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Study on habitat ecology and burrow structure of *Bandicota bengalensis* in groundnut

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ABSTRACT

The Lesser Bandicoot rat is the most dreaded vertebrate pest of Groundnut. The study on habitat burrow ecology of *B. bengalensis* in groundnut was carried out during both during *Kharif* and summer of 2012-13 in groundnut crop at Thagachuguppey village, Magadi Taluk of Ramanagara district of Karnataka state. The study indicated that mean diameters of burrow opening of *B. bengalensis*, was 6.10±0.74 and that of side tunnels was 3.36±1.01cm. The maximum depth of the burrow was 89 cm and total length was 753 cm for *B. bengalensis* species.

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INTRODUCTION

Rodents are mammals of the order Rodentia, characterized by a single pair of continuously growing incisors in each of the upper and lower jaws which must be kept short by gnawing. Rodents are important pests of groundnut with 30-40 percentage damage to seeds at germination, 6-9 percentage damage at pod maturation and 4-9 percentage damage to mature pods besides their hoarding. The species inflicting damage to groundnut in Karnataka are *Bandicota bengalensis* (Gray), *Tatera indica* (Hardwicke), *Mus booduga* (Gray) and *Mus meltada* (Gray) (Sridhara and Tripathi, 2005). Most dreaded of all vertebrate pest is *Bandicota bengalensis* (Gray). A good deal of work on insect pests has been done on groundnut in many parts of India. However, very little is known about rodent's infestation in groundnut and the information on burrowing habit, hoarding behavior, breeding and the faunal association in the burrows of rats in India.

MATERIAL AND METHODS

The burrows of *Bandicota bengalensis* present in and around the groundnut field were identified based on certain characteristic features as mentioned below. The lesser bandicoot (*B. bengalensis*) rat burrows revealed the presence of heaps of soil covering the openings located at different points of burrow. Confirmation regarding the presence of rats inside the burrows was done by closing the burrow at one evening and taking observation in next morning. If the closed burrow is opened in next morning then it was considered as live burrow and if the closed burrows remain closed it was considered as dead burrow.

Burrows were excavated in and around groundnut

fields of farmers at different stages of crop (Germination, Peg formation, Harvesting and Post harvesting) both during *Kharif* and *Summer* during 2012-13. Twenty burrows of *Bandicota bengalensis* were excavated. At each stage five burrows were excavated to study the burrow structure. While excavating heap of soil was removed and the opening was traced to the ground level with the help of a spade or a crowbar and pickaxe. As the digging operation was on positions of the tunnel openings, side tunnels, nest chambers, food chambers, bolt holes and blind tunnels were marked using wooden pegs. Measurements of the positions marked by wooden pegs were taken with the help of measuring tape. Length, width and depth of the burrows, diameter of the burrow openings, length of blind tunnels, bolt tunnels and diameter of the tunnel were measured. Number of the openings of the burrow, number of the side tunnel, number of the food chambers and different types of hoarding materials in the burrow was also recorded. Presence of litters in each burrow was also taken into consideration and litter size was recorded. The temperature inside the burrow was recorded with the help of soil thermometer. After the excavation, sketches of the burrows were drawn to show the various position of the burrow and photographs of the structure of burrows of different rodent species were taken.

RESULTS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under the following heads:

Burrowing behaviour:

The lesser bandicoot rat burrows were clearly marked by the presence of heaps of soil at different points along the burrow length. All the openings were covered completely by the excavated loose soil which was heaped on the surface in the form of soil mounds. The soil mounds appear in the form of "Mole hills". Careful examination of very large mounds of burrow revealed that two or more adjacent mounds merged to form one composite mole-hill. All the openings were sealed from inside by rat using loose excavated soil. The diameter of the finished mole-hill varied from 13 to 60 cm and the height ranged from 6 to 38 cm. The amount of soil excavated by the bandicoot adults differed from burrow to burrow. The mean weight of the soil thrown out was 5.55±3.1 kg. However, a maximum of 25 kg and a minimum of excavated soil were recorded from two burrows. Excavated soil contained cut roots of grasses and other weed plant roots. The mole hill formation due to excavated soil mounds in lesser bandicoots burrows have been reported (Bhaduria and Mathur, 1993 and Sood Pankaj and Chand Prem, 2007).

Burrow structures:

Main entrance:

Main entrance of the lesser bandicoot rat was difficult to locate. However the presence of fresh soil heap near an opening of burrow was considered as the main entrance. The mean diameter of the main entrance were 6.29±0.31 and the mean diameter in *Kharif* season were more than summer season with 6.49±0.44 cm which increases from 6.13 cm in germination stage to 6.35 cm during peg formation and reaches maximum to 6.98 cm in harvesting stage and decrease during post harvest season to 6.27 cm. The case was similar in summer season with mean diameter 6.19±0.24 cm with harvesting stage had highest mean diameter of 6.43 cm and lowest during germination stage with 5.96 cm. Peg formation and post harvest had an intermediate range with 6.18 cm and 6.09 cm, respectively. Over all range was 5 to 7 cm (Table 1). Reported that mean diameter of the burrow openings varies with the stages of the crop and climatic condition (Sood Pankaj and Chand Prem, 2007).

