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## To observe population fluctuation of citrus whitefly in lemon trees

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In Pakistan, citrus are grown on an average area of 193.2 thousand hectares with production of 1472.4 thousand tons annually. Several species of insects pests species attack citrus trees among that whitefly is one of the most important pests of *Citrus* spp., to which it may cause serious damage. It is evident from the data that arrival of the whitefly on lemon orchard initiated from 1<sup>st</sup> March during the time of the study on yellow and green traps with the range of 1.66 and 0.16 per traps respectively. Later, increasing trend in growth was observed of whitefly on pan traps and reached its peak on 24<sup>th</sup> June. During this period the highest rate of increase went on 76.66, 46.66 and 16.06 for yellow, green and white traps, respectively. Then, capturing abundance started decreasing from 1<sup>st</sup> July to 26<sup>th</sup> August. Later on, once again a population on pan traps improved from 1<sup>st</sup> September to onward. The first population of whitefly in lemon orchard were examined on 1<sup>st</sup> March and their number increased linearly. A noticeable increase in population levels occurred at the 1<sup>st</sup> July. It was concluded that from the results that the seasonal population of the whitefly was highest in month of June through both sampling methods. Data indicate that yellow coloured water pan traps attracted a numerous number of whitefly followed by green and white water pan traps. This basic information will facilitate to growers for pre-cautionary measures for in integrated control programs directed against whitefly on lemon by the use of cultural controls and timed application of selective insecticides.

### Introduction

Citrus is a general term, which refers to a large number of species of fruit trees in the family Rutaceae. It includes grapefruit, lime, lemon, malta, mosambi, orange and pomelo (Swingle, 1943). Most of these fruits are of Indian origin, rest has been introduced from South-East Asia, Southern China and West Indies. Citrus fruits are rich in vitamin C and mineral salts, and are consumed as dessert, squashes, marmalades, pickles and jellies. They are also

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used in the preparation of a large number of concentrated products like citric acid, pectin (Webber *et al.*, 1967).

Citrus whitefly, *Dialeurodes citri* (Ashmead), is an important and widely known pest of citrus and causes great losses in quality throughout the citrus-growing regions of the world.

It was introduced from specimens taken in Florida citrus in 1885 (Ashmead, 1885). Woodworth (1907) stated the first report of *D. citri* in California after 1900 when it was reported infesting citrus. Mound and Halsey, 1978 has reported that the genus *Dialeurodes* is mostly found from southeastern Asia and the Orient, where this species were observed from citrus and related plants. The other areas this species were found are Taiwan, Pakistan, north into China and in Japan. Gossard (1903); Berger (1930) reported that in the 1880s, this species was recorded in the southeastern United States and after 20 years the same was recorded in California (Woodworth, 1907). Uygun *et al.* (1994) stated that this species is detected in the Mediterranean region Israel in 1975, Turkey in 1976 .

Lemon (*Citrus limonia* Osbeck ) **trees are attacked by a numerous insect pests such as, Aphids, Citrus Leaf Minor, and Citrus Whitefly. Among the ones causing the most damage is citrus whitefly** (Bellows *et al.*, 1992). **This pest causes a serious damage** of citrus, due to his direct feeding potential of injury and sooty mold motivation as well as for their role as vectors in transmission of plant pathogens (KEItSTiNG *et al.*, 1996). Until the 1970ies, the prominent whitefly species on citrus was *Aleurocanthus spiniferus* (Quaintance), especially in old-age citrus orchards ZHANC (1981). Afterward, as concept of new orchards established in 1980ies, *Dialeurodes cirri* (Ashmead) became the dominant whitefly species (HuANC and GAO, 1988). Keeping in view the increasing problem of this pest in lemon orchards and experiment with following objectives was carried out.

The objectives of this research were to observe the seasonal population fluctuation of the whitefly and to determine the efficiency of two different sampling methods. This basic information will facilitate to growers for precautionary measures for in integrated control programs directed against whitefly on lemon by the use of cultural controls and timed application of selective insecticides.

## **Material and methods**

An experiment was carried out on population fluctuation of whitefly on lemon eco-system at lemon orchard Mirpurkhas and following sampling methods were used.

### ***Sampling methods***

Weekly observations intervals were observed through *in situ* plant count as well as water pans. The *in situ* plant count sampling was also made. Fifty matured branches were observed randomly at weekly intervals during the period March 2009 to September 2010.

