THE ECONOMIC IMPORTANCE OF DESERT LOCUST

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ABSTRACT:-The desert locust (Schistocerca gregaria, Gryllus gregarius) is a species of locust, a swarming short-horned grasshopper in the family Acrididae. It is one of the most devastating migratory pests in the world and it is highly mobile and feeds on large quantities of any kind of green vegetation, including crops, pasture, and fodder. A typical swarm can be made up of 150 million locusts per square kilometre and is carried on the wind, up to 150 km in one day. Even a very small, one-square-kilometre locust swarm can eat the same amount of food in one day as about 35 000 people. It is an international trans boundary pest which threatens agricultural production and livelihoods in many countries in Africa, the Middle East, and south and south western Asia. Its migratory nature and capacity for rapid population growth present major challenges for control, particularly in remote semiarid areas, which characterize much of the distribution area.

KEYWORDS:- Desert, Locust , Economic importance and Ecosystems.

INTRODUCTION:

Locusts (Orthoptera: Caelifera, Acridoidea) are an essential component of healthy, and disturbed grassland ecosystems. These insects are abundant in natural and anthropogenic habitats (rangelands, wetlands, agricultural fields, lawns, etc.). They stimulate plant growth, participate in nutrient cycling, and play important role in food chains. Insects are by far the oldest, most numerous and smallest flying machines. Comprising 9.5 lakh described species, they account for more than 54% of all living organisms. The number of World's insect species is assumed to be 8 million (Hawksworth et. al, 1995). In this case the number of insect species so far known may account for hardly 11.9% of the total, leaving 88.1% still uncensored. Recent high profile of biodiversity as a scientific issue, is leading to increasing interest in insects because of their astonishingly high species richness. (Cherian, P.T, 2004) Directly or indirectly most of the insects influence human life. They are of extreme value to mankind as they play an important role in the economy of the world. Some greatly benefit human society directly in the role of agricultural pollinators and food providers and indirectly in the form of parasites and predators of pests, weed controllers, scavengers etc. They affect human life adversely in the form of pests damaging crops and as vectors of diseases. Insects become pests when they conflict with human welfare, aesthetics or profits. Pest status of an insect population depends on abundance of individuals as well as the type of nuisance or injury that the insects inflict. The shorthomed grasshoppers are a category of pests that attack plants as short as rice to as tall as teak.

MATERIAL AND METHODS:

Desert locusts have two phases, the solitary phase and the gregarious phase. This is a type of polyphenism. It has been shown that solitary locusts nymphs and adults can behave gregariously within a few hours of being placed in a crowded situation, while it takes gregarious locusts one or more generations to become solitary when reared in isolation. There are differences in morphology and behaviour between the two phases. In the solitary phase the hoppers do not group together into bands but move about independently. Their colouring in the later instars tends to be greenish or brownish to match the colour of the herbage. The adults fly at night and are also coloured so as to blend into their surroundings, the immature adults being grey or beige and the mature adults being a pale yellowish colour. In the gregarious phase the hoppers bunch together and in the later instars develop a bold colouring with black markings on a yellow background. The immatures are pink and the mature adults are bright yellow and fly during the day in dense swarms.

The change from an innocuous solitary insect to a voracious gregarious one normally follows a period of drought, when rain falls and vegetation flushes occur in major desert locust breeding locations. The population builds up rapidly and the competition for food increases. As hoppers get more crowded, the close physical contact causes the insects' hind legs to bump against one another. This stimulus triggers a cascade of metabolic and behavioral changes that cause the insects to transform from the solitary to the gregarious phase. When the hoppers become gregarious, their colouration changes from largely green to yellow and black, and the adults change from brown to pink (immature) or yellow (mature). Their bodies become shorter, and they give off a pheromone that causes them to be attracted to each other, enhancing hopper band and subsequently swarm formation. The nymphal pheromone is different from the adult one. When exposed to the adult pheromone, hoppers become confused and disoriented, because they can apparently no longer "smell" each other, though the visual and tactile stimuli remain. After a few days, the hopper bands disintegrate and those that escape predation become solitary again. It is possible that this effect could aid locust control in the future. During quiet periods, called recessions, desert locusts are confined to a 16-million-square-kilometer belt that extends from Mauritania through the Sahara Desert in northern Africa, across the Arabian Peninsula, and into northwest India. Under optimal ecological and climatic conditions, several successive generations can occur, causing swarms to form and invade countries on all sides of the recession area, as far north as Spain and Russia, as far south as Nigeria and Kenya, and as far east as India and southwest Asia. As many as 60 countries can be affected within an area of 32 million square kilometers, or approximately 20 percent of the Earth's land surface.

