, but the parasite larva failed to penetrate the integument and died in a few hours.

Hanna, H. M. and I. E. Atries. 1968. On the time of flight of certain nocturnal Lepidoptera as measured by a light trap. Bull. Soc. Entomol. Egypte 52: 535-545.

The flight of *A. ypsilon* seems to be favored by low temperature and a high relative humidity. The males and females of this species have different night distribution. The biological significances of these differences are discussed.

Hanna, H. M. and I. E. Atraies. 1970. The effect of moonlight on certain nocturnal Lepidoptera. Bull. Soc. Entomol. Egypte 53: 7-12.

A Robinson mercury vapor light trap was operated once every three nights for a year in the sugar cane fields at Fikrya near Abu-Quarquas. Moonlight had no effect on the flight activity of *A. ipsilon*, the largest numbers of which were trapped at new moon in Feb., Apr. and Oct.; at the 1st quarter in June and Aug.; at full moon in May and Sept.; and at the 2nd quarter in Dec., Jan., March, July, and Nov.

Hanna, H. M. and I. E. Atries. 1970. The flight activity of certain nocturnal lepidoptera in relation to temperature and humidity. Bull. Soc. Entomol.Egypte 53: 1-6.

Flight studies of *Agrotis ipsilon* indicated the mean night temperature was related more to the activity of the moth than the maximum day and minimum night temperatures. Activity is favored by a high daily temperature range in winter and a low daily temperature range in autumn in Egypt.

Hannothiaux, M. 1965. Observation sur les ennemis des cultures fourragères en Tunisie (Observations on the pests of forage crops in Tunisia). Bull. Eć. Sup. Agr. Tunis. 8-9: 231-235.

Agrotis ipsilon attacked lucerne and other leguminous crops in Tunisia.

Harrendorf, K., and R. E. Klutis. 1967. Insecticidal activity of hexamethylditin (Pennsalt TD-5032) on six species of Noctuidae. J. Econ. Entomol. 60 (5): 1471.

Laboratory investigations using topical application techniques showed hexamethylditin (Pennsalt TD-5032) to have relatively ineffective insecticidal activity against larvae of the black cutworm.

Harris, C. R., J. A. Begg, and J. H. Mazurek. 1958. A laboratory method of mass rearing of the black cutworm, *Agrotis ypsilon* (Rott.), for insecticidal tests. Can. Entomol. 90 (6): 328-331.

Mass rearing techniques of black cutworm larvae have been developed in the laboratory yielding 500-1000 fourth-instar larvae per week. The diet consists of clover, tobacco, and Beck's diet (Beck *et al.*, 1949). Fifth-instar larvae must be separated to avoid cannibalism.

Harris, C. R., and J. H. Mazurek. 1961. Bioassy of organic insecticides, in terms of contact toxicity, to the black cutworm, *Agrotis ypsilon* (Rott.). Can. Entomol. 93 (9): 812-819.

Aldrin, DDT, dieldrin, Dylox, endrin, Guthion, heptachlor, malathion, PVP-Iodine, carbaryl, and toxaphene were assayed for effectiveness against *A. ypsilon*, using the spray tower technique. Results include LD_{50}, LD_{95} and relative toxicities. Chlorinated hydrocarbons were found to be most toxic.

Harris, C. R., G. F. Manson, and J. H. Mazurek. 1962. Development of insecticidal resistance by soil insects in Canada. J. Econ. Entomol. 55 (5): 777-780.

Tests on soil insects collected from a number of areas in Canada indicated that the dipterous insects were rapidly becoming resistant to the cyclodiene insecticides. The common cutworm species of economic importance in Southwestern Ontario *(Agrotis ipsilon)* showed no indication of cyclodiene resistance. The organophosphate insecticides were generally less toxic to cutworms than the cyclodiene insecticides.

Harris, C. R., J. H. Mazurek, and G. V. White. 1962. The life history of the black cutworm, *Agrotis ipsilon* (Hufnagel), under controlled conditions. Can. Entomol. 94 (5): 1183-1187.

At 78° F. ± 2°, the life cycle of *A. ipsilon* required 54.5 ± 5.0 days. All stages are described. The effects of temperature and humidity were studied.

Harris, C. R. and H. J. Sevec. 1968. Toxicological studies on cutworms. III. Laboratory investigations on the toxicity of insecticides to the black cutworm with special reference to the soil type, soil moisture, methods of application, and formulation on insecticide activity. J. Econ. Entomol. 61 (4): 965-969.

Only endrin and Dursban were found to be more effective than aldrin against *Agrotis ypsilon.* Larval instars showed a marked difference in tolerance to aldrin and Dursban and became increasingly tolerant with each successive instar. Soil moisture, soil type, method of application, and formulation were all factors influencing the toxicity of insecticide-soil treatments.

Harris, C. R. 1969. Why chemicals fail to control cutworms. Agr. Chem. May 1969: 39-43.

A comparison of direct-contact toxicity of aldrin and Dursban to the various larval instars of the black cutworm showed Dursban to be more effective. Preventive control using preplanting treatments may be most satisfactory.

Harris, C. R. 1972. Behavior of dieldrin in soil: laboratory studies on the factors influencing biological activity. J. Econ. Entomol. 65 (1): 8-13.

Soil type is a major factor influencing biological activity. Dieldrin was as toxic or more so than aldrin by direct contact to third and fourth instar *Agrotis ipsilon.*

Harris, C. R. and W. W. Sans. 1972. Behavior of heptachlor epoxide in soil. J. Econ. Entomol. 65 (2): 336-341.

As a direct contact poison, the epoxide was as effective or more so than heptachlor against black cutworms. However, in soil it was less effective than heptachlor.

Harris, C. R., H. J. Sevec and W. W. Sans. 1973. Toxicological studies on cutworms. X. Laboratory and field microplot studies on effectiveness and persistence of some experimental insecticides used to control the black cutworm in organic soil. J. Econ. Entomol. 66 (1): 203-208.

Primary screening tests in the laboratory with 12 insecticides indicated that 8 were more toxic by contact than DDT and 4 were as toxic or more toxic than endrin to third instar cutworms. Microplot field trials, using plots seeded to onions and artificially infested with fourth instars, indicated that leptophos was most effective> cholorpyrifos> N-2596> DDT.

Harris, H. M., *et al.* 1949. Division of Entomology and Apiculture. Iowa Dep. Agr., 49th Iowa Dep. Agr., 49th Iowa Year Book of Agriculture. 123.

Black cutworms were unusually numerous and injurious in the spring of 1948. Infestations were largely confined to fields which had been previously flooded. Thousands

of acres of corn had to be replanted as a result of the depredations of this pest.

Harris, H. M. 1949. Emergency insect investigation. Iowa Agr. Exp. Sta. Rep. on Agr. Res. for the year ending June 30, 1949: 228-229.

DDT and chlordane surface dusts failed to control *Agrotis ypsilon*. They may give control if disced into the soil. (229)

Harris, T. W. 1841. A treatise on some of the insect pests of New England which are injurious to vegetation. First ed. Cambridge Univ. Press: 1-459. Cambridge, Mass.

Harris reared cutworms found in cabbage and potato fields in Massachusetts. The largest of the moths reared was *Agrotis telifera* (=*Agrotis ipsilon*), the lance rustic. It closely resembles the dark sword rustic, *Agrotis suffusa* (=*Agrotis ipsilon*) of Europe. He also described the adult.

Harris, T. W. 1842. A treatise on some of the insects of New England which are injurious to vegetation. Cambridge Univ. Press: 1-459. Cambridge, Mass.

Contents of article same as Harris, T. W. 1841.

Harris, T. W. 1862. A treatise on some of the insects injurious to vegetation. Third ed.: 1-640. Boston, Mass.

Contents of article same as Harris, T. W. 1841.

Harvey, F. L. 1891. Report of the botanist and entomologist. Annu. Rep. Maine Agr. Exp. Sta. for 1891: 175-207.

This report describes egg, larva, and adult of *Agrotis ypsilon*. The larvae were found destroying cabbage, tomatoes, potatoes, tobacco, cotton, corn, and beans. Suggestions are given for natural and artificial controls. (194-198)

Hasegawa, Tsutomu, and Chiba Takekatsu. 1969. Relations of temperature to the development of the egg and larval stage of *Agrotis ipsilon* and *Agrotis fucosa:* (Preliminary Report). Jap. J. Appl. Entomol. Zool. 13 (3): 124-128.

Under a long-day condition a linear relation between temperature and developmental velocity in both species, *Agrotis ipsilon* and *Agrotis fucosa*, was observed at 15~30° C. in the egg stage and at 20~30° C. in the larval stage. The calculated threshold of development and the thermal constant of the egg and larval stages in the two species are 11.3° C, 56.5 day degrees and 5.6° C, 387.3 day degrees, in *A. ipsilon* and 11.0° C., 78.8 day degrees, and 4.2° C., 589.0 day degrees, in *A. fucosa*, respectively. The threshold of development in both stages was hardly different in the two species, but there is a remarkable difference in the developmental duration between these two species, especially with increasing temperature. The larval development was more or less retarded under short-day condition in *A. fucosa*, whereas in *A. ipsilon* no such tendency was observable only under short or long-day condition. From the results it may be suggested that in *A. fucosa* the larval diapause was induced by photoperiodic condition.

Hassanein, M. H. 1956. Nocturnal activity of insects as indicated by light-traps. Bull. Soc. Entomol. Egypte 40: 463-479. Cairo.

Four generations of *Agrotis ypsilon* developed between late September and mid-July, and its absence in August confirmed earlier findings of its migratory habit. Numbers were greatest in April, and 52.5% of the adults were females.

Hassanein, M. H. and H. Radwan. 1963. The morphology and anatomy of the mature larva of the greasy cutworm, *Agrotis ypsilon* Rott. (Lepidoptera: Noctuidae). Bull. Soc. Entomol. Egypte 46 (55): 385-400.

The morphology and anatomy of the last-instar larva of *Agrotis ypsilon* are described in detail.

Hassanein, M. H., F. M. Khalil, and A. A. Elnaby. 1971. The effectiveness of certain insecticides on the greasy cutworm, *Agrotis ipsilon* Rott., in Upper Egypt (Lepidoptera: Noctuidae). Bull. Entomol. Soc. Egypt Econ. Ser. 5: 61-67.

Telodrin, dytox 8, endrin, torbidan, DDT/lindane, folithion, Carbaryl, veldin, nexion, sumithion, zolon, dytox 5, and cidial were tested at different rates against *Agrotis ipsilon*.

Hayslip, N. C. 1944. Biology and control of cutworms and armyworms in Florida. Fla. Agr. Exp. Sta. Annu. Rep., 1944: 138-139.

Severe damage by *Agrotis ypsilon* was reported in the Everglades area during the 1943-44 season. Effective bait materials were difficult to obtain.

Hayslip, N. C. 1948. Insecticide studies on Chinese cabbage for the control of the turnip aphid, *Rhopalosiphum pseudobrassicae* (Davis), and certain foliage feeding larvae. Fla. Entomol. 31: 80-87.

Parathion, DDT, and benzene hexachloride gave best control of cutworms (mostly *Agrotis ypsilon*) attacking Chinese cabbage. (86)

Hayward, K. J. 1941. Department de Entomologia (Department of Entomology) (Report for 1940 of the Tucumán Experiment Station). Rev. Ind. Agr. Tucumán 31 (1-3): 50-58. Tucumán, Argentina.

Agrotis ypsilon was a pest on potato, cotton seedlings, and beets.

Hayward, J. J. 1943. Departmento de Entomologia (Department of Entomology) (Report for 1942 of the Tucumán Experiment Station). Rev. Ind. Agr. Tucumán 33 (4-6): 66-84. Tucumán, Argentina.

Potato was attacked by *Agrotis ypsilon*.

Hector, G. P. 1923. Report of the economic botanist to the government of Bengal for the years 1921-22. Rep. Dep. Agr. Bengal 1921-22: 37-41.

A serious attack of *Agrotis ypsilon* occurred on hemp (ganja), *Cannabis sativa*, in 1922. Poison bait proved useless. Hand picking and irrigation were used for control.

Hedayetullah, S. 1941. Annual report of the economic botanist, Bengal, for 1939-40. Rep. Dep. Agr. Bengal 1939-40. Pt. II: 1-18. Alipore, India.

Flax was attacked by *Agrotis ypsilon*.

Hellins, J. 1868. Note on *Agrotis suffusa*. Entomol. Mon. Mag. 4: 255.

An attempt was made to determine the number of generations per year of *A. suffusa* (=*Agrotis ipsilon*).

Herrick, G. W. 1926. Some long-standing and some more recent insect pests with hints on methods of control. Proc. 71st. Annu. Meet. N. Y. State Hort. Soc.: 4-17. Rochester.

Cutworms (*A. ypsilon* and *Euxoa messoria*) destroyed lettuce on muck. A poison bait formula is given.

Hewitt, C. G. 1914. Report of the Division of Entomology for the year ending March 31, 1914. Dominion of Can., Dep. Agr., Dominion Exp. Farms: 851-876. Ottawa.

Agrotis ypsilon was recorded as a pest of potatoes in New Brunswick.

Hewitt, C. G. 1920. Report of the dominion entomologist and consulting zoologist for the two years ending 31st March 1919. Can. Dep. Agr.: 1-23.

Agrotis ypsilon was recorded as a pest of turnips.

High, M. M. 1933. A new strawberry pest. J. Econ. Entomol. 26 (4): 911-912.

Agrotis ypsilon was suspected of damaging strawberry plants. However, the pest was determined to be a tenebrionid beetle, *Crypticus obsoletus* (Say).

Hinks, C. F. 1967. Relationship between serotonin and the circadian rhythm in some nocturnal moths. Nature. 214(5086): 386-387. London.

The author suggests that light activation in the circadian rhythm is mediated directly through the nervous system and dark activation is mediated or enhanced by the secretion of serotonin from the brain. *Agrotis ypsilon* was used in these experiments.

Hinks, C. F. 1970. The neuroendocrine organs in adult noctuidae. Can. J. Zool. 48(4): 831-835.

This is a detailed study of the innervation of the neuroendocrine organs in eight species of Noctuidae. The possible significance of these nerves is discussed in context of known endocrine functions. *Agrotis ypsilon* was one of the species used in this study.

Hofmaster, R. N., R. L. Waterfield and J. C. Boyd. 1967. Insecticides applied to the soil for control of eight species of insects on Irish potatoes in Virginia. J. Econ. Entomol. 60 (5): 1311-1318.

None of the soil systemics gave satisfactory reduction of *Agrotis ipsilon* damage to the tubers when used at practical rates. Likewise, dieldrin, chlordane, and diazinon, with only 65% reduction in damage, could not be considered satisfactory. Foliage treatments with DDT, azinphosmethyl, or carbaryl gave best results when timed to coincide with peak moth flights.

Holland, W. J. 1968. The moth book. Dover Publications, Inc., N. Y. 479 pp.

The Ypsilon dart (*Agrotis ypsilon*) is common in Canada, the U.S., and Europe. The author considers it a waste of time to take specimens of *Agrotis ypsilon* when sugaring for moths. (149, 182)

Hope, G. D. 1914. The cultivation of tea in Trans-Caucasian Russia. Quart. J. Sci. Dep. Indian Tea Assoc., Calcutta, part 3: 77-92.

Agrotis ypsilon larvae damaged the stems of young tea plants in Trans-Caucasian Russia.

Howard, L. O. 1899. The principal insects affecting the tobacco plant. U.S. Dep. Agr. Yearbook for 1898: 120-150.

Agrotis ypsilon was considered a pest of tobacco. Paris green was suggested for use either in a poison bait or sprayed on vegetation which cutworms feed on. (140-142)

Howard, L. O. 1930. A history of applied entomology. The Smithsonian Institution, Washington, D. C. 464 pp.

"Worms" mentioned on ancient papyri from Egypt were speculated to be *Agrotis ypsilon*. (367)

Hutson, J. C. 1919. Progress report of the entomologist for quarter, July-Sept., 1919. Trop. Agr. 53 (5): 341. Peradeniya, Ceylon.

Agrotis ypsilon was recorded as a miscellaneous pest.

Ignoffo, C. M. and O. P. Boening. 1970. Compartmented disposable plastic trays for rearing insects. J. Econ. Entomol. 63 (5): 1696-1697.

Agrotis ypsilon has been reared from neonates to pupation using the described rearing tray.

Ingram, J. W., H. A. Jaynes and R. N. Lobdell. 1939. Sugarcane pests in Florida. Proc. Int. Soc. Sugar Cane Technol. 6: 89-98. Baton Rouge, La.

Agrotis ypsilon attacked sugarcane in Florida. Parasites reared from cutworms included *Microdus texanus* Cress., *Enicospilus purgatus* Say, *Eucelatoria comosa* Wulp, and *Paniscus ocellatus* Vier.

Ingram, J. W., et. al. 1951. Pests of sugarcane and their control. U.S.Dep. Agr. Circ. 878: 36

The black cutworm, granulate cutworm, fall armyworm, and other species of cutworms have all attacked sugarcane at one time or another. Controls discussed under fall armyworm also apply to related species.

