Evaluation of Different Pest Scouting Methods for Monitoring Whitefly Population in Cotton fields at Multan (Pakistan)

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Abstract

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Whitefly, *Bemisia tabaci* (Genn.) population was monitored during 1998 by three different scouting methods i.e., yellow sticky traps, yellow plastic trays filled with water and visual (leaf–turn) method in cotton fields at Multan, Pakistan. Highest counts were recorded through visual method, whereas yellow sticky trap and yellow plastic tray methods provided weak capture of whitefly population. The correlation between whitefly adults captured in yellow traps, trays and leaf-turn method showed a weak relationship. For pest management decision making, leaf-turn method was more reliable to assess the adult population.

Key words: *Bemisia tabaci*, pest scouting, monitoring, cotton, Pakistan.

Introduction

Bemisia tabaci (Genn.) (Homoptera: Aleyrodidae) is a major pest of cotton in Pakistan. With its multivoltine generations and behaviour as polyphagous and vector of *Cotton leaf curl virus* (CLCuV, family *Geminiviridae*), it has hampered the cotton yield to a great extent. Heavy infestation by both nymphs and adults of whitefly can arrest the vegetative growth and thus causes the reduction in boll formation (6, 14). Mound (9) reported that a population of 35 whitefly nymphs per leaf could cause 50% reduction in yield, through the honeydew production, making the lint sticky and finally causing the development of sooty mould. Yellow sticky traps have been used by some workers (3, 4, 5, 7, 8, 10, 11, 14, 15) to trap adult whiteflies, which helped in forecasting the pest abundance, and to adopt timely control measures, whereas some other workers directly counted whitefly adults on leaves (1, 10). The present study was conducted to determine the relationship between different scouting methods and explore the possibility to find an easy and reliable method for monitoring *Bemisia tabaci* population in cotton fields.

Materials and Methods

Studies were conducted in cotton farmers' field at Multan, Pakistan during 1998 season. The area was divided into three plots of 0.4 hectare each per treatment. The treatments were the following: (i) treatment 1 (T_1) = one trap and one tray per plot; (ii) treatment 2 (T_2) = two traps and two trays per plot; and (iii) treatment 3 (T_3) = three traps and three trays per plot. Three millimetres thick yellow corrugated plastic sheets, measuring 7.5 cm x 12.5 cm and coated with a thin layer of castor oil, were used as traps. These were attached to the iron stands that held the traps in the plots above the crop level in horizontal position. Iron stands were installed in a row on one side of the crop, one meter outside the plots. Where one trap per plot (T_1) was used, the stand with trap was installed in the middle i.e., 30.50 m from the edge of the plot. Where two traps per plot were used (T_2); one was installed 21.5 m from the edge of the plot and the second 23 m away from the first trap. Where three traps were used (T_3), the first trap was installed at a distance of 15 m from the edge of the plot. The traps were also 15 m apart. Whitefly adults were counted daily on the traps from July 10 to September 25. The traps were wiped off with a piece of cloth and castor oil was applied again. Similarly, six yellow plastic trays, each measuring 17.5x10x2.5 cm and filled with water, were placed in the plots at the same spots where sticky traps were installed. Their number was the same as that of traps per plot, i.e. 1, 2 and 3 in different treatments. After counting whitefly adults daily the trays were filled with water again.

Visual counts of whitefly were made from each plot by following pest scouting leaf-turn method at 6:00 to 7:30 a.m. daily. Twenty-four plants were selected and nymphs and adults of whitefly were counted from upper, middle and lower leaves on alternate plants. Insecticides were applied whenever the whitefly population reached the economic threshold level i.e., 5 adults/leaf. The relationship among mean whitefly population recorded through different pest scouting methods was determined by calculating the correlation matrix (13).