Locust swarms fly with the wind at roughly the speed of the wind. They can cover from 100 to 200 kilometers in a day, and will fly up to about 2,000 meters above sea level (it becomes too cold at higher altitudes). Therefore, swarms cannot cross tall mountain ranges such as the Atlas, the Hindu Kush or the Himalayas. They will not venture into the rain forests of Africa nor into central Europe. However, locust adults and swarms regularly cross the Red Sea between Africa and the Arabian Peninsula, and are even reported to have crossed the Atlantic Ocean from Africa to the Caribbean in ten days during the 1987-89 plague. A single swarm can cover up to 1200 square kilometers and can contain between 40 and 80 million locusts per square kilometer (a total of around 50 to 100 billion locusts per swarm, representing 100,000 to 200,000 tons, considering an average mass of 2 grams per locust). The locust can live between three and six months, and there is a ten to 16-fold increase in locust numbers from one generation to the next. It is estimated that desert locusts consume the equivalent of their body weight (2 g (0.07 oz)) each day in green vegetation. They are polyphagous and feed on leaves, shoots, flowers, fruit, seeds, stems and bark. 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. Crop loss from locusts was noted in the Bible and Qur'an; these insects have been documented as contributing to the severity of a number of Ethiopian famines. Since the twentieth century, desert locust plagues occurred from 1926–1934, 1940–1948, 1949–1963, 1967–1969, 1987–1989, 2003-2005 and 2019-2020[15]. In March–October 1915, a plague of locusts stripped Ottoman Palestine of almost all vegetation. The significant crop loss caused by swarming desert locusts exacerbates problems of food shortage, and is a threat to food security.

RESULT & DISCUSSION:-

Various insecticides are used in the form of chemical sprays or dusts and poisoned baits, that kills either by contact or when eaten. Ploughing weeds and stubble fields exposes the egg masses and nymphs of grasshoppers. Parasitic insects laying eggs or larvae on grasshoppers also constitute a factor in their control. Sarcophaga keliye Alb. (Diptera: Sarcophagidae) parasitises grasshoppers by laying eggs on undersurface of their wings. Epicauta vittata Fabricius (blister beetle) (Coleoptera: Melalonthidae) larvae ravishes the nest of grasshoppers and devour eggs. The indiscriminate use of insecticides on crops have lead to loss of biodiversity, appearance of insecticide resistant varieties, and hazardous residues in water, air etc. The grasshopper pest Melanoplus spretus Walsh (the rocky mountain grasshopper) has become extinct, the last live specimen reported being in 1902. The rocky mountain grasshopper was among the greatest impediments to the settlements of the Western United States. A commission was employed to suggest methods for the extermination of grasshoppers that recommended tactics like killing individuals or destroying egg beds. They killed as many as possible to avoid economic harm to themselves. This along with their habitat interference by man ultimately ended up in its extinction. The idea of IPM for pest control has thus arose which integrates chemicals along with the use of resistant plant varieties, predator and parasites, pheromones, hormones and lethal genes. All these methods are highly specific and can only succeed if the identity of the pest is accurately determined. Thus the taxonomic studies of grasshoppers become relevant.

Early warning and preventive control is the strategy adopted by locust-affected countries in Africa and Asia to try to stop locust plagues from developing and spreading. In the 1920s-1930s, locust control became a major field for international cooperation. The International Agricultural Institute developed several programmes aimed at exchanging data about the desert locust and international conferences were held in the 1930s: Rome in 1931, Paris in 1932, London in 1934, Cairo in 1936 and Brussels in 1938. Colonial empires were heavily involved in these attempts to control locust pests which affected heavily the Middle East and parts of Africa. The USSR also used locust control as a way to expand its influence in the Middle East and Central Asia.

FAO's Desert Locust Information Service (DLIS) in Rome, Italy monitors the weather, ecological conditions and the locust situation on a daily basis. DLIS receives results of survey and control operations carried out by national teams in affected countries, and combines this information with satellite data such as MODIS, rainfall estimates and seasonal temperature and rainfall predictions to assess the current situation and forecast the timing, scale and location of breeding and migration up to six weeks in advance. The situation assessments and forecasts are published in monthly locust bulletins that date back to the 1970s. These are supplemented by warnings and alerts to affected countries and the international community. Those since the 1990s are available on the FAO Locust Watch web site. FAO also provides information and training to affected countries and coordinates funding from donor agencies in case of major upsurges and plagues.