Number of openings:

The surface openings were externally covered by the excavated soil heaps. The openings were sealed on the surface with the packing of loose soil and packing was not usually hard. The thickness of the earthen seal ranged from five to fifteen cm. The mean numbers of burrow openings were 3.76±1.29 numbers. During *Kharif* season it was 3.69±1.52 with highest during harvesting season (5.01) when the rodent activity was maximum and lowest during germination stage (2.03) when the rodent activity was minimum. During peg formation and post harvest season it was 4.13 and 3.11 respectively. In summer season it were 4.24±1.67 with highest during harvesting season (5.96) when the rodent activity was maximum and minimum during germination stage (2.63) when the rodent activity was minimum. During peg formation and post harvest season it was

4.13 and 3.11, respectively (Table 1). Reported the mean diameter of the burrow openings was 3.1 cm (Sood Pankaj and Chand Prem, 2007) and reported the mean number of openings of 2.3±0.28 (Maqbool *et al.*, 2011) and the range of 1-3. The reported differences in the mean burrow openings and range of the present study may be due to location of burrows or due to changes in type of crop and soil conditions.

Tunnels:

The study revealed that the burrow usually branched off into several lanes or tunnels distributed in different directions. The branching was not uniform. The tunnel passage ways were almost circular and were widened at the junctions where branching was seen. The mean diameter of the tunnel passage ways in different cropping seasons were 7.07±0.77 cm. During *Kharif* season it was 7.15±1.01cm with highest during harvesting season (8.13 cm) when rodent activity was maximum in field and lowest during germination stage (6.11 cm) when the rodent activity was minimum. During peg formation and post harvest season it was 7.21cm and 6.97 cm, respectively. In summer season it were 7.1±1.00 cm with highest during harvesting season (7.99 cm) when the rodent activity was maximum and minimum during germination stage (6.01 cm) when the rodent activity was minimum. During peg formation and post harvest season it was 7.30 cm and 6.81 cm, respectively (Table 1). Reported that burrow branching was too intense in lesser bandicoots compared to other rodent species (Sood Pankaj and Chand Prem, 2007 and Maqbool *et al.*, 2011).

Blind tunnels:

The lesser bandicoot rats often hoarded food grains in a few of the blind alleys or tunnels situated in the burrow. Most of the burrows excavated revealed the presence of a deeper blind tunnel which was frequently associated with the nest area. Such blind tunnels always had a greater depth compared to rest of the blind tunnels in a burrow. The maximum and minimum vertical depth of a blind tunnel was 58 cm and 18 cm, respectively. When bandicoot burrows were excavated the adult rats were found always in these blind alleys or blind tunnels, trying to hide their presence by covering themselves with the dugout loose soil. Sometimes, the adult rats were found to seal the tunnel completely with earthen packing. The mean lengths of the blind tunnels in cropping season were 54.18±9.36 cm. During *Kharif* season it was 48.77±8.74 cm with highest during harvesting season (54.89 cm) when the rodent activity was maximum and lowest during germination stage (38.10 cm) when the rodent activity was minimum. During peg formation and post harvest season it was 52.43 cm and 51.40 cm,

Table 1 : Burrow characteristics of *Bandicota bengalensis* in and around groundnut **(n=40)**

Season	Crop stage	Month	Total length of burrow (cm)	Depth (cm)	Diameter of tunnel (cm)	No. of openings	Diameter of opening (cm)	No. of blind tunnels	Length of blind tunnels (cm)	No. of side tunnels	No. of food chambers
Kharif	Germination	July	293.30	33.10	6.11	2.03	6.13	2.13	38.10	2.13	0.93
	Peg formation	Sep	397.10	42.30	7.31	4.03	6.35	3.57	52.43	3.61	1.16
	Harvesting	Nov	621.00	72.10	8.13	5.01	6.98	3.65	54.89	4.01	1.96
Mean±SD			437.13±	52.6±	7.15±	3.69±	6.49±	3.11±	48.77±	3.25±	1.35±
			167.48	27.58	1.01	1.52	0.44	0.85	8.74	0.99	0.54
Post-harvest (Off season)	December		314.12	36.79	6.97	3.11	6.27	3.51	51.40	3.00	1.89
Summer	Germination	Jan	335.70	28.10	6.01	2.63	5.96	2.34	45.76	2.03	1.04
	Peg formation	Feb	481.30	38.36	7.19	4.13	6.18	3.71	63.36	3.62	1.36
	Harvesting	Apr	633.10	62.42	7.99	5.96	6.43	4.08	65.41	5.13	2.03
Mean±SD			483.37±	42.96±	7.1 ±	4.24±	6.19±	3.37±	58.17±	3.59±	1.47±
			148.71	17.61	1.00	1.67	0.24	0.91	10.8	1.55	0.50
Post-harvest (Off season)		May	423.78	33.63	6.81	3.16	6.09	3.66	62.11	3.33	2.18
Total Mean±SD			437.43±	43.35±	7.07±	3.76±	6.29±	3.33±	54.18±	3.36±	1.50±
			132.04	15.54	0.77	1.29	0.31	0.69	9.36	1.01	0.49
t- value			2.11*	2.03*	NS	NS	NS	NS	NS	NS	NS