Results and Discussion

The results showed that where one trap and one tray were used (T_1), about 47% correlation between whitefly adults/cm^2 of tray and nymphs/leaf (in leaf-turn method) was observed (Table 1). With two traps and two trays (T_2), about 28% correlation between adult/cm^2 of trap and adult/leaf was observed. Where three traps and three trays (T_3) were used, about 40% correlation between adult/cm^2 of tray and adult/leaf was observed. Highest correlation in T_1 was found between adults in tray/cm^2 and nymphs/leaf, whereas in T_2 and T_3, the highest correlation was between adults in trap/cm^2 and adults in tray/cm^2. None of the correlation in any treatment was reliable enough to be adopted as scouting technique instead of leaf-turn method. The correlation between whitefly adult population by different methods i.e., using traps or trays showed a little relationship with that of conventional visual (leaf–turn) method. It may be concluded that leaf–turn method in all the treatments is better than the other two methods since the other two methods cannot be relied upon to assess the whitefly population. These results are also supported by the findings of Naranjo *et al*. (11) who suggested leaf-turn method as the most reliable, economical and quicker to assess the whitefly population level in the field. Our results are different from those of Melamed-Madjar *et al.* (7, 8) who used yellow sticky traps to apply timely control measures against this pest. The results are also different from those of Chu *et al.* (2) who found a significant correlation between trap catches and leaf-turn method. This

might be due to the difference in traps used in the two studies and the whitefly species. They used CC traps for silverleaf whitefly, *Bemisia argentifolii* and we used sticky traps for *B. tabaci*. In the leaf – turn method, the assessment of whitefly population is reliable, whereas with other methods the direction and speed of wind, temperature and vapour pressure might affect the whitefly catch.

The above results reveal that there is a poor relationship between whitefly adults trapped in yellow sticky traps and in yellow plastic trays with adults, nymphs or both adults and nymphs population counted by leaf-turn method. Non-significant correlation exists between these methods for an effective assessment of whitefly population, probably because so many environmental factors have direct or indirect effects on whitefly catch by these traps. It is thus apparent that yellow plastic trays and yellow sticky traps may not be recommended for the assessment of whitefly to apply control measures. Leaf-turn method appears to be the most reliable, quick and precise as has been reported by Naranjo *et al*. (11) and Palumbo *et al*. (12).

Table 1. A correlation matrix between the mean population of whitefly per leaf with leaf-turn method and that of adult population per cm^2 on yellow sticky traps and yellow plastic trays in cotton fields at Multan, Pakistan.

		Scouting methods			
		Leaf-turn method		Traps	Trays
Treatment		Adult/ leaf	Nymph/leaf	Adult in trap per cm^2	Adult in tray per cm^2
One trap and one tray/plot	Adult/leaf	1.000	0.442	0.407	0.321
	Nymph/leaf		1.000	0.377	0.473
	Adult in trap per cm^2			1.000	0.199
	Adult in tray per cm^2				1.000
Two traps and two trays/plot	Adult/leaf	1.000	0.074	0.284	0.236
	Nymph/leaf		1.000	0.105	0.227
	Adult in trap per cm^2			1.000	0.486
	Adult in tray per cm^2				1.000
Two traps and two trays/plot	Adult/leaf	1.000	0.210	0.334	0.399
	Nymph/leaf		1.000	0.054	0.128
	Adult in trap per cm^2			1.000	0.573
	Adult in tray per cm^2				1.000

الملخص

أحمد، منير ومحمد اسلام. 2002. تقويم طرائق كشف مختلفة لرصد عشائر الذبابة البيضاء في حقول القطن بمقاطعة "ملتان" بالباكستان. مجلة وقاية النبات العربية. 20: 52–54.

تم تقويم عشائي الذبابة البيضاء في حقول القطن بمقاطعة "ملتان" بالباكستان خلال عام 1998 باستخدام ثلاث طرائق كشف مختلفة: المصائد اللاصقة الصفراء، صواني صفراء بلاستيكية مملوءة بالماء وبالنظر (قلب الورقة). وتم تسجيل أعلى عدد للذبابة بالطريقة التقليدية (قلب الورق)، في حين كان المسك ضعيفاً بالطريقتين الأخريتن. وكان الارتباط في عدد الحشرات الممسوكة بالطرائق الثلاثة ضعيفاً. ويبدو أن طريقة قلب الورقة هي الأكثر مصداقية لتقويم عشائر البالغات واتخاذ قرار بإدارة الآفة.

