

**Bio-ecology of Red Palm Weevil and Other Palm Borers  
Including GAP Against Palm Borers in Date Palm**

***Jose Romeno Faleiro***  
***Goa, India***

[jrfaleiro@yahoo.co.in](mailto:jrfaleiro@yahoo.co.in)

**International Training Workshop on the Management of  
Major Insect Borers in Date Palm  
*Organized by ICARDA in Al-Madinha, Kingdom of Saudi Arabia*  
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## Major Insect Borers of Date Palm



Source: M. Zaidan Khalaf

**Frond borer, *Phonapate frontalis*  
(Coleoptera : Bostrichidae)**



Source: M. Zaidan Khalaf

**Rhinoceros beetle, *Oryctes* spp.  
(Coleoptera:Scarabaeidae)**



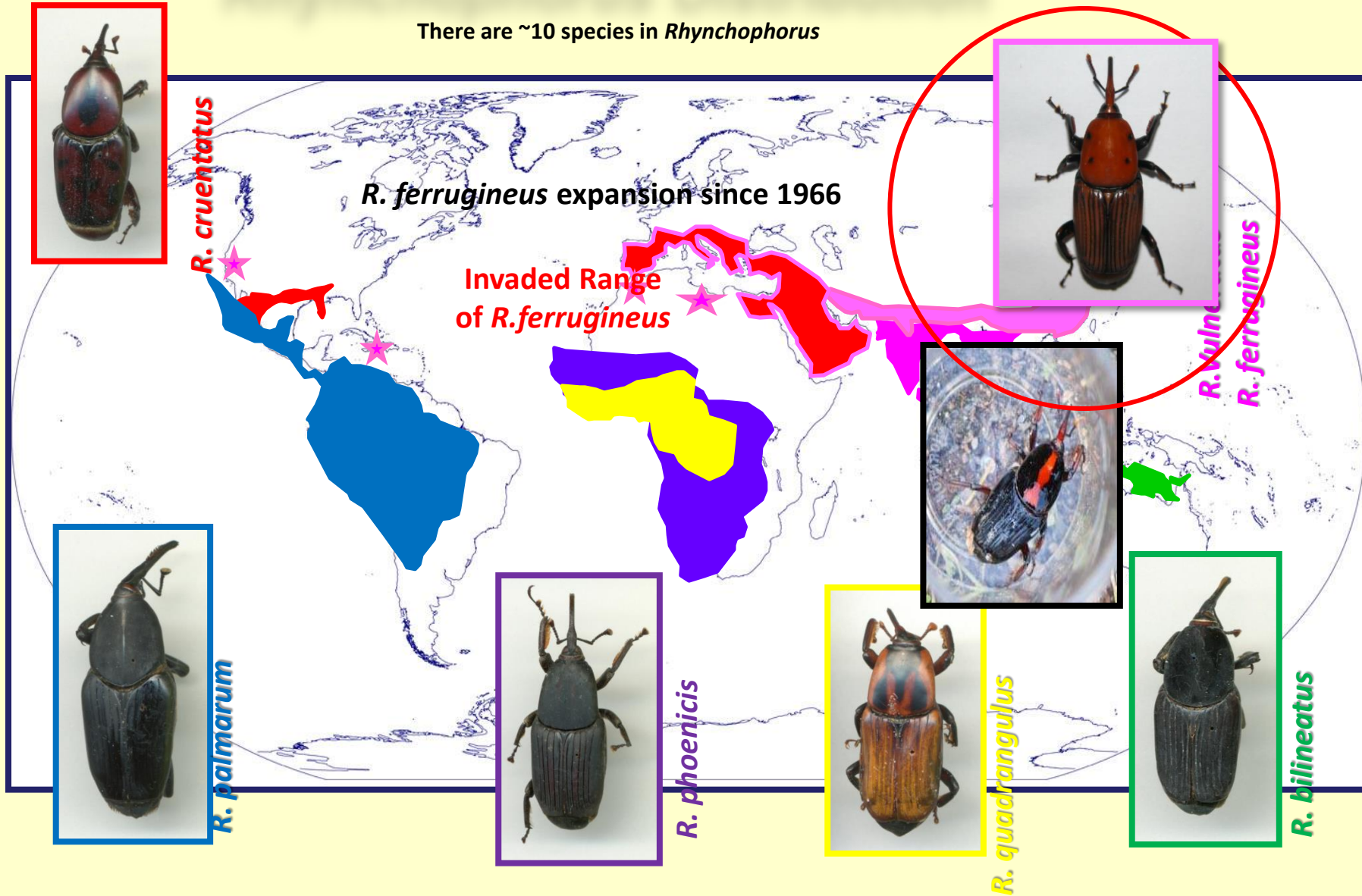
**Longhorn stem borer, *Jebusaea hamerschmidtii*  
(Coleoptera:Cerambycidae)**



