THE BATTLE TO CONTAIN GIGANTIC LOCUST SWARMS

Biopesticides and better monitoring are needed to control the biggest outbreak in a quarter of a century.

By Antoaneta Roussi

Swarming locusts are advancing across East Africa, Asia and the Middle East, threatening food supply and livelihoods. At least 20 million people are at risk as governments and scientists race to control the insects.

In Kenya, one unusually large swarm occupied an area of 2,400 square kilometres, more than three times the size of New York City. Swarms typically occupy 100 square kilometres; even at this size, they can contain between 4 billion and 8 billion locusts, with the ability to consume in a day the equivalent of what at least 3.5 million people would eat.

The Food and Agriculture Organization (FAO) of the United Nations has appealed for US$138 million in urgent funding — half to support affected communities and half to curb the locusts' spread. At the same time, researchers say, better monitoring is needed to predict the insects' movement and growth, and alternatives to synthetic chemical pesticides are required to attack locusts before they breed in larger numbers.

The desert locust (*Schistocerca gregaria*), which is found in more than 65 of the world's poorest countries, usually lives a solitary lifestyle in the deserts between West Africa and India. It breeds after periods of rainfall, because it needs moist soil to lay its eggs. But when rains are especially heavy, the population can build up rapidly, resulting in vast swarms.

The present outbreaks coincided with cyclones in 2018 and warm weather at the end of 2019, combined with unusually heavy rains. Large swarms were detected at the start of 2020 in Ethiopia and Somalia. From here, they spread rapidly to countries including Kenya, Uganda and Sudan. Swarms have also been forming in Yemen, Saudi Arabia, Iran, Pakistan and India.

There are other factors, says Segenet Kelemu, director-general of the International Centre of Insect Physiology and Ecology in Nairobi, which is advising the Kenyan government on control measures. For example, ongoing war has made much of Yemen inaccessible to humanitarian and research workers, slowing the response to the outbreak there. "Countries like Yemen are in no position to take care of invasive pests," says Kelemu.

Furthermore, locust monitoring in Africa is underfunded, says Robert Cheke, a zoologist at the Natural Resources Institute in London, which is advising Uganda on locust control. Cheke says that many of the affected countries are behind in funding the Desert Locust Control Organization for Eastern Africa (DLCO-EA) in Addis Ababa, which provides an early-warning system and helps to control outbreaks. Djibouti, Somalia and Sudan collectively owe more than $8 million to the organization. Uganda partially cleared its arrears last month, but still owes $2 million.

The DLCO-EA "can't do anything if they haven't been given their contributions", Cheke says. When contacted by *Nature*, Stephen Njoka, the organization's director, confirmed that payment shortfalls have limited its capacity. The DLCO-EA has only four aircraft that can be used to spray the pests, and has problems maintaining supplies of the necessary chemicals.

Kenya is experiencing its worst locust swarms for 70 years.

TONY KARUMBA/AFP/GETTY

Biological control

Researchers are also concerned that spraying chemicals such as the widely used insecticide chlorpyrifos could be harmful to humans and the environment. So Cheke and his colleagues are advising on alternative control measures — especially biologically based 'biopesticides' — that can target insects without damaging the surrounding environment.

In particular, Cheke's team is recommending a fungus called *Metarhizium anisopliae*, which kills a locust by growing inside its body. Unlike a chlorpyrifos spray, the fungus "is specific to the insect targets rather than killing anything that it hits", Cheke says. Ecotoxicological studies show that the fungus poses a low risk to other organisms, including insects (R. Peveling *et al*. *Crop Prot.* **18**, 323–339; 1999).

In contrast to chlorpyrifos, biopesticides work best when young locusts — known as hoppers — are still developing their wings, says Belinda Luke, principal scientist in the biopesticides team at the Centre for Agriculture and Bioscience International in Egham, UK. Luke's team is using historical data on climate and locust outbreaks to develop a model to predict how quickly a locust can become an adult. When ready, she says, this model could help researchers determine when in a locust's life cycle biopesticides will be most effective.

The problem for the present outbreak, says Kelemu, is that biopesticides are not available in large quantities at short notice. That is forcing governments to resort to synthetic sprays. Luke also says that biopesticides do not work as quickly as the sprays. "You can't spray and then go back an hour later and see dead insects, because it takes anywhere between 7 and 14 days for the fungus to kill them." And that limits their effectiveness in a sudden outbreak.

Njoka agrees that biological control is the better option, but says that in an emergency — like now — established pesticides are the obvious choice. "Farmers want to see pests hit faster than yesterday," says Njoka.