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Exotic storage pests intercepted in raw cashew nuts shipments imported into India and cost of salvaging the intercepted material

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India is the largest producer, processor and exporter of cashew kernels. India consumes nearly 32% of cashew produced in the world. Cashew ranks high among the Agri-horticultural commodities exported from India, thereby earning foreign exchange to the tune Rs. 4000 crores per annum. Cashew is grown in Kerala, Karnataka, Goa and Maharashtra along the West coast, and Tamil Nadu, Andhra Pradesh, Orissa and West Bengal along the East coast. Cashew is also being cultivated in Chattisgarh, North Eastern states like Assam, Manipur, Tripura, Meghalaya and Nagaland and Andaman and Nicobar Islands to limited extent.

In India, nearly 14 lakh tones of cashew nuts are processed as against annual production of 7 lakh tones. To bridge the gap, India imports raw cashew nuts from different countries. The Indian cashew industry is almost export-oriented; more than 3900 processing units are functioning in India under the organized and unorganized sector. These processing units provide sustainable employment opportunities to 1.5 million people in processing and agrarian sector, especially women thereby contributing substantiality to the rural economy. The raw material availability is the

major challenge for cashew processing units. The domestic production of cashew nut meets half of the demand by cashew processing units, while the remaining is met through imports. Over 15 African and Asian countries exported raw cashew to India were cleared from Plant Quarantine Station, Tuticorin, Tamil Nadu alone. The present study records the storage pests intercepted in the raw cashew nuts imported from different countries.

The Plant Quarantine (Regulation of Import into India) Order 2003 issued under Destructive Insects & Pests Act, 1914 (Act 2 of 1914), Government of India regulates the import of all agricultural commodities into India. Imported raw cashew shipments were inspected as per provisions of Plant Quarantine Order. Ship loads of raw cashew nuts are being imported either in bulk or in gunny bags in shipping containers. Consignments in containers were inspected by partially opening the door and examined for flying insects. The outside of gunny bags were examined for any crawling insects. The bags were opened and the interior of the gunny bags were examined. The random samples drawn were spread on a white sheet and examined for insect infestation. The insects thus intercepted were

collected in 70% ethanol for identification. The specimens were sent to the National Bureau of Agricultural Insect Resources (NBAIR), Bangalore for identification.

The raw cashew nuts imported from different countries were intercepted with four species of storage pests namely, *Ahasvesus advena* (Waltl.) (Coleoptera: Silvanidae), *Cryptolestes ferrugineus* (Stephens) (Coleoptera: Cucujidae), *Ephestia cautella* (Walker) (Lepidoptera: Pyralidae) and *Carpophilus* sp. (Coleoptera: Nitidulidae) (Fig. 1).

Shipments from Madagascar and Mozambique were free of *A. advena*; those of Cote d'Ivoire, Madagascar, Tanzania and Togo were free of *Carpophilus* sp. and shipments from Burkina Faso were free of *C. ferrugineus*. *Ephestia cautella* infestation was found in shipments of all the 15 countries. Of the insects intercepted, *A. advena* was not known to occur in India, with *C. ferrugineus* having limited distribution.

During 2018–2020, 8,600 shipments of raw cashew nuts weighing 864,055 MT were imported from 15 countries. More than 80% of the shipments were imported from seven countries namely Benin, Burkina Faso, Cote d'Ivoire, Ghana, Guinea, Guinea Bissau and Senegal. Of the total shipments imported, 370 shipments were intercepted with at least one storage insect and the extent of interception

ranged a minimum of 0.67 to a maximum of 10% (Table 1).

Intercepted shipments were observed to be infested by multiples species of insects. Shipments from Madagascar were intercepted with only two species of insects, those from Togo, Tanzania, Mozambique, Burkina Faso were infested by three species. All the four species of storage insects intercepted were found in shipments from Senegal, Nigeria, Mali, Indonesia, Guinea, Ghana, Gambia, Cote d'Ivoire and Benin (Fig. 2).

The intercepted raw cashew nuts were recommended for fumigation with methyl bromide @ 32 g/m³ for 24 hours at Normal Atmospheric Pressure (NAP) (PQ Order 2003). In India, fumigations are being carried out by the Pest Control Operators (PCOs) accredited by the Directorate of Plant Protection Quarantine and Storage as per the guidelines issued under National Standard for Phytosanitary Measures (NSPM) – 12 (DPPQS, 2022). The shipments are re-inspected after 24 hours of fumigation and released for use, if found free of live infestation.

