Evaluation of Different Date Palm Varieties and Pheromone Traps Against Red Palm Weevil *(*Rhynchophorus *ferrugineus)* in Sindh

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Abstract: In a two-year study ten commercial date palm varieties were evaluated. The varieties showed varying response to *Rhynchophorus ferrugineus* Oliv; some varieties suffered heavy infestation while others indicated tolerance against *R. ferrugineus*. The most tolerant varieties with less infestation percentage against *R. ferrugineus* were Muzawati (8%) followed by Pathri (12%), Thothar (15%), Khar and Shakri (16%) respectively. The varieties which suffered high infestation rate were Karbalain, Dhedhi, Fasli, Aseel and Eidan Shah. To control the *R. ferrugineus* infestation pheromone trapping system was used. Significantly more *R. ferrugineus* (18-21) adults were captured during the 1st, 2nd, 3rd week of July and 2nd week of June. The studies conducted will be helpful in survey and control of *R. ferrugineus* infestation in Khairpur District of Sindh province.

Keywords: Date palm, infestation, pheromone, red palm weevil, varieties.

INTRODUCTION

Date palm (*Phoenix dactylifera* L.) is one of the oldest fruit cultivated in the world. Pakistan is 4th largest date palm producing country [1] with total area about 90,100 hectares and production 557,500 tons annually. In Sindh province date palm occupy an area of 30,000 hectares and production is more than 200,000 tons. Khairpur district is the biodiversity centre having more than 300 date palm varieties. In this area date palm occupies over 22,310 hectares and its production is 158,775 tons [2]. The date palm has very strong effect on the socio-economic conditions of Khairpur district. More than 30 species of insects are reported to attack date palm in different parts of the world. However, in district Khairpur, red palm weevil and scale insect are major and regular pests of date palm since 1980 [3]. Different researchers have conducted the studies to understand the response of different date palm varieties to attack of *R. ferrugineus* and to know the rate and control of the infestation by *R. ferrugineus*. Farazmand *et al*. reported the maximum and minimum weight of *R. ferrugineus* larvae on different date palm varieties [4]. They reported that the most sensitive date palm cultivars to *R. ferrugineus* attack were Halileh and Mazafati, while the most tolerant was wild palm. Mass trapping of this pest for four years between 1994 and 1998 with pheromone traps was successfully used on a large scale in date plantations of Saudi Arabia to curtail the growth of *R. ferrugineus* in the field [5, 6].

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Farazmand *et al.* [7] have reported the age of date palm infestation. Young palm trees from 5 and 20 years old were most susceptible to *R. ferrugineus* attack and infestation was directly correlated with date palm density. The chemically synthesized pheromones can boost the attractiveness of food-baited traps by many-folds [8]. Pheromone is a synthesis of the male-produced aggregation pheromone 'ferrugineol' (4-methyl-5-nonanol) and can be used with food-baited to trap adult weevils [9]. Ferrugineol attracts both male and female weevils. Pheromone traps has been extensively practiced in inspection and mass trapping programmes in various countries where *R. ferrugineus* is a serious problem [6, 10-13]. It is advantageous that ferrugineol-based pheromone traps, these traps mostly attract and capture female weevils. However, it is general that females lay eggs and eggs continue to be an adult. The trapped female weevils could play a most important role in slowing population of *R. ferrugineus*. Ferrugineol (4-methyl -5-nonanol) has become a significant component of the IPM strategy currently adopted to trap the weevils, which attack date palm trees in the Middle East [14]. At present, two formulations of the pheromone are widely used, which are Ferrolure® and Ferrolure+®. In order to sustain the efficiency of the trapping system and its continuity, it is crucial to have a constant release of the pheromone into the environment and replace shattered lures with fresh ones. The longevity of lures is different in both the seasons (winter and summer) and its chemical release, when directly exposed to sunlight or beneath shade. In summer season, pheromone lures were expired faster than winter season, this is due to higher temperature

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and day light. Longevity of the pheromone traps could be achieved in longer fields under shade conditions. The present studies were therefore conducted to survey the *R. ferrugineus* infestation in Khairpur District, Sindh and to make the strategies to control *R. ferrugineus*.

