



Status of rodent damage to coconut in Andaman and Nicobar Islands

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Abstract

The Andaman and Nicobar group of islands forms an arched string of 572 islands and islets stretching from Union of Myanmar in the north to Sumatra in the south. Coconut is the major plantation crop in the Bay islands in about 20927 ha land in India. Rodents cause severe losses to coconut in nurseries as well as in orchards world over, however, such information from Andaman and Nicobar islands is lacking. Therefore, studies on status of rodent problem (infestation rate and nut damage) in coconut were undertaken at thirty-nine locations of Andaman including nearby islands of south, north and middle Andaman districts. Nineteen rodent species exist in these islands belonging to genera *Rattus*, *Mus* and *Funambulus*, three species have been reported to be associated with losses in coconuts. Among various rodent species, the black rat (*Rattus rattus*) is primarily responsible for tender nut damage and is considered to be the major pest. All the orchards were infested with rodent pests ranging from 2.5 per cent (Dollygunj) to 74.5 per cent (Adajik) in Andaman and from 5.6 to 65.2 per cent in other islands (Little Andaman, Neil and Havelock Islands). Similarly, the nut damage ranged from 4.2 to 6.3 per cent (Andaman) and 4.1 to 5.9 per cent (other islands). The overall average rodent infestation and nut damage in the study areas was 26.1 and 5.1 per cent, respectively. The present maiden and extensive finding therefore indicates the need to evolve effective rodent management strategies for enhancing coconut production in these Islands.

Keywords: Andaman and Nicobar islands, coconut, damage, infestation, rodent

Introduction

Andaman and Nicobar islands, a Union Territory of India comprising of 572 islands and islets, is situated in the Bay of Bengal, midway between the peninsular India and Union of Myanmar. These islands have a tropical climate, which is warm and moist. In these Islands, rodents are major constraint to coconut production. In India, rodents present a great faunal diversity with 103 species and 89 subspecies under 46 genera (Pradhan and Talmale, 2009). Birah *et al.* (2010) have listed 15 species of rodents from Andaman and Nicobar islands, however, with the recent reports of three new species by Birah and Tripathi (2011) and one by Chakraborty and Chakraborty (2010) the total rodent diversity in the islands has reached to nineteen.

Rodents have been one of the major biotic constraints in food production since commencement of agriculture (Advani, 1985). Moreover, agro-ecosystems provide regular supply of energy-rich food and breeding shelters to rodents round the year making them a serious problem in any production system. Coconut (*Cocos nucifera* L.) is the major plantation crop of Andaman and Nicobar islands. It is one of the most vulnerable crops for rodent damage. Information on rodent damage in coconut growing states of India compiled by Sridhara and Tripathi (2005) indicate a nut damage of 4.5-55 per cent by rodents. Similarly, in the nurseries, the crop has been reported to suffer 6.8-8.0 per cent damage by fossorial rodents in Karnataka (Guruprasad and Srihari, 1983). Extent of damage to the crops by rodents largely depends upon the species involved,

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its population and also the availability of crop and suitability of physical environment (Parshad *et al.*, 1989; Jain and Tripathi, 2000).

The information on rodent problem in coconut from Andaman and Nicobar Islands is very scanty. No systemic data on rodent infestation and damage is available from the islands except for some preliminary reports available earlier (Sadanandan, 1974; Advani, 1985). Keeping this in view, detailed studies were undertaken at 39 locations representing two districts of north and middle Andaman and nearby islands of south Andaman to assess the rodent species composition, nature of damage and extent of infestation and nut damage in coconut plantations.

