

# 2022 Statewide Pistachio Day

## Navel Orangeworm Management: Sanitation, Mating Disruption and SIT

Kent Daane (sanitation)



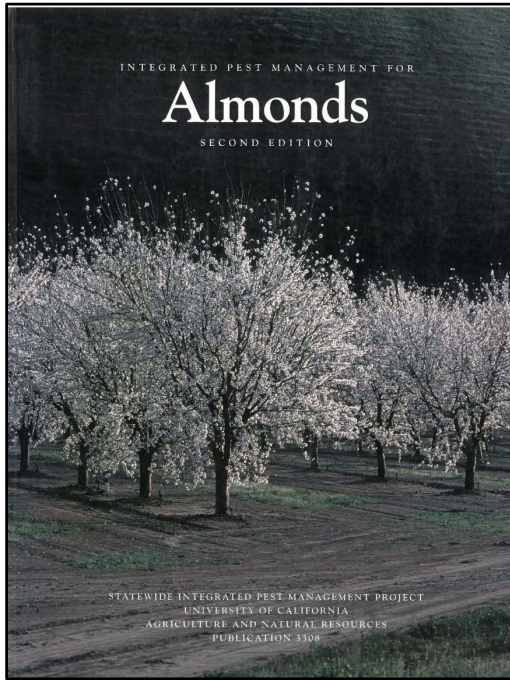
David Haviland (mating disruption)



Houston Wilson (sterile insect technique)







# UC IPM Guidelines : Almonds

## Cultural Control

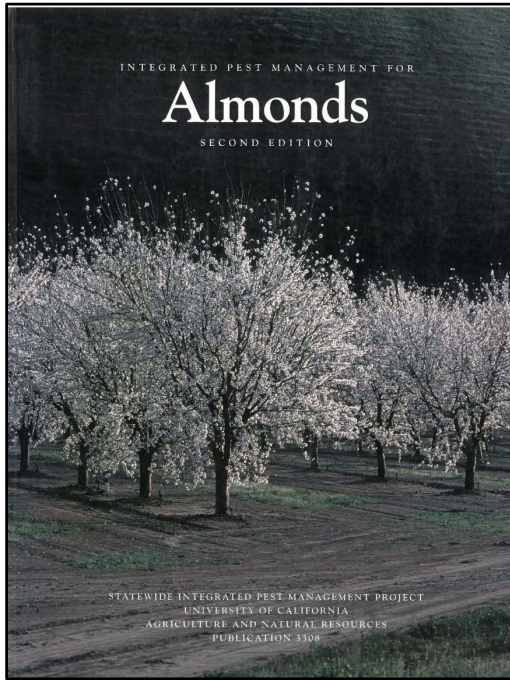
### Remove Mummy Nuts (Sanitation)

“Remove mummy nuts from trees before bud swell by mechanically shaking the tree or hand poling, or both. Blow or sweep fallen mummy nuts to the row centers and destroy them by discing or flail mowing by March 1, especially where ground cover is not present or in years with dry winters.”



Caltagirone et al. 1964, Engle & Barnes 1983,  
Zalom et al. 1984, Higbee & Siegel Cal Ag 2009





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Remove mummies  
to < 2 nuts / tree

¼ mile away  
(NOW flight from  
infested fields)

Destroy mummies  
on ground by March  
1<sup>st</sup>-15<sup>th</sup> up to May 1<sup>st</sup>



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Cultural Control

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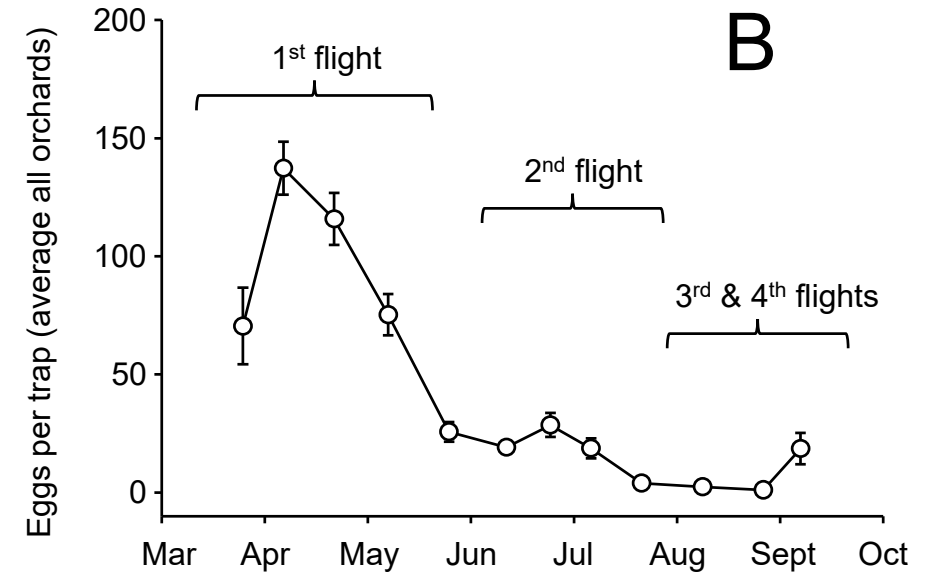
A



