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Field evaluation of different sticky traps against RSW in oil palm crop

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Abstract

Invasive species are one of the major and most rapidly growing threats to agriculture, of these *A. rugioperculatus* (RSW) was a feeding pest that causes stress to the host plant by removing water and nutrients, as well as production of honeydew, which covers the surface of leaves results in reduced photosynthesis of the plant. Present investigation was carried out in oil palm orchard at farmers field, Venkataramannagudem to evaluate the attraction efficiency of RSW towards different colour sticky traps (Yellow, Blue, Green, White, Black, Red and Brown) in 2 seasons, where in each season experiment was repeated twice. The results revealed that yellow sticky traps attract more number of RSW (23.40 adults/15 days in both repeated experiments in winter and 23.00 & 22.60 adult/15days seasons in summer, respectively), irrespective of the season when compared to all the other stick traps tested.

Keywords: *A. rugioperculatus*, colour sticky traps, oil palm

Introduction

International agricultural trade with increased global interactions lead to the movement of invasive insect species from one region of the world to another region. Invasive species are one of the major and most rapidly growing threats to agricultural biodiversity, livelihoods, human and animal health, forestry and biodiversity; and result in huge economic losses, Neha Gupta *et al.* (2018) [5]. In the recent past this type of invasions of exotic pests such as papaya mealy bug, *Paracoccus marginatus* Williams and Granara de willink on papaya during 2007 in Coimbatore, Tamil Nadu, Jhala *et al.* (2008) [4] and South American tomato leaf miner, *Tuta absoluta* Meyrick on tomato during 2014, Fall army worm, *Spodoptera fugiperda* Smith in 2018, western flower thrips, *Thrips parvispinus* Karny during 2021, Rachana *et al.* (2022) [6] in India caused awful situations among scientists and farmers. Another invasive species, *A. rugioperculatus* Martin (Hemiptera: Aleyrodidae) invaded into India. *A. rugioperculatus* feeding causes stress to the host plant by removing water and nutrients. Production of honeydew, which covers the surface of leaves results in the growth of sooty mold. Although sooty mold is not a plant disease, its presence on the upper surface of the leaf can potentially reduce photosynthesis of the plant. Although, mode of entry of *A. rugioperculatus* into India is unknown, it is expected that the pest gained entry into the country through trade of ornamental plants, Shanas *et al.* (2016) [8]. Initially, this whitefly was observed in several coconut farms in the Pollachi area of Coimbatore district, Tamil Nadu and first reported in Kottayam from Kerala during July – August 2016, Sundararaj and Selvaraj (2017) [9]. Where as in Andhra Pradesh, this pest has been first reported from Kadiyapulanka nurseries during October-November, 2016, Rao *et al.* (2018) [7], now it has spread to all parts of the state, signaling a serious threat to coconut, oil palm and various ornamental and horticulture crops like coconut, oil palm and guava cultivated in large area in coastal districts of Andhra Pradesh.

Even though many scientists have worked out pest management strategies and still attempts are going on in different directions to suppress the invasive pests. However, Indiscriminate and unwise use of chemical insecticides can result in control failure, besides polluting the environment and upsetting the ecological balance. In order to minimize the harmful effects of chemical pesticides, integrated pest management involving various eco-friendly tactics and sensible use of pesticides is needed to reduce the losses caused by pests to tolerable levels. With the broad view of above facts, the present investigation was carried out to evaluate the attraction efficacy of different colour sticky traps to control RSW.

Material and Methods

Evaluation of sticky traps against rugose spiralling whitefly

A field experiments were carried out in 3 years old oil palm plantation located at farmers field, Venkataramannagudem to evaluate the attraction efficacy of different colour sticky traps (1x1mt). The first one was carried out during December, 2020 to January, 2021 the second during March to April 2021. The experiments were conducted in a randomized block design (RBD).

Treatment details

T₁: Yellow colour sticky trap T₂: Blue colour sticky trap T₃: Green colour sticky trap T₄: White colour sticky trap T₅: Black colour sticky trap T₆: Red colour sticky trap T₇: Brown colour sticky traps.

The data was recorded 2 times by replacing the traps at 15 days intervals in each season *i.e.* December, 2020 to January, 2021 (first season) and March to April 2021(second season) with same set of treatments, and the observations were recorded.

Results and Discussion

Field evaluation of different sticky traps against RSW in oil palm crop

Different colour sticky traps *viz.*, yellow, black, blue, white, red, brown, green were used to attract the *A. rugioeperculatus* adults in oil palm crop during winter and summer season of 2020 and 2021, respectively. Among the sticky traps used during winter seasons confirm that the yellow colour sticky traps attracts more number of adults (23.40 adults/15 days) followed by blue colour sticky traps (17.60 adults/15 days), green colour sticky traps (13.60 adults/15 days), red colour sticky traps (13.40 adults/15days), black colour sticky traps (13.00 adults/15days), brown colour sticky traps (11.20 adults/15 days) and white colour sticky traps (8.80 adults/15

days) (Table - 1). Likewise, the experiment was repeated after 15 days of completion of first experiment with same set of treatments. Results revealed that the adult population attracted more in the yellow colour sticky traps (23.40 adults/15 days) followed by blue colour sticky traps (16.00 adults/15 days), green colour sticky traps (12.40 adults/15 days), red colour sticky traps (9.80 adults/15days), brown colour sticky traps (9.60 adults/15 days), black colour sticky traps (7.40 adults/15 days) and white colour sticky traps (7.20 adults/15 days) (Table - 2).

