Two days National Training Workshop On Desert Locust

During 11th & 12th March, 2024

at

Regional Locust Cum IPM Centre

Jodhpur-342001 Rajasthan (India)

Government of India

Ministry of Agriculture & Farmer's Welfare

Department of Agriculture & Farmer's Welfare

Directorate of Plant Protection Quarantine & Storage

Faridabad

Two days National Training Workshop on Desert Locust

During 11th & 12th March, 2024

at

Regional Locust Cum IPM Centre, Jodhpur-342001 Rajasthan (India)

Report prepared by: RLCIPMC, Jodhpur (e-mail: lwo-jod-rj@nic.in)

-: Disclaimer: -

The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of **Regional Locust Cum IPM Centre, Jodhpur**-342001 Rajasthan (India)

Table of Contents

Sl. No.	Particular	Page No.
1.	Introduction	1
2.	Resource Person	1
3.	Participants	2
4.	Training Programme	2
	Day 1: 11/03/2024	2
5.	Registration of participants	3
6.	Inaugural session	3
7.	Pre-evaluation test	3
8.	Technical Session	3
9.	Classroom lectures / exercise: Day 1	3
	Day 2: 12/03/2024	4
10.	Field exercise	4
11.	Classroom lectures / exercise: Day 2	4
12.	Post training evaluation test	4
13.	Wrap up	4
14.	Conclusion	5
	Annexures	
15.	Annexure-I: List of Resource Person	6
16.	Annexure-II: List of Trainees	7-8
17.	Annexure-III: Schedule Programme for two days	9
18.	Annexure-IV: Test result: Pre & Post training evaluation	10-11
19.	Annexure-V: Power Point Presentations	12-115
20.	Annexure-VI: Photographs of Inaugural session	116
21.	Annexure-VII Mock drill of Wireless, Ulva Mast, Micronair & tractor mounted sprayer at Uchiyarda village of Jodhpur	117-118
22.	Annexure-VIII Group Discussion	119
22.	Annexure-IX: Publication	120

Introduction:

During the 33rd Session of South West Asia Commission (SWAC) [A FAO Commission for Controlling the Desert Locust in South West Asia], it was decided that the trust fund will supplement national training workshops upon request by the member country that includes workshop date, participant, trainers, subjects and detailed budget. In order to implement the same and strengthening technical skill of officials involved in desert locust related activities, India has planned a Two days National Training Workshop on Desert Locust. The LWO, Jodhpur organized two days National Training workshop on 11th & 12th March, 2024 (Batch-I) sponsored by FAO-SWAC at the office of LWO, Jodhpur. In this connection, a detailed program including training schedule, training date, List of participants, estimated budget etc. prepared and sent to the appropriate authorities for approval/sanction. After detailed deliberations between RLCIPMC, Jodhpur (previously Known as LWO, Jodhpur) Directorate of Plant Protection Quarantine & Storage and FAO, a national training program was finalized. Various improvements suggested by FAO and the Directorate for organizing the national training program were accepted and date were finalized i.e. 11th & 12th March, 2024.

Regional Locust Cum IPM Centre (RLCIPMC), Jodhpur is the prime office for locust control in India. There are eleven offices i.e. Ten Locust cum IPM Centre (LCIPMCs) and one Locust & IPM Research Central (L&IPMRC) are governed by the RLCIPMC under supervision of Directorate of Plant Protection, Quarantine and Storage, NH-IV, Faridabad (Haryana).

This National Training workshop was completed under the chairmanship of Dr. N. Sathyanarayana, Joint Director (PP) Headquarter, Directorate of Plant Protection, Quarantine and Storage, Faridabad. The Senior National Program Officer Mr. Rajesh Dubey from FAO India was examined and was an observer of this programme, Dr. Shaloo Ayri, Deputy Director (E) also participated from Directorate of Plant Protection, Quarantine and Storage, Faridabad.

Resource Person:

In consultation with SWAC and the Directorate a team of **six** resource persons was identified as Trainers. The programme included Classroom, field exercises, demonstrations, practice training session, Pre and Post evaluation tests etc.

The resource persons were advised in advance for preparation of their respective lectures and other responsibilities assigned to them for national training workshop. They have been requested to report at the training venue one day before of the commencement of the training workshop to discuss preparation and effective training. They were also advised to use latest teaching methods *viz.* best use of Power Point Presentation, field exercises

besides the participatory approach amongst the participants during the course of training workshop. The List of resource persons is annexed at **annexure-I.**

Participants:

Participants for the training were identified from RLCIPMC, Jodhpur, 10 LCIPMCs, 01 LIPMRC, 03 L-CIPMCs, 06 participants from H.Q. Faridabad, 02 participants from Gujarat. State Agriculture department of Rajasthan and Gujarat were required to nominate district level officials for the training Programme. Keeping in view the limited resource persons it has been decided to identify and select 35 trainees' participants from different LCIPMCs and given giving equal representations. These trainees' participant is involved in field survey & related activities at their respective field offices and National Headquarter were identified to participate in the training. Initially it was decided to choose qualified, newly appointed and some old experienced person and rest will be trained in the subsequent batches. The list of participants is annexed at **Annexure-II**.

Training Program:

Keeping in view the locust active season in India which probably commence from June month, It was decided to organize the National Training workshop during 11th & 12th March 2024 on locust biology, migration and seasonal distribution of desert Locust, New initiatives for sustainable Desert Locust Management, Locust Incursion/ Upsurges 2019: A case study of successful Locust Control, field exercise/ Demonstration of tractor mounted sprayer, Micronair, Ulva mast, eLocust3mPro (Mobile App), Safety measures, Alternative approaches for Locust control etc. Accordingly, a detail schedule of training programme including date, time for each classroom and field activities was identified with respect to the training program and got approved by the appropriate authorities. A copy of the programme is annexed at **Annexure-III**.

Day 1: 11/03/2024

Registration of the participants:

The National Training Workshop began with the registration of participants / resource persons. During the registration, the participants were provided a folder, training literature in pen drive, T-shirt, cap, notepad & pen etc.

Inaugural Session:

1. Inaugural session started with welcome address by Dr. Shaloo Ayri, Deputy Director (PP) Regional Locust Cum IPM Centre (RLCIPMC), Jodhpur. In her welcome address, she encouraged all the participants to adopt participatory approach during the course training workshop. It was also emphasized that the participants use their practical experience in order to improve their skill and share their experience/knowledge with trainees' participants. Then the function was started by the lighting the lamps together with Dr. N. Sathyanarayana, JD (PP), Directorate of Plant Protection, Quarantine & Storage, Faridabad and Sh. Rajesh Dubey, Senior National Program officer, FAO India, Dr. K.L. Gurjar, Deputy Director (PP), CIB & RC, Faridabad and Sh. Dr. Virendra Kumar, Assistant Director (PP)/ Officer In-charge, Regional Locust Cum IPM Centre (RLCIPMC), Jodhpur
2. Sh. Rajesh Dubey, Senior National Program officer, FAO India, emphasizes locust control activities conducted by RLCIPMC, Jodhpur, Considering the facts that many new comers have joined the locust scheme either their first entry into the Government system or transfer from other scheme, the national training programme will provide required knowledge and exposure to these new entrants.

Pre-evaluation Test:

In order to evaluate the skill of the participants, a pre-evaluation test was conducted. The Questionnaire was comprising of questions related to biology, behavior, survey & eLocust3mpro. All trainees participants attempted the pre-evaluation test. The comparative result of pre-evaluation / post evaluation test is given at **annexure-IV.**

Technical Session:

Classroom lectures / exercises: Day -1

During classroom technical session lecture was taken on "Biology, migration and seasonal distribution of Desert Locust" by Dr. K.L. Gurjar, Joint Director (PP), CIB & RC, Faridabad by using power point presentation.

Post lunch, technical session resumed with the lecture on "New initiatives for sustainable Desert Locust Management" by Dr. Shaloo Ayri, Deputy Director (E) Locust Div., Hqr., Faridabad using all the means of training techniques. followed by another lecture on "Locust Incursion/ Upsurge 2019: A case study of successful Locust Control by Sh. P.K. Gaur, APPO (E) P&C Div. Hqr., Faridabad.

Day 2: 12/03/2024

Field exercise:

During second day of the training workshop i.e. 12/03/2024 at 08.00 AM, all the trainees participants along with Master trainers reached to the assigned field for mock drill at Uchiyarda village of Jodhpur. Demonstration of Tractor mounted sprayers, Micronair, Ulvamast, Micro Ulva, eLocust3mPro mobile App was done Dr. K.L. Gurjar, JD(PP), ,Dr. Virendra Kumar, AD (PP) and Sh. P. K. Gaur, APPO (E) and mock drill with the help of mechanic Sh. Dharma Ram, RLCIPMC, Jodhpur and the field demonstration of eLocust3mpro in the field was demonstrated by Sh. R.G.Meena from LCIPMC, Nagaur. This exercise lasted for three hours. After conducting field exercise all the participants as well as Master Trainers came back to the training venue for the remaining technical session.

Classroom lectures / exercises: Day-2

Post Lunch session was taken by Dr. Virendra Kumar Assistant Director (PP), RLCIPMC, Jodhpur, he explained in detail about "Safety measures" taken during locust control.

Then second lecture taken by Dr. Shaloo Ayri, Deputy Director (E), Locust Div. Hqr., Faridabad on the topic of "Alternatives approaches for locust control" followed by a group discussion among groups where each team leader of a group presented a brief on the two days training workshop.

Post training evaluation Test:

After completion of the technical session a post training evaluation test was undertaken to evaluate the difference in skill of the participants. Result of pre & post evaluation test is shown at **Annexure-IV**.

Wrap up & Vote of Thanks: At the end of the National Training Workshop all the activities undertaken during the course of two days training were once again briefed by Dr. N. Sathyanarayana, JD (PP) to the participants and doubts were clarified on various topics related desert locust. Dr. Virendra Kumar, AD (PP) RLCIPMC, Jodhpur delivered vote of thanks to all dignitaries & participants.

Conclusion:

The following observations are made on the two days National training workshop on desert locust:

1. Classroom discussions & field exercises viz. demonstration on eLocust3mpro, locust survey and control provided excellent practice training session to the participants which not only improved the skill of the participants but also sensitize them to think out of the box on all relevant issues.
2. Pre and Post evaluation test results indicates that participants have acquired the fresh knowledge on the relevant topics covered during the training workshop.
3. The workshop offered an opportunity to improve technical skill by learning & practical methodology. All participants exchanged their knowledge and experience during the field exercise & group discussion session.
4. The participants expressed their keen interest more in practical session followed by classroom training and suggested to continue mere such training programs in future.
5. Entire workshop conducted in Hindi and English languages. Keeping in view of positive feedback of the participants and success of this program, it has been decided to submit a proposal for next training on “Locust Control Techniques” covering other subject.

Annexure – I

List of Resource Person

S. No.	Name of Resource Person	Designation	Headquarter
1.	Dr. N. Sathyanarayana	JD (PP)	Locust Div., Hqr. Faridabad
2.	Sh. Rajesh Dubey	Senior Programme Officer	FAO, India, New Delhi
3.	Dr. K.L. Gurjar	JD (PP)	CIB&RC, Faridabad
4.	Dr. Shaloo Ayri	DD (E)	Locust Div., Hqr. Faridabad
5.	Dr. Virendra Kumar	AD (PP)	RLCIPMC, Jodhpur
6.	Sh. Pramod Kumar Gaur	APPO	P & C Division, Faridabad

Annexure – II

List of Trainees

S.No.	Name of participants	Designation	Headquarter
1.	Sh. S. J. Patel	AD (Ag Ext.)	Sub Division Kutch
2.	Sh. Dhaval Joshi	AD (Ag. Far.)	Farmers Training Centre, Gujarat
3.	Sh. Shri Ram Didel	PPO (PP)	CIPMC, Jaipur
4.	Sh. Milind Bhide	PPO	CIPMC, Baroda
5.	Sh. A. K. Dave	PPO (PP)	LCIPMC, Phalodi
6.	Sh. Babu Lal Meena	PPO	LCIPMC, Bikaner
7.	Sh. Guru Prasad G.R.	PPO (PP)	Locust & IPM Research Central (L&IPMRC)
8.	Sh. Ram Gopal Meena	PPO (PP)	RCIPMC, Nagaur
9.	Sh. S. K. Chaudhary	PPO (WS)	RCIPMC, Churu
10.	Sh. Shashi Kumar R.S.	PPO (PP)	RCIPMC, Bhuj
11.	Sh. Pramod Gaur	APPO	HQtr. Faridabad
12.	Sh. CS Sharma	APPO	HQtr. Faridabad
13.	Sh. Shyo Ram	APPO	CIPMC, Jaipur
14.	Mohd. Arif Mansuri	APPO	CIPMC, Baroda
15.	Sh. Gaurav Chauhan	APPO	RCIPMC, Faridabad
16.	Sh. Vinod Maitraya	APPO	HQtr. Faridabad
17.	Sh. Sudhir Kumar	APPO	CIB&RC, Faridabad

18.	Sh. Yogendra Kumar	APPO	CIPMC, Ganganagar
19.	Sh. Bhaskar Anand	APPO	P&C, Faridabad
20.	Sh. Vikash Kumar	SA	LCO, Jaisalmer
21.	Sh. Pawan Singh Panaura	SA	LCO, Jaisalmer
22.	Sh. KS Godse	SA	LCO, Palanpur
23.	Sh. Pradeep Sharma	SA	LCO, Jalore
24.	Sh. Ashok Bohra	SA	LCO, Barmer
25.	Sh. S.A Prabhuraj	SA	LCO, Bhuj
26.	Sh. Jayant Hooda	SA	LCO, Suratgarh
27.	Sh. Atul Kakkad	SA	LCO, Churu
28.	Sh. Maneesh Kumar Sharma	TA	LCO, Nagaur
29.	Sh. Rahul Sharma	TA	LCO, Nagaur
30.	Sh. Virendra Godara	APPO	LCO, Nagaur
31.	Sh. Ajay Jevaria	SA	LWO, Jodhpur
32.	Sh. Aman Kaim	SA	LCO, Jaisalmer
33.	Sh. Gajanan Gije	TA	LCO, Suratgarh
34.	Sh. Ram Karan Dude	APPO	LWO, Jodhpur
35.	Sh. Sarwan Singh	SA	LWO, Jodhpur

Annexure – III

Two Days FAO Sponsored Training Programme on Desert Locust and its Control in SDA/Non – SDA (11th &12th March, 2024)

Training Schedule

Date	Time	Events
11.03.2024	09:00-10:00	Registration of participants
	10:00-11:00	Inauguration Welcome: Dr. Shaloo Ayri DD(E), Hqr. Faridabad Key Note Speaker: Dr. N Sathyanarayana, Joint Director(PP), Locust Divison, HQ, Faridabad Special Address: FAO Representative of India
	11:00-11:30	Tea Break
	Technical Session	
	11:30-12.00	Pre-evaluation test
	12.00-13.00	Biology, Migration and Seasonal distribution of Desert Locust – Dr. K.L Gurjar JD
	13:00–14.00	Lunch Break
	14.00-14.45	New Initiatives for Sustainable Desert Locust Management- Dr. Shaloo Ayri
	14.50-15.25	Locust Incursion/Upsurges 2019: A case study of successful Locust Control -P.K. Gour, APPO, (E)
	15.30-16.00	**Tea Break**
12.03.2024	08.00-12.00	Field exercise/Demonstration of tractor mounted sprayer, Micronair, Ulva Mast, Micro Ulva, eLocust3mpro mobile app. Dr. K.L Gurjar, JD(PP) Dr. Virendra Kumar, AD(PP) P.K. Gour, APPO(E)
	13.00-14.00	**Tea Break.**
	14.00-14.30	Contingency Plan, Preparedness for any Locust emergency: Representative of State Govt. Agriculture officials Or Safety measures: Dr. Virendra Kumar, AD(PP) LWO, Jodhpur
	13:00-14:00	Lunch Break
	14.30-15.00	Alternative approaches for Locust Control : Dr. Shaloo Ayri, DD(E)
	15.00-15.30	Post evaluation test
	15.30-16.00	Tea break
	16.00-16.30	Group discussion and feedback
	16.30-17.30	Valedictory Programme: Certificate distributionVote of Thanks : Dr. Virendra Kumar AD(PP), LWO, Jodhpur

Annexure - IV

Test Result: Pre & Post training evaluation

Sl. No.	Name of Participants	Pre-evaluation	Post-evaluation	Difference (+)
1.	Sh. S. J. Patel	26	59	33
2.	Sh. Dhaval Joshi	31	65	34
3.	Sh. Shri Ram Didel	48	92	44
4.	Sh. Milind Bhide	26	87	61
5.	Sh. A. K. Dave	39	87	48
6.	Sh. Babu Lal Meena	35	81	46
7.	Sh. Guru Prasad G.R.	47	89	42
8.	Sh. Ram Gopal Meena	62	90	28
9.	Dr. Suran Karan Chaudhary	54	84	30
10.	Sh. Shashi Kumar R.S.	66	90	24
11.	Sh. Pramod Gaur	64	32	32
12.	Bhanwar Singh	54	75	21
13.	Sh. Shyo Ram	47	58	11
14.	Mohd. Arif Mansuri	65	95	30
15.	Sh. Gaurav Chauhan	44	93	49
16.	Sh. Vinod Maitraya	66	82	16
17.	Sh. Sudhir Kumar	84	65	19
18.	Sh. Yogendra Kumar	24	69	45

19.	Sh. Bhaskar Anand	58	82	24
20.	Sh. Vikash Kumar	42	48	6
21.	Sh. Pawan Singh Panaura	39	46	7
22.	Sh. KS Godase	32	74	42
23.	Sh. Pradeep Sharma	61	82	21
24.	Sh. Ashok Bohra	18	52	34
25.	Sh. S.A Prabhuraj	27	40	13
26.	Sh. Jayant Hooda	34	57	23
27.	Sh. Atul Kakkad	31	59	28
28.	Sh. Maneesh Kumar Sharma	30	48	18
29.	Sh. Rahul Sharma	25	93	68
30.	Sh. Virendra Godara	77	66	11
31.	Sh. Ajay Jevaria	66	87	21
32.	Sh. Aman Kaim	40	71	31
33.	Sh. Gajanan Gije	27	40	13
34.	Sh. Ram Karan Dude	69	77	8
35.	Sh. Sarwan Singh	55	34	21

Annexure-V

POWER POINT PRESENTATION

(1)

Biology, Migration and Seasonal Distribution of Desert Locust.

Dr.K.L.Gurjar
Joint Director(PP)

Desert Locust

- Class: Insecta
- Order: Orthoptera
- Suborder: Caelifera
- Family: Acrididae
- Subfamily: Cyrtacanthacridinae
- Tribe: Cyrtacanthacridini
- Genus: Schistocerca
- Species: S. gregaria
- Binomial name:Schistocerca gregaria

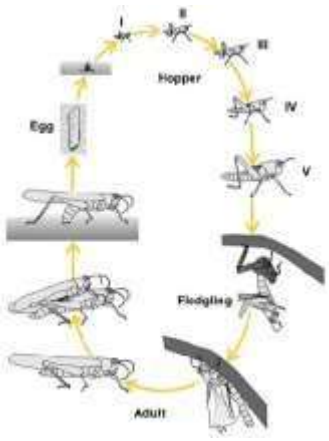
Locust Biology

- 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. Gregarious female usually lay 2-3 egg pods having 60-80 eggs in average. Solitarious female mostly lay 3-4 times having 150- 200 eggs in average. The rate of development of eggs depends on soil moisture and temperature . No development takes place below 15°C. The incubation period is 10-12 days when the optimum temperature is between 32-35°C.
- Hopper: After incubation is complete the eggs hatch and nymph (young ones) emerge . There are 5 instars in gregarious and 5-6 instars in solitarious population. In each instars there is a growth and change in characteristic coloration.

