Journal of Plantation Crops, 2002, 30 (2) : 61-63

Physico-chemical changes due to coreid bug infestation on coconut

(Manuscript Received : 28-08-2001; Revised : 14-06-2002; Accepted :29-07-2002)

Keywords : Coreid bug, nut crinkler, coconut, oil, physical changes, chemical properties

The coreid bug (*Paradasynus rostratus* Dist.) has ained the status of a potential pest of coconut in Kerala. e pest was first reported on coconut in the seventies urian *et al.*, 1972). The bio-ecology of this pest has en extensively studied on the main host, coconut and so on collateral hosts like guava and tamarind (Kurian al., 1979 and Anonymous, 1994). Both adults and mphs of the bug feed on developing buttons. When adult bugs and nymphs infest buttons during early ges of button growth, the entire bunch dries-up. wever, when the buttons after three months of elopment are damaged, they show further growth ressing infestation symptoms of varying intensities ue course of development. The buttons, which mature w feeding marks as permanent deep depression lting in eye-like crinkle surrounded by necrotic ons.

Recently, the quantitative loss in terms of weight, ume of nut and percentage of oil has been reported Nair *et al.*, (1997). However, the information on the sible changes in the qualitative chemical parameters il from coreid bug infested nuts is not available. ce, the present investigation was carried out to study changes in physical characteristics of nut and mical properties of oil due to coreid bug infestation.

Thirty two pairs of 12 months old uninfested and sted nuts were harvested from 28 tagged bunches of nut palms of variety West Coast Tall in Kayangulam ppuzha Dt.) and Chirayinkizh (Thiruvananthapuram areas of Kerala. Severely infested nuts were not luded in the study as the kernel formation was mplete and dry inside such nuts. The nuts which were derately infested with one or two feeding points eloped into deep depression and had volume of nut with husk between 1200 and 1600 mm^3 were used for the study. The kernels from each nut was removed and dried at 40 °C in an oven to obtain copra. Kernels were dried in controlled condition to avoid influence of biotic/ abiotic agents during copra making. The weight of copra from each nut was recorded. During removal of kernels, the nut water content was also noted.

Precisely weighed quantity of copra was powdered mixing with anhydrous sodium sulphate (to remove moisture) and oil was extracted by cold-percolation method using hexane as solvent (Kartha and Sethi, 1957). The oil was estimated gravimetrically until constant weight and used for analyzing chemical constants viz., iodine value, acid value, peroxide value and saponification value according to AOAC methods (Harwitz, 1984). Copra samples from infested and uninfested nuts were dried at 110 °C for measuring moisture level of copra used for extraction of oil for studying qualitative parameters.

In Table 1, the physical characteristics of nut and copra are given. Some of these attributes like amount of nut water, moisture in kernel and copra have direct relevance to chemical qualities of oil *vis-a-vis* infestation by insects. The weight and volume of infested nuts showed considerable reduction compared to that of uninfested nuts. The weight and volume of whole infested nuts had registered 28.8 and 33.5 per cent reduction from the whole uninfested nuts. Similarly, the weight and volume of dehusked infested nuts showed 27.8 and 36.3 per cent reduction from dehusked uninfested nuts. The volume of water and weight of kernel showed significant reduction in the case of infested nuts as compared to uninfested nuts. The volume of nut water and weight of copra showed 52.5 and 28.7% reduction respectively in

infested nuts. Though the pattern of results of present study was similar to reported by Nair *et al.* (1997), the quantitative changes in physical features in the present study are higher. This could be due to type and size of nuts selected for the studies and stage of infestation. The fresh kernel and copra from infested nuts had 4.2% less and 0.81% more moisture respectively than uninfested nuts. The nut water content and moisture in kernel is less in the infested nuts, while retention of moisture in copra of infested nuts is more than that of uninfested nuts owing to restricted water movement created by deep depression at the feeding point and crinkling and necrotic lesions on the nut produced by the infestation of the coreid bug. Student's t-test performed between uninfested and infested nuts for each characteristics showed significant differences.

Table 1: Physical characteristics of nut and copra infested by coreid bug (Mean values with SD)

Characteristics of nut/copra	Uninfested	Infested	t-value
Weight of whole nut (g)	1520±56	1082±41(28.8)	10.67**
Weight of nut without husk (g)	782±32	520±21(33.5)	20.05**
Volume of whole nut (mm^3)	2046 ±129	1477±83(27.8)	12.10**
Volume of nut without husk (mm^3)	652 ±33	415±27(36.3)	16.47**
Amount of nut water (ml)	238± 17	113±14(52.5)	9.67**
Weight of copra (g)	143 ±13	102±8(28.7)	5.04**
Moisture in kernels (%)	38.4± 2.6	34.2±1.49	2.41**
Moisture in copra (%)	6.21 ±0.25	7.02±0.24	3.52**