كلمات مفتاحية: *Bemisia tabaci*، كشف الآفة، رصد، قطن، باكستان.

References

1. **Ahmad, Z. and M.A. Vaughon.** 1980. Pest scouting on cotton. Pakistan Agri. 2: 44-46.
2. **Chu, C.C., T.J. Henneberry and E.T. Natwick.** 1999. Silverleaf whitefly adults caught in CC traps at different heights and trap catch relationships to leaf-turn counts on cotton. USDA Whitefly Abstracts. Biology, Ecology and Population dynamics.
3. **Gerling, D. and A.R. Horowitz. 1984.** Yellow traps for evaluating the population levels and dispersal patterns of *Bemisia tabaci* (Gennadius) (Homoptera: Aleyrodidae). Ann. Entomol. Soc. Am. 77: 753-759.
4. **Gillespie, D. R., R. McGregor, D. Quiring and M. Foisy.** 2000. Biological control of greenhouse whitefly with *Dicyphus hespress.* An update on the development of an omnivorous predator from British Columbia Greenhouse Industry. Tech. Report No. 157. Pacific Agri.-Food Research Center, Agassiz, Canada.
5. **Hart, W., D. Meyerdirk, M. Sanchez, W. Stone and R. Rhode.** 1978. Development of a trap for the citrus black fly, *Aleurocanthus woglumi* Ashby. Southwest. Entomol. 3: 219-225.
6. **Hussain, M.A. and R.N. Trehan.** 1942. The nature and extent of damage caused by *Bemisia gossypiperda* Misra and Lamba, the whitefly of cotton in the Punjab. Indian J. Agri. Sci. 12:793-821.
7. **Melamed-Madjar, V., S. Cohen, M. Chen and S. Tam.** 1979. Determination of the whitefly population in cotton fields. Hassadeh, 58: 1913-1915.
8. **Melamed-Madjar, V., S. Cohen, M. Chen, S. Tam and D. Rosilio.** 1982. A method for monitoring *Bemisia*

tabaci and timely spray applications against the pest in cotton fields. Phytoparasitica, 10(2): 85-91.

9. **Mound, L.A.** 1965. Effect of whitefly (*Bemisia tabaci*) on cotton in the Sudan Gezira. Emp. Cotton. Grow. Rev. 42: 290-294.
10. **Naranjo, S.E. and H.M. Flint.** 1994. Spatial distribution of adult *Bemisia tabaci* in cotton and development of precision sampling plan for estimating population density. Environ. Entomol. 43: 48-57.
11. **Naranjo, S.E., H.M. Flint and T.J. Henneberry.** 1995. Comparative analysis of selected sampling methods for adult *Bemisia tabaci* (Homoptera: Aleyrodidae) in cotton. J. Econ. Ent. 88: 1666-1678.
12. **Palumbo, J.C., A. Tonhasca Jr. and N.D. Byrne.** 1995. Evaluation of three sampling methods for estimating adult sweet-potato whitefly (Homoptera: Aleyrodidae) abundance on cantaloupes. J. Econ. Ent., 88: 1393-1400.
13. **Steel, R.G.D. and J.H. Torrie.** 1984. Principles and Procedures of Statistics. McGraw Hill Books Co. Inc., New York.
14. **Thomas, R.** 1932. Periodic failure of the Punjab American cotton crop. Agri. Livestock, India, 3: 243-274.
15. **Webb, R.E. and F.F. Smith.** 1980. Greenhouse whitefly control of an integrated regimen based on adult trapping and nymphal parasitism. Bull. W. Palearctic Reg. Soc. Int. Union Biol. Sci. 111: 235-246.

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