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ALL INDIA COORDINATED
RESEARCH PROJECT ON
RODENT CONTROL

CENTRAL ARID ZONE
RESEARCH INSTITUTE,
JODHPUR 342 003

RODENT NEWSLETTER

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ALL INDIA COORDINATED RESEARCH PROJECT ON RODENT CONTROL

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Extent of Rodent Damage to Cocoa (*Theobroma cocoa* L.) Pods in Hill Region of Karnataka

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Cocoa is popular in hill region of Karnataka and is being grown as an intercrop in Areca, Coffee and Cardamom plantations or as a pure crop.

A number of wild animals attack cocoa fruits. Among the rodent pests, squirrel (*Funambulus tristriatus* Wroughton) and rat *(Bandicota bengalensis L.*) were observed feeding on cocoa pods. Squirrels fed on unripe or about to ripe pods. Squirrels made irregular small holes on the fruits to feed on the internal contents. They usually damaged the pods at the centre while rats, at the corner. Squirrels and rats were observed feeding during day and night, respectively. Many incisor teeth markings of rat/squirrels were observed on the surface of the affected fruits. It was also observed that squirrels selectively attacked the fresh fruits, while rats were non selective of either matured or young, fresh or damaged fruits. Squirrels damage was confined to the begining of the fruiting season (July-August) while rat damage persisted throughout the fruiting period (July to December) in hill region.

The extent of rodent damage to cocoa pods in 5 acres of plot at Thirthahally, Shimoga district during 1989-90 varied from 0 to 27 per cent by squirrels and 0 to 30 per cent by rats.

Table 1 Rodent damage on cocoa during 1989-90

Plot nos.	Cocoa pods (%) damage	
	Squirrel	Rat
1	0	0
2	0	0
3	13	7
4	12	11
5	12	0
6	3	17
7	27	30
Mean	9.57	9.28
CD at 5%		5.88
Binomial expansion (2) test		N.S.

Evaluation of Some Plant Extracts Against Field Rodents of Tea Orchards

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Field rats, *Bandicota bengalensis* were collected from tea orchards and kept in cages under laboratory conditions. Wheat flour kneaded pellets and water *ad libitum* were provided to these rats for fifteen days during acclimation period. Different plant species reported as economically important with some toxic effects to insects were collected and their crude extract was made by crushing them in pestle and morter separately and kept in different vials. The wheat flour pellets were made in these extracts. 5 ml of each extract was taken and diluted in distilled water to make it 25 ml. Then 25 ml of each extract was mixed in 50g of wheat flour and 24 pellets of approximately equal size were made. Eight rats were taken for each treatment and each rat was provided with 3 pellets only in the morning, whereas, with normal wheat flour kneaded pellets in the evening. This treatment was continued for 3 days and results are presented in Table-1.

Table 1 *Evaluation of some plant extracts against Bandicota bengalensis*

S.No.	Name of plant type	No. of animals fed in each treatment	Mortality (Cumulative) 1 day	2 day	3 day	7 day	% Mortality
1.	*Verbena sp.*	8	0	0	0	0	0
2.	*Artemisia sp.*	8	0	0	0	0	0
3.	*Polygonum sp.*	8	0	0	0	0	0
4.	*Ricinus communis*	8	NA	NA	NA	NA	NA
5.	*Ageratum haustonianum*	8	0	0	0	0	37.5
6.	*Lantana camara*	8	0	0	0	0	12.5
7.	*Canabis sativa*	8	0	0	0	0	0
8.	*Eupatorium sp.*	8	0	0	0	0	0
9.	*Plantago lanceolata*	8	0	0	0	0	0
10.	*Trifolium repens*	8	0	0	0	0	0
11.	*Cyperus rotundus*	8	0	0	0	0	0
12.	*Datura stramonium*	8	0	1	1	1	12.5
13.	*Bidens pilora*	8	0	0	0	0	0

NA = Not accepted.