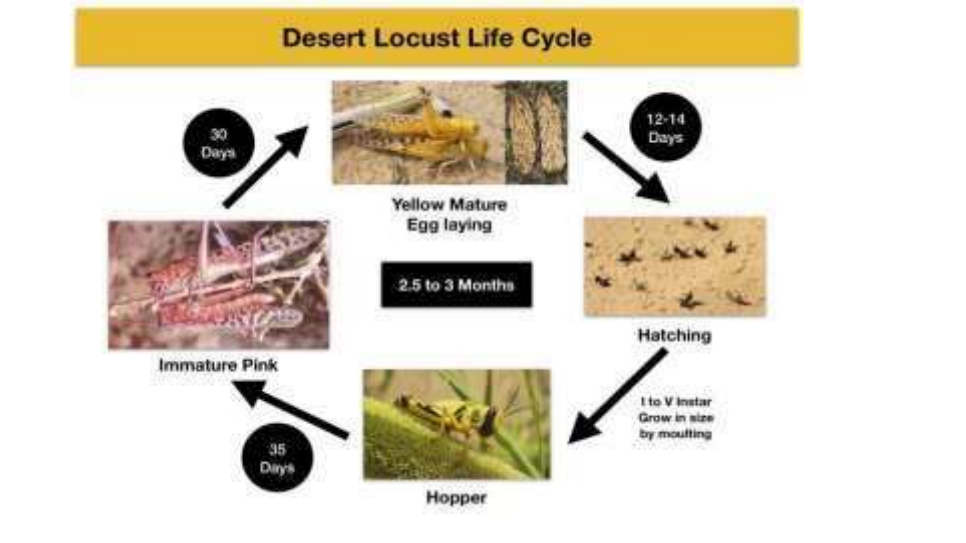
- Ist Instar: Newly hatched are white but turns black in 1-2 hours.
- IInd Instar:Head is larger and pale colour pattern is conspicuous.
- IIIrd Instar :Two pairs of wing buds projects on each side of thorax
- IVth Instar: Colour is conspicuously black and yellow.
- Vth Instar: Colour is bright yellow with black pattern.

Life Cycle

- Three stages: egg, nymph (hopper) and adult
- Eggs are laid by females, hatch into wingless nymphs called hoppers.
- Hoppers shed their skins five or six times called **moulting** and the stage between moults is referred to as an **instar**.
- The final moult from fifth (or sixth) instar hopper to adult is called **fledging** adult known as a **fledgling**.



Life Cycle Parameters		
Stage	Egg, Hopper, Adult	
Duration	Egg	10-15 days
	Hopper	24-96 days (36 days average)
	Adult	2.5 - 5 months
	Adult maturation	3 weeks
Nymphal instars	5-6 (solitarious)	5 (gregarious)
Phases	solitarious, transient, gregarious	


Desert Locust Life Cycle
30 Days
Yellow Mature
Egg laying
12-14 Days
2.5 to 3 Months
Hatching
Immature Pink
I to V Instar
Grow in size
by moulting
35 Days
Hopper


• Mating / Egg Laying / Eggs

- Hopper Stages

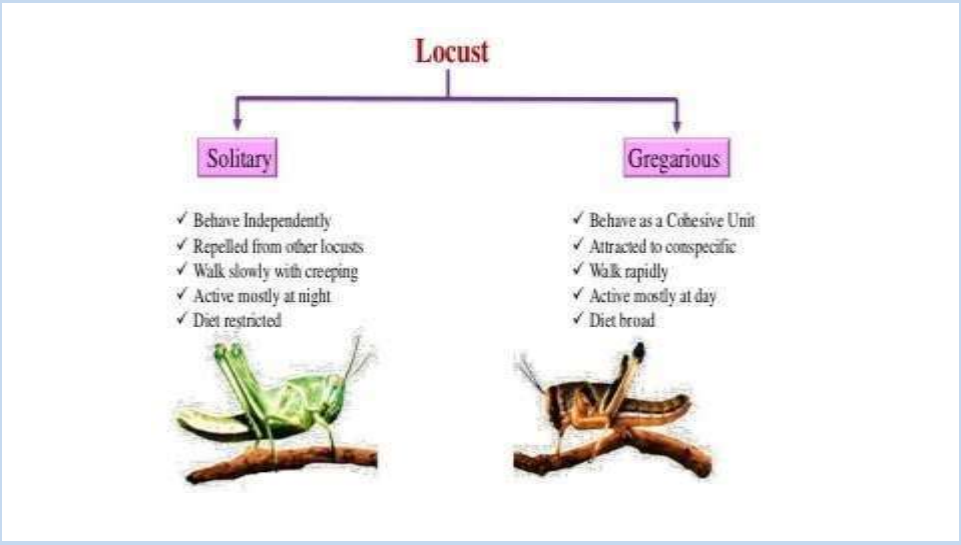
Immature adults(Pink Locust)

Mature Adults

Locust Phases

1. Solitarious- present in low densities, individual live separate from each other.

2. Gregarious – when large number of individual gather together.



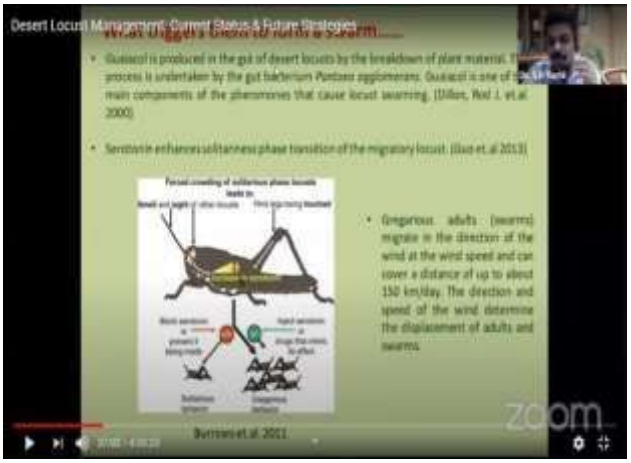
Desert Locust Phases

Difference between Desert Locust & Grasshopper

Desert Locust

Grass Hopper

The desert locust has the ability to change its behaviour and habits and can travel long distances in the group stage.



Dispersal

A. Dispersal through Walking
- Immature stages of insect disperse through locomation
- Armyworm

B. Dispersal through flying
- Trivial flight
- Displacement of insects within breeding or feeding sites.
- Usually movement over short distances.
- Typically does not involve displacement of entire population.
- Butterfly feeding, lightning, bug mating

Migration

- * It involves displacement of entire population from breeding , feeding and overwintering sites.- flight.
- * Individual predispose to flight or transport.
- Eg. Non appetetial behavior- un distracted by mates, food or oviposition sites.
- Regular feature of seasonal cycle for some insects.
- Can result in substantial mortality, only a minute fraction may locate suitable habitat.

What is Migration ?

1. Persistent prolonged movement.
2. Straitened course of movement.
3. Undistracted by usual stimuli.(e.g. food , mates.)
4. Distinct arrival and departure behavior.
5. Reallocation of energy in advance of migration.

- **Migration**

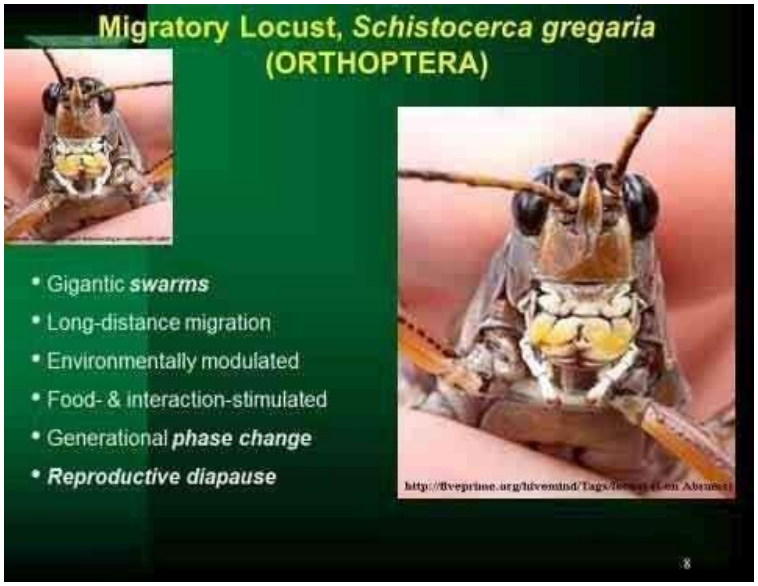
- Mass movement of entire population where some insects return again to the area from which they had moved.

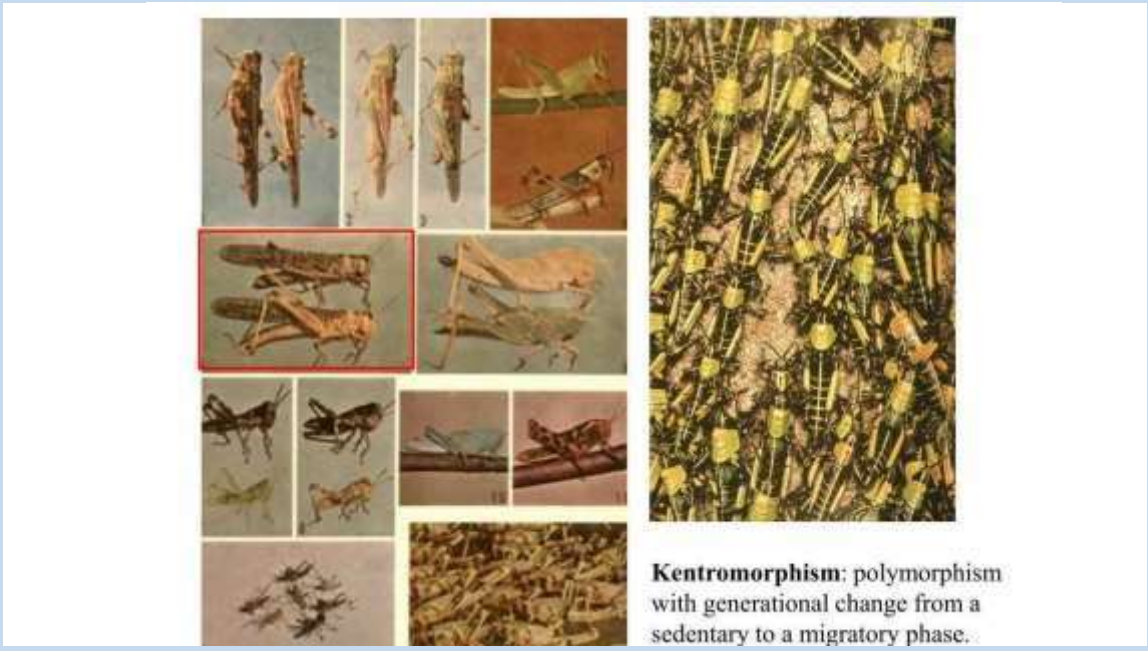
(Dhaliwal,2003)

Migration within boundary layer

* That altitudes at which wind speed equals to insect flight speed below the boundary layer, insect can have direct flight.
* Usually only a few meters high, flight of insect directly observable.
* Insect control their own flight path, seem to maintain study course.

Eg. Migratory butterflies(monarch butterfly. Dragonflies).





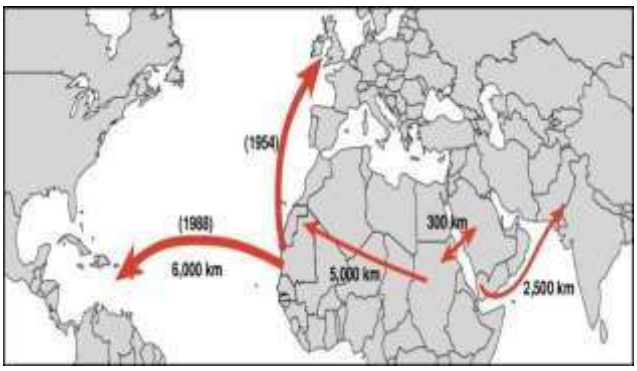
Kentromorphism: polymorphism with generational change from a sedentary to a migratory phase.

- A change brought about by environmental stimuli (high or low population density) in locusts, the larva of Lepidoptera and a few other insects, that cause coloration and pattern differences, anatomical proportions, physiology and behavioral differences; see gregaria, solitaria.

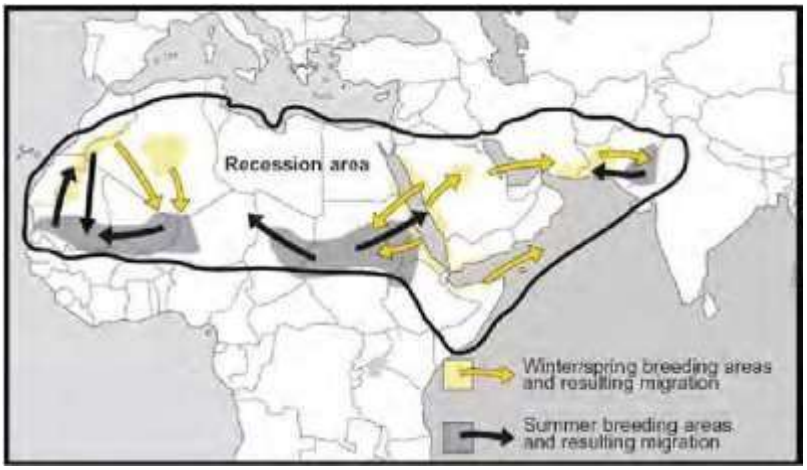
Some Migratory Locust swarms may contains hundreds of billions of insects , weighing thousands of tons.

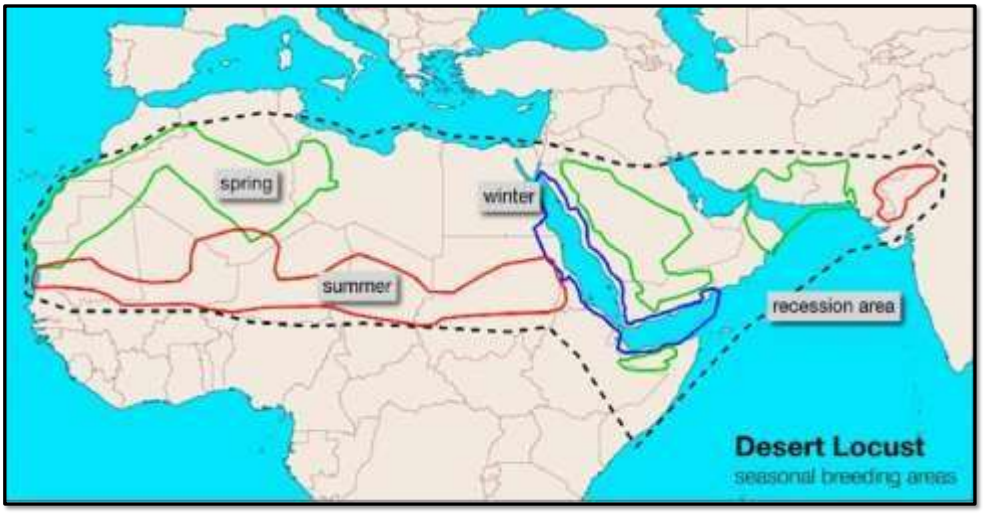
How far and how fast can desert locust migrate.

- Desert locust usually fly with the winds at a speed of 16-19 km/hr depending on the wind. Swarm can travel up to 5-130 Km or more in a day. Locust can stay in air for long period of time.
- For example, Locust regularly cross the Red sea a distance of 300 Km. In the past there have been some spectacular and very long distance swarm migrations. For example from North West Africa to British Isles in 1954 and from West Africa to the Caribbean, a distance of 5,000 Km in about 10 days in 1988.
- Solitary Desert Locust Adults usually fly at night whereas gregarious adults(swarms) fly during the day.



Within the recession area, locusts move with the winds. These bring them into particular zones during the summer (the Sahel and the Indo-Pakistan desert) and during the winter/spring (northwest Africa, along the Red Sea and Baluchistan).





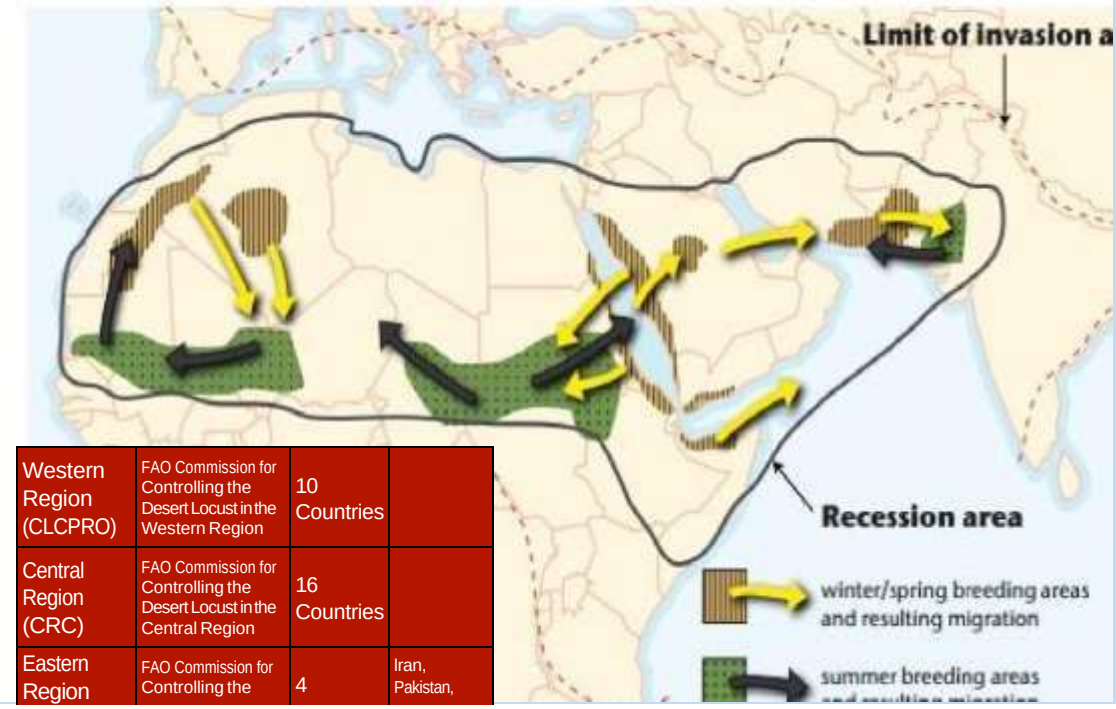
- Downwind displacement tends to bring locusts into an area during the season when rain is most likely, for example, the Sahel of West Africa and the Sudan in the summer and the Red Sea coasts in the winter. Once the rain falls, the locusts will mature and breed. By the time the new generation of adults is capable of sustained flight, the seasonal wind pattern may well have changed and breeding conditions become poor. The locusts will then migrate rapidly, often over very great distances, to another area.

- All this is true only in a very general way. Often there are movements that take place during periods of particular winds rather than coinciding with the prevailing wind flow. Moreover, rare and even unprecedented movements continue to occur. This is one reason why, in any given year, only part of the seasonal breeding area will be infested. The other major reason for unsuccessful breeding will be failure of the seasonal rains.

Spring breeding areas	Summer breeding areas
▪Northwest Africa	●Sudan, Eritrea, Ethiopia
▪Iran, Pakistan	●East Africa*
▪Interior of Saudi Arabia and Yemen	●Sahel, West Africa
▪Somalia Peninsula and East Africa*	●Indo-Pakistan border

Winter breeding areas
- Red Sea and Gulf of Aden coasts
- Somali Peninsula and East Africa*

* During plagues



Western Region (CLCPRO)	FAO Commission for Controlling the Desert Locust in the Western Region	10 Countries	
Central Region (CRC)	FAO Commission for Controlling the Desert Locust in the Central Region	16 Countries	
Eastern Region	FAO Commission for Controlling the	4	Iran, Pakistan,

Locust season	Rainfall season	Hatching	Fledging
Spring (long rains)	February – May	March – June	May – August
Summer	June – September	July – September	August – October
Winter (short rains)	October – January	October – January	November – February

2.

