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Comparative Study on Fecundity of Solitary and Gregarious Phases of *Schistocerca gregaria* from Thar Desert, Pakistan

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Abstract: The adults of *Schistocerca gregaria* were captured from cultivated fields having Pearl millet (*Pennistum glaucum*), Cluster bean (*Syamopsis tetragonoloba*) and from wild grasses like snow bush (*Aerva javanica*), bekar grass (*Indigofera caerulea*), bhurat (*Cenchrus biflorus*). Comparative study on the fecundity rate of Solitary and Gregarious Phases of *Schistocerca gregaria* (Forskal) was carried out, from Thar Desert. Insects were reared under laboratory condition. It was noted that the female of *S. gregaria* lays 123.71±11.10 eggs in each egg pod in Solitarious phase, while 81.8±9.10 eggs per egg pod in gregarious phase. Moreover, it was noted that fecundity of Solitarious phase was high, although the population density was comparatively low than gregarious phase. Hopefully, this finding will be beneficial for the pest control agencies.

1. INTRDUCTION

The genus *Schistocerca* Stal is considered as largest and unique genus of Sub-family Cyrtacanthacridinae, containing nearly 36 species and 08 sub-species (Eades, *et al.,* 2016). Out of these only *Schistocerca gregaria* (Forskal) is found in Pakistan. The desert locust, *Schistocerca gregaria* (Forskal) is only single representative of old World of this genus and notorious pest of several crops throughout the world including Pakistan. It exhibit Solitary phase with lower population and gregarious phase with higher and disastrous population, which are different in physiology, morphology and behavior (Uvarov, 1977; Pener, 1991; Simpson, *et al.,* 1999). As for as the fecundity rate of desert locust is concerned, it vary from species to species. Locusts with high fecundity can cause damage to the agro-economy of the world including Thar (Samejo, *et al.,* 2016). Several authors i-e (Dirsh, 1965, 1974; Dirsh and Uvarov, 1953; Kumar and Usmani, 2012; Noris, 1962, 1963; Riffat, *et al*., 2012, 2013; Riffat and Wagan, 2010, 2011, 2015; Roffey and Popov, 1968; Simpson *et.al*., 1999; Song, 2004; Steedman, 1990; Sword, 1999; Uvarov, 1921a, 1921b, 1924, 1927, 1942, 1966, 1977) have carried out significant work on taxonomic, ecological and biological aspects of locusts and grasshoppers from different climatic regions.

But unfortunately none of them have provided detailed description about the fecundity rate of *Schistocerca gregaria* from this area. It was therefore felt necessary to conduct research on this aspect. Hopefully, data from this study will be beneficial for the pest control agencies in future.

2. MATERIAL AND METHOD

2.1. Collection and rearing

Present observation was carried during June 2014 to September 2015. The adults of *Schistocerca gregaria* were captured from cultivated fields having Pearl millet (*Pennistum glaucum*), Cluster bean (*Syamopsis tetragonoloba*) and from wild grasses like snow bush (*Aerva javanica*), bekar grass (*Indigofera caerulea*), bhurat (*Cenchrus biflorus*). The culture was maintained under laboratory conditions (25º- 23´N, 68º- 24´E).

2.2. Experimental procedure

Present study was carried out to note the comparative fecundity of *Schistocerca gregaria*. For this purpose specimens were kept in large wooden cages (1.5x1.5x2 ft) weaves with metal wire and the bottom of cages were filled with wet soil were kept at room temperature (27 ± 2^0C , 32 ± 2^0 C) with relative humidity (43±5% , 52±5%) leaves of different plants were served to adults. For observing the copulation phenomenon, 20 pairs were kept in rearing cages. After observing this, females were transferred to perforated plastic jars. Sometimes females of desert locust deposit eggs over surfaces instead of deep in wet soil, if they did not find any suitable soil for oviposition. She laid egg on bottom of jars.

2.3. Collection of egg pods

Beside the collection of egg's pods from the cages and jars maintained under laboratory condition majority of egg's pods were also collected from field.

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3. RESULTS

3.1. Solitary phase

The processes of fecundity in solitary phase of *Schistocerca gregaria* occur as like that of other locusts. It was began by inserting ovipositor (10–10.16 cm) deep in moist soil. The females of solitary phase oviposit an average of 123 eggs per pod. Oviposition activity was noted from the month of June to August during summer breeding. Present study showed that the females perform oviposition 2-3 times in their life span. The female takes (93 to 115 mints) for oviposition. The eggs were cylindrical in shape, reddish yellow in color when deposited. In some circumstance the female lays eggs without digging hole. The oviposition was observed during the dawn and dusk time.