MATERIALS AND METHODS

The studies were carried out on date palm orchards at village Visro Wahan Tehsil Therhi District Khairpur, Sindh during 2007 and 2008. Ten commercial varieties i.e; Karbalain, Aseel, Dhedhi, Fasli, Eidan Shah, Shakri, Khar, Thothar, Pathri and Muzawati were studied. 100 trees of each variety were selected on commercial orchard. The experiment was replicated four times each replication consisting 25 date trees. The age of trees in each variety ranged from 8 to 10 years. Data on infestation was recorded on monthly interval basis. All the agronomic practices i.e; ploughing, earthing and inter-culturing in the garden was carried out as usual.

Control of *R. ferrugineus* through pheromone traps was used for two consecutive years (2007 and 2008) at village Gagri (Khairpur). Pheromone traps were imported from SEDQ (Sociedad Expanola De Desarrollos Quimicos S.L.). As per guidelines of the company, the pheromone traps were installed in the centre of an orchard of 5 acres which contained 500 trees. Five replications were used and each replication consisted of 100 date palm trees. Captured/dead weevils in traps were counted on weekly basis and the experiment was continued till three months (June, July and August) for both years. The data of means of captured weevils and decrease in the attack percentage were calculated throughout the years (2007 and 2008).

STATISTICAL ANALYSIS

All statistical analyses were undertaken in Minitab 14.0 (Minitab Inc., USA), SigmaPlot 10.0.0.54 (Systat Software Inc., Germany).

RESULTS

Symptoms of *R. ferrugineus*

The female of *R. ferrugineus* laid eggs inside the wounds, which were counted through harvesting/pruning or when suckers were removed. Hatching grubs bored tunnel into the trunk where *R. ferrugineus* completed its lifecycle. Many generations can be passed in the same palm trees. The symptoms of *R. ferrugineus* infestation showed presence of small holes and oozing out of reddish brown fluid and extrusion of fibbers from these holes and slightly audible sounds by feeding of grubs into the stem in attacked date trees (Figure **1**).

Figure-1: Symptoms of *R. ferrugineus* infestation on the trunk of date palm trees.

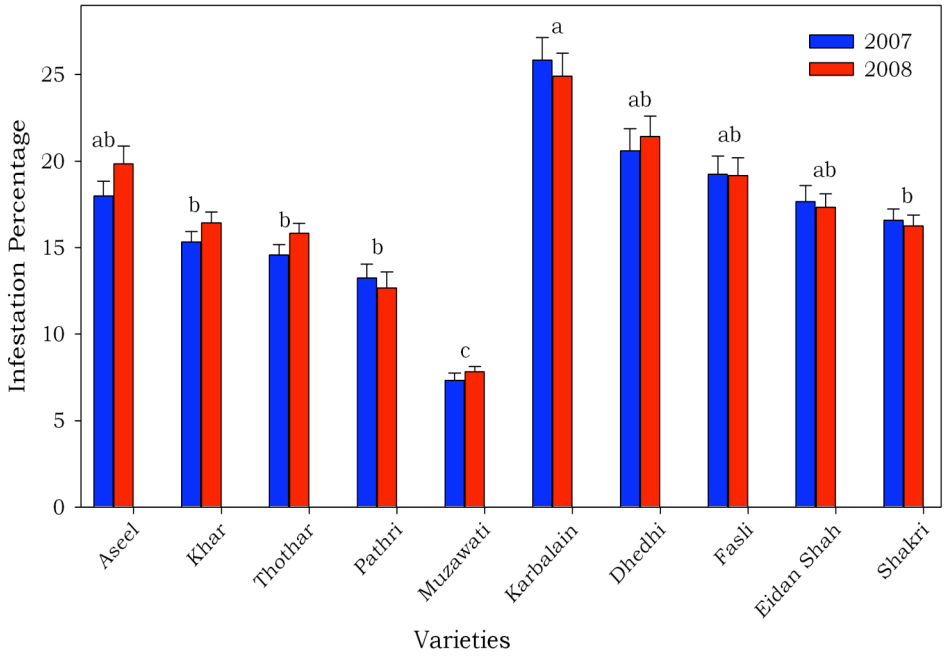

Figure-2: Infestation percentage of *R. ferrugineus* during 2007 and 2008 at village Visro Wahan (Therhi), Dist. Khairpur (means followed by the same letter do not differ significantly at $p < 0.05$).

