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IMMATURE NUT FALL OF COCONUT AND INCIDENCE OF RUGOSE SPIRALING WHITEFLY *ALEURODICUS RUGIOPERCULATUS* MARTIN

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ABSTRACT

Studies on the immature nut fall in *Aleurodicus rugioperculatus* Martin infested coconut palms with low (<10 spirals/ leaflet), medium (10-20 spirals/ leaflet) and high (> 20 spirals/ leaflet) incidence in Dr YSRHU- Godavari Ganga hybrid and local East Coast Tall (ECT) variety were undertaken at the Dr YSRHU- Horticultural Research Station (HRS), Ambajipeta and Kalavalapalli plantations. The overall dropped nuts (%) was 4.84, 27.48 and 35.32% at Ambajipeta, while it was 5.50, 28.11 and 36.01% in Godavari Ganga hybrid palms with low, medium and high incidence during 2020-21 at Kalavalapalli. The % of dropped nuts in ECT variety with low incidence, respectively was representing the general dropping with 4.06 and 4.68% at Ambajipeta and Kalavalapalli, respectively during 2020-21. In case of ECT palms with medium and high incidence, the nut dropping was 22.33 and 28.51% (Ambajipeta), and 23.49 and 30.58% (Kalavalapalli).

Key words: *Aleurodicus rugioperculatus,* coconut, nut fall, incidence, Dr YSRHU- Godavari Ganga hybrid, East Coast Tall, low, medium, high, Ambajipeta, Kalavalapalli

Coconut (*Cocos nucifera* L.) commonly known as "tree of heaven", "tree of abundance", "tree of life" and "kalpavriksha" is devastated by incidence of several pests and diseases that not only deteriorate the quality of nuts but also reduced the vigour and yield. (Chowdappa et al*.,* 2018; Neeraja et al*.,* 2020). In the recent era, coconut palms are damaged with invasion of many new pests, predominantly whiteflies. Invasion of rugose spiraling whitefly (RSW) *Aleurodicus rugioperculatus* Martin has been reported from India in Tamil Nadu (Sundararaj and Selvaraj, 2017) and Andhra Pradesh (Chalapathi Rao et al*.,* 2018). This exotic and invasive pest feeds and reproduces prolifically on adaxial surface of coconut palm leaves (Sundararaj and Selvaraj, 2017; Srinivasan et al*.,* 2017) which leads to honey dew secretion facilitating the growth of sooty mould on leaves, which further degrades photosynthetic activity and vigour, resulting yield loss in coconut palms. Earlier, studies of Voegele (1989) estimated 50-70% loss due to the coconut hispid beetle *Brontispa longissima* Gestro (Coleoptera: Chrysomelidae). Perera (1993) reported heavy occurrence of pests causing over 40% damage to the coconut leaves during an outbreak of *Opisina arenosella* Walker; its severe incidence caused nut yield reduction by 45.4% (Chandrika et al*.,* 2010). Rajapakse et al. (2010) reported 5% immature nut fall in coconut due to incidence of mealy bugs (*Dysmicocus* spp.), scale insects (*Aspidiotus destructor*), mites (*Dolichotetranychus* spp.), *Cyclodes omma* larvae and weevil (*Meridolus* spp.). However, literature on the dropped nuts in coconut palms due to *A. rugioperculatus* is very meagre. Nut yield reduction must be quantified so as to plan for IPM in coconut palms, and hence the present study to estimate the dropped nuts in relation to *A. rugioperculatus* incidence at different intensities.

MATERIALS AND METHODS

Studies on dropped nuts (%) in *A. rugioperculatus* infested coconut palms of Dr YSRHU- Godavari Ganga hybrid (35 and 13 years) and East Coast Tall (ECT) (45 and 25 years) with low (<10 spirals/ leaflet), medium (10- 20 spirals/ leaflet) and high (> 20 spirals/ leaflet) incidence were quantified at the Dr YSRHU- HRS, Ambajipeta (16°59'38"N, 81°95'36"E) and Kalavalapalli plantations (16°94'82"N, 81°63'98" E). Fifteen palms carrying developing nuts after fertilization i.e., three months and above from each cultivar were identified and marked by using simple random sampling technique (Rajapakse et al*.,* 2010). The data was recorded on annual leaf production, number of bunches, buttons, dropped nuts and harvested nuts/ palm at monthly intervals during 2020-21.

