



**WELCOME**

**COURSE SEMINAR (ENT – 699)**

**Integrated management practices against desert locust,  
*Schistocerca gregaria* (Forsk.) In India.**



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## INTRODUCTION

- Locusts are the group of different species of short horned grasshoppers belonging to the family Acrididae (Order: Orthoptera). **Joshi *et al.*, 2020**
- Locusts are generally differentiated from grasshoppers with their swarm forming ability, body shape, size and colour changing morphological characters (**Symmons & Cressman, 2001**).
- Swarms of desert locust can fly large distances up to 150 km in the direction of wind (**Zhang *et al.*, 2019**)
- When adult locusts are in large numbers, they show gregarious behaviour called swarms. Similarly, gregarious behaviour shown by larval stage (hopper) are called as bands (**Symmons & Cressman, 2001**).
- Government of India in month of September 2020 reported that before covid-19 pandemic during 2019-20, locust attack was reported in some districts of Rajasthan and Gujarat.

## Systemic Position:

Kingdom: Animalia

Phylum: Arthropoda

Class: Insecta

Order: Orthoptera

Suborder: Caelifera

Family: Acrididae

Subfamily: Cyrtacanthacridinae

Tribe: Cyrtacanthacridini

Genus: *Schistocerca*

Species: *S. gregaria*

**There are 10 important species of locusts in the world listed below**

<b>S. No.</b>	<b>English Name</b>	<b>Scientific Name</b>
<b>1</b>	The Desert Locust	<i>Schistocerca gregaria</i>
<b>2</b>	The Bombay Locust	<i>Nomadacris succincta</i>
<b>3</b>	The Italian Locust	<i>Calliptamus italicus</i>
<b>4</b>	The Moroccan Locust	<i>Dociostaurus morocannus</i>
<b>5</b>	The Red Locust	<i>Nomadacris septemfasciata</i>
<b>6</b>	The Brown Locust	<i>Locustana pardalina</i>
<b>7</b>	The South American Locust	<i>Schistocerca paranensis</i>
<b>8</b>	The Australian Locust	<i>Chortoicetes termenifera</i>
<b>9</b>	The Tree Locust	<i>Anacridium Spp.</i>
<b>10</b>	The Migratory Locust	<i>Locusts migratoria manilensis</i>

## Invasion in India:

- The desert locust is an international pest affecting about 60 countries, mainly India, Pakistan, Afghanistan, Arabia, Persia, Iraq and Africa. (Steedman 1990).
- A very small swarm eats about as much food as 35,000 people eat in a day.
- During 2020, swarms of locusts from East Africa enroute to Iran, Pakistan reached India, causing damage to crops in parts of Madhya Pradesh, Gujarat, Haryana, Uttar Pradesh and Rajasthan.
- Usually, the locust swarms enter the Scheduled Desert Area of India through Pakistan for summer breeding in the month of June/July with the advent of monsoon.

## Conti....

- Pink immature adults fly high and cover long distances during day hours from one place to another along with the westerly winds coming from the Pakistan side.
- Most of these pink immature adults settle on the trees during night and mostly fly during day.
- In India During 2019-20, India witnessed a massive locust attack which was successfully controlled.
- Starting from 11th April, 2020 till 25th August, 2020, control operations have been done in 2,79,066 hectares area in States of Rajasthan, Madhya Pradesh, Punjab, Gujarat, Uttar Pradesh and Haryana by Locust Circle Offices (LCOs).



## Distribution

- Desert locust: Desert locust is considered the most important pest all over India.
- Migratory Locust: Important only in Maharashtra, Gujarat and Rajasthan.
- Bombay Locust: Mainly Maharashtra and South Indian zone.

## Groups

Two types of groups are found:

1. Swarms are composed of winged adults.
  2. Bands are composed of hoppers (nymphs).
- One swarm can cover an area of 1000 sq. km.



## Damaging stage:

- Locust is a polyphagous insect which destroy the all kind of crops.
- It damages on host at any stages of crop growth.
- They are polyphagous and feed on leaves, shoots, flowers, fruit, seeds, stems, and bark.
- Occasionally defoliation of bushes occurs, but locusts do most damage at the flowering stage or when they settle on bushes in such large numbers that their weight breaks the branches.
- Nearly all crops and noncrop plants are eaten, including pearl millet, maize, sorghum, barley, rice, pasture grasses, sugarcane, cotton, fruit trees, date palms, banana plants, vegetables, and weeds.