Through water pan traps the 48 water pan traps were installed to screen the whitefly in the field. The traps were four different colours i.e. yellow, white, and green and pale yellow. Twelve pan traps (three of each colour) were randomly placed on wooden stands 3-ft above the ground. The pans were filled with 5% formalin and left in the field for 24- hour. The collected specimens were removed by a camel-hair-brush. Weekly counts were made. The data were subjected to statistical analysis using by using CurvExpert program

### **Results and discussions**

#### ***Population fluctuation of whitefly on different pan traps***

Experiments results of population fluctuation of whitefly captured on different colour pan traps installed around the lemon orchard are presented in Figure-1. It is evident from the data that arrival of the whitefly on lemon orchard initiated from 1<sup>st</sup> March during the time of the study on yellow and green traps with the range of 1.66 and 0.16 per traps respectively. Later, increasing trend in growth was observed of whitefly on pan traps and reached its peak on 24<sup>th</sup> June. During this period the highest rate of increase went on 76.66, 46.66 and 16.06 for yellow, green and white traps, respectively. Then, capturing abundance started decreasing from 1<sup>st</sup> July to 26<sup>th</sup> August. Later on, once again a population on pan traps improved from 1<sup>st</sup> September to onward.

#### ***Comparative population of whitefly on different colour pan traps***

The comparative population of whitefly captured on different coloured water pan traps indicate that largest number was 35.99 on yellow followed by green (18.70) and white water pan traps (5.59). The ANOVA results reveal that the colour of traps was highly significant ( $F=106.08$   $df=2$ ,  $P<0.01$ ). The DMR test for colours of traps exhibited that there was highly significant difference between them.

### ***Consolidated population of whitefly on different coloured pan traps***

It has been found from the data in Figure-3 that in the initial days of experiment the population of the whitefly recorded on water pan traps the potential rate of increase was slow and it increased linearly and reached their peak on 24<sup>th</sup> June with a slope of line 2.4216X and R-square was 0.99 it depicted that 99% variation in population was found due to date interval. Later, there was a decline in whitefly population with a declining curve -3.8593X and R-square was found 0.84. The data further describes that once again an increase in pest population was found with a rate of 1.64X and R-square was 0.94.

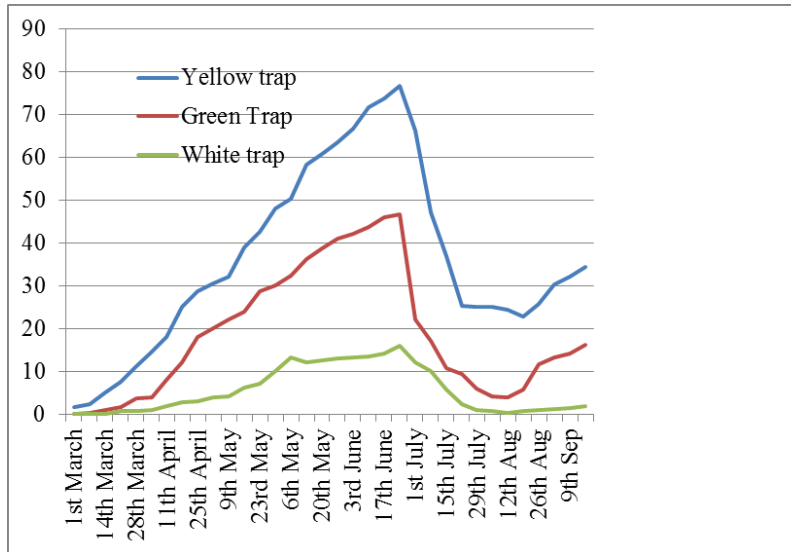
### ***Population fluctuation of whitefly through in situ plant count method***

The first population of whitefly in lemon orchard were examined on 1<sup>st</sup> March and their number increased linearly. A jump in growth in population levels occurred at the 1<sup>st</sup> July. A linear regression model for the population fluctuation of whitefly with a slope of line 0.8722X and R-square was 0.96 it indicates that 96% population variation occurred due to date intervals. It decreased and reached its minimum population on 19<sup>th</sup> August. Linear regression models with a declining curve -1.888X and R-square 0.83. It was estimated from the data that an increasing curve was observed in population from 26<sup>th</sup> August to onward regression model shows 0.825X and R-square 0.94. It indicated that 94% increase was owing to date intervals.

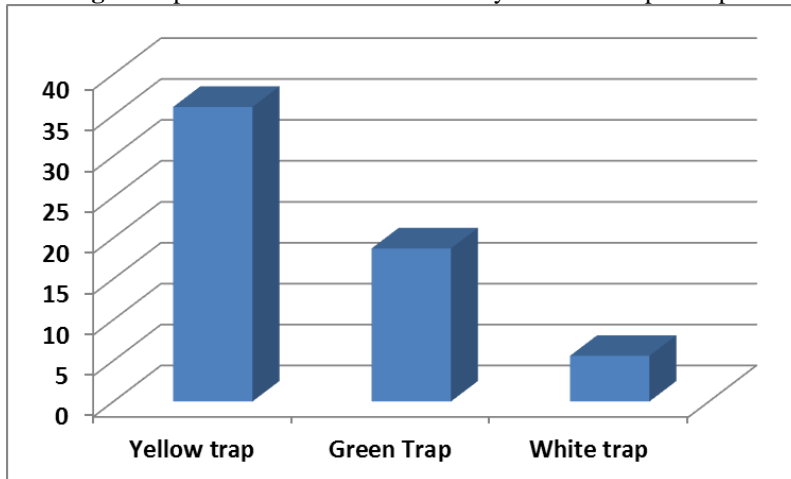
The population fluctuation of whitefly on lemon eco-system indicates that it occurred on lemon orchard from 1<sup>st</sup> March through both sampling methods sticky traps and *in situ* leaf count methods.