**Red Palm Weevil, *Rhynchophorus ferrugineus*  
(Coleoptera:Curculionidae)**

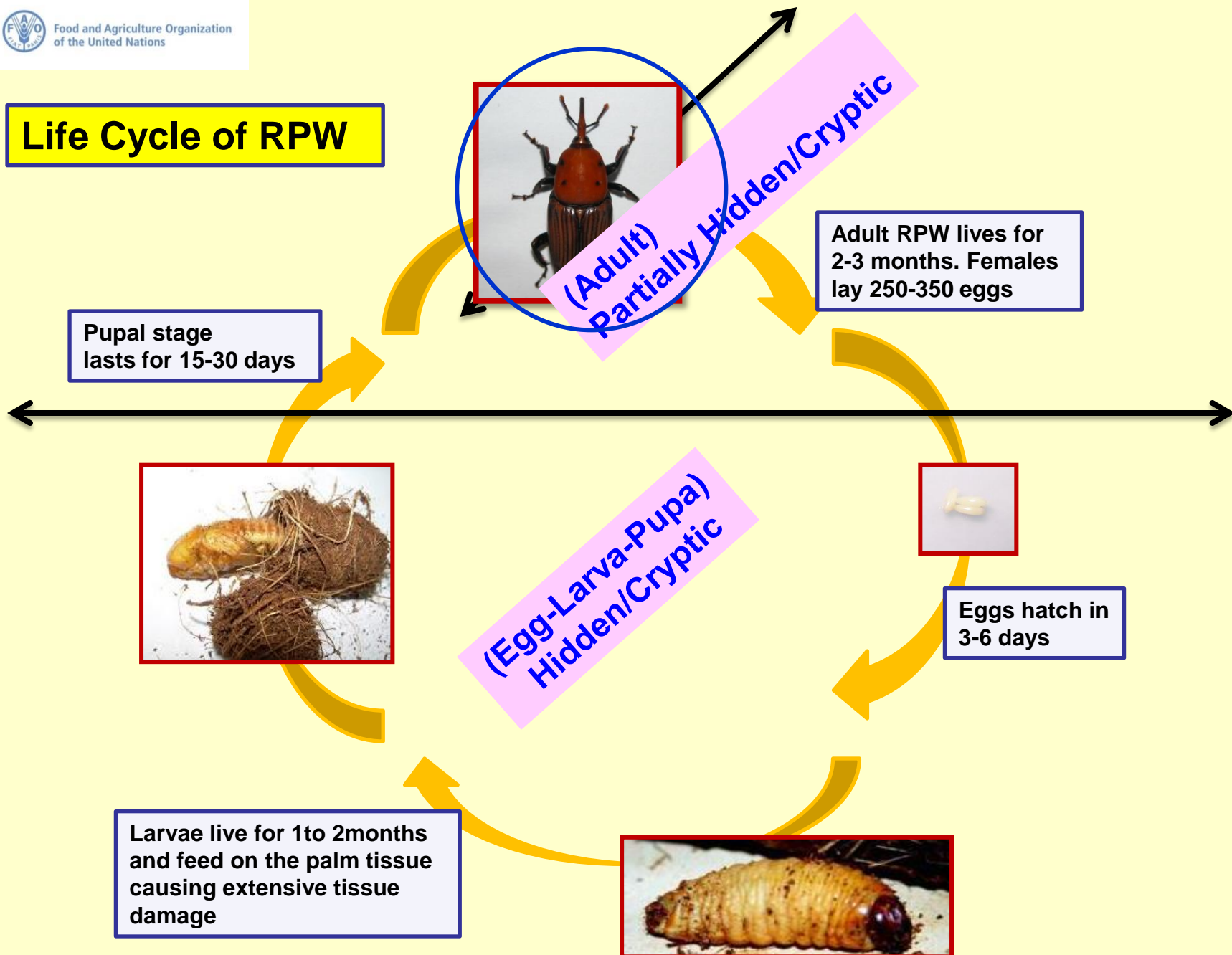
# Rhynchophorus Distribution

There are ~10 species in *Rhynchophorus*





## Life Cycle of RPW





Most Preferred Hosts – *Phoenix canariensis*,  
*P.dactylifera* and *Cocus nucifera*



## Large Stretches of Monocultures of Young Palms



## Temperature Thresholds for RPW

Character	Number in days
No. of eggs/ female	58-531 <b>Concealed</b>
Incubation period	1-6
Larva: Larval period	25 – 105 (3-17 instars) <b>Concealed</b>
Pupal period	11-45 <b>Concealed</b>
Adult	50-90 <b>Concealed/Exposed</b>
Egg-Adult	45-139

### Lower Temperature Thresholds

Oviposition : 15.45 ° C

Hatching : 13.95 ° C (Dembilio et al., 2012)

< 1 generation a year in areas with mean annual temperature below 15 ° C.

>2 generations where mean annual temperature is above 19 ° C (Dembilio et al., 2010)