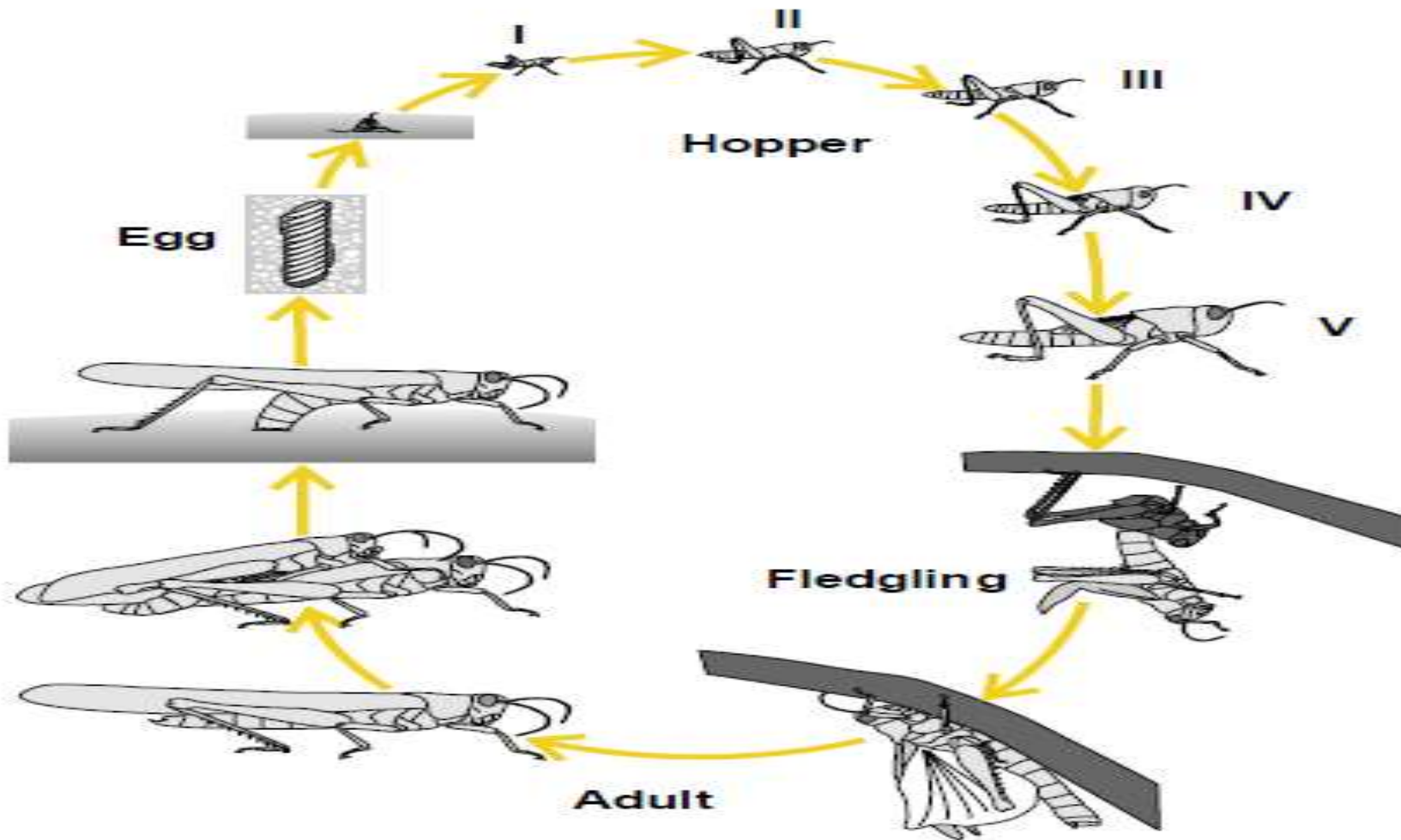


## Deferent between grasshopper and locust:

Grasshopper	Locust
➤ Size -38-50 mm long	➤ Size -38-50 mm long
➤ Colour – brown , Yellow, Green.	➤ Green when solitary but turn
➤ Long , thin antenna and the ability to jump.	➤ Antenna is short and thick
➤ A grasshopper comparatively covers a very small distance.	➤ Have powerful wing ability to fling long distance.
➤ A grasshopper is specifically a solitary insect.	➤ Locust cover vast distance in its lifetime.

