IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Studies On The Oviposition And Egg Structure Of *Diaeretiella Rapae* (M'INTOSH), A Parasitoid Of Mustard Aphid, *Lipaphis Erysimi* (Kalt.)

Indu and *S.C.Dhiman

Government Degree College, Nanauta Saharanpur (India)

***Entomology Research Lab. Deptt. of Zoology, M.S. College, Saharanpur -247001**

ABSTRACT

D. rapae is a primary parasitoid of mustard aphid, *L.erysimi* in India. Its oviposition and egg structure is described in this paper. Usually III, IV ,V and adult apterous aphids are preferred for oviposition. Egg is deposited generally in convex dorsal part of the abdomen, rarely in other parts of the host body. Usually one egg is deposited in one host. Slection of the host is made by moving sensory antennae. The rate of deposition is decreased with an increase in the number of successive oviposition. The egg is elongated with both ends equally rounded. The egg is slightly curved and measures 0.07 mm in length and 0.02 mm in width on an average. Hatching of egg occurs in the host body within 72 hrs. at 20°C and 70±5% R.H. The hatched larva is “C” shaped and creamy white.

Key words:- Oviposition, egg structure, *D. rapae, L. erysimi*, parasitoid, host.

INTRODUCTION

The crop pests mainly insects, mites and nematodes are the major limiting factors for increasing the productivity of crops and warranting crop protection measures. The indiscriminate use of synthetic organic pesticides for test control causing

environmental and health hazards. This leads to the evolutionary IPM strategy using alternate methods of pest management. The concept of biological control has been receiving priority in research development and training all over the world. Hence, biological control methods have the merit of reducing the use of toxic chemicals for plant protection. Biological control methods are eco friendly and cost effective. ***Diaeretiella rapae*** (“MINTOSH”) is an important biocontrol agent of mustard aphid, ***Lipaphis erysimi*** (Kalt.). It limits the population of the aphid upto some extent in nature. Various studies are made on this biocontrol agent (***D. rapae***) time to time by Deshraj and Lakhan Pal(1998),Dogra et, al., (2003), Dhiman and Singh (2002) and Dhiman(2005,2006). But its biology has been rarely described. Hence, in present paper its oviposition and egg structure is being described here.

MATERIAL AND METHODS

Adults of ***D. rapae*** were collected from mustard field by aspirator during peak season, February and March and brought alive in polythene bags in the lab, perforated by needle for arration. In the laboratory these were kept in hurricane glass lantern chimneys covered at top by fine muslin cloth. Thirty percent honey solution was kept in a small petridish as food and moist cotton swab for maintaining necessary R.H.. Healthy aphid population of ***L.erysimi*** was maintained on a caged potted mustard plant. The plants were irrigated and well mannered time to time whenever required. Thus, ready stock culture of both parasitoid and host aphid was maintained for experimental purpose for present studies.

In separate 5 chimneys healthy aphid infested twigs of mustard plant dipped in a water containing vial plugged by cotton wool were taken. In each such chimney, a mated female was released for ovipositing eggs in host aphid. The process was keenly observed by a hard lens (20x). After oviposition, the females were removed from the chimney and the aphids were dissected under the binocular microscope keeping the aphids in saline water (10%). The laid eggs of ***D. rapae*** were taken out from the aphid and mounted on a slide using a dehydration process. The eggs were also taken out from the mated gravid female ***D. rapae*** by dissecting them. Thus, laid and unlaid eggs both are studied under microscope and figures are drawn using graticule on a graph sheet.

RESULTS AND DISCUSSION

It was observed that before oviposition the female ***D. rapae*** needs host searching. This behaviour was described by Dhiman and Kumar (1987). The female use antennae in tapping the host. First, she touches the host aphid by antennae whether the host is suitable or not for oviposition. If the host is not suitable, she moves herself for suitable ones. During the host finding both the antennae remain erect parallel to the body and moves slowly.

After the selection of suitable host generally III, IV and V nymphs and adults apterous aphids, the female stands firmly on her legs and bends its abdomen anteriorly just beneath the thorax and reaches upto the head between the legs. With the help of muscles, the retractile ovipositor and ovipositor sheath are pushed forward rapidly and inserted within the abdomen or thorax of the host and the egg is deposited.

