



FIRST HOST REPORT OF EARHEAD WORM, *AUTOBA SILICULA* (SWINHÖE, 1897) ON MAIZE

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ABSTRACT

Earhead worm *Autoba silicula* (Swinhoe, 1897) (Lepidoptera: Erebidæ) is recorded for the first time in India on maize. Larvae were found feeding on maturing grains and silk, fully fed matured larvae pupates under a dome shaped or elongated galleries made of silk inside the cob. Roving survey conducted during 2019 and 2020 recorded on an average 0.40 and 0.45 larvae per plant, respectively, which is below the economic threshold. In the present study, information on species diagnosis with illustrations, occurrence, nature and symptoms of damage are provided.

Key words: *Autoba silicula*, Erebidæ, Lepidoptera, morphology, taxonomy, male genitalia, host plants, maize, cob silk, new record, distribution, occurrence, New Delhi, India

Maize (*Zea mays* L.) is one of the most important cereal crop in the world. Globally, Maize is known as a queen among cereals because of its highest productivity. In India, maize is one of the most important food crop after rice and wheat, cultivated in an area of 96.33 million hectares with a production of 258.99 million tonnes and productivity of 2.69 tonnes per hectare (Anonymous, 2017). It's a staple food for human being and also a quality feed for livestock. Maize is a basic raw material for thousands of industrial products that includes starch, alcoholic beverages, pharmaceutical, oil, protein, food sweeteners, cosmetic, gum, film, textile, package and paper industries etc. Among the insects infest on maize Stem borers, *Sesamia inferens* (Wlk.), *Chilo partellus* (Swinh.), are important insect pests in Delhi and recently, fall armyworm *Spodoptera frugiperda* (J E Smith) infestation is serious and considered as major pest. In 2019-20, we have observed a different lepidopteran larva not previously reported on maize were found feeding on silk and maturing grains. We have reared the larvae and identified morphologically as *Autoba silicula* (Swinhoe, 1897). *A. silicula* (Lepidoptera: Erebidæ) has been reported as a pest of pearl millet, *Pennisetum typhoides* (Burm.) (Kishore, 1996; Vinita et al., 2006); sorghum, *Sorghum vulgaris* (David and David, 1961; Ayyar, 1965; Fletcher, 1921; Hardas et al. (1979, 1980); Nayar et al. (1982), Taley et al. (1974); mango, *Mangifera indica*

L. (Nielsen et al., 1996; Butani, 1993); finger millet, *Eleusine coracana* (Gaertn.) (David, 1962) as earhead and flower feeding caterpillar. In this paper, *A. silicula* (Swinhoe, 1897) is recorded for the first time on maize from India. An account of occurrence, morphological identification with detailed photographic illustrations and symptoms of damage are also provided.

MATERIALS AND METHODS

In 2019-20, feeding of *A. silicula* was observed in maize fields. Maize cobs showing symptoms or presence of *A. silicula* larvae and pupae were placed in plastic bags and brought to the laboratory for further study. The geographical coordinates were taken and data related to the altitude was gathered. Roving survey was conducted to record the symptoms of damage, occurrence of larvae (*A. silicula*). Field collected larvae were reared on cob silk in plastic petri dishes (60 mm × 15 mm), when the mean atmosphere temperature was 15.4 °C and relative humidity was 61%. Cob silk were then replaced every alternate day, together with the absorbent paper lining on the bottom of the box. Fully fed larvae were kept in room temperature for pupation till the emergence of adults. These were then utilized for taxonomic identification. After morphological identification, the abdomen has been detached from specimen with help of forceps, and then placed in 10 per cent KOH for tissue digestion. After complete digestion of the tissue the