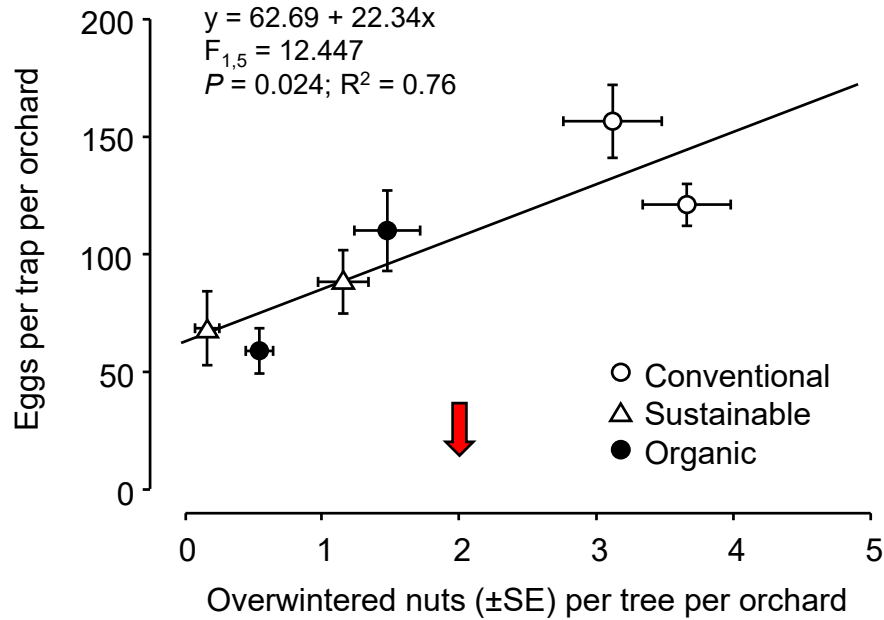
**Compare pistachio mummies to NOW:**  
 Counted mummies per tree in six orchards (conv., sustainable, organic) over four years, from Feb-Mar to Jul-Aug.



