



TO STUDY OF PRE-OVIPOSITOR, EGG STRUCTURE HATCHING AND INCUBATION PERIOD, OF *AUDINETIA SPINIDENS* FABR. (HETEROPTERA- PENTATOMIDAE)

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ABSTRACT

A pre-ovipositor period of 25 hrs, to 72 hrs, with an average of 50 hrs. Is required period to egg laying (Table-1) in the beginning of ovipositor, the female stands firmly on her slender legs and leans forward a little. Insects are a highly specialized group of invertebrates belonging to the largest animal phyla, the arthropoda, which comprises about 70% of the known species. Their tendency for life is amazing and their capacity for multiplication and wonderful adaptations has made them a serious threat to human existence. Among these insects, Heteroptera bugs pose a great problem to the farmers as they cause extensive loss to the valuable crops. *Audinetia spinidens* Fabr.(Heteroptera-Pentatomidae) is a sap sucking phytosuccivorous bug which infests berseem (*Trifolium alexandrinum*), maize (*Zea maize*), bajra (*Pennisetum glaucum*), jawar (*Sorghum vulgare*) and rice(*Oryza sativa*) crops in Saharanpur district and adjacent areas causing considerable loss in the yield Then the ovipositors touch the substratum and single egg takes about one minute for laying. Eggs are laid in group or batches. In a batch, eggs are attached with each other and to the substratum by a glued substance come out by accessory reproductive glands during ovipositor. Eggs are milky white in colour which becomes brownish and blackish on exposure to air. The length varies from 1 mm to 1.5mm with an average of 1.28mm and width varies from 1.0mm to 1.5mm with an average of 1.27mm (Table-2). The eggs are anteriorly closed by round disc-shaped operculum lifted by chitin us triradiate egg burster. Around the anterior margin there is a single circular row of small processes of micropyles. Egg chorionic is smooth. During embryonic development, the egg colour changes from milky white to yellowish, brownish and on maturity turn blackish .It varies according to temperature and humidity of the environment and ranges from 6 to 10 days with an average period of 7.5 days (Table-3).

Key words: Pre-ovipositor, Egg structure, hatching and Incubation period.

INTERODUCATION

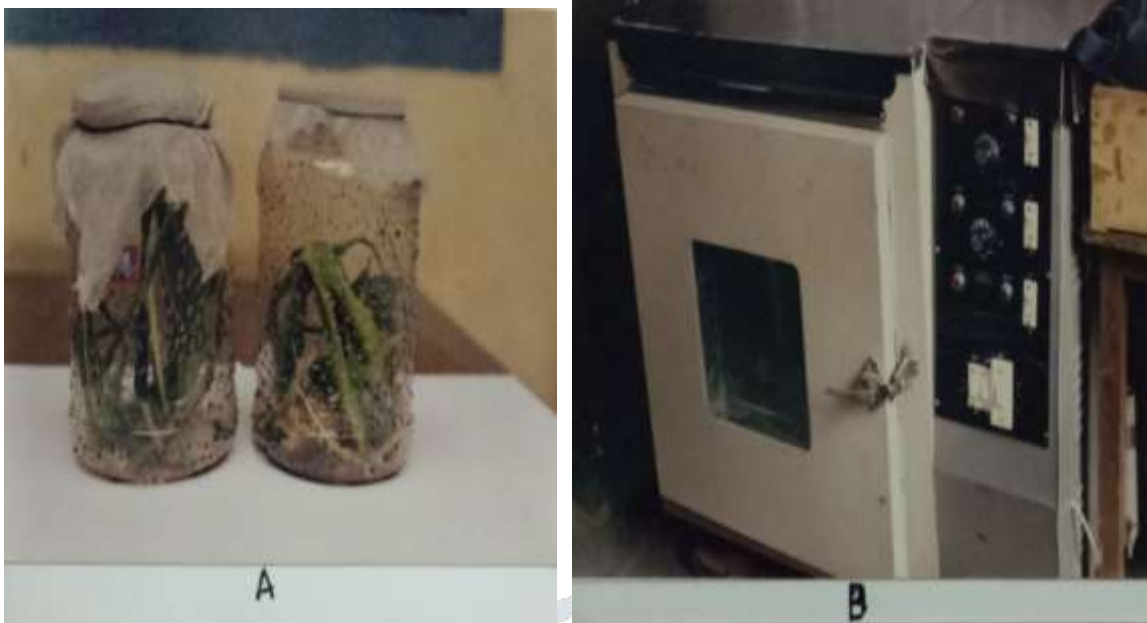
Maize is the major source of starch based industrial products in many parts of the world. Other industrial uses of maize include manufacture of distilled spirits for beverage purposes breakfast foods, maize oil and cattle feeds. Insects are a highly specialized group of invertebrates belonging to the largest animal phyla, the arthropoda, which comprises about 70% of the known species. Their tendency for life is amazing and their capacity for multiplication and wonderful adaptations has made them a serious threat to human existence. Among these insects, Heteroptera bugs pose a great problem to the farmers as they cause extensive loss to the valuable crops. **Audineta spinidens** Fabr.(Heteroptera- Pentatomidae) is a sap sucking phytosuccivorous bug which infests berseem (**Trifolium alexandrinum**), maize (**Zea maize**), bajra (Pennisetum glaucum), jawar (Sorghum vulgaris) and rice(Oryza sativa) crops in sharanpur district and adjacent areas causing considerable loss in the yield. Adults and nymphs of *A. spinidens* were collected by hand picking methods in polyethylene bags from the fields of host plants viz., bajra, barseem and maize plants. The nymphs were reared in hurricane glass lantern chimneys till their final moults. The newly emerged pairs were sorted out from the culture and kept separately for further rearing aforesaid chimneys. Wooden wire gauze cages and plastic containers were also used for rearing (Plate-4). Suitable amount of parts of food plant and water soaked cotton swab were also placed in these chimneys.

