Identification and Oviposition Response of *Sitophilus oryzae* (L.) (Coleoptera: Curculionidae: Dryophthorinae) on Various Food Grains

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Abstract: In this study weevils were collected from the local areas of Tandojam and its surroundings. While further identification was performed at the Laboratory of postgraduate student, Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University, Tandojam. The collected weevils from the local areas of Tandojam, were killed in a jar by applying potassium cyanide and were mounted through entomological pins on their right elytron. The specimens were also labeled, which contains information about the date of collection, name of collector, host of plant if was known. After that abdomen were separated and put at 10% potassium hydroxide for overnight at room temperature separately and were heavily sclerotized. The specimens were also heated for 10 minutes. In the next day these specimen were rushed in water for 5 minutes. During this experiment habitus images were taken with the help of camera fitted in microscope. The examination of gentile and other remaining parts were performed under the microscope for capturing of necessary images. For habitus images model of camera canon Power shot (sx510 HS) were utilized and for the gentile organ images USB camera fitted microscope 350k pixel (1) Kyowa Medilux (2) Labomed CSM2 20 to 40x were used. For the oviposition response on various grains, tested grains include; wheat, barley, oat, maize, gram, millet. A pair of newly emerged *Sitophilus oryzae* (Fabricius, 1775) from a laboratory colony was placed in plastic jars of 150 ml. There were 6 treatments, each treatment with 3 replications. Eggs were counted in each jar containing pair of weevils. Analysis was carried out through statistical software SXW 8.0, to categorize the preference of *Sitophilus oryzae*.

Keywords: Oviposition, Tando Jam, food grains, *Sitophilus oryzae*.

INTRODUCTION

Different external as well as internal structures such as lateral, dorsal and ventral features have been observed helpful to identify the *stiophilus* as the important member of weevils group [1]. It has been also reported that the internal as well as external structure showed identical features like as genital can be identified to observe their sex [1, 2]. To observe gentile structure mainly the techniques used dissecting microscopy performed [3]. It has been observed that the behavior of *Sitophilus ssp.* oviposition adaptation in male insect, while the pattern and result fitness of various ovipostion decision still are not clearly identified. It has been observed that the behavior has showed to emphasized the level of pollution effect on the distribution of eggs [5]. Because of poor knowledge about internal as well external features of oviposition and local population different procedure of weevil seed in *Stiphilus* genus, current research was performed to gain knowledge about this genus.

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MATERIALS AND METHODS

Collection Method

In this study collection of weevils were performed at local market of Tandojam.

Killing and Preservation of Weevils

The killed weevils were kept in jar that contain potassium cyanide and were mounted with the help of entomological pin on their right elytron. While specimens were also labeled, which contains information about the date of collection, name of collector, host of plant if known and locality were pinned below the specimen?

Identification Method

For the identification purpose specimen wise it is important to perform examination of male genitalia [6], for this purpose examination of genitalia identification method were performed with 10% potassium hydroxide prescribed by [7]. The abdomen part were separated and kept in 10% potassium hydroxide for overnight at room temperature and heavilysclerotized specimens

ISSN: 1814-8085 / E-ISSN: 1927-5129/17

were also heated for 10 minutes. In the next day these specimen were rushed in water for 5 minutes.

Observation Method

For study purpose habitus images were taken with the help of camera fitted in microscope. The examination of gentile and other remaining parts were performed under the microscope for capturing of necessary images.

Imaging Method

For habitus images model of camera canon Power shot (sx510 HS) were utilized and for the gentile organ images USB camera fitted microscope 350k pixel (1) Kyowa Medilux (2) Labomed CSM2 20 to 40x were used.

Oviposition Response on Various Grains

Food grains tested: wheat, barley, oat, maize, gram, millet

A pair of newly emerged *Sitophilus oryzae* (Linnaeus, 1763) from a laboratory colony was placed in plastic jars of 150 ml. There were 6 treatments (T_1Barlya, T_2 Gram, T_3, Maize, T_4 Millet, T_5, Oat, T_6 wheat) each treatment with 3 replications, 5 jars in each replication (15 jars in each treatment). Eggs were counted in each jar containing pair of weevil regularly. 50 grams of grain was placed in each jar. The experiment lasted from 3rd March to 15 June 2015, the temperature and humidity ranged 25ºC – 39 ºC and 25% rh – 60% rh respectively, about 50 grains were put in jars and the observations are as under Analysis was carried out through statistical software SXW 8.0, to categorize the preference of lesser grain borer.