The population of whitefly observed increasing till 24<sup>th</sup> June through water pan traps and *in situ* method after that the population decreased and reached its minimum on 16<sup>th</sup> September. It displayed from data that yellow pan traps trapped maximum number of whiteflies as compared to other colours. It is close to the findings of Barro (1991) in Australia. He found the efficiency of yellow traps, bright green, white and young wheat green on cereal insect pests and reported that traps should be used to monitor the arrival and departure of insect pests. It was also found that they were attracted mostly by yellow, followed by 'bright' green. It is in agreement with those of Mari, *et al.* (2005) who reported that yellow traps should be used for monitoring aphids. From experiment it was depicted that trap colors were an important for pest monitoring. Boiteau and Parry (1996) mentioned that yellow trap attracted almost all species. He also described that the traps could be installed in every crop to monitor the arrival the pests. Hadian and Seyedoleslami (2002)

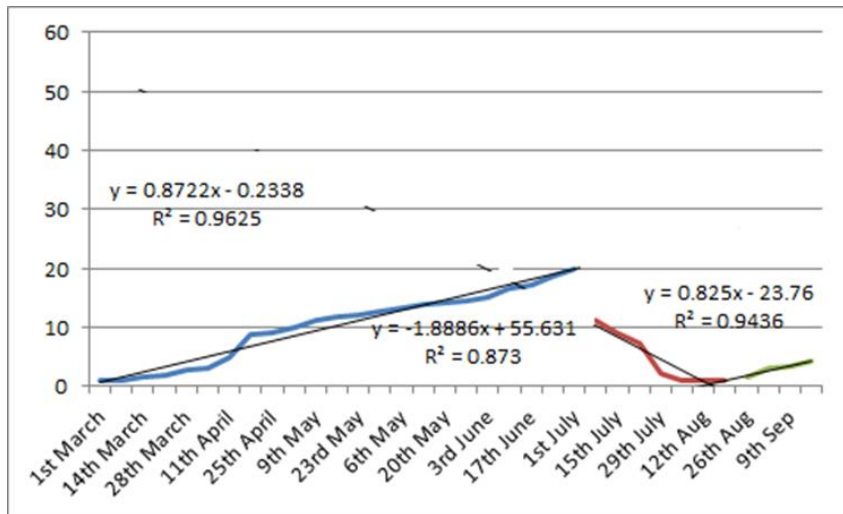
installed yellow sticky boards and limb jarring and observed that yellow traps better than limb jarring.



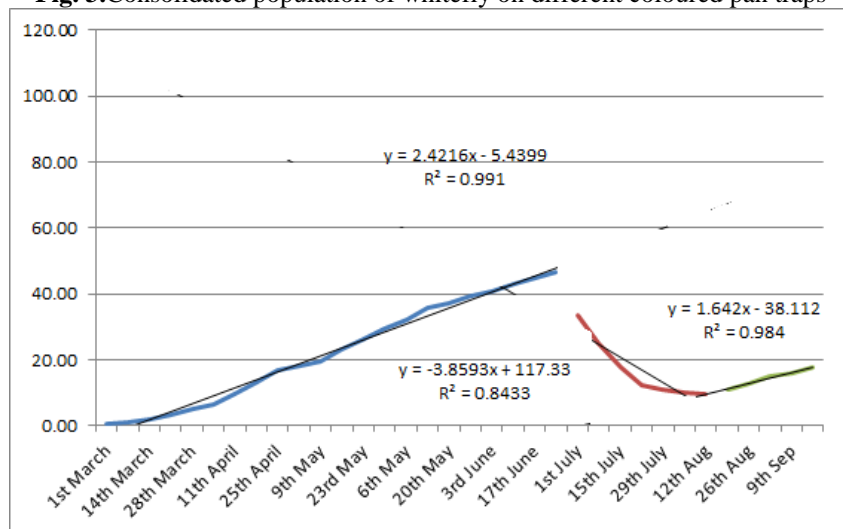
**Fig. 1.** Population fluctuation of whitefly on different pan traps



**Fig. 2.** Comparative population of whitefly on different colour sticky traps



**Fig. 3.** Consolidated population of whitefly on different coloured pan traps



**Fig. 4.** Population fluctuation of whitefly through *in situ* plant count method

## Conclusion

It was concluded that from the results that the seasonal population of the whitefly was highest in month of June through both sampling methods. Data indicate that yellow coloured water pan traps attracted a numerous number of whitefly followed by green and white water pan traps. This basic information will facilitate to growers for pre-cautionary measures for in integrated control programs directed against whitefly on lemon by the use of cultural controls and timed application of selective insecticides.

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