The incubation period, the first nymphal instar hatches out of the egg. It first thrusts the egg operculum by head, operculum separates off and then the nymph protrudes out its head first and then appendages, thorax and at last pulls out its abdomen from the egg. Transparent exuvium is left within the empty egg shell. It takes 2 to 5 minutes for hatching, average being 3.5 minutes. The duration of nymphal period varies from 29 to 41 days with an average of 36.2 days, depending upon temperature, R.H. and other climatic factors. The maximum time for first nymphal instar is 8 days and minimum is 5 days, with an average period of 6.5 days. The second instar requires 5 days as minimum and 9 days as maximum of 10 days are required for third instar to moult. The fourth instar requires 5 days as minimum and 9 days as maximum, with an average of 7.5 days.

MATERIALS AND METHODS

Field observations were mainly in district Saharanpur and adjacent areas. *A. spinidens* were collected from the field of maize, bajra and bar seem during active breeding period March to October by hand picking method. These were brought alive in laboratory along with spikes or ear head and leaves. In lab these were maintained in wooden wire gauze cages on daily supply of fresh food. Eggs were kept for transparency in acid for a week and then cleared in lacto phenol and mounted in Canada balsam. Nymphal stages were mounted in Canada balsam after dehydration in alcoholic series. For the study of mouth parts, antennae, rostrum and legs, these were first treated to 2% KOH, then washed in distilled water several times, dehydrated, stained in eosins and then mounted after clearing in clove oil.

Figures were drawn with the help of micrograph (graticule) on graph sheets. Measurements were also taken through ocular micrometer. Various experiments were carried out for Bio-ecology and life cycle and these are described in concerned chapters. Adults and nymphs of *A. spinidens* were collected by hand picking methods in polyethylene bags from the fields of host plants viz., bajra, barseem and maize plants. The nymphs were reared in hurricane glass lantern chimneys till their final moults. The newly emerged pairs were sorted out from the culture and kept separately for further rearing aforesaid chimneys. Wooden wire gauze cages and plastic containers were also used for rearing (Plate-4). Suitable amount of parts of food plant and water soaked cotton swab were also placed in these chimneys.