Response of Different Varieties

Different date palm varieties showed different response against attack of *R. ferrugineus*. The infestation percentage of red palm weevil (*R. ferrugineus*) was observed significantly higher (*P*<0.001) on Karbalain variety, followed by Dhedhi, Fasli, Aseel, Eiden Shah, Shakri, Khar, Thothar and Pathri during both the years of study (2007 and 2008). The variety Muzawati showed significantly the lowest infestation percentage (7%) as compared to all other varieties; which indicated that the resistance of this variety against *R. ferrugineus* infestation. Four varieties namely Khar, Thothar, Pathri and Shakri showed also

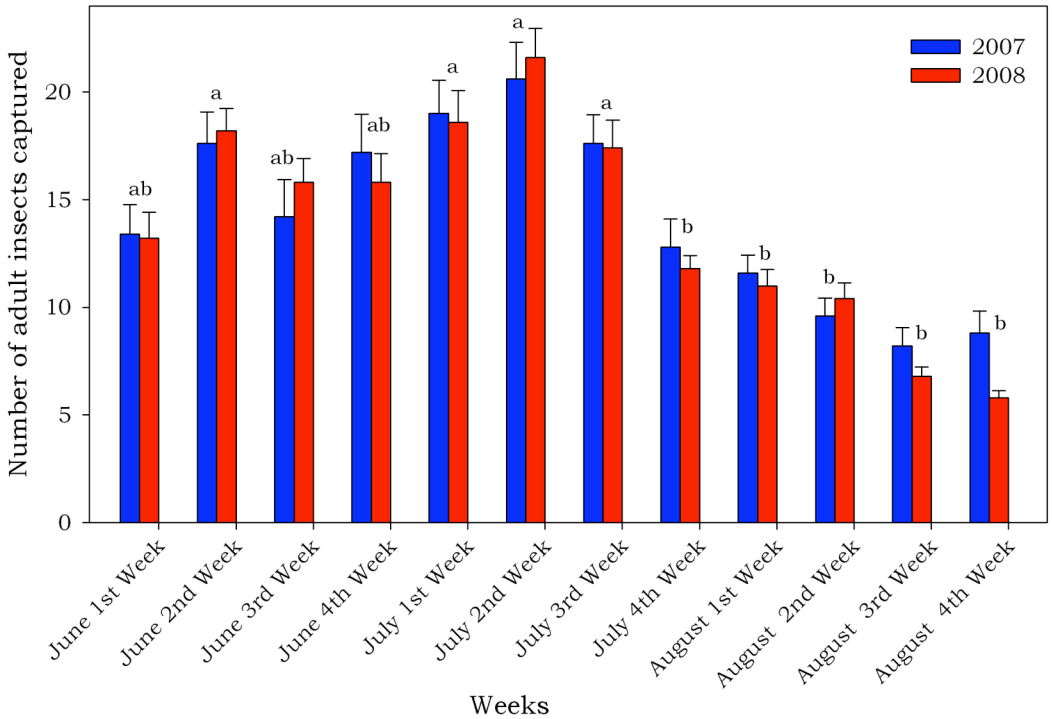

Figure-3: Number of adult *R. ferrugineus* captured by using pheromone traps (means followed by the same letter do not differ significantly at $p < 0.05$).

