



ISSN: 1023-1072 (Print), ISSN: 2663-7863 (Online)

Pak. J. Agri., Agril. Engg., Vet. Sci., 2019, 35 (1): 67-71

SHORT COMMUNICATION

CURRENT LOCUST THREATS AND MEASURES IN PAKISTAN

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ABSTRACT

During recent entry of locust in Pakistan the farmers are restless and trying to get most updated information on what actual species of locust is? Where and why have they entered within boundaries of Pakistan? What strategies can be adapted for the control measures? The present attempt has been initiated to identify species of locust for which diagnosis is provided with all necessary characteristics. Updated information is provided on reasons and development of swarms. Control measures and the role of various departments and organizations to minimize the population of locust are stated.

Keywords: aerial, control, locust, plague, *Schistocerca gregaria*

INTRODUCTION

Locusts are commonly known as short horned grasshoppers of the family Acrididae. When they increase in numbers and swarm to cover greater distance and invade crops to damage and create the condition of plague. Historically, the locust outbreaks have been in Pakistan during 1950s, 1960s and 1990s that covered an area of about 300,000 square kilometers, including Balochistan, Cholistan, Bahawalpur, Umerkot, Nara desert, Sukkur, Khairpur, Mirpurkhas and other Indian borders. Later the previous large populations were recorded during 1993 and 1997, as the locust requires sandy area with moist condition to lay their eggs and with the availability of more rain and vegetation they take the chance of multiplication rapidly.

Commonly well-known locust species include; American locust: (*Schistocerca americana*), Bombay locust (*Nomadacris succincta*), Brown locust (*Locustana pardalina*), Desert locust (*Schistocerca gregaria*), Italian locust (*Calliptamus italicus*), Migratory locust (*Locusta migratoria*), Red locust (*Nomadacris septemfasciata*) and Tree locusts (*Anacridium* spp.), etc.

Solitarious and gregarious phases: Locusts consist two phases; 1. Solitarious Phase (or phasis solitaria) and 2. Gregarious or Migratory phase (or phasis gregaria). Sometimes when rain falls more than usual these solitary

grasshoppers take an advantage and breed more than usual, their increase rate becomes 16-20 times more than usual after every three months. When desert vegetation starts to finish then large numbers of locust populations are confined to vegetation, after gathering of large populations they come into contact and when they touch the outer surface of hind femora, then they are attracted to each other and form groups, the conversion of solitary phase to the gregarious phase only take one hour, if the swarm lives together for a long time, again it takes long time to be solitary. Initially nymphs make large groups and are called as hopper bands, as population increases the bands become thicker and thicker and at the adult stage they start swarming, and from solitary grasshopper to the swarming locust is known as gregarization. Gregarious females when lay eggs they pour gregarization chemical to their egg pods to insist their offspring for gregarious behavior. Some morphological changes can be observed as changes in colour and shape, the gregarious colour can be observed after one crowded generation and shape usually take two or more generations (Cressman, 2001; Symmons and Cressman, 2001).

MATERIALS AND METHODS

The specimens were collected from district Shahdadpur, Sindh Pakistan.

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Maceration

The abdomen was put in KOH for overnight to remove soft connective tissues and fat bodies to study genital complex.

Identification

The specimen was compared with the pertinent literature and further confirmation was done personally by communication with Hojun Song at Texas A and M University, expert on Locust studies.

Imaging

The images were captured using stereo Microscope fitted with camera.

Evolution of damage

The figure is prepared on photoshop to show the extent of damage from recession to plague.

Locust updated image

The current image is provided from FAO webpage.

RESULTS AND DISCUSSION

The recent entry of locust in Pakistan persuaded to identify species which was diagnosed and identified as *Schistocerca gregaria* (Forskål, 1775) (Plate 1 and 2).