Such interceptions and subsequent fumigations add to the cost of the imported shipments and become expensive to the consumers. The approximate market rate of fumigating a 20' container is Rs. 1500/-. At this rate, importers altogether might have spent approximately Rs. 28,09,500/- (Twenty-Eight Lakhs Nine Thousand and Five Hundred)

towards treating the infested raw cashew nuts. Such consignments are re-inspected after 24 hours of fumigation to check for pest freedom, which is additional man power and cost. The cost is exclusive of container retention charges. In addition, the infested material has to be on hold for at least 24 hours, which has the cascading effect on the processing industries. Above all, methyl bromide is an Ozone depleting substance, use of which has been restricted except for Plant Quarantine purposes. Interception of insects in the imported shipments leads to use of methyl bromide on the Indian shores, which adds to the cost of imported shipments and environmental pollution (Table 2).

Under India's ambitious "One District One Product (ODOP)" program seven districts of four states namely Andhra Pradesh (Srikakulam), Assam (South Salmora), Chhattisgarh (Kondgaon), Meghalaya (West Garo Hills), Tamil Nadu (Ariyalur, Cuddalore and Pudukottai) are identified for processing of raw cashew nuts. The imported shipments are moved within country to different processing industries located in different states. Intercepted insects are storage pests and exotic, which contaminate the storage products in these processing industries ultimately leading to output of processed products.

Ahasverus advena is found in Angola, Ethiopia, Lesotho, Malawi and Nigeria. Bangladesh, Indonesia, Malaysia, Philippines, Singapore and Sri Lanka in Asia. Widespread

in Bangladesh and Sri Lanka. This species occurs on a wide variety of food stuffs, including grains, cereal products, oil seeds and their products, dried fruit, and spices. *Cryptolestes ferrugineus* found in Chad, Egypt, Ethiopia, Kenya, Namibia, Nigeria, Somalia, Sudan, Zimbabwe. Bangladesh, India (Andhra Pradesh and Haryana), Japan, Saudi Arabia, Singapore, South Korea, Sri Lanka, Taiwan, Turkey, Vietnam. Their original native habitat was probably under the bark of trees and shrubs but they have adapted to commodities in storage including wheat, barley, flour, peanuts, sorghum, oilseeds, cassava root, dried fruits, chillies (CABI, 2022). *Carpophilus*, also known as driedfruit beetles, are a worldwide pest of fruits, both pre- and post-harvest, and grains. Driedfruit beetles attack a wide variety of hosts including stone fruit, persimmons, fallen citrus, apples and figs. Adult *carpophilus* can cause feeding damage on ripening stone fruit and is a vector of the fungal disease brown rot. Most commercial feeding damage is done to ripening stone fruit. Stone fruit can be attacked on the tree, beetles burrow into the fruit, particularly near the stem end suture line. They also enter through splits and mechanical damage. In other fruits such as citrus, apples and figs, only fallen fruit is attacked (DPIRD, 2022).

Interception of large number of exotic storage insects in the imported shipments indicates the poor crop management and storage conditions in the country of origin,

failure of plant quarantine inspections carried out by the NPPOs of exporting countries, and fumigation failure, if carried out. Such instances have to be promptly brought to the notice of the exporting countries as per international norms and plant quarantine inspectors at the point of entry should always be alert while inspecting such consignments. The intercepted insects are biosecurity risk to India. Therefore, all imported shipments intercepted with storage pests were fumigated using Methyl Bromide @ 32 g/ m³ for 24 hrs at Normal Atmospheric Pressure (NAP). The treated shipments were re-inspected prior to release to ensure they were free of live infestation. The non-compliances were

notified to the trading partners on each interception as per the guidelines in the ISPM-13.

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Table 1. Raw Cashew nuts imported and intercepted with storage insects during 2018–2020.

Country	Import		Interception	
	# Shipments	Quantity (MT)	# Shipments*	Quantity (MT)
Benin	594	46,050	36 (6.06)	3,484
Burkina Faso	460	33,287	15 (3.26)	1,288
Cote d Ivoire	1,664	196,227	70 (4.21)	7,357
Gambia	236	16,416	18 (7.63)	1,274
Ghana	2,013	190,080	56 (2.78)	4,123
Guinea	677	60,346	47 (6.94)	5,566
Guinea Bissau	813	127,258	37 (4.55)	3,056
Indonesia	223	18,581	3 (1.35)	710
Madagascar	30	1,483	3 (10)	260
Mali	9	571	5 (55.56)	275
Mozambique	167	21,432	9 (5.39)	1,393
Nigeria	909	60,950	50 (5.50)	3,532
Senegal	306	34,561	17 (5.56)	1,908
Tanzania	297	44,385	2 (0.67)	865
Togo	202	12,428	2 (0.99)	2,364
	8,600	8,64,055	370	37,455

* Figures in parenthesis are percentages

Table 2. Cost of salvaging the infested material

Infested Raw Cashew	# 20' Containers (@ 20 MT/Container)#	MBR used @ 32 g/m³ (Volume of one 20' Container is 33 CuM)*	Amount spent on fumigation (Rs. 1500/20' Container)**
37,455 MT	1873 No.	2019 kg.	Rs. 28, 09, 500/-

Note: Values are indicative for the purpose of calculating approximate cost of salvaging the infested material. # Each 20' container can hold 16-20 MT of raw cashew nuts and raw cashew nuts imported in shiploads is also converted to container volume for ease of calculation. *Actual volume increases based on the sheeting skill of the fumigation operator. ** PCO's approximate market cost of fumigating a 20' container is Rs. 1500.