RESULTS

The pre-ovipositor period ranges from 25 hrs to 72 herewith an average of 50 hrs. Eggs are laid in group or batches. Female lays eggs on the leaf as well as on the inflorescence of the host plants. Number laid in a batch varies from 16-28 and during life 56-84 eggs with an average of 66 eggs. Eggs laid are not looked after. Single egg takes about one minute for laying. The newly laid eggs are milky white in colour which becomes brownish on exposed to air. The eggs are interiorly closed by round disc-shaped operculum lifted by chitin us triradiate egg burster. Around the anterior margin there is a single circular row of small processes of micropyles. Egg chorion is smooth. During embryonic development the egg colour changed from milky white to yellowish, brownish and on maturity turns blackish. The incubation period ranges from 6 to 10 days with an average of 7.5 days. Eggs laid in late November could not hatch and collapsed. During hatching the nymph protrudes out its head first and then appendages, thorax and at last pulls out abdomen from the egg. Transparent exuvium is left within the empty egg shell. The first instar nymph after hatching undergoes five moults before emerging into adults.

OVIPOSITION: - A pre ovipositor period of 25hrs, to 72hrs, with an average of 50 hrs. Is required prior to egg laying .In the beginning of ovipositor, the female stands firmly on her slender legs and leans forward a little. Then the ovipositors touch the substratum and single egg takes about one minute for laying. Eggs are laid in group or batches. In a batch, eggs are attached with each other and to the substratum by a glued substance come out by accessory reproductive glands during ovipositor .Female lays eggs on the leaf as well as on the inflorescence of the host plants. Number of eggs in a batch is 16 to 28.

EGG STRUCTURE: Eggs are milky white in colour which becomes brownish and blackish on exposure to air. The length varies from 1 mm to 1.5mm with an average of 1.28mm and width varies from 1.0mm to 1.5mm with an average of 1.27mm the eggs are anteriorly closed by round disc-shaped operculum lifted by chitinous triradiate egg burster. Egg chorine is smooth. During embryonic development, the egg colour changes from milky white to yellowish, brownish and on maturity turn blackish.

INCUBATION PERIOD: -It varies according to temperature and humidity of the environment and ranges from 6 to 10 days with an average period of 7.5 days During summer and rainy months (April-

August) it takes 6 to 8 days for hatching while during late summer months (September to October). It requires 8 to 10 days. No eggs are laid during winter months.

HATCHING:-After incubation period, the first nymphal instar hatches out of the egg. It first thrust the egg operculum by head, operculum separate off and then the nymph protrudes out its head first and then appendages, thorax and at last pulls out its abdomen from the egg. Transparent exuvium is left within the empty egg shell. It takes 2 to 5 minutes for hatching, average being 3.5 minutes.

DURATION OF NYMPHAL INSTARS: - The nymphs of *A. Spinidens* develop gradually and the nymphal period start soon after emergence. The first instars nymph, after hatching, undergoes five moults before emerging into adults. The duration of nymphal period varies from 29 to 41 days with an average of 36.2 days, depending upon temperature, R.H. and other climatic factors. The maximum time for first nymphal instar is 8 days and minimum is 5 days, with an average period of 6.5 days. The second instar requires 5 days as minimum and 9 days as maximum of 10 days are required for third instar to moult. The fourth instar requires 5 days as minimum and 9 days as maximum, with an average of 7.5 days. The fifth instar takes 6 days as minimum and 9 days as maximum period with 8.5 days as an average period.

Table – 1

AVERAGE PRE-OVIPOSITOR PERIOD OF *A. spinidens* (IN LABORATORY)

Copulation Finished		ovipositor started		Pre ovipositor period in Hrs.	Avg. Temp.	Avg. R.H.
Date	Time	Date	Time			
20.4.98	9.00 AM	21.4.98	10.00 AM	25	24.30	69.70
27.4.98	6.00 PM	29.4.98	6.00 AM	36	24.50	69.80
15.5.98	7.00 AM	18.5.98	5.00 AM	70	25.20	70.20
28.5.98	11.00 AM	30.5.98	11.00 AM	48	26.30	71.30
10.6.98	2.00 PM	12.6.98	10.00 PM	56	31.10	70.40
19.5.98	9.00 AM	21.6.98	10.00 PM	63	30.20	69.80
5.7.98	6.00 AM	6.7.98	2.00 PM	32	29.90	75.10
25.7.98	8.00 AM	27.7.98	12.00	52	28.30	74.00
2.8.98	3.00 PM	4.8.98	Noon	46	26.10	80.30
21.8.98	2.00 PM	24.8.98	1.00 PM 2.00 PM	72	85.40	85.40

(Average pre copulation period = 50 Hrs.) Min. = 25 Hrs. Max. = 72 Hrs

Table – 2**AVERAGE NUMBER OF EGGS LAID BY FEMALE DURING HER LIFE SPAN.**

Months	Number of days			Total eggs
	3-10	16-24	22-33	
March to April	19	16	21	56
May to June	19	21	23	86
July to August	28	27	28	83
September to October	20	18	24	62
November to February – Hibernation in adult stage.				

