BURROW FUMIGATOR

AN ECOFRIENDLY DEVICE FOR RODENT MANAGEMENT

A. Ranga Reddy, K. Vasanta Bhanu
S.M. Zaheruddeen and P. Raghava Reddy
ANG Ranga Agricultural University
APRRI, MARUTERU-534 122 (W.G.) A.P.

All India Network Project on Rodent Control
Central Arid Zone Research Institute, Jodhpur-342 003, India

Technical Bulletin : No. 11

Network Coordinating Unit
All India Network Project on Rodent Control
Central Arid Zone Research Institute, Jodhpur-342 003, India

Published by :

Project Coordinator (Rodent Control)
For Indian Council of Agricultural Research
Central Arid Zone Research Institute, Jodhpur

July, 2005

Printed by :
Evergreen Printers
14 C, Heavy Industrial Area, Jodhpur

BURROW FUMIGATOR

AN ECOFRIENDLY DEVICE FOR RODENT MANAGEMENT

A. Ranga Reddy, K. Vasanta Bhanu
S.M. Zaheruddeen and P. Raghava Reddy
ANG Ranga Agricultural University
APRRI, MARUTERU-534 122 (W.G.) A.P.

भाकृअनुप
ICAR

All India Network Project on Rodent Control
Central Arid Zone Research Institute, Jodhpur-342 003, India

डॉ. गौतम कल्लू
उप महानिदेशक
(बागबानी एवं फसल विज्ञान)
Dr. G. Kalloo
Deputy Director General
(Horticulture & Crop Sceince)

भारतीय कृषि अनुसंधान परिषद्
कृषि अनुसंधान भवन–2, पूसा, नई दिल्ली–110 012
Indian Council of Agricultural Research
Krishi Anusandhan Bhawan-II, New Delhi-110 012
Tel. : 011-25842068(O), 25840191(R)
Fax : +91-11-25841976 E-mail : kalloog@icar1.nic.in

FOREWORD

Eastern coasts, especially the Godawari and Cauvery Delta regions of southern India are commonly referred as Rice bowl of the country. Amongst many biotic stresses, field rodents are considered a serious impediment in realizing the real potential of rice yields. I understand that the lesser bandicoot rat, *Bandicota bengalensis* is the most predominant vertebrate pest of the region and take a heavy toll of total productivity of the region. ICAR, through its All India Network Project on Rodent Control is engaged in research and developement of technical knowledge to combat rodent menace, which need to be permeated to grass root level in villages. Chemical rodenticides have been the only answer for containing the rodent problem in crop fields in modern rodent management technology. Due to various threats for human life and other ecosystems there is a need to discourage these toxicants by developing alternative strategies, such as fumigators.

I am happy that the scientists of ANG Ranga Agril. University, Maruteru working under AINP on Rodent Control have pioneered in innovating a safer and eco-friendly device, the 'Burrow Fumigator' for the control of subterranean rodents, damaging our crops. It gives me utmost satisfaction and delight to learn that the scientists have successfully improved the tribal knowledge of burrow fumigation in a highly scientific manner, which is handy and easy to operate with utmost safety to non-target systems and eco-friendly. I therefore appreciate and congratulate the All India Network Project on Rodent Control and its scientists for this innovation and also for bringing out this Technology Bulletin No. 11 by the Project Coordinator. I hope the technology and the process shall be adopted by State Departments of Agriculture and Horticulture for effective rodent management.

(G. Kalloo)

डॉ. टी. पी. राजेन्द्रन
सहायक महानिदेशक
(पौध संरक्षण)
Dr. T. P. Rajendran
Assistant Director General
(Plant Protection)

भारतीय कृषि अनुसंधान परिषद्
कृषि भवन, नई दिल्ली–110 001
Indian Council of Agricultural Research
Krishi Bhawan, New Delhi-110 001
Tel. : 011-23384414 (O)

MESSAGE

Rodents are known to inflict severe damage to standing crops from sowing till harvest. Besides they are responsible for colossal losses to our stored commodities and also act as carriers of several diseases to man and livestock. Present day rodent management technology is mainly based on use of rodenticides, which are highly toxic to a wide range of other animals including humanbeings. Therefore, there is a need to evolve safer, eco-friendly and cost effective technologies for rodent management.

I am happy to learn that the scientists working under ICAR sponsored AINP on Rodent Control at Andhra Pradesh Rice Research Institute (formerly Agricultural Research Station) of ANG Ranga Agril. University, Maruteru, West Godawari Distt. (A.P.) have developed a 'Burrow Fumigator' for effective and eco-friendly rodent management. On this occasion I would like to congratulate the scientists viz., Drs. A. Ranga Reddy, K. Vasanta Bhanu, S.M. Zaheruddeen and P. Raghava Reddy for their initiative and thinking to innovate this rurally adoptable technology.I wish that the 'Burrow Fumigator' developed by these Project scientists will be helpful in managing the rodent menace. It is desired that the prototype is rapidly multiplied and utilised in other agro-ecological regions of the country. I appreciate the efforts of the Project Coordinator and the concerned scientists in bringing out this publication for the benefit of scientists, extension workers, farmers and rural folk.