The point of oviposition in host aphid body is described in detail by Dhiman and Kumar (1986), but it has been seen mainly confined to abdomen cases of egg deposition in other parts of body such as head, antennae, legs, cornicle and cauda have also been noticed by Sekhar (1957) in ***Aphidius testaceipes***.

In ***D.rapae*** in such cases, the development could proceed only upto first larval stage, after which the larva died.Only the ova deposited in abdomen or posterior part of thorax completed the full development and produced the adult parasitoid. In most of the cases, the ovipositing female remained some distant away from the host and contacted it only with the ovipositor. During the oviposition, the anterior end of the flagellum of the antennae hold the host aphid body and her wings are held over the abdomen horizontally.

Generally, the female parasitoid finds her host aphids for egg deposition within a few minutes. Normally, so many failure attempts are done prior to an actual oviposition. The time taken for oviposition is about 40 to 80 seconds. In the opinion of Stary(1970), the length of oviposition can be influenced directly by the age of the female and the size of the host. Our observations also support his view.

After the deposition of eggs, the female contracts her ovipositor and ovipositor sheath from the host body immediately and replace the abdomen and wings in the normal position. After cleaning the ovipositor by cleaning comb of tibial extremity of posterior legs, she is again ready to oviposit the eggs into another host. During the exposure time, she deposits the egg in succession. This act is interrupted by a short interval of rest. It was observed that after one or two hours, the rate of oviposition decreases with an increase in the number of successive oviposition. This is perhaps due to exhaustion as well as less number of mature eggs present in the female. In the resting period the female sits quietly and walks slowly around the host colony or clean her ovipositor, body parts, keep her antennae vertical and moves slowly, wings remain in normal position. This phase of insect is termed as rest by Stary (1970). Few hours may lapse before the female parasitoid tries to oviposit again. In the second act she deposits a small number of eggs usually within longer intervals. After some time, she goes to hide for one or more hours. In field, She may hide in an appropriate site, usually on the under surface of the leaves. This period of inactivity is spent by her as a rest, as said above. Towards the end of oviposition the female exhibit indifference to the host, flying and walking to other place far from the host colonies. During the field studies, it was observed that the female begins oviposition in the early morning and late evening because, light and temperature reduces the fecundity. She avoid hot sun during oviposition and hide herself under the leaves of the mustard or other host plant of aphid.

The length of oviposition varies among the different species of aphidiid wasp from 0.02 to 3.00 minutes (Tremlay, 1964 and Das and Chakarbarti, 1986). In ***D. rapae*** it varies from 40-80 seconds with an average of 65 seconds. In ***D. rapae***, the point of oviposition was mainly noticed in dorsal part of the abdomen. Subba Rao and Sharma (1962) and Das and Chakarbarti (1986) also mentioned a high percentage of strike on abdomen in ***Trionyx indicus*** and ***K. aphidis***.

Structure of egg:- For the study at egg structure newly laid eggs from aphid body were taken out by dissection under binocular microscope and by taking

out mature eggs from the body of gravid female by dissecting them. The eggs are observed for detailed structure by making temporary glycerine mount as well as stained permanent mounts under high (10x45) as well as low(10x10) magnification power of compound microscope. Measurements are taken by using a micrometre. The fully matured egg is elongated with both ends equally rounded. Hence, immediately after ovulation it is not easy to distinguish the caudal end from the cephalic end. The egg is slightly curved and much wider in the middle. It is transluscent and consists of granular ooplasm with smaller yolky droplets. The egg chorion is smooth. No operculum is seen. The average length of the fully matured egg (based on measurements of 20 eggs) was 0.07mm and average width was 0.02mm. The range in length was from 0.069 to 0.074 and width 0.019 to 0.021mm.

After deposition, the egg begins to increase rapidly in size within the host aphid, so just prior to eclosion, the egg measures approximately 0.3 mm in length and 0.02 mm in width. This increase in size is due to elongation of the embryo and its trophic membrane.

After 24 hrs. of egg deposition, the embryo is clearly visible resting on one side of the egg and at this time segmentation is vaguely apparent. The cells of serosa (trophamnion) have started to expand and can be seen easily. After 48 hrs. of deposition, the head is most clearly differentiated being very much like to ultimate shape. The cells of serosa continue to increase in size and number.