Table 2 Evaluation of three plant extracts against *Bandicota bengalensis*

S.No.	Name of plant type	No. of animals fed in each treatment	Mortality (Cumulative) 1 day	2 day	3 day	7 day	% Mortality
1.	*Ageratum haustonianum*	8	0	1	1	2	25
2.	*Lantana camara*	8	0	0	0	0	0
3.	*Datura stramonium*	8	0	0	1	1	12.5

It was observed that out of 13 extracts evaluated only three viz., *Ageratum haustonianum*, *Lantana camara* and *Datura stramonium* responded to rats Table-1. These three extracts were again tested to confirm their toxicity, if any, to these rats and results are presented in Table-2, which indicates that though mortality is very low but some toxic effects are there in *Ageratum haustonianum* and *Datura stramonium*. Different dilutions/combinations are being tried to know their efficacy against rodents.

Relative Efficacy of Stored and Fresh Conspecific Urine Towards Desert Gerbil, *Meriones hurrianae*

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An attempt was made to study the efficacy of stored and fresh urine of female desert gerbil, in masking the poison shyness. The urine was stored in the deep freeze in amber colour bottles to protect it from photo-chemical degradations. In multiple choice test, a female desert gerbil, was placed in the central chamber of plus maze. Plain pearl millet kept in food bowl, pearl millet + 3 years old urine, pearl millet + one year old urine and millet + freshly collected urine were placed individually in various arms of plus maze. Daily food consumption was recorded in each arm for 6 days on six female gerbils separately.

The results of experiments showed that the urine mixed food in all the combinations was significantly ($P < 0.001$) preferred over plain pearl millet (consumption of bait g/100 body weight/24 hours of plain millet 0.13±0.005, fresh urine 1.72±0.39, one year old, 1.20±0.15, 3 years old urine 1.07±0.19). The fresh urine was preferred over one year and 3 years old urine but differences were not statistically significant. These observations indicate that the efficacy of urine does not deteriorate due to long term cold storage. Thus the stored urine can be used for masking of bait shyness behaviour among desert gerbils.

Feeding Potential of *Millardia meltada* to Soybean and Gram Pods

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The soft-furred filed rat, *Millardia meltada* (Gray) is a serious pest of soybean and gram. A preliminary study was undertaken to assess the feeding potential of *M. meltada* to pods of soybean and gram under laboratory. Counted number of green soybean and gram pods were provided separately to individual test rodents in cages for 24 hrs. After this the number of fed pods were separated for knowing its feeding (damaging) potential. It was found that pod damage per rodent ranged from 16 to 30 pods of soybean (mean 18.7) and 22 to 50 pods for gram with a mean of 40.50 is 24 hours. The number of fed pods was more in gram probably due to its smaller size as compared to soybean.

Report of Partial Albinism or Piebald in the Norway Rat, *Rattus norvegicus* from Calcutta

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During the study of rodent collections at the Zoological Survey of India three piebald specimens of the Norway Rat, *Rattus norvegicus* were noticed. Albinism, complete or partial has already been recorded in *Rattus rattus*, *Rattus norvegicus*, *Rattus blanfordi*, *Rattus niviventer*, *Bandicota bengalensis*, *Bandicota indica*, *Tatera indica* and *Funambulus palmarum*.

The piebald *Rattus norvegicus* from Calcutta is worth recording. As it is known that such a variation is the raw material of evolution. All such variations found in the nature of a particular species are likely to help ultimately to draw definite conclusion about its evolution and thus speciation. Here the genetic changes involved are clearly revealed by the phenetic expression of the partial albinic character which is same like the specimens described by Joshee and Kamath from Bombay in 1963. Thus this change of normal colour (partial albinism) in case of *Rattus norvegicus* of both in Bombay and Calcutta is due to similar kind of change in genes or chromosomes, i.e. mutations.

From the appearance it is clear that posterior two thirds of the body of the specimens is white, except for a streak of brown in the mid-dorsal line continuing from the anterior third of the body, which is normal brown. The tail has brown hair on the upper side but only a few hairs on the lower side, and consequently appeared pale and scaly beneath. The terminal portion of the tail is white.