New Initiatives for Sustainable Desert Locust management

Dr.Shaloo Ayri
Deputy Director(E)
Locust Control & Research
Headquarter, Faridabad

New Initiatives taken by Locust Division

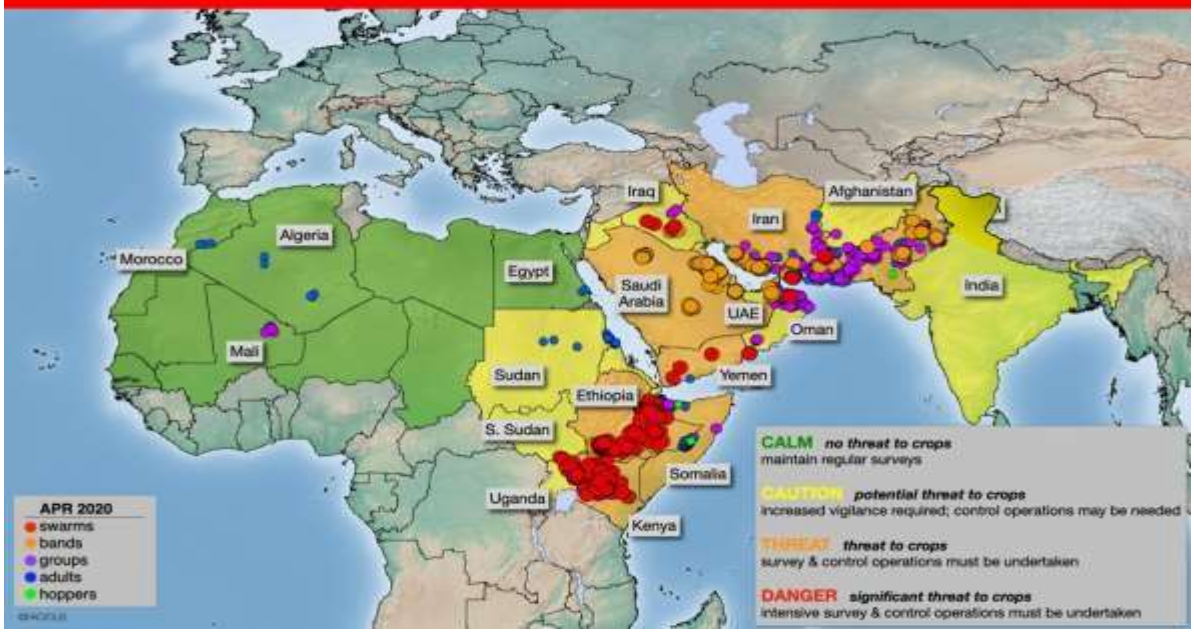
1. Country Specific Dashboard
2. Bio–pesticides
3. Insect Growth Regulators

1

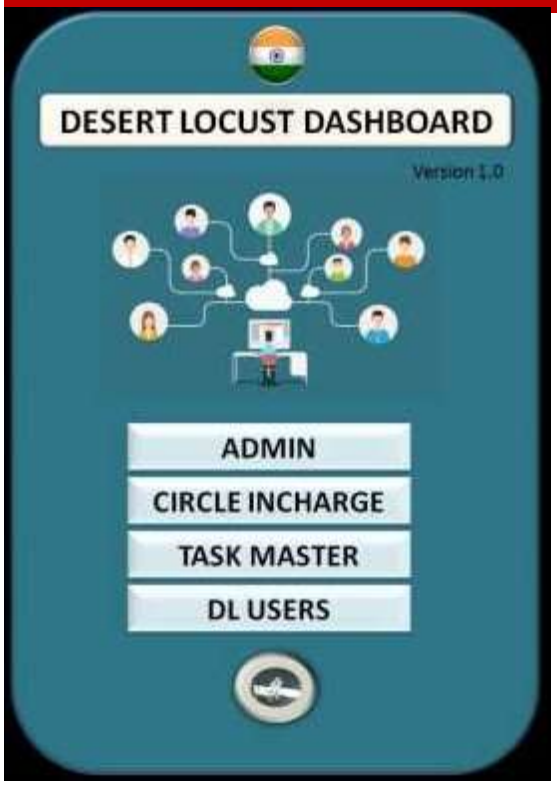
Country Specific Dashboard

Existing data entry/transmission equipments

Locust Survey data received from eL3, eL3m, eL3g plotted on map for further analysis and forewarning



Concept of Country Specific Dashboard



32nd SWAC Session : Development of a dashboard was recommended in the session.

The matter was discussed during every SWAC virtual meeting thereafter.

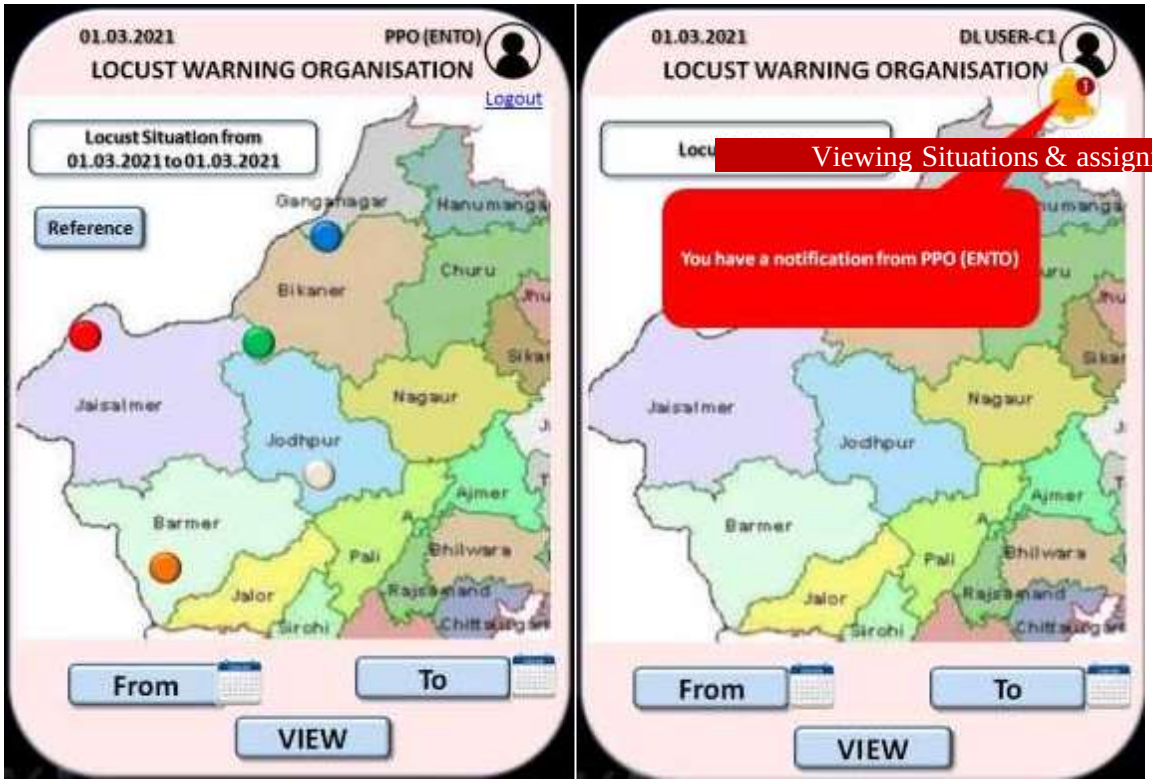
India proposed a concept of country specific dashboard.

India prepared a design of country specific dashboard and demonstrated during a virtual meeting specially organized for dashboard demo on 9th March, 2022

Concept appreciated, discussed with IT cell by FAO and the same virtual meeting was repeated for Secretary Western, Central , Eastern region, developer of eL3m and PP Organization of Pakistan on 05 th April, 2022.

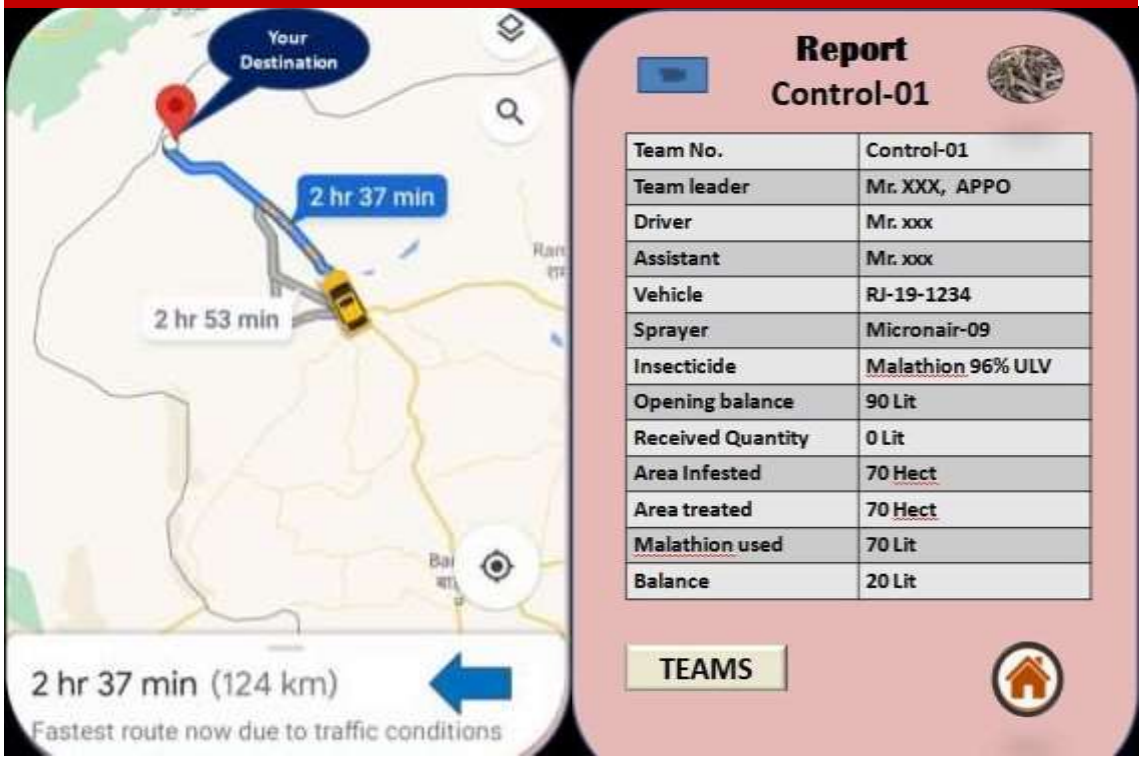
Country Specific Dashboard features

- Enhancement of present app
- Integral part of existing eLocust3 m app.
- Survey and Control data entry
- Team constitution and edit features.
- Dynamic reports generation.
- Survey, Control situation viewed on map.
- Various task assignment.
- Vehicle, Equipment, Insecticide, Staff detail
- Navigation feature to locate destination.
- E–tutorial.



Team constitution/update information

Navigation/Submission of Survey,Control reports



Circle In–charge tasks/Dynamic reports

Present Status of Dashboard

- The concept of dashboard was appreciated by FAO, eL3m developer and Secretaries of Western, Central and Eastern region.
- Development of dashboard is under consideration with FAO.

2

Bio–Pesticide

Since several decades, desert locust control in India is completely achieved by using chemical pesticides like Malathion, BHC, Deltamethrin etc.

Large quantities of chemical pesticides were used to control locust upsurges in different years.

Current upsurge 2019–2021

Chemical Control

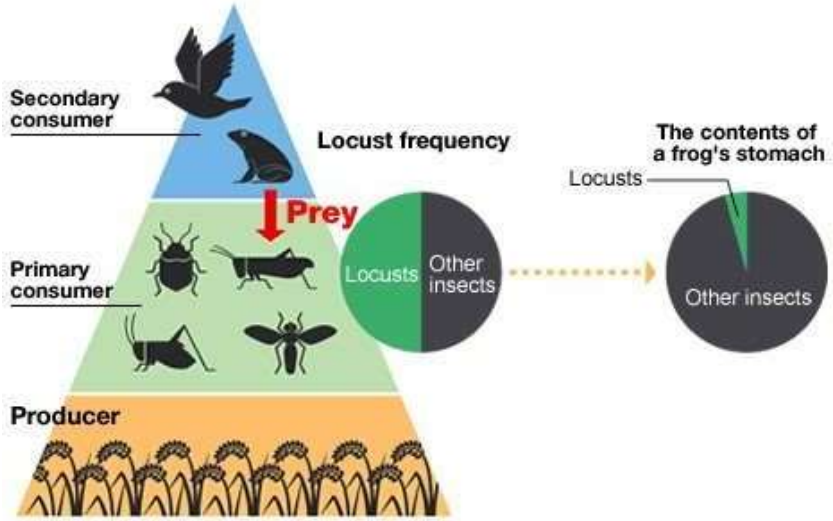
Cyclones in May and October,2018 brought heavy rains that gave rise to favourable breeding conditions in the Empty Quarter of the southern Arabian Peninsula for at least nine months since June.
As a result, three generations of breeding occurred that was undetected and not controlled.

INDIA

Year	Area treated (Ha)	Malathion 96% Used (Lit)
2019-20	403488	314645
2020-21	279916	245590
Total	683404	**560235**

5,60,235 Lit

Chemical insecticides are hazardous for predators and parasites of locust

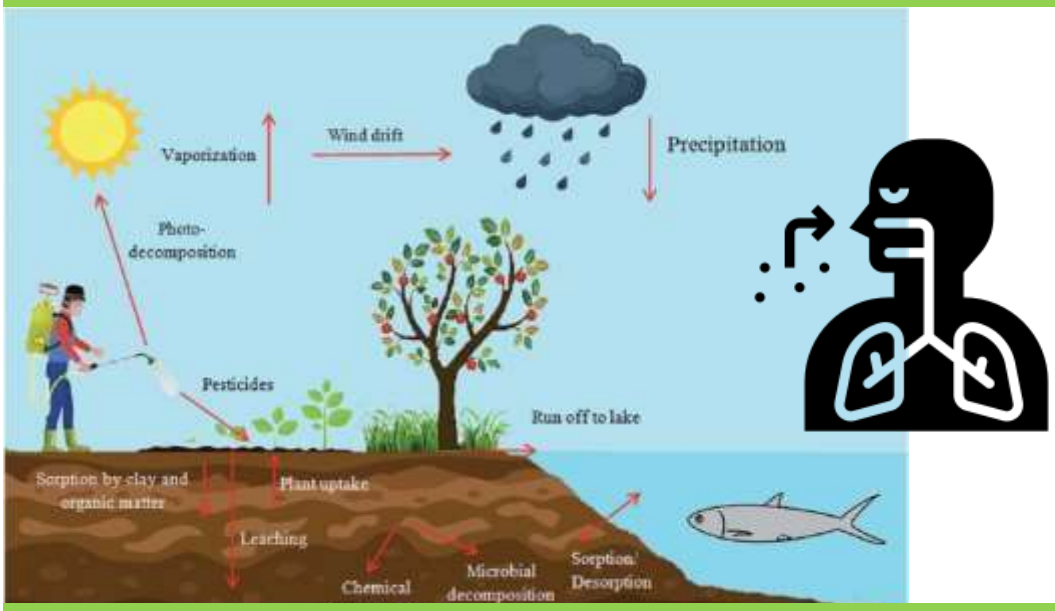


Adverse effect on fauna and flora of desert

Hazardous for desert biodiversity

Reptilian , Eagles, Beetles, Birds etc.

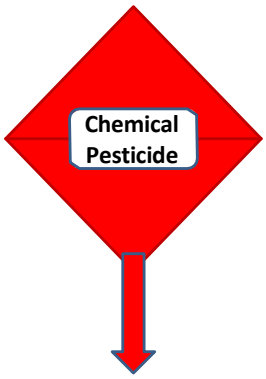
Hazardous for ecosystem

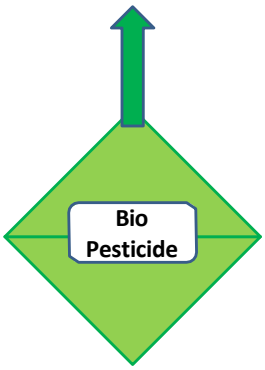


Living, Non living things, Human health

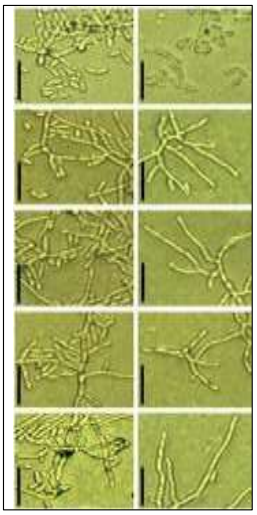
Alternative approaches

- To bring down consumption of chemical pesticide, promote use of bio –pesticide for Desert Locust control in future.





Metarhizium acridum (Green Muscle)



Kingdom:	Fungi
Division:	Ascomycota
Class:	Sordariomycetes
Order:	Hypocreales
Family:	Clavicipitaceae
Genus:	Metarhizium
Species:	M. acridum
Binomial Name	
Metarhizium acridum	

Metarhizium acridum doses against DL

- ⋆ The active ingredient is a micro−organism entomopathogenic fungus Metarhizium acridum.
- ⋆ It provokes an epidemic disease among the treated insects.

Recommended dose against Desert locust:

Aerial Application	50 gm of Green muscle or Novacrid powder mixed with 1 litre of diesel oil per hectare
Ground Application: Vehicle mounted, knapsack or handheld ULV sprayers	Volume of oil is 2 liters per hectare This dose rate equals to 2.5 gms into 10^{12} spores of Metarhizium acridum per hectare
High and Dense Vegitation	Dose rate can be increased to 100 gm per hectare

Metarhizium acridum availability

- Bio−pesticide product for Locust are available commercially.
- Bio−pesticide products are commercialized as dry powder of spores of Metarhizium acridum in vacuum sealed bags

Market Brand

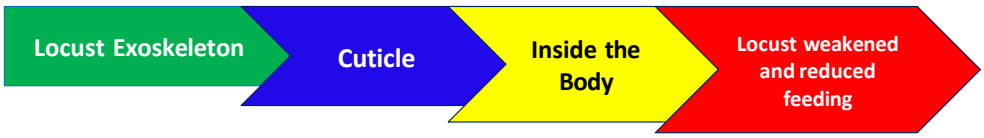
1. Green Muscle

2. Novacrid

GREEN MUSCLE

Mode of Action

How does bio-pesticide work?



Spores of M. acridum

Spores Germinate & penetrate inside Cuticle with pressure & enzymatic action

The fungus multiplies inside the body

Locust start dying 7th day onwards

Spray Equipment used for Bio-pesticide

- Ultra low volume sprayers
- Aircraft, vehicle mounted, Knapsack or handheld sprayers

Metarhizium acridum (Green Muscle) trials at FSIL

- Post approval by CIB&RC, FAO facilitated the import of 3 Kg of *M.acridum* for trial and evaluation purpose
- Successful bio−efficacy trials have been conducted at FSIL on *M.acridum* with mortality rate of 95−100%
- *M.acridum* have been shared with RCIPMCs for maintaining and multiplication purpose

Metarhizium acridum treated locust

Eco−friendly

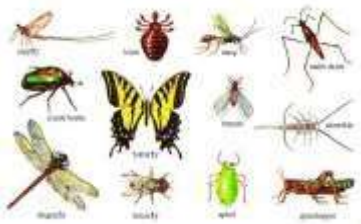
Somalia : Aerial Control with Bio–pesticide

Spraying was funded by the U.S. Agency for International Development

Advantages of Bio-pesticide

- Highly **specific to Locust**

- No negative effect on honey bees and other **beneficial arthropods**; non polluting



- **Not toxic** to **humans** or animals such as **birds, fish, reptiles, amphibians** etc.