Ionescu, M., *et al.* 1962. Contributie la studiul combaterii speciilor de buha semanaturilor *(Agrotis)* daunatoare culturilos de proumb. (Contributions to the study of cutworms *(Agrotis)* injurious to corn crops.) Ann. Inst. Cent. Cerc. Agr. 29 (B) (1961): 445-451. Bucharest.

The bionomics of *Agrotis ipsilon* and other cutworms was studied at Bucharest, Romania. BHC dust or aldrin incorporated into the soil gave best control.

Ionescu, M., E. Romascu, A. Coicev and V. Lemeni. 1967. Contributii la studiul biologiei si combaterii speciei *Agrotis ipsilon* Rott. (Agrotinae). (Contributions to the study of the bionomics and control of *A. ipsilon.*) Ann. Inst. Cerc. Prot. Pl. 4: 227-240. (Sum. in Russian and English)

Damp, easily flooded, and fertile soils provide best conditions for development of black cutworm larvae. The highest survival rates of overwintering larvae occurred in the absence of frost and excessive humidity during March and April. Field and laboratory life history studies were conducted. Aldrin, heptachlor, Duplitox 5+3, and Thiodan gave best control.

Isaac, P. V. 1933. Report of the imperial entomologist. Sci. Rep. Imp. Inst. Agr. Res. Pusa 1931-32: 141-145. Delhi, India.

Agrotis ypsilon attacked potato tubers in 1931-32.

Isaac, P. V. 1936. Report of the imperial entomologist. Sci. Rep. Inst. Agr. Res. Pusa 1933-34: 168-174. Delhi, India.

Agrotis ypsilon damaged tobacco, crucifers, peas, and linseed. Hand picking, trenching, poison baits, and flooding were used to control larvae. Light spraying with napthalene emulsion restricted oviposition.

Jack, R. W. (Probably 1913). Insect pests of tobacco in Southern Rhodesia. Dep. Agr. Rhodesia, Bull. 140. (N. D.): 1-18. Salisbury.

Agrotis ypsilon was recorded as a tobacco pest. Larvae were capable of fasting for several consecutive weeks and the duration of the larval stage was thus very variable.

Jack, R. W. 1918. Cutworms. Rhodesia Agr. J. 15(3-4): 225-237; 344-345. June-August. Salisbury.

Agrotis ypsilon sometimes occurs in overwhelming numbers, but is sporadic in its outbreaks. A discussion of life cycle and cutworm problems in general is given.

Jarvis, H. and J. H. Smith. 1946. Lucerne pests. Queensland Agr. J. 62(2): 79-89. Brisbane.

Notes are given on the bionomics and control of the chief pests of alfalfa (lucerne) in Queensland, including *Agrotis ypsilon*.

Jewett, H. H. 1955. Controlling tobacco insects. Ky. Agr. Ext. Serv., Circ. 525: 20-22.

Agrotis ypsilon lives overwinter in the pupal stage. During the year probably four broods of larvae develop. This is one of the most destructive cutworms. Control in beds and fields is discussed.

Johansen, C. 1973. How to recognize cutworms, armyworms and loopers. Pacific N. W. Coop. Ext. Pub. 130: 1-31.

This article includes distinguishing features, timing, main crops attacked, and illustrations of 13 species of cutworms, including *Agrotis ypsilon*. (22-23)

Johnson, C. G. 1969. Migration and dispersal of insects by flight. Methuen & Co. Ltd., London. 763 pp.

Contains references to migration of *Agrotis ypsilon*. It passes its diapause on the plains and breeds in the hills in parts of India. (32) It probably migrates 200 miles towards the Himalayas from the Ganges Valley. (451) In the spring of 1962 *A. ypsilon* invaded Israel in unusually large numbers. (526)

Johnson, J. H. 1953. Evidence of hearing in *Agrotis ypsilon* Rott. (Lep. Caradrinidae.) Entomologist 86 (3): 83-84.

A high pitched squeak repeatedly made by scraping glass or even by pursing the lips caused a male moth to jump and move its antennae sharply back.

Johnson, W. G. 1898. The black peach aphis - cutworms in young tobacco - law providing for the suppression and control of insect pests and plant diseases in Maryland. Md. Agr. Exp. Sta. Bull. 55: 137-149.

Adult *Agrotis ypsilon* began emerging in breeding cages July 19, 1897. The larvae were abundant in tobacco fields in the latter part of May and early June. Paris green bait was suggested for control. (141-144)

Jones, T. H. 1918. Miscellaneous truck-crop insects in Louisiana. U. S. Dep. Agr. Bull. 703: 1-19.

Agrotis ypsilon attacked the globe artichoke during the cooler months of the year when only smaller developing leaves were present on the plants. (5)

Kamal, M. 1951. The biological control of the cotton leaf-worm (*Prodenia litura* F.) in Egypt. Bull. Soc. Fouad Ier. Entomol. 35: 221-270. Cairo.

Eggs of *Agrotis ypsilon* can be used as hosts for the scelionid egg parasite, *Telenomus nawaii*.

Kambe, T. 1934. List of insect pests of cotton in Chosen and other countries. Ann. Agr. Exp. Sta. Chosen 7 (4): 359-404. Suigen, Korea. (In Japanese)

Very brief notes are given on the feeding habits and seasonal occurrence of 45 insects which attack cotton in Korea, including *Agrotis ypsilon*.

Kamel, A. A. M. and A. Shoeb. 1958. The chemical control of the greasy cutworm. Agr. Res. Rev. (Engl. Ed.) 36 (1): 24-39. Cairo, Egypt.

Four series of tests were conducted to assess the value of various insecticides in baits, sprays, and seed dressings as substitutes for Paris green in the control of *Agrotis ypsilon*.

Kapur, A. P. 1955. On moths of the greasy cutworm - *Agrotis ypsilon* Rott. - found dead in numbers on snow over Rhotang Pass, N. W. Himalayas. Indian J. Entomol. 17: 289-294.

Moths believed to have migrated from the plains in India were collected at altitudes of 13,000 to 15,000 feet.

Kelsheimer, E. G. 1944. A test of some poisons and their carriers on two destructive cutworms. Proc. Annu. Meet. Fla. State Hort. Soc. 57: 211-215.

A description of *Agrotis ypsilon* and its habits is given. Poison bait tests were carried out using *Feltia subterranea*.

Kelsheimer, E. G. 1944. Biology and control of cutworms and armyworms in Florida. Fla. Agr. Exp. Sta. Annu. Rep. 1944: 108.

Agrotis ypsilon was destructive to bean, corn and tomato at the Vegetable Crops Laboratory farm. *A. ypsilon* was more prevalent in moist ground. During a mild winter the larvae were found from early fall to late spring. A 1:10 cryolite-rice-bran-molasses bait was found to be the most practical means of control. (108)

Kent, G. H. 1889. Some notes from Mississippi. Injurious insects in Mississippi for 1888. U. S. Dep. Agr., Div. Entomol., Insect Life 1:17, 216-217.

Agrotis ypsilon destroyed cabbage plants as fast as they were transplanted in Mississippi. It was considered one of the most injurious insects to field and garden crops in 1887. It also damaged cotton in 1888. (17, 217)

Kent, G. H. 1891. Notes from Mississippi. U. S. Dep. Agr., Div. Entomol., Insect Life 3 (7): 337-338.

Agrotis ypsilon was more numerous than last season, being very destructive in all gardens during April and May to young cabbage and tomato plants. (337)

King, C. B. R. 1935. Report of the entomologist for the year 1934. Tea Res. Inst. Ceylon Bull. 12: 26-31. Kandy (1935); also in Rep. Board Tea Res. Inst. Ceylon 1934: 26-31. (Ceylon Sess. Paper 19 - 1935). Colombo.

Agrotis ypsilon was a pest of tea in Ceylon. Paris green bait was suggested for control.

King, H. H. 1929. A note on the use of dried poison bait against locusts in the Sudan. Bull. Entomol. Res. 20 (1): 99-101. London.

The use of sun-dried poison bran was not restricted to the destruction of locusts. It has also been employed with success against cutworms (larvae of *Agrotis ipsilon*).

King, K. M. and N. J. Atkinson. 1927. Quantitative methods of collecting and rearing soil cutworms. J. Econ. Entomol. 20: 821-830.

This paper describes the methods of collecting and rearing soil-infesting cutworms which several years' experience has shown to be the most suitable and efficient for securing accurate estimates of the relative abundance of the cutworm species involved. The abundance and effectiveness of their various insect parasites and diseases is also discussed (nothing specific on *Agrotis ypsilon*).

Kiyoku, M. and R. Tsukuda. 1968. Experiments concerning the utilization of the bean basic semisynthetic media for rearing two species of cutworm, *Agrotis ipsilon* Hufnagel, and *A. fucosa* Butler (Lepidoptera, Noctuidae). Sci. Rep. Fac. Agr. Okayama Univ. 31: 1-10.

Differences in rate of development of cutworm larvae on different synthetic diets were compared.

Knott, J. E. and A. A. Tavernetti. 1944. Production of head lettuce in California. Cal. Agr. Ext. Serv. Circ. 128: 3-51.

A. ypsilon was a serious pest of lettuce in California. Paris green bait was suggested for control. (36)

Knowlton, G. F. 1958. Some Utah insects-1958. Part II. Utah State Univ. Ext. Serv., Mim. Ser. 171-A: 9-13.

"*Agrotis ypsilon* (Rott.) Delta, September 16, 1957 (Davis, Haws & Bunker); Spanish Fork, August 3, September 7, 1957; Logan, September 8, 1957; and at Delta, May 26, 1958. The larvae of this species were severely damaging celery at Tremonton, October 2, 1958 (K. & R. Finch); Descret-Delta area, July 8 (R. C. Bunker); in light trap at Delta, August 4."

Knutson, H. 1944. Minnesota Phalaenidae (Noctuidae). The seasonal history and economic importance of the more common and destructive species. Minn. Agr. Exp. Sta., Tech. Bull. 165: 1-128.

The seasonal history and economic importance of *Agrotis ypsilon* (Rott.) are discussed. It was reported as one of the most destructive cutworms in the state and cited especially for the damage to strawberry beds. Life history data indicate overwintering in the pupal stage. (22-24)

Koch, M. 1966. Research on migrating butterflies in Hungary and Rumania. Entomol. Ber. 59-60.

Agrotis ypsilon was trapped at 35 light stations in Hungary.

Koizumi, K. and M. Kiyoku. 1959. Studies on the biology and control of cutworms. I. Cutworm faunal compositions in the tobacco field at the planting season in Okayama Prefecture. Sci. Rep. Fac. Agr. Okayama Univ. 14: 7-18. (In Japanese)

A survey of tobacco fields in Okayama Prefecturk, Japan, showed the presence of three species of cutworms, *Agrotis segetum, A. tokionis,* and *A. ypsilon,* which occurred in the proportions 71: 19.9: 9.1. Local distribution is discussed.

Krishtal', O. P. and O. I. Petrukha. 1930. Pests of field crops in 1929. Kiev Reg. Agr. Exp. Sta., Dep. Entomol. No. 62: 1-52. Kiev, U.S.S.R. (In Ukrainian)

Adults of *Agrotis ypsilon* were caught with molasses baits.

Kruger, G. 1934. Frammenti di entomologia cirenaica. (Fragments of Cyrenaican Entomology.) Agr. Colon. 28 (9): 460-463. Florence, Italy.

Experiments were conducted with baits suitable for the very dry climate in Cyrenaica, Libya. Baits proved effective in almost completely eradicating the larvae of *Agrotis ypsilon.*

Kulash, W. M. 1947. Soil treatment for wireworms and cutworms. J. Econ. Entomol. 40(6): 851-854.

Cutworms, *Agrotis ypsilon,* and wireworms have been observed as serious pests of row crops in the Wilmington, N. C., area. A DDT-sand mixture, containing 5% DDT and used at the rate of 500 lb. per acre, applied in a narrow strip on either side of seedling corn, afforded some protection from the smaller stages of the cutworms. Neither the older forms of this cutworm, *Agrotis ypsilon,* nor the wireworms were controlled by this treatment. Results of a preliminary test with liquid and dust forms of DDT and benzene hexachloride seemed to indicate that the dust forms of these compounds were safer to use than were the wettable forms. Retardation of seed germination occurred when heavy applications of DDT and benzene hexachloride were made in the form of a dust or a liquid suspension.

Kulash, W. M. 1949. Soil insecticides for control of cutworms. J. Econ. Entomol. 42 (4): 705-707.

Dust formulations of chlordane, benzene hexachloride, DDT, and a combination dust of DDT and benzene hexachloride were used in two fields 160 miles apart in North Carolina. Dust applications were made by a power duster to the soil surface. One part of the field was treated in January, 9 weeks ahead of corn planting, and the other part of the field was treated in March, 2 weeks before corn planting. On both fields black cutworm damage was more severe in the earlier treated part of the field.

Kulash, W. M. 1958. Soil insect pests of corn and their control in North Carolina. Proc. Int. Congr. Entomol. 10 (3): 313-316.

In cool, wet springs *Agrotis ypsilon* may be a serious pest of corn. Damage seems to be more severe in soils which are "cloddy" from cultivating the ground when it is too wet. Aldrin and heptachlor appeared to give the best control.

Kuwayama, S., K. Sakurai, and K. Endo. 1960. Soil insects in Hokkaido, Japan, with special reference to the effects of some chlorinated hydrocarbons. J. Econ. Entomol. 53 (6): 1015-1018.

In Hokkaido, Japan, many species of cutworms are pests of sugar beets, flax, legumes, onion, cabbage, and other crops. *Agrotis ipsilon* is common and devours crops ravenously on occasions. Farmer recommendations were the application of poison baits, trapping moths by molasses, and regulation of transplanting time of some crops. Chlorinated hydrocarbons also controlled cutworms. Mixing heptachlor or aldrin dust with the soil in furrows just before sowing or in holes just before transplanting prevented attacks.

Kuwayama, S. and K. Oshima. 1964. Ecological studies on *Calosoma chinense*, a predacious carabid against army- and cutworms, and some related species. Rep. Hokkaido Nat. Agr. Exp. Sta., 66: 1-46. Sappora, Japan. (In Japanese)

This report gives the life cycle and habits of *Calosoma chinense*. The larvae feed on several cutworm larvae, including *Agrotis ipsilon*. Control measures for cutworms (except trenching and poison bait) are harmful to beetle larvae.

Lacroix, D. S. 1935. Insect pests of growing tobacco in Connecticut. Conn. Agr. Exp. Sta. Bull. 379: 88-130.

Appearance, habits, distribution, and food plants other than tobacco are given for *A. ypsilon*. (95).

Lang, W. H. 1944. Insects affecting guayule with special reference to those associated with nursery plantings in California. J. Econ. Entomol. 37: 396.

"The greasy cutworm, *Agrotis ipsilon* Rott., caused some damage to seedlings in the Alisal nursery in July."

Langston, J. M. 1928. Cutworm investigations following the overflow. Quart. Bull. Miss. Plant Board, 8 (1): 7-8. A & M College, Miss.

Agrotis ypsilon was the most abundant cutworm species in Mississippi in the flooded areas, causing severe damage to cotton, corn, and soybeans.

Leefmans, S. 1930. Ziekten en plagen der cultuurgewassen in Nederlandsch Oost-Indië in 1929. (Diseases and pests of cultivated plants in the Netherland Indies in 1929.) Meded. Inst. Pl Ziek, 79: 1-100. Buitenzorg.

Agrotis ypsilon did considerable damage to corn in the Dutch Indies. Parasites were imported and released as a control measure.

Lever, R. J. A. W. 1938. Entomological Notes. Agr. J. Fiji 9 (3): 19-24. Suva, Fiji Islands.

In August, some slight damage to tobacco was caused by *Agrotis ypsilon*, which had not previously been recorded from Fiji.

Lever, R. J. A. W. 1940. Insect pests of citrus, pineapple and tobacco. Agr. J. Fiji 11 (4): 99-101. Suva, Fiji Islands.

Agrotis ypsilon was a pest of tobacco in Fiji but was controlled by means of a poison bran bait.

Lever, R. J. A. W. 1943. Division of Entomology. Annu. Rep. for 1942. Agr. J. Fiji 14 (3): 83-85. Suva, Fiji Islands.

Agrotis ypsilon was recorded as a pest on turnips during 1942 in Fiji.

Lever, R. J. A. W. 1945. Annual report of entomologist for 1944. Agr. J. Fiji 16 (3): 87-88. Suva, Fiji Islands.

Agrotis ypsilon was considered a minor pest on potato in Fiji.

Levin, V. M. 1936. Comparative cold-resistance of preimaginal stages of *Agrotis ypsilon* and *Agrotis exclamationis*. Sum. Sci. Res. Work Inst. Plant Prot. 1935: 53-54. Leningrad.

This is a study of the effects of low temperatures on eggs and larvae of *Agrotis ypsilon*.

Li, Feng-Swen and Tsing-chao Ma. 1934. A synopsis of cotton insects in China. Yearbook Bur. Entomol. Hangchow 3: 185-187. Hangchow, China. (In Chinese)

A preliminary list of 116 pests of cotton in Hangchow, China is given. *Agrotis ypsilon* was considered an important pest.