Excavating of House-Plant Pots for Breeding Holes by the House Mouse (*Mus musculus*) in House

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The House mouse (*Mus musculus*) has been observed largely breeding in rags, under sofas, seats and holes in walls of houses, excavated by the female mouse. Unconventionally the mouse was observed excavating holes in decorative house-plant pots for the last ten years in upper storey apartment of my house. It is noteworthy, excavating of hole was observed only in the May month, not during rest part of the year. According to muridologists the house mouse breeds, thorought the year, optimum period is in March. But digging of plant-pots in the month of May be for better humidity in breeding hole. May is the driest month of the year with very low humidity. Eight years ago a large Saw-scale viper (*Echis carinatus*) climbed up the upper storey through the climber on the wall to hunt the mouse, in the hole excavated in plant pots in late hours of the night. The snake remained hidden under the plant pots till it was located by me while watering plants in the morning. Water sprinkling disturbed the snake and tried to escape but was killed.

This year (1994), excavating hole in plant pots in the month of May was excessive, formerly it was confined to one large pot, but this year it was in 15 pots by two pregnant female mouse. Excavating by the mouse was observed thorought the day period. I kept the pots much waterd to discomfort and discourage the mouse to excavate the pots; the mouse was observed excavating the pots as soon the soil got bit less water logged and dry, because of high temperature and verylow humidity of the day in May.

Excavating of pots endangered survival of plants, as roots were exposed and succulant bases of plants were damaged by mouse. Hence I planned to kill the female mouse by rodenticide. I placed three plates at haunt sites of the mouse, powdered Makhan-Bada sweet, and lightly sprinkled zinc phosphide over that. One mouse was located dead in three hours at a pot, two other mice and a large female house rat (*Rattus rattus*) were observed dead in the early morning the next day.

Distribution of Rodent Burrows in Paddy Fields in Hill Region of Karnataka

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Paddy is greatly affected by rodents throughout the crop growth period in hill regions Karnataka. However, more severe damage is received during ripening or harvesting stage. For effective protection of paddy plants from rodent menace, an idea of the distribution of rodents burrows in paddy fields is basically important.

Table 1 Distribution of *Bandicota Bengnalensis* burrows in paddy fields during 1991-92

Location	Dates	Mean umber of burrows/10 plots/ arce/site	
		Standing crop	Fallow (Border area)
RRS Farm	2.7.91	10.00	8.83
	11.7.91	7.70	6.94
	2.8.91	7.10	6.67
Hale Mudigere	2.7.91	2.34	5.31
	12.7.91	4.68	4.81
	2.8.91	4.72	4.20
Mutkepura	3.7.91	29.00	31.00
	14.7.91	32.00	16.00
Mean		12.18	10.41
Binomial expansion test (Z)			

Observations recorded on the distribution of mole rate (*Bandicota bengalensis*) burrows at three sites in *Mudigere* during 1991-92 is given in Table 1.

The assessment showed that on an average, 50 per cent of burrows were concentrated at the corners of the paddy fields. Therefore poison baiting to burrows at edges would be necessary to protect paddy from rodent damage.

Rodent Damage to Tomato Crop

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Quite often it has been observed that the rodent damages are of significant proportion to tomato berries grown in the kitchen gardens of urban houses. Hence, a surveillance carried in an extension area of Mysore city revealed that most of the houses (53 out of 130 houses) grew tomatoes along with other vegetables viz., brinjal, radish, french beans and other greens. Also, the surveillance showed that atleast in 46 houses, tomatoes were being attacked or damaged by the large bandicoot, *Bandicota indica*. Their preference was for the raw berries which were firm, with abundant flesh and little watery pulp. Generally, the type of damage observed was that they consumed the raw (prior to 4-5 days of ripening) tomatoes to an extent of 1/4 to 3/4 portion, scooping out the fleshy portion and seeds. The remaining unconsumed portion (pericarp) was left either in the plant or on the ground. A single bandicoot was found to damage 2-6 tomatoes (weighing 60-115 gms) over-night, and such type of damage was observed daily till the end of fruiting season. Whether the rodents attack tomatoes due to (i) the texture of raw tomatoes, (ii) availability of abundant vitamin C (ascorbic acid), vitamin A and calories, or (iii) water content, has to be confirmed by further experiments.