- Contrary to chemical pesticides, bio–pesticides can be applied in areas with **water bodies**

Initiatives taken for Bio–Pesticide

- Locust Division DPPQS has submitted request for import license with CIB&RC for importing *Metarhizium acridium* and correspondence are in progress with CIB&RC.
- A presentation was made by M/s Elephant Vert, France via virtual mode on 28th April on Bio–pesticide *M.acridium* and its potential use against Desert Locust.
- M/s Elephant Vert, France has been advised to approach CIB&RC for registration of *M.acridium* as per insecticide rules.
- The company can supply upto 1000 Kgs for which a minimum of six weeks prior intimation is rquired. However, for less than 50 kgs the company is ready to supply immediately on giving an indent.

3

Insect Growth Regulators

INSECT GROWTH REGULATORS (IGR)

- IGRs are compounds which interfere with:
  - Growth,
  - Development
  - Metamorphosis
- IGRs include synthetic analogues of insect hormones such as
  - Ecdysoids
  - Juvenoids
- Non−hormonal compounds such as
  - Precocenes (Anti JH)
  - Chitin synthesis inhibitors

Mode of Action

- Disruption of chitin formation and deposition
- Disrupts molting process
- Physical abnormalities
- Lethargy
- Cessation of feeding
- Death

Availability of commercial IGRs

- Diflubenzuron (Dimilin)
- Benzoylphenyl Ureas (BPUs)
- Chlorofluazuron (Atabron)
- Novaluron (Rimon)

IGR APPROVED BY CIB&RC

Pesticide approved used for control of DL on Crop, Acacia & other trees.

S.No.	Chemical	Does	
		a.i.(gms)/ha	Formulations (gm/ml) ha
1	Chloropyriphos 20% EC	240	1200
2	Chloropyriphos 50% EC	240	500
3	Deltamethrin 2.8% EC	12.5	500
4	Deltamethrin 1.25% ULV	12.5	1000
5	Diflubenzuron 25% WP	60* (Hoppers)	240
6	Fipronil 5% 5% SC	6.25	125
7	Fipronil 2.92% EC	6.25	220
8	Lamdacyhalothrin 5% EC	20	400
9	Lamdacyhalothrin 10% WP	20	200
10	Malathion 50% EC	925	1850
11	Malathion 25% WP	925	3700

Advantages of IGR

Advantages
Effective in minute quantities, economical
Target specific, safe to natural enemies
Biodegradable ,non−persistent
Non−polluting

Some other alternatives

Neem extracts

A systematic investigation of extracts of the seeds ofneem (*Azadirachta indica*) has been carried out to isolate a feeding inhibitor for the desert locust (*Schistocerca gregaria*). Feeding inhibition for starved fifth instar larvae was measured by presenting them with filter papers impregnated with 0·25 M sucrose and fractions of the seeds. In this way, the substanceazadirachtin has been isolated from the terpenoid fraction. This compound completely inhibits feeding in the locust with test solutions down to a concentration of 40μg/l.

Inhibits feeding in the locust

Trenching and burying hoppers

2 feet wide and 2 feet deeper trenching for mechanical control of hoppers

Locust as food

Locusts are considered a delicacy and eaten in many African, Middle Eastern, and Asian countries. They have been used as food throughout history.


THANKS

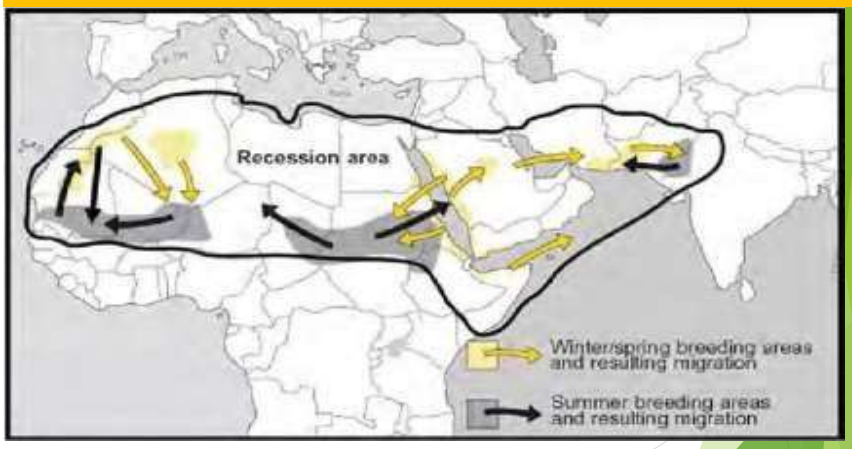
(3)

Locust Upsurge/ Incursion 2019

Presented By

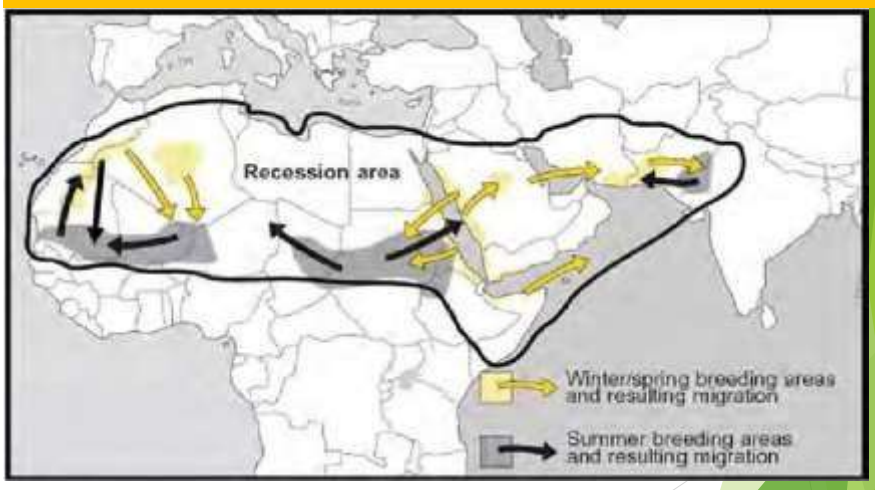
Sh. Pramod Kumar Gour
Assistant Plant Protection Officer (E)
DPPQS Faridabad

Desert locust recession area with seasonal breeding zones and population movements between them



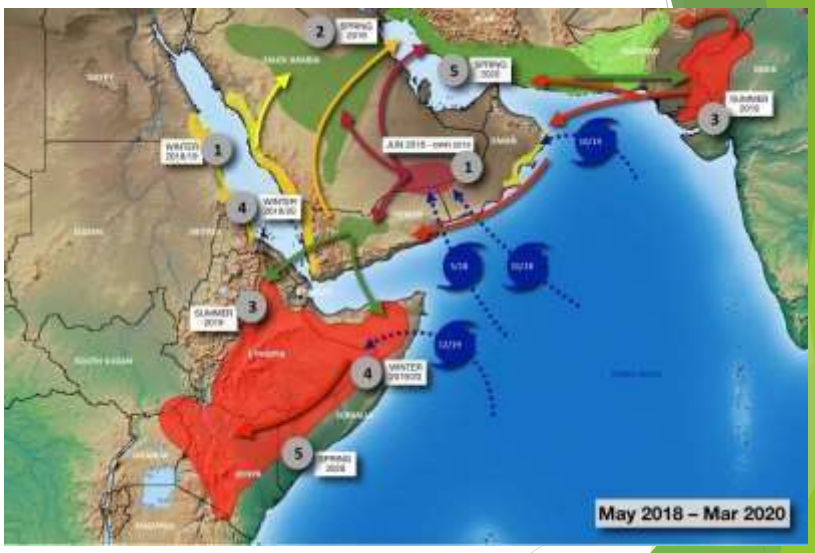
During quiet periods (known as recessions) **Desert Locusts** are usually restricted to the semi-arid and arid deserts of Africa, the near east and southwest Asia .

Desert locust recession area with seasonal breeding zones and population movements between them



During quiet periods (known as recessions) **Desert Locusts** are usually restricted to the semi-arid and arid deserts of Africa, the near east and southwest Asia .

Current Upsurge 2019-2020



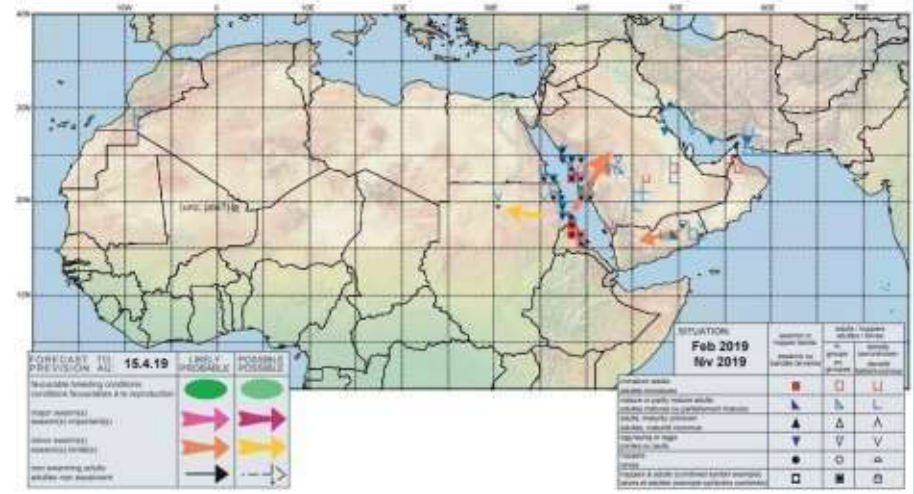
INCURSION-2019

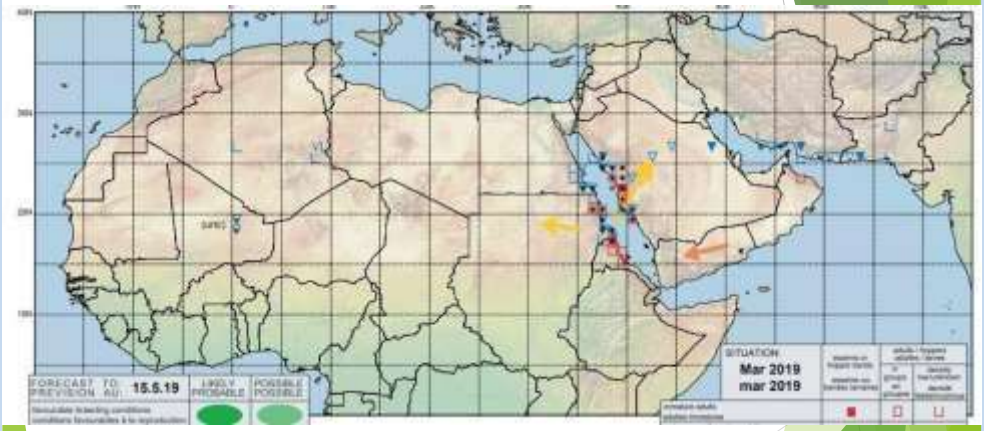
- MAY -: swarms invade the Indo-Pakistan border from Iran and up to three generations occur due to longer than normal monsoon, giving rise to large numbers of swarms.

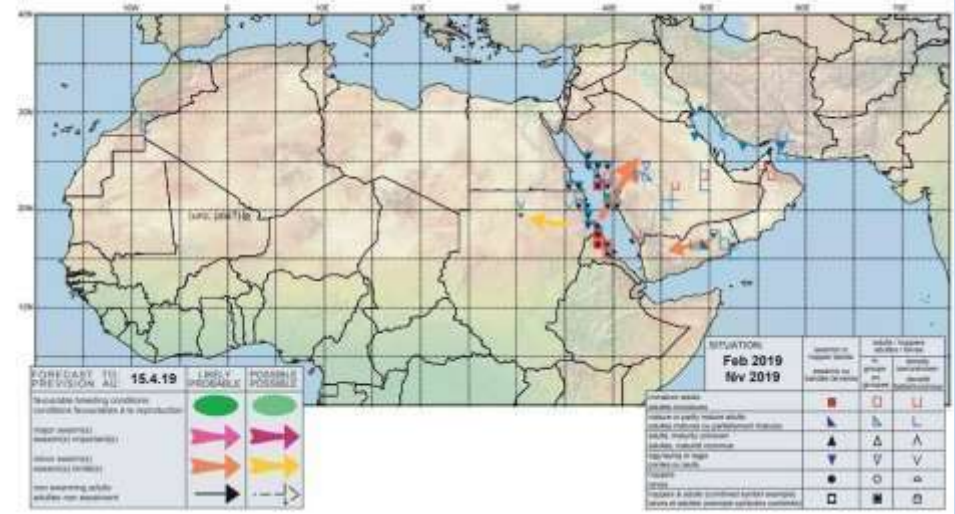
Control Operation 2019

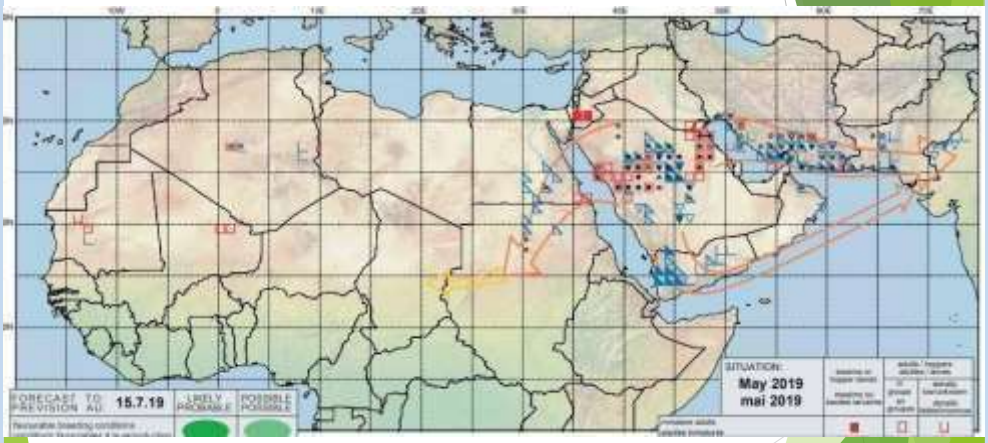
Total area surveyed	-	9,40,484 Ha
Area treated	-	4,03,488 Ha
Malathion used	-	3,14,645.5 ltr
Control against Adults	-	2,25,803 Ha
Control against Hoppers	-	1,77,685 Ha
Manpower engaged	-	200
Vehicle utilized	-	65

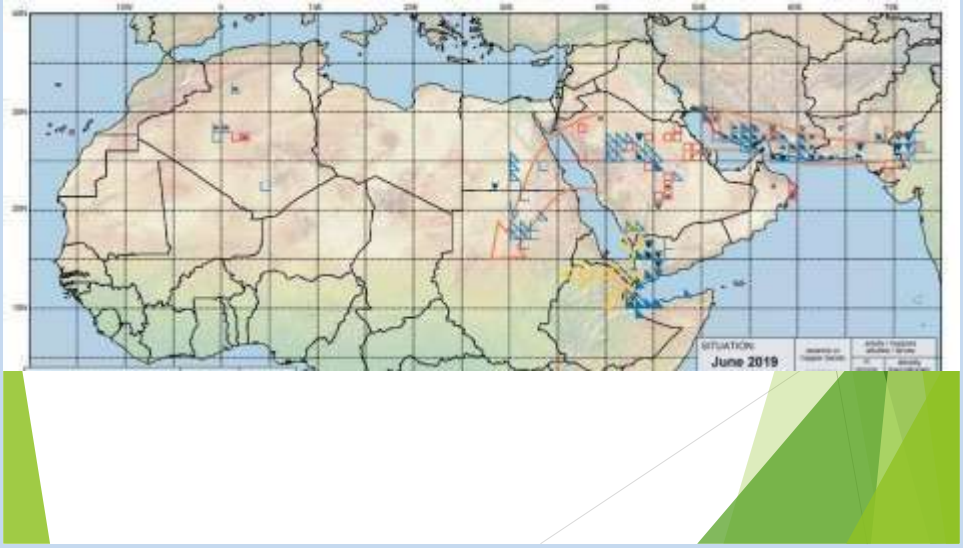
Control operation successfully conducted in 11district of Rajasthan, 2 district of Gujarat & 1 district in Punjab

