

Awareness and extension in Andhra Pradesh to manage the invasive rugose spiralling white fly, *Aleurodicus rugioperculatus* Martin (Hemiptera: Aleyrodidae) on coconut and oil palm

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The coconut crop is mainly confined to the four southern states of India, accounting for 90% of the area under coconut, among which Andhra Pradesh shares about 1.15 lakhs ha area with a production of 1,377.53 m nuts. Recently, an invasive rugose spiraling whitefly (RSW), *Aleurodicus rugioperculatus* Martin (Hemiptera: Aleyrodidae) has entered India and has been reported on coconut palm (*Cocos nucifera* L.) for the first time during August-September, 2016 at Pollachi taluk, Coimbatore district in Tamil Nadu and Palakad taluk in Kerala (Sundararaj and Selvaraj, 2017). In Andhra Pradesh it was first reported at Kadiyam nurseries during December 2016 (Chalapathi Rao et al., 2020) probably entering Andhra Pradesh through infested coconut seedlings obtained from Kerala. The RSW was initially reported from Miami-Dade County, Florida, United States of America from gumbo limbo, *Burera simaruba* (L.) as a pest. However, it was originally described from Belize in 2004 on coconut (Martin, 2004) where its natural population was reported.

As per the Department of Horticulture, Government of Andhra Pradesh statistics in February 2019 the coconut and oil palm plantations of East and West Godavari districts of Andhra Pradesh had a severe (more than 30 spirals/leaflet) incidence of this pest. The West Godavari district was found to be more affected as compared to other coconut growing districts probably due to contiguous areas of coconut and oil palm (Table 1).

As compared to 2018-19 the incidence of RSW in coastal Andhra Pradesh decreased in 2020-21 particularly due to massive awareness campaigns carried out both by Department of Horticulture, Government of Andhra Pradesh in association with Horticultural Research Station, Ambajipeta, DRYSR Horticultural University. The management strategies were adopted for RSW on a collective scale in a community based approach. The data collected on incidence and intensity of RSW in four selected villages in East and West Godavari districts revealed that the

incidence of RSW in the case study villages decreased by 30 to 42 percent and intensity by 24 to 59 percent (Table 2) .

Table 1: Extent of area infested by RSW in Andhra Pradesh (February 2019)

Name of the district	Number of orchards affected	Area affected with RSW			GPS Coordinates
		Coconut (ha.)	Oil Palm (ha.)	Total area (ha.)	
West Godavari	63	4428.20	9092.60	13520.80	16 ⁰ 55' 48"--NL 81 ⁰ 37' 48"--EL
East Godavari	155	1535.80	2461.50	3997.30	17 ⁰ 23' 14"--NL 82 ⁰ 46' 64" -EL
Krishna	1	2.80	0.00	2.80	16 ⁰ 61' 00"--NL 80 ⁰ 72' 14"--EL
Srikakulam	36	2185.25	129.00	2314.25	18 ⁰ 33' 53" –NL 83 ⁰ 95' 92"--EL
Vizianagaram	36	1336.0	45.00	1381.00	18 ⁰ 07' 29" –NL 83 ⁰ 65' 94"--EL
Visakhapatnam	28	738.20	16.00	754.20	17 ⁰ 66' 61"--NL 82 ⁰ 61' 05"--EL
Total	319	10226.25	11744.10	21970.35	

Source : Department of Horticulture ., Govt of AP 2019

The continuous monitoring of the pest in 2019 and 2020 and massive extension programs created awareness on this invasive. The wide publicity given through print and electronic media coupled with utilisation of the staff (village horticulture assistants and agriculture assistants) working in Rythu Bharosa Kendras (RBKs) (Farmer Assurance Centres) of Government of Andhra Pradesh lead to up scaling of extension activities against RSW. The VHAs and VAAs are technical and skilled youth with horticulture and agriculture education employed in villages. The staff were thoroughly trained for monitoring and promoting management of RSW and updating of field status of the pest to Horticulture department officials who in turn coordinated with technical staff of the university. This new concept of Rythu Bharosa Kendras at village level improved the services of government in qualitative and quantitative terms especially, to deliver the farm advisory services.

Table-2: Impact of extension activities and decrease in RSW incidence and intensity on coconut in selected villages of A.P during 2018-2021

Year	Pulleitukuru (East Godavari)		Kadiyapulamka (East Godavari)		Chagallu (West Godavari)		Kalavalapalli (West Godavari)	
	Incidence* (%)	Intensity (%)	Incidence (%)	Intensity (%)	Incidence (%)	Intensity (%)	Incidence (%)	Intensity (%)
2018-19	41.35±1.25	45.06±1.65	43.50±0.89	67.82±3.50	48.92±1.65	42.80±2.10	58.81±1.89	62.60±2.65
2019-20	22.04±2.21	37.33±3.56	27.02±3.25	37.15±3.56	25.24±1.50	31.56±1.45	32.47±1.70	24.71±1.60
2020-21	11.73±3.25	17.66±2.21	9.57±3.45	13.30±3.56	13.93±3.01	18.53±2.20	16.36±3.56	13.43±1.70

*values in the table are mean followed by standard error.

