

STORAGE PESTS OF ARECANUT—A SURVEY*

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ABSTRACT

Arecanut in storage is damaged by many pests including fungi. The results of a survey on the pests of stored arecanut carried out in Mangalore (Karnataka) are given here along with a review of the literature. Four storage insects, a parasite and a predatory bug are reported here as new records. *Coccotrypes carpophagus* was the most serious pest. Twenty one pests have been recorded so far.

INTRODUCTION

The arecanut palm *Areca catechu* L. is mainly used for its seeds, which are used as a masticatory. In India, it is cultivated in over 1,75,000 ha and produces about 168,000 tonnes nuts annually. The ripe arecanuts, after harvest, are sun-dried for some days and stored for upto one year without husking. When market prices are acceptable, the arecanuts are husked, and such nuts (known as *chali*) are sold in the market. In godowns, this *chali* is stored in gunny bags for variable periods (from one week upto one year) and insect damage becomes a problem at this stage.

Ayyar (1963) was the first to report insect infestation in stored arecanut. The insect was *Araecerus fasciculatus* DeG. Later, Nair and Oommen (1969) published the results of a survey of storage pests of arecanut in Kerala. They listed 14 insects and mites and outlined the biology of the major ones. They recommended the use of jute

bags soaked in 1% suspension of DDT or 0.1% lindane for storing arecanuts. When nuts are stored in such bags, they remained free from insect infestation for upto six months.

Phostoxin tablets, used at the rate of 800g/100 m³, are also effective in controlling stored arecanut pests. Dry chips of tender nuts are damaged by *Coccotrypes carpophagus*, *Lasioderma serricorne*, and *Araecerus fasciculatus*. Tender arecanut chips (which are prepared by boiling cut tender nuts and drying them) show maximum resistance to infestation by insects (Nair and Oommen, 1969).

A project for the survey of pests of stored arecanut was completed at this Station in 1976. The results of the survey and a review of the work done so far are presented here.

MATERIALS AND METHODS

The survey was carried out in Mangalore,

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which is the biggest arecanut market in India. They come from all parts of South Kanara and Coorg districts of Karnataka and northern parts of Cannanore district of Kerala. They are stored in gunny bags or polyethylene-lined gunny bags from one week upto one year.

For this study, 15 godowns were selected at random. Arecanut samples (5 samples from each godown) were collected approximately at two-monthly intervals during November 1975–December 1976 (Total 7 collections); The number of godowns was increased to 20 in March, 1976.

Each godown was observed for storage conditions. The collected samples (250 g

each) were analysed in the laboratory for the extent and intensity of infection, the kinds and number of insects present, the extent and intensity of fungal infection, and moisture content (on oven dry weight basis).

RESULTS AND DISCUSSION

Only six out of the 20 godowns surveyed were practising regular prophylactic measures against the storage pests like spraying and fumigation. These were generally owned by cooperative societies. Most of the private godowns do not follow regular cleaning and spraying. Sulphur fumigation of arecanuts

Table 1. List of insects and arachnids recorded from stored arecanut

Name of the pest	Family	Authors
1. <i>Araecerus fasciculatus</i> DeG.	Anthribidae	Ayyar, 1963
2. <i>Coccotrypes carpophagus</i> H.	Scolytidae	Oommen & Nair, 1968
3. <i>Lasioderma serricorne</i> F.	Anobidae	Nair & Oommen, 1969
4. <i>Corcyra cephalonica</i> (Stainton)	Galleridae	"
5. <i>Setomorpha rutella</i> Zell.	Tineidae	"
6. <i>Ephestia cautella</i> (Walk.)	Phycitidae	"
7. <i>Tribolium castaneum</i> Hest.	Tenebrionidae	"
8. <i>Alphitobius piceus</i> O.G.	"	"
9. <i>Microcrypticus scriptipennae</i> F.	"	"
10. <i>Cryptolestes pusillus</i> Schonh	Cucujidae	"
11. <i>Carpophilus mutilatus</i> Er.	Nitidulidae	"
12. <i>C. pilosellus</i> Mots.	"	First reported
13. <i>Ahasverus advena</i> Waltl.	Cucujidae	Nair & Oommen, 1969
14. <i>Attagenus gloriosae</i> F.	Dermestidae	"
15. <i>Thaneroclerus buquet</i> (Lefebvre)	Cleridae	First reported
16. <i>Sitophilus oryzae</i> L.	Curculionidae	"
17. <i>Proceus</i> sp. (?) <i>depressus</i> Woll.	"	"
18. Psocid sp. (undetermined)	Psocidae	"
19. <i>Tyrophagus putrescentiae</i> Schrank	Acaridae	Nair & Oommen, 1969
20. Pseudoscorpion	Pseudoscorpionidae	First reported
21. A mite (undetermined)	Cheyletidae	"

is done in most godowns, but this is given primarily for imparting an attractive yellowish hue to the nuts. Its insecticidal effect, if any, may only be marginal. At any one time these godowns may contain 100-20,000 bags (one bag 65-70 kg nuts). These are generally stored from one week to rarely more than one year. Generally, arecanuts which are stored upto one month did not show any insect infestation, but they showed fungal infection.