Materials and Methods

Rodent species composition was assessed through three nights trapping in three coconut orchards. Studies on rodent infestation rate and nut damage to coconut plantations were undertaken at 39 locations of south, north and middle Andaman districts during 2009-11 following unit count method. It included 28 locations in Andaman islands, five in Little Andaman island and three each in Neil and Havelock islands. Details of locations are presented in Table 1 and 2. Based on the symptoms of rodent damage, the types of damage in nurseries, young plants and damage to nuts were also analyzed. For assessing the rodent damage to nuts a block of 50-150 trees were selected in each plantation and the number of infested tree due to rat activity were recorded based on freshly fallen nuts near the base of tree (Ali *et al.*, 2003). The rodent infestation percentage was calculated using the following formula (Devaprasad and Rao, 2008):

$$\text{Per cent rodent infestation (RI)} = \frac{\text{No. of trees with fallen nuts}}{\text{Total No. of trees}} \times 100$$

Similarly, the nut damage was assessed by randomly selecting 10 trees with fallen nuts in the same orchards. The number of healthy and damaged nuts on the branches of selected trees was recorded. Rodent nut damage (%) was calculated using the following formula:

$$\text{Nut damage (\%)} = \frac{\text{No. of damaged nuts}}{\text{Total number of nuts}} \times \text{RI}$$

Table 1. The rodent infestation and damage to coconut in different locations of Andaman

Sl. No.	Locations	Rodent infestation (%)	Nut damage (%)
1	Bimbliton	45.50 ± 6.78	5.85 ± 1.92
2	Terla Bad	23.33 ± 4.96	5.55 ± 1.55
3	Bambha Nallah	15.62 ± 6.57	5.00 ± 1.24
4	Naya Shehar	45.56 ± 3.45	5.88 ± 1.85
5	Humfri Gunj	13.20 ± 4.50	5.55 ± 1.45
6	Macca Pahad	5.64 ± 1.23	5.25 ± 1.24
7	Kodiyaghat	23.54 ± 5.68	5.00 ± 1.74
8	Rangachang	12.63 ± 4.35	4.76 ± 0.84
9	Bidnobad	6.23 ± 1.50	4.54 ± 0.99
10	Ograbranch	25.42 ± 4.86	4.34 ± 0.71
11	Tushnabad	6.78 ± 2.30	4.16 ± 0.94
12	Tirur	21.53 ± 5.45	6.25 ± 2.24
13	Collin Pur	46.23 ± 5.76	5.83 ± 1.97
14	Manpur	15.50 ± 2.56	5.55 ± 1.05
15	Mangultan	25.23 ± 4.69	5.00 ± 0.95
16	Gupta Para	16.54 ± 3.59	4.76 ± 0.74
17	Manjeri	18.56 ± 6.84	4.54 ± 1.01
18	Sippighat	25.50 ± 4.65	4.16 ± 1.03
19	Hasmatabad	26.54 ± 5.64	6.25 ± 2.01
20	Minie Bay	23.50 ± 4.92	5.55 ± 1.59
21	Dollygunj	2.50 ± 1.20	5.26 ± 1.45
22	Ranchi Basthi	26.54 ± 9.25	5.00 ± 1.54
23	Shadipur	46.52 ± 9.52	4.54 ± 0.96
24	Chidiya Tapu	26.51 ± 6.94	3.84 ± 0.46
25	Baratang	58.62 ± 12.50	5.88 ± 1.43
26	Adajik	74.52 ± 13.65	5.55 ± 1.32
27	Naya Basthi	61.23 ± 11.52	4.98 ± 1.34
28	Indra Nagar	23.41 ± 9.56	5.26 ± 1.05
	SE (m)	2.86	NS
	CD (5%)	8.07	--
	CV%	19.18	--

Table 2. The rodent infestation and damage to coconut in other islands of Andaman

Sl. No.	Locations	Rodent infestation (%)	Nut damage (%)
Little Andaman Island			
1	Robindra Nagar	12.65 ± 4.45	5.00 ± 1.31
2	Vivekananda Pur	23.50 ± 5.96	4.76 ± 0.87
3	Netaji Nagar	45.12 ± 8.45	5.88 ± 2.01
4	Ram Krishna Pur	23.50 ± 3.56	5.00 ± 1.67
5	Harminder Bay	65.23 ± 10.34	5.88 ± 1.78
Neil Island			
1	Village No. 4	12.31 ± 2.54	5.00 ± 1.76
2	Village No. 3	25.60 ± 5.78	5.65 ± 1.43
3	Village No. 1	12.53 ± 1.98	5.00 ± 0.98
Havelock Island			
1	Govind Nagar	5.64 ± 1.78	4.42 ± 0.21
2	Village No. 3	15.33 ± 2.76	4.14 ± 0.32
3	Krishna Nagar	12.42 ± 3.85	4.16 ± 0.45
	SE(m)	3.71	NS
	CD (5%)	10.76	--
	CV%	27.60	--

The data were analyzed by using the statistical method with one-way ANOVA using OPSTAT (online computer software).

