ISSN: 1989-6581

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Samejo *et al.* (2016)
ARQUIVOS ENTOMOLÓXICOS, **15**: 85-89

ARTIGO / ARTÍCULO / ARTICLE

Incidence of the desert locust *Schistocerca gregaria* (Forskål, 1775) (Cyrtacanthacridinae: Acrididae: Orthoptera) in the Thar Desert, Sindh (Pakistan).

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Abstract: The Thar Desert plays an important role in the agro-economy of the districts of Umerkot and Tharparkar (Pakistan). In this desert extensive surveys on the occurrence of the desert locust *Schistocerca gregaria* (Forskål, 1775) (Acrididae: Orthoptera) were carried out during the year from June 2014 to May 2015. 243 scattered individuals were captured in crop and non-crop fields indicating solitarious phase. The incidence of this destructive species along the summer monsoon season was high with 205 specimens (84%). But the collection of such a great number of individuals in solitarious phase may lead to the conversion into gregarious phase which is responsible for formation of swarms.
Key words: Orthoptera, Acrididae, *Schistocerca gregaria*, solitarious phase, incidence, summer monsoon season, Thar Desert, Pakistan.

Resumen: Incidencia de la langosta del desierto *Schistocerca gregaria* (Forskål, 1775) (Cyrtacanthacridinae: Acrididae: Orthoptera) en el desierto de Thar, Sindh (Pakistan). El desierto de Thar desempeña un importante papel en la agroeconomía de los distritos de Umerkot y Tharparkar (Pakistán). En este desierto se llevaron a cabo extensos estudios sobre la existencia de la langosta del desierto *Schistocerca gregaria* (Forskål, 1775) (Acrididae: Orthoptera) durante el año de junio de 2014 a mayo de 2015. Se capturaron 243 ejemplares dispersos en campos de cultivo y terrenos no cultivados, señal de estar en fase solitaria. La incidencia de esta destructiva especie a lo largo del monzón de verano fue alta, con 205 ejemplares y un 84%. Pero la captura de tan elevado número de individuos en fase solitaria puede ser indicio de la conversión a fase gregaria, que es la responsable de la formación de plaga.
Palabras clave: Orthoptera, Acrididae, *Schistocerca gregaria*, fase solitaria, incidencia, monzón de verano, desierto de Thar, Pakistán.

Recibido: *22 de diciembre de 2015* ***Publicado on-line:*** *9 de febrero de 2016*
Aceptado: *15 de enero de 2016*

Introduction

The desert locust *Schistocerca gregaria* (Forskål, 1775) (Cyrtacanthacridinae: Acrididae: Orthoptera) is the most dangerous and notorious locust pest because of swarming and invades 29 million km^2 in about 60 Afro-Asian countries (www.fao.org). It is a pest in vast areas of the old world from Mauritania in the west to India and its bordering areas with Pakistan in the east. Because of its polyphytophagous behaviour it feeds on more than 400 species of crop and non-crop plants (Uvarov, 1977). During recession period it remains in a solitarious phase and do not cause much more loss, but after outbreak it forms large swarms of adults or bands of hoppers which cause a plague that brings vast destruction to fields and consume about all vegetation. In West African countries harvest losses were valued about 2.5 billion US dollars due to the outbreak from 2003 to 2005 which supposed serious a threat (Shu'aibu *et al.*, 2013) and FAO invested 400 million dollars to fight this outbreak. Swarms of desert locust have been observed in different years in Pakistan. A desert locust in its first instar eats

about 20 mg of vegetation, in its fifth instar about 1.5 g and a mature adult up to 2 or 3 g, equal to its body weight. Solitarious phase of the desert locust change into gregarious phase due to a continuous 4 hours physical touching of their hind legs. When vegetation is consumed swarms migrate to other places, like in 1992, when vegetation was depleted and the swarm of *S. gregaria* migrated to deserts of Pakistan, Tharparkar and Chaulistan (Showler, 2013). They can migrate to distances about 5,000 km long. Total breeding area of *S. gregaria* in Pakistan is about 400,000 km^2. There are two breeding zones of desert locust in Pakistan: a winter-spring breeding zone which lies in areas of Baluchistan bordering with Iran and the summer monsoon breeding zone which lies in areas of Punjab and Sindh bordering with India. Various scholars, as Uvarov (1923, 1966, 1977), Joyee (1952), Dirsh (1974), Venkatesh (1975), Jago *et al.* (1979), Steedman (1990), Roessingh *et al.* (1993), Islam *et al.* (1994), Simpson *et al.* (1999), Sword (1999), Ibrahim *et al.* (2000), Song (2004), Van der Werf *et al.* (2005), Ely *et al.* (2011) and Riffat *et al.* (2013), and organizations as Anti-Locust Research Center, National Resource Institute, Locust Watch under WHO and Schistocerca Information Site have been doing studies on different aspects of the desert locust throughout the world due to the calamities caused by this destructive species, but the incidence of this notorious species is not recorded and studies are not carried out in Thar Desert, Sindh (Pakistan) even when huge crop in past years were destroyed.