Crop Losses due to Rodents in Rice Fields of Raigarh District (M.P.)

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Losses due to *Bandicota bengalensis* and *Rattus rattus* in rice field at Boirdadar Farm, Raigarh (M.P.) were assessed in the transplanted rice Kranti, IR 36, Ananda and Mashuri. All the fields had narrow, small bunds with light (*matasi*) to medium (*dorsa*) soils.

In all thirty fields, each of 0.02 to 0.4 ha were observed at prematurity stage of crop for number of healthy/rodent damaged tillers. Data were recorded in five randomly selected (0.25 m^2) samples along a diagonal line/field. The total number of rodent burrows present in and on the bunds were also counted. The tillerwise yield was also calculated at harvest from the mean of 100 healthy tillers and utilized the same for estimation of yield losses.

It was observed that the rodents cut 0.0-8.6 tillers with a mean of 1.51 tillers/0.25 m^2 cropped area at prematurity stage of crop. The burrow intensity ranged from 0.0-25.0 with a mean of 20.6 burrows/ha. Estimated yield loss was upto 17.72 g/ 0.25 m^2, with a mean of 3.11 g/0.25 m^2 (124.4 kg/ha). The high population of snakes prevailed during the crop season and this seems to be one of the limiting factors for low intensity of rodent damage in rice crop in the fields under observation.

Rodent Depradation in Sesamum

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Sesamum (*Sesamum indicum* L.) also known as sesame, til and gingelly, is an important oil yielding crop. Its oil content varies from 46 to 52 percent. This crop is grown in cauvery delta, Tamilnadu instead of pulses soon after the harvesting of *Samba* or *Thaladi* season paddy. A study was undertaken to know the rodent species composition of sesame crop fields and their damage to three successive development stages of the crop.

The present study was carried out in 1.5 ha sesame crop fields near Erukkattancheri of Nagapattinam Quaid-e-Milleth district, Tamilnadu during April and June '93. The population of rodents were estimated by live burrow count method, in the fields at three developmental stages viz., vegetative, pod formation and pod maturation of the crop. Simultaneously, rodent depradation was assessed by diagonal method. In the diagonal line of each plot one sq m (1m^2) quadrat was put at every 5m intervals and within the quadrats the cut (Plants and pods) and uncut plants were enumerated to compute the percentage of damage to three development stages of the crop.

The lesser bandicoot rat, *Bandicota bengalensis* was found to inhabit the sesame fields in all the three developmental stages of the crop. The number of live burrows were estimated to be 15, 8 and 7 per ha in the fields with vegetative, pod formation and pod maturation stages, respectively. The popula-

tion of *B. bengalensis* showed a decreasing trend when the crop advances to its successive developmental stages. The inhabitants could have migrated to nearby fields either for better shelter or food.

Apparently, no damage could be observed in the vegetative and pod formation stages while the pod maturation stage was subjected to 11.28% of rodent damage. The nature of damage was by cutting the pods from the branches of the stem of the plants. Then the pods were cut opened and the seeds were taken by the rodents, leaving the pod's outer carp at the feeding site. Opened and unopened sesame pods could also be observed at the burrow entrances of *B. bengalensis*.

Vulnerability of Rodent Attack to the Fibre Optic Cables

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Fibre Optic transmission plays an important role in adapting communication systems to information technology use. Presently, this technology is mainly used in long distance tele-communication transmission. This system allows lower costs and lower capacity applications, such as television signal transmission, railway signaling, data communication and industrial control. These civil applications have military equivalents too. Indian Railways adapted the Fibre Optical technology on an experimental basis in the line of the Danish fail safe system to avoid accidents. This system was installed during 1989-90 between Nagpur, Durg and Bhusawal. However, during the installation the Railways suffered a major setback due to severe rodent depredations to the under-ground laid Fibre Optic cables enroute Nagpur-Durg-Bhusawal. We surveyed the area and found that cables along with the other HDPE pipe were edvastated by field rodents viz., *Rattus meltada, Bandicota bengalensis* and *Tatera indica*. In view of this, a number of F.O. Cables having different dimensions and coverings were supplied by manufacturers for testing their efficacy against rodent attack. The present communications is the first attempt to study the extent of rodent damages to different types of Fibre Optic Cables in the laboratory.