*indicates significance of value at P= 0.05 NS=Non-significant

respectively. In summer season it were 58.17±10.8 cm with highest during harvesting season (65.41 cm) when the rodent activity was maximum and minimum during germination stage (38.10 cm) when the rodent activity was minimum. During peg formation and post harvest season it was 63.36 cm and 62.11 cm, respectively (Table 1).

Depth of the burrows:

The maximum depth of the burrow recorded is 89 cm and it varies from season to season and from stages of the crop. Mean depth of the burrow and its variation in stages of the crop and seasons were 43.35 ± 15.54 cm. During *Kharif* season it was 52.6 cm ±27.58 cm with highest during harvesting season (72.10 cm) when the rodent activity was maximum and lowest during germination stage (33.10 cm) when the rodent activity was minimum. During peg formation and post harvest season it was 42.30 cm and 36.79 cm, respectively. In summer season it were 42.96±17.61 cm with highest during harvesting season (62.42 cm) when the rodent activity was maximum and minimum during germination stage (28.10 cm) when the rodent activity was minimum. During peg formation and post harvest season it was 51.10 cm and 37.66 cm respectively (Table 1). Lesser bandicoots make deeper burrows during rainy season (Maqbool *et al.*, 2011). It corroborates with present study but with slight variation that deepest burrows were observed in harvesting season.

Length of the burrow:

The maximum total length of the burrow is recorded is 753 cm and it varies from season to season and from stages of the crop. Mean total length of the burrow were 437.43 cm ± 132.02 cm. During *Kharif* season it was 437.13 cm ±167.48 cm with highest during harvesting season (621 cm) when the rodent activity was maximum and lowest during germination stage (293.30 cm) when the rodent activity was minimum. During peg formation and post harvest season it was 397.10 cm and 314.12 cm, respectively. In summer season it was 483.37±148.41 cm with highest during harvesting season (633.10 cm) when the rodent activity was maximum and minimum during germination stage (335.70 cm) when the rodent activity was minimum. During peg formation and post harvest season it was 481.30 cm and 423.78 cm, respectively (Table 1).

Nest/Brood chamber:

Both male and female rat burrows were having identical nest chambers. Male rats utilized the chambers for resting purposes and the female rats in addition to nesting use the chambers for brood rearing purpose also. The shape of the nest/brood chamber in general varied from spherical to oblong. It showed a shallow depression of 3 to 6 cm in the floor of the chamber. Reported that the nest chamber had spherical to oblong shape which, supports the present investigation (Maqbool *et al.*, 2011). Nesting materials were used as mat for lining the floor of the nest chambers. The mat of nesting materials lining the floor of the chamber was 2 to 4 cm in thickness. Materials used for nesting are stem and root cuttings of ginger grass (*Panicum repens* L.), ragi straw and dried leaves of jack fruit tree (*Artocarpus integrifolia* L.).

Table 2 : Hoarding behaviour and litter size of *Bandicota bengalensis* in and around groundnut field

Season	Crop stage	Month	No. of food chambers	Quantity of material hoarded (g)	Materials hoarded	No. of litters/burrow
Kharif	Germination	July	0.93	_		0.00
	Peg formation	Sep	1.16	37.2	Ragi earheads	3.77
	Harvesting	Nov	1.96	64.90	Groundnut pods	2.87
Mean±SD			1.35±0.54	21.63±37.47	–	3.32±0.64
Post-harvest (Off season)	December		1.89	67.43	Groundnut pods	1.96
Summer	Germination	Jan	1.04	–	–	0.00
	Peg formation	Feb	1.36	–	*Cyanodon dactylon, Panicum repens*	2.23
	Harvesting	April	2.03	76.20	Groundnut pods	3.63
Mean±SD			1.47±0.50	25.4±43.99	–	2.93±0.99
Post-harvest (Off season)		May	2.18	81.35	Groundnut pods	1.83
Total Mean±SD			1.50±0.49	36.24±39.06	–	2.72±0.84

The nest size varied from 8cm x 6 cm to 20 cm x 15 cm.