Due to its polyphytophagous and swarming nature, the desert locust may bring calamity at any time in Thar Desert. We hope this paper to be a help to the knowledge in agriculture field and valuable for agencies dealing with agro-economy in Sindh.

Material and methods

Adult specimens of desert locust were collected by hand from crop and non-crop fields in Thar Desert during early morning because at dawn they are inactive, while during the warm part of the day they were captured by mean of a net after vigorous struggle due to their attentive nature to passersby in their surroundings. Specimens were brought to laboratory in plastic jar after each survey from June 2014 to May 2015.

Specimens were killed and preserved according to standard entomological methods. Collected specimens were chloroformed in laboratory; then some specimens were stretched in a stretching board for the study of morphological characters of taxonomic interest. After some hours, the dried specimens were removed from the stretching board. Pin was inserted on the right side of the median carina of pronotum of each specimen to preserve them for further study in wood boxes and napthol balls were placed for protecting them from ants and other destructive insects.

Specimens were identified by taking photographs and drawing lines of taxonomic parts under Stereoscopic Dissecting Binocular Microscope and their comparison with keys and description of taxonomic parts available from different literature and websites as http://www.orthoptera.org and http://www.schistocerca.org.

Results and discussion

During this study 243 specimens of *S. gregaria* (Figs. 1-4) were collected in different areas of the Thar Desert (Map I) and its incidence was recorded monthly throughout a year from June 2014 to May 2015. In the Table I is shown that desert locust was reported in large numbers in the months of August and September with 23.04 and 25.51% respectively during those surveys, while a very low number of specimen was reported in the months of January, February and March with 0.82, 1.23 and 0.82%, respectively. A possible reason could be the need of the locusts of a loose and wet soil for oviposition, which it's possible after monsoon rainshowers between the months of June and October. That's why the incidence of the desert locust is very high during summer breeding season. It is

reported in the Table II that 205 specimens (84.36%) were collected during the summer monsoon breeding season. This reveals that our study area, Thar Desert, is not favorable for the desert locust during winter and spring breeding season. Nayeem & Usmani (2012) while working on the taxonomy and field observation of grasshopper and locust fauna of Jharkhand, India, reported single male and single female of *S. gregaria* from shrubs and Riffat *et al.* (2013) reported only one specimen of desert locust from Thar Desert. In the present study we have collected a significant number of specimens. Mostly the specimens were sampled from herbs and shrubs as wheat, cotton, bajra, guar and watermelon crops. While surveying we found these specimens scattered, whereas during the warm part of the day they were hidden in grasses and shades of herbs and shrubs, flying when disturbed by activities of passersby. The coloration of the different developmental stages of this notorious species was also noted: nymphs were yellow and green in color and adults were rusty brown, sandy colored with lightest green shadow, and wheat colored and pale in color. Their coloration was seemingly related to surrounding environment in which they were collected like specimen collected from fresh and dense vegetation were sandy in color with lightest green shadow, while Steedman (1990) observed green color in solitarious immature and pale grey or beige and pale yellow in solitarious adults.

No swarm was observed during the present survey. These conditions show that desert locusts were in a solitarious phase. Because monsoon rains were not continuous, there was a long span between second and third rain spell and their eggs were desiccated due shortage of water in soil. If there is a continuous rainfall throughout the summer monsoon season, they would form swarm at any time. This present study recommends that an extensive survey should be taken every year during the summer monsoon that is the breeding season of the desert locust to prevent from transforming into swarm or gregarization, because once they become swarm the pest management authorities will not be able to control it without the use of aerial spraying.

Table I.- Monthly incidence of *S. gregaria* in Thar Desert during the year 2014-15.