Figures in parentheses are mean percentage loss, calculated based on mean values.
**Significant at 1% level

The qualitative chemical parameters of coconut oil from coreid bug infested and uninfested nuts are given in the Table 2. The oil content in copra was reduced by 17.8% (from 70.8% in uninfested to 58.2% in infested nuts). Iodine value showed a decrease by 0.6 in oil from infested nuts. The iodine value (IV) of oil from uninfested nuts was 8.9 as against 8.3 in oil from infested nuts. IV is a measure of the amount of unsaturated fatty acids in the oil. Greater the amounts of unsaturated fatty acids, more prone is the oil to oxidative rancidification. In the present study, the decrease in iodine value of oil from infested nuts is not drastic since iodine value of coconut oil is itself low (8-9), being a saturated oil.

Acid value was found to increase in the oil from bug-infested nuts. An increase of 6.52 was noticed in oil of infested nuts (7.8) from that of uninfested nuts (1.28). Acid value is the measure of hydrolysis of glycerides and content of free fatty acids (FFA). The increase in acid value may be due to retention of higher percent of residual moisture in copra of infested nuts (Table 1), which accelerated the hydrolysis of glycerides to glycerols and FFA.

Table 2 shows a rise in the peroxide value (PV) oil from infested nuts to 4.2 from 1.42 meq./kg uninfested nuts. This increase of PV in oil due to resid moisture of copra from infested nuts is in correspondenc with a decrease in iodine value of 0.6. This shows t the unsaturated fatty acids of coconut oil viz., linole linolenic and arachidonic, which are present in min amounts are affected due to infestation, as is reflected both IV and PV. Statistical analysis revealed hig significant positive correlation between moisture cont in copra from infested nuts and chemical parameters iodine value, acid value and peroxide value of oil fr infested nuts, the r-values being 0.59, 0.84 and 0.78. T implies that increase of moisture content in copra infested nuts correspondingly increased these chemi parameters of the oil from infested nuts.

Table 2: Chemical properties of oil from uninfested and coreid infested nuts (Mean values).

Properties of oil	Uninfested	Infested	r-value
Oil content (%)	70.8	58.2 (17.8)	-
Iodine value	8.9	8.3(0.6)	0.59
Acid value	1.28	7.8(6.52)	0.84
Peroxide value (meq./kg)	1.42	4.2(2.78)	0.78
Saponification value	259	260.4(1.4)	0.06

Figures in parentheses are mean increase/ decrease of values.
†Correlation coefficient between moisture in copra (infested) and c parameters of oil (infested)
*Significant at 5% level
**Significant at 1% level
NS- Not Significant

In the case of saponification value, no appreci change had occurred in the oil from infested nuts. 0 saponification value of 1.4 was found to vary in the The mean saponification value in uninfested nuts 259, while it was 260.4 in infested nuts. Correla studies between moisture level in copra a saponification value of oil was found to be statistic insignificant meaning moisture level in copra of infe nuts did not affect the saponification value of the oil f infested nuts. This indicates that the chain length of fatty acids is chemically intact, even though the formed due to hydrolysis by the extra moisture percent in the copra.

Acknowledgement

The authors thank Dr. C. Kesavan Nampoot Tech. Officer (Statistics), CPCRI-RS, Kayangulam help with statistical analyses.

References

...mous, 1994. Central Plantation Crops Research Institute-Annual Report 1993-1994, Kasaragod, India. pp. 95-96.

...z, W. (ed.), 1984. Official Methods of Analysis of the Association of Analytical Chemists, 13th edn., Washington D.C.

...n, C., Abraham, V.A. and Koya, K. M. A. 1979. Studies on *Paradasynus rostratus* Dist. (Heteroptera: Coreidae) a pest of coconut. In: *Proc. 2nd Annu. Symp. on Plantn Crops. UPASI, Coonoor* pp. 484-503.

Kurian, C., Pillai, G. B., Abraham, V.A. and Mathen, K. 1972. Record of a coreid bug (nut crinkler) as a new pest of coconut in India. *Curr. Sci.* **12:37**.

Kartha. A. R. S. and Sethi, A. S. 1957. A cold percolation method for rapid gravimetric estimation of oil in small quantities of oilseeds. *Indian J. agric. Sci.* **27**: 211.

Nair, K. K. R., Visalakshi, A., Nandakumar, C., Beevi, S. N., Reghunath, P. and Pillai, K. S. 1997. Quantitative loss due to nut crinkler (*Paradasynus rostratus* Dist.) damage on coconut. *Entomon* **22**(3&4): 239-241.

...al Plantation Crops Research Institute,
...al Station, Kayangulam,
...puram - 690 533, Kerala.

M. Mayilvaganan
C.P. Radhakrishnan Nair