RESULTS AND DISCUSSION

The overall mean of dropped nuts was 7.80 (4.84%) in Dr YSRHU- Godavari Ganga hybrid with low *A. rugioperculatus* incidence, whereas comparatively more nut fall of 43.60 nuts (27.48%) and 55.60 nuts (35.32%) was observed with medium and high incidence during 2020-21 at the Dr YSRHU- H.R.S, Ambajipeta, respectively; while, in Dr YSRHU- Godavari Ganga hybrid palms, more nut dropping was observed (November 2020 to March 2021) comparatively with 5.20 (3.23%), 29.60 (18.74%) and 40.00 nuts (25.40%) than during its absence (April to October 2021) with 2.60 (1.61%), 13.80 (8.73%) and 15.60 nuts (9.92%) with low, medium and high incidence at the Dr YSRHU-HRS, Ambajipeta, respectively. The overall mean of dropped nuts was 8.80 nuts (5.50%) in Dr YSRHU-Godavari Ganga hybrid when the incidence was low; whereas comparatively higher nut fall of 43.20 nuts (28.11%) and 57.00 nuts (36.01%) was observed with medium and high incidence at Kalavalapalli. Similar observations were made in the Kalavalapalli plantations too. However, there was a conspicuous increase in nut dropping with incidence (November 2020 to March 2021) -about 3.49% (5.60 nuts), 17.46% (26.80 nuts) and 25.05% (39.60 nuts) as compared to 2.00% (3.20 nuts), 10.66% (16.40 nuts) and 10.97% (17.40 nuts) during April to October 2021.

The dropped nuts were at 4.80 nuts (4.06%) in East Coast Tall (ECT) with low incidence, but increased to 28.20 (22.33%) and 36.20 nuts (28.51%) with medium and high incidence at the Dr YSRHU- HRS, Ambajipeta. In East Coast Tall (ECT) palms, more nut dropping was observed at 3.40 (2.88%), 19.00 (15.04%) and 24.00 nuts (18.88%) (November 2020 to March 2021), but during its absence (April to October 2021) it reduced to 1.18 to 9.60% at the Dr YSRHU- H R S, Ambajipeta, respectively. It amounted to 4.68 nuts (4.40%) in East Coast Tall (ECT) with low incidence, reaching to 23.49 nuts (19.80%) and 26.40 nuts (22.14%) with medium and high incidence. at Kalavalapalli; similar observations were made at the Kalavalapalli plantations too; however, there was a conspicuous increase in nut dropping during November 2020 to March 2021 reaching 3.44 (4.40 nuts), 16.98 (19.80 nuts) and 22.14% (26.40 nuts) compared to 1.24 (1.60 nuts), 6.50 (7.60 nuts) and 8.43% (10.00 nuts) noticed during April to October 2021 (Table 1).

Thus, the nut dropping was observed to be more in case of palms with high incidence (28.51- 36.01%). Rajapakse et al., (2010) revealed only 5% immature nut fall due to mealy bugs (*Dysmicocus* spp.), scale insects (*Aspidiotus destructor*), mites (*Dolichotetranychus* spp.), *Cyclodes omma* larvae and weevil (*Meridolus* spp.). In the present study, nut fall ranging from 22.33 to 36.01% was observed with medium to high incidence of *A. rugioperculatus* at both the locations. This drop was observed in spite of adoption of recommended package of practices. The dropping of nuts might be attributed to nutrient (nitrogen), protein, sugar content and water loss due to the sucking nature of *A. rugioperculatus* coupled with secretion of honey dew that facilitates the growth of sooty mould fungus (*Leptoxyphium* spp.) which further disrupts the photosynthetic ability (Josephraj et al., 2017). The favourable weather factors viz., minimum and maximum temperature and relative humidity play a vital role in incidence (Josephraj et al., 2018; Elango and Nelson, 2020). As the season progressed from November to March, the climatic conditions favoured the population buildup and consequent sap sucking resulting in more nutrient loss and resultant nut fall.

A minimal nut fall was observed during April to October, when incidence was absent; with Dr YSR HU - Godavari Ganga hybrid (T x D) drop was more than that of ECT palms which might be due to inheritance of susceptible characters of the dwarf parent. The dwarf coconut palms are more prone to heavy incidence compared to tall palms (Sundaraj and Selvaraj, 2017; Chandrika et al., 2017; Fousiya et al., 2019). Srinivasan et al. (2016) observed that dwarf palms suffered severe attack as compared to that of West Coast Tall and Arasampatti Tall. Selvaraj et al., (2016) observed that invasive *A. rugioperculatus* prefers to colonize on hybrid and dwarf varieties. Rajesh et al. (2020) observed more populations in dwarf Gautami Ganga followed by hybrids in Chhattisgarh. In the present study too, high incidence was observed in the Dr YSR HU- Godavari Ganga hybrid as compared to East Coast Tall (ECT). Kalavalapalli plantations revealed more nut fall compared to that of Dr YSR HU- HRS, Ambajipeta as intensity at Kalavalapalli was high due to highly suitable multicropping system of coconut and oil palm plantation. Similar findings were also reported by Kalidas (2019). The present observations on the yield loss are in contrast to those of Chandrika et al. (2017) and Subramanian et al. (2018) who stated that high incidence may not result in any economic loss in coconut. Perera (1993) reported heavy occurrence of pests causing over 40% damage to the coconut leaves during an outbreak of *O. arenosella*. Chandrika et al. (2010) recorded yield loss of 45.4% due to *O. arenosella.* Rajan et al. (2011) reported that