Month	Collected spec.	%
June	13	5.34
July	39	16.04
August	56	23.04
September	62	25.51
October	35	14.40
November	11	4.52
December	8	3.29
January	2	0.82
February	3	1.23
March	2	0.82
April	5	2.05
May	7	2.88
TOTAL	243	100

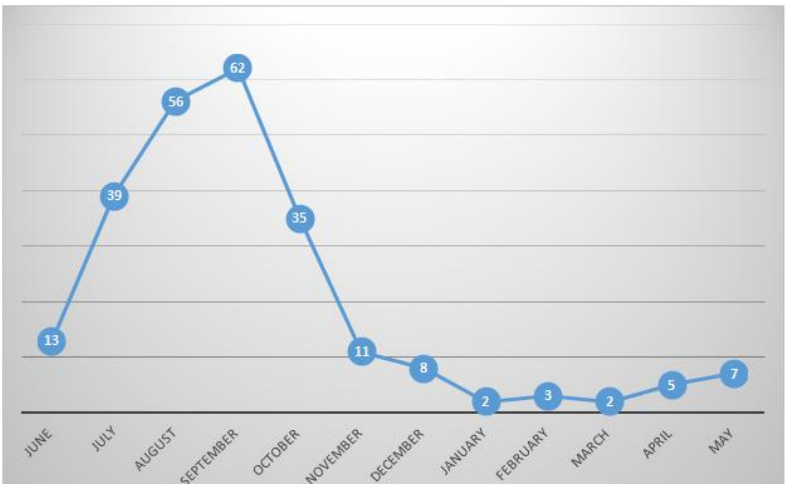
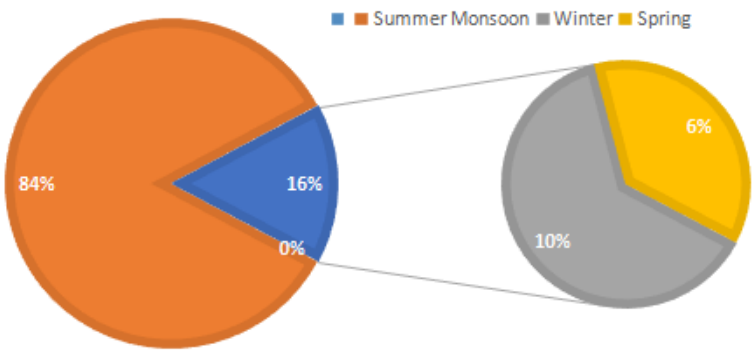


Table II.- Captures of desert locust in different breeding season from June 2014 to May 2015.

Breeding season	Collected spec.	%
Summer Monsoon	205	84.36
Winter	24	9.87
Spring	14	5.76
TOTAL	243	100



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Map I.- Incidence of the desert locust in Thar Desert (Pakistan).

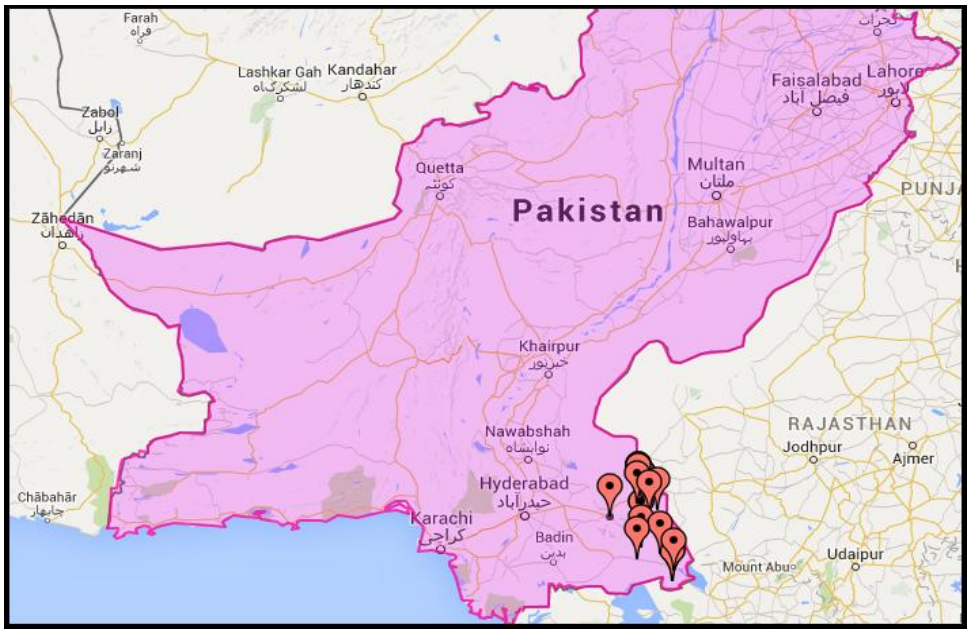

Fig. 1.- *Schistocerca gregaria* (Forskål).

1.- Male.
2.- Female.
3.- Ventral view.
4.- Lateral view.