RESULTS

Identification

At the completion of morphological sign of these granary weevils. Following are the results of different morphological characteristic which showed difference among male and female sexes of granary weevils, only can be differentiate by the help of stereos, optical implement microscope, thinner and electron longer in female sexes due to shape of body is highly curved in male sex. While in female electron is thinner and longer. The host named ommatidia having structure of eye compound have 108 male and 92 female. The olfactory sensillae antennas were longer in female as compared to male stomach that was flat, whereas the curved belly was observed in male sex. After the identification of this difference there were no need to prove the results observed by the genital observations and morphological structural investigation of the granary weevils were performed to observe the monitoring program with non-polluted procedures. The sexual connected pheromones desiccant, ovogenesis at modified atmospheres.

Sitophilus oryzae (L.)

Taxonomic Hierarchy

Order:	Coleoptera Linnaeus, 1758
Suborder:	Polyphaga Emery, 1886
Infraorder:	Cucujiformia Latreille, 1802
Superfamily:	Curculionoidea Latreille, 1802
Family:	Dryophthoridae Schönherr, 1825
Subfamily:	Rhynchophorinae Schönherr, 1833
Tribe:	Litosomini Lacordaire, 1865
Genus:	Sitophilus Schönherr, 1838
Species:	*oryzae*
Author:	Linnaeus
Year:	1763

Description

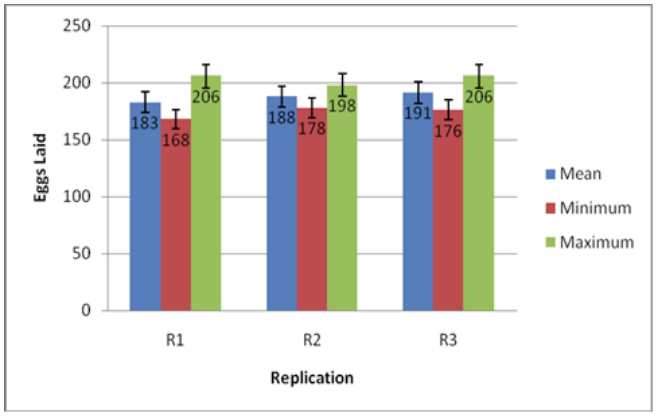
The *Sitophilus* groups of taxonomy was not clearly understood early, therefore the importance of much previous literature on the mentioned insects has been decreased, because of the problem of knowing the species which are referred. In the beginning, Linnaeus described it in 1798 as Curculio oryza. Later its group was changed by De Clairville and Scheltenburg in 1098 as Caladraorzae and its common genetic name is Sitophilus. Many workers subsequently recognized that two distinct forms of the species existed, which were described as the 'large' and 'small' forms. In 1855, Motschulsky recognized the large form as a distinct species, which he named *Sitophilus* zeama. Unfortunately, few workers recognized this revision and the name *Calandra oryzae* continued to be applied to all insects in this complex. This confused situation continued until 1959, when [3] revised the complex; this was followed by a further revision by [4]. In these revisions it was shown that Linnaeus originally described the smaller species and that Motschulsky's

description of the larger species was valid. Both species were therefore placed in the genus *Sitophilus* with the specific names proposed by Linnaeus and Motschulsky.

Egg Laying Behavior

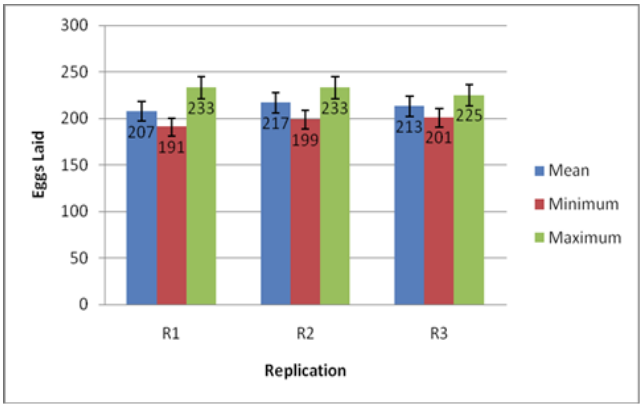
Egg laying response of *Sitophilus oryzae* (L.) on various food grains were checked under laboratory, from 3rd March to 15 June 2015, the temperature and humidity ranged 25ºC – 39ºC and 25% rh – 60% rh respectively, about 50 grains were put in jars and the observations are as under.

