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Preference of rugose spiralling whitefly to coconut hybrids with respect to biophysical characters

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Abstract

Among the different coconut hybrids tested CRP-509 proved to be the best hybrid based on various biophysical parameters such as more height, less number of leaflets per leaf, minimum leaflet length and width. The plant height was significant and negatively correlated with percent RSW infestation, whereas total number of leaflets per leaf, leaflet length and width exhibited significant and positive correlation with percent RSW infestation.

Keywords: Rugose spiralling whitefly, bio-physical characters, leaflet length, leaflet width, palm height

Introduction

Coconut, *Cocos nucifera* L. is a member of Arecaceae family, popularly known as 'Tree of life', 'Tree of heaven', 'Tree of abundance' and 'Kalpavriksha'. In addition to its food value, it has health, cosmetic, and medicinal value. The RSW infestation on coconut ranged from 20 to 35 % in Mangaluru and Udupi districts of Karnataka (Selvaraj *et al.*, 2017) [7]. The RSW infestation ranged from 75.85 to 95.00 % on coconut, whereas the incidence ranged from 81.42 to 100.00 % in West Godavari district of Andhra Pradesh (Sushmitha *et al.*, 2021) [8].

Coconut is infested by various insect pests, among them rhinoceros beetle (*Oryctes rhinoceros* L.), red palm weevil (*Rhynchophorus ferrugineus* O.), black head caterpillar (*Opisina arenosella* W.) and eriophyid mites (*Aceria guerreronis* K.) damage severely (Abhishek and Dwivedi, 2021) [1].

In India, RSW was first reported on coconut palm in Tamil Nadu at Coimbatore during September, 2016 (Sundararaj and Selvaraj, 2017) [7]. It was also found infesting many fruit crops and several ornamental plants in Kerala, Karnataka and Andhra Pradesh. It almost affects each and every part of the coconut palm including inflorescence, exocarp and entire under surface of leaf lamina (Selvaraj *et al.*, 2016) [8]. RSW is highly polyphagous with 118 host plants belonging to 43 plant families including economically important crops in Florida (Francis *et al.*, 2016) [3].

Rugose whitefly feeding causes stress to the host plant by withdrawing water and nutrients and producing honeydew, which covers the bottom leaves and promotes sooty mould growth (Elango *et al.*, 2019) [2].

The biophysical features of plants are linked to the insect pests' attraction, feeding, and oviposition. They are the most important characters in this context, as they constitute the primary source of defense adopted by plants against insect pests. The study on preference of RSW to the various hybrids on coconut is meagre. Hence an attempt is made to study the preference of RSW on coconut hybrids with respect to various biophysical characters.

Materials and Methods

A field experiment was carried out at All India Coordinated Research Project (AICRP) on Palms, Odisha University of Agriculture and Technology (OUAT), Bhubaneswar during 2020 - 2021. Various plant biophysical characters viz., height of the coconut palm, overall appearance of the crown, colour of the petiole, number of leaflets, length of leaflets, width of leaflets were recorded from eight coconut crosses such as Chandra Laksha (LO X COD), VHC-1 (ECT X

MGD), Konkani Bhatye Hybrid - 1 (GB X ECT), Gauthami Ganga X Kera Chandra (GB X PHO), CRP 509 (ECT), VHC-2 (ECT X MYD), Laksha Ganga (LCT X GB) and Godavari Ganga (ACT X GB) replicated five times. The mean height of the coconut palm, number of leaflets, length of leaflets, width of leaflets were correlated with percentage infestation of RSW.

The plant height of coconut palm was recorded in meters using a rope with pre-calibrated measurement on it. Thickness of the crown was measured by taking mean of total leaves from the selected five plants from each cross with high, medium and low value and averaged out. Petiole colour of the coconut leaf, whether it is green/ red/ yellow/ brown/ other colour was recorded based on visual observations and the petiole colour was noted. Number of leaflets per leaf was recorded by making count of leaflets present on either side of the leaf. Length of the leaflet from the base to the tip of the leaflet was measured by using a measuring tape from four leaflets (two on either side) from the middle portion of the leaf and value was presented in centimeters. The width of the leaflet was measured by using a measuring tape from the mid portion of the four leaflets (two on either side) of a leaf and value was presented in centimeters.

The data recorded on biophysical parameters were subjected to statistical. Simple correlation was calculated between biophysical characters and RSW infestation by using SPSS 26 software. F test was conducted to test the significance of variations in the treatments. One way ANOVA was done for RSW incidence and bio-physical characters. The standard error mean [(SE(m) $\pm$)] and critical difference (CD) @ 5% level of significance were also calculated by following the procedure given by Gomez and Gomez (1984)^[4].

Results and Discussion

Various biophysical characters of coconut were recorded from eight coconut hybrids in AICRP on Palms, Bhubaneswar and are presented in Table 1.

The height of coconut palms was ranged between 8.20 and 9.54 m. The highest palm height was recorded on CRP -509 (9.54 m) having least RSW infestation (71.50 %), which was at par with VHC-1 (9.38 m) having 75.00 percent infestation. The lowest palm height was recorded on Chandra Laksha (8.20 m) with maximum RSW infestation of 87.00 %. The current result obtained is in accordance with the findings of Jethval *et al.*; Elango *et al.* (2019)^[2]; Karthick *et al.* (2019)^[9] and Srinivasan *et al.* (2016), who reported that dwarf and hybrid coconut palms were more severely affected by RSW than tall palms.