(T.P. Rajendran)

INTRODUCTION

Rodents are the major pests in all the rice growing areas of Andhra Pradesh. The predominant species infesting rice are the lesser bandicoot, *Bandicota bengalensis* and the field mouse, *Mus booduga* in wet lands; Indian gerbil, *Tatera indica* and soft furred field rat, *Millardia meltada* in uplands. All these four species are burrow dwellers. Among these *B. bengalensis* is the dominant species and is well adapted to wetland conditions. Although rodents damage rice at seedling, tillering and grain formation stages, the most vulnerable crop stage being boot to grain hardening. At this stage, unlike as in tillering the rice plant cannot regenerate the lost tillers and recoup as such, the loss will be total. In addition to tiller cutting, the rodents *B. bengalensis* and *M. meltada* hoard ripened panicles inside their burrows which range from 0.5 to 4 kg/burrow.

An estimate by Andhra Pradesh Rice Research Institute, Maruteru, indicated the rodent damage to rice as 15.9% in West Godavari district and 10.4% in East Godavari district of A.P. where rice crop is grown in both wet and dry seasons. Breeding in rodents also coincides with the reproductive phase of the crop. Rodent control at this stage is very difficult because rodents avoid traps and poison baits. Fumigating the burrows with aluminium phosphide is usually advocated at this stage to control field rats. But this has to be done under technical supervision. Due to the operational hazard and restricted availability of aluminum phosphide, its use is very much limited. Under these circumstances farmers do not have an effective rodent control method to save their crops. The search made by Scientists of AICRP on Rodent Control, AP Rice Research Institute (formerly Agril. Res. Station) of ANG Ranga Agricultural University, Maruteru, West Godavari Distt (AP) for an effective and safe method of control to contain rodents has led to the development of a handy device, the 'burrow fumigator'.

BURROW FUMIGATOR

Most of the field rodents live in burrows for shelter, protection from predators and for thermo-regulation. Killing these subterranean pests by fumigating their burrows with natural smoke is an age-old practice. Burning pine leaves, dry leaves with chillies and cow dung inside the burrows have been in practice in rural areas with varying success. The deaths of rodents occur by suffocation due to exposure to smoke, which mainly contain Carbon dioxide and Carbon monoxide.

After the flash floods of Godavari in 1986, there was an outbreak of rodents. During that period, the tribal people "*Yenadi*" killed the rodents with natural smoke through small earthen pot having a hole at its base. They simply fill the pot with paddy straw and ignite the straw. As the straw catches fire, they place the mouth of the pot on the burrow opening and slowly blow the air with mouth, through the hole into the pot and the liberated smoke passes into the burrow. The rodents die within 10-15 minutes.

Based on the same principle a compact handy device "burrow fumigator' was developed for the control of field rodents.

DESIGN

The unit consists of a hollow cylinder of 10" diameter and 8" height made of 14 gauge MS sheet. There is an inlet on the top made of 1.5" G.I. pipe of 4" length. The outlet is at the bottom made of 3.8" G.I. pipe of 5" length. Handle is provided at the side to carry the unit from place to place.

METHOD OF OPERATION

The cylindrical portion of the unit is stuffed with paddy straw through the outlet and ignited. As the straw catches fire, air is blown slowly by rotating the hand blower inserted into the top inlet. In the initial stage, thick Yellowish smoke comes out through the outlet pipe. Then the outlet of the smoke fumigator is kept on the opening of the rat burrow, smoke enters into the burrow and within a short time, all the tunnels of the burrow are filled with smoke killing all rats including litter inside. Generally, two persons are required to operate the equipment, one is meant for blowing the air and the other to block the leakage of smoke and also to kill the escaping rats. The total cost of the equipment is around Rs. 700/-, which can be purchased by the marginal farmers.

COMPARATIVE EFFICACY OF BURROW FUMIGATOR OVER OTHER METHODS

Field experiments were conducted at APRRI, Maruteru to compare the efficacy of 'Burrow Fumigator' with traps and aluminum phosphide and economics of these methods were calculated.

BURROW FUMIGATOR Vs. 'BUTTA' TRAP

In coastal Andhra Pradesh the traditional trap locally called as 'Butta' made of bamboo was commonly used for the control of rodents

in rice fields. The tribal people set the traps in the evenings and next day morning they collect the trapped rats. Experiments were conducted for two years 2002 and 2003 to compare the efficacy of these two methods.

Table - 1. Efficacy of Burrow Fuminator over Butta Trap

Particulars	2002*		2003+	
	Burrow fumigator	Butta trap	Burrow fumigator	Butta trap
1. No. of traps installed	---	100	---	100
2. No. of burrows treated	280	---	280	---
3. Mean mortality (%)	91.79	2.78	92.27	12.12
't' value	58.15**		34.61**	

* Mean of 14 observations + Mean of 11 observations.