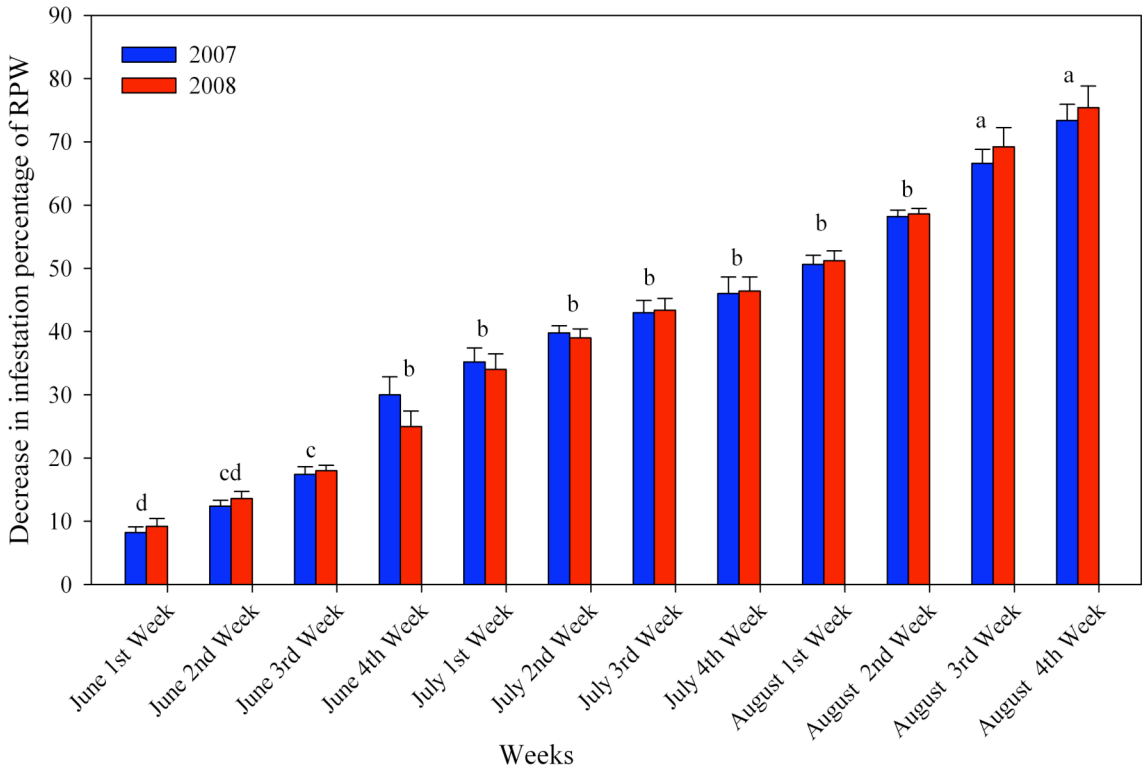

Figure-4: Effect of pheromone trap on *R. ferrugineus* infestation (means followed by the same letter do not differ significantly at $p < 0.05$).

low infestation followed by Muzawati; the differences in these varieties were non significant. The same trend of *R. ferrugineus* was observed during both the years of study (Figure **2**).

Effect of Pheromone Trap

In the year 2007 and 2008 significantly (P<0.05) higher adult male and female *R. ferrugineus* were captured during the 2nd week of June, 1st week of July, 2nd week of July and 3rd week of July as compared to 4th week of July, 1st week of August, 2nd week of August, 3rd week of August and 4th week of August at village Gagri, Khairpur (Figure **3**).

In the year 2007 and 2008 the most significant (P<0.01) decrease of ~70% in infestation of *R. ferrugineus* was recorded on 3rd week of August and 4th week of August, followed by 3rd week of June, 4th week of June, 1st week of July, 2nd week of July and 3rd week of July, 4th week of July, 1st week of August and 2nd week of August (P<0.05) as compared to 1st week of June at village Gagri, Khairpur (Figure **4**). On the other hand, lowest adult *R. ferrugineus* ~7 were captured in the last week of August 2007 and 2008 (Figure **3**). During the experimental period 169 adults of *R. ferrugineus* were captured through pheromone traps.

DISCUSSION

Different genotypes of date palm have different response to tolerate against different races of insects pests and diseases. The most tolerant variety of date palm against *R. ferrugineus* was Muzawati (~8% attack of *R. ferrugineus*), followed by Pathri ~12%, Thothar ~15% Khar and Shakri ~16%. The results are with the agreement of Farazmand *et al*. [7] who have found significant differences in tolerance to *R. ferrugineus* among different varieties of date palm. The most susceptible varieties against *R. ferrugineus* were Karbalain (~25%), Dhedhi (21%), Fasli, Aseel (~19%) and Eidan Shah (18%) during both the years of studies. Similar results were reported previously by Baloch *et al*. [3] that Aseel and Karbalain varieties were most susceptible against *R. ferrugineus* attack. Most of the *R. ferrugineus* adults were captured during the 1st, 2nd, 3rd week of July and 2nd week of June 2007 and 2008. These results are in agreement with the findings of Gunawardena and Swarnakanthi [15] and Oehlschlager *et al*. [16]. Pheromone trapping system is one of the modern techniques in Pakistan which helps to control the insect population and various diseases. Trapping adults of *R. ferrugineus* with food-baited pheromone traps have been widely practiced in several countries in mass trapping programs [5, 6, 9, 11, 13,

17]. The trend of decrease in infestation percentage was gradually decreased throughout the experimental period during both the years.

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