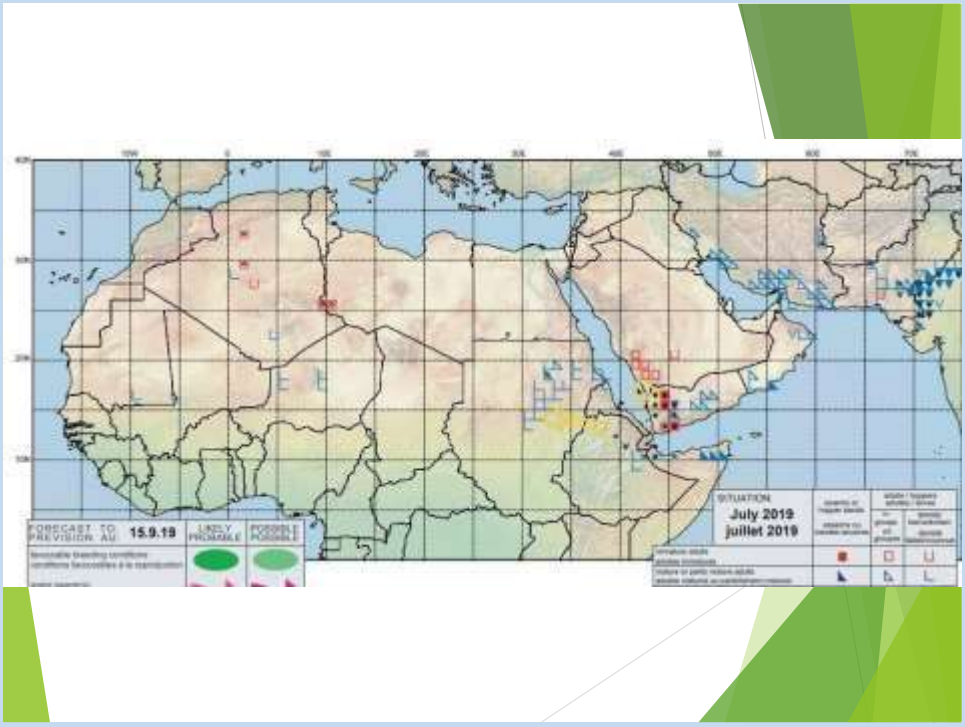

SITUATION
Feb 2019
fév 2019
FORECAST TO
PREVISION AU
15.4.19
LIKELY
PROBABLE
POSSIBLE
POSSIBLE

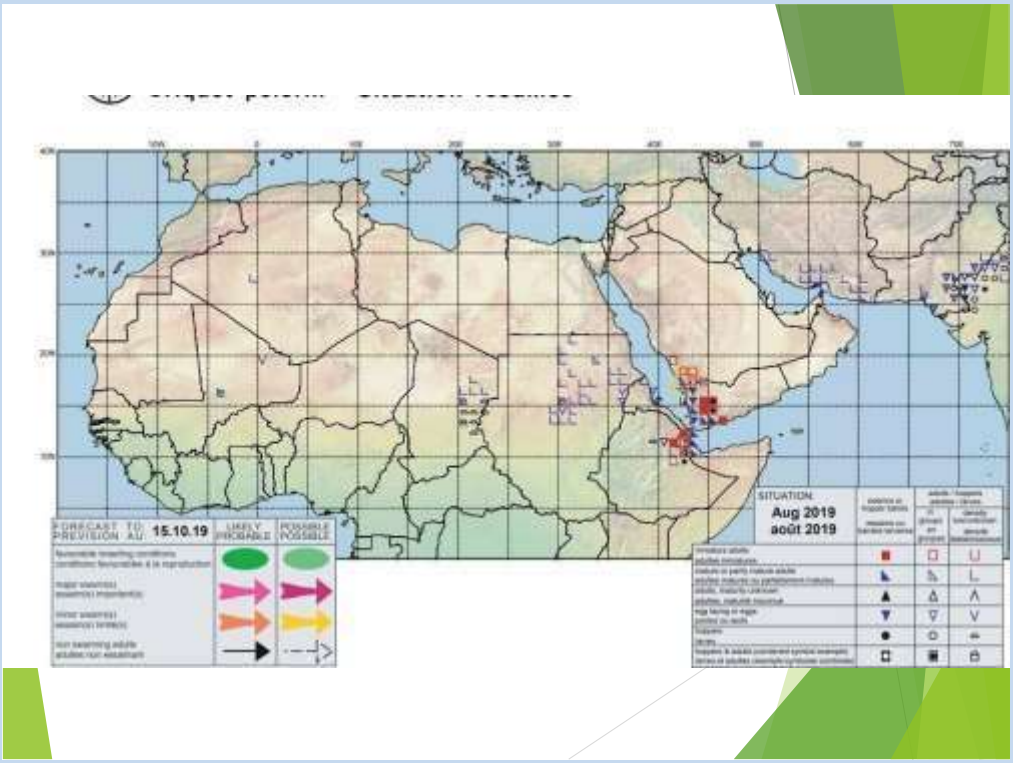

SITUATION
Mar 2019
mar 2019
FORECAST TO
PREVISION AU
15.5.19
LIKELY
PROBABLE
POSSIBLE

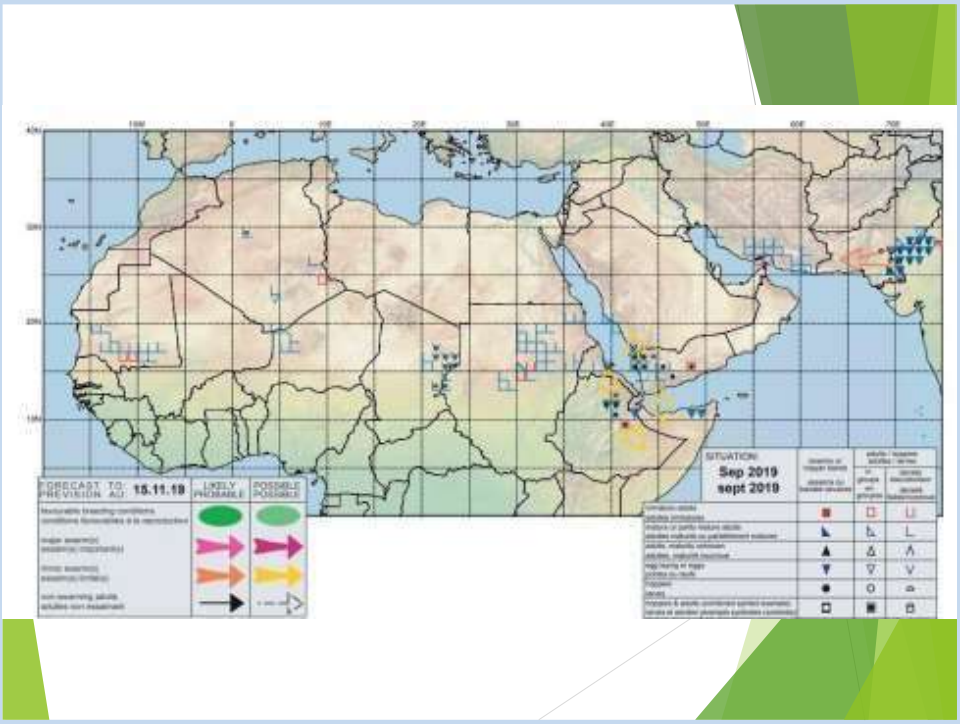

SITUATION:
Feb 2019
fév 2019
FORECAST TO
PREVISION AU
15.4.19
LIKELY
PROBABLE
POSSIBLE
POSSIBLE

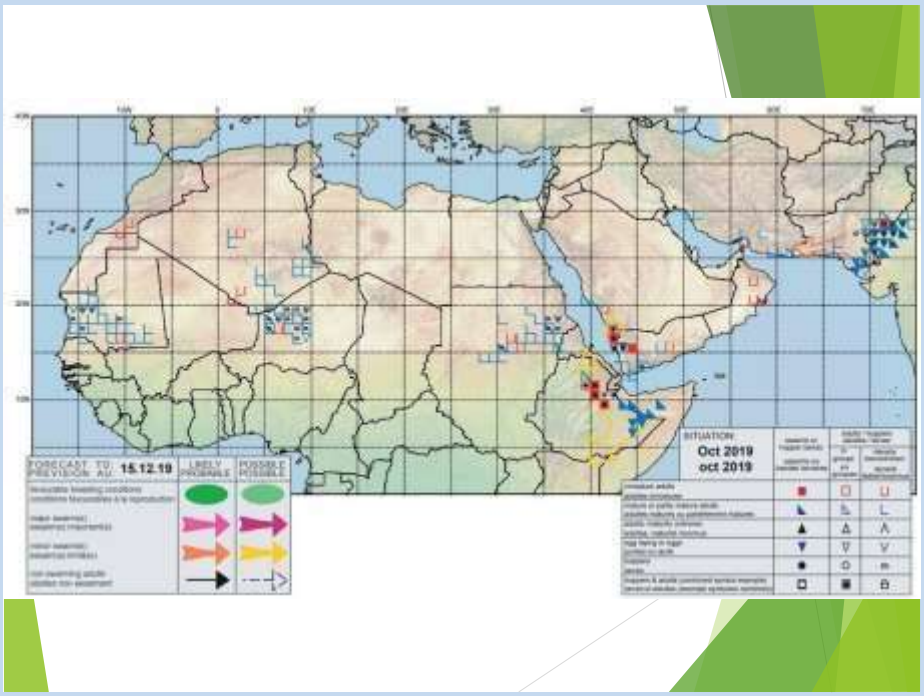

SITUATION:
May 2019
mai 2019
FORECAST TO
PREVISION AU
15.7.19
LIKELY
PROBABLE
POSSIBLE
POSSIBLE

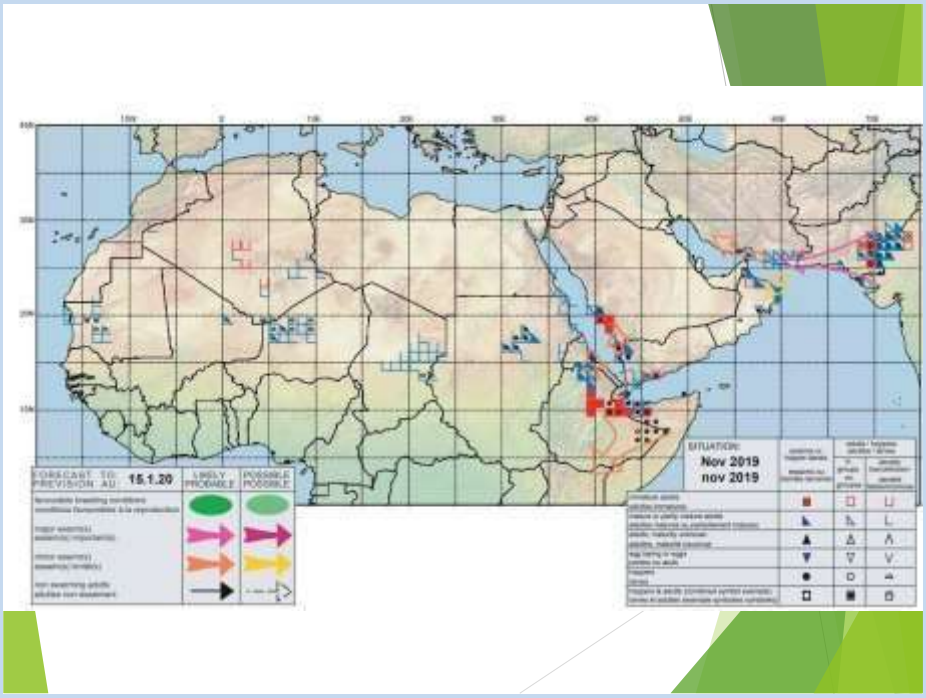

SITUATION
June 2019

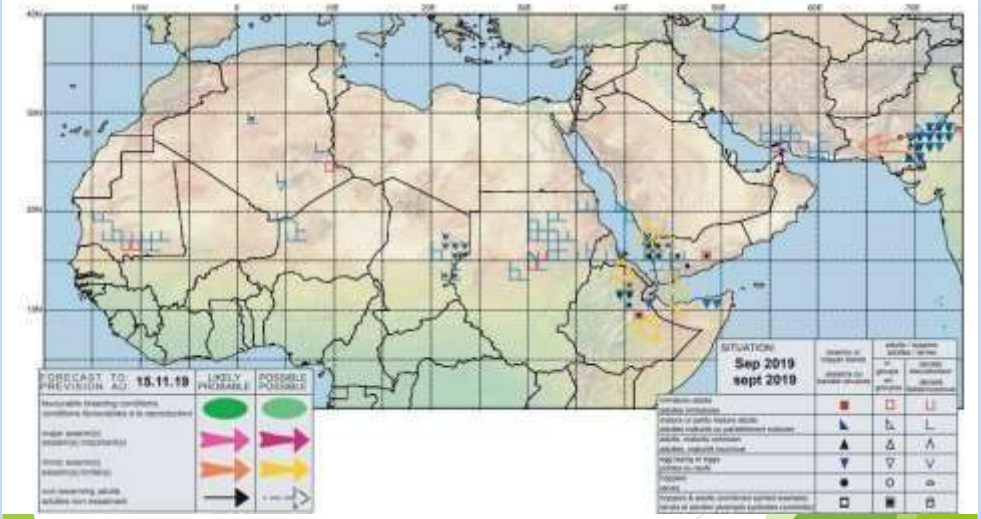

FORECAST TO
PREVISION AU
15.9.19
LIKELY
PROBABLE
POSSIBLE
POSSIBLE
SITUATION
July 2019
juillet 2019

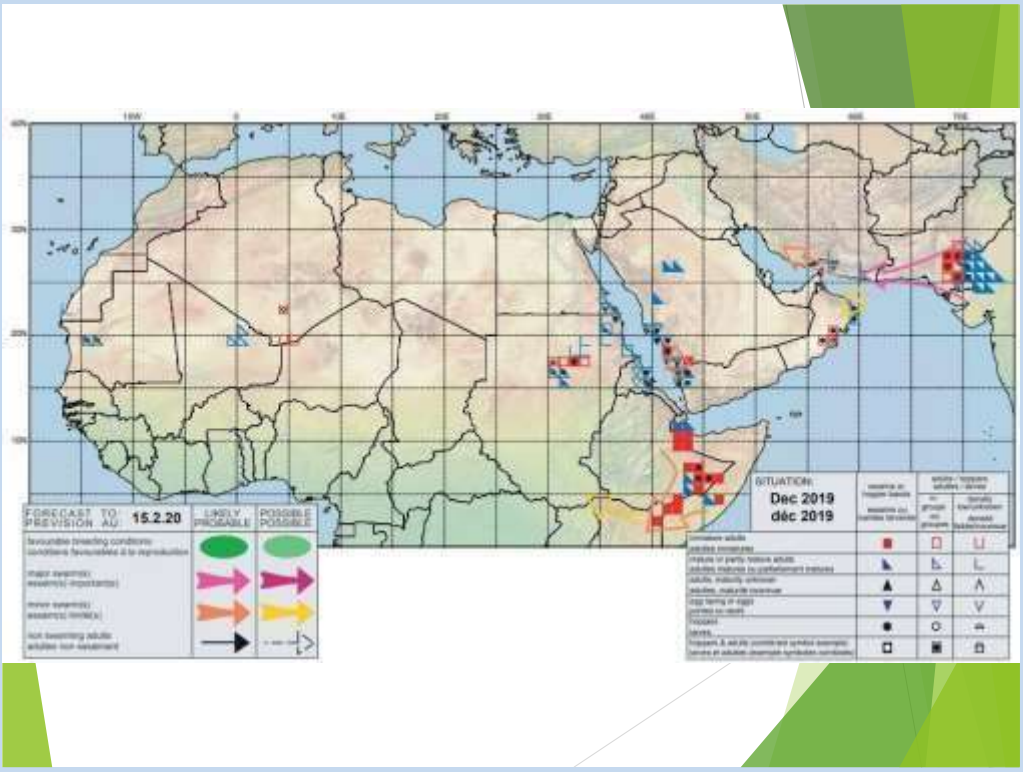

SITUATION
Aug 2019
août 2019
FORECAST TO
PREVISION AU
15.10.19
LIKELY
PROBABLE
POSSIBLE
POSSIBLE


SITUATION
Sep 2019
sept 2019
FORECAST TO
PREVISION AU
15.11.19
LIKELY
PROBABLE
POSSIBLE
POSSIBLE


FORECAST TO
PREVISION AU
15.12.19
LIKELY
PROBABLE
POSSIBLE
POSSIBLE
SITUATION
Oct 2019
oct 2019


FORECAST TO
PREVISION AU
15.1.20
LIKELY
PROBABLE
POSSIBLE
POSSIBLE
SITUATION
Nov 2019
nov 2019


SITUATION
Sep 2019
sept 2019
FORECAST TO
PREVISION AU
15.11.19
LIKELY
PROBABLE
POSSIBLE
POSSIBLE


SITUATION
Dec 2019
déc 2019
FORECAST TO
PREVISION AU
15.2.20
LIKELY
PROBABLE
POSSIBLE
POSSIBLE

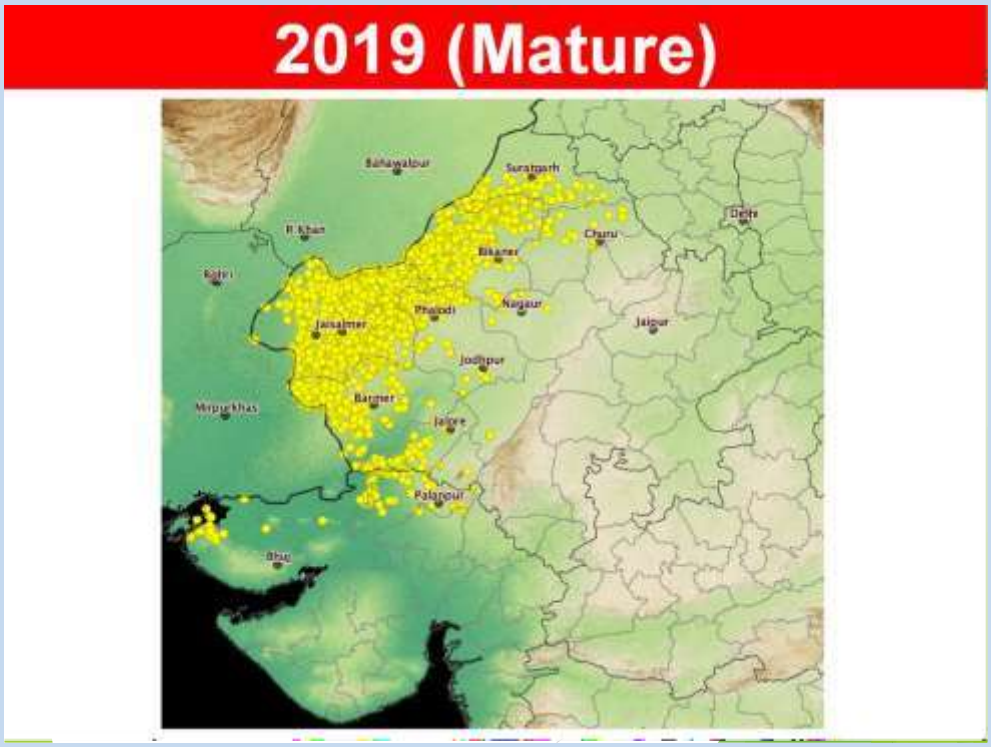
INCURSION-2020

- MAY: Second-generation swarms form in Iran and Pakistan, and migrate to Indo-Pakistan, continuing to northern India. 1. Why Migrates ?
- JUNE: Spring-bred swarms continue to move to Rajasthan and northern states of India.
- JULY: First-generation laying, hatching and band formation occurs along Indo-Pakistan border. (Upserge)
- AUGUST: Widespread hatching and band formation in SW Asia.
- SEPTEMBER: SW Asia returns to calm

Control Operation 2020

Total area surveyed	-	4,75,015 Ha
Area treated	-	2,87,986 Ha
Malathion used	-	2,45,590.5 ltr
Ground Control	-	2,79,166 Ha
Aerial Control	-	8,820 Ha
Manpower engaged	-	300
Vehicle utilized	-	120

Control operation successfully conducted in 6 States viz., Rajasthan, Gujarat, Punjab, Haryana, MP & UP


2019 (Mature)
Bahawalpur
Suratgarh
Delhi
Churu
Bikaner
Nagaur
Phalodi
Jaisalmer
Jaipur
Jodhpur
Barmer
Jalore
Palanpur
Bhuj


Global situation of the Desert Locust Upsurge 2019-2020
29 Jan 2020
swarms
breeding
solitary
Dangerous
Serious
Threatened
Calm
None


13–19 May 2020
swarms & adult groups
hopper bands & groups
6–12 May 2020
swarms & adult groups
hopper bands & groups
Dangerous
Serious
Threatened
Calm
None

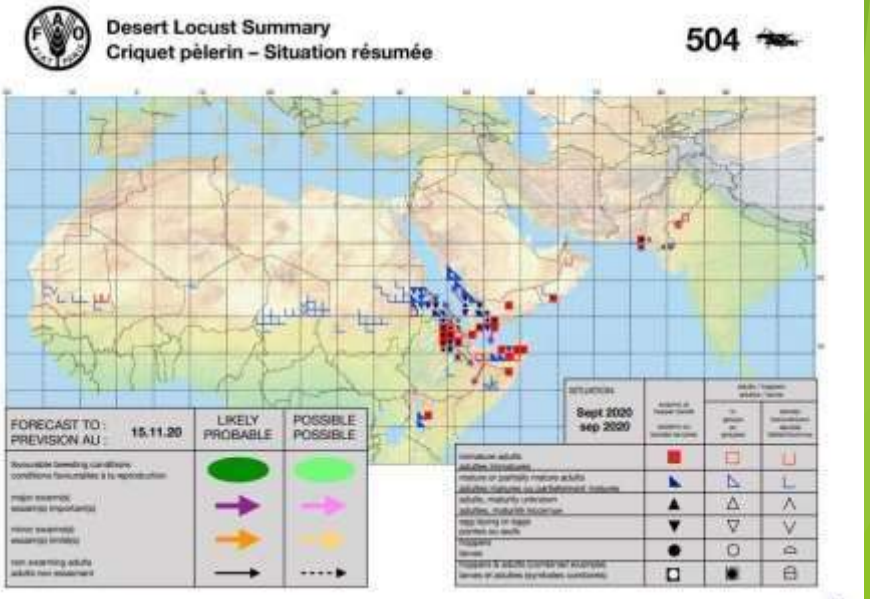

27 May – 2 Jun 2020
swarms & adult groups
hopper bands & groups
20–26 May 2020
swarms & adult groups
hopper bands & groups
Dangerous
Serious
Threatened
Calm
None

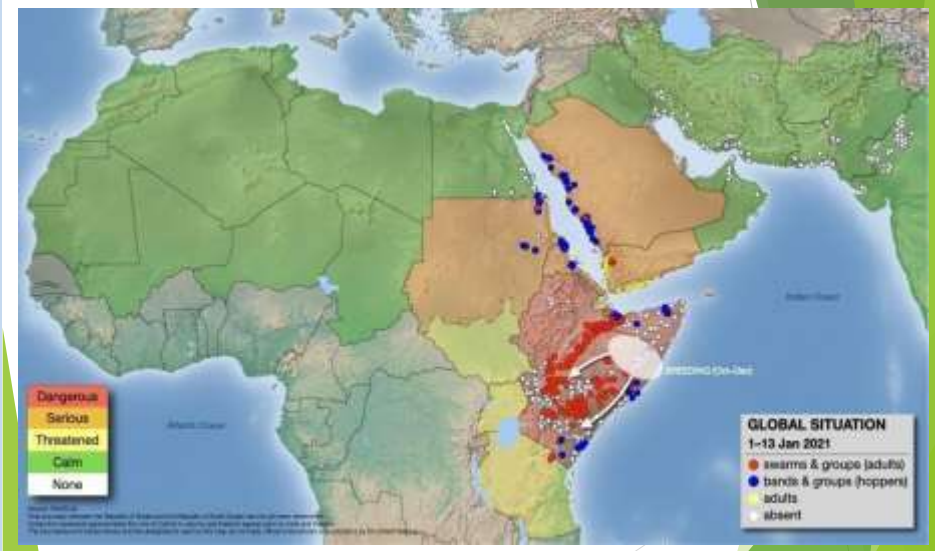

17–23 June 2020
swarms & adult groups
hopper bands & groups
10–16 June 2020
swarms & adult groups
hopper bands & groups
Dangerous
Serious
Threatened
Calm
None