The desert locust is a difficult pest to control, and control measures are further compounded by the large and often remote areas (16-30 million km²) where locusts can be found. Undeveloped basic infrastructure in some affected countries, limited resources for locust monitoring and control, and political turmoil within and between affected countries further reduce the capacity of a country to undertake the necessary monitoring and control activities. At present, the primary method of controlling desert locust infestations is with insecticides applied in small concentrated doses by vehicle-mounted and aerial sprayers at ultra-low volume (ULV) rates of application. The insecticide is acquired by the insect directly or via secondary pickup (i.e. walking over or eating the residue on a plant). Control is undertaken by government agencies in locust-affected countries or by specialized organizations such as the Desert Locust Control Organization for East Africa (DLCO-EA).

The desert locust has natural enemies such as predatory wasps and flies, parasitoid wasps, predatory beetle larvae, birds and reptiles. These may be effective at keeping solitary populations in check but are of limited effects against gregarious desert locusts because of the enormous numbers of insects in the swarms and hopper bands. Farmers often try mechanical means of killing locusts, such as digging trenches and burying hopper bands, but this is very labour-intensive and is difficult to undertake when large infestations are scattered over a wide area. Farmers also try to scare locust swarms away from their fields by making noise, burning tires or other methods. This tends to shift the problem to neighbouring farms, and locust swarms can easily return to reinfest previously visited fields. Biopesticides include fungi, bacteria, neem extract and pheromones. The effectiveness of many biopesticides equals that of conventional chemical pesticides, but there are two distinct differences. Biopesticides in general take longer to kill insects, plant diseases, or weeds, usually between 2 and 10 days.

There are two types of biopesticides - biochemical and microbial. Biochemical pesticides are similar to naturally occurring chemicals and are nontoxic, such as insect pheromones used to locate mates, while microbial biopesticides, come from bacteria, fungi, algae or viruses that either occur naturally or are genetically altered. Entomopathogenic fungi generally suppress pests by mycosis: causing a disease that is specific to the insect. Biological control products have been under development since the late nineties; Green Muscle and NOVACRID are based on a naturally occurring entomopathogenic fungus (i.e. insects-infecting fungus), Metarhizium acridum. Species of Metarhizium are widespread throughout the world, infecting many groups of insects, but show a low risk to humans, other mammals and birds. The species M. acridum has specialised on short-horned grasshoppers, to which group locusts belong, and has therefore been chosen as the active ingredient of the product. The product is available in Australia under the name Green Guard and in Africa, it used to be available as Green Muscle. However, since Green Muscle seems to have disappeared from the market, another product, NOVACRID, was developed for Africa, Central Asia and the Middle East. These products are applied in the same way as chemical insecticides, but do not kill as quickly. At recommended doses, the fungus can take up two weeks to kill up to 90% of the locusts. For that reason, it is recommended for use mainly against hoppers, the wingless early stages of locusts. These are mostly found in the desert, far from cropping areas, where the delay in death does not result in damage. The advantage of the product is that it affects only grasshoppers and locusts, which makes it much safer than chemical insecticides. Specifically, it allows the natural enemies of locusts and grasshoppers to continue their beneficial work.

These include birds, parasitoid and predatory wasps, parasitoid flies and certain species of beetles. Though natural enemies cannot prevent plagues, they can limit the frequency of outbreaks and contribute to their control. Biopesticides are also safer to use in environmentally sensitive areas such as national parks or near rivers and other water bodies.

Green Muscle was developed under the LUBILOSA Programme, which was initiated in 1989 in response to environmental concerns over the heavy use of chemical insecticides to control locusts and grasshoppers during the 1987-89 plague. The project focused on the use of beneficial disease-causing microorganisms (pathogens) as biological control agents for grasshoppers and locusts. These insects were considered to be too mobile and to reproduce too fast to be readily controlled by classical biological control. Pathogens have the advantage that many can be produced in artificial culture in large quantities and be used with ordinary spraying equipment. Entomopathogenic fungi were traditionally seen as needing humid conditions to work well. However, the LUBILOSA Programme found a way to avoid this by spraying fungal spores in an oil formulation. Even under desert conditions, Green Muscle can be used to kill locusts and other Acridid pests, such as the Senegalese grasshopper. During trials in Algeria and Mauritania in 2005 and 2006, various natural enemies, but especially birds, were abundant enough to eliminate treated hopper bands in about a week, because the diseased hoppers became sluggish and easy to catch.

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