Taxonomic hierarchy

Schistocerca gregaria (Forskål, 1775)

Class	Insecta
Order	Orthoptera grasshoppers
Suborder	Caelifera short-horned grasshoppers
Superfamily	Acridoidea
Family	Acrididae grasshoppers and locusts
Subfamily	Cyrtacanthacridinae
Genus	<i>Schistocerca</i>
Species	<i>gregaria</i>

Diagnosis

Schistocerca gregaria (Forskål, 1775)

The colour of desert locust depends on the age, food availability and other climatic conditions, but general appearance seems brownish, they jump with their powerful legs as their name indicate hopper, body size is about 40-65mm in length, small filiform antennae, oval eyes, tegmina with dark brown spots (Plate 1 and 2). It consists of 3-6 generations per year and egg

pod consists of 20-100 eggs, lays 2-3 pods, duration of life cycle depends on the season, summer takes 10 days and winter 65, it takes 5-6 molts in 24 days to reach adult stage (Symmons and Cressman, 2001). The most preferred plants include; pearl millet, phog, cluster bean, jujube, snow bush, mustard tree, bekar grass, watermelon, bhurat (Samejo and Sultana, 2016).



Plate 1. *Schistocerca gregaria* Male: a. Habitus dorsal view, b. Habitus ventral view c. Habitus lateral view, d,f. Head and pronotum lateral view, e. Head frontal view, g. Phallic complex, i,j. parts of genital plate , k. aedeagus



Plate 2. *Schistocerca gregaria* Female

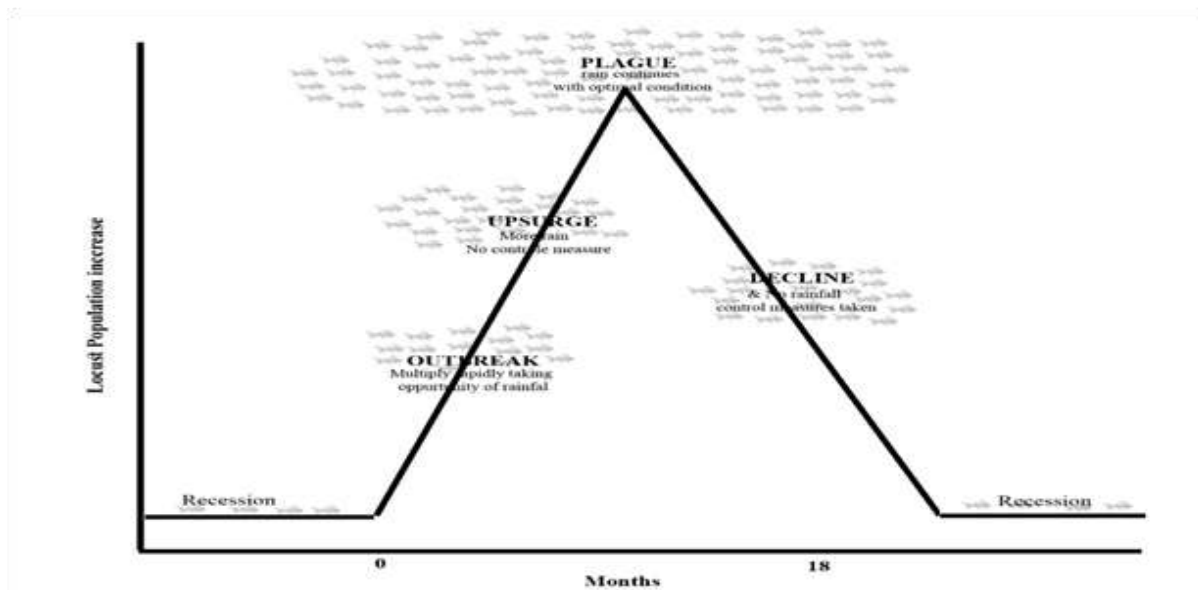


Figure 1. Evolution of locust population

The *Schistocerca gregaria* (Forska^o) is considered amongst the most dangerous migratory pests of the world. Due to its Plague conditions the world is well aware and united to control this noxious pest, thus FAO (Food and Agriculture Organization) has well aware and developed early warning system. In response to the changes in environmental conditions it changes its behavior and physiology from solitary to the gregarious form. During normal weather conditions it lives under solitary phase and population tends to live small in numbers in deserts to survive on sparse vegetation, affecting almost 30 countries of the world covering about 16 million km² and this area is referred to as recession area.