Li, Feng-Swen. 1934. Preliminary notes of the life history of the cotton cutworms, *Agrotis* spp. Entomol. and Phytopath. 2 (31): 608-610. Hangchow, China. (In Chinese)

This article describes an unidentified species of *Agrotis* and *A. ypsilon* in Hangchow, China. *A. ypsilon* has three generations a year and caused severe injury to young cotton plants in May. One female lays about 800 eggs.

Liang, Tung-ting and Hsien-hsiu Liu. 1959. Laboratory tests of the toxicity of chemicals for cutworm (*Agrotis ypsilon* Rott.) larvae. Agr. Res. 8 (2): 43-47. Taipei, Formosa.

Laboratory tests were conducted to assess the toxicity of DDT, lindane, heptachlor, dieldrin, aldrin, and endrin to fifth-instar larvae of *Agrotis ypsilon*.

Light, S. S. 1927. Report of the entomologist for 1926. J. Tea Res. Inst. Ceylon, Bull. 1: 16-20. Kandy, Ceylon.

Preliminary trials were made with baits for *Agrotis ypsilon* in Ceylon. Cabbage and sweet potato leaves spread over the tea beds between plants may be used as traps and should be examined early each morning for cutworms hiding there.

Light, S. S. 1928. Pests of tea nurseries. Tea Quarterly, J. Tea Res. Inst. Ceylon. 1 (1): 19-22. Nuware Eliya.

This paper describes damage to tea plants in Ceylon by *Agrotis ypsilon* and gives recommendations for control such as poison bait.

Light, S. S. 1928. Report of the entomologist (for 1927). Tea Res. Inst. Ceylon Bull. 2: 25-34. Kandy.

Agrotis ypsilon was recorded as a pest of tea in Ceylon.

Lilly, J. H. 1950. Control of cutworms in Iowa. Proc. 5th Annu. Meet. North Cent. Br.; Amer. Assoc. Econ. Entomol. 5: 21.

The predominant species in Iowa in 1949 were the black cutworm and the glassy cutworm. Toxaphene appeared to be the outstanding material tested. Two pounds of toxaphene per acre was recommended for cutworm control on corn in Iowa in 1950.

Lingren, P. D., R. J. Guerra, J. W. Nickelsen, and C. White. 1970. Hosts and host-age preference of *Campoletis perdistinctus* (Viereck). J. Econ. Entomol. 63 (2): 518-522.

Agrotis ypsilon was parasitized by *C. perdistinctus* (Hymenoptera: Ichneumonidae).

Lintner, J. A. 1893. A new onion pest, *Agrotis ypsilon* (Rott.). 8th Rep. of the N. Y. State Entomol. (From the 45th Rep. N. Y. State Museum): 188-191. Albany.

The habits and life history of *Agrotis ypsilon* are discussed. A soap and kerosene emulsion was suggested for control. This was the first record of *A. ypsilon* as an onion pest near Canastota, N. Y.

Liu, Kuo-si. 1935. Notes on the life-history of *Agrotis ypsilon* Rott. in Hangchow (Lep: Noctuidae). Yearbook Bur. Entomol. Hangchow 4: 121-125. Hangchow. (In Chinese)

Agrotis ypsilon attacked many economic plants in central China and the provinces along the southeastern coast. It was especially injurious to cotton seedlings. Hibernation takes place in the larval or pupal stage.

Lobdell, R. N. 1933. Insect pests and their control. Univ. Fla. Agr. Exp. Sta. 1933. Annu. Rep.: 169-171.

There was a considerable flight of black cutworm moths (*Agrotis ypsilon*) during the third week in March. In one field where no bait was used, 96 cutworms of all ages were collected within a 1-foot radius of a destroyed tomato plant.

Lockwood, S. and E. T. Gammon. 1949. Incidence of insect pests. Cal. Dep. Agr. Bull. 38 (4): 190-203.

The greasy cutworm was responsible for serious losses to grapes and vegetable crops in Riverside County, California. (196)

Lofty, M. S. 1959. Treatment of soil before sowing with soil insecticides and its effect on infestation of plants with larvae of *Agrotis ypsilon* Rott. Agr. Res. Rev. 37 (3): 306-314.

Treating the soil before sowing with 20% dieldrin at the rate of 7.5 liters in 120 liters of water per feddan gave satisfactory protection of cotton seedlings against *Agrotis ypsilon*. Similar treatment with dieldrin 20%, DDT 25%, or toxaphene 60% gave good protection of lentils against the same pest in Egypt.

Loutfy, M. S., F. A. Khalil, and A. H. El-Hemaesy. 1970. Effect of certain soil insecticides on the cutworm *Agrotis ipsilon* in cotton. Agr. Res. Rev. 48 (1): 12-21. Cairo.

Seed dressings with 50% Frumin, Thimet, or 50% Di-Syston at a dose of 1 kg/20 kg seed were effective against the cutworm *Agrotis ipsilon*. Soil treatment of cotton fields with granular 5% Solvirex applied shortly after planting had little effect. Moderate results were shown by soil treatments with granular 10% Thimet, or 10% heptachlor and 2% endrin sprays. Very good results were obtained by combining seed treatment with Di-Syston and spraying with endrin.

Loutfy, M. S., A. H. El-Hemaesy, and S. A. El-Monsef. 1972. A list of insects caught by a light trap at El-Quseir (Red Sea Governorate). Agr. Res. Rev. 50 (1): 31. Cairo.

A list of insects caught in light traps during a study on migration of *Agrotis ipsilon* in Egypt is presented.

Loutfy, M. S., A. H. El-Hemaesy, S. A. El-Monsef, H. I. Youssef and S. M. Tantawy. 1972. Studies on the effect of certain insecticides on the greasy cutworm *Agrotis ipsilon* Hfn. Agr. Res. Rev. 50 (1): 25-30. Cairo.

Mass rearing of *Agrotis ipsilon* is described. Veldrin, EF 2910, FD 5228, endrin/Bidrin, and endrin gave the best control on cotton.

Lugger, O. 1899. Butterfiles and moths injurious to our fruit-producing plants. Minn. Agr. Exp. Sta. Bull. 61: 55-320.

Agrotis ypsilon attacked all sorts of garden products and other low growing plants; it was frequently quite destructive to strawberry beds. Descriptions are given of larva and adult. (213-214)

Lyle, C. 1927. Cutworms not affected by seed treatments. Quart. Bull. Miss. Plant Board. 7 (2): 1-2. A. & M. College, Miss.

Experiments were conducted to determine whether treating corn with turpentine or kerosene before sowing had any effect on attack by cutworms. Both materials proved valueless in preventing damage by *Agrotis ypsilon, Spodoptera frugiperda,* and *Prodenia ornithogalli.*

Lyle, C. 1927. Cutworm bait poisons. Quart. Bull. Miss. Plant Board 7 (2): 3-4. A. & M. College, Miss.

Experiments to test the relative value of sodium fluosilicate and Paris green showed Paris green was, in every case, more toxic to cutworms (*Agrotis ypsilon).*

Lyle, C. 1928. Poisons for cutworm baits. J. Econ. Entomol. 21 (5): 748-750.

A comparison of Paris green with sodium fluosilicate in poison baits against the greasy cutworm, *Agrotis ypsilon,* and the southern armyworm, *Spodoptera frugiperda,* indicated that Paris green was more rapid in its action and considerably more toxic, and that *A. ypsilon* was more easily killed than *S. frugiperda.* The tests were made in individual salve boxes with about 300 cutworms.

Lyle, C. 1929. Further tests of cutworm bait poisons. J. Econ. Entomol. 22 (5): 797-798.

Using about 300 cutworms of five species, including *Agrotis ypsilon,* in individual boxes containing the same food on which the cutworms were feeding when collected, it was found that a poisoned bait made of 1 lb. of Paris green and 50 lb. wheat bran gave an average kill of 95% in 24 hrs., in comparison with 53.6% kill with sodium fluosilicate bait of the same proportions. When the sodium fluosilicate was completely dissolved in water before adding to the bran, the mortality was 44.8% in 24 hrs.

Lyle, C. 1929. Paris green for cutworm bait. Quart. Bull. Miss. Plant Board, 8 (4): 23-24. A. & M. College, Miss.

A poison bait consisting of 1 lb. of Paris green plus 50 lb. bran produced an average mortality of 96%. This formulation, moistened with water, was recommended to control *Agrotis ipsilon.* Control recommendations included the application of 10 lb. per acre 1-2 days before plants are set in field.

Lyle, G. T. 1921. On three new species of Indian Braconidae. Bull. Entomol. Res., London 12 (2): 129-132.

Microplitis similis was a parasite of *Agrotis ypsilon*.

MacKenna, J. 1916. Report on the progress of agriculture in India for 1915-16: 50-56. Calcutta.

Agrotis ypsilon was controlled by Andrés Mairés traps on rabi crops.

Malicky, H. 1967. Causes and extent of migration of butterflies. Umschau Wiss Tech. 67 (15): 501.

Approximately 1 million lepidopterous insects were estimated to migrate in one summer night through the High Tavern (Austria), of which 0.4% were *Agrotis ypsilon*.

Mangat, B. S. 1970. Rearing the black cutworm in the laboratory. J. Econ. Entomol. 63 (4): 1325-1326.

Techniques used to rear the black cutworm for three consecutive generations on a laboratory-prepared artificial diet with no outside stock are described.

Mangat, B. S. 1971. Development of the black cutworm. J. Econ. Entomol. 64 (3): 766.

The effect of temperature on the rate of development of *Agrotis ipsilon* is discussed; 67.5 ± 4.8 days at 20° C, 41.2 ± 2.0 days at 26° C, and 32.5 ± 1.9 days at 30° C.

Mansour, M. H. and N. Z. Dimetry. 1972. Effect of crowding on larvae and pupae of the greasy cutworm *Agrotis ipsilon* Hfn. Z. Angew. Entomol. 72 (2): 220-223. (German summary)

The effect of crowding on weights of larvae and pupae was found to be significant. Crowding caused longer larval and pupal periods, increased larval mortality, and lowered fecundity.

Martin, S. and F. B. Cotner. 1934. Serological studies of moth proteins with special reference to their phylogenetic significance. Ann. Entomol. Soc. Amer. 27: 372-383.

Serological studies (precipitin reaction) were made of 14 genera and 20 species of moths, including *Agrotis ipsilon*, placed in six subfamilies of the family Noctuidae (Phalaenidae). It was evident from the reactions of certain proteins from the species that the precipitin reaction was useful in determining phylogenetic relationships between genera and subfamilies of the family Noctuidae.

Mathur, A. C. 1962. *Agrotis ypsilon* (Rott.) (Noctuidae, Lep.) as a pest of *Atropa belladonna* Linn. Indian J. Entomol. 24 (1): 67-68. New Delhi.

Larvae of *Agrotis ypsilon* caused considerable damage in experimental plots during the spring months. At night they became active, cut the plant at the surface of the ground, and devoured the foliage.

Maxwell-Lefroy, H. and C. C. Ghosh. 1907. The Indian surface caterpillars of the genus *Agrotis*. Mem. Dep. Agr. India Entomol. Ser. 1: 253-274.

A very complete life history of *Agrotis ypsilon* is given. (259-274)

McDaniel, E. 1931. Insect and allied pests of plants grown under glass. Mich. Agr. Exp. Sta., Spec. Bull. 214: 3-117.

Brief descriptions are given of various cutworms, including *Agrotis ypsilon*. Because of its subterranean habits, this species is difficult to control with poison baits. (79)

McSwiney, J. 1920. Report of the Agricultural Department Assam, for the year ending 31 March 1920: 6-7. Shillong.

Hand picking was practiced to reduce the numbers of *Agrotis ypsilon* attacking tobacco in India.

McSwiney, J. 1921. Report of the Agricultural Department Assam, for the year ending 31 March 1921: 7-8. Shillong.

Agrotis ypsilon was recorded as a pest of potatoes and tobacco in India.

Meisner, J. 1964. Laboratory trials of insecticides against larvae of Noctuidae. I. *Cirphis unipuncta* (Sauzia) Haw. and *Peridroma margaritosa* Haw. II. *Agrotis ypsilon* Rott. Nat. & Univ. Inst. Agr., Spec. Bull. 63: 1-22. Rehovot.

Of the organophosphates assayed, only diazinon, Cidial, and Rogor were effective against *Agrotis ypsilon*. Chlorinated hydrocarbons were effective only against larvae 13 and 23 mm.in length. Of the combinations tested, only diazinon-Rogor was toxic at all concentrations against larvae 30-32 mm.in length.

Mendoza, C. E. and D. C. Peters. 1962. Inbreeding of black cutworms, *Agrotis ipsilon* (Hufn.) Entomol. Soc. Amer., North Cent. Br. Proc. 17: 123-124.

Variability and homogenity due to inbreeding in a laboratory culture of *Agrotis ipsilon* was demonstrated.

Menezes Mariconi, F. A. 1954. As lagartas rosca. Pragas des plantas horticolas. (Cutworms: Pests of Vegetables.) Biologico 20 (3): 41-46. São Paulo.

There was serious injury in 1953 to cabbage, cauliflower, tomato, and potato by *Agrotis ypsilon* in São Paulo, Brazil. Bionomics and control of cutworms in general are reviewed from the literature.

Menon, M. G. R., N. S. Bhattacharjee, and S. L. Gupta. 1967. Cutworms associated with the wheat crop at Delhi. Indian J. Entomol. 29: 307.

The authors collected and reared cutworms attacking the wheat crop at Delhi, India. Of the total of 113 cutworms collected, five were later identified as *Agrotis ypsilon*. The black cutworm has also been recorded as pest of corn, jowar, sugarcane, rice, gram, tobacco, cotton, coffee, and many other plants.

Menozzi, C. 1934. Andamento delle infestioni entomatiche rilevate durante la campagna saccarifera 1934. (The course of insect infestations observed during the sugar-beet season in Italy in 1934.) Ind. Saccar. Ital. 27 (12): 1-10. Genoa.

A small infestation of *Agrotis ypsilon* was checked by a lead arsenate spray. (No location was given.)

Merkl, M. E. and T. R. Pfrimmer. 1956. Light trap investigations at Stoneville, Miss., and Tallulah, La., during 1954. J. Econ. Entomol. 48 (6): 740-741.

This paper presents records of light trap catches using black-light and mercury-vapor light traps. *Agrotis ypsilon* was caught at Tallulah, La., June 1 to October 1, 1954.

Meszaros, Z., and B. Nagy. 1968. Outbreak of the black cutworm (*Scotia ipsilon* Hufn.) in Hungary and comments on migration of adults: preliminary report. Acta Phytopathol. 3 (2): 261-265.

A serious outbreak of *Agrotis (Scotia) ipsilon* in Hungary in 1965 may have resulted from availability of suitable oviposition sites at a time when migrations were in progress. Corn, cabbage, beans, and cucumbers were attacked. Poison bait (bran and lindane) was used for control.

Metcalf, C. L., W. P. Flint, and R. L. Metcalf. 1962. Destructive and useful insects. Their habits and control. McGraw-Hill Book Co., N. Y. 1087 pp.

Agrotis ypsilon lays its eggs singly or a few together on the leaves or stems of plants, often in low or overflowed land. The winter is spent in the larval or pupal stage. Control measures are given for cutworms in general. (476, 477, 594)

Middleton, M. S. 1913. Cutworms and their control. Proc. Entomol. Soc. British Columbia. 3, N. S.: 36-37. Victoria, B. C.

This describes control methods for *Agrotis ypsilon* and other cutworms, including poison bait, tanglefoot, banding with cotton batten, chickens, cultivation, and destruction of cover crops.

Miller, D. 1922. Insect notes: 1921-22 season. New Zealand J. Agr. 24 (5): 294-296. Wellington.

Agrotis ypsilon was recorded as a pest of rape and root crops in New Zealand.

Miller, D. 1924. The "turnip-fly" and its associates. New Zealand J. Agr. 28 (4): 239-247. Wellington.

Agrotis ypsilon was a pest of seedling turnips, especially in the vicinity of hedgerows and coarse grass. Autumn cultivation destroys the pupae. It was parasitized by a tachinid and eaten by birds.

Miller, N. C. E. 1933. Insect pests of tobacco in Malaya. Malayan Agr. J. 21 (2): 66-72. Kuala Lumpur.

Brief notes are given on the bionomics of several lepidopterous pests of tobacco in Malaya, including *Agrotis ypsilon*.

Milliron, H. E. 1958. Economic insect and allied pests of Delaware. Del. Agr. Exp. Sta. Bull. 321: 1-87.

Distribution, seasonal occurrence, destructive stage, and hosts are given for pests, including *Agrotis ypsilon*. It was noted as a pest of corn, cabbage, peas, peppers, potatoes, and tomatoes. It was troublesome when temperatures were below average and precipitation was plentiful and evenly distributed. (22, 28, 49, 51, 53, 60, 73, 82)

Mirzayans, H. and S. H. Hodjat. 1971. List and relative abundances of moths caught by light trap in 1970 from alfalfa field in Evin (Tehran). Plant Pests Dis. Res. Inst. Tehran CENTO Res. Proj. 2 (5): 45-51. Tehran.