Full development of first instar larva occurs within 72 hrs. At 20**°C** and 70± 5% R.H. Hatching from an egg occurs after 3 days by rupture of the cephalic end of egg chorion within the host aphid. The chitinized mandibles of the larva helps in rupturing the chorion and larva comes out in haemocoel of host aphid by making wriggling movement. Very soon of eclosion, the trophamnion cells were seen in large number and the adipose tissue of the host, ***L. erysimi*** changed from the characteristic composition to a mass of small globular particles.

The size and shape of the oviposited egg differs in various parasitoid wasp. Schlinger and Hall (1961) also reported the transluscent milky white egg similar to ***D. rapae,*** measuring 0.073 mm. in length and 0.027 mm. in width in ***Trionyx utilis*** but never observed eclosion behaviour.

ACKNOWLEDGMENT

The authors are extremely obliged to the Principal and Head of the Zoology Department, M.S. College, Saharanpur, for laboratory facilities and to the farmers Mr. Avtar Singh and Chhatar Singh for giving permission for the study of their mustard fields.

REFERENCES

Das, B.C. and Chakarbarti, S, 1986. Mating and oviposition of ***Kashmiria aphid*** (***Aphidiidae-Hymenoptera***).Proc. 2nd Nat. symp. Recent Trends Aphid Std. Modinagar (Editor S.P. Kurl), 103-117.

Desh Raj and Lakhan Pal, G.C. 1998. Efficiency of endo parasitoid ***Diaeretiella rapae*** (M"INTOSH) on aphid complex infesting rape seed in Himachal Pradesh (India). J.Ent. Res.**22**(3)245-251

Dhiman, S.C and Kumar, V.1986. Studies on the oviposition site of ***Diaeretiella rapae***, a parasitoid of ***Lipaphis erysimi*** (kalt.). Entomon, **11**, 247-250

Dhiman, S.C and Kumar, V.1987. Studies on the host selection and discrimination behaviour of ***Diaeretiella rapae*** (M'INTOSH), a parasitoid of ***Lipaphis erysimi*** (Kalt.). Entomon, **12,** 63-67

Dhiman, S.C. 2005. Feeding potential of ***Dieretiella rapae*** (M'INTOSH), a parasitoid of mustard aphid, ***Lipaphis erysimi*** (kalt.). J. Appl.Zool.Res. 16,(1), 39-40

Dhiman, S.C 2006. ***Diaeretiella rapae*** (M'INTOSH) (***Hymenoptera-Aphidiidae),*** a potential biocontrol agent of mustard aphid, ***Lipaphis erysimi*** (Kalt.).Adv. Ind. Ent, Productivity & Health Vol. II, page 101-109

Dhiman, S.C. and Singh S. 2002. Feeding and Migratory behaviour of ***Diaeretiella rapae*** (M'INTOSH), a parasitoid of mustard aphid, ***Lipaphis erysimi*** (kalt.). J.Appl. Zool. Res. **13** (2 and 3), 132-134

Dogra, L, Devi N. and Raj, D. 2003. Parasitization of mustard aphid ***Lipaphis erysimi*** (Kalt.) by ***Diaretiella rapae*** (M'INTOSH) in the mid Hill Zone of Himachal Pradesh (India). J.Ent.Res **27** (2), 145-149.

Schlinger, E.I and Hall, J.c. 1961. The Biology, Behaviour and Morphology of ***Trionyx utilis,*** an Internal Parasite of the alfa alfa aphid, ***Therioaphis maculata*** (***Hymenoptera-Braconidae-Aphidiidae).*** Ann. Ent. Soc. Amer. 54 , 34-45

Sekhar, P.S.1957. Mating, oviposition and discrimination of host by ***Aphidius testaceipes*** (Cresson) and ***Praon aguti*** Smith, primary parasitoid of aphids. Ann. Ent.Soc. Amer. 51, 1-7

Stray, P.1970. Biology of aphid parasites (***Hymenoptera-Aphidiidae***) with report on integrated control. Series Entomologica, Vol. 6, Dr.W.Junk, The Hague, 643pp.

Subba Rao and Sharma, B.R and Sharma, A.K.1962. Studies on the biology of ***Trionyx Indicus*** Suuba Rao & Sharma 1958, a parasitoid of ***Aphis gossypii*** Glover. Proc. Natl.Inst.India, Biol. Sci,**28,** 164-182

Tremblay, E.1964. Recerchi singi imenotteri parasite. I - Studio morphology Sul ***Lysipheiby fabarum*** (Marshall). Biol. Lab. Ent. Agri. Portici. 22, 1-119