24–30 June 2020
swarms & adult groups
hopper bands & groups
17–23 June 2020
swarms & adult groups
hopper bands & groups
Dangerous
Serious
Threatened
Calm
None


22–28 July 2020
swarms & adult groups
hopper bands & groups
15–21 July 2020
swarms & adult groups
hopper bands & groups
Dangerous
Serious
Threatened
Calm
None


Dangerous
Serious
Threatened
Calm
None
1–14 August 2020
swarms & adult groups
hopper bands & groups
non-gregarious locusts


Desert Locust Summary
Criquet pèlerin – Situation résumée
504
FORECAST TO :
PREVISION AU :
15.11.20
LIKELY
PROBABLE
POSSIBLE
POSSIBLE
Sept 2020
sep 2020



Decline

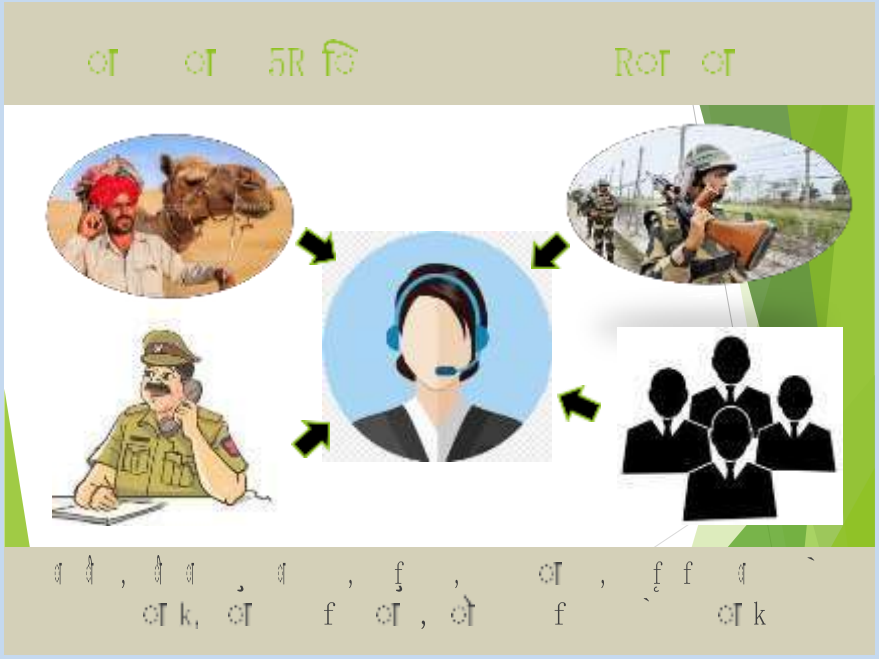
Plagues commonly come to an end through a combination of natural and human factors such as large-scale migration to unfavourable habitats, failure of seasonal rains resulting in lack of food and breeding activity, and mainly due to **control operations**.

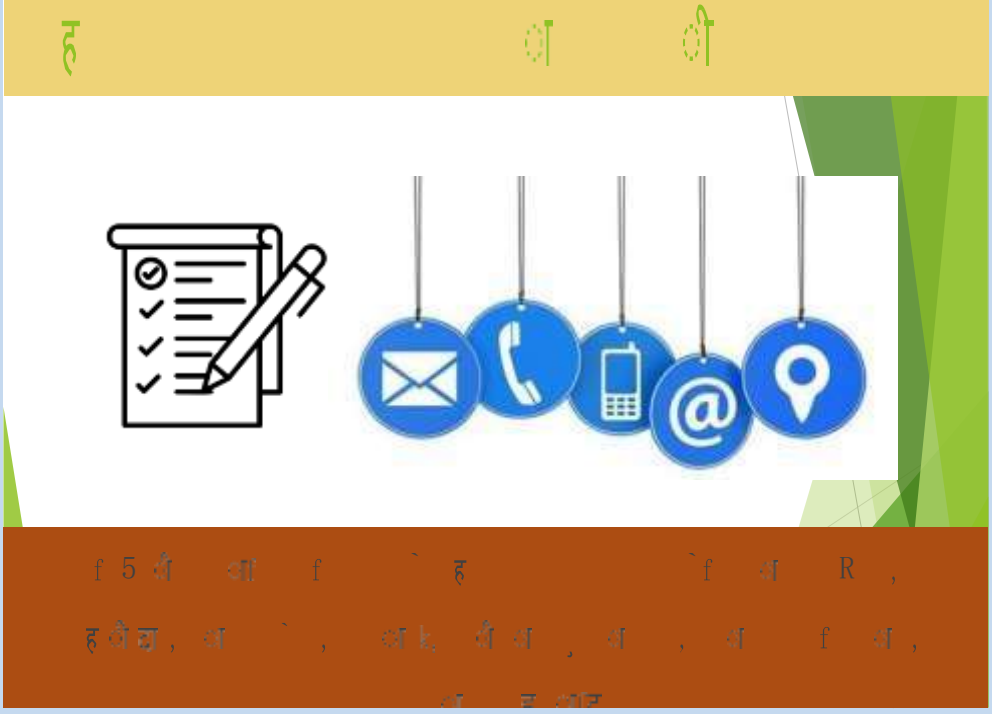
Large-scale migration to areas unsuitable for breeding

Failure of seasonal rains

Control operations

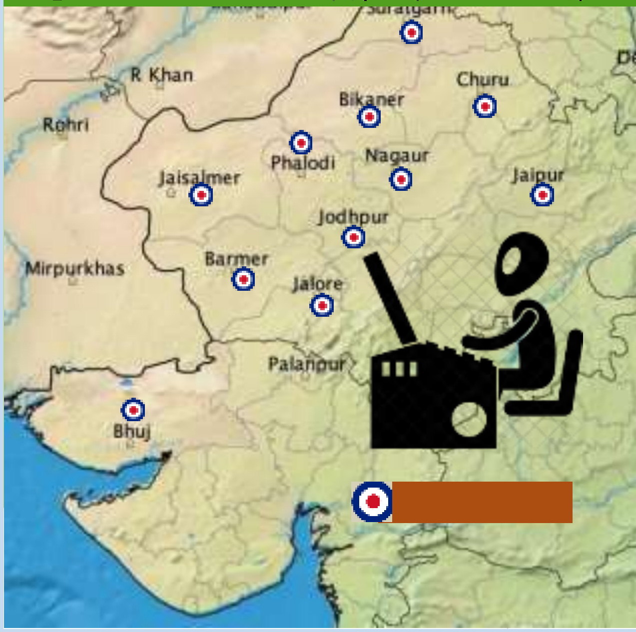
Successful locust control Advance Preparedness





(Data collection)

-
-
-
-



LWO, Jodhpur
Dr. S.Sundaramoorthy, Assistant Director,
Airforce Road, Opp. Sati Mata Ka Than, Jodhpur
email-lwo-jod-rj@nic.in Mobile : 8124531485

LCO, Bikaner
Shri Dhanne Singh Pooniya, Plant Protection Officer(E), Nagnichiji Road, Pawanpuri, Bikaner
email : lwcrj09@nic.in, Mobile : 8826052003

LCO, Barmer
Shri Mahesh Chandra, Assistant Director (PP)
Opp BNC Hotel, Aanchal Cinema, Uttarlai Road, Barmer, email : lwcrj08@nic.in, mobile : 9461965383

LCO, Jaisalmer
Shri Dr. Rajesh Kumar, Plant Protection Officer
Near Earth Satellite Station, Jaisalmer
email : lwcrj04@nic.in, Mobile : 9971221539

LCO, Suratgarh
Shri N.K.Meena, Plant Protection Officer (PP)
Near Aakashwani, NH-62, Bikaner Road, Suratgarh
email : lco.sog-dppqs@nic.in, Mobile : 9867500517

LCO,Churu
Shri Brijesh Kumar, Plant Protection Officer (E)
Near Collectorate office, Churu
email : lco-chu-rj@gov.in, Mobile : 9811712909

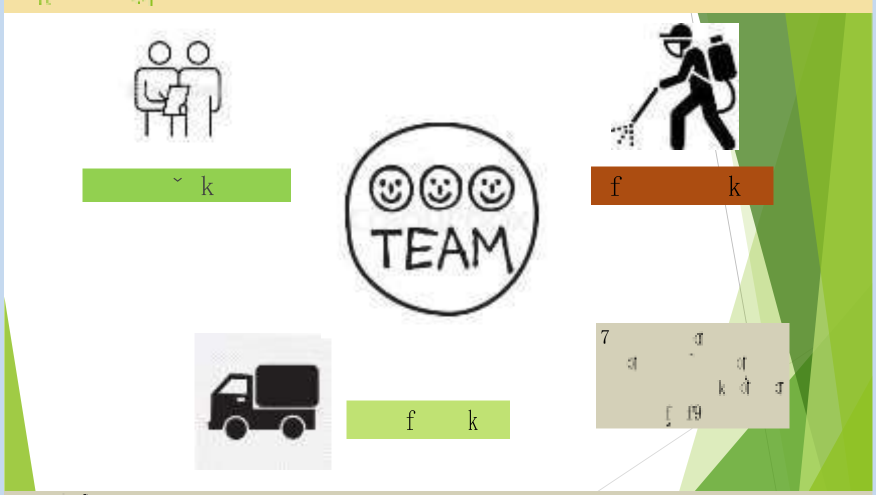
LCO, Nagaur
Shri Debasis Roy, Assistant Director (WS)
Basani Road, Nagaur
email : lcongr-rj@gov.in, Mobile : 7872243090

LCO, Phalodi
Shri Pawan Kumar, Plant Protection Officer(WS)
Near ITI, NH-15, Phalodi
email : lcodppqs-jod-rj@gov.in Mobile : 7888468443

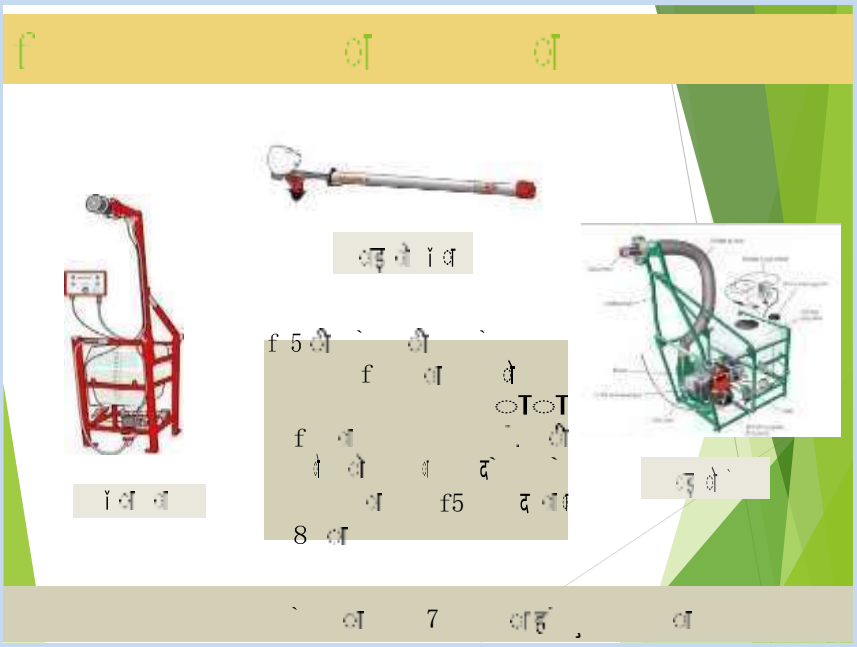
LCO, Jalore
Shri Bal Ram Meena, Assistant Director (PP)
Behind ITI College, Surpura Road, Jalore
email : lco.jalore-agri@nic.in , Mobile : 63377379158

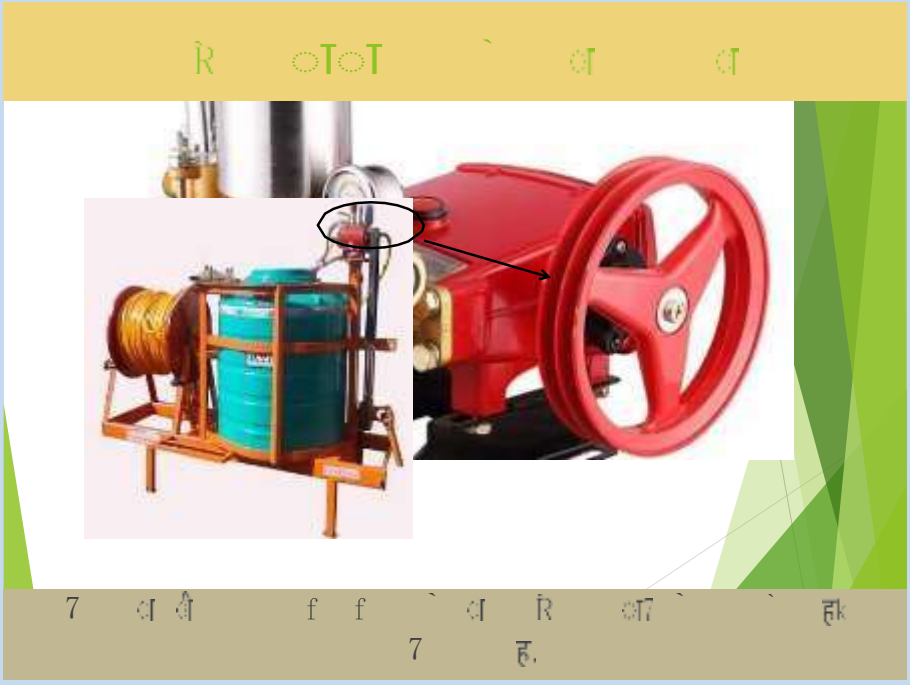
LCO, Palanpur
Shri K.L.Meena, Plant Protection Officer (WS)
Near RTO Check post, Ambaji Highway, Palahnpur. email : lwcgj09@nic.in, Mobile : 7738338456

LCO, Bhuj
Shri A.M.Baraiya, Plant Protection Officer (E)
Near Rajput Samajwari, Bhuj
email. : appolocust.bhu-jagri@gov.in Mo 9898922950




eLocust3g
eLocust3m
eLocust3w
eLocust3





समस्त वाहनों का रखरखाव

ह ा f ा ा

5ो हे f ो 7 ा

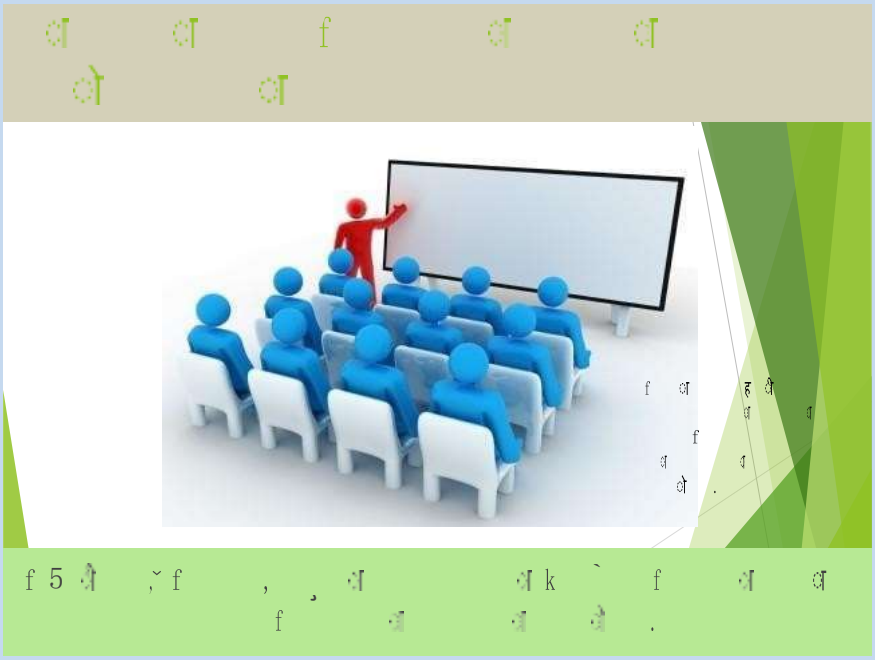
ा kद, f ा, ा ा, ा
f `ा

` ाk ा ी ी द ा ा ि ा ी ि ा ी ` हं ,
, ोद ा ा f


SOAP


B U D G E T


ō
5R fR
9


f
f 5
,

Deployment of Helicopters - Bell 206-B3 (private) & Mi17 (IAF) for aerial control

Wire1ess co tact duri g aeria1 co tro1

Actual location during control

Late evening Location


THANK YOU

(4)

Safety measures

Presented By,
Dr. Virendra Kumar,
Assistant Director (PP)
Locust Warning Organisation, Jodhpur

Need For Safe And Judicious Use of Pesticides

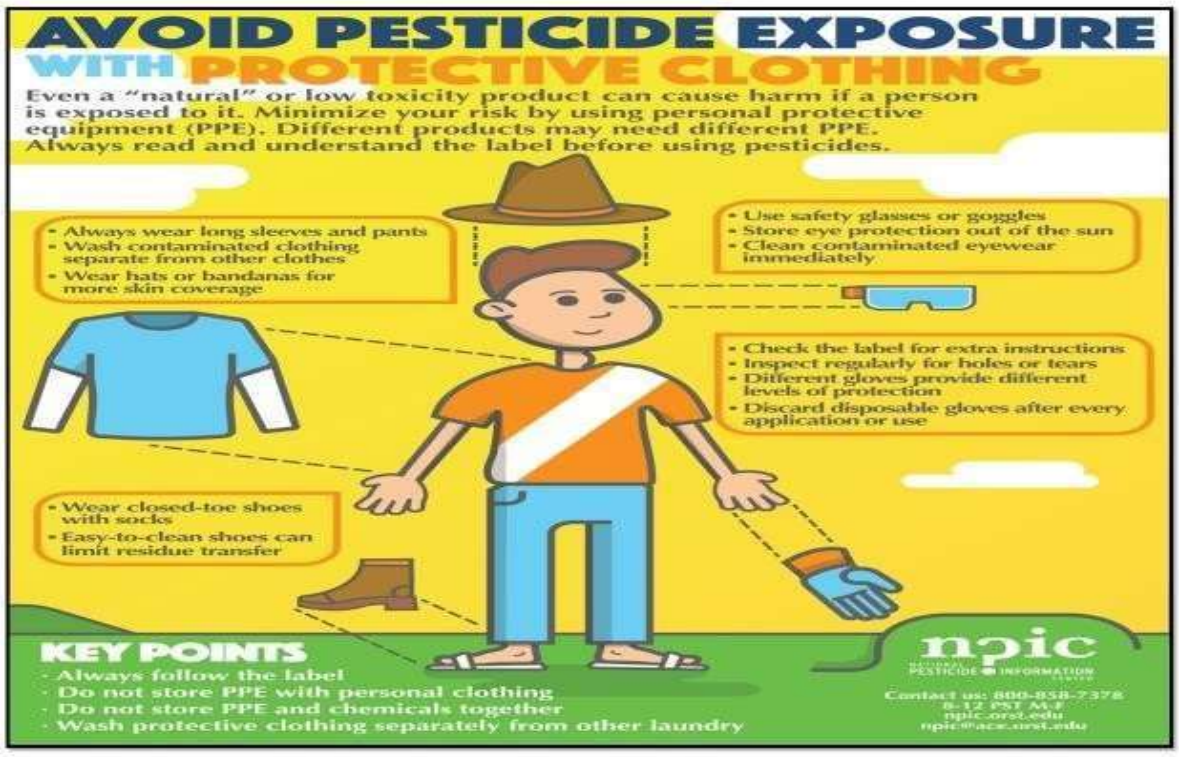
Pesticides are toxicants, capable of affecting all taxonomic groups of biota, including non-target organisms. **So, it is important to ensure the use of right pesticide at right time and in right doses.**

The under dose of pesticides may give poor results along with increasing the immunity of the insects whereas their overdose may cause harmful effects to the environment and other forms of life.