Egg laying behavior of *Sitophilus oryzae* (L) on wheat grains: R_1.mean182.80, range (168.00- 206.00); R_2.mean187.80, range (178.00- 198.00); R_3.mean191.40, range (176.00- 206.00). Details are presented in Graph **1**.



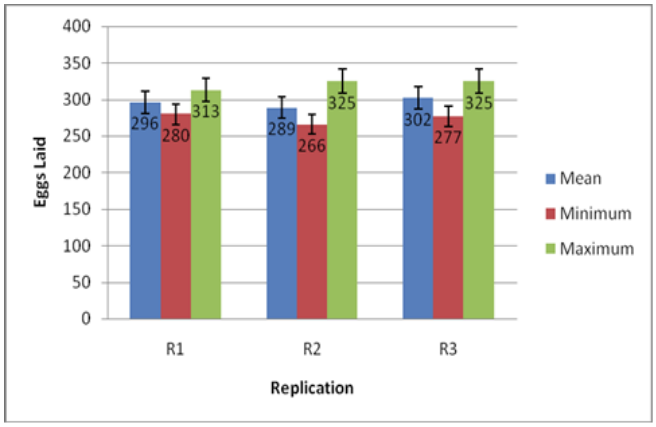
Graph 1: Egg laying behaviour of *Sitophilus oryzae* (L) on wheat grains.

Egg laying behavior of *Sitophilus oryzae* (L) on maize grains: R_1.mean207.40, range (191.00- 233.00); R_2.mean217.00, range (199.00- 233.00); R_3.mean213.00, range (201.00- 225.00). Details are presented in Graph **2**.



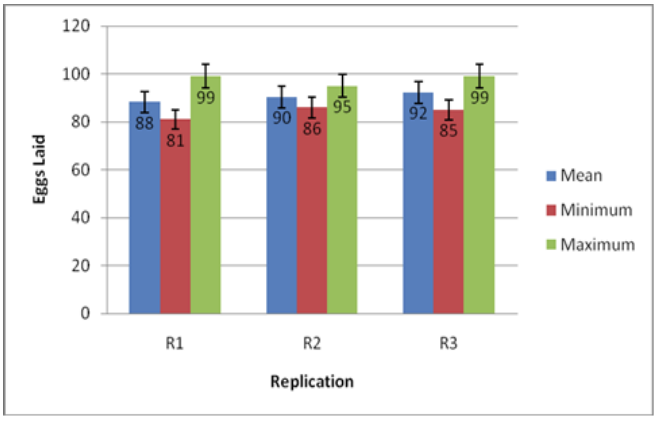
Graph 2: Egg laying behavior of *Sitophilus oryzae* (L) on maize grains.

Egg laying behavior of *Sitophilus oryzae* (L) on gram grains: R_1.mean296.20, range (280.00- 313.00); R_2.mean288.80, range (266.00- 325.00); R_3.mean302.20, range (277.00- 325.00). Details are presented in Graph **3**.



Graph 3: Egg laying behavior of *Sitophilus oryzae* (L) on gram grains.

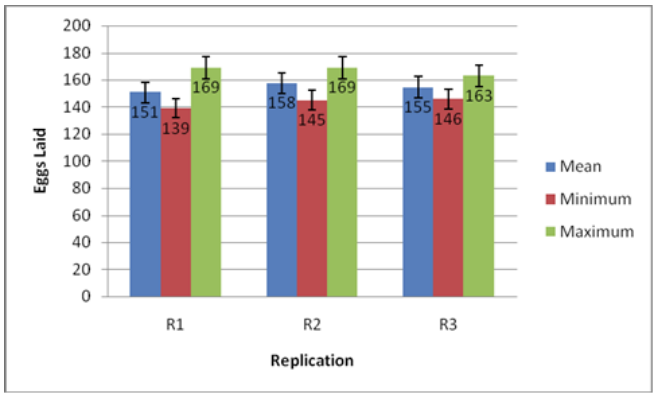
Egg laying behavior of *Sitophilus oryzae* (L) on millet grains: R_1.mean88.200, range (81.00 - 99.00); R_2.mean90.400, range (86.00 - 95.00); R_3.mean92.200, range (85.00 - 99.00). Details are presented in Graph **4**.