Results and Discussion

Rodent pest species

In the present investigation, three species *viz.*, the house rat *Rattus rattus* (80.4%) Indian field mouse, *Mus booduga* (3.8%) and Northern palm squirrel, *Funambulus pennanti* (16.1%) were trapped from the study sites. Amongst these, *R. rattus* proved to be the most ubiquitous species in the residential premises (as commensal) as well as in plantation orchards of Bay islands and is primarily responsible for major losses to coconut. The species is capable of climbing very tall plants and commonly nests in the crown of such trees. Several species of *Rattus* which are endemic in the Andaman islands cause damage to the plantation crops (Subiah, 1983). The squirrels (*F. pennanti*) which are diurnal and arboreal in habit were reported from nurseries and orchards, but their damage was observed more in the nurseries. *Mus booduga*, a fossorial rodent was also trapped from both the sites (Birah *et al.*, 2012). Rodent species composition were reported in coconut plantations by Advani (1984; 1985; 1987) Bhat and Sujatha (1987) from Kerala and Lakshadweep; Chakravarthy (1983) from Karnataka, Rao and Subiah (1982) from Andhra Pradesh. Advani (1987) reported that in addition to *R. rattus*, *M. booduga* is also an important pest of coconut. Similarly, Parshad (1999) reported *F. pennanti* to inhabit coconut orchards and cause severe damage. Our results are in close agreement with these findings.

In Andaman and Nicobar islands 18 species of rodents are reported to be inhabited (Subiah and Mathur, 1992; Birah *et al.*, 2010; Birah and Tripathi 2011). They included one sciurid (squirrel) and 17 murids (15 rats and two mice). Recently, Chakraborty and Chakraborty (2010) observed presence of lesser bandicoot rat, *Bandicota bengalensis* also from the urban locales of Port Blair. The present study, however, revealed that only a few species may be regarded as pests in coconut plantations.

Rodent infestation

The extent of rodent infestation and nut damage in coconut across 39 locations of the Union Territory are given in the Tables 1 and 2. The rate of rodent infestation (RI) varied from 2.5% to 74.5 per cent (Adajik). If the RI is grouped in four categories, *viz.*, (i) 0-9 (ii) 10-19 (iii) 20-39 and (iv) >40 per cent, majority of the study orchards (36%) fell into third group with RI between 20-39 per cent followed by eleven orchards (28%) registering RI between 10-19 per cent. Rodent infestation of over 40 per cent was observed in nine plantations (23%) however, none of the study sites in Neil and Havelock Islands fell in this category. The RI was more than 60 per cent in Naya Basthi (61.2), Harminder Bay (65.2%) and the maximum in Adajik (74.5%). Only five study plantations *i.e.*, four in Andaman (Dollygunj, Tushnabad, Bidonabad and Macca Pahad) and one in Havelock (Govind Nagar) can be categorized into least infested orchards (RI below 7%). In general, the average RI for 28 locations of Andaman was 27.2 per cent. Among the islands, Little Andaman recorded maximum rodent infestation (average 34%) followed by Neil (16.8%) and Havelock Island (11.1%). Of the five villages of Little Andaman island, Harminder Bay and Netaji Nagar registered relatively higher RI of 65.2 and 45.1 per cent respectively. Neil and Havelock Islands are the inhabited important and popular tourist spots of Andaman. Rodent infestation recorded in three villages of Neil island showed highest infestation of 25.6 per cent in Village No.3 followed by 12.5 and 12.3 per cent in Village No.1 and 4, respectively. In the Havelock island, the rodent infestation was considerably low *viz.*, 5.6, 12.4 and 15.3 per cent in Govind Nagar, Krishna Nagar and Village No. 3 respectively. Overall average RI of 39 locations was 26.1 per cent.