Evolutionary increase in locust population is provided in Figure 1. The rainfall in desert is not fixed in any part, but wherever rainfall occurs on recession area and if two generations occur rapidly the gregarization is likely to take place (Cressman, 2001). When locust population continues to increase due to gregarization it leads to hopper bands and swarms (Roffey and Popov, 1968) which is referred to as outbreak. If it continues with the benefit of rainfall for two or more generations is referred to as upsurge. Further, when it continues one or more years in the form of hopper bands and swarms is called as plague. When two or more areas are affected simultaneously it makes the condition of major plague. An outbreak occur within an area of 100 sq kilometer whereas, in upsurges and plagues

about 32 million sq kilometer is invaded (Roffey *et al.*, 1970). An upsurge effects on numerous countries, whereas, plague expands to continent or more. Solitarious fly early in the evening and the locust swarms fly during daylight hours till sunset, they have the capability to fly for 100-150 km per day at the height of 2 km. The first plague on record is from Egypt in the Era of Pharaoh. In 20th century the first sixty years five major plagues are on record (Cressman, 2001).

Locust update in Pakistan

The locust appeared first Eritrea and Sudan and then moved to Yemen and Saudi Arabia and invaded Iran and covered about 400,000 square kms of 7 regions till March 2019. The breeding condition for locusts in Iran was favourable due to heavy rainfall and moist soil, the government of Iran took immediate action and treated about 350,000 hectares area. As a neighboring country Iran could not completely control the pest and it entered in Pakistan from coastal belt of Turbat and Pasni. The recent rain in Pakistan has provided favourable conditions to locust, previously five teams were actively working in Balochistan including Turbat, Gwadar, Lasbela, Khuzdar, Kharan and other areas of Sindh. In Thari Mirwah about 2400 hectares area was treated (Khan, 2019). In Balochistan about 5,020 hectares were sprayed by the Ministry of National Food Security and Research's Department of Plant Protection (DPP). The landing of locust in Sindh was at Nara and

Mirwah talukas in Khairpur district where it was feeding on bushes, but the farmers were afraid as their crops were just seven kilometers away. The DPP aircraft carried out aerial spray in Sarai Mardan area and deployed another aircraft at Sukkur airport to meet emergencies at Nara desert. They treated 2000 hectares in Thari Mirwah (Ilyas, 2019). The DPP added that aerial spraying is done on locust hoppers when it is sprayed over hundreds of hectares, otherwise in present conditions ground operations are more effective. The locust is now reached in Dadu, Matiari, Benazirabad, NaushehroFeroz, Sanghar and Jamshoro (Hanif, 2019).

FAO 04 July locust update

In Balochistan the spring breeding came to an end in early June, the last report of hoppers and hopper groups was near Lasbela, Turbat, Gwadar, near Dalbandin. In Sindh the breeding occurred in Nara desert and Cholistan. Hopper groups formed mainly near Nara, where mature adults were also present. The aerial control was undertaken to spray 800 ha, whereas more 7884 ha were treated from ground. *Forecast:* The breeding will continue in Nara and Cholistan, the second generation may start in the month of August, which may lead to the formation of hopper bands and eventually small swarms. Further, with the onset of monsoon rains the breeding may occur in Tharparkar desert.

Control measures

For the control of locust mainly organo-phosphorus chemicals are applied in small concentrations (Ultra Low Volume), which is

mounted on vehicle with particular speed and rarely with knapsack sprayers. The primary responsibility of controlling locust lies on Ministry of Agriculture by national locust control sub-units. At the time of plagues and outbreaks usually external donor agencies are required to control. As a biological control method current research is only going on pathogens and growth regulators, though birds and people eat locust, but these sources are not enough to reduce the population. Satellites in fact cannot be used for the detection of swarms, but highly sophisticated satellites with military can detect locust but still it is not possible for experts to interpret hundreds of images per day. Desert locust is very difficult to control due to covering large areas 16-30 million sq. km, inaccessible remote areas, unavailability of locust monitoring system, lack resources to reach affected areas, availability of trained staff when there is no locust for a longer period and political ties between locust affected countries, difficulty in application of pesticide directly on locust (FAO, 2019).

Chemical control of locust includes; Fenitrothion EC for ground control and ULV for aerial control, best for pasture and sorghum conditions. Fipronil available in ULV is best for aerial control on pasture and sorghum. Chlorophyrifos is recommended in EC form for the ground control. Fungus *Metarhizium anisopliae* var. *acidum* is used as biological control agent and the product is available under brand name Green Muscle ® contains spores of the naturally occurring fungus, which germinate on the skin of locusts and penetrate through their exoskeletons (DPI, 2019).