A. CHOICE TESTS

I. *Corrugated steel armoured F.O. Cables :* These cables had strong corrugated steel armouring covered with HDPE/PVC coating. All three species of rodents attacked these cables from both the ends as was evident from the presence of tooth marks within 7 days of exposure. However, *R. meltada* proved more destructive than the other two species. This species started playing with the cable within an hour of exposure. On the 3rd day, 5-7 tooth marks were recorded. On the 10th day, more tooth marks were visible which were further deepened. Most of the activity of *R. meltada* was restricted to the middle portion of the cables. After 15-20 days, this rodent removed the outer jacket to a width of about 1.5 cm at 3-4 places, resulting in the complete exposure of the metallic armour. Further observations revealed that the rodents did not attack the corrugated steel armour leaving the optical fibres safe. Food and water intake was normal throughout the study.

T. indica did not show any tooth marks for first seven days of exposure later, tooth marks were observed on the armoured cables at several places at the ends. The species did not probe the cable further and maintained a low profile. The bandicoot rat, *B. bengalensis* is considered the most destructive rodent pest in agriculture. It is an extensive burrower. Surprisingly, this species did not approach the F.O. Cables for first 15 days, however, the food and water intake was normal. On the 25th day of exposure, we could notice 5-7 very shallow tooth marks at the cable ends. Although *B. bengalensis* proved the least destructive in captivity, its severe devastating potentialities in the real field situation may not be ruled out to the under ground laid F.O. Cables.

II. *Unarmoured F.O. Cables : R. meltada* and *T. indica* were found to attack the unarmoured cables in higher proportions, whereas, *B. bengalensis* maintained limited attack. Among the unarmoured cables, the jelly filled cables proved more vulnerable to rodent attack. Within three days, there were 5-8 deep tooth marks of *R. meltada* and *T. indica*. During the second week of exposure, these two species concentrated their gnawing activity on the cable ends resulting in 0.8-1.2 cm reduction in cable ends. After 30 days of exposure these two rodent species had completely eaten away 1.5-2.0 cm of cable at both the ends. Besides the cable ends, 1-2 mm deep tooth marks were also noticed in the middle portion of the cable. Similar damage was reported with non-jelly filled unarmounred cables. Maximum damage by *T. indica* was reported in Olex metal free F.O. Cables. This species

removed the outer covering within two days of exposure and then completely devastated the remaining portion of the cable in next 10-15 days. *B. bengalensis* did not cause any significant damage to both the types of unarmoured cables. The consumption of alternate food remained normal (10-15 g per day) throughout the study period.

B. NO CHOICE TESTS

Under no choice test, where test rodents were not provided with any alternate food, rodent activity was more vigorous during initial 5-7 days. The tooth marks were evenly distributed throughout the cable length. Un-armoured cables were completely damaged at the cable ends, whereas, in case of armoured cables, 25-30 tooth marks were noticed within 15 days of exposure. Due to non-availability of food, the test rodents decreased their activity after 15-20 days. In two sets, *R. meltada* died of hunger on 26th day. This shows that rodents attack the cables not for food but they simply play and nibble the cables in their natural process of gnawing their incisor teeth.

Effectiveness of Neramycine and 0.2% Cyclohexamide (aerosol) treated F.O. Cables against rodents

This study was carried out as (i) multichoice, i.e., all three treated cables were exposed to the test rodent species in each experimental cage along with one untreated cable as control and (ii) Single choice, i.e., each type of treated cable was exposed to the test rodent individually. An alternative food, *Pennisetum typhoides* and tap water was provided in both tests. All test rodent species were found to avoid the treated cables in multiple choice tests. The food consumption was normal. However, untreated (control) cable did record several tooth marks. *R. meltada*, which proved most destructive species in our earlier experiments, did not attack treated cables. It indicated that Nera-mycine alone as well as with 0.2% Cyclohexamide treatment had repellency effect on the rodents. It is further confirmed by our observations in the single choice trial, where, these test rodents did not inflict any damage to the treated cables. However, field testing of this chemical needs further exploration.