Typically, the rats gnaw the outer covering and make a small hole (about 5 cm diameter) near the perianth region of coconut. The damaged nut usually remains on the bunch for 2 to 6 days and finally such nuts fall on the ground. The fallen nuts with cut holes near perianth region is an important symptom of rat infestation/damage. The damage ranges from slight gnawing on small nuts to complete consumption of the meat inside the cavity

of large and medium coconuts. The nuts were usually tunneled into near the basal portion or about half way along the length of the pericarp or outer husk. The basal portion of the nut is more accessible to rats than the lateral or distal portions. Shamsuddin and Koya (1985) from Lakshadweep have also reported that most of the damaged nuts fall to the ground. *Rattus rattus* has been reported as a major rodent pest of coconut in India by Advani (1987) and in Sindh region of Pakistan (Ali *et al.*, 2003). The number of damaged nuts varied according to the size of nuts, location and extent of damage which has been reported by many workers investigations (Advani, 1987; Bhat, 1993).

Rodent nut damage

Rodent damage to nuts ranged between 3.8-6.3% across 39 study locations with an average of 5.1 per cent (Tables 1&2). No definite relation was however observed between RI and nut damage as the plantations with maximum (74.5%) and minimum (2.5%) RI showed significantly at par nut damage of 5.6 at Adajik and 5.3 per cent at Dollygunj. Coconut plantations with highest nut damage of 6.3 per cent at Tirur and Hasmatabad had registered a moderate RI of 21.5 and 26.5 per cent. Similarly, the study orchards with least nut damage (3.8%) had almost similar (26.5%) rodent infestation rate.

The maximum rodent damage (6.3%) observed at Hastamabad and Tirur was significantly at par to those at Collin Pur (5.8%), Bimbliton (5.9%) and Naya Shehar, Baratang, Netaji Nagar and Harminder Bay (5.9% each) which may be regarded as the most rodent vulnerable coconut plantations. Similarly, least affected plantation with 3.8% nut damage at Chidiya Tapu was at par with that of Tushnabad and Sippighat village (4.2% each) in Andaman and Krishna Nagar (4.2%) and village No 3 (4.1%) in Havelock islands. Five study plantations had uniform nut damage of 5.5 per cent. Seventeen locations with 5-5.6 per cent nut damage may be regarded as plantations with moderate damage, whereas others plantations with <4 per cent damage may be grouped as least affected.

Among the islands, Harminder Bay and Netaji Nagar plantations in Little Andaman islands with relatively higher RI of 65.2 and 45.1 per cent

recorded maximum nut damage of 5.9 per cent in both these sites (Table 2). Average nut damage due to rodents was least in Havelock islands (4.2 %) as compared to Neil island (5.2%) and Little Andaman island (5.3%). The major reason for high rodent infestation and moderate nut damage is high palm density (400-600 palms/ha) in Andaman. Rodent cause damage in one palm and prefers to shift to another palm very swiftly. There is need to educate the farmers of the islands to maintain optimum plant population (175 palm/ha).

Reports of rodent damage in other coconut growing states of India indicate a nut damage of 9-21 per cent in Kerala; 2-12 per cent in Karnataka; 14.7 per cent in Andhra Pradesh; 4.5-55 per cent in Lakshadweep; and 15 per cent in Tripura (Advani, 1985; Chakravarthy, 1983; Rao and Subiah, 1982; Advani, 1984 and Sarkar, 1986). The present findings indicate lower nut damage by rodents in Andaman and Nicobar islands as compared to other regions of the country. Productivity of coconut in Andaman and Nicobar islands is very low (15-30 nuts/palm/year). Thus, the rate of rodent infestation in the study sites (as high as 74%) and significant nut damage evidently reflect the potential of pest rodents to impact coconut production in these islands. The present maiden and extensive finding therefore indicates the need to evolve effective rodent management strategies for enhancing coconut production in these islands.

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