Average no. of eggs lay by female = 66 hrs. Min. = 56 hrs. Max. = 83 hrs.

Table – 3**OBSERVATION OF EGGS COLOUR CHANGE OF *A. spinidens*.**

Days	Change in colour
First day	Milky, transparent, moistened & sticky
Second day	Milky, yellow wit dry ext. surface
Third day	Light yellow
Fourth day	Dark yellowish
Fifth day	Brownish yellow
Sixth day	Dark brown
Seventh day	blackish

TABLE – 4 EGGS MEASUREMENT IN (IN MM.) OF *A. spinidens*.

Serial number of eggs	Length	Width
1	1.20	1.26
2	1.12	1.36
3	1.43	1.46
4	1.23	1.20
5	1.32	1.34
6	1.16	1.18
7	1.28	1.24
8	1.12	1.10
9	1.26	1.20
10	1.34	1.24
11	1.38	1.32
12	1.16	1.12
13	1.42	1.40
14	1.50	1.46
15	1.38	1.36
16	1.21	1.18
17	1.32	1.30
18	1.42	1.44
19	1.25	1.22
20	1.22	1.20

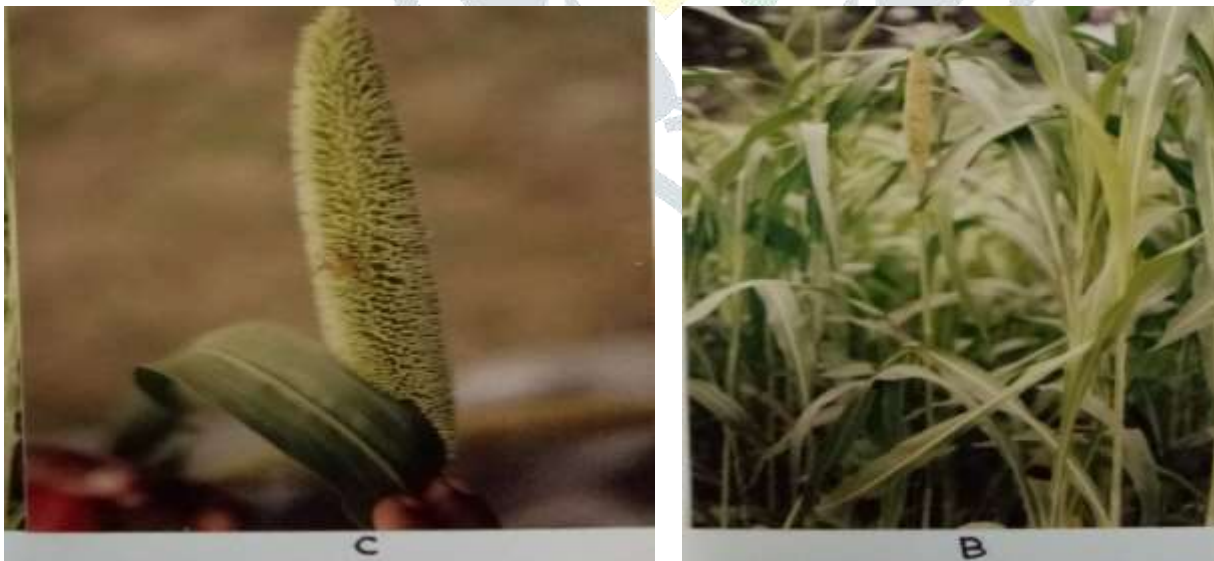
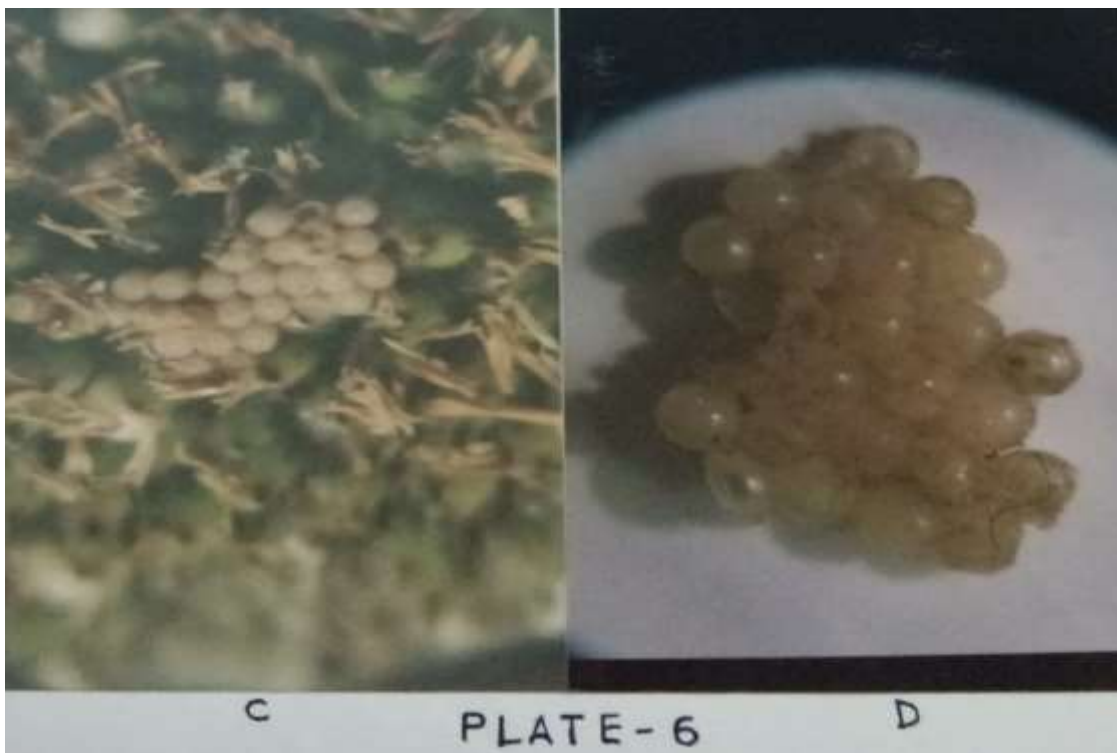
Average length of 20 eggs = 1.28 Average width of 20 eggs = 1.27

TABLE – 5 OBSERVATIONS ON INCUBATION PERIOD OF *A. spinidens*