3.2. Gregarious phase

This process was began by inserting ovipositor (9.7 – 10.01 cm) deep in moist soil. The females gregarious phase oviposit an average of 81 eggs per pod. Present study showed that the females perform oviposition 3 times entire life. The female took (60 to 83 mints) for oviposition. The eggs were cylindrical in shape reddish yellow in color when deposited after that they become brownish. The oviposition was observed during the day and night time.

4. DISCUSSION

Finding of mate in gregarious form mostly depends on the repeated encounters between the insects (Roffey and Popov, 1968). In the contrast, solitary populations live in very low density with the individuals scattered widely in areas. Present study reveals that fecundity of solitary phase of *S. gregaria* is higher than gregarious phase. Table-1 and Fig-1 discloses clear cut difference in fecundity of two phases. In this study it has been observed that female of *S. gregaria* lays average 123.71±11.10 eggs in each egg pod during solitary phase, while 81.8±9.10 eggs per egg pod during gregarious phase. Present study suggests that fecundity of solitary phase is high, although, population density is too low in comparison with population density of gregarious phase. At present we reported 107 and 139 eggs per pod with lower and higher numbers in solitary phase respectively. Similarly, (Ashall and Ellis, 1962) found the mean number of eggs in pods laid by wild solitary females to be as high as 95 and 128. In other field observation, solitary females in a low-density scattered population in Tamesna in Niger, laid egg between 90 and 146 eggs (mean of 123 egg/pod) (Popov, 1958).

Surprisingly, it has been noticed that the size of eggs in gregarious phase is larger than eggs of solitary which increases maturation process and on the other hand environmental factors favor process of fertility and synchronization of gregarious desert locust. Whenever condition becomes unfavorable, they migrate over long distances in search of favorable areas, and they perform copulation and oviposition in group in new areas where they are immigrated. Faster synchronization and favorable environmental conditions will not give more chance to mortality factors like desiccation of eggs, predation, scarcity of food etc. Normally fecundity of solitary desert locust is high; however their population is very low because fertility rate and synchronization is very low. Actually number of eggs per egg pod in solitary desert locust is very high, whereas size of eggs is smaller than that of gregarious one, consequently process of maturation become delay and our field observation suggest that biotic (predation, parasitism, utilization as food by human) and abiotic (desiccation of eggs, scarcity of food) environmental factor adversely affect the survivorship of these locust, while they pass through the immature stages lately.

The results showed that despite of high fecundity rate females of solitary locust cannot produce large number of progeny, while females of gregarious phase can produce large number of progeny by faster maturation and synchronization process, though fecundity rate is very low. This finding is guideline for the control planner how they recognize the gregarious and solitary phase.

Table-1 Showing fecundity of *Schistocerca gregaria*

Phase	Fecundity	
	Egg pods per female	No. of eggs per pod
Solitary	2.14±0.69	123.71±11.10
Gregarious	3.0±0.0	81.8±9.1

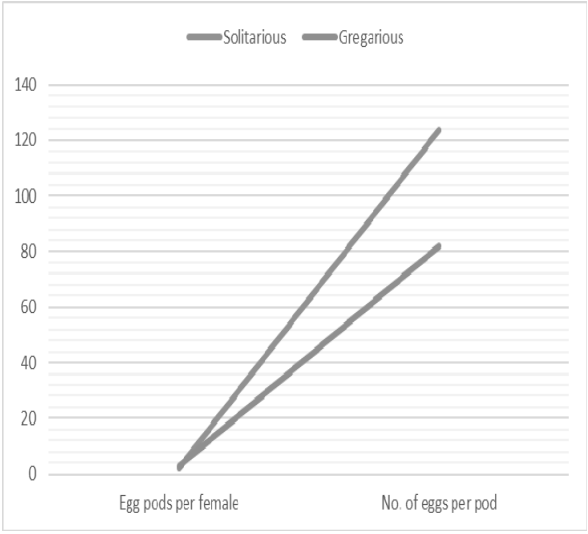


Fig-1. Showing the variation in the fecundity of solitary and gregarious Phases of *Schistocerca gregaria*

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