Burrow fumigator was significantly superior in controlling the *B. bengalensis* and recorded 91.79 and 92.27% mortality during 2002 and 2003, respectively whereas butta recorded 2.78% and 12.27% mortality in respective years (Table-1).

Fumigation of burrow with Burrow fumigator is worked out to be cheaper (Rs 3.45) than the trapping of rodents by employing professional trappers by paying Rs 5/rodent.

BURROW FUMIGATOR Vs. ALUMINIUM PHOSPHIDE

The active burrows of *B. bengalensis* were identified and were fumigated each with aluminium phosphide and with burrow fumigator and closed with wet mud. Next day morning the reopened burrows were counted and the percent mortality was calculated and the economics of the two treatments were calculated.

Both the methods effectively controlled the population of *B. bengalensis*. During 2002, aluminium phosphide recorded a mortality of 96.07% and burrow fumigator recorded a mortality of 91.79% (Table -2). The differences in the mortality of rodents in these two methods were not significant.

Table - 2. Efficacy of Fumigation with Burrow Fumigator & Aluminium Phosphide against *B. bengalensis*

Particulars	2002		2003	
	Quickphos	B.F.	Quickphos	B.F.
1. Total Burrows treated (Nos.)	280	280	280	280
2. Burrows reopened (Nos.)	11	23	4	20
3. Rodent mortality (%)	96.07	91.79	98.57	92.86
't' value	1.79N.S.		3.12	

BF : Burrow fumigator

Table - 3. Economics of Fumigation of burrows

S.No.	Particulars	Fumigation with BF	ALP @ 1.2 g/ burrow
1.	Total No. of burrows treated	280	280
2.	No. of Work days required	14	7
3.	Cost of labour @ Rs 68/woman/day	Rs. 952.00	Rs. 476.00
4.	Cost of input	Rs. 14.00	Rs. 240.80
5.	Total Cost	Rs. 966.00	Rs. 716.80
6.	Cost of input/burrow	Rs. 3.45	Rs. 2.56

BF: Burrow fumigator; ALP: Aluminum phosphide

Note : 1. Cost of ALP (Quickphos) Rs 346/480g container
2. Quantity of paddy straw required for 280 burrows is 140 kgs
3. Cost of paddy straw Rs. 100/t

During 2003, out of 280 burrows treated each with ALP and BF, four burrows in case of ALP and 20 burrows in case of BF were reopened and recorded a mortality of 98.57 and 92.86%, respectively. The differences in mortality of *B. bengalensis* were non-significant (Table - 2).

Cost of inputs for fumigation with ALP and BF worked out to be Rs. 2.56 and Rs. 3.45 per burrow, respectively (Table -3).

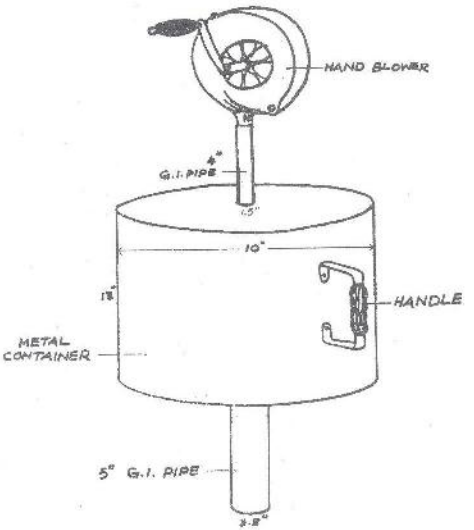

Fig. 1 Burrow Fumigator

Even though aluminum phosphide was found more effective and economic than burrow fumigator, because of its high toxicity to non-target animals, absence of an antidote, limited availability, it is advisable to employ burrow fumigator for the control of field rodents. It is environmentally safe and effectively manages field rodents with reasonable cost.

ACKNOWLEDGEMENTS

The assistance provided by Indian Council of Agricultural Research, New Delhi to the Maruteru Center, ANGR Agricultural University under AINP on Rodent Control is thankfully acknowledged. The authors wish to thank Dr. A. Padam Raju, Director (Research), ANG Ranga Agril. University, Hyderabad for providing necessary facilities and encouragement. We express over deep sense of gratitude to Dr. G. Kalloo, Deputy Director General (Horti and Crop Sceince) and Dr. T. P. Rajendran, Assistant Director General (PP), Indian Council of Agricultural Research, New Delhi for their blessings in the form of Foreword and Message for this Bulletin. Thanks are also due to Dr. R.S. Tripathi, Project Coordinator (Rodent Control) for guidance and suggestions for bringing out this publication for popularization of this eco-friendly rodent management technology.

Bandicota bengalensis

Mus booduga

Borrow Fumigator fixed in borrow

Borrow Fumigator in operation

Evergreen # 2434647