Rodenticides – are they safe?

Bamboo flowering is considered to be a biological enigma followed by certain mysterious incidents which is evident from the massive loss of bamboo resources and sudden increase in rodent population. It is baffling, though the mass fruiting of the bamboo is the obvious clue. The enormous quantity of bamboo seeds available after flowering are consumed by rodents inducing a boom in their population. These rodents later start attacking the crops, causing famine in the adjoining areas of the bamboo forests[1–4]. Wild rodents also act as vectors in spreading many deadly diseases like babesiosis, leptospirosis, salmonellosis, scrub typhus, typhoid and bubonic plague[5]. In south east Asia, many diseases spread through rodents remained undiagnosed and account for 30–50% fevers of unknown origins[6].

In order to combat the impending rodent upsurge in different parts of NE India, large quantities of different rodenticides are freely distributed to the inhabitants by the agriculture and allied departments. Temporally it may be effective to ward off the rodents but the subsequent impacts on the environment and different ecosystems are still at large, which needs to be given prior attention. Indirectly they may also harm non-targeted species by acting through the food chain and biological magnification of the toxic inorganic chemicals. Surprisingly in many parts of NE India, many tribal communities consume rodents which are killed by using the rodenticides and are also eventually sold in local markets for commercialization. Direct consumption of the poisoned rodents may hamper the coordinating systems in humanbeings and may prove fatal in the near future. Reports on health hazards on humans and other non-target animals by rodenticides are lacking and limited but it may not be wise witnessing a possible major health hazardous scenario in the near future due to the application of such chemicals. Prior risk assessment is of principal importance in the present context.

In Mizoram, a notable quantity of aluminum phosphide, zinc phosphide, coumatetralyl and bromadiolone were used during the period 2004–2008 to control rodents. Though these chemicals are regarded as readily degradable with less impact, they cannot be recognized as ecofriendly for the following reasons.

Aluminum phosphide and zinc phosphide are used to control insects and rodents but their products have been classified under restricted use category due to inhalation hazards to humanbeings and are grouped under toxicity category I[7,8]. Both react with moisture in the atmosphere and hydrochloric acid in the gastrointestinal tract of the poisoned animals, forming a highly toxic gas phosphine (an active substance that is effective against pests). In some cases zinc phosphide application has resulted in mortality of non-target wild animals including microentities[9].

Coumatetralyl is a first generation anticoagulant chemical compound of the warfarin type. High concentration or repeated exposure even at low concentrations can change the fibrinogen development behaviour and may cause haemorrhage. Symptoms may include easy bruising, nosebleeding, gumbleeding and release of blood cells through urine and stools. Anaemia due to severe or repeated bleeding may also develop[10].

Bromadiolone is a vitamin K antagonist which is very toxic to all mammals and is known to affect some non-targeted species[11]. The major site of action of bromadiolone is the liver, where vitamin K dependent post-translation process takes place before being converted into the respective procoagulant zymogens. Absorption of the compound is through the gastrointestinal tract, skin and respiratory system and is usually reported as an unchanged parent compound in the liver[12].

Since all these chemicals are hazardous to healthy environments, opting for other ecofriendly tools and techniques to combat the rodent menace is recommended.

1. Hazarika, S., *Strangers of the Mist: Tales of War and Peace from India's North-east*, Penguin Books, New Delhi, 1995.
2. Mendoza, T. L., *Rice Today*, 2009, **8(4)**, 44–45.
3. Chakraborty, S., *India eNews*, 2009; http://www.indiaenews.com/pdf/120416.pdf
4. Jeeva, S., Kiruba, S., Lalhruitlianga, H., Prasada, M. N. V. and Rao, R. R., *Curr. Sci.*, 2009, **96**, 1165–1166.
5. Anon., Protection from rodent-borne diseases with special emphasis on occupational exposure to Hantavirus, Technical information memorandum no. 41, Defense Pest Management Information and Analysis Center, Forest Glen Section, Walter Reed Army Medical Center, Armed Forces Pest Management Board, Washington, DC, 1999.
6. Peacock, S. J. and Newton, P. N., *Trans. R. Soc. Trop. Med. Hyg.*, 2008, **102**, 5–6.
7. EPA, R.E.D. facts, aluminum and magnesium phosphide, prevention, pesticides and toxic substances (7508C), EPA-738-F-98-015, 1998, pp. 1–16.
8. EPA, R.E.D. facts, zinc phosphide, prevention, pesticides and toxic substances (7508W), EPA-738-F-98-003, 1998, pp. 1–8.
9. Kathleen, F. A., Primary and secondary hazards of zinc phosphide to nontarget wildlife – a review of the literature, Field Rodent Symposium, WRCC-95, Reno, Nevada, 1993.
10. Anon., Hazardous substance fact sheet, Department of Health and Senior Services, New Jersey, 2003, pp. 1–6; http://nj.gov/health/eoh/rtkweb/documents/fs/2297.pdf
11. Stone, W. B., Okoniewski, J. C. and Stedelin, J. R., *J. Wildlife Dis.*, 1999, **35**, 187–193.
12. WHO/FAO, Data Sheets on Pesticides No. 88, 1996; http://www.inchem.org/documents/pds/pds/pest88_e.htm

CH. SADANANDA*
SALAM DILIP
RASESHOWRI DEVI
L. B. SINGHA

Department of Forestry,
North Eastern Regional Institute of Science and Technology,
Nirjuli,
Itanagar 791 109, India
**e-mail: chingangbam.sadananda@gmail.com*