# Biology of desert locust:

**Life cycle:** Locust life cycle has three distinct stages (i) Egg, (ii) Hopper and (iii) Adult.



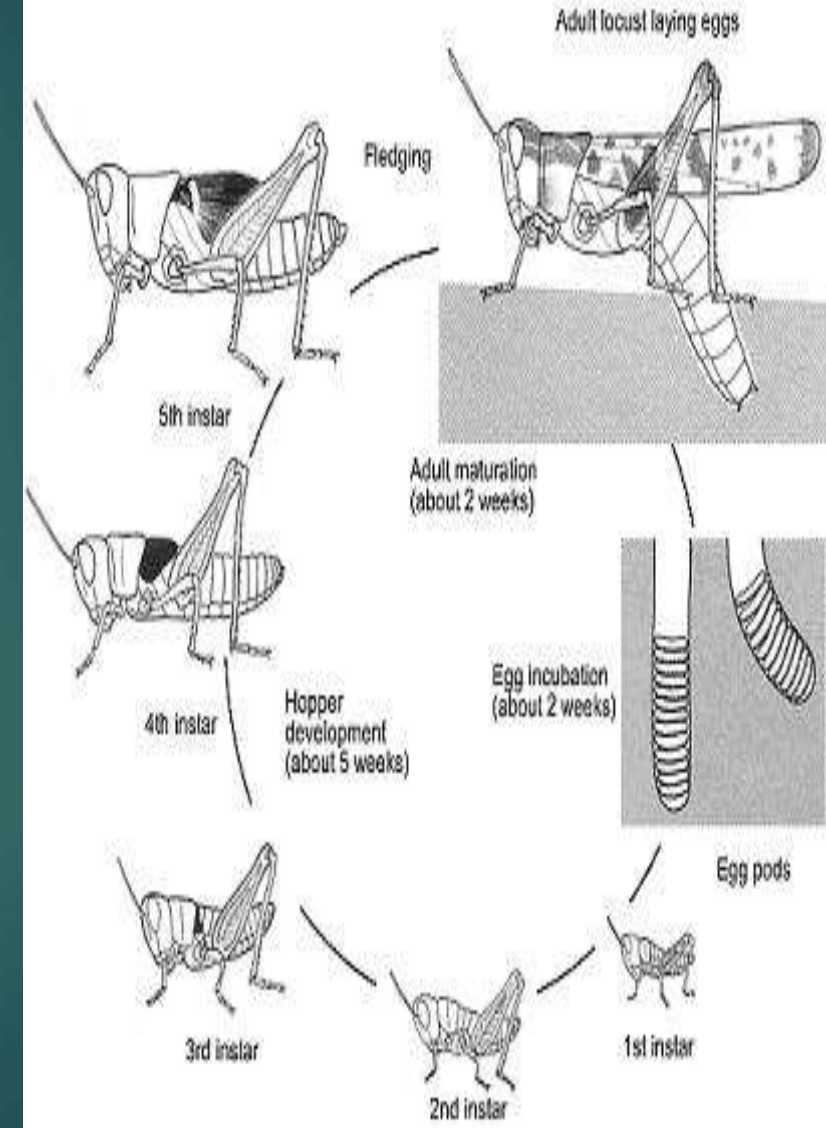
## Egg:

- Eggs are laid in pods in moist sandy soil at a depth of about 10 cms at an interval of 7 – 10 days.
- Egg are yellowish – brown in colour and 7-8mm long.
- Gregarious female usually lay 2-3 egg pods having 60-80 eggs in average, Cressman, (2001).
- Solitaries female mostly lay 3-4 times having 150-200 eggs in average.
- No development takes place below 15°C, (Eltoum *et al.*, 2014).
- Egg hatch in 14-20 days



## Nymph:

- This stage starts with hatching an egg into a nymph called hopper (Symmons & Cressman, 2001).
- *S. gregaria* hopper develops in about 30 to 40 days which undergoes five to six stages
- In these stages, solitarious hoppers shed their skin for five to six times and five times in gregarious hoppers (Joshi et al., 2020)
- The first instar after hatching are white colored and get changed into black within 1 to 2 hours (Claeys et al., 2003).
- Lighter in colour than adult in its final stage.



## Adult:

- The V<sup>th</sup> Instar nymph moults into adult stage.
- Adult appear from june to early july.
- Large size about 45-60 mm in length.
- Green or brown in the solitary form.
- Hind wing have no markings.  
(Symmons & Cressman, 2001).
- Adult flight is strong and steady.
- Life span of adult is almost 8 weeks.



## Control:

### Role of locust warning organization:

- Keep constant vigil through field survey to prevent crop losses due to locust attack in approximately 2 lakh sq. kms Scheduled Desert Area in the States of Rajasthan and Gujarat
- Train the Farmers, State functionaries and locust staff on latest locust control technologies.
- Issuance of Desert Locust Situation Bulletin at fortnightly intervals to inform all concerned stakeholders about emerging locust situation in India.
- Conduct research at Field Station on Investigation on Locusts (FSIL) at Bikaner on bio-efficacy of pesticides and bio-pesticides for locust control.



## Cultural practices:

Use during the early/initial stages of locust attack,  
Train/orient farmers to implement these on their  
farms.