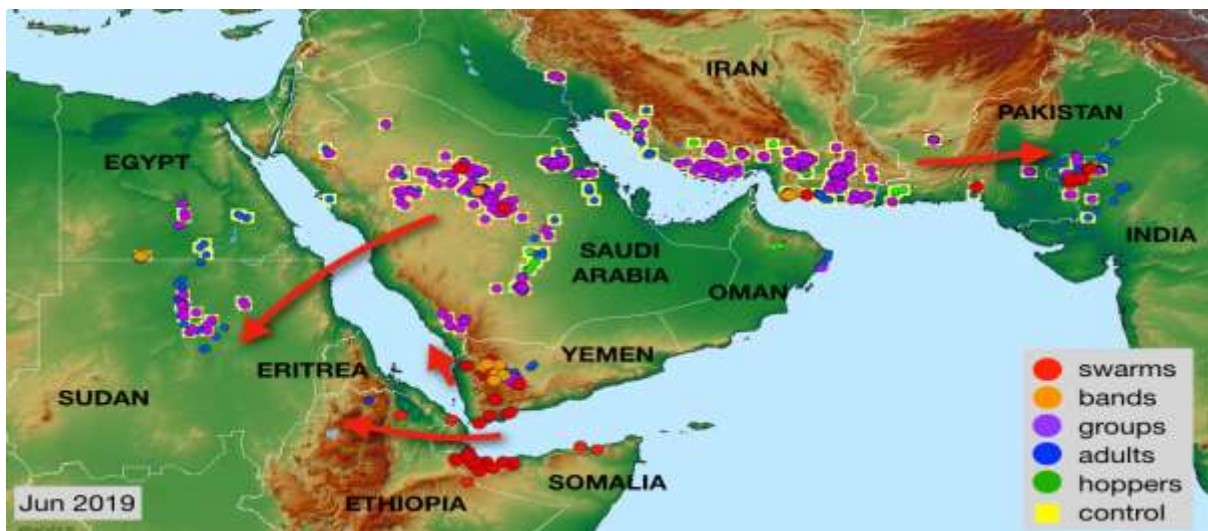


Figure 2. Current Locust update from FAO June 20, 2019

ACKNOWLEDGMENTS

I am thankful to Dr. Hojun Song, Ph.D. Associate Professor, Department of Entomology, Texas A and M University for confirmation of locust species; Dr. Riffat Sultana, Associate Professor, Department of Zoology, University of Sindh Jamshoro, Sindh Pakistan for his discussion on updated surveys and Dr. Waheed Ali Panhwar, Department of Zoology, Shah Abdul Latif University Khairpur, Sindh, Pakistan for detailed conversation on morphological characteristics of locust.

REFERENCES

- Cressman, K. 2001. Desert Locust, Food and Agriculture Organization of the United Nations, Rome, Italy.
- DPI, 2019. Locust control insecticides, department of Primary Industries, New Zealand, accessed from <https://www.dpi.nsw.gov.au/climate-and-emergencies/locusts/chemicals/faq-insecticides> 4.7.2019, 09:45 pm.
- FAO, 2019. Food and Agriculture Organization (FAO) of the United Nations, Rome, Italy, 'Locust Watch, Desert Locust' accessed from <http://www.fao.org/ag/locusts/en/info/info/faq/index.html> on 4.7.2019, 09:31 pm.
- Hanif, U. 2019. Desert Locust the Express Tribune, June 25th, 2019.
- Ilyas, F. 2019. Desert Locust, Dawn, June 17th, 13th, 2019.
- Khan, T. 2019. The desert Locust, by Tarique Khan, Director Plant Protection. The Express Tribune, June 25th, 2019.
- Roffey, J., G. Popov and C. F. Hemming. 1970. Outbreaks and recession populations of the desert locust, *Schistocerca gregaria* (Forsk.). Bulletin of Entomological Research, 59 (4): 675-680.
- Samejo, A. A. and R. Sultana. 2016. Comparative study on the various species of locusts with special reference to its population fluctuation from Thar desert, Sindh. Journal of Entomology and Zoology Studies, 4 (6): 38-45.
- Symmons, P. M. and K. Cressman. 2001. Desert Locust Guidelines. 1. Biology and Behaviour. 2nd Ed. Food and Agriculture Organization of the United Nations, Rome.

(Accepted: June 30, 2019)