abdomen was transferred to cavity block with distilled water to remove traces of KOH solution from sample. Smooth brushing was done using camel hair brush to remove scale and hairs attached to abdomen. After that, the abdomen was transferred to watch glass containing 20 per cent alcohol and cleaned thoroughly. Then the abdomen is placed into the cavity block with 70 per cent alcohol for final clearing. Genitalia was pulled out of the abdomen carefully under stereo binocular microscope. In case of male genitalia, the aedeagus was carefully pulled with the help of forceps holding the valvae with another pair. In female genitalia the hypodermic syringe was used to remove extra material from corpus bursae by making small slit if necessary. The genitalia was placed in cavity block with absolute ethanol. The valvae was stretched apart carefully with the help of fine needle and forceps. Then the genitalia was placed over the clean microscope slide (wiped with 100 per cent ethanol and dried with tissue paper before use) and pure glycerine (98% glycerol) and air bubbles are removed carefully. Then the cover slip was placed upon the glass slide carefully covering the four sides (Robinson, 1976). Photographs were taken with a Leica DFC 425C digital camera attached to a Leica M205FA stereo zoom automontage microscope. The voucher specimens were deposited in the National Pusa Collection, Division of Entomology, ICAR-Indian Agricultural Research Institute, New Delhi, India.

RESULTS AND DISCUSSION

In 2019-20, *A. silicula* was first observed on maize crop during reproductive stage at IARI, Pusa campus, New Delhi (Fig. 1A). We have noticed the presence of many larvae and pupae on the host plant. The larvae of *A. silicula* were feeding on relatively mature grain, silk and some larvae and pupae remain hidden under a dome-shaped or elongated gallery formed from silken threads and cob silk (Fig. 1B-C).

Taxonomy

Family: Erebidae Leach, 1815

Subfamily: Boletobiinae

Autoba silicula (Swinhoe, 1897)

=*Eublemma silicula* Swinhoe, 1897: 167;

=*Autoba silicula saturata* Warren, 1913: 225;

=*Eublemma compsoprepes* Turner, 1945: 157.

Distribution: Andhra Pradesh, Bihar (Rao, 1920), New Delhi (Kishore and Jotwani, 1982; Taley et al., 1974), Maharashtra, Telangana.

Host Range: This insect previously recorded on

pearl millet, *Pennisetum typhoides* (Burm.) (Kishore, 1996; Vinita et al., 2006); sorghum, *Sorghum vulgaris* (David and David, 1961; Ayyar, 1965; Fletcher, 1921; Hardas et al. (1979, 1980); Nayar et al. (1982), Taley et al. (1974); mango, *Mangifera indica* L. (Nielsen et al., 1996), (Gardner, 1941); finger millet, *Eleusine coracana* (Gaertn.) (David, 1962); castor, sunflower, cotton, hibiscus, *Albizia lebbbeck*, *Alcearosea*, *Michelia champaca* (NBAIR, 2022).

Survey and population density: During roving survey, twenty plants at 10 randomly selected spots were selected and a total of 0.40 (2019: Nov-Dec) and 0.45 (2020: Nov-Dec) larvae per plant observed.

Material examined: India: 5♂, 9♀, New Delhi: Pusa campus, IARI, 28°25'12"N, 77°07'12"E, 228.61m, 5.xii.2019, net sweep, Coll. Ramaiah M.

Mature larvae: The larvae were initially greenish coloured with brown sclerotized head and later turn into brown yellow colour having numerous hairs and white dots along the lateral sides (Fig. 1A). The pupa was brown in colour and covered with silken webbing threads, made by fully grown larvae (Fig. 1B).

Adult: Wingspan 8.0-9.5 mm, moth pale brown, costa of forewings fading to white, with some dark markings. Wings with rusty brown transverse line. Forewings have a wave-shaped margin (Fig. 2A-B).

