



Locust Attack and Its Impact on Crops

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In recent days, the massive locust attack of December, 2019 has affected about 25,000 hectares of land in two of the worst-hit North Gujarat districts of Banaskantha and Patan. The State government has assessed the damages and announced relief assistance to about 11,000 farmers from 285 villages in the 15 talula across these two districts. About 24,750 hectares is affected in Banaskantha, while in Patan the affected area is about 750 hectares.



Why are locusts so destructive?

Locusts are large herbivorous insects that can be serious pests of agriculture due to their ability to form dense and highly destructive swarms. Locust belongs to family Acrididae and order Orthoptera that are distributed worldwide. They are species of short-horned grasshoppers that periodically form large populations in dense migrating groups, where individuals differ in several characteristics from those living separately.

Locusts undergo incomplete or direct metamorphosis. Unlike in insects such as butterflies or moths, there is no pupal stage and juveniles are similar in appearance to adults. There are three main stages of development - egg, nymph and adult. Green vegetation is necessary for nymph and adult survival, adult migration and egg development. How long it takes a locust to reach maturity depends on the species, habitat conditions and temperature. Nymphs and adults are able to regulate their body temperature by basking in the sun or moving to shade.

A phase theory has been developed to account for the sporadic appearance and disappearance of locust swarms. According to the theory, a plague species has two phases: one solitary and the other gregarious. The phases can be distinguished by differences in coloration, form, physiology, and behaviour. A solitary-phase nymph, for example, adjusts its coloration to match that of its surroundings, does not collect in groups, has low metabolic and oxygen-intake rates, and is sluggish. A gregarious-phase nymph, on the other hand, has black and yellow or orange coloration in a fixed pattern, gathers in large groups, has high metabolic and oxygen intake rates, and is active and nervous. Adult locusts differ more in form than in colour. The solitary phase has shorter wings, longer legs, and a narrower pronotum, or dorsal sclerotic (with higher crest and larger head), than the gregarious phase. The adult of the gregarious phase has a more saddle-shaped pronotum, broader shoulders, and longer wings. When a nymph of a solitary-phase locust matures in the presence of many other locusts, it undergoes a physiological change and produces offspring of the gregarious type. If crowding is sufficiently dense and of long enough duration, the majority of a local population will shift

to the gregarious migratory phase. A gregarious-phase locust is restless and irritable, and it flies spontaneously on warm dry days, when its body temperature is high. The muscular activity of flight further raises its temperature. A swarm ceases flying only when environmental conditions change e.g., rain falls, temperature decreases, or darkness occurs. In 1869 desert locust swarms reached England, probably from West Africa, and a flight across the Red Sea in 1889 was estimated to be about 5,000 square km



(2,000 square miles) in size. The long-distance dispersal of these swarms is usually associated with either frontal winds of storm systems or high-level jet-stream winds. The acridids typically fly almost straight up into these fast-moving winds and then are carried with the winds until they slow to the point where gravity overcomes wind speed, causing them to drop from the sky.

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It is believed that the latest swarm has emerged following hatching of the eggs laid by the earlier one. The climate and the wind directions provide support to the locust movement and allow them to spread. The Locust Warning Organization (LWO) in Jodhpur had also predicted its trajectory - crossing the international border from Pakistan and entering India via Rajasthan. But the wind directions pushed the swarms into Gujarat from the northern districts. Their original flight path was towards Pakistan but due to suitable wind direction and moisture, they landed in Banaskantha and other parts of the state.

Besides Banaskantha and Patan, the districts of Mehsana, Kutch and Sabarkantha had also reported presence of locusts but were brought under control with preventive measures. There were total 18 operational Central teams, who had expertise in using the hazardous - highly toxic chemical - 96 per cent malathion, the State teams used Chlorpyrifos (CPS) 20 per cent and 50 per cent for sprayers.

The range of the migratory locust (*Locusta migratoria*) is wider than that of any other acridid. It is found in grasslands throughout Africa, most of Eurasia south of the taiga, the East Indies, tropical Australia, and New Zealand. The desert locust (*Schistocerca gregaria*) inhabits dry grasslands and deserts from Africa to the Punjab and can fly upward to about 1,500 metres (5,000 feet) in huge towers of individuals. The smaller Italian and Moroccan locusts (*Calliptamus italicus* and *Dociostaurus maroccanus*) cause extensive plant damage in the Mediterranean area, with *D. maroccanus* found as far east as Turkestan.

Impact on Agriculture

- Locust swarms devastate crops and cause major agricultural damage and attendant human misery-famine and starvation. They occur in many parts of the world, but today locusts are most destructive in sustenance farming regions of Africa.
- The desert locust (*Schistocerca gregaria*) is notorious. Found in Africa, the Middle East, and Asia, they inhabit some 60 countries and can cover one-fifth of Earth's land surface. Desert locust plagues may threaten the economic livelihood of one-tenth of the world's humans.

- A desert locust swarm can be 460 square miles in size and pack between 40 and 80 million locusts into less than half a square mile.
- Each locust can eat its weight in plants each day, so a swarm of such size would eat 423 million pounds of plants every day



Management

Once developed, a locust plague is almost impossible to stop or control. Control measures include destroying egg masses laid by invading swarms, digging trenches to trap nymphs, using hopper dozers (wheeled screens that cause locusts to fall into troughs containing water and kerosene), using insecticidal baits, and applying insecticides to both swarms and breeding grounds from aircraft.

Natural Enemies

- Egg parasites: Several species of small wasps (3-5 mm long) belonging to the genus *Scelio* parasitise the eggs of locusts and grasshoppers.
- Flies (Diptera): Various species of fly are parasites of locusts. They are usually seen in higher rainfall areas and can kill or reduce the fertility of locusts.
- *Blaesoxipha* spp. (sarcophid blowflies) female fly deposits minute maggot-like larvae directly on the locust which bore through the cuticle. It usually does not kill the adult, but parasitized females lay fewer eggs.
- *Ceracia fergusonii* (tachinid fly) female fly glues eggs directly onto the body of locusts. On hatching a small larva burrows through the base of the egg and enters the host.
- Mites: Tarsonemid mites (tracheal mites) are frequently overlooked as they live on the inside of locust tracheae (breathing organs).
- Fungi, bacteria and viruses: Locusts infected by fungi are rarely seen in the field and this may be due to the general aridity of the environment where outbreaks occur.
- Predators: Numerous birds, mammals and insects eat locusts but generally they are non-specific feeders and have not been shown to have a large impact on locust numbers during an outbreak.