In summer season similar experiment was conducted as that of winter season also with same set of treatments. Results revealed that the yellow colour sticky traps were attracted a greater number of adults (23.00 & 22.60 adult/15 days, respectively) followed by blue colour sticky traps (16.60 & 15.00 adults/15 days, respectively), green colour sticky traps (14.00 & 14.60 adults/15 days, respectively), red colour sticky traps (12.40 & 13.80 adults/15days, respectively), brown colour sticky traps (12.20 & 9.80 adults/15 days, respectively), black colour sticky traps (12.20 & 9.20 adults/15 days, respectively) and white colour sticky traps (7.60 & 8.00 adults/15 days, respectively) (Table 3 & 4).

The above results confirmed that the attractive efficiency was more for yellow traps when compared to other traps tested, one of the possible reasons might be yellow traps has high reflectance in the long-wave region from green to red (about 500-640 nm) and low reflectance in the short wave region from UV to blue (about 300-500 nm), which particularly attracts leaf feeding insects like whiteflies and another possible reason may be yellow traps create a contrast between the trap and the field background, this affects the optomotor of the insect eyes and influences the landing response of the flying insects (Idris *et al.*, 2012) [3]. The present finding which was similar to results obtained by many workers *viz.*, Susmitha *et al.* (2020) [10], Elango *et al.* (2016) [2] and Boopathi *et al.* (2014) [1].

Table 1: Field evaluation of different coloured sticky traps against *A. rugioeperculatus* in oil palm crop in winter season (2020)

S. No.	Treatments	Number of adults/traps					Average
		After 24 hrs	After 3 days	After 5 days	After 10 days	After 15 days	
1	T1: Yellow	23.15 (4.79) ^a	22.16 (4.68) ^a	24.14 (4.93) ^a	24.16 (4.89) ^a	24.17 (4.96) ^a	23.40
2	T2: Blue	17.12 (4.19) ^b	16.15 (4.08) ^b	18.15 (4.27) ^b	19.12 (4.35) ^b	18.16 (4.31) ^b	17.60
3	T3: Green	16.13 (4.03) ^b	17.14 (4.15) ^b	15.13 (3.87) ^{bc}	11.14 (3.31) ^c	9.16 (2.97) ^c	13.60
4	T4: white	16.11 (4.07) ^b	10.12 (3.26) ^c	9.16 (3.09) ^c	6.14 (2.49) ^e	3.24 (1.71) ^e	8.80
5	T5: Black	16.13 (4.03) ^b	16.12 (4.03) ^b	13.14 (3.64) ^{cd}	11.16 (3.31) ^c	9.18 (2.99) ^c	13.00
6	T6: Red	15.12 (3.90) ^b	17.13 (4.12) ^b	14.14 (3.73) ^c	11.13 (3.41) ^c	10.12 (3.15) ^c	13.40
7	T7: Brown	17.16 (4.12) ^b	15.15 (3.86) ^b	10.13 (3.20) ^{de}	9.12 (2.99) ^d	5.14 (2.36) ^d	11.20
8	C.V %	6.21	6.20	6.86	4.73	10.48	
9	S.Em+	0.15	0.14	0.15	0.09	0.19	
10	C.D (0.05)	0.46	0.44	0.46	0.29	0.59	

Figures in parenthesis are the square root transformation values

In a column, means followed by a common letter (s) are not significantly different (P = 0.05)

Table 2: Field evaluation of different coloured sticky traps against *A. rugioeperculatus* in oil palm crop in winter season (2020)

S. No.	Treatments	Number of adults/traps					Average
		After 24 hrs	After 3 days	After 5 days	After 10days	After 15 days	
1	T1: Yellow	24.13 (4.89) ^a	25.13 (4.99) ^a	22.16 (4.72) ^a	21.13 (4.61) ^a	25.16 (4.99) ^a	23.40
2	T2: Blue	14.12 (3.78) ^{bc}	16.14 (3.98) ^b	17.18 (4.11) ^b	14.16 (3.78) ^b	19.17 (4.36) ^a	16.00
3	T3: Green	15.12 (3.87) ^b	13.14 (3.64) ^{bc}	12.18 (3.54) ^c	11.12 (1.1) ^{bc}	11.14 (3.41) ^b	12.40
4	T4: white	13.18 (3.60) ^{cd}	8.18 (2.94) ^e	6.17 (2.57) ^{de}	5.12 (2.26) ^{ef}	4.15 (2.13) ^c	7.20
5	T5: Black	11.11 (3.41) ^d	10.13 (3.20) ^{de}	5.14 (2.22) ^e	4.14 (1.95) ^f	7.16 (2.64) ^{bc}	7.40
6	T6: Red	14.14 (3.74) ^{bc}	11.16 (3.36) ^{cd}	8.14 (2.81) ^d	8.13 (2.88) ^{cd}	8.14 (2.82) ^{bc}	9.80
7	T7: Brown	13.14 (3.69) ^{bc}	11.15 (3.31) ^{cd}	11.18 (3.41) ^c	7.13 (2.69) ^{de}	6.12 (2.49) ^c	9.60
8	C.V %	3.18	5.63	9.12	11.09	13.48	