Light trap records between April 4 and November 30, 1970 in Tehran, Iran, included *Agrotis ipsilon*.

Misaka, K., T. Koreishi and I. Kayashima. 1940. Observations concerning the injuries of fruit flies to fruits and vegetables in Formosa. Injuries to tomato. Res. Bull. Plant Quar. Sta. Formosa 7: 1-59. Taihoku. (In Japanese)

Agrotis ypsilon fed on the fruit of tomato in Formosa.

Moore, I. and A. Navon. 1964. An artificial medium for rearing *Prodenia litura* F. and two other noctuids. Entomophaga 9 (2): 181-185. Paris.

This artificial medium was suitable for rearing *Agrotis ypsilon*.

Morrill, A. W. 1919. The value of molasses and syrups in poisoned baits for grasshoppers and cutworms. J. Econ. Entomol. 12: 337-343.

Poor results against *Agrotis ypsilon* and other cutworms were reported when molasses was omitted from poison bait used to protect cauliflower, tomatoes, kohlrabi, and peppers. No difference was observed due to omission of molasses when used to protect cabbage, eggplants, and beans.

Mosseri, V. 1917. Coup d'oeil retrospectif sur la culture du tabac en Egypte. (A retrospective glance at tobacco cultivation in Egypt.) Union Agriculteurs d'Egypte. Bull. 119: 53-54. Cairo.

Agrotis ypsilon was a serious pest of tobacco in Egypt.

Moutia, A. 1932. Entomological Division. Annu. Rep. Dep. Agr., Mauritius 1931: 9-12. Reduit.

Agrotis ypsilon was recorded as a pest on vegetables in Mauritius.

Muma, M. H. 1946. Insects injurious to corn in Nebraska. Neb. Agr. Ext. Serv. Cir. 1537: 1-20.

A large number of cutworms, including *A. ipsilon*, injure corn in Nebraska. Corn planted in fields which were weedy the previous season or on newly turned sod-land was liable to cutworm injury because the natural food had been eliminated and the worms concentrated on the corn. (17)

Nasr, El-Sayed A. and M. A. Naguib. 1964. Behavior of full-grown larvae and adults of the cutworm, *Agrotis ypsilon* Rott., in Egypt (Lepidoptera: Noctuidae). Bull. Soc. Entomol. Egypt 47: 267-272.

This study shows a soil moisture of 10% is optimal for pupation. Peak emergence occurs at 10:00 p.m. Mating and oviposition occur between 10:00 p.m. and 6:00 a.m. Females oviposit 1-10 times.

Nasr, El-Sayed A. and M. A. Naguib. 1964. Contribution to the biology of the greasy cutworm, *Agrotis ypsilon* Rott. (Lepidoptera: Noctuidae). Bull. Soc. Entomol. Egypte 47: 197-200.

In this study the prepupal stage averaged 3.7 days and pupal stage 15.2 days for males and 14 days for females. Mating did not affect the life span of males, 6.9 days; females survived 9.3 days when mated and 6.6 days when unmated. Minimum, maximum, and average number of eggs laid per female were 143, 826, and 346.

Nasre, El-Sayed, A. and M. A. Naguib. 1965. Effect of relative humidity on rate of oviposition and longevity of the adult stage of the greasy cutworm, *Agrotis ypsilon* Rott. Bull. Soc. Entomol. Egypte 48: 177-178.

The rate of oviposition and duration of adult survival are affected by relative humidity. Most eggs were laid at 90% R.H. and adult longevity was favored. No eggs were laid at 0-30% R.H.

Nikolova, V. 1961. Data on the bionomics of *Agrotis ypsilon* Rott. (or *Feltia, Rhyacia ypsilon* Rott.) and tests for its control. Izv. Inst. Zasht. Rast. 1: 83-109. Sofia. (In Bulgarian)

The time of development was related to temperature for all life stages. Adult longevity was related to different larval foods. Results of laboratory and field insecticide tests in Bulgaria are given.

Nikolova, V. 1963. A contribution to the study of the injurious insect soil fauna in Bulgaria. Izv. Inst. Zasht. Rast. 5: 87-100. Sofia. (In Bulgarian) (Sum. in Russian and English).

Food plants, distribution, numbers, and economic importance of certain soil insects in Bulgaria, including *Agrotis ipsilon*, are given.

Nikolova, V. 1963. Studies on the noxious soil entomofauna in Bulgaria. Bull. Inst. Plant. Prot. Kh. 5: 87-100. (In Bulgarian)

The most noxious of the Noctuidae family during the period 1955-61 were *Agrotis ypsilon, A. segetum,* and *Euxoa temera.*

Nirula, K. K. 1961. Insecticidal control of *Agrotis ypsilon* Rott. Indian Potato J. 3 (1): 42-47. New Delhi, India.

Heptachlor, aldrin, DDT, toxaphene, and BHC were applied at 2 lb./acre. Heptachlor gave the best results (81-93% control), aldrin was next, varying from 60-82%. DDT gave 45 to 55% control and toxaphene and BHC gave poor results.

Nirula, K. K. and R. Kumar. 1963. Studies on the rate and mode of application of heptachlor and aldrin for the control of *Agrotis ipsilon* Rott. Indian Potato J. 5 (1): 38-45. New Delhi.

The most economical and effective dosages of heptachlor and aldrin for the control of *Agrotis ypsilon* were: heptachlor at 1.50 lb. per acre and aldrin at 2.25 lb. per acre. There was no significant difference in the method of application.

Nolte, H. W. and R. Fritzsche. 1953. Beobachtungen anlässlich des Massenauftretens der Ypsiloneule (*Rhyacia = Agrotis ypsilon* Rott.) in sommer 1952 in Mitteldeutschland. (Observations concerning the outbreak of *A. ypsilon* in the summer of 1952 in central Germany.) Anz. Schädlingsk. 26 (3): 33-35. Berlin, Germany.

Agrotis ypsilon was not normally a serious pest in Germany but caused considerable damage to various crops, including gladiolus, carrots, beet, and potato, in 1952. The injury was described and possible reasons for the outbreak were discussed. Many of the larvae were parasitized by *Amicroplus collaris* (Spin.).

Oatman, E. R. and G. R. Platner. 1972. An ecological study of lepidopterous pests affecting lettuce in coastal southern California. Environ. Entomol. 1 (2): 202-204.

Agrotis ipsilon was a pest of winter lettuce grown in the absence of pesticides in southern California.

Okumara, G. T. 1959. Illustrated key to the lepidopterous larvae attacking lawns in California. Cal. Dep. Agr. Bull. 48: 15-21.

This bulletin includes turf hosts, distribution in California and descriptions of larvae including *Agrotis ypsilon.* Hosts are common lawn grasses, dichondra, and white clover.

Okuni, T. 1940. Keshi no Gaichu Yoho. (Insects injurious to the poppy in Formosa; Preliminary report). Formosa Agr. Exp. Sta. Bull. 139: 1-30.

Agrotis ypsilon was recorded as injuring the leaves of the poppy in Formosa.

Olalquiaga Fauré, G. 1953. Pests of edible legumes in Chile. FAO Plant Prot. Bull. 1 (11): 166-168. Rome, Italy.

Severe outbreaks of cutworms (*Agrotis ypsilon*) appear periodically in the pea growing areas of Chile. Two tachinid flies, *Archytas infirmus* and *Gonia pallens* help reduce the prevalence of cutworms.

Orbet, G. H. 1930. Entomological notes. First quarter, 1930. J. Malayan Agr. 28 (4): 212-214. Kuala Lumpur.

Agrotis ypsilon caused minor damage to tea seedlings. This cutworm appears to confine its attention essentially to the young seedlings and apparently causes no damage to established plants.

Osman, A. 1928. Lutte contre les ennemis du tabac. Les vers gris. Rev. Tech. Monopole des Tabacs, 1 (2): 47-55. Galata, Constantinople, Turkey.

This paper gives a general account of the cutworms infesting tobacco. Control methods include hand picking, protective discs, baits, barium chloride sprays, autumn cultivation, trenches, and destruction of adults. *Agrotis ypsilon* was among the most important species in Turkey.

Özer, M. 1964. Preliminary studies on mites and insects harmful to mint in the Samsun and Istanbul areas and to sesame and vegetables in Antalya. Ankara Univ. Zir. Fak. Yill. 14 fasc. 3-4: 205-222. (Sum. in English)

Agrotis ipsilon injured sesame at Antalya, Turkey. It also attacked tomato, pepper, eggplant, watermelon, melons, and weeds.

Özer. M. 1968. Insect pests of grain in the field in Turkey. Yearbook Fac. Agr. Univ. Ankara 7: 151-160.

Notes were made on the nature and extent of damage caused by the principal cereal pests in Turkey, including *Agrotis (Scotia) ipsilon*.

Padilla, R. C. 1952. Aldrin y dieldrin. Dos nuevos insecticidas organicos de grandes perspectivas para la proteccion de nuestra agricultura. Fitofilo 6 (7): 35-36.

This discusses the potential of two new organic insecticides, aldrin and dieldrin, for crop protection in Mexico. The recommendations for black cutworm control include the use of a 2.5% aldrin dust at the rate of 39 to 40 kilograms per hectare.

Palm, C. E. and W. D. Wylie. 1942. Biology and control of cutworms. Cornell Agr. Exp. Sta. 54th Annu. Rep.: 130.

Two to three lb. of sodium fluosilicate to 100 lb. of bran made the most effective cutworm (including *A. ypsilon*) bait, followed by sodium arsenite, white arsenic and Paris green.

Panchabhavi, K. S., V. M. Bankapur, K. S. Mutalikdesai, M. B. Malipatil, and G. Thimmaiah. 1972. Note on the estimation of loss of potato tubers caused by greasy cutworm, *Agrotis ypsilon* Rott. (Lepidoptera:Noctuidae). Indian J. Agr. Sci. 42 (5): 428-429.

A. ypsilon infested tubers were not discarded in India. Net loss was determined by weighing the infected parts cut away. Percentage infestation was 30.7, but the actual loss amounted to only 9.8%.

Pawar, V. M. and N. Ramakrisnar. 1971. Investigations on the nuclear polyhedrosis of *Prodenia litura* Fab.: I. Nature of the polyhedral disease. Indian J. Entomol. 33 (2): 111-122.

Cross infectivity tests on the larvae of *Agrotis ypsilon* proved negative.

Pepper, J. H. 1932. Observations on a unidirectional flight of army cutworm moths and their possible bearing on aestivation. Can. Entomol. 64 (11): 241-242.

There was evidence that *Agrotis ypsilon* migrates away from cultivated areas prior to summer in Egypt and India.

Pepper, J. H., G. R. Roemhild and L. N. Graham. 1954. Montana insect pests, 1953-1954. Mont. Agr. Exp. Sta. Bull. 504: 1-27.

Severe damage occurred in many sugar beet fields in Big Horn County. Damage was caused by subterranean attack of plants in the crown area by *Agrotis ypsilon.* (12)

Perkins, G. H. 1894. Report of the entomologist. 7th Annu. Rep. Vt. Agr. Exp. Sta.: 3-151.

Agrotis ypsilon was one of the most common cutworms in Vermont. Descriptions of larva and adult stages are given. (138)

Peters, D. C. and C. Mendoza. 1960. Some aspects of rearing black cutworms. Entomol. Soc. Amer., North Cent. Br. Proc. 15: 73-74.

"The genetic variability among insects used in evaluating small plant populations must be minimized to obtain cogent information about plant variability. Inbreeding is the simplest method of reducing genetic variability. We have been able to inbreed moths for at least four generations of brother-sister mating. This inbreeding has decreased the viability of eggs, but the vigor and size of the larvae do not appear to be affected."

Pfrimmer, T. R. 1957. Response of insects to different sources of black light. J. Econ. Entomol. 50 (6): 801-803.

Three types of light traps were operated to determine which was most attractive to certain species of moths. A 100-watt mercury vapor attracted 201 (49% female) *Agrotis ypsilon* in 1955 and 59 (56% female) in 1956. A 15-watt BL lamp attracted 1,277 (50% female) in 1955 and 326 (52% female) in 1956. A 15-watt BLB lamp attracted 877 (57% female) in 1955 and 440 (60% female) in 1956.

Phillips, W. J. 1909. The slender seed-corn ground beetle. U. S. Dep. Agr. Bur. Entomol. Bull. 85, Part II: 13-28.

Cutworms, probably *Agrotis ypsilon,* and ground beetles destroyed 50% of the corn in the lower part of a field in New Paris, Ohio, in May, 1908. (23)

Pierce, W. D. 1917. How insects affect the cotton plant and means of combating them. U. S. Dep. Agr. Farmers Bull. 890: 1-27. Washington, D. C.

The author states that Paris green poison bait should be distributed as soon as the cotton starts to appear above ground to control *Agrotis ypsilon.* Frequently, cutworms migrate to cultivated fields from adjoining grassland. (5-6)

Pierstorf, A. L. and T. H. Parks. 1931. Cutworms. Ohio Ext. Serv., Plant Dis. and Insect Notes 2 (2): 1-4.

The black cutworm laid its eggs in low spots in the field or on land subject to the overflow of rivers. It became very injurious in some seasons and was known as the "overflow worm".

Pigatti, A. 1959. Ensaios de contrôle da lagarta - rôsca - *Agrotis ypsilon* (Rott.) - Com insecticidas organicos modernos (Lepidoptera: Noctuidae). (Tests on the control of the cutworm, *A. ypsilon* with modern organic insecticides.). Arq. Biol. Inst. 26: 161-166. São Paulo, Brazil.

The recommended treatment of 2.5% aldrin dust failed to control *Agrotis ypsilon.* Best control in the laboratory came from 10% dusts of carbaryl, TDE (Rhothane), and DDT. In field tests the best results were obtained with carbaryl, which caused 100% mortality.

Pigatti, A. and P. Pigatti. 1966. Ensaios complementares de campo para o contrôle da lagarta-rosca *Agrotis ypsilon* (Rot.). (Complementary field tests for the control of *Agrotis ipsilon.).* Biológicia 32 (11): 250-252.

Laboratory studies showed that carbaryl, TDE, and DDT were effective against *Agrotis ypsilon.* In the field, dusts were much more effective than sprays in reducing the numbers of living larvae in the soil around the treated plants.

Pinto da Fonseca, J. 1934. Report of the principal pests observed in 1931-33 on the chief cultivated plants in the State of Sâo Paulo. Arch. Inst. Biol. 5: 263-289. Sâo Paulo, Brazil.

Brief notes on the distribution in Sâo Paulo of most of the pests and the nature of the injury they cause were given. *Agrotis ypsilon* was recorded as a pest of potatoes.

Pittioni, B. 1923. Noctuidenfang an "natürlichem" Köder. (Noctuids caught at natural baits.) Entomol. Z. 37 (9): 21-22. Frankfurt A. M.

In this list of 58 different species of noctuid moths, 38 were taken feeding on the honeydew of aphids. Those of economic importance included *Agrotis ypsilon.*

Plank, H. K. 1933. Damage caused by bean worms and some important problems connected with their control. Calif. Dep. Agr. Mon. Bull. 22(7-11): 366-378. Sacramento.

Agrotis ypsilon damaged bean pods. Barium fluosilicate and cryolite were suggested for control.

Popov, P. 1963. A mass outbreak of *Agrotis ipsilon* (Hfn.) in 1963 in Bulgaria. Rast. Zasht. 11(10): 17-31. Sofia. (In Bulgarian)

Large numbers of *A. ipsilon* in April-May 1963 caused severe damage to corn, tobacco, and other crops in various parts of Bulgaria. The outbreak was attributed to favorable overwintering conditions.

Purohit, M. L., A. K. Khatri, and C. B. Shinde. 1971. Notes on the relative efficacy of different modern insecticides against *Agrotis ipsilon* on potato (*Solanum tuberosum*). Indian J. Agr. Sci. 41 (11): 1018-19.

Of several insecticides tested, dimecron (0.03%) emulsion applied as a spray at 1 month after crop sowing and again 20 days after the first spraying at 750 l/ha was the most effective in controlling *A. ipsilon* in potato fields. Rogor emulsion (0.03%) and carbaryl suspension (0.02%) were next most effective, and diazinon emulsion (0.03%) was the least effective, but all insecticides improved potato yield per/ha compared to control.

Puttler, B. and S. E. Thewke. 1970. Biology of *Microplitis feltiae* (Hymenoptera: Braconidae), a parasite of the black cutworm, *Agrotis ipsilon*. Ann. Entomol. Soc. Amer. 63 (3): 645-648.

M. feltiae is a solitary endoparasite of *A. ipsilon*. Females oviposit in first to third instar larvae and last instar parasite larvae emerge from third or fourth instar host larvae.

Puttler, B. and S. E. Thewke. 1971. Field and laboratory observations of *Hexamermis arvalis* (Nematoda: Mermithidae) a parasite of cutworms. Ann. Entomol. Soc. Amer. 64 (5): 1102-1106.