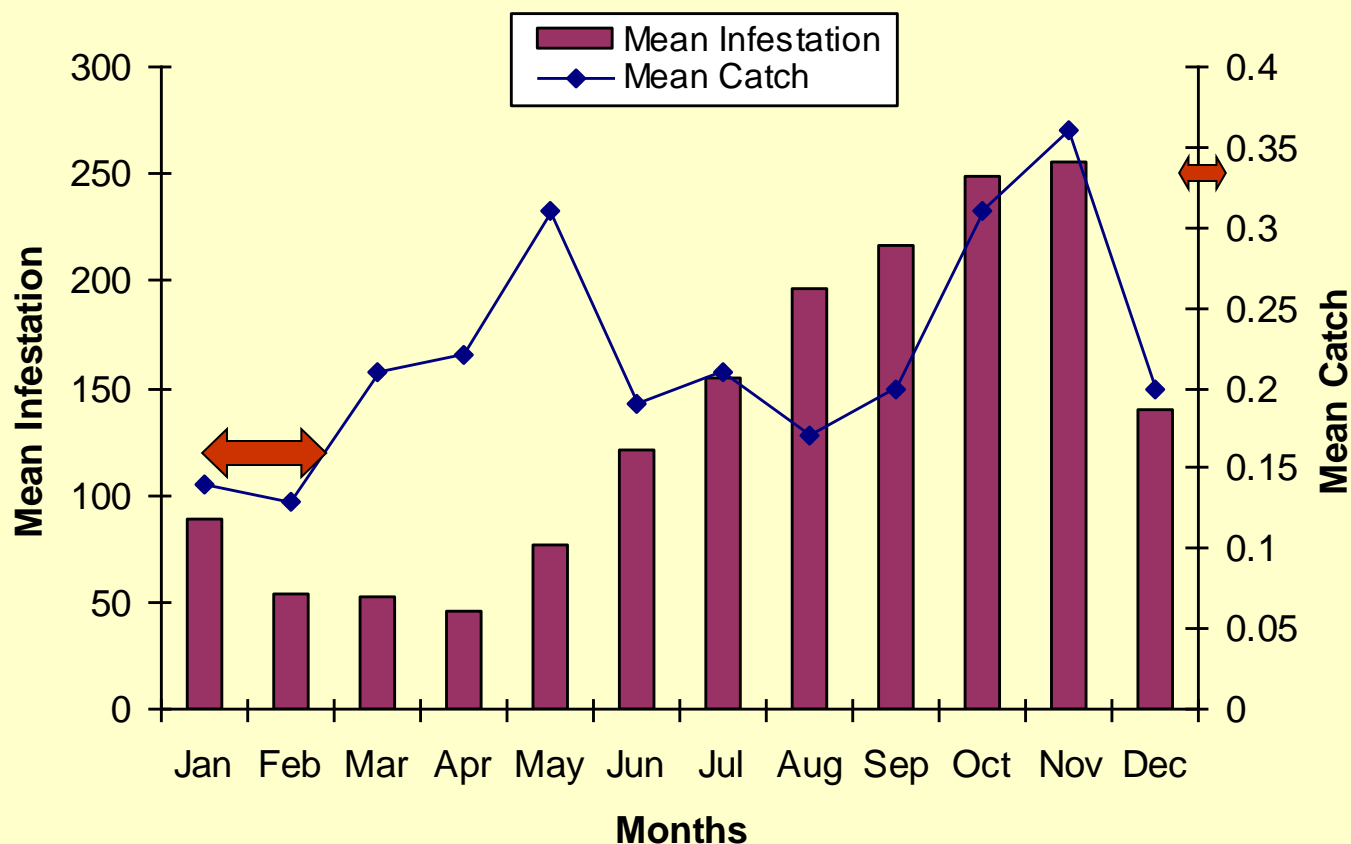
### Minimum lethal temperature

10 ° C for eggs

15 ° C for larvae

0 ° C for pupae

(Martin and Cabello, 2005, Cabello, 2006)



**Seasonal infestation in date palm and weevil captures in pheromone traps (Al-Hasa, Saudi Arabiaa, 1994 - 1997)**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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# Behavior & Bio-ecology of RPW

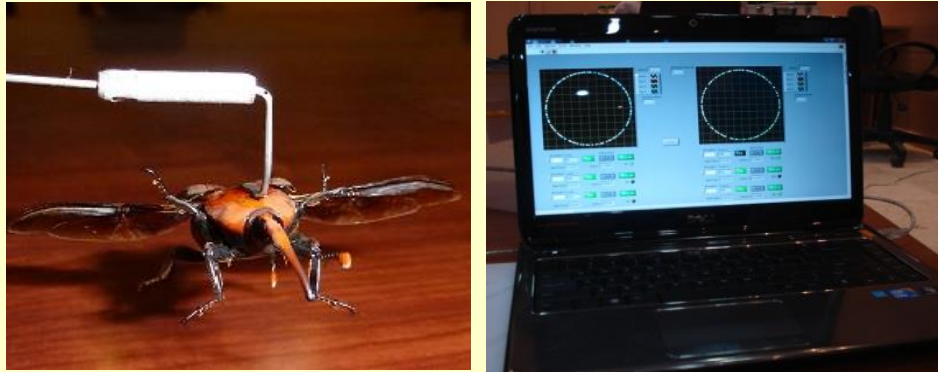
**Behavior of  
RPW : Not Well  
Understood**

**Why is This Weevil Here?**

- On Freshly Ploughed Barren Land
- From where did it come?