The insects damage the nuts by drilling holes into them, and feeding and pulverising the nuts. All stages of the insects are present in infested nuts.

The insects and arachnids so far recorded on stored arecanut are listed in Table I. The important ones are discussed below.

1. **The arecanut beetle, *Coccotrypes carpophagus* Horn. (Coleoptera: Scolytidae).** This is the most important storage pest of arecanut. The damage was maximum during November. Nuts affected by this beetle were not seen to develop secondary infestation by other insects. Nair and Oommen (1969) noticed that its distribution in Kerala was confined to Alleppey and Ernakulam districts and that it caused 5-100% damage. Its life cycle is completed in 22-29 days (Oommen and Nair, 1968). In the present survey, we collected samples which had upto 100% damage caused by this pest.

Damage is caused mainly by the adult beetles which bore into the nuts and feed on the internal contents. The infested nuts show holes of 0.6-1.0 mm diameter. In samples with 100% infestation, upto 121 adults of this beetle were counted.

2. **The coffee bean weevil, *Araccerus fasciculatus* DeG. (Coleoptera: Anthribidae).** Ayyar (1963) first recorded this pale grey beetle on arecanuts. Nair and Oommen (1969) reported this beetle on arecanut from Kerala.

Eggs are laid singly in small holes on the nut surface. On an average, 26 eggs are laid

by a female beetle. The incubation period is 5-6 days. Larval period is completed in 21-23 days and the pupal period in 7 days (Nair and Oommen, 1969).

This insect was found throughout the year in the godowns at Mangalore. Both adults and grubs damage the nuts. Infested nuts show holes of 1.5-2.5 mm diameter. Unhusked nuts with intact calyx were not seen to have been infected by this insect even after one year of storage. Nut samples containing only 3-5% moisture were not damaged by this insect. When the moisture content was raised to 6-10%, 6-8% infestation occurred in 45 days (Prem Kumar and Mariamma Daniel, 1974). A parasite, *Anisopteromalus calandrae* (Howard) (Hymenoptera: Pteromalidae), was collected from this beetle.

3. **Cigarette beetle, *Lasioderma serricorne* F. (Coleoptera: Anobiidae).** This widely distributed storage pest is found infesting stored arecanut in both Kerala and Karnataka. The adult beetle is reddish brown with shining hairs. This beetle is present in the godowns throughout the year.

The adults and grubs easily damage by making tunnels (1.0-1.5 mm diameter) within the nuts and reducing them to a powder (Nair and Oommen, 1969). They also observed that the life cycle of this insect was completed in 39-69 days.

This beetle caused 8-10% damage to nuts when the moisture content was 4-5% and 12% damage at 8-10% moisture level after 45 days (Prem Kumar and Mariamma Daniel, 1975).

A predatory bug was collected feeding on the grubs of this beetle. The parasite *Anisopteromalus calandrae* also was collected from arecanuts infested by this beetle.

4. **Rice moth, *Corcyra cephalonica* (Stainton) (Lepidoptera: Galleridae).** This moth was present in all the godowns and was collected from infested arecanuts also. The caterpillars construct galleries of silk and

fruss over the nuts, remain within them and feed on the nuts (Nair and Oommen, 1969; Prem Kumar and Mariamma Daniel, 1975). The larval period of this moth lasts one month (Nair and Oommen, 1969).

5. **Flat grain beetle, *Cryptolestes pusillus* Schonh (Coleoptera: Cucujidae)**. This pest is considered as a minor pest of stored products. However, it was present throughout the year in arecanut samples (Table III).

6. **Red flour beetle, *Tribolium castaneum* Herbst (Coleoptera: Tenebrionidae)**. This is also a minor pest, although it occurs throughout the year on stored nuts. They feed and breed on broken pieces of arecanut and impart an abnoxious smell to the commodity (Nair and Oommen, 1969).

7. ***Thaneroclerus buques* (Lefebvre), (Coleoptera: Cleridae)**. This is a light brown beetle with hairy body and cylindrical head. This is a new record on stored arecanut. It is a minor pest.

8. ***Carpophilus pilosellus* Mots. (Coleoptera: Nitidulidae)**. This beetle with short fore wings is also a new record on stored arecanuts. It is found only occasionally.

9. **Rice weevil, *Sitophilus oryzae* L. (Coleoptera: Curculionidae)**. This common cereal pest is a new record on arecanut. It is seen inside the nuts damaging it. It is also found occasionally.