Therefore, the insecticide use should be optimized in order to reduce the environmental contamination while maximizing its effectiveness against the targetinsect

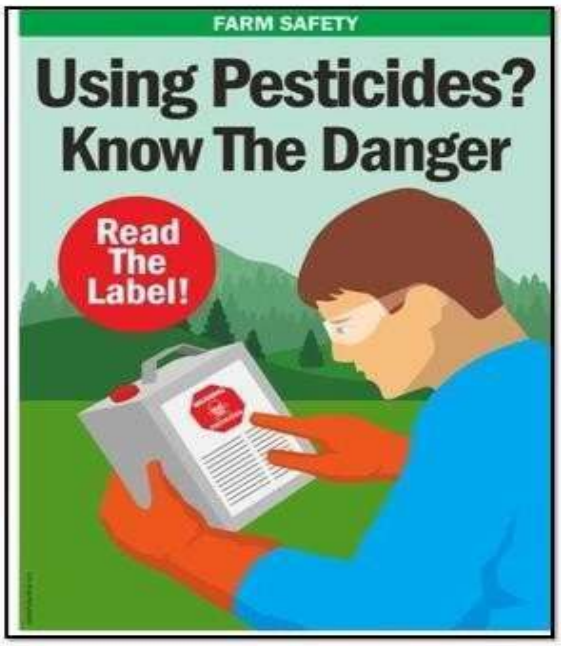
CLASSIFICATION OF PESTICIDES BASED ON TOXICITY

Label	Name	Level of toxicity	Oral lethal dose (mg/kg)	Listed chemicals
	Red label	Extremely toxic	1–50	Monocrotophos, zinc phosphide, ethyl mercury acetate, and others.
	Yellow label	Highly toxic	51–500	Endosulfan, carbaryl,[2] quinalphos,[2] and others.
	Blue label	Moderately toxic	501–5000	Malathion, thiram, glyphosate,[2] and others.
	Green label	Slightly toxic	> 5000	Mancozeb, oxyfluorfen, mosquito repellant oils and liquids, and most other household insecticides.


AVOID PESTICIDE EXPOSURE
WITH PROTECTIVE CLOTHING
Even a "natural" or low toxicity product can cause harm if a person is exposed to it. Minimize your risk by using personal protective equipment (PPE). Different products may need different PPE. Always read and understand the label before using pesticides.
• Always wear long sleeves and pants
• Wash contaminated clothing separate from other clothes
• Wear hats or bandanas for more skin coverage
• Use safety glasses or goggles
• Store eye protection out of the sun
• Clean contaminated eyewear immediately
• Check the label for extra instructions
• Inspect regularly for holes or tears
• Different gloves provide different levels of protection
• Discard disposable gloves after every application or use
• Wear closed-toe shoes with socks
• Easy-to-clean shoes can limit residue transfer
KEY POINTS
· Always follow the label
· Do not store PPE with personal clothing
· Do not store PPE and chemicals together
· Wash protective clothing separately from other laundry
npic
Contact us: 800-858-7378
8-12 PST M-F
npic.orst.edu
npic@ace.orst.edu

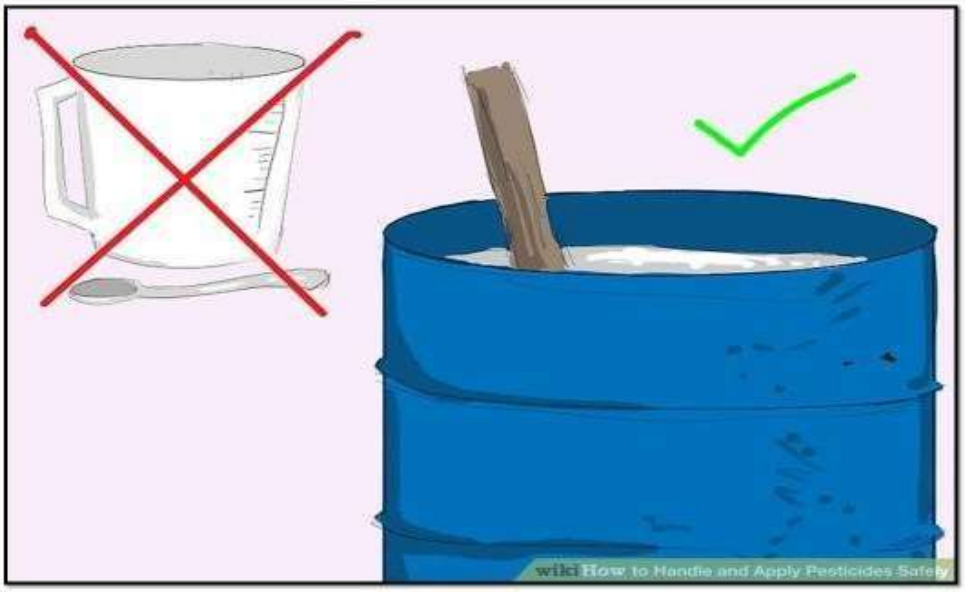

5 PESTICIDE SAFETY TIPS
FOR FARMWORKERS
DO IT FOR YOU. DO IT FOR YOUR FAMILY!
1 Wear clothes with long sleeves and long pants, shoes or boots, socks, a hat and/or scarf, and gloves.
2 Always wash your hands before eating, drinking, smoking, chewing gum, using your phone, or going to the bathroom.
3 Do not mix clothes that have pesticide residues with other clothes. You must wash them separately.
4 Take a shower or bath as soon as you get home from work and before any contact with children or family.
5 Never put pesticides in food or drink containers and never take farm pesticides or their containers home.
dpr Department of Pesticide Regulation
www.cdpr.ca.gov
CASPIR
WKR SAFETY TIPS/E 0519

Read and follow all label instructions.

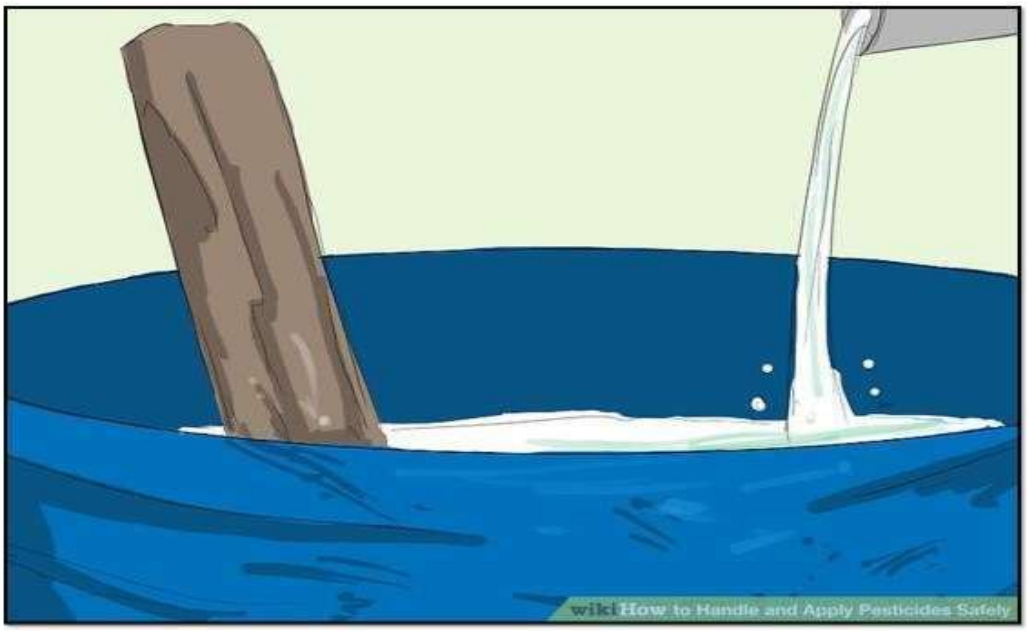


Read the warning label

Use only appropriate containers for measuring, mixing, and applying pesticides.

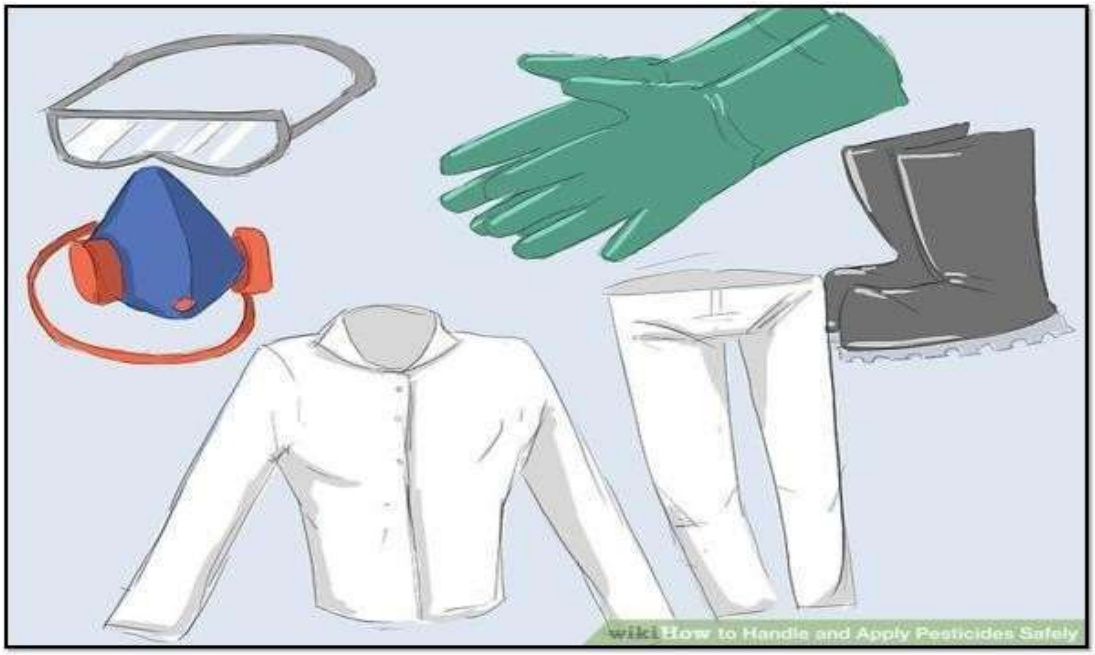


Mix only the amount of the product you intend to use.



Wash all equipment after each use

Use appropriate safety equipment.



Never smoke, drink, or eat while applying pesticides.

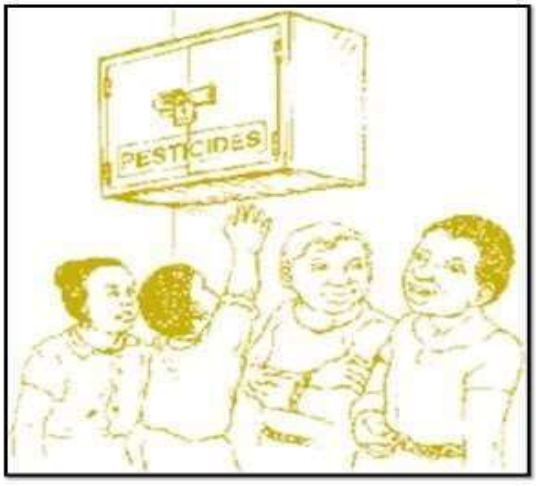
Keep people and animals out of areas treated with insecticides and other chemicals for the period recommended on the product label.

Do not use pesticides after any expiration dates on the package.

Apply pesticides in the early morning or late evening to avoid excessive drift (wind is normally lower during these time periods), and to prevent exposing beneficial insects like bees and ladybugs to the effects of them.

Alternate suitable pesticides to obtain the best results in pest control.

Keep / store of pesticides away from the reach of children



Do's	Don'ts
While Purchasing ▪ Purchase pesticides/biopesticides only from Registered pesticide dealers having valid Licence. ▪ Purchase only just required quantity of pesticides for single operation in a specified area. ▪ See approved labels on the containers/packets of pesticides. ▪ See Batch No., Registration Number, Date of Manufacture/ Expiry on the labels. ▪ Purchase pesticides well packed in containers.	**While Purchasing** ▪ Do not purchase pesticides from foot path dealers or from un-licenced person. ▪ Do not purchase pesticide in bulk for whole season. ▪ Do not purchase pesticides without approved label on the containers. ▪ Never purchase expired pesticide. ▪ Do not purchase pesticides whose containers are leaking/loose/ unsealed.

During Storage

▪Store the pesticides away from house premises.

▪Keep pesticides in original containers.

▪Pesticides must be stored separately and that area should be marked with warning signs.

▪Pesticides be stored away from the reach of the children and live stocks.

▪Storage place should be well protected from direct sunlight and rain.

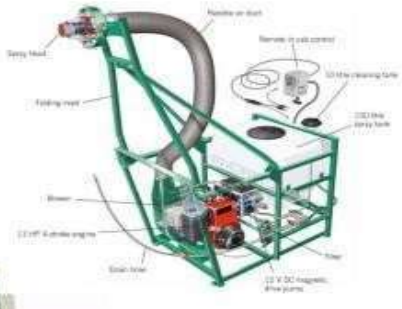
Selection of Equipments

- Select right kind of equipments.
- Select right sized nozzles.
- Use separate sprayer for insecticides and weedicides.
- Do not use leaky or defective equipments.
- Do not use defective/non-recommended nozzles.
- Do not blow/clean clogged nozzles with mouth.