- Deep summer ploughing for exposing the eggs
- Trimming and cleaning the farm bunds
- Scattering straw over roosting sites and then burning it

## Mechanical method:

- Make loud sound in the cropped field by beating empty tins/metal plates, drum or radio or through any other electronic sound system to prevent locust swarm landing on the crop. (Ibrahim *et. al.*, 2013)
- If hopper band is formed observed marching, ignite dry grass or any trash in front of the marching hopper band to kill the nymphs. (Sharma, 2014 )
- Dig a trench 2 feet deep and 2 feet wide in front of marching hopper band for trapping and killing by the application of any one of the insecticides mentioned here with (Wiktelius *et al.*, 2003).



## Biological control:

- Bio Pesticides like *Metarhizium acridum* (mycoinsecticide) can be used, depending on the availability, during early stage of locust attack when intensity is low. (Matthews, 2019)
- Spraying of Entomopathogen *Metarhizium anisopliae* (strain IMI 330189) @ 2.5 x 10<sup>12</sup> conidia/ha (Oil formulation). ). (Hunter *et. al.*,. 2016)
- Spraying the crops with *Neem* based insecticides (*Azadirachtin* 1500 ppm) @ 5 ml/lit mixed with spreading agent like soap solution as a prophylactic measure. . (Patel *et. al.*,. 2016)
- Rose - coloured and common stralings . (*Pastor roseus* and *Sturnus vulgaris*) are common birds (25 bird perches/ha.)
- Blister beetle ,Ground beetle and cricket are egg predators.
- Flesh flies, Tachinid flies and Tangled veined flies are nymph and adult parasitiods.. (Long & Hunter, 2005)

## Insect Growth Regulators:

➤ Use for preventing growth of the larvae  
Do not use close to waterbodies, as they may interfere with the natural growth of arthropods and mollusks

➤ Diflubenzuron, Teflubenzuron and Triflumuron can be used which will interfere with production of cuticle.

## Chemical Control:

- Insecticides and baits were used in the 1880s, but after the 1940s–1950s, they were replaced by less expensive specks of dust and sprays due to their high toxicity and negative impact on human health (Latchininsky & Van Dyke, 2006).
- The most commonly used materials for swarm control against the Desert Locust are fenitrothion and malathion. (Arthurs, 2008).
- The primary chemical and microbial pesticides are vehicle-mounted or aerial ultra-low volume (ULV) spraying (Nguyen & Symmons, 1984) & (Rachadi 2010).



Sl No.	Chemical Name	Dosage		
		a.i.(gms)/ha	Formulations (gm/ml)/ha	Dilution in water(lit/ha)
1	Chlorpyriphos20% EC	240	1200	500
2	Chlorpyriphos50% EC	240	500	500
3	Deltamethrin 2.8%EC	12.5	500	500
4	Diflubenzuran 25% WP	60	250	Need based
5	Fipronil 5% SC	6.25	1.25	500
6	Labdacyhalothrin 5%EC	20	400	500
7	Labdacyhalothrin 10% WP	20	200	500
8	Malathion 50%EC	925	1850	500
9	Malathion 25%EC	925	3700	500

## Cautions:

- The control measures for locust swarms should not be carried out by individual farmers. The infestation may be reported to the nearest locust warning centres and their help may be sought for the management.
- Apply during cool hours: 7-00 to 10-00 am or 5-00 to 7-00 pm.
- Wear protective clothing/face mask, hand gloves /goggles/head cap while applying this mixture and leave the field as early as possible.
- The crop should not be harvested for seven days after this treatment

# Traditional Methods of Locust Control:





## Integrated pest management:

- Integrated Pest Management (IPM) is a broad ecological pest control solution.
- Natural enemies, such as ducks, which help in locust control, are susceptible to locust invasion (FAO, 2016).
- Similarly, electronic devices which produced ultrasound help to reduce swarms of the desert locust. Likewise, nets that are sprayed with garlic or neem can help to repel different locusts and grasshoppers in small nurseries and kitchen gardens (Shrestha et al., 2021).
- The pathogenic fungi *Metarhizium anisopliae* var. *acridum* has been prepared for ULV (Ultra Low Volume) spraying field-infested locust. It is also called a Green Muscle (Van Huis et al., 2007).
- The conservation of established existing natural enemies, crop rotation, intercropping, and the use of pest-resistant varieties are all part of integrated pest management.

# Conclusion

Desert locust has been a devastating pest in deserts of North Africa, the Middle East, and Southwest Asia. The swarm outbreak leads to food insecurity as the insect feeds on various parts of plants such as leaves, shoots, flowers, fruit, seeds, stems, and even bark. Local crop protection is not feasible. Other countries carry out different control strategies. The various insecticides and baits have been used to control locusts, but they have adverse effects on human health and the environment. As a result, the best control methods are now integrated pest management (IPM), survey and surveillance re-  
porting. The proper advancement and adaptation of modern technologies can assist in the management of desert locusts. For the effective management of desert locusts, monitoring, mechanical, biological, botanical, chemical pesticides should be integrated.

**THANK YOU!**