The appearance of the crown in coconut palms showed no significant influence on RSW infestation. The appearance of crown in coconut palms had no profound influence on RSW infestation. The present findings are similar with the results of Sushmitha *et al.* (2021)^[8], who observed that crown shape had no effect on RSW infestation.

The colour of the petiole of the coconut leaves from AICRP on Palms was found to be green and it exhibited no significant influence on RSW infestation. This result is well supported by the findings of Sushmitha *et al.* (2021)^[8], who reported that there was no influence of leaf petiole colour on RSW infestation. The number of leaflets per leaf was ranged from 196.84 to 210.65 per leaf on eight coconut crosses. The highest number of leaflets per leaf was recorded in hybrid Chandra Laksha (210.65), which was at par with Laksha Ganga (210.56) and

differed significantly from rest other hybrids. The lowest number of leaflets per leaf was recorded on CRP-509 (196.84), which was at par with VHC-1 (198.50).

The data on average length of the leaflet on coconut palms was ranged from 141.90 to 155.70 cm in eight different crosses. The maximum length of the leaflet on palm was noticed on Chandra Laksha (155.70 cm), which differed significantly with Laksha Ganga (152.40 cm), Gauthami Ganga x Kera Chandra (150.78 cm) and Konkani Bhatye Hybrid -1 (149.50 cm). The minimum length of the leaflet was observed on coconut hybrid, CRP-509 (141.9), which differed significantly with VHC-1 (145.60 cm), VHC-2 (148.20 cm) and Godavari Ganga (148.50 cm). In coconut palm, leaflet with maximum length showed high infestation (87.00 %) and leaflet with minimum length exhibited least infestation (71.50 %). This was in accordance with the findings of Sushmitha *et al.* (2021)^[8], who revealed that the leaflets with maximum length were most affected with RSW in coconut.

Observations on width of the leaflet on eight coconut crosses were varied between 3.80 and 5.42 cm. The maximum leaf width was witnessed on coconut hybrid Chandra Laksha (5.42 cm), which was at par with Laksha Ganga (5.40 cm) and Gauthami Ganga x Kera Chandra (5.26 cm). The minimum leaf width was noticed on CRP-509 (3.80 cm), which differed significantly with other crosses. Similar trend was noticed towards RSW infestation while the leaf width was taken into consideration. The current results derive ample support from the findings of Sushmitha *et al.* (2021)^[8] who stated that increase in leaf width led to increase in RSW infestation in oil palm. This result is also in agreement with the findings of Ozgur and Sckeroglu (1986)^[5], who revealed that broad leaved varieties of cotton suffered more damage by whiteflies when compared with narrow leaved varieties.

Correlation between biophysical parameters and RSW infestation

The correlation between biophysical parameters and percent RSW infestation on coconut palms was presented in Table 2. Palm height was significant and negatively correlated with percent RSW infestation ($r = -0.994^{**}$). The RSW infestation decreased with increase in plant height. The number of leaflets on coconut palm was significant and positively correlated with RSW infestation with correlation of coefficient value (r) of 0.990 ** . These results are in contrast to the findings of Sushmitha *et al.* (2021)^[8], who recorded that number of leaflets was non-significant and positively correlated with RSW infestation ($r = 0.542$). The length of leaflet was significant and positively correlated with percent RSW infestation ($r = 0.968$). The RSW infestation increased with increase in leaflet length. These results lie in conformity with the findings of Sushmitha *et al.* (2021)^[8], who opined that the length of the coconut leaflet was positively and significantly correlated with RSW infestation ($r = 0.923$). The width of the coconut leaflet was significant and positively correlated with percent infestation of RSW with correlation coefficient value of ($r = 0.990$). These results partially contradict with the findings of Sushmitha *et al.* (2021)^[8], who recorded the width of coconut leaflet was non-significantly and positively correlated with RSW infestation ($r = 0.189$) indicating that if the width of the leaflet increases, the RSW infestation will also increase, but not at a significant level.

Table 1: Influence of biophysical parameters of coconut palm on RSW infestation

Sl. No.	Varieties/ Hybrids	Palm height (m)	Crown thickness	Petiole colour	No. of leaflets	Leaflet Length (cm)	Leaflet Width (cm)	RSW Infestation (%)
1	Chandra Laksha	8.20	Thick	Green	210.65	155.70	5.42	87.00
2	VHC - 2	9.10	Thick	Green	200.70	148.20	4.54	77.00
3	Konkan Bhatye Hybrid - 1	8.62	Thick	Green	206.00	149.50	4.92	82.00
4	Gauthami Ganga x Kera Chandra	8.46	Thick	Green	208.40	150.78	5.26	84.00
5	VHC - 1	9.38	Thick	Green	198.50	145.60	4.15	75.00
6	CRP - 509	9.54	Thick	Green	196.84	141.90	3.86	71.50
7	Laksha Ganga	8.42	Thick	Green	210.56	152.40	5.40	85.00
8	Godavari Ganga	8.82	Thick	Green	204.2	148.50	4.70	80.00
SE (m) ±		0.072	-	-	0.889	0.913	0.077	-
CD (P = 0.05)		0.21	-	-	2.57	2.65	0.22	-

Table 2: Correlation matrix between biophysical parameters and per cent RSW infestation

Sl. No.	Parameters	% RSW infestation
1	Palm height	-0.994 **
2	Number of leaves	0.990 **
3	Length of leaflets	0.968 **
4	Width of leaflets	0.990 **

* Significant at 5% level, ** significant at 1% level

Conclusion

Among the different coconut cross combinations CRP-509 proved to be the best based on various biophysical parameters such as more height, less number of leaflets per leaf, minimum leaflet length and width.

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