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Drive to Check Devastation by Rodents

A three day Apex Level Training, which was attended by senior officers of the Agriculture Departments of N.E.H. Region was organised from 24-26 Oct., 1994 at the ICAR Research Complex for N.E.H. Region Shillong. This special training was organised in order to intensify rodent control operations in the NEH Region and to prevent the recurrence of rodent upsurge during bamboo flowering which is expected to take place around the year 2000 A.D. The Shillong Centre of AICRP on Rodent Control, has been entrusted with the job to monitor the rodent problem periodically and to provide technical know how to various states of the Region.

While inaugurating this Training on 24.10.94. Minister of Agriculture, Govt. Meghalaya, Mr. C. Marek stressed the need and urgency with which the rat problem should be tackled to save millions of tonnes of foodgrains from rodents and to prevent the recurrence of plague in this country. The recent outbreak of plague in Gujarat and Maharasthra has caused tremendous loss, he pointed out. The genesis and scope of this training were explained to delegates by Dr. B.D. Rana, Project Coordinator AICRP on Rodent Control.

The Director, ICAR Research Complex for NEH Region, Shillong, Dr. S. Laskar, while welcoming the delegates from different states recalled that in the years 1880-84, 1910-12, 1928-29, 1958-59, 1976-77, the rats multiplied in large number causing tremendous damage to rice and other crops creating famine conditions in this region. He told that prior training of the field staff with the knowledge and techniques of rodent control would help to serve this region from any such devastation in future. Dr. R.P. Shukla, Head, Division of Entomology briefed the participants about the significance of this training in NEH Region. Dr. S.S. Ghosh gave away the certificates to the trainees on 26.10.94 and advised them to make use of this training in intensifying the drive against rodents in their respective regions.

To prevent the losses due to rodents, which go upto 10-12 million tonnes of foodgrains annually in India, and also for prevention of diseases like plague, the ICAR has decided to organize similar trainings in other parts of the country also. This was disclosed by Dr. O.P. Dubey, Principal Scientist of the ICAR New Delhi. The next similar training would be conducted at Andhra Pradesh Agricultural University at Maruteru, where the field staff from Southern States would be trained in methods of Rodent Control. He told that expertise on rodent control from different centres of AICRP on Rodent Control and other agencies would be used in these trainings.

Chronology of Plague in India

1500-600 B.C. – Recorded in Bhagvata Purana.

1031-32 A.D. – Plague reached India from central Asia following invasion of Sultan Mohammad (Arabian chronicles).

1325 A.D. – Plague in Malabar following invasion of Mohammad Tughlaq and again after Timur.

1403 A.D. – Sultan Ahmed's army destroyed by plague epidemic in Malwa.

1617 A.D. – Plague reported during the Mughal emperor Jahangir's reign from Punjab, Ahmedabad, Surat and Deccan and some other parts of India-described by Edward Ferry, ambassador to the Mughal court.

1707 A.D. – Plague in Berhampur.

1812-21 A.D. – Plague hits Kathiawar, Gujarat and Cutch – supposed to have been imported from Persia.

1836 A.D. – In Mewar and Rajputana – known as Pali plague.

1895 A.D. – In Calcutta – diagnosed bacteriologically on April 17, 1898, by Dr. Neild Cook. Imported from Hong Kong.

1896 A.D. – In Bombay, first diagnosed on October 13, 1897. From here plague spread rapidly to most parts of India.

1907 A.D. – Peak year of plague in India with 1,315,892 deaths.

1926-27 A.D. – Severe epidemic in Hyderabad and Deccan.

1947-52 A.D. – A temporary rise in incidence of plague in Calcutta and rise in several old foci in India.

1954-58 A.D. – Plague reappeared in Andhra Pradesh and Mysore and appeared for the first time in Guwahati (Assam).

1960-69 A.D. – Sporadic outbreaks in Mysore, Madras, Himachal Pradesh and Rajasthan.

(Compiled by Dr. M. Idris)

Contributions for inclusion in the Newsletter may please be forwarded along with 1-2 good black and white photographs to :

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