In Missouri and adjacent states, the nematode *Hexamermis arvalis* Poinar & Gyrisco was commonly found in clover and alfalfa fields parasitizing *Agrotis ipsilon, Feltia subgothica* and *Lacinipolia renigera*. A method of rearing postparasitic juveniles to adults was devised, and a method of sampling field populations of the nematode was successful.

Puttler, B., R. E. Sechriest, and D. M. Daughtery, Jr. 1973. *Hexamermis arvalis* parasitizing *Agrotis ipsilon* in corn and the origin of the pest infestation. Environ. Entomol. 2 (5): 963-964.

In Clinton County, Ill., a sample of 217 larvae, from the second to the sixth instars, was parasitized by *H. arvalis*. Parasitization determined by dissection presents circumstantial evidence that *A. ipsilon* overwinters as larvae. If this is true, a sampling method should be developed to estimate the overwintering population of *A. ipsilon* before planting. Such sampling would not only estimate the pest population, but would also indicate the degree of parasitization. Such data could then be analyzed and used in pest management.

Quaintance, A. L. 1898. Insect enemies of tobacco in Florida. Fla. Agr. Exp. Sta. Bull. 48: 150-188.

Agrotis ypsilon was the most common cutworm pest of tobacco in Florida. Other plants attacked were cabbage, strawberries, beans, onions, turnips, and corn. One strawberry grower reported finding as many as 40 larvae near a single plant. Description of larva and adult and control measures (Paris green bait) are given. (181-183)

Randolph, N. M. 1956. Control of insects affecting vetch seed production. J. Econ. Entomol. 49 (3): 403-404.

Three insecticide sprays, malathion, parathion, and toxaphene-DDT, were applied to vetch near Terrell, Texas, in 1955 for the control of insects. The chief injurious insects were the pea aphid and certain species of armyworms and cutworms (*Agrotis ipsilon*). Each of the three insecticides controlled pea aphids, but toxaphene-DDT gave the best control of aphids, armyworms, and cutworms.

Raun, E. S. and D. L. Brooks. 1963. Bacterial pathogens in Iowa corn insects. J. Insect Path. 5 (1): 66-71.

Numerous strains of bacteria exert pressure on corn insect populations in Iowa. How severe this pressure may be has not been determined. Undoubtedly an interaction of other factors with the infection by these various bacteria occurs, and most bacteria are secondary or facultative pathogens. *Streptococcus faecalis* var. *liquifaciens* and *Streptoccus mitis* were isolated from *Agrotis ipsilon.*

Razowski, J. and E. Palik. 1972. The lepidopterous fauna of the Cracow vicinity. Acta Zool. Cracoviensia No. 11: 117-217.

"*Agrotis ypsilon* (Hufn.). Numerous and widespread in the whole area (of Cracow, Poland). April 1 - Oct. 2."

Reed, W. V. 1915. Some of the more important truck crop pests in Georgia. Georgia State Board Entomol. Bull. 41: 1-39.

Agrotis ypsilon can be controlled by clean cultivation and the use of poison bait. They overwinter as immature larvae, especially on sodded ground. (16-18)

Reese, J. C. and M. L. Fairchild. 1971. Laboratory studies of *Agrotis ipsilon* (Hfn.), the black cutworm (Lepidoptera: Noctuidae). Entomol. Soc. Amer., North Cent. Br. Proc. 26: 89.

Morphological and growth studies were made on laboratory-reared larvae. These studies were especially concerned with the alimentary canal.

Reese, J. C., L. M. English, T. R. Yonke, and M. L. Fairchild. 1972. A method for rearing black cutworms. J. Econ. Entomol. 65 (4): 1047-1050.

Field collected adults were used to start a culture. Adult diet consisted of water, beer, and honey. Larval diet consisted basically of water and pinto beans. The culture was maintained for 4 years, producing 800 larvae per week. Hatching to pupation averaged 23.9 days.

Reese, J. C., T. R. Yonke, and M. L. Fairchild. 1972. Fine structure of the midgut epithelium in larvae of *Agrotis ipsilon*. J. Kans. Entomol. Soc. 45 (2): 242-251.

There are two cell types in the epithilium of the larval midgut of *Agrotis ipsilon*. All of the epithelial cells of the midgut have many microvilli on their mesal surfaces and on portions of the intercellular surfaces. These cells contain larger numbers of ribosomes on endoplasmic reticulum and large numbers of mitochondria.

Reid, W. J. and F. P. Cuthbert, Jr. 1957. Control of caterpillars on commercial cabbage and other cole crops in the South. U. S. Dep. Agr. Farmers Bull. 2099: 1-24.

Cutworms feed mostly at night and hide during the daytime on or just below soil surface. They cut off the stalks of young plants; they also feed on the leaves, buds and heads. Several species, including *Agrotis ipsilon,* attack cabbage and related plants in the South. (3, 8, 18).

Rekach, V. N. 1933. Cutworms as pests of cotton and other crops in Transcaucasia. Trans. Transcauc. Cotton Sci. Res. Inst., 40: 1-44. Tiflis. (In Russian, Sum. in English)

Notes on the life cycle of *Agrotis ypsilon* are given. Of three annual generations, only the first is economically important.

Reynolds, H. T., T. R. Fukuto, R. L. Metcalf and R. B. March. 1957. Seed treatment of field crops with systemic insecticides. J. Econ. Entomol. 50 (5): 527-539.

Thimet 44% on charcoal and Thimet emulsion showed promise in controlling black cutworms attacking cotton seedlings in California.

Riley, C. V. 1867. A chapter on cutworms. Prairie Farmer 35: 413-417. June.

"Extract from J. Townley's 'Do cut-worms destroy tree buds?'. Buds of fruit trees destroyed by the larvae of *Agrotididae;* other ravages and means against the same; descriptions of the larvae of *Agrotis subgothica* (=*A. herilis* and *A. tricosa*), A. telifera (=*A. ypsilon*), and *Celoena (=Hadena) renigera;* description of *A. cochranis* n. sp. (=*A. messori*); figures larva and imago of *A. cochranis, A. telifera,* and *Celoena renigera;* and imago of *A. subgothica;* habits, seasons, and vernacular names of *Agrotididae.*"

Riley, C. V. 1869. First annual report on the noxious, beneficial and other insects of the state of Missouri. 4th Annu. Rep. State Board Agr.: 80-81.

The greasy cutworm larvae, *Agrotis ypsilon*, are very variable in coloration. General characters of the moth and descriptions of larva, chrysalis, and imago are given. Larval injury to tomato and tobacco plants are described.

Riley, C. V. 1876. Three worms and their work. N. Y. Weekly Tribune July 12 (14): 132.

"Answer to letter of 'subscriber'; means against larvae of *Agrotididae*, of *Elateridae* and earthworms, *Lumbricus* sp.; eggs of *Agrotis ypsilon* in spring."

Riley, C. V. 1884. Cabbage insects. Annu. Rep. U. S. Comm. Agr. 1884: 289-418. Washington.

This report discusses the distribution, habits, and life history, and gives a brief description of egg, larva, and adult *Agrotis ypsilon*. Food plants include cabbage, corn, apple, grape, cypress vine, cotton, and potato. (294-295)

Rings, R. W., R. K. Lindquist, F. J. Arnold, and G. J. Musick. 1973. Comparative effectiveness of Mesurol and Sevin baits for control of black and variegated cutworms. Ohio Pesticide Inst. News 26 (3): 62, 64, 66.

Neither 2% Mesurol nor 5% Sevin baits were effective in controlling sixth instar *Agrotis ipsilon* on corn in simulated field tests. Wet baits of both materials were more effective than dry baits. Mesurol sprays were ineffective in controlling *A. ipsilon*. Poisoning symptoms were cessation of feeding, difficulty in walking, regurgitation of pellets, and finally convulsions and paralysis.

Ripley, L. B. 1921. The external morphology and postembryology of noctuid larvae. Univ. Ill., Entomol. Lab. Contrib. No. 86. Vol. 3: 246-345. Urbana.

This paper presents a graphic representation of the epicranial index for *Agrotis ipsilon* (Plate I) and diagrams of spinneret and labium (Plate VII). By rearing this species at 21 or 28° C. in 100% humidity, the author decreased the normal number of molts by one.

Rivnay E. 1963. Present status of lepidopterous pests of maize and other gramineous crops in Israel. FAO Plant Prot. Bull. 11. (1): 1-3. Rome.

Agrotis ypsilon was the most troublesome cutworm in Israel. It was active mainly in autumn after the corn season was over and in the spring before corn was sown.

Rivnay, E. 1964. A contribution to the biology and phenology of *Agrotis ypsilon* Rott. in Israel. Z. Angew. Entomol. 53 (3): 295-309.

The duration of life stages was related to temperature. There was a discussion of the yearly cycle in Israel.

Rivnay, E., and S. Yathom. 1964. Phenology of Agrotinae in Israel. Z. Angew Entomol. 55 (2): 136-152.

Agrotis ipsilon was numerous in spring and autumn and was migratory. It was the most injurious of the six economically important *Agrotinae* in Israel.

Roberts, S. J., E. J. Armbrust, and D. K. Sell. 1972. Supercooling points of several species of Lepidoptera found on soybeans. Environ. Entomol. 1 (5): 671-672.

Supercooling is the ability of an insect to withstand low temperatures before freezing. The supercooling point of *Agrotis ipsilon* pupae was -24.42° C.

Robinson, G. S. 1966. Notes and observations. Entomol. Rec. & J. Variation 78 (6): 158. June.

One *Agrotis ipsilon*, larger and paler than the autumn species, was taken in a mercury vapor light trap in Westmorland, England, on March 15, 1966.

Rockwood, L. P. 1925. An outbreak of *Agrotis ypsilon* Rott. on overflow land in western Oregon. J. Econ. Entomol. 18 (5): 717-721.

This report contains recorded outbreaks, outbreak in western Oregon, control, habits, natural enemies, life history, and a description of the larva. It would be well for cultivators of overflowed lands in the Pacific Northwest and entomologists to bear in mind that similar sudden and destructive outbreaks of this species may occur in the future on lands which have been subjected to unseasonable overflow. The time of potential danger from oviposition by the moths of this species is not definitely known, but may be expected to occur from near the end of April to late May or early June.

Rockwood, L. P. 1926. Some important wheat insects of the north Pacific region. Columbia Port Digest 4 (3): 10-11, 25. Portland, Oregon.

A brief account of the principal insect pests of wheat in the northwestern U. S., with notes on their biology and control. *Agrotis ypsilon* was sometimes injurious to grain crops.

Rojas, P. A. 1965. Identificationes de insectas entomofagos. (Identifications of entomophagous insects.) Agricultura Tech. 25 (1): 39-40. Santiago, Chile.

Apanteles bourquini (Hymenop.: Braconidae) was a natural enemy of *Agrotis ypsilon* in Chile.

Ruppel, R. F., G. M. Benavides and A. Saldarriaga. 1957. Chemical control of the fall armyworm, *Laphygma frugiperda* (S.), in maize in Colombia. FAO Plant Prot. Bull. 5 (5): 69-74. Rome.

Corn in Colombia was severely attacked by *Agrotis ypsilon*.

Saharia, D. and G. C. Sharma. 1971. Studies on the presowing insecticidal treatment in relation to time of planting and variety for controlling cutworm *(Agrotis ipsilon)* affecting potato crop. J. Assam. Sci. Soc. 14 (1): 7-11.

Aldrin (T), followed by chlordane and DDT applied at 2.25 kg/ha to furrows before planting, effectively reduced the infestation of potatoes (*Solanum tuberosum*) by cutworms (*A. ipsilon*). In India, an early December planting was better in reducing the infestation than any November planting, while the up-to-date variety was more susceptible to cutworms than the Rongpuria variety.

Samy, O. 1964. Effect of insecticides on the eggs of certain cotton insects. Agr. Res. Rev. 42 (3): 18-28. Cairo.

DDT, lindane, endrin, and dieldrin were tested for effectiveness against the eggs of *Agrotis ipsilon*. Percent mortalities respectively were 98, 55, 18-20, and 0.

Sanderson, E. D. 1902. Insects injurious to staple crops. John Wiley & Sons. N. Y. 295 pp.

Agrotis ypsilon is one of the most common cutworms attacking tobacco. Paris green bait should be distributed from 3 to 5 days before plants are sent out.

Sanderson, E. D. 1905. Miscellaneous cotton insects in Texas. U. S. Dep. Agr. Farmers Bull. 223: 1-24.

The species of cutworm most commonly found on cotton in 1904 was *Agrotis ipsilon*. Cutworms are more abundant in seasons following a fall in which there have been abundant rains, making grass and weeds plentiful. (5-6)

Sanderson, E. D. 1906. Miscellaneous cotton insects in Texas. U. S. Dep. Agr. Bur. Entomol., Bull. 57: 1-63.

Agrotis ypsilon seemed to overwinter as pupae and larvae. Those which overwintered as larvae did not mature until July. (8-9)

Satterthwait, A. F. 1933. Larval instars and feeding of the black cutworm, *Agrotis ipsilon* Rott. J. Agr. Res. 46 (6): 517-530.

This paper deals with larval development and determination of instars, duration of instars, effect of temperature on development, and feeding experiments. Includes graph of foliage consumed by black cutworm in various larval instars.

Saunders, W. 1883. Insects injurious to fruits. J. P. Lippincott & Co., Phila. 436 pp.

Agrotis ypsilon is considered a strawberry pest. There is a description of the adult and larva. Controls suggested include sprinkling the plants with air-slaked lime, ashes, or powdered hellebore, or showering them well with water containing Paris green. (327-329)

Schuster, M. F. and J. C. Boling. 1973. Species of cutworms in the lower Rio Grande Valley. J. Econ. Entomol. 66 (4): 999-1000.

Agrotis ipsilon was more predominant in clay soils. It was more numerous in the coastal counties of Cameron and Willacy than in the interior Hidalgo County, which has less rainfall during the winter.

Scott, J. W. 1918. Report of parasitologist. Wyoming Agr. Exp. Sta. 18th Annu. Rep.: 83.

Agrotis ypsilon did damage to gardens and was considered economically important in Wyoming.

Scott, W. L. 1923. Entomology . Rep. Agr. Dep., Assam, 1922-23: 6. Shillong, India.

Work on the control of *Agrotis ypsilon* on onion crops has been continued with Andrés-Mairés traps, and the results favorably impressed the cultivators.

Sechriest, R. E. 1966. A simple technique for screening insecticides to control black cutworm larvae, *Agrotis ipsilon* (Hufnagel). J. Econ. Entomol. 59 (2): 485.

This is a method of screening insecticides in the greenhouse which approximates field conditions and permits rapid evaluation. The most successful insecticides can be taken to the field for further evaluation.

Sechriest, R. E. and W. H. Luckmann. 1966. Controlling black cutworm on corn-greenhouse tests. Proc. North Cent. Br., Entomol. Soc. Amer. 21: 48-49.

Insecticides were tested under greenhouse conditions to ascertain the most effective ones for controlling the black cutworm. Flats of seedling corn were artificially infested with laboratory-reared larvae and percent of plants remaining was recorded. Dieldrin was included as a standard for comparison in addition to the untreated check.

Sechriest, R. E. and A. C. York. 1967. Evaluating artificial infestations of black cutworms. J. Econ. Entomol. 60(4): 923-925.

Tests were conducted to determine the amount of damage caused by an artificial infestation of *Agrotis ipsilon*. An infestation of one larva per plant was determined to be suitable for tests of the effectiveness of insecticides.

Sehriest, R. E. 1967. Studies on black cutworm control. Proc. North Cent. Br., Entomol. Soc. Amer. 22: 89-93.

Promising insecticides were selected from laboratory screening tests and evaluated in the field in 1966 against natural infestations of *Agrotis ipsilon*. Granular diazinon, Bayer 37289, Thimet + EI-47470, Dyfonate and Dylox, GC-6506, and Dursban gave promising control.

Sechriest, R. E. 1968. Greenhouse experiments of baits for control of the black cutworm. J. Econ. Entomol. 61 (3): 591-593.

Ten insecticides formulated as baits were evaluated in the greenhouse against *Agrotis ipsilon* (Hufnagel). Cutworm larvae (fourth instar) from a laboratory culture were used to infest corn seedlings. Apple pomace and wheat grain were effective baits at 20 lb. of bait-insecticide formulation (1/2 lb. of actual toxicant) per 13,068 feet of row. Effective toxicants included: trichlorfon, Amer. Cyanamid CL-47470 (cyclic propylene (diethoxyphosphenyl) dithioimidocarbonate), Abate, ethyl parathion, Mirex, TDE, and carbaryl.

Sechriest, R. E. and D. K. Sell. 1968. Field evaluation of insecticides to control the black cutworm *Agrotis ipsilon* (Huf.) on seedling corn in Illinois. Proc. North Cent. Br., Entomol. Soc. Amer. 23: 101-105.

Granular, emulsifiable, and bait formulations of registered and experimental insecticides were evaluated at sowing time and post-emergence to determine their effectiveness in controlling *Agrotis ipsilon*.

Sechriest, R. E. 1971. Black cutworm control aided by attractants. Entomol. Soc. Amer., North Cent. Br. Proc. 26:73.