10. ***Proceus* sp. (?) *depressus* Woll. (Coleoptera: Curculionidae)**. This minute weevil is also a new record on stored arecanut.

11. The nymphs and adults of a psocid (Psocoptera: Psocidae; yet to be determined) were collected from many samples. They were found inside the central space of the nuts.

12. ***Tyrophagus putrescentiae* Schrank (Acari: Acaridae)**. This mite damages stored nuts especially during the rainy season. It feeds on the embryo and soft kernel (Nair and Oommen, 1969).

A predatory mite (Cheylitidae) was collected feeding on the stages of this mite.

13. Another species of mite was collected breeding on powdered arecanut.

14. A pseudoscorpion (Arachnida: Pseudoscorpionidae) was collected from many samples of arecanut. They were seen in the central space of the nuts.

Nymphs of a blattid, silver fish, and ants were occasionally found in some samples.

In addition to the above listed pests, Nair and Oommen (1969) observed the following insects on stored arecanuts.

15. ***Setomorpha rutella* Zell. (Lepidoptera: Tineidae)**. The caterpillar of this small moth was recorded as a pest of stored arecanut in some regions of Kerala. The minute caterpillars spin a loose silken gallery on the nut surface and feed on it. The whole nuts and the chips are webbed together by the caterpillars.

16. **Almond moth, *Ephestia cautella* (Walker) (Lepidoptera: Phycitidae)**. The caterpillar of this moth was noted as a pest in central and north Kerala.

17. **Black fungus beetle, *Alphitobius piceus* Ol. (Coleoptera: Tenebrionidae)**. This black beetle is only seldom observed. It causes only secondary damage.

18. **Foreign grain beetle, *Ahasverus advena* Waltl (Coleoptera: Cucujidae)**. An occasional pest.

19. ***Carpophilus mutilatus* Er. (Coleoptera: Nitidulidae)**. This is a secondary pest.

20. ***Attagenus gloriosae* F. (Coleoptera: Dermestidae)**. This beetle is observed occasionally on arecanut.

21. ***Microcrypticus scriptipenne* Fairm. (Coleoptera: Tenebrionidae)**. This yellowish brown oval beetle is seen also only occasionally on stored arecanut.

The survey (Table II) showed that insect damage was maximum during the rainy months when the atmospheric humidity is high and minimum during winter and summer months (Tables II and III). The insect *C. carpophagus* was the most serious storage pest.

Table II. *Extent and intensity of insect and fungal damage on stored arecanut*

Collection date	No. samples studied	Extent of insect damage (% attacked samples)				Total	Intensity of insect damage*(%)	Extent of fungal attack	Intensity of fungal damage**
		Less than 10%	10-50%	50-99%	100%				
Nov. '75	70	20.0	10.0	22.9	11.4	64.3	18.4	88.6	27.3
Jan. '76	65	20.0	13.9	6.2	6.2	46.3	8.5	92.3	19.4
Mar. '76	95	30.5	23.2	2.1	1.1	54.7	8.0	94.7	22.8
May '76	98	39.8	38.8	1.0	1.0	80.6	11.4	72.4	25.1
Jul. '76	82	39.0	32.9	4.9	1.2	78.0	12.3	95.1	25.1
Sep. '76	84	33.3	39.3	3.6	6.0	82.1	15.6	100.0	26.6
Dec. '76	85	5.18	24.7	1.2	3.5	81.2	10.0	100.0	23.6

*Per centage of insect infested nuts

**Per centage of fungal infested nuts

Table III. *Number of major insects (larvae, pupae, and adults together) collected from stored arecanut**

Insect	Nov.	Jan.	Mar.	May	Jul.	Sep.	Dec.
1. <i>A. fasciculatus</i>	4.73	0.06	2.65	0.90	2.20	4.55	1.25
2. <i>C. carpophagus</i>	144.47	9.33	0.00	0.05	13.70	25.35	11.45
3. <i>C. serricornis</i>	1.13	0.40	0.60	2.80	5.29	1.75	0.50
4. <i>C. cephalonica</i>	0.33	0.00	0.35	0.55	0.55	1.10	0.00
5. <i>C. pusillus</i>	1.53	1.67	4.75	4.45	1.15	5.55	1.65
6. <i>T. castaneum</i>	0.53	0.87	1.20	0.75	0.50	2.55	1.75

*Mean values

Fungal infection of the nuts was present in almost all the samples and almost throughout the year (Table II). Nuts which appeared uninfected outwardly were found to be infested by fungi when cut open. *Aspergillus niger*, *A. flavus*, *A. fumigatus*, *Eurotium* sp. *Cervularia* sp., and *Penicillium* sp. were the fungi isolated from infected arecanuts (Prem Kumar and Mariamma Daniel, 1974). The moisture content of the samples varied from 8.0-28.3% on oven dry weight basis.

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