Incidence = Number of leafs infested in palm/Total no of leafs in palm x 100

Intensity = Number of leaflets infested in leaf /Total no of leaflets in leaf x 100

a. Capacity building program on bio agents mass production to oil palm processing companies

Training on multiplication of *Corcyra cephalonica* and neuropteran predator *Pseudomallada astur* was given to stakeholders especially to oil palm processing companies with focus on augmentative bio control.

b. Capacity building programs to farmers and staff of RBKs on entomopathogen-*Isaria fumosorosea* NBAIR pfu-5 production :

Fifteen training programs on production of entomopathogenic fungus *I.fumosorosea* were conducted. A total number of 365 farmers including 49 RBK staff were trained to produce this fungus on broken rice in their own farms and villages at a low cost (Table 3).

Extension activities: During 2018-21 the scientists of Horticultural Research Station, Ambajipeta participated in a total of 95 farmers training and awareness programs on RSW in association with Horticulture department in all the coastal districts and a total number of 5000 farmers attended these training programs and awareness on management of RSW was imparted.

Extension activities during Covid -19: The Dr.YSR Horticultural University declared 2020-21 as Dr. YSRHU year of Coconut. Due to prevailing Covid -19 pandemic the university

took innovative steps to reach farmers and started plant protection advisory cell, farmer's advisory cell and phone- in live programs in which various webinars in vernacular language were organised on coconut with emphasis on bio control based management strategies for RSW. A tremendous impact was created through various extension functionaries creating a positive impact on managing RSW.

Table-3: Training programs on production of entomopathogen *I. fumosorosea* NBAIR pfu5 in association with Horticulture Department

Sl. No.	Dates	Village and District	No. of progressive farmers/RBK personal trained	GPS Coordinates
1	08.02.19	Kothapeta, East Godavari	34	16 ⁰ 71'60"---NL 81 ⁰ 89'58"---EL
2	12.02.19	Ainavilli, East Godavari	20	16 ⁰ 66'01"---NL 82 ⁰ 01'14"---EL
3	14.02.19	P. Gannavaram, East Godavari	30	16 ⁰ 58'91"---NL 81 ⁰ 89'05"---EL
4	15.02.19	Rollapalem, East Godavari	18	16 ⁰ 55'06"---NL 81 ⁰ 99'85"---EL
5	21.02.19	Sakhinetipalli, East Godavari	34	16 ⁰ 42'43"---NL 81 ⁰ 71'85"---EL
6	22.02.19	Kadiyam, East Godavari	20	16 ⁰ 53'48"---NL 81 ⁰ 49'28"---EL
7	23.02.19	Ramachandrapuram, East Godavari	23	16 ⁰ 49'39"---NL 82 ⁰ 2'11"---EL
8	25.02.19	Kadiyapulanka, East Godavari	24	16 ⁰ 53'34"---NL 81 ⁰ 49'12"---EL
9	27.02.19	Peddapuram, East Godavari	28	17 ⁰ 03'31"---NL 82 ⁰ 08'08"---EL
10	28.02.19	Narsipatnam, Vishakhapatnam	27	17 ⁰ 66'61"---NL 82 ⁰ 61'05"---EL
11	01.03.19	Kalavalapalli, West Godavari	21	16 ⁰ 58'48"---NL 81 ⁰ 46'48"---EL
12	02.01.20	Kaviti, Srikakulam district	23	18 ⁰ 33' 53" ---NL 83 ⁰ 95' 92"---EL
13	04.01.20	Kanchili, Srikakulam	23	18 ⁰ 59' 45"---NL 84 ⁰ 36' 40"---EL
14	07.01.20	Tekkali, Srikakulam	22	18 ⁰ 60' 58"---NL 84 ⁰ 23' 02"---EL
15	09.01.20	Ranasthalam, Srikakulam	18	18 ⁰ 11' 27"---NL 83 ⁰ 42' 37"---EL
		Total	365	



RSW Infested coconut palm



RSW infested oil palm



RSW adult



Field diagnostic visit to RSW infested gardens



Awareness through electronic media



Training on production of entomopathogen *I. fumosorosea* NBAIRpFu 5 to farmers

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