The use of attractants results in the use of less toxicant per acre. Apple pomace, molasses, and Tractum were successful in attracting *Agrotis ipsilon* larvae. Carbaryl, Dyfonate, N-2596, and Dylox were effective toxicants.

Sechriest, R. E. 1971. Baits for cutworms, Ill. Nat. Hist. Sur. Rep. 107:3-4.

Corn meal proved to be the most attractive bait of 12 materials tested on the black cutworm. A large granule of 10/20-mesh size or a small pellet one-eighth of an inch thick by three-eighths of an inch long was found to be most effective.

Sechriest, R. E. and D. W. Sherrod. 1973. 1972 field experiments to control cutworms and wireworms. Twenty-fifth Ill. Custom Spray Oper. Train. Sch., Summaries of Presentations, Jan. 24-25, Urbana. 25: 99-102.

The author reports on various experimental chemical controls for the black cutworm and the sandhill cutworm. It was believed that the sandhill cutworm can best be controlled by using a granular, insecticidal treatment at planting time. For black cutworm, a pelleted bait (Sevin) should provide good control of larvae and save the corn stand when applied properly.

Selman, C. L. and H. E. Barton. 1972. Seasonal trends in catches of moths of 12 harmful species in blacklight traps in northeast Arkansas. J. Econ. Entomol. 65 (4): 1018-1021.

In 1970 in Craighead County, Arkansas, 68 specimens of *Agrotis ipsilon* were taken from April 17 to Nov. 11. Records indicated four generations that year.

Shreevastava, Y. P. 1955. Trials of various weedicides on the wild host plants of the greasy cutworm (*Agrotis ypsilon* Rott.) in Bihar. Indian J. Entomol. 17 (2): 273-274.

It was found that *Agrotis ypsilon* survives the off-season, June to September, by breeding on some wild species of weeds. Five herbicides were tested against these weeds.

Singh, M. P. 1949. On the possibility of *Agrotis ypsilon* Rott. passing the summer months in the plains of Bihar breeding on alternate host plants. Indian J. Entomol. 11: 103-105.

Tests show *Agrotis ipsilon* does not undergo any compulsory diapause in the form of aestivation. It probably breeds in some place other than the plains wherever it finds suitable temperature, humidity, and food.

Slingerland, M. V. 1895. Climbing cutworms in western New York. Cornell Univ. Agr. Exp. Sta. Bull. 104: 639-685.

Indications are that the adult moth (*Agrotis ypsilon*) hibernates, and egg-laying takes place early in the spring. It is not considered by the author as a climbing cutworm.

Smith, C. E. and R. W. Brubaker. 1938. Observations on cabbage worm populations at Baton Rouge, La. J. Econ. Entomol. 31 (6): 697-700.

Agrotis ypsilon was not considered a "cabbage worm" but may infest and injure cole crops.

Smith, F. F., R. A. Fulton and F. I. Edwards. 1952. New insecticides for greenhouse vegetables. Veg. Grow. Assoc. Amer. Rep. 43: 21-28.

Parathion was the only organic insecticide listed as being effective against *Agrotis ypsilon*.

Smith, J. B. 1893. Catalogue of the lepidopterous superfamily Noctuidae found in boreal America. Bull. U. S. Nat. Museum 44: 66.

"*A. ypsilon* Rott.

1776. Rott., Naturf. XLI, 141, *Noctua*.
1816. Hub., Verzeichniss, 225, *Exarnis*.
1875. Speyer, Stett. Ent. Zeit., XXXVI, 135, *Agrotis*.
1883. Saund., Fruit Insects, 327, f. 338, *Agrotis*.
1889. Butler, Trans. Ent. Soc. Lond., 380, *Peridroma*.
suffusa S. V.
1776. S. V., p. 80, *nomen Catalogi*.
1852. Gn., Sp. Gen., Noct., I, 268, *Agrotis*.
1857, Wlk., C. B. Mus., Het., X, 309, *Agrotis*.
telifera Harr.
1841. Harr., Rept. Ins. Mass., *Agrotis*.
1842. Harr., Inj. Ins., 323, *Agrotis*.
1864. Grt., Proc. Ent. Soc. Phil., III, 95, pr. syn.
1868. Riley, Rept. Ins. Mo., I, 28,80, pl. 1, f. 8-10, *Agrotis*.

1881. Riley, Index and Suppl. to Mo. Repts., 55, pr. syn. *Idonea* Cram.
1782. Cram., Exot., III, 150, 275, f. H, *Phalaena.*
1852. Gn., Sp. Gen., Noct., I, 269, pr. var.
1856. Wlk., C. B. Mus., Het., 309, pr. Syn.
HABITAT.--United States and Canada, June to October; Europe. This common and well-known species has a large European bibliography, and has been frequently described in all its stages in economic publications. What has been given above will authenticate the synonymy as far as necessary here."

Smith, J. B. 1910. Insects injurious to field crops. New Jersey Agr. Exp. Sta. 21st Annu. Rep.: 351-352.

Poison bran failed to control the second brood of *Agrotis ypsilon* in lettuce, making it necessary to spray. A loss of $2,000 could have been prevented by early detection.

Smith, J. H. 1939. Report of the entomological section. Annu. Rep. Dep. Agr. Sta. Qd. 1938-1939: 32-35. Brisbane.

Agrotis ypsilon attacked alfalfa extensively in southern Queensland, and also autumn-planted cereals and vegetables.

Smith, J. H. and N. E. H. Caldwell. 1947. Armyworm and other Noctuid outbreaks during 1946-47. Qd. Agr. J. 65 (6): 396-401. Brisbane.

Sprays of 0.1% DDT directed downwards to the base of the plants gave good results and seemed likely to supersede the more cumbersome baiting technique in controlling *Agrotis ypsilon.*

Smith, L. M. and E. M. Stafford. 1955. Grape pests in California. Calif. Agr. Exp. Sta. Ext. Serv. Circ. 445: 43-45.

Agrotis ypsilon damaged buds on grapevine. The appearance, development, injury, and control practices are given. Controls include fall plowing, poison baits, sticky bands, and sprays.

Smith, R. C. 1937. Climate and injurious insect investigations. Eighth Bien. Rep. Kans. Agr. Exp. Sta. (1934-36): 94-95.

Soil moisture tests indicated the optimum soil moisture for *Agrotis ypsilon* larvae was between 25 and 30% of the dry weight of the soil. Upper and lower limits were 58% and below 5%. (95)

Smith, R. C. 1943. Common insects of Kansas. Kans. State Board Agr. Rep. 62 (255): 240.

Agrotis ypsilon frequently damaged corn and gardens following floods and overflows. Descriptions of the larva and adult are given.

Sonan, J. 1940. On the insect pests of flax in Formosa. Formosan Agr. Rev. 36 (6): 577-586. Taikohu, Formosa. (In Japanese)

The larvae of *Agrotis ypsilon* fed on the basal parts of the flax stalks.

Soueref, S. T. 1965. Infestation of wheat by *Agrotis ipsilon* (Hfn.) in Thesprotin and tests on its control. Rep. Minist. Agr. Phytopath. Sta. Patras (1963-64): 34-35. Patros, Greece. (In Greek)

The larvae of *Agrotis ipsilon* caused severe damage to springsown wheat in the district of Margarition, in northwestern Greece. A wettable powder spray of aldrin was applied at 0.18 lb. toxicant per acre and resulted in 81.8% control after 6 days.

Speare, A. T. 1920. Further studies of *Sorosporella uvella*, a fungous parasite of noctuid larvae. J. Agr. Res. 18(8): 399-439.

Sorosporella uvella is a parasitic fungus whose hosts include *Agrotis ypsilon* and various other cutworms and noctuids in the eastern U. S. and Canada. Life history, culture of the organism, and inoculation experiments are discussed.

Specht, H. B. 1972. Cutworms of tobacco in Nova Scotia. I. Species complex and infestations. Can. Entomol. 104 (12): 1855-1864. Kentville, Nova Scotia.

Several species of cutworms damaged tobacco. Only a trace of *Agrotis ypsilon* was found in one field. The major cutworm pest was *Euxoa messoria.*

Speyer, E. R. 1918. Report on the work of the entomological division, including special investigations into shot-hole borer of tea. Ceylon Admin. Rep. for 1917, Dep. Agr.: C10-13.

The cutworm, *Agrotis ypsilon*, was troublesome on vegetables and experiments with traps and poison baits were conducted.

Stanley, W. W. 1965. Seasonal abundance of 13 species of moths caught in light traps in Tennessee. J. Tenn. Acad. Sci. 40 (4): 118-131.

Black light traps were operated in seven counties in Tennessee from 1955 to 1958. Black cutworm moths were caught from the first week in March to the second week in November. Plate 5 graphs the light trap catches of *Agrotis ipsilon*.

Stedman, J. M. 1906. The more important insects injurious to corn in Missouri. Mo. Board Agr. Rep. 38: 271-286.

The habits and life history of *Agrotis ypsilon* are discussed. It overwinters as a larva. One of the best control methods is to turn hogs into the grass fields in the fall before plowing the sod under in preparation for planting corn. (281-282)

Stephens, J. F. 1829. Illustrations of British entomology; or, a synopsis of indigenous insects containing their generic and specific distinctions with an account of their metamorphoses, times of appearance, localities, food, and economy as far as practicable. Haustellata. 2: 1-203.

The author described the larva and adult of *Agrotis ipsilon* as *Agrotis suffusa* Steph. It was found occasionally at Birch and Darenth woods in July. It was also very common in June and September near Epping, England, in some seasons.

Stewart, P. A. and J. J. Lam, Jr. 1969. Hourly and seasonal collections of six harmful insects in traps equipped with black light lamps. J. Econ. Entomol. 62 (1): 100-102.

In 1965 and 1966, hourly and seasonal catches of *Agrotis ipsilon* in Johnston and Wilson counties, North Carolina, were graphed. The highest percentage of moths was trapped between 3:00 and 4:00 a.m.

Stewart, P. A. and J. J. Lam, Jr. 1968. Catch of insects at different heights in traps equipped with blacklight lamps. J. Econ. Entomol. 61 (5): 1227-1230.

UVL traps were mounted at 11 ft. intervals up to 99 feet. Height distribution was reported for *Agrotis ipsilon*; a greater percentage (16.7%) of black cutworm moths was collected at 22 feet.

Stock, T. D. 1926. Entomology. Rep. Dep. Agr. Burma, 1925-26: 16-17. Rangoon.

Agrotis ypsilon was recorded as a pest on tobacco.

Swezey, O. H. 1915. A preliminary list of the Hymenopterous parasites of Lepidoptera in Hawaii. Proc. Hawaiian Entomol. Soc. 3 (2): 99-109. Honolulu.

Agrotis ypsilon was parasitized by *Icheneumon koebelei.*

Swezey, O. H. 1937. Notes on potato insects in Hawaii. Hawaiian Entomol. Soc. Proc. 9: 433-435. Honolulu.

Potatoes grown on fallow cane land were attacked by *Agrotis ypsilon.* This was an unrecorded habit for this cutworm. Frequently tubers were found with much damage from larval feeding.

Symons, T. B. 1905. The common injurious and beneficial insects of Maryland. Maryland Agr. Exp. Sta. Bull. 101: 125-204.

Agrotis ypsilon is another of the voracious cutworms attacking young tobacco and tomato plants, as well as being especially destructive to cornfields and gardens. Late fall plowing exposes larvae to freezing and thawing, which will destroy them. Paris green and salty fertilizer were also recommended for control. (162)

Takiguichi, M. 1955. Ecological notes of *Agrotis ypsilon* Rott. in Fukuoka Prefecture. Kyushu Agr. Res. 15: 90-92. (In Japanese)

Agrotis ypsilon was found in the same environment as *Euxoa segetis* and *Agrotis tokionis* in this vegetable-growing area of Japan. There are five generations per year in this area. Ecological studies were made on the seasonal moth flights, longevity of males and females, preoviposition and oviposition period, incubation period, and

length of life stages. Larval instars varied from five to seven depending on the amount of Chinese cabbage consumed.

Thimmaiah, G., K. S. Panchabhavi, A. R. Khan, S. Usman, and N. B. Kajjari. Insecticidal control of cutworm (*Agrotis ypsilon* Rott.) on tobacco (*Nicotina tabacum* L.). Indian J. Agr. Sci. 42 (10): 925-927.

Aldrin and heptachlor at 2.0 kg. and parathion at 0.5 kg. actual insecticide per hectare gave good control of *A. ypsilon*.

Thomann, H. 1944. Über Erdraupenschäden im sommer 1943 an tabak und mais im Graübundner Rheintal. (Injury caused by cutworms to tobacco and maize in the Rhine Valley in the Canton of Grisons during the summer of 1943). Mitt. Schweiz. Entomol. Ges. 19 (4-5): 169-179. Berne.

The bionomics, distribution and economic importance of *Agrotis ypsilon* in Europe are discussed from the literature, and preliminary investigations on its control on tobacco are described. Gesarol (2%) was recommended for control.

Thompson, B. G. 1926. Cutworm control in Oregon. Oregon Agr. Exp. Sta., Cir. 70: 1-6. Corvallis.

Seasonal history and habits are given for cutworms in general. Poison bran mash was suggested for control. *Agrotis ypsilon* was considered one of the three most important species in Oregon.

Thompson, B. G. 1935. Cutworm control in Oregon. Oregon State Agr. Coll., Agr. Exp. Sta., Cir. lll: 1-6.

Agrotis ypsilon was considered an important pest in Oregon. Seasonal history and habits are given for cutworms in general. Several poison bait formulas are given, using Paris green, white arsenic, or sodium fluoride.

Tietz, H. M. 1951. The Lepidoptera of Pennsylvania. A Manual. Penn. State College, Agr. Exp. Sta. 193 pp.

This manual lists references relating to classification and life history. Food plants of *Agrotis ipsilon* included onion, peach, asparagus, oats, beets, mustard, cabbage, cauliflower, peppers, orange, cucumber, squash, strawberry, cotton, lettuce, tomato, apple, tobacco, bean, radish, potato, spinach, clover, cranberry, grape, corn and grasses. (52)

Tissot, A. N. 1944. Biology and control of cutworms and armyworms in Florida. Fla. Agr. Exp. Sta. Annu. Rep. 1944: 57.

"Work was started on the greasy cutworm, *Agrotis ypsilon*. This species is now in the beginning of the third insectary reared generation." (57)

Tissot, A. N. 1945. Biology and control of cutworms and armyworms in Florida. Fla. Agr. Exp. Sta. Annu. Rep. for 1945: 64.

A list of cutworm parasites reared from laboratory stock is given . It includes *Eucelatoria armigera* (Coq.) (Dipt.) and *Meteorus vulgaris* (Cress.) (Hymenoptera) reared from *Agrotis ypsilon*.

Treat, A. E. and K. D. Roeder. 1959. A nervous element of unknown function in the tympanic organs of moths. J. Insect. Physiol. 3: 262-270.

The B neurone is in close anatomical relation with the nerve fibers coming from the scoloparium. No direct interaction with the acoustic elements has been demonstrated, and the function of the cell remains unknown. A B neurone has been found in every noctuid species examined. A histological preparation was made from *Agrotis ypsilon*.

Treherne, R. C. 1914. The strawberry root weevil (*Otiorhynchus ovatus* Linn.) in British Columbia with notes on other insects attacking strawberry plants in the Lower Fraser Valley. Canada Dep. Agr. Div. Entomol. Bull. 8: 1-44.

The larvae of the greasy cutworm, *Agrotis ypsilon*, one of the common species of cutworms throughout British Columbia, was also reported injurious to roots of strawberries.

Tryon, H. 1919. Report of the entomologist and vegetable pathologist. Queensland Annu. Rep. Dep. Agr. and Stock for the Year 1918-1919: 37-49. Brisbane.

Agrotis ypsilon was recorded as a pest on cabbage and turnips.

Tseng, Sheng. 1943. A comparative study on the morphology of cutworms, Part I, External morphology. pp. 41-56. (Sine loco).

Details are given of the external morphology of the larvae of four cutworms known to be injurious in China, including *Agrotis ypsilon*.

Tu, C. C. and T. H. Lin. 1966. The investigation on noctuids of flax. J. Taiwan Agr. Res. 15(1): 42-52. (In Chinese, Sum. in English)

A. ipsilon was collected about flax in light traps and by field collecting larvae.

Tulashvili, N. 1930. Beobachtungen über die schädlinge des teestrauches und der citrusgewachse (citronen, apfelsinen) am Strandgebiet Batum im Laufe von 1927-1928. (Observations on pests of tea and citrus on the Batum Coast during 1927-28). Mitt. PflSchabt, Volkskom. Landw. S.S.R. Georg., No. 1:189-230. Tiflis, U.S.S.R. (In Russian, German summary)

Brief notes are given on the bionomics of tea pests, including *Agrotis ypsilon* on the Batum Coast, Georgian S.S.R.

Turati, E. and V. Zanon. 1922. Materials for a fauna of the Lepidoptera of Cyrenacia. Atti. Soc. Ital. Sci. Nat. 61 (2): 132-178. Milan

Agrotis ypsilon was recorded as a pest of lettuce in Cyrenaica.