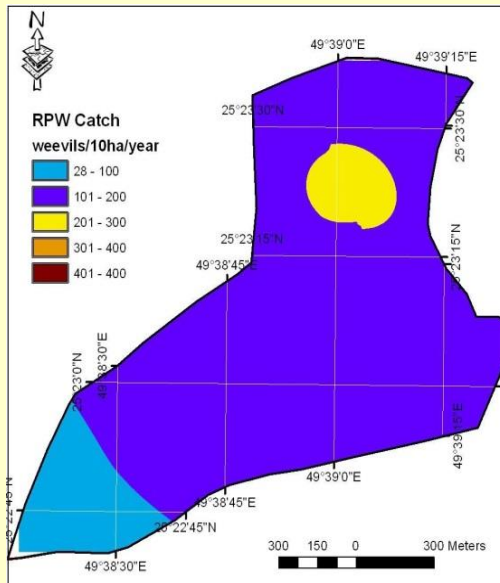


**How Far Can the Red Palm Weevil (Coleoptera: Curculionidae) Fly?: Computerized Flight Mill Studies With Field-Captured Weevils (Hoddle et al., 2015)**

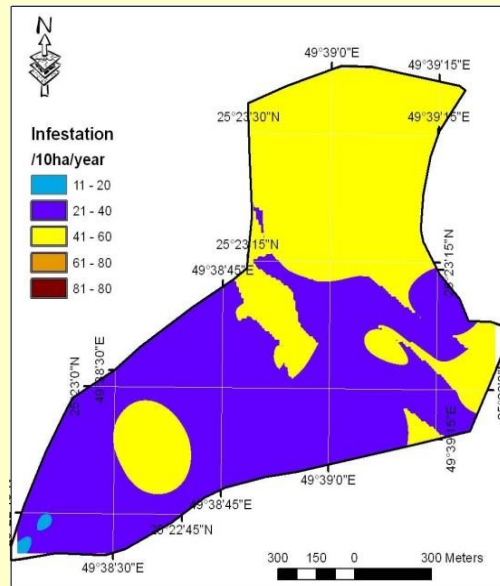


Considerable proportion (70%) of field-captured RPW exhibited an ability to fly > 1 km in a 24-h period. Of those weevils flying > 1 km 55% flew > 10 km in a 24-h