B



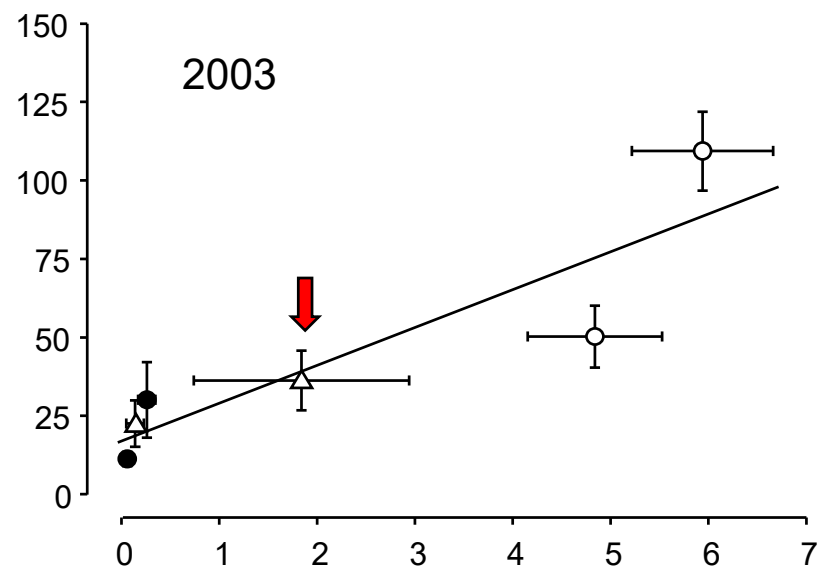
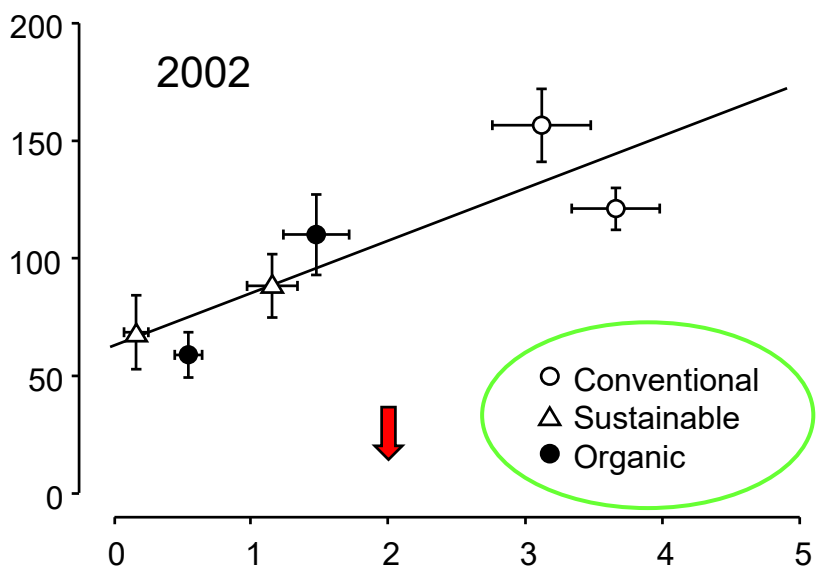
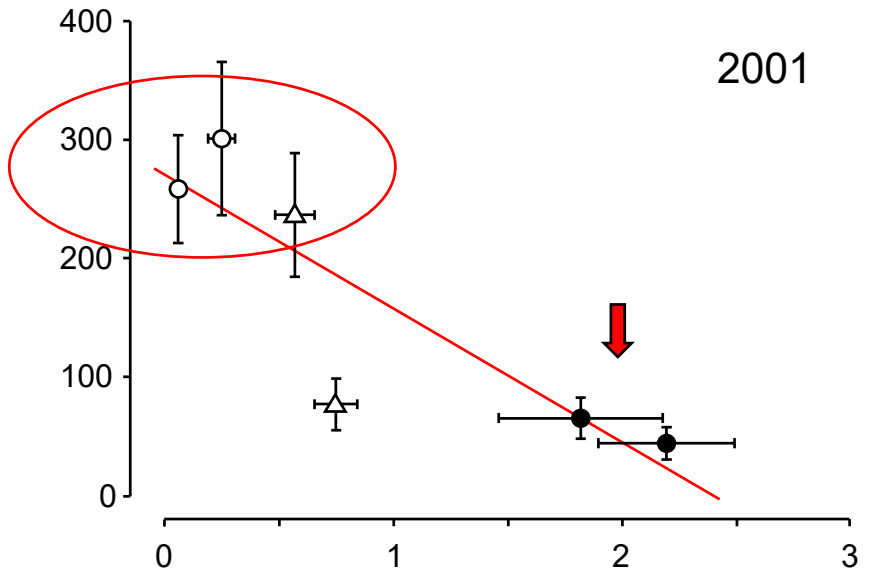
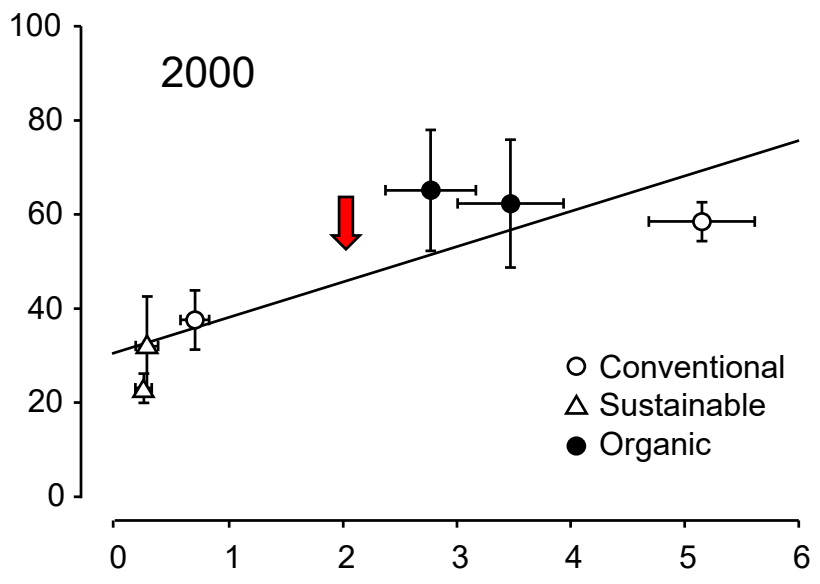
C



NOW egg traps to monitor flight as an indication of NOW density and to correlate to overwintered nuts in the tree. Here we used first flight averages.



First flight eggs per trap per orchard



Overwintered nuts (±SE) per tree per orchard



# What factors that impact the relationship between nuts per tree and NOW first flight?

**Before sanitation (January)**

**$48.4 \pm 3.1$  mummies per tree**

**After sanitation practices were implemented**

**$1.40 \pm 0.16$  (March) mummies per tree