U. S. DEPARTMENT OF AGRICULTURE
COOPERATIVE ECONOMIC INSECT REPORT[1]

The Bureau of Entomology of the U. S. Department of Agriculture, in cooperation with the state entomologists, entomologists of the agricultural experiment stations, state departments of agriculture, agricultural colleges, and other entomological agencies organized an Insect Pest Survey in 1921. This survey attempted to assemble and disseminate all data on the distribution, seasonal and regional fluctuation of insect abundance, weather data as related to insect outbreaks, phenological data, and other miscellaneous information. Each year an annual digest of the important facts gathered during the past season is published in the form of Insect Pests Summaries.

From 1921 to 1950, this publication was entitled "The Insect Pest Survey Bulletin". In 1951, the Bulletin was replaced by the Cooperative Economic Insect Report, Vol. 1., No. 1 July 31, 1951. No explanation is given in this publication for the name change.

Since these references are too numerous to list separately, they are listed by years.

1922. USDA Insect Pest Survey Bulletin. 2: 67, 114.
1923. USDA Insect Pest Survey Bulletin. 3: 241.
1924. USDA Insect Pest Survey Bulletin. 4: 104, 128, 155, 156.
1925. USDA Insect Pest Survey Bulletin. 5: 67, 100, 127, 232.
1926. USDA Insect Pest Survey Bulletin. 6: 43, 91, 136, 195.
1927. USDA Insect Pest Survey Bulletin. 7: 140, 166, 191, 203, 264.
1928. USDA Insect Pest Survey Bulletin. 8: 69, 144, 201, 202, 326.
1929. USDA Insect Pest Survey Bulletin. 9, 109, 165, 215, 219, 272, 322.
1930. USDA Insect Pest Survey Bulletin. 10: 10, 46, 47, 85, 137, 138, 204, 257, 262, 440.
1931. USDA Insect Pest Survey Bulletin. 11: 11, 247, 249, 331, 412, 653.
1932. USDA Insect Pest Survey Bulletin. 12: 10, 83, 196, 252.
1933. USDA Insect Pest Survey Bulletin. 13: 68, 105, 106, 145, 149, 150, 297, 330.
1934. USDA Insect Pest Survey Bulletin. 14: 96.
1935. USDA Insect Pest Survey Bulletin. 15: 29, 65, 66, 147, 330.
1936. USDA Insect Pest Survey Bulletin. 16: 29, 100, 164, 165.
1937. USDA Insect Pest Survey Bulletin. 17: 159, 160, 217.
1938. USDA Insect Pest Survey Bulletin. 18: 145, 152, 247.
1940. USDA Insect Pest Survey Bulletin. 20: 50, 78, 142, 226, 299.
1941. USDA Insect Pest Survey Bulletin. 21: 11, 73, 150, 151, 237, 502, 629.
1952. Cooperative Economic Insect Report.[2] 2: 25, 137, 163, 176, 357, 361, 419, 427, 432, 445.
1953. Cooperative Economic Insect Report. 3: 38, 85, 119, 126, 174, 299, 320, 431, 453, 475, 538, 660, 701, 827, 853.

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[1]Issued by Plant Protection and Quarantine Programs, Animal and Plant Health Inspection Service, U. S. Department of Agriculture.

[2]The U. S. Dept. of Agriculture Insect Pest Survey was not bound or indexed for the years 1942 to 1949 and did not report insect conditions.

1954. Cooperative Economic Insect Report. 4: 50, 55, 159, 160, 197, 217, 233, 268, 271, 290, 295, 306, 325, 355, 362, 374, 385, 387, 395, 405, 418, 425, 433, 439, 454, 466, 472, 493, 595, 624, 695, 885, 922, 960, 1007, 1033, 1050, 1067, 1072.

1955. Cooperative Economic Insect Report. 5: 7, 28, 43, 114, 120, 132, 157, 176, 190, 227, 228, 230, 256, 258, 277, 299, 319, 326, 336, 346, 347, 348, 352, 368, 369, 377, 378, 392, 400, 418, 427, 444, 454, 463, 470, 480, 492, 493, 500, 507, 527, 538, 556, 566, 572, 583, 591, 602, 610, 611, 637, 645, 662, 663, 671, 691, 693, 725, 755, 756, 782, 783, 808, 829, 854, 855, 874, 896, 918, 934, 950, 960, 967, 980, 1011, 1025, 1026, 1039, 1040, 1055, 1068, 1084, 1086, 1113, 1121.

1956. Cooperative Economic Insect Report. 6: 6, 8, 21, 40, 48, 58, 77, 88, 98, 100, 118, 123, 143, 146, 172, 174, 196, 199, 225, 229, 231, 244, 248, 251, 265, 272, 283, 288, 314, 315, 338, 358, 359, 380, 427, 449, 470, 488, 498, 519, 531, 545, 572, 596, 626, 636, 651, 680, 688, 704, 742, 749, 772, 803, 832, 862, 880, 899, 919, 937, 956, 969, 986, 1000, 1016, 1030, 1031, 1032, 1045, 1060, 1072, 1083, 1099, 1112, 1119, 1120, 1129, 1135, 1141.

1957. Cooperative Economic Insect Report. 7: 5, 6, 7, 33, 57, 78, 95, 102, 116, 122, 138, 155, 157, 176, 178, 194, 199, 202, 215, 237, 256, 276, 299, 310, 329, 338, 346, 362, 366, 387, 407, 415, 424, 430, 450, 474, 500, 520, 541, 542, 549, 561, 562, 568, 587, 594, 609, 631, 638, 653, 674, 695, 717, 732, 740, 750, 766, 784, 798, 818, 830, 842, 854, 863, 877, 889, 900, 909, 923, 932, 942, 944, 947.

1958. Cooperative Economic Insect Report. 8: 4, 17, 45, 56, 73, 77, 106, 112, 128, 146, 169, 175, 190, 192, 215, 216, 221, 238, 262, 283, 284, 287, 302, 307, 328, 350, 372, 387, 395, 396, 397, 398, 399, 417, 418, 455, 464, 465, 494, 495, 506, 515, 521, 530, 542, 543, 550, 556, 563, 571, 578, 588, 596, 605, 620, 634, 640, 641, 649, 662, 682, 683, 706, 707, 729, 730, 749, 772, 792, 800, 806, 825, 838, 839, 856, 869, 880, 884, 898, 943, 957, 970, 971, 983, 996, 997, 999, 1009, 1013, 1014, 1024, 1026.

1959. Cooperative Economic Insect Report. 9: 10, 22, 32, 33, 52, 66, 77, 88, 93, 96, 109, 115, 134, 155, 172, 174, 195, 206, 220, 240, 265, 285, 290, 295, 303, 318, 339, 355, 363, 365, 383, 395, 413, 420, 470, 478, 496, 503, 524, 525, 535, 544, 557, 558, 569, 590, 591, 597, 613, 618, 637, 661, 671, 689, 690, 734, 740, 741, 788, 862, 917, 931, 938, 964, 993, 1000, 1018.

1960. Cooperative Economic Insect Report. 10: 5, 82, 162, 189, 199, 257, 293, 320, 325, 340, 368, 382, 392, 408, 415, 450, 474, 482, 501, 536, 538, 547, 574, 581, 594, 606, 607, 612, 633, 641, 666, 693, 694, 723, 739, 748, 775, 776, 809, 824, 894, 903, 952, 968, 974, 1081.

1961. Cooperative Economic Insect Report. 11: 18, 49, 94, 117, 119, 132, 135, 148, 158, 160, 177, 184, 201, 233, 270, 299, 343, 344, 362, 391, 411, 431, 434, 439, 440, 465, 490, 491, 520, 525, 536, 547, 548, 572, 586, 641, 642, 662, 675, 705, 738, 739, 766, 767, 789, 813, 836, 843, 848, 922, 1017.

1962. Cooperative Economic Insect Report. 12: 21, 42, 73, 124, 202, 224, 229, 233, 314, 353, 392, 424, 425, 449, 475, 503, 504, 514, 536, 537, 576, 577, 583, 605, 644, 645, 651, 661, 675, 676, 711, 712, 719, 720, 746, 755, 787, 806, 812, 813, 841, 1030, 1121, 1248.

1963. Cooperative Economic Insect Report. 13: 47, 93, 139, 150, 226, 253, 259, 289, 359, 370, 407, 443, 473, 501, 522, 547, 567, 591, 605, 626, 627, 635, 646, 661, 662, 667, 696, 697, 704, 715, 734, 735, 771, 772, 805, 806, 841, 905, 934, 935, 936, 953, 967, 968, 969, 983, 1011, 1063, 1251, 1401.

1964. Cooperative Economic Insect Report. 14: 8, 37, 54, 131, 163, 168, 181, 212, 221, 246, 247, 250, 255, 262, 269, 342, 368, 383, 400, 413, 450, 452, 465, 486, 503, 525, 561, 562, 566, 591, 602, 630, 632, 633, 638, 669, 670, 675, 704, 712, 741, 742, 743, 781, 782, 788, 823, 824, 855, 856, 891, 892, 956, 1008, 1033, 1094, 1127.

1965. Cooperative Economic Insect Report. 15: 59, 109, 136, 159, 249, 242, 269, 271, 449, 460, 475, 503, 512, 536, 544, 567, 568, 574, 599, 600, 626, 627, 635, 646, 660, 661, 672, 683, 708, 769, 770, 771, 838, 839, 840, 877, 879, 886, 897, 911, 932, 1041, 1121, 1149, 1205, 1345.

1966. Cooperative Economic Insect Report. 16: 107, 114, 140, 177, 186, 208, 286, 301, 386, 484, 512, 514, 536, 547, 569, 583, 601, 629, 636, 781, 802, 809, 863, 905, 988, 1036, 1080, 1120, 1157.

1967. Cooperative Economic Insect Report. 17: 39, 139, 145, 183, 204, 206, 209, 211, 212, 242, 307, 340, 363, 380, 386, 404, 436, 442, 462, 478, 503, 504, 513, 531, 541, 559, 566, 587, 593, 615, 623, 643, 650, 670, 671, 676, 697, 704, 757, 849, 1011.

1968. Cooperative Economic Insect Report 18: 91, 105, 108, 121, 144, 160, 162, 168, 201, 330, 332, 359, 391, 412, 434, 467, 486, 517, 520, 543, 547, 550, 551, 575, 587, 606, 613, 664, 672, 673, 758, 882, 884, 901, 982, 1035, 1046, 1048.

1969. Cooperative Economic Insect Report. 19: 132, 151, 167, 178, 180, 275, 362, 394, 398, 422, 447, 472, 489, 517, 632.

1970. Cooperative Economic Insect Report. 20: 118, 278, 324, 350, 382, 400, 423, 441, 443, 471, 578, 782.

1971. Cooperative Economic Insect Report. 21: 142, 146, 147, 200, 292, 344, 355, 372, 390, 394, 408, 427, 445, 487, 490, 511, 526, 670.

1972. Cooperative Economic Insect Report. 22: 92, 93, 242, 318, 330, 351, 381, 403, 414.

Ustinov, A. A. 1932. A review of pests of tobacco in Abkhazia observed in 1931. Roy. 8: 1-38. Sukhum, Abkhazsk. Tabachn. Zonal'n Sta. (In Russian)

This article reviews the life history of *Agrotis ypsilon*. Paris green was more effective than poison baits as a control. Hibernation occurred as a last instar larva or pupa.

Van Der Goot, P. 1924. Overzicht der voornaamste ziekten van het aardappelgewas op Java. (Survey of the principal diseases of the potato in Java.) Inst. Plantenziekten, Bull. 18: 1-44. Buitenzorg, W. Java.

The cutworm *Agrotis ypsilon* was especially troublesome in fields of young plants in Dutch East Indies. Collection was considered more satisfactory than the use of poison baits.

van Hall, C. J. J. 1916. Ziekten en plagen der cultuuragewassen in Nederlandsch-Indië in 1915. (Diseases and pests of cultivated plants in the Dutch East Indies in 1915). Meded. v.h. laboratorium voor Plantenziekten, Buitenzorg, 20: 1-47. W. Java.

Agrotis ypsilon was recorded as a tobacco pest in Dutch East Indies.

van Hall, C. J. J. 1925. Ziekten en plagen der cultuurgewassen in Nederlandsch-Indië in 1924. (Diseases and pests of cultivated plants in the Dutch East Indies in 1924). Meded. Inst. Plantenziekten, 67: 1-53. Buitenzorg, w. Java.

Agrotis ypsilon was recorded as a pest of potato in Dutch East Indies.

van Hall, C. J. J. 1926. Ziekten en plagen der cultuurgewassen in Nederlandsch-Indië in 1925. (Diseases and pests of cultivated plants in the Dutch East Indies in 1925). Meded. Inst. Plantenziekten, 70: 1-51. Buitenzorg, W. Java.

Agrotis ypsilon was recorded as a pest of potato and tobacco in the Dutch East Indies.

Venkatraman, T. V. 1954. A note of the possibility of *Agrotis ypsilon* Rott., migrating from plains to hills during summer months in parts of India. Indian J. Entomol. 16: 197-198.

The adults of *Agrotis ypsilon* are strong fliers and many are known to be migratory. Adult migration is probably important in determining the seasonal incidence and distribution of outbreaks of larvae.

Voûte, A. D. 1937. Die biologische bekampfung der insekten in Niederl. Indien. (The biological control of insects in the Netherlands Indies). Naturk, Tijdschr. Ned.-Ind. 97 (2): 28-34. Batavia.

The results of the importation of various parasites from Java into Celebes against *Agrotis ypsilon* on corn were uncertain.

Vul'fson, R. 1936. Pests and diseases of vegetables observed in 1935 in the Far East region. Sum. Rep. Sci. Res. Inst. Plant Prot. 1935: 152-153. Leningrad.

Agrotis ypsilon was recorded as a pest of beets. (No location given.)

Walkden, H. H. 1937. Noctuidae taken at a bait trap in Kansas. Ann. Entomol. Soc. Amer. 30 (2): 296-303.

Records of species taken, proportion of sexes, and seasonal flight records were noted. *Agrotis ypsilon* Rott. was one of the first species to be taken in the trap in the spring. It was also noted that *Agrotis ypsilon* was one of the five species which appeared in the trap for 11 consecutive years.

Walken, H. H. 1950. Cutworms, armyworms, and related species attacking cereal and forage crops in the central Great Plains. U. S. Dep. Agr. Circ. 849: 1-52.

Distribution, economic status, food plants, larval habits, seasonal history, reproductive capacity, and life cycle of *Agrotis ypsilon* are given. A life cycle table shows the number of days per instar. (15-16)

Walker, Francis. 1856. List of the specimens of lepidopterous insects of the British Museum. Part 10. Noctuidae: 309.

The author described the moth of *Agrotis ipsilon* as *Agrotis suffusa* in Latin.

Wallace, F. N., *et al*. 1928. Report of the Division of Entomology. 9th Annu. Rep. Dep. Conservation Indiana 1926-27: 23-71. Indianapolis.

Agrotis ypsilon was recorded as injuring corn and vegetable crops in Indiana.

Walsh, B. D. and C. V. Riley. 1869. Cutworms. Amer. Entomol. 1: 224.

"Answer to inquiry of N. C. Burch; ravages of *Agrotis telifera* (=*ypsilon*). It had attacked a peach sprout."

Walsh, B. D. and C. V. Riley. 1869. Cutworms severing cabbage plants. Amer. Entomol. 1: 205.

"Answer to inquiry of N. C. Burch; characters of larva of *Agrotis telifera* (=*ypsilon*)."

Walton, W. R. and J. J. Davis. 1920. Cutworms and their control in corn and other cereal crops. U. S. Dep. Agr. Farmers' Bull. 739: 1-7. Washington D. C.

This bulletin discusses the life history of cutworms and control of cutworms, including control by livestock and poison bait. The greasy cutworm, *Agrotis ypsilon*, and other cutworms were said to be similar.

Wang, Shi-ming and Chang-Zheng Wang. 1965. Tests on chemical control for eggs and larvae of cutworms. Acta. Phytophyl. Sin. 4 (3): 231-236. (In Chinese, Sum. in English)

Laboratory and field tests indicated that organophosphorus insecticides such as parathion and trichlorfon (Dipterex) are toxic to the eggs and larvae of *Agrotis ipsilon*. Mixing the two toxicants increased toxicity to the eggs.

Washburn, F. L. 1904. Injurious insects of 1904. Ninth Annu. Rep. State Entomol. Minn.: 13-190.

Cutworms may be controlled by trapping or poisoning. Larva and adult *Agrotis ypsilon* are figured. (77).

Waters, H. A. 1943. Rearing insects that attack plants. Amer. Assoc. Adv. Sci. Pub. 20: 3-28.

Instructions are given for rearing *Agrotis ypsilon* from egg to adult. (15-16)

Whelan, D. B. 1926. Cutworms. Market Growers J. 38: 85.

There are many different kinds of cutworms named from their appearance or because of their habits. Some of them are the variegated cutworm, glassy cutworm, greasy cutworm, spotted cutworm, etc.

White, G. F. 1923. Cutworm septicemia. J. Agr. Res. 26 (10): 487-496.