9	S.Em+	0.07	0.12	0.18	0.19	0.25	
10	C.D (0.05)	0.21	0.36	0.54	0.60	0.78	

Figures in parenthesis are the square root transformation values

In a column, means followed by a common letter (s) are not significantly different (P = 0.05)

Table 3: Field evaluation of different coloured sticky traps against *A. rugioeperculatus* in oil palm crop in summer season (2021)

S. No.	Treatments	Number of adults/traps					Average
		After 24 hrs	After 3 days	After 5 days	After 10days	After 15 days	
1	T1: Yellow	24.32 (4.96) ^a	23.65 (4.82) ^a	24.12 (4.96) ^a	21.13 (4.58) ^a	23.54 (4.82) ^a	23.00
2	T2: Blue	17.21 (4.12) ^b	17.32 (4.12) ^b	17.16 (4.20) ^b	17.35 (4.11) ^b	15.32 (3.90) ^b	16.60
3	T3: Green	15.15 (3.94) ^{bc}	13.32 (3.64) ^c	13.25 (3.60) ^c	15.32 (3.87) ^{bc}	14.14 (3.74) ^{bc}	14.00
4	T4: White	12.32 (3.50) ^c	9.25 (3.10) ^d	8.32 (2.82) ^e	5.65 (2.22) ^f	4.32 (2.09) ^d	7.60
5	T5: Black	22.32 (4.75) ^a	13.25 (3.64) ^c	9.32 (3.10) ^{de}	7.12 (2.64) ^e	10.36 (3.15) ^c	12.20
6	T6: Red	15.32 (3.91) ^{bc}	12.32 (3.54) ^c	11.32 (3.36) ^{cd}	13.25 (3.64) ^c	11.36 (3.40) ^{bc}	12.40
7	T7: Brown	15.32 (3.90) ^{bc}	14.25 (3.73) ^{bc}	11.32 (3.31) ^{cd}	11.32 (3.31) ^d	10.21 (3.20) ^c	12.20
8	C.V %	7.13	6.12	5.51	4.79	9.74	
9	S.Em+	0.17	0.13	0.11	0.09	0.19	
10	C.D (0.05)	0.52	0.41	0.35	0.29	0.60	

Figures in parenthesis are the square root transformation values

In a column, means followed by a common letter (s) are not significantly different (P = 0.05)

Table 4: Field evaluation of different coloured sticky traps against *A. rugioeperculatus* in oil palm crop in summer season (2021)

S.no.	Treatments	Number of adults/traps					Average
		After 24 hrs	After 3 days	After 5 days	After 10days	After 15 days	
1	T1: Yellow	21.36 (4.65) ^a	22.25 (4.69) ^a	22.36 (4.69) ^a	24.54 (4.89) ^a	24.36 (4.89) ^a	22.60
2	T2: Blue	16.25 (3.99) ^b	14.23 (3.82) ^{bc}	16.25 (3.99) ^b	14.32 (3.82) ^b	15.32 (3.87) ^b	15.00
3	T3: Green	16.23 (3.99) ^b	15.15 (3.87) ^{bc}	15.36 (3.91) ^b	14.36 (3.78) ^b	13.65 (3.69) ^b	14.60
4	T4: white	13.12 (3.60) ^c	11.32 (3.31) ^d	8.36 (2.81) ^c	6.65 (2.42) ^c	2.16 (1.47) ^e	8.00
5	T5: Black	13.12 (3.69) ^c	11.36 (3.41) ^d	9.25 (2.99) ^c	7.32 (2.75) ^c	6.12 (2.57) ^d	9.20
6	T6: Red	16.36 (4.03) ^b	16.12 (3.99) ^b	16.36 (3.99) ^b	11.36 (3.41) ^b	10.36 (3.26) ^c	13.80
7	T7: Brown	14.32 (3.82) ^{bc}	13.32 (3.64) ^{cd}	10.36 (3.20) ^c	7.25 (2.70) ^c	5.36 (2.22) ^d	9.80
8	C.V %	4.24	5.04	6.32	7.10	7.67	
9	S.Em+	0.10	0.11	0.13	0.14	0.14	
	C.D (0.05)	0.30	0.34	0.41	0.43	0.42	

Figures in parenthesis are the square root transformation values

In a column, means followed by a common letter (s) are not significantly different (P = 0.05)

Conclusion

The above field trails confirmed that the yellow sticky traps attract more number of RWS irrespective of the season which advocated the use of yellow sticky traps as an effective method for the control of RSW.

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