## GIS Based Spatial Spread of RPW [Al-Soodha (126ha) KSA- 2008]



**Weevil Captures**



**Infestation**

### Implications:

1. Infestations in clusters
2. Field trials (Trapping trials): Prone to error due to 'spot effect'



## Symptoms of Damage Due to RPW





# Predisposing Factors for RPW Attack



**Neglected Gardens**



**- - - Wounds on the Palm - - -**



**Breeding site – Cut Palm**

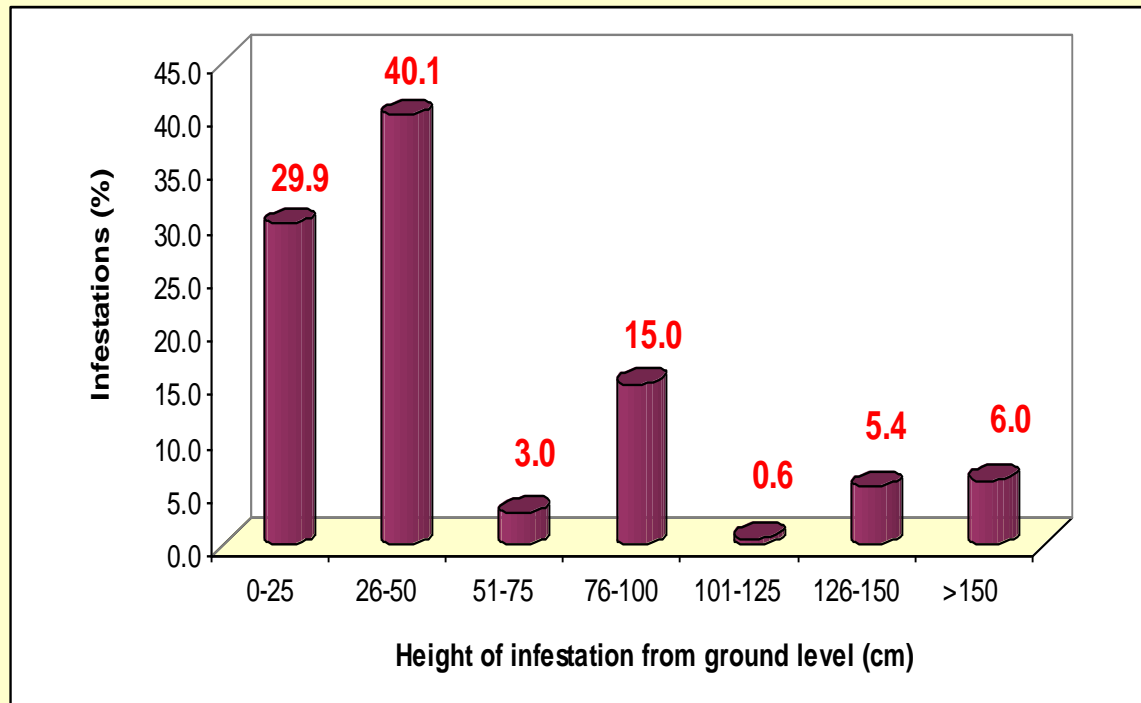


**Closed Garden**



**In-groove Humidity\***

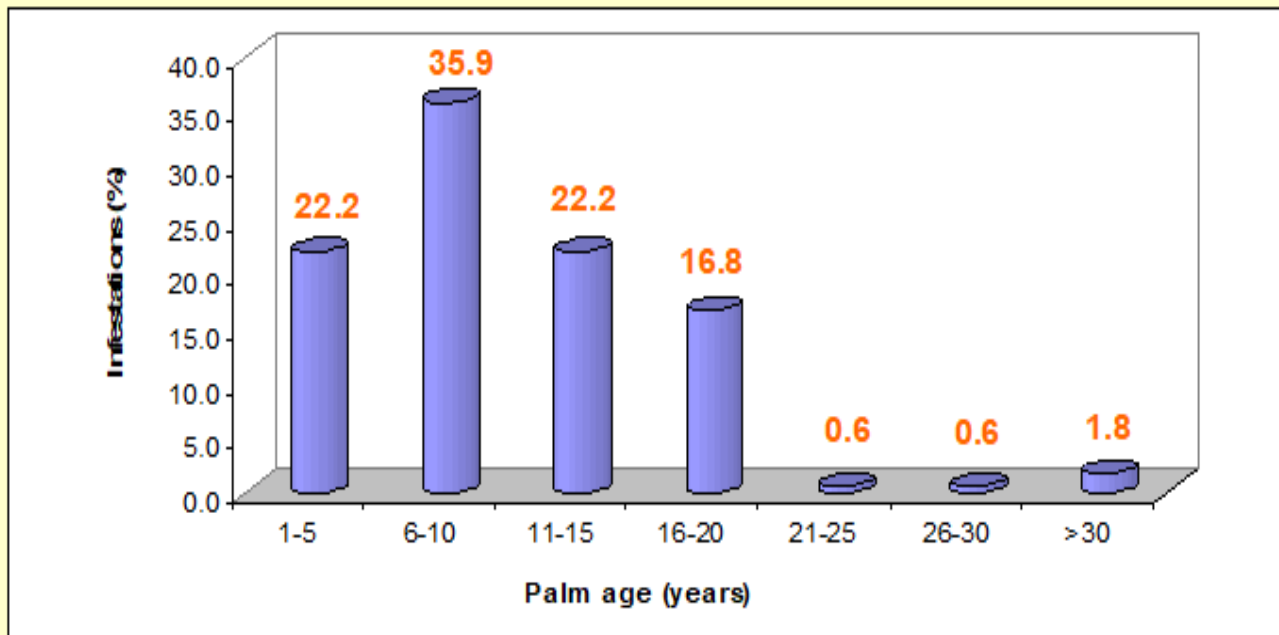
## Height of Infestation Due to RPW in Date Palm