"This infection produced by puncture inoculation runs a course of from two to four days, the period depending very much upon the temperature. The most prominent symptoms of the experimentally produced disease are a lessened appetite and finally its failure, listlessness, a lack of turgidity of the body, a diarrhea, a thin discharge from the mouth, and death. The bacterial species occurring in the septicemia is demonstrated to be a short, actively motile bacillus to which the name *Bacillus noctuarum* is here given and used."

Wilkinson, D. S. 1930. A revision of the Indo-Australian species of the genus *Microplitis* (Hym. Bracon). Bull. Entomol. Res., 21 (1): 23-27. London.

This is a key to species of the genus *Microplitis*. The parasite *Microplitis similis* was reared from *Agrotis ypsilon* in India.

Williams, C. B. 1926. Further records of insect migration. Trans. Entomol. Soc. London 74 (2): 193-202.

Notes relating to migration in Lepidoptera and Odonata are given. The occurrence in Egypt of *Agrotis ipsilon* is discussed.

Williams, C. B. 1926. Records of migratory insects, chiefly from Africa. Bull. Soc. Roy. Entomol. Egypte 10: 224-256.

This is a collection of records of undirectional flights of insects (chiefly Lepidoptera) and other notes relating to migratory insects. Notes are given on *Agrotis ypsilon*.

Williams, C. B. 1937. Butterfly travelers. Nat. Geo. Mag. 71: 568-585.

A considerable amount of money was spent in trapping *Agrotis ypsilon* in Egypt before it was discovered that it was a regular migrant. All of the trapped moths would have left the country and laid their eggs in Europe.

Williams, J. L. 1942. Unorthodox and abnormal structures of Lepidoptera. Entomol. News 53 (4): 91-94.

An abnormal structure was found in female *A. ypsilon* reproductive tract which had one ovary consisting of four egg-tubes and the other having three.

Wilson, J. W. 1946. Biology and control of cutworms and armyworms in Florida. Fla. Agr. Exp. Sta. Annu. Rep. for 1946: 187.

The infestation of *Agrotis ypsilon* was very light during the spring growing season. In plots designed for testing poison baits, cutworms did not appear in sufficient numbers to yield results.

Wilson, J. W. and N. C. Hayslip. 1951. Insects attacking celery in Florida. Fla. Agr. Exp. Sta. Bull. 486: 1-37.

Agrotis ypsilon was especially destructive in celery seedbeds and to recently transplanted seedlings. Control measures include poison baits. (17-19)

Wilson, J. W. and E. G. Kelsheimer. 1955. Production of southern peas (cowpeas) in Florida (II. Insects and their control). Fla Agr. Exp. Sta. Bull. 557: 14-23.

Agrotis ypsilon was a pest of southern peas (cowpeas). Young plants were cut off near the surface. Controls included early season discing and poison baits. (21)

Wilson. J. W. and W. G. Genung. 1956. Insect problems in the production of southern peas (cowpeas). Fla. State Hort. Soc. Bull. 69: 217-223.

Agrotis ypsilon cut off young plants at or near the soil surface. Grass, weeds or cover crops should be worked into the soil at least 30 days prior to planting. Toxaphene or chlordane poison baits were suggested for control. (222-223)

Wiltshire, E. P. 1946. Studies in the geography of Lepidoptera. III. Some middle east migrants, their phenology and ecology. Trans. Roy. Entomol. Soc. London 96 (10): 163-182.

Records of eight migrants and two non-migrants show their appearance and absences on different types of biotope during the calendar year. These include *Agrotis ypsilon.*

Winters, N. E. 1925. Manual para el cultivo del algodonero en la Republico Argentina. (A manual on cotton cultivation in Argentina.) Argentina Minist. Agr., Cir. 539: 1-78. Buenos Aires.

Agrotis ipsilon is dealt with as a pest of cotton.

Woo, F. C. 1935. Survey of the distribution and prevalence of cotton insects in China during the year 1934. Spec. Pub. Nat. Agr. Res. Bur. China 12: 1-34. Nanking.

Agrotis ypsilon and two other cutworms were present in Nanking. Cutworms injured 50-60% of seedling cotton in Kiangsu and 20-40% in Chekiang.

Woodhouse, E. J. and T. B. Fletcher. 1912. The caterpillar pest of the Mokameh Tal lands. Agr. J. India 7: 343-354.

Agrotis ypsilon passed its diapause on the plains and bred in the hills in parts of India.

Woodhouse, E. J. and H. L. Dutt. 1913. Further work against surface caterpillars at Mokameh in 1912. Agr. J. India 8 (4): 1-18. Calcutta.

An account is given of a campaign in which the Andrés-Mairés moth-traps were used on a large scale to check damage caused by *Agrotis ypsilon*.

Woodhouse, E. J. and H. L. Dutt. 1914. The campaign against surface caterpillar at Mokameh in 1913. Bihar and Orissa Agr. J. Patna, 2: 16-35.

This paper is a minutely detailed account of the operations and local conditions at Mokameh, India. Andrés-Mairés traps were used to control *Agrotis ypsilon*. Tables are given showing details of the catches in the traps from August to January.

Woroniecka-Siemaszko, J. 1928. Observations on the pests of cultivated plants in the surroundings of Pulawy and Lublin in 1928. Mem. Inst. Nat. Polon. Econ. Rur. Pulawy 9 (2): 555-573. Pulawy. (Sum. in English)

A list of 73 insect pests observed in eastern Poland in 1928 is given. *Agrotis ipsilon* was considered important on beet and potatoes.

Woroniecka-Siemaszko, J. 1929. *Agrotis ypsilon* Rott., jako szkodnik róslin uprawnych Polsce. (*Agrotis ipsilon* Hufn., as an agricultural pest in Poland.) Polskie Pismo Entomol., 7: 193-201 Lemberg, Poland.

An account is given of observations of *Agrotis ipsilon*. Seasonal distribution in the lab vs. in the field is discussed. A parasite, *Amicroplus collaris*, and a fungus, *Entomopthora megasperma*, attack *Agrotis ipsilon*.

Wressell, H. B. 1965. A resume of soil insect control studies in southwestern Ontario. Entomol. Soc. Amer., North Cent. Br. Proc. 20: 161.

Broadcast treatments of hydrocarbon insecticides gave excellent control of *Agrotis ipsilon*. Surface sprays followed by shallow harrowing were also very effective.

Wylie, W. D. and C. E. Palm. 1940. A method for production of cutworms in greenhouses. J. Econ. Entomol. 33 (3): 462-463.

Agrotis ypsilon moths were placed in battery jars partially filled with small sticks of wood and covered with muslin caps. Paper toweling on the bottom of the jars furnished desirable hiding quarters for the moths during the day. The eggs were deposited on the sticks and on the caps. The eggs were transferred to beds planted

to rape, turnips, or sweet clover. If it were necessary to use eggs deposited over a period of days, those deposited first were placed in a refrigerator and kept until all eggs were introduced in the beds at once. This procedure was adjustable to secure larvae of uniform size and thus reduce cannibalism to a minimum. Rape foliage cut daily was fed to the larvae after they consumed the plants growing in the rearing cages.

Wylie, W. D. Insect pests in the Everglades area. Fla. Agr. Exp. Sta. Annu. Rep. 1947: 203.

Several outbreaks of cutworms occurred in this area. *Agrotis ypsilon* and *Feltia subterranea* were the most injurious species.

Yamada, Y. 1918. Minami Manshu ni okeru Kansai no Gaichu. (Insects injurious to beet in South Manchuria.) Nojishikenji Iho. (Bull. of the Agr. Exp. Sta.) Koshurei, South Manchurian Railway Company, No. 4: 1-32.

Agrotis ypsilon burrows 1 or 2 inches into the ground near the root by day and attacks the leaf stalks at night. Plants may be protected by means of trenches in which pans containing petroleum are placed.

Yang Wen, Kuo Ching-Yang and Tseng-fang Yeh. 1965. Studies on the biology *Linnaemyia compta* (Fallen) (Diptera, Larvae voridae). Acta Entomol. Sin. 14 (5): 446-460. Peking. (In Chinese)

Linnaemyia compta is one of the most important natural enemies of *Agrotis ipsilon* in the west of Inner Mongolia, parasitizing 10.2 - 34.7% of first and second instar larvae. Details of development are described.

Yathom, S. 1966. Occurrence of migrant lepidoptera in the south of Israel in spring 1964. Israel J. Entomol. 1: 192.

In the second half of April, high populations of *Agrotis ypsilon* Rott., *Plusia gamma* L., and *Chloridea* spp. were attracted to lights in Beersheba.

Zacher, F. 1913. Die Afrikanischen Baumwollschädlinge (African cotton pests). Arbeit K. Biol. Anst. Land-und-Forst-Wirtschaft 9 (1): 121-230. Berlin.

Agrotis ipsilon was noted as a cotton pest in Africa damaging roots, leaves, bolts, and seeds.

Zacher, F. 1917. Notes on pests of tropical cultivated plants. No. 10. African tobacco pests. Tropenpflanzer 20 (4-6): 159-175, 207-222, 259-265.

Agrotis ypsilon was a tobacco pest in Africa.

Zaher, M. A. and M. A. Moussa. 1963. Effect of larval crowding on the cutworm, *Agrotis ypsilon* (Lepidoptera: Agrotidae). Bull. Soc. Entomol. Egypte 46: 365-372. Cairo.

Larvae reared under crowded conditions were darker in color, and required longer larval development. The preoviposition period of females derived from crowded larvae was prolonged and the number of eggs laid was reduced.

Zvierzomb-Zubovsky, E. 1918. Brief report on the work of the Don bureau for the control of pests of agricultural plants for 1917, and review of the pests of agriculture in the Don Province. Rostoff, 1918: 1-36. 10 figs.

Agrotis ypsilon was recorded as a pest of beets in the Don Province in southeast Russia.

Index

The index was prepared on the computer from keywords indicated on the index card file. Information may be retrieved by author's name (left-hand column) and date (right-hand column); by host plant, by geographical locality, and by subject, *i.e.*, larval description, life history, outbreak, distribution, etc.

BIGGER, CHLORINATED-HYDROCARBONS* BIGGE 56 1959
BIRKETT, MIGRATION ENGLAND* BIRKETT, MI 57 1957
BISHARA, EGYPT GEOGRAPHICAL-DISTRIBUTION 58 1932
BLAIR, LARVAL-KEYS* BLAIR, LARVAL-KEYS* 59 1968
BOWLES, PREDATORS HOST-RANGE PARASITES* 60 1880
BRAIN, COTTON SOUTH-AFRICA* BRAIN, COTT 61 1918
BRAZIL GEOGRAPHICAL-DISTRIBUTION GROUND- 44 1962
BRAZIL POTATOES* PINTO, BRAZIL POTATOES 371 1934
BRAZIL* MENEZES, VEGETABLES BRAZIL* ME 322 1954
BRETHERTON, MIGRATION REARING* BRETHERT 62 1969
BRITTON, CONTROL TOBACCO* BRITTON, CONT 64 1926
BRITTON, CHEMICAL-CONTROL TOBACCO* BRIT 63 1907
BRITTON, GOLF-GREEN* BRITTON, GOLF-GREE 65 1929
BROOKS, POISON-BAITS* BROOKS, POISON-BA 66 1947
BULGARIA HOST-RANGE ECONOMIC-IMPORTANCE* 344 1963
BULGARIA PASTURE* BURESCH, BULGARIA PAS 68 1914
BULGARIA SOIL-INSECTS* NIKOLOVA, BULGAR 345 1963
BULGARIA TEMPERATURE* NIKOLOVA, BULGARI 343 1961
BULGARIA* POPOV, OUTBREAK BULGARIA* PO 375 1963
BULLETIN* USDA, INSECT PEST SURVEY BULL 467 21-50
BULYGINSKAYA, CHEMOSTERILANTS* BULYGINS 67 1965
BURESCH, BULGARIA PASTURE* BURESCH, BUL 68 1914
BURMA POTATOES* GHOSH, BURMA POTATOES* 170 1931
BURMA TOBACCO* GHOSH, BURMA TOBACCO* G 169 1929
BURMA TOBACCO* STOCK, BURMA TOBACCO* S 448 1926
BURMA TOBACCO* GHOSH, BURMA TOBACCO* G 168 1924
BURT, HOST-RANGE* BURT, HOST-RANGE* BU 69 1918
BUTTLER, CHILE SYNONYMS TAXONOMY* BUTTL 70 1882
CABBAGE COTTON ECONOMIC-IMPORTANCE* KEN 259 1889
CABBAGE HOST-RANGE* RILEY, CABBAGE HOST 393 1884
CABBAGE LARVAL-BEHAVIOR* REID, CABBAGE 388 1957
CABBAGE,* BESSEY, CABBAGE,* BESSEY, CA 52 1871
CABBAGE* GIBSON, CANADA CABBAGE* GIBSO 174 1917
CABBAGE* GARMAN, CABBAGE* GARMAN, CABB 161 1904
CABBAGE* WALSH, CABBAGE* WALSH, CABBAG 480 1869
CABBAGE* SMITH, CABBAGE* SMITH, CABBAG 429 1938
CALORA, PHILIPPINES CHEMICAL-CONTROL* C 71 1968
CAN, CANADA PEST SURVEY* CAN, CANADA PE 72 23-71
CANADA ASPARAGUS* CHITTENDEN, CANADA AS 77 1898
CANADA CABBAGE* GIBSON, CANADA CABBAGE* 174 1917
CANADA CHLORINATED-HYDROCARBONS* BEGG, 50 1959
CANADA CHLORINATED-HYDROCARBONS ORGANIC- 51 1963
CANADA HOST-RANGE* GIBSON, CANADA HOST- 171 1911
CANADA HOST-RANGE* GIBSON, CANADA HOST- 172 1912
CANADA HOST-RANGE* GIBSON, CANADA HOST- 173 1915
CANADA HOST-RANGE* GORHAM, CANADA HOST- 177 1929
CANADA PEST SURVEY* CAN, CANADA PEST SU 72 23-71
CANADA POTATOES* HEWITT, CANADA POTATOE 226 1914
CANADA TURNIPS* HEWITT, CANADA TURNIPS* 227 1919
CANADA* GORHAM, POTATOES CANADA* GORHA 178 1930
CANADA* HARRIS, INSECTICIDAL-RESISTANCE 201 1962
CANNIBALISM* FRANKLIN, CANNIBALISM* FR 147 1924
CARBAMATES* BEGG, CANADA CHLORINATED-HY 51 1963
CARBAMATES* APPLE, ORGANIC-PHOSPHATES C 33 1967
CARROTS INDIA* FLETCHER, CARROTS INDIA* 139 1928
CAYROL, CHEMICAL-CONTROL POISON-BAITS* 73 1962

WHITE. BACILLUS-NOCTUARUM PATHOLOGY* WH	486	1923
WILKINSON. MICROPLITIS PARASITES* WILKI	487	1930
WILLIAMS. MIGRATION EGYPT* WILLIAMS. MI	488	1926
WILLIAMS. MIGRATORY-INSECTS AFRICA* WIL	489	1926
WILLIAMS. EGYPT MIGRATION* WILLIAMS. EG	490	1937
WILLIAMS. ABNORMALITIES* WILLIAMS. ABNO	491	1942
WILSON. CELERY* WILSON. CELERY* WILSON	493	1951
WILSON. COWPEAS* WILSON. COWPEAS* WILS	495	1956
WILSON. COWPEAS* WILSON. COWPEAS* WILS	494	1955
WILSON. POISON-BAITS* WILSON. POISON-BA	492	1946
WILTSHIRE. MIGRATION* WILTSHIRE. MIGRAT	496	1946
WINTERS. COTTON ARGENTINA* WINTERS. COT	497	1925
WOO. COTTON CHINA* WOO. COTTON CHINA*	498	1935
WOODHOUSE. INDIA DIAPAUSE* WOODHOUSE. I	499	1912
WOODHOUSE. INDIA BAIT-TRAPS* WOODHOUSE.	500	1913
WOODHOUSE. INDIA BAIT-TRAPS* WOODHOUSE.	501	1914
WORONIECKA-SIEMASZKO. POLAND BEET-POTATO	502	1928
WORONIECKA-SIEMASZKO. POLAND PARASITES P	503	1929
WRESSELL. INSECTICIDAL-EVALUATION* WRES	504	1965
WYLIE. EVERGLADES ECONOMIC-IMPORTANCE*	506	1946
WYLIE. REARING-TECHNIQUES GREENHOUSE* W	505	1940
YAMADA. BEET MANCHURIA* YAMADA. BEET MA	507	1918
YANG. MONGOLIA PARASITES* YANG. MONGOLI	508	1965
YATHOM. ISRAEL MIGRATION* YATHOM. ISRAE	509	1966
ZACHER. COTTON AFRICA* ZACHER. COTTON A	510	1913
ZACHER. TOBACCO AFRICA* ZACHER. TOBACCO	511	1917
ZAHER. EGYPT LARVAL-CROWDING* ZAHER. EG	512	1963
ZVIERZOMB-ZUBOVSKY. USSR BEETS* ZVIERZO	513	1918