Cleaning & Maintenance of PP Equipments

Ulva mast V4

Micronair AU8115 MS

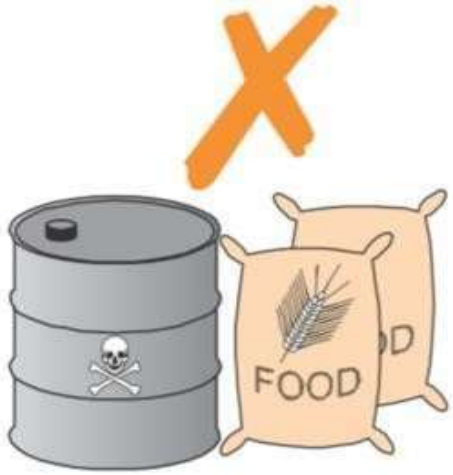


Safety measures

Load and unload carefully

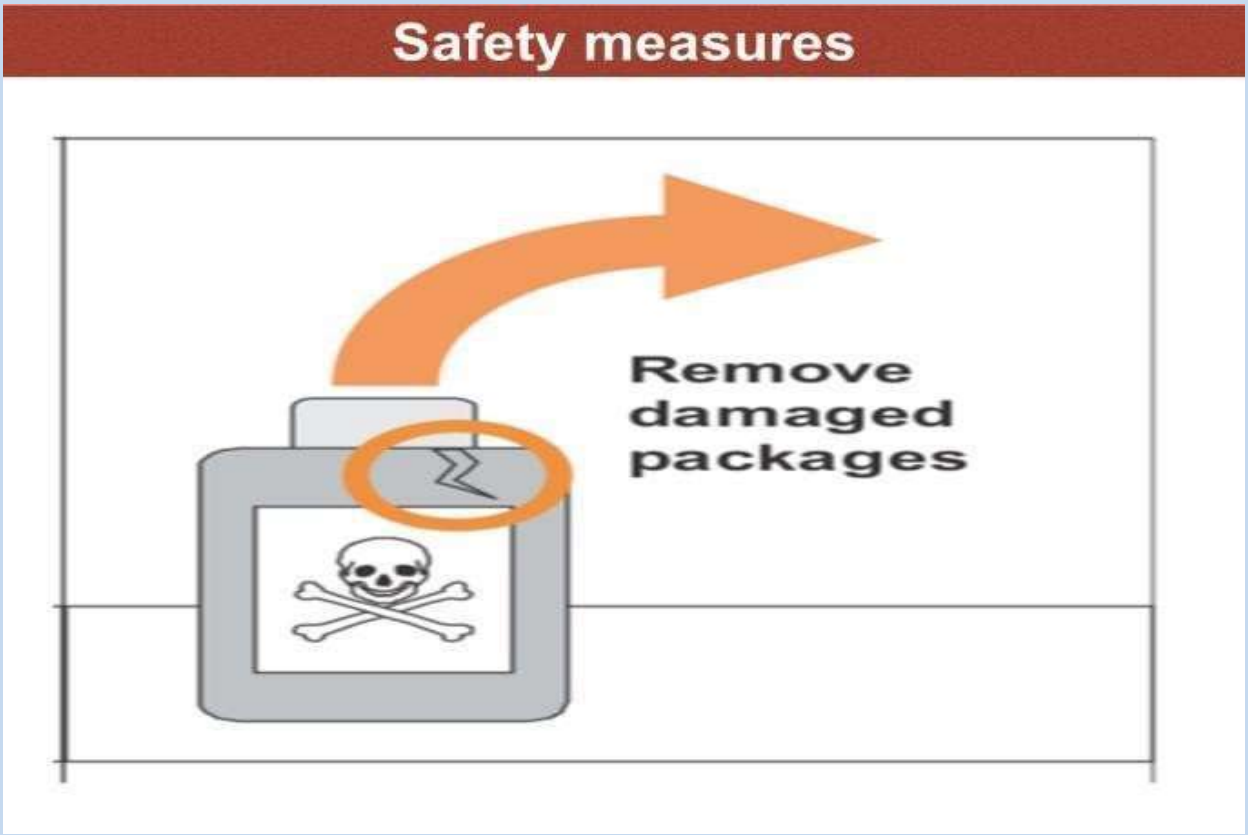
Safety measures

Do not transport together with food



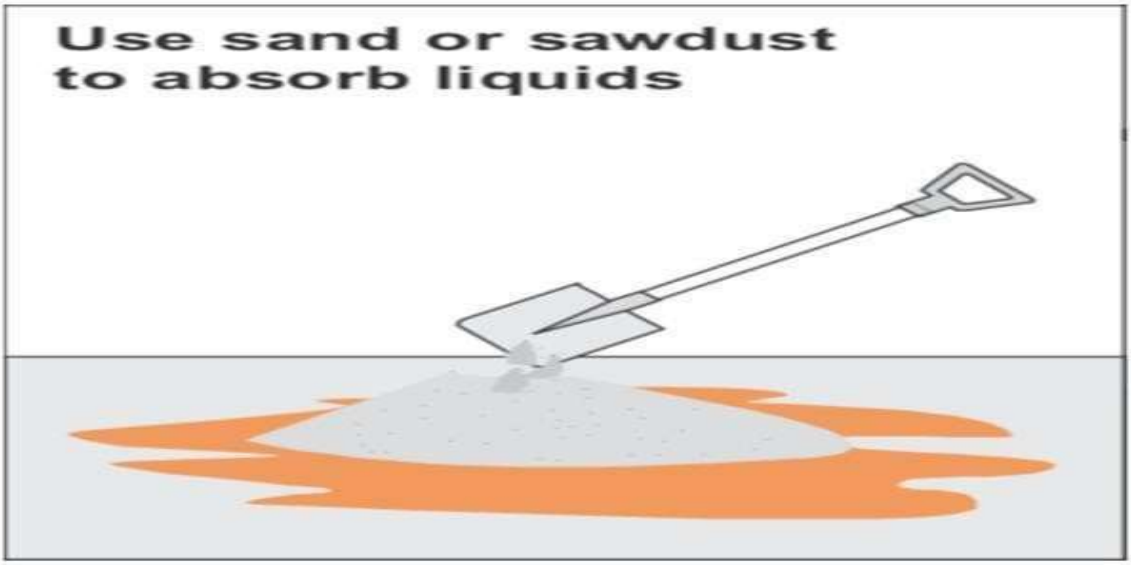
Avoid bad stacking of containers


Safety measures
Do not smoke
or use fire
near a spillage

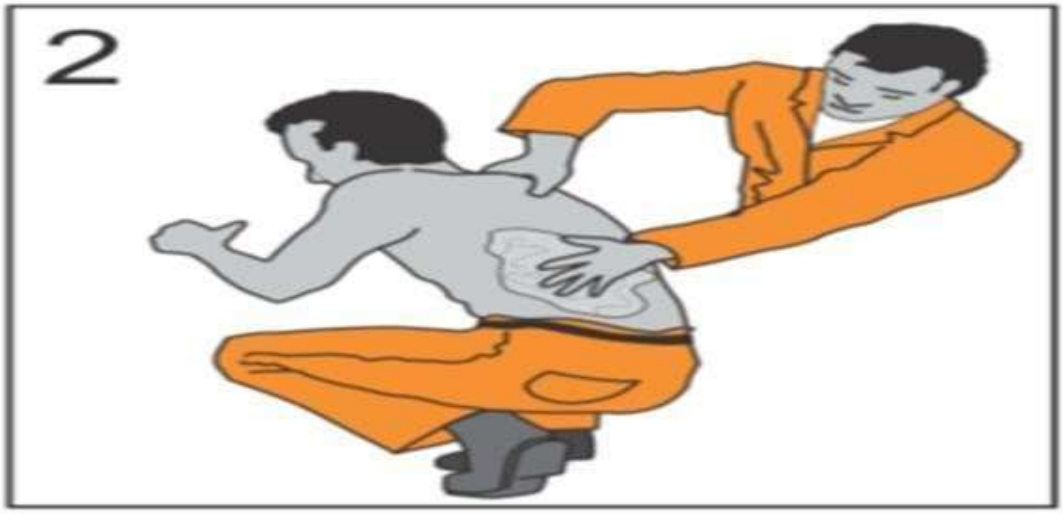

Safety measures
Remove
damaged
packages

Safety measures

Safety measures



First aid measures to be taken in case of insecticide exposure and poisoning

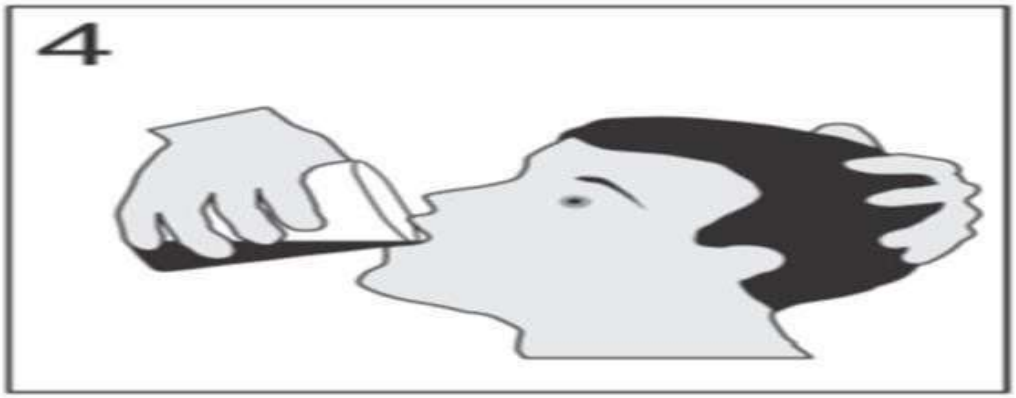


If insecticide on SKIN – wash thoroughly with clean water and soap

First aid measures to be taken in case of insecticide exposure and poisoning

If insecticide on CLOTHING – take off clothing and wash skin with water and soap

First aid measures to be taken in case of insecticide exposure and poisoning



If insecticide INGESTED – do not induce vomiting – give active charcoal solution

First aid measures to be taken in case of insecticide exposure and poisoning

If person is UNCONSCIOUS – check that breathing passages are clear – place person on the side with head down and tongue drawn forward

First aid measures to be taken in case of insecticide exposure and poisoning

If person STOPS BREATHING – start artificial respiration (make sure you do not get contaminated yourself)

First aid measures to be taken in case of insecticide exposure and poisoning

ALWAYS – keep person calm and cool

First aid measures to be taken in case of insecticide exposure and poisoning

ALWAYS – take person to nearest medical facility

ANTIDOTE

An antidote is a substance which can counteract a form poisoining.

Antidote or Treatment	Pesticides Group
Atropine with 2-PAM (2-Pralidoxime aldoxime methyl chloride) in symptomatic dosage, artificial respiration may be required	Organophasphates
Atropine , artificial respiration may be required	Carbamates
Barbiturates , if convolsions occurs	Chrorinated Hydrocarbons
Intravenous Sodium Nitrile followed by Sodium Thiosulfate	Fumigants

5

Alternative Approaches for Desert Locust-Control and Management

Dr. Shaloo Ayri Bhardwaj
Deputy Director (Entomology),
Locust Division, HQR., Faridabad

Upsurge 2019–2021 INDIA

Cyclones in May and October,2018
Heavy rains
Gave rise to favourable breeding conditions in the Empty Quarter of the southern Arabian Peninsula for at least nine months since June.
As a result, three generations of breeding occurred that was undetected and not controlled.

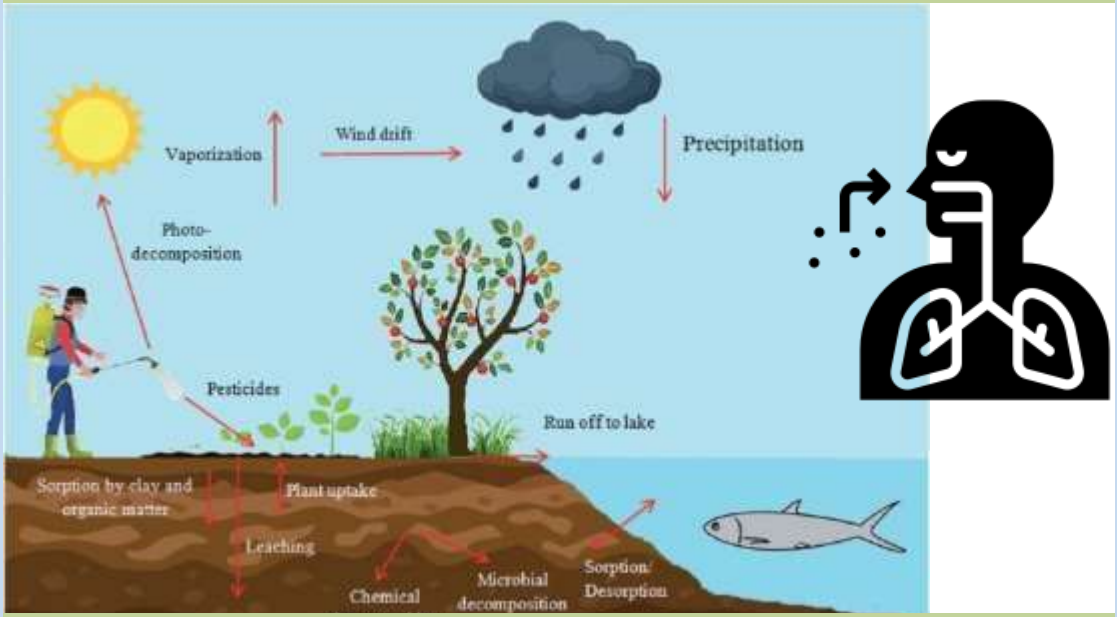
Successful control (2019-2021)
Desert locust, India

Rapid control measure for Desert locust
Malathion 96% ULV
Huge quantity of chemical i.e 5,60,235 litres

Chemical Control

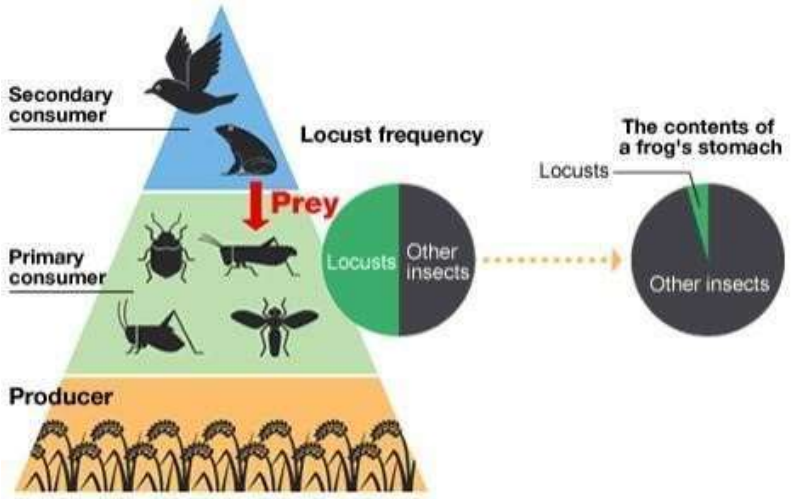
Year	Area treated (Ha)	Malathion 96% Used (Lit)
2019-20	403488	314645
2020-21	279916	245590
Total	683404	**560235**

Hazardous for ecosystem



Living, Non living things, Human health

Chemical insecticides/pesticides are hazardous for predators and parasites of locust

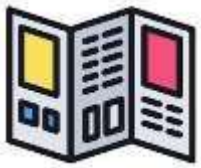


Adverse effect on fauna and flora of desert

Hazardous for desert biodiversity

Reptiles , Birds, insects, Scavangers etc.

Expenses towards safety measures

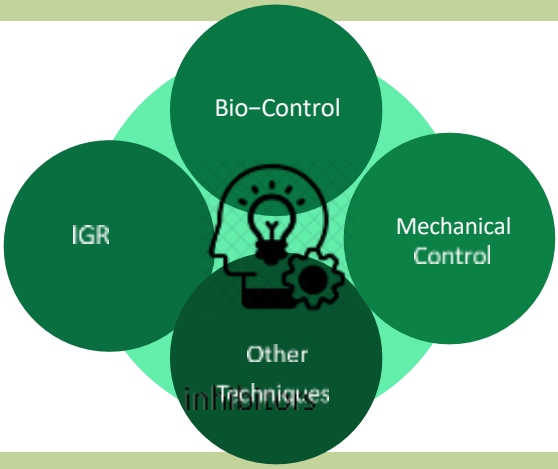


Awareness campaign, Warning posters, Pamphlet distribution, Manpower

Disadvantages - Chemical control

- Non biodegradable
- Hazardous to human health (users)
- Disturbing ecosystem
- Hazardous to desert fauna
- Expensive

Need to switch over alternative techniques.



Use of chemical pesticides should be discouraged with replacement of eco-friendly techniques

Solutions / Alternatives to chemical control

- Biocontrol
  - Biopesticide
  - Insect Growth regulators/inhibitors
- Mechanical control
  - Economic use of locust

Bio-Pesticides

Metarhizium acridum (Green Muscle)

Isolate of M. acridum	
Scientific classification	
Kingdom:	Fungi
Division:	Ascomycota
Class:	Sordariomycetes
Order:	Hypocreales
Family:	Clavicipitaceae
Genus:	Metarhizium
Species:	M. acridum
Binomial Name	
Metarhizium acridum	
(Driver & Milner) J.F. Bisch., Rehner & Humber (2009)	

Metarhizium acridum (Green Muscle)

- The active ingredient is a micro–organism entomopathogenic fungus Metarhizium acridum.
- It provokes an epidemic disease among the treated insects.

Recommended dose against Desert locust:

Aerial Application	50 gm of Green muscle or Novacrid powder mixed with 1 litre of diesel oil per hectare
Ground Application: ***Vehicle mounted, knapsack or handheld ULV sprayers***	Volume of oil is 2 litres per hectare This dose rate equals to 2.5 gms into 10^{12} spores of Metarhizium acridum per hectare
High and Dense Vegitation	Dose rate can be increased to 100 gm per hectare

Mode of Action

How does bio-pesticide work?

Spores of M. acridum

Spores Germinate & penetrate inside Cuticle with pressure & enzymatic action

The fungus multiplies inside the body

Locust start dying 7th day onwards

Spray Equipment used for Bio-pesticide

- Ultra low volume sprayers
- Aircraft, vehicle mounted,

  Knapsack or handheld sprayers

Advantages of Bio-pesticide

- Highly specific to Locust
- No negative effect on honey bees and other beneficial arthropods; non polluting
- Not toxic to humans or animals such as birds, fish, reptiles, amphibians etc.
- It requires standard personal protective equipment(usually a facemask and long sleeved shirt) and can be applied with same ULV spraying equipment as for chemical pesticides
- Contrary to chemical pesticides, bio–pesticides can be applied in areas with water bodies

Disadvantage of Bio-pesticide

Non rapid action

(Minimum 01 WEEK)

Best strategy to apply Bio-pesticide

- Treating locust in ecologically sensitive zones, such as nature reserves, wetlands or other areas with water bodies
- Most effective to treat initial small groups of hoppers and prevent them from forming dense and huge hopper bands

Metarhizium acridum (Green Muscle) trials at FSIL


- Post approval by CIB&RC, FAO facilitated the import of 3 Kg of *M.acridum* for trial and evaluation purpose
- Successful bio–efficacy trials have been conducted at FSIL on *M.acridum* with mortality rate of 95–100%
- *M.acridum* have been shared with RCIPMCs for maintaining and multiplication purpose

Metarhizium acridum treated locust


Eco–friendly

Somalia : Achieved success in Desert Locust control with Bio-pesticide using aerial methods




Spraying was funded by the U.S. Agency for International Development

Insect Growth Regulators (IGRs)

INSECT GROWTH REGULATORS (IGR)

- IGRs are compounds which interfere with:
  - Growth,
  - Development
  - Metamorphosis
- IGRs include synthetic analogues of insect hormones such as
  - ecdysoids
  - juvenoids
- Non−hormonal compounds such as
  - precocenes (Anti JH)
  - chitin synthesis inhibitors

Mode of Action

- Disruption of chitin formation and deposition
- Disrupts molting process
- Physical abnormalities
- Lethargy
- Cessation of feeding
- Death

Availability of commercial IGRs

- Diflubenzuron (Dimilin)
- Benzoylphenyl Ureas (BPUs)
- Chlorofluazuron (Atabron)
- Novaluron (Rimon)

Advantages and Disadvantages of IGR

Advantages	Disadvantages
Effective in minute quantities hence, economical	Pest stage specific
Target specific, safe to natural enemies	Slow mode of action
Biodegradable, non−persistent and	possibility to build−up of resistance
Non−polluting	Unstable in the environment

Mechanical Control

Mechanical Control

- Use of Neem Extract
- Killing/collection by trenching and burying hoppers
- Locust as Food

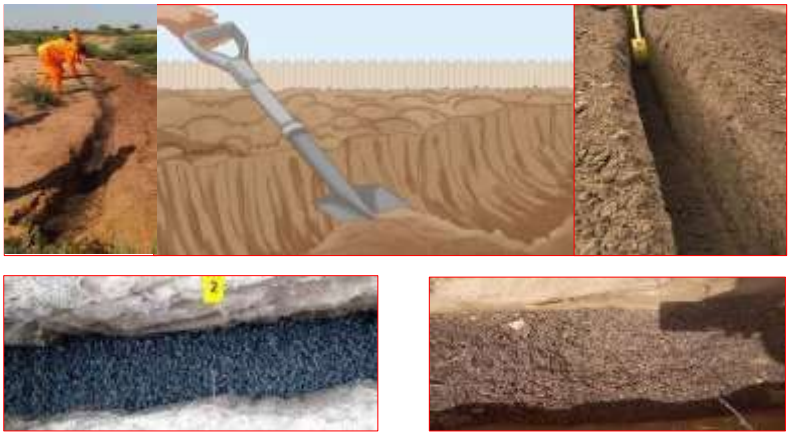
Neem Extract

- Acts as anti−feedant
- Blocks the action of insect molting hormone ecdysone
- Azadirachtin acts as growth regulators (limonoids)

Neem extracts commercial availability

It acts as a repellant and inhibits feeding in the locust

Trenching and burying hoppers



2 feet wide and 2 feet deeper trenching for mechanical control of hoppers

Locust as Food

Locust as Pet(fish/birds) food

Media Coverage

Nutrition

Background Jun 19, 2020

Swarms of locusts to become chicken feed

Enormous swarms of locusts – about 60 million insects – have caused major devastation to crops and livelihoods in countries in East Africa, Asia and the Middle East. Scientists in Pakistan have come up with a way to turn these critters into chicken feed.

The locusts, combined with the impacts of Covid −19, could have catastrophic consequences on livelihoods and food security." − FAO

A simple but clever solution

Muhammad Khurshid, a civil servant in the Ministry of National Food Security and Research, together with Johar Ali, a biotechnologist from the Pakistan Agricultural Research Council, came up with an innovative pilot project which encourag es farmers to trap the locusts that are then turned into chicken feed.

https://www.poultryworld.net/Nutrition/Articles/2020/6/Swarms -of-locusts-to-become-chicken-feed-600449E/

Media Coverage

Catch locusts. Earn money. Save crops

They identified Pakistan's Okara district as the most suitable area to carry out a3 –day pilot project due to it being heavily populated and where the locusts were less likely to be contaminated by insecticides. Using the slogan, "Catch locusts. Earn money. Save crops", the project offered to pay farmers 20 Pakistani rupees (US$ 0.12) per kg of locusts caught, reports The Third Pole. Locusts only fly in daylight. During the night they cluster on trees and on the open ground in sandy areas where they remain almost motionless until dawn.

If we can capture the locusts without spraying on them, their biological value is high and they have good potential for use in fish, poultry and even dairy feed."

7 tonnes of locusts per night

The community catches an average of 7 tonnes of locusts a night, which are weighed and sold to nearby chicken feed plants. Farmers earned up to 20,000 Pakistani rupees (US$ 125) each for one night's work. The Third Pole adds that Muhammad Athar, GM of Hi–Tech Feeds, says his firm fed the locust feed to its broiler chickens in a 5–week study: "All nutritional aspects came out positive. If we can capture the locusts without spraying on them, their biological value is high and they have good potential for use in fish, poultry and even dairy feed," he said.

Media Coverage

Locusts contain more protein than soy

"We currently import tonnes of soybean and after extracting the oil for sale, we use the soya bean crush to use in animal feed.
Soybean has 45% protein whereas locusts have 70% protein.

Soybean meal is purchased whereas locusts are free – the only cost is capturing them and drying them,"

The most challenging part of this project, says Ali, is confirming if the locusts are free of pesticides, which is not suitable for feeding. The most exciting part, he says, is seeing people earn money. Despite interest from large–scale commercial operators, scaling up the project had to be put on hold due to the coronavirus pandemic. The lockdown is easing in Pakistan and so they can start again. All that is needed is for the local community to collect the locusts and sell them.

Media Coverage

https://www.aljazeera.com/news/2020/6/10/pakistan –turns–locusts–into–chicken–feed–to–tackle–the–invasion

For a reward of 20 rupees (12 cents) per kilogramme (roughly two pounds) of locusts, locals worked all night to collect them.

Annexure - VI

Photograph of Inaugural Session & PPT/Lecture Presentations

Annexure – VII

Mock drill of Ulvamast, Micronair, eLocust3mPro, eLocust3 and tractor mounted sprayer at the Uchiyarda village of Jodhpur

Photographs of all trainees with trainer during mock drill of PP equipment in the field region of Uchiyarda village of Jodhpur

Annexure - VIII

Group Discussion

Annexure- IX

Publications