39330 date palms were inspected in which 167 infestations were detected in AlAhsa-KSA

Sallam et al., 2012

## Age of RPW Infested Date Palms



39330 date palms were inspected in which 167 infestations were detected in AlAhsa-KSA

Sallam et al., 2012

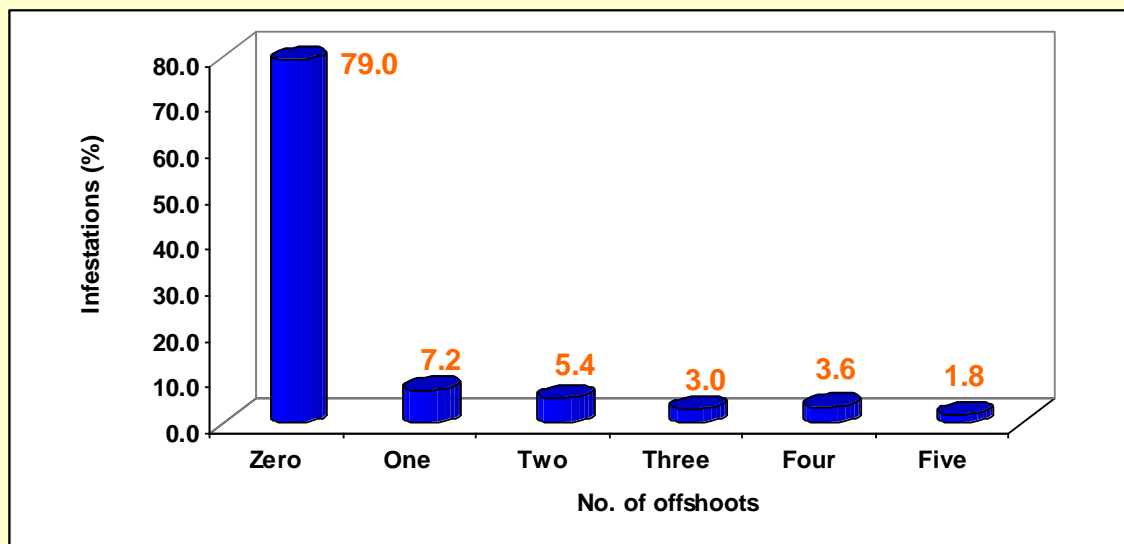


## ***Date Palm : Nature's Treasure***





## RPW Infestation in Date Palm v/s Number of Offshoots



39330 date palms were inspected in which 167 infestations were detected in AlAhsa-KSA

Sallam et al., 2012

## Treat Fresh Injuries on Priority



## Excess In-groove Humidity / Close Spacing : Open Flood Irrigation





# Dry Plantation : Not Preferred by RPW





Damage due to which Insect ???



# Symptoms of Damage : LHSB





# Neglected Palms Used for Landscaping : Harbour Insect Pests



Egg:15 days; Larva:10-11 months (3-4 instars); Pupa:3 weeks; Adult: 15-20 days (El Shafie, 2015)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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# Long Horn Stem Borer (LHSB)

## *Jebusea hammerschmidt*





# Stalk and Stem Borer (Rhinoceros Beetle)

*Oryctes* spp. (*O.agamemon*, *O.elegans*, *O.rhinoceros*)



# Palm Debris : Breeding Site for Rhinoceros Beetle



## ***Orytes elegans:***

**Egg:10 days; Larva:3 months(three instars); Prepupa:7 days and Pupa:31 days; Adult:4months (Khalaf,2018)**

## Damage By *Oryctes* spp (*O.elegans*/*O.agamemon* in Date Palm



(Photo Source: M. Zaidan Khalaf)

Jan

Feb

Mar

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec





**Damage by Palm Frond Borer *Phonapate frontalis***  
(Source: M. Zaidan Khalaf)

Jan

Feb

Mar

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec





THANK YOU

شكراً لحسن الاستماع