

Entomology

Field Evaluation of Fecundity, Longevity, and Oviposition Period of Millet Head Miner (Lepidoptera: Noctuidae) in Niger

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Introduction

Millet head miner, *Heliocheilus albipunctella* de Joannis, has been a major pest of pearl millet, *Pennisetum glaucum* (L.) R. Br., since its first recorded major outbreak in the Sahel during the drought years of 1972-74 (Vercambre 1978). Millet head miner often causes severe grain yield loss, as much as 81% in Niger, and reduces millet grain quality (Guevremont 1982).

In a review of millet head miner biology, its natural enemies, and a descriptive biological control research approach, Gilstrap et al. (1995) concluded that a cohesive management strategy was not available for millet insect pests. Therefore, the objective of this research was to determine factors regulating development and abundance to improve understanding of millet head miner biology as a part of a larger research effort to assess the impact of natural enemies on millet head miner abundance.

Materials and methods

Research was conducted at the the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) Sahelian Center at Sadore, 45 km southeast of Niamey, Niger. Seed of 3/4 HK (an early maturing pearl millet variety) was sown in the field on 6 and 21 Jun and 7 Jul 1996, and 23 Jun and 4 and 16 Jul 1997. Sowing dates were varied so relationships between millet head miner development and growth of pearl millet could be observed throughout the growing season. Each plot of millet consisted of 35 rows, 25 m long and 0.75 m apart. Hills in each row were 1 m apart After emergence, plants were thinned to three per hill to assure uniform plant growth.

Exclusion cages were used to assess millet head miner adult fecundity, longevity, and oviposition period in the field. Cages were 70-90 cm long x 30 cm diameter and constructed from wire frames covered with fine cotton-mesh screen. Each cage was placed in the field over a panicle exserted 5-10 cm. Panicles were supported with strings attached to iron bars to prevent stalk breakage. A pair (1f:1m) of millet head miner adults from a laboratory colony was released into each cage at sundown to coincide with the time adults become active in the field. Daily, a dissecting microscope was used to examine cut panicles for eggs. The total number of eggs oviposited by each female during its life span was recorded. Longevity, fecundity, and length of oviposition in the cage were assessed by maintaining individuals until they died. Mean number of days for millet head miner pairs, longevity, female fecundity, and length of oviposition period were estimated on pearl millet panicles.

Table 1. Field longevity, fecundity, and oviposition period of millet head miner on enclosed panicles of pearl millet cultivation 3/4 HK, ICRISAT Sahelian Center, Sadore, Niger, 1996 and 1997.

Sowing date	No of pairs	Longevity (days)		Oviposition period (days)	Eggs laid female ⁻¹	Eggs laid day ⁻¹
		male	female			
6 Jun 96	5	3.8	4.0	2.4	29.6 (7-52) ¹	12.2
23 Jun 97	10	3.5	3.5	2.9	27.60 (7-50)	10.0
4 Jul 97	10	3.4	3.4	3.4	69.8 (13-106)	21.6
16 Jul 97	10	3.2	3.1	3.0	37.2 (4-88)	12.4
Mean	-	3.4	3.3	3.2	44.9	14.7

1. Numbers in parentheses represent the range of eggs oviposited during a female lifetime.

Results and discussion

Mean number of days millet head miner adult pairs lived and oviposition period are presented in Table 1. Also presented are the total number of eggs oviposited by each female during its life span in the exclusion cage. In 1996, mean numbers of days of adult longevity on the panicles were 3.8 for males and 4.0 for females. In 1997, mean numbers of days of adult longevity were 3.4 for males and 3.3 for females. For both years, millet head miners in exclusion cages survived between 2 and 6 days. This confirmed the conclusion reached by Ndoye (1992) that adults survived 5-6 days in nature or in closed cages. For both years, the female oviposition period was 1-4 days. Mean oviposition period for a female was 2.4 days in 1996 and 3.1 days in 1997. The longest oviposition period of 3.4 days per female was recorded on pearl millet sown on 4 Jul 1997, while the shortest oviposition period of 2.9 days was recorded on pearl millet sown on 23 Jun 1997. Mean number of eggs oviposited per female was 29.6. This mean is very low compared to the 400 eggs in batches of 20-50 reported by Gahukar (1984). In 1996, the total number of eggs oviposited by each female was between 7 and 52, while in 1997, the total number oviposited was between 4 and 106. In 1997, the number of eggs oviposited differed by sowing date. Ranges of 7-50, 13-106, and 4-88 eggs oviposited per female were recorded for the three sowing dates. Mean numbers of eggs oviposited per female were 29.6 in 1996 and 44.9 in 1997.

These data will be used to construct a stage-specific life table to gain an understanding of factors that regulate the biology and abundance of millet head miner. The life table can be used to develop an improved plan for managing millet head miner on pearl millet in West Africa.

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Impact of Natural Enemies on Abundance of Millet Head Miner (Lepidoptera: Noctuidae) in Niger

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Since its first major outbreak following the 1972 drought, millet head miner, *Heliocheilus albipunctella* de Joannis, has been the most serious insect pest of pearl millet, *Pennisetum glaucum* (L.) R. Br., in the Sahel (Vercambre 1978). Guevremont (1983) reported yield losses of 60%. Gilstrap et al. (1995) proposed that biological control might be effective but that indigenous natural enemies of millet head miner first needed to be assessed. The goal of this research was to use exclusion methodology to assess mortality, particularly impact and contributions of natural enemies, on abundance of millet head miner in the field.

Research was conducted in 0.5-ha plots at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) Sahelian Center, Sadore, Niger, and in farmers' fields at Daybon and Dogalkeina, 3 and 7 km from the ICRISAT Sahelian Center. Each week from emergence to maturity, 10 millet panicles in each plot were selected randomly, labeled with a number correlated to the date of emergence from the boot, and cut. Millet head miner eggs and larvae were collected from the panicles and counted. Parasites and predators were collected on panicles in the field by using aspirators,