No. of Observation	Date of egg laying	Date of Hatching	Incubation period in days (Breeding period)	Temp in °C	R.H. In%
1	5.3.98	11.3.98	6	23.40	62.50
2	4.4.98	11.4.98	7	30.10	40.20
3	25.4.98	1.5.98	6	31.20	45.20
4	12.5.98	19.5.98	7	33.30	40.30
5	2.6.98	9.6.98	7	30.10	75.10
6	21.6.98	28.6.98	7	31.40	72.20
7	12.7.98	21.7.98	8	29.40	79.20
8	5.8.98	13.8.98	8	30.70	80.30
9	20.8.98	28.8.98	8	30.60	83.40
10	10.9.98	18.9.98	8	29.70	86.30
11	3.10.98	13.10.98	10	25.30	77.20
12	4.3.99	10.3.98	6	18.40	73.20
13	21.3.99	27.3.98	6	19.30	71.40
14	14.4.99	21.4.98	7	26.30	46.30
15	5.5.99	13.5.99	8	31.40	38.30
16	23.5.99	30.5.99	7	30.10	39.70

17	10.6.99	18.6.99	8	32.10	80.30
18	1.7.99	9.7.99	8	28.70	78.40
19	21.7.99	29.7.99	8	32.30	74.50
20	6.8.99	15.8.99	9	31.10	80.40

Average incubation period of 100 eggs = 7.5 days Min. = 6 days Max. = 10 days



A. Maize crop (*Zea mays*), a host plant of *A. spinidens*. B. Close view of the maize crop.

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