Food chambers:

Food chambers were encountered in the burrows of both the sexes. In both cropping seasons as well as in the off seasons food materials are stored. In cropping seasons only harvesting stages the hoarding is noticed. The food chamber was oblong to semi-circular in shape, with smooth inner walls. Usually the food chambers were built in middle of the tunnel passageways and occasionally noticed at the end of the blind tunnels. Maximum number of food chamber observed was 3 per burrow (Table 2). Size of the food chamber varied from 4cm x 6 cm to 35 cm x 45 cm. Rat faeces were observed in the food chambers than in any parts of the burrow (Table 1).

Hoarding habits:

Both the male and female rats stored large quantities of food grain in the burrows. The ear heads of crops brought by rats were not only found stored in the food chamber but were even noticed in the blind tunnel ends, at junctions were the tunnel branched and sometimes in the middle of tunnel passages. Revealed that the hoarding of *B. bengalensis* was more evident in the field than in the store houses (Chakraborty, 1975). The hoarded materials in different seasons and in different stages of the crop and the groundnut hoarding was noticed only during harvesting season and post harvest season with 64.80 g average per burrow during *Kharif* season and 67.43 g in preceding post harvest season. During summer season it was 76.20 g and 81.35 g in the preceding post harvest season. Noticeably more hoarding of groundnut pods were seen in post harvest season because of non availability of food material during off seasons. Ragi ear heads collected from the burrow were cut at the base, leaving a short stock of 1 cm to 3cm. During summer season, in addition to other hoarding materials neatly cut ginger grass were found in blind tunnels and sometimes found in nest chambers also. The rhizomes were being nibbled by adult rats and remnants of nibbled pieces of rhizomes were found scattered at different points of the burrow (Table 2).

Breeding season and litter size:

Young ones of the rats were found during peg formation and harvesting seasons of *Kharif* and summer crops. When the burrows were dug the unfurled young blind rattling's noticed within brood chamber. The maximum numbers of litter size were noticed six. Litter size was observed more during peg formation stage of *Kharif* (3.77) and this lead to increase of population in harvesting season but in summer season during peg formation period (2.33) it was less compared to summer (3.66) mainly due to adverse climatic conditions (Table 2). According to AINP (2010), *B. bengalensis* had two seasonal peaks of breeding *i.e.* September–October and January- March.

Conclusion:

The lesser bandicoot rat burrows were clearly marked by the presence of heaps of soil at different points along the burrow length. The soil mounds appeared in the form of "Mole hills". The mean weight of the soil thrown out was 5.55±3.1 kg. The presence of fresh soil heap near an opening of burrow of *B. bengalensis* was considered as the main entrance of the burrow. The burrows were kept sealed, perhaps to prevent the entry of snakes and prevent desiccation. The surface openings of lesser bandicoot rat burrows were externally covered by the excavated soil heaps. The openings were sealed on the surface with the packing of loose soil and packing was not usually hard. The mean numbers of openings observed were 3.76±1.29 and range was 1-4. The mean numbers and mean diameter of side tunnels present during the cropping seasons and off seasons were 3.36±1.01 and 7.07±0.77 cm. The present investigation revealed that maximum depth of the burrow was 89 cm and total length of the burrow recorded was753 cm. Male and female rats stored large quantities of food grain in the burrows. The quantity of groundnut hoarded was found to be 36.24±39.06 g per burrow. Young ones found during peg formation and harvesting stages of *Kharif* and summer seasons. When the burrows were dug the unfurled young blind rattling's noticed within brood chamber.

REFERENCES

AINP (2010). Annual Progress Report of All India Network Project on Rodent Control (2009-2010), University of Agricultural Sciences, Bangalore, India pp. 89.

Bhaduria, A.S. and Mathur, Y.K (1993). Burrow patterns of bandicoot rat, *Bandicota bengalensis* (Gray). *J. Ent. Res.*, **17** : 267-273.

Chakraborty, S. (1975). Field observations on the biology

and ecology to the lesser bandicoot rat, *Bandicota bengalensis* (Gray) in West Bengal. *Proc. All India Rodent Seminar,* Ahmedabad, pp. 102–112.

Maqbool, S., Khan, A. A. and Siddique, M. (2011). Burrowing characteristics and food hoarding behaviour of *Bandicota bengalensis* in wheat fields of Jammu and Kashmir and Pakistan. *Pakistan J. Zool*., **43** : 987-992.

Sood Pankaj, P. and Chand Prem, U. (2007). Burrow pattern of lesser bandicoot rat, *Bandicota bengalensis* (Gray) in Himachal Pradesh. *Agri. Sci. Dig.*, **27** : 307-308.

Sridhara, S. and Tripathi, R.S. (2005). Recent trends in Coordinated Research on Rodent Control. *Rodent Newslett.*, **34** : 2-4.