Raw cashew nuts in gunny bags in containers



Visual examination



Drawal of primary samples



Live beetles crawling on bags



Ahasversus advena (Waltl.)
(Coleoptera: Silvanidae)



Carphophilus sp. (Coleoptera: Nitidulidae)



Cryptolestes ferrugineus (Stephens)
(Coleoptera: Laemophloeidae).



Ephestia sp. (Lepidoptera: Pyralidae).

Fig. 1. Inspection and intercepted insects on raw cashew nuts imported from different countries.

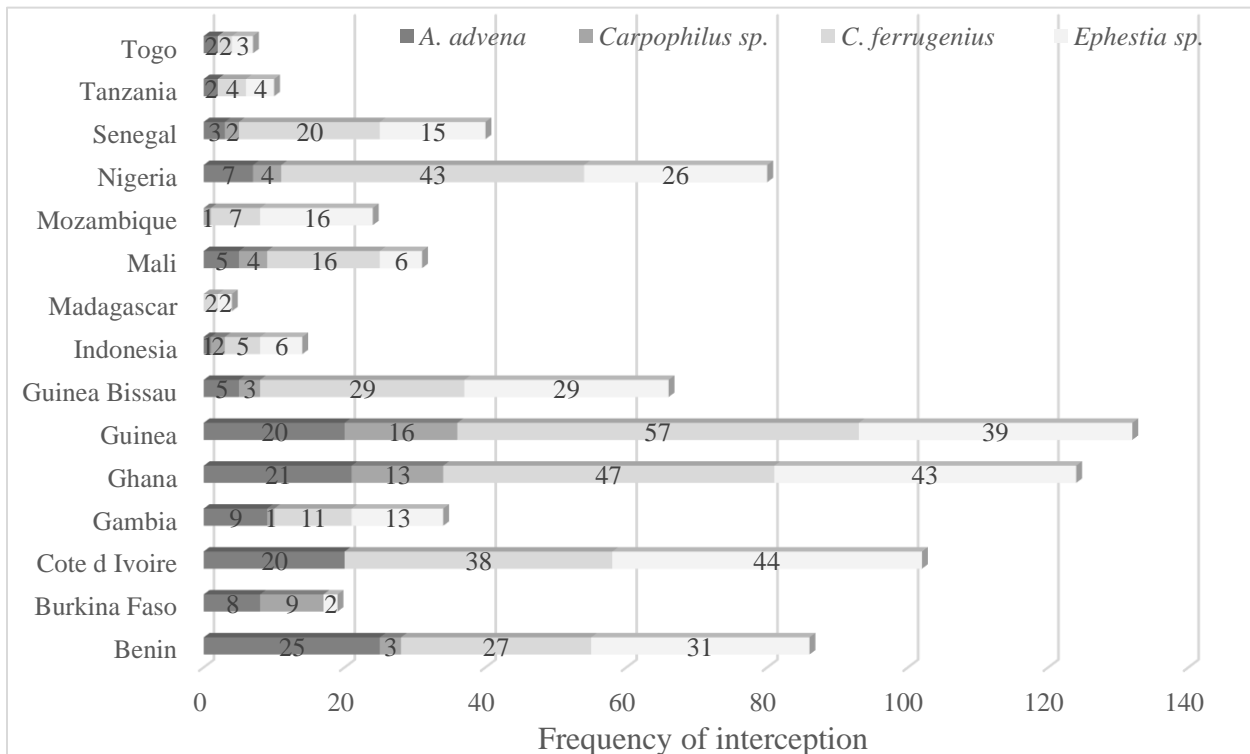


Fig. 2. Frequency of storage pests intercepted in raw cashew nuts.

References

CABI 2022. <https://www.cabi.org>. (Accessed 24 May 2022).

DPIRD (Department of Primary Industries and Regional Development), 2022. <https://www.agric.wa.gov.au/citrus/dried-fruit-beetle-carpophilus-pest-stone-fruit>. (Accessed 24 May 2022).

Directorate of Plant Protection, Quarantine & Storage (DPPQ&S). 2022. <https://plantquarantineindia.nic.in> (Accessed 30 May 2022).

ICAR-DCR 2015. Insects pests of cashew and their management, ICAR-Directorate of Cashew Research, ICAR-DCR Technical Bulletin No. 2. pp. 70.

Plant Quarantine (Regulation of Import into India) Order 2003 and its amendments. *The Gazette of India* Part II; Section-3; Sub-section (ii) published by the Ministry of Agriculture and Farmers Welfare (Department of Agriculture and Farmers Welfare) Notification, New Delhi dated 18th November, 2003.

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