Table 1. Coconut dropped nuts (%) vs. *A. rugioperculatus* incidence- Dr. YSR HU- HRS, Ambajipeta/ Kalavalapalli (Mean± S.E)

Scale of incidence	Annual leaf production	No. of bunches	No. of buttons	Harvested nuts	Dropped nuts for 1 year	% of dropped nuts for 1 year (November 2020 to October 2021)	RSW incidence (November 2020 to March 2021)		No RSW incidence (April to October 2021)	
							Dropped nuts	% of dropped nuts for 6 months	Dropped nuts	% of dropped nuts for 6 months
Dr YSRHU-Godavari Ganga hybrid										
Ambajipeta										
Low (< 10 spirals/ leaflet)	13.80± 0.20	12.40± 0.24	160.80± 1.01	153.40± 0.71	7.80± 0.73	4.84± 0.43	5.20± 0.37	3.23± 0.23	2.60± 0.51	1.61± 0.31
Medium (10- 20 spirals/ leaflet)	13.20± 0.37	11.80± 0.37	157.80± 0.86	114.40± 1.72	43.60± 2.38	27.48± 1.35	29.60± 1.03	18.74± 0.55	13.80± 1.56	8.73± 0.98
High (> 20 spirals/ leaflet)	12.80± 0.37	11.20± 0.20	157.60± 1.81	102.00± 3.16	55.60± 1.86	35.32± 1.39	40.00± 1.00	25.40± 0.78	15.60± 0.93	9.92± 0.65
Kalavalapalli										
Low (< 10 spirals/ leaflet)	13.40± 0.24	12.00± 0.32	159.80± 1.02	151.00± 0.71	8.80± 0.73	5.50± 0.43	5.60± 0.51	3.49± 0.30	3.20± 0.37	2.00± 0.23
Medium (10- 20 spirals/ leaflet)	13.20± 0.37	11.60± 0.51	153.60± 1.63	110.40± 1.08	43.20± 1.07	28.11± 0.51	26.80± 0.86	17.46± 0.61	16.40± 1.03	10.66± 0.58
High (> 20 spirals/ leaflet)	13.00± 0.32	11.20± 0.37	158.20± 2.92	101.20± 1.80	57.00± 1.73	36.01± 0.67	39.60± 1.54	25.05± 0.97	17.40± 1.12	10.97± 0.53
East Coast Tall (ECT)										
Ambjipetta										
Low (< 10 spirals/ leaflet)	13.00± 0.44	11.60± 0.51	119.20± 3.03	112.80± 2.78	4.80± 0.73	4.06± 0.57	3.40± 0.51	2.88± 0.39	1.40± 0.24	1.18± 0.19
Medium (10- 20 spirals/ leaflet)	12.60± 0.24	11.20± 0.37	126.40± 1.57	98.20± 1.96	28.20± 1.16	22.33± 0.96	19.00± 0.71	15.04± 0.55	9.20± 0.58	7.29± 0.49
High (> 20 spirals/ leaflet)	12.00± 0.32	10.80± 0.58	127.00± 0.71	90.80± 0.96	36.20± 1.36	28.51± 0.95	24.00± 1.58	18.88± 1.19	12.20± 0.86	9.60± 0.66
Kalavalapalli										
Low (< 10 spirals / leaflet)	13.40± 0.40	11.80± 0.37	128.00± 3.71	122.00± 3.51	6.00± 0.45	4.68± 0.31	4.40± 0.51	3.44± 0.41	1.60± 0.24	1.24± 0.17
Medium (10- 20 spirals /leaflet)	12.60± 0.51	10.80± 0.37	116.80± 1.53	89.40± 2.09	27.40± 1.08	23.49± 1.06	19.80± 1.69	16.98± 1.52	7.60± 0.68	6.50± 0.56
High (> 20 spirals /leaflet)	12.00± 0.32	10.40± 0.51	119.20± 2.31	82.80± 2.44	36.40± 0.93	30.58± 0.95	26.40± 0.93	22.14± 0.64	10.00± 1.09	8.43± 1.01

slug caterpillar (*Macroplecta nararia* Moore) inflicts higher yield losses. Subramanian et al. (2018) reported that red palm weevil multiplies abundantly in young coconut plantations causing loss to an extent of 1-3%.

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AUTHOR CONTRIBUTION STATEMENT

All the authors have made a substantial contribution to the concept, design of the experiment and interpretation of data for the article. All the authors have read manuscript critically, involved in refining the article.

CONFLICT OF INTEREST

No conflict of interest.

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