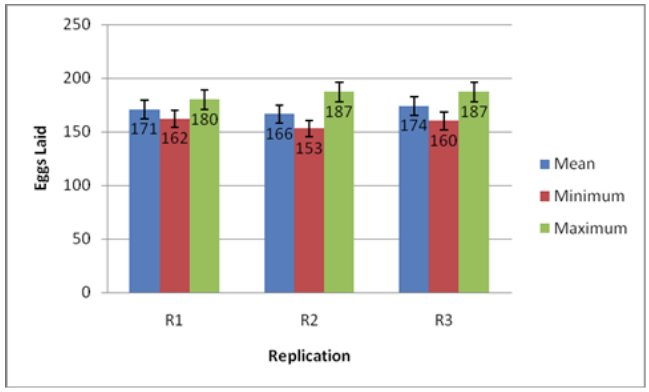
Graph 4: Egg laying behavior of *Sitophilus oryzae* (L) on millet grains.

Egg laying behavior of *Sitophilus oryzae* (L) on barley grains: R_1.mean150.80, range (139.00- 169.00); R_2.mean157.60, range (145.00- 169.00); R_3.mean154.60, range (146.00- 163.00). Details are presented in Graph **5**.

Egg laying behavior of *Sitophilus oryzae* (L) on oat grains: R_1.mean170.80, range (162.00- 180.00); R_2.mean166.40, range (153.00- 187.00); R_3.mean174.20, range (160.00 - 187.00). Details are presented in Graph **6**.

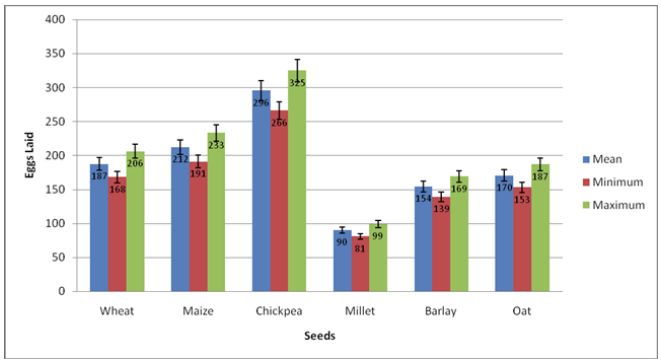


Graph 5: Egg laying behaviour of *Sitophilus oryzae* (L) on barlay grains.



Graph 6: Egg laying behavior of *Sitophilus oryzae* (L) on oat grains.

Overall maximum mean number of eggs 295.73 was recorded on Gram, maize ,212.47, wheat,187.33, oat,170.47barlay,154.33 millet,90.267. Details are presented in Graph **7**.



Graph 7: Egg laying behavior of *Sitophilus oryzae* (L) on various food grains.

DISCUSSION

The size difference between *S. oryzae* and *S. zeamais* is not consistent, so it is not possible to be sure that references to the large and small forms of *Calandra oryzae* refer to *S. zeamais* and *S. oryzae*, respectively. Therefore the only true and unconfused synonym of *S. oryzae* is *Calandra sasakii*; in pre-1960s literature, *C. oryzae* 'small' and 'large' forms could refer to either *S. zeamais* or *S. oryzae*, and it is also possible that some references to *'S. oryzae'* in the 1960s and early 1970s literature actually relate to *S. zeamais* misidentified by use of old keys.

Hollowed out the deposit of the eggs one by one, in the sides of the hole's mouth Females typically give up thy seed after the laying of one egg in the seed there is owing to the Females can lay eggs multiple by day, and lay a great multitude of eggs, the eggs to lay down Male S. *oryzae* were more likely to starve in a great manifold kernels of multiple eggs appear to be a descendant of the first increase in visits oviposition so it does not increase the number of eggs per visit.

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Received on 03-07-2017 Accepted on 07-07-2017 Published on 02-08-2017

https://doi.org/10.6000/1927-5129.2017.13.67