Male genitalia: Uncus long, slender, sclerotized, slightly broadened medially and highly sclerotized, hooked apically; socius atrophied; tegumen uniform width, sclerotized marginally, rounded apically; gnatha and gnathal hooks are not prominent; valva membranous broader at base and slightly tapering to apex, valva with spinose valval lobe; costa narrow, rounded apically and median costa slightly bulged outer; transtilla membranous, narrow at both end and wider at the centre; juxta very prominent and slightly sclerotized; sacculus at base of valva, slightly sclerotized but not touching costal margin; saccus poorly developed; vinculum membranous and well developed; aedeagus long, tubular, sclerotized basally and medially with rounded, membranous apex provided elongated with linear deciduous cornutus (Fig. 2C-E).

Female genitalia: Anal papillae well developed, setosed, sclerotized; anterior apophyses longer than posterior apophyses; lamella ante-vaginalis large, slightly sclerotized, proximal membrane allows ventral movement; lamella post vaginalis slightly

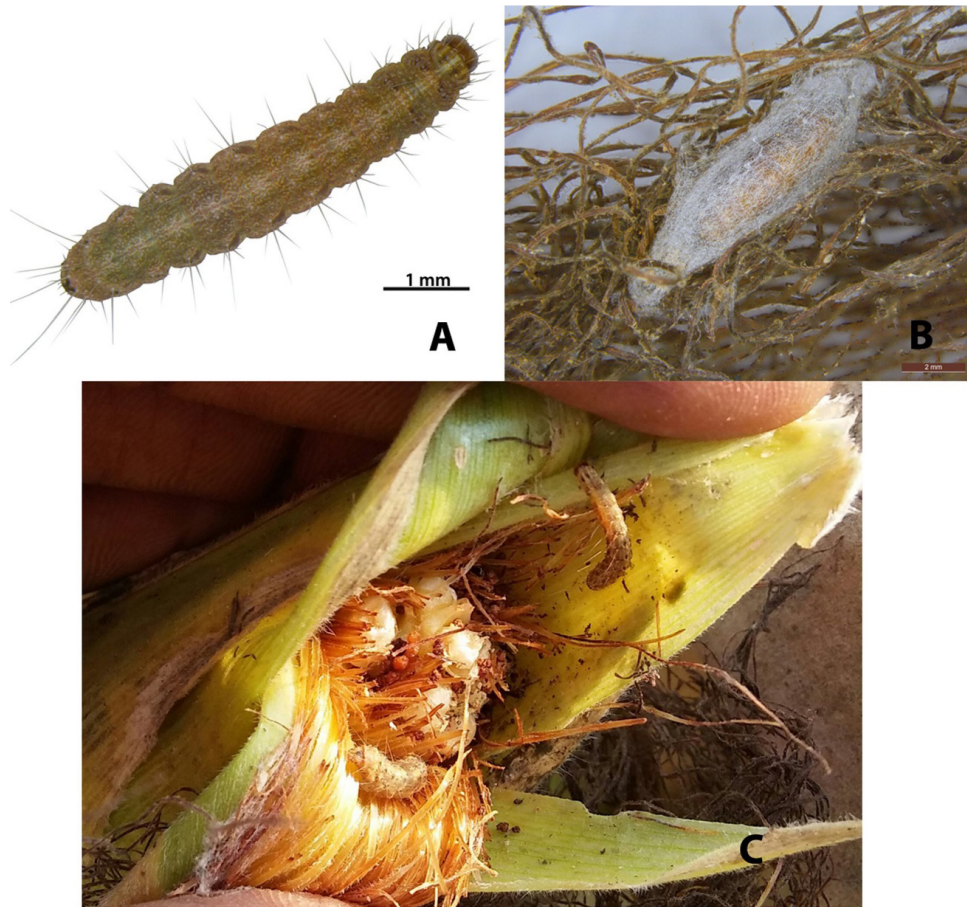


Fig. 1. *Autoba silicula* (Swinhoe, 1897) stages and infestation in the maize field:
A: matured larvae, B: pupation inside silk, C: nature and symptoms of damage

sclerotized; ostium bursae small, sclerotized, cup-shaped lobe; ductus bursae long, tubular, curved, uniformly sclerotized. Corpus bursae semiovate, signum with pair of different sized sclerotized stripes. Bulla seminalis well developed and membranous (Fig. 2F).

Diagnosis: This species looks similar in forewing pattern to *Eublemma guiera* and *E. gayneri* (Roths.) and tentatively placed next to that species. These three species, however, readily distinguished by their size and differences in color of the forewings.

Discussion: In the present study occurrence of *A. silicula* was recorded on maize in New Delhi. During 2019 and 2020, an average of 0.4 and 0.45 larvae per plant recorded by roving survey, respectively. The insect pest was identified as earhead worm, *Autoba silicula*. The larvae feeding on relatively mature grain, silk and some larvae and pupae remain hidden under a dome-shaped or elongated gallery formed from silken threads and cob silk. *A. silicula* larvae have been observed feeding on several plant species (David and

David, 1961; Ayyar, 1965; Fletcher, 1921; Hardas et al. (1979, 1980); Nayar et al. (1982), Taley et al. (1974); Nielsen et al. (1996); Gardner, 1941; David, 1962). In New Delhi, this species was observed feeding on developing grains of sorghum (Kishore and Jotwani, 1982) as well as serious outbreak (2 to 6 per ear head) was observed on pearl millet by feeding on maturing grains and concealed themselves under a small dome shaped or elongated gallery made of anther and silk (Kishore, 1996; Vinita et al., 2006). In past, this pest was not reported on maize and till date, there is no authentic taxonomy information, detailed description and illustrations are available this species. Our knowledge about the pest status of many maize insect pests and their economic injury level is still incomplete. Information on important taxonomic characters of the larvae and adult is limited. In India, recently invaded fall armyworm, *Spodoptera frugiperda* changed the insect pest's scenario in maize crop, so careful monitoring and timely reporting of changing pest status is necessary to avoid any future outbreak.

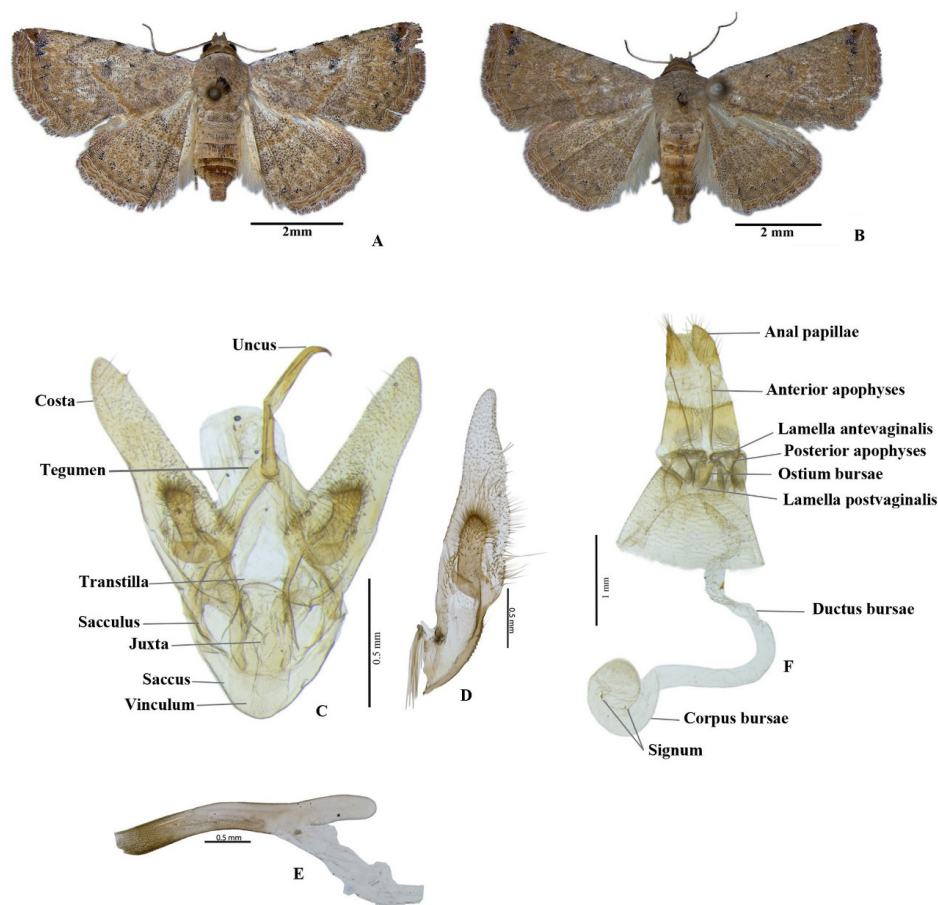


Fig. 2. Habitus and genitalia of *Autoba silicula* (Swinhoe, 1897): A: adult male (dorsal view), B: adult female (dorsal view), C-E: male genitalia, F: female genitalia

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AUTHOR CONTRIBUTION STATEMENT

MR first observed the pest; collected specimens, made biological observations, preparation of the manuscript; SN collected specimens, prepared plate, gathered biological data; NMM identified the insect, made observations; BSN writing up of the manuscript; SPR Planning, guiding the MR and manuscript grammar editing, correction and formatting.

CONFLICT OF INTEREST

No conflict of interest.

REFERENCES

- Anonymous. 2017. Area, production and productivity. Ministry of Agriculture and Farmers Welfare, Website: <http://www.Indiastat.com>.
- Ayyar T V R. 1965. Earhead worms. Handbook of economic entomology for South India (Revised). The controller of stationery and printing, Madras. 169 p.
- Butani D K 1993. Mango: Pest Problems. Delhi, India: Periodical Expert Book Agency 290 pp.
- David B V, David S K. 1961. Lepidopterous larvae injurious to sorghum earheads. Madras Agricultural Journal 48: 93-97.
- Fletcher T B 1921. Annotated list of Indian crop pests. Bulletin no.100. Calcutta, India: Imperial Agricultural Research Institute, Pusa. 246 pp.
- Hardas M G, Bhagawat V R, Sharnagat B K 1979-80. Influence of associate cropping system on the incidence of sorghum pest complex. Nagpur Agricultural College Magazine 51 -52, 19-27.
- Jotwani M G. 1982. Estimation of avoidable losses caused by the earhead caterpillars on sorghum and their control. Entomon 7(1): 65-69.

- Kishore P. 1996. Changing pest status of earhead caterpillar, *Eublemma silicula* Swinh. on pearl millet, *Pennisetum typhoides* (Burm.), Journal of Entomological Research 20(3): 277-279.
- Nayar K K, Ananthakrishnan T N, David B V. 1982. General and applied entomology. New Delhi, India: Tata McGraw-Hill. 589 pp.
- Nielsen E S, Edwards E D, Rangsi T V. 1996. Checklist of the Lepidoptera of Australia. Monographs on Australian Lepidoptera. Volume 4. Melbourne, Australia: CSIRO Australia, 529 pp.
- Rao Y R. 1920. *Eublemma silicula* Swinhoe. Proceedings of Third Entomological Meeting 1:72.
- Robinson G S. 1976. The preparation of slides of Lepidoptera genitalia with special reference to the Microlepidoptera. Entomologist's gazette 27(2): 127-132.
- Swinhoe C. 1885. On the Lepidoptera of Bombay and the Deccan. Heterocera. Proceedings of the Zoological Society of London 1885 (2): 287-307.
- Taley Y M, Dongardeo M L, Sharnegat B K. 1974. Bionomics of sorghum earhead worms. Indian Journal of Entomology 36(2):151-152.
- Vinita M, Ganesh R, Kishore P. 2006. Monitoring of insect pest problems on pearl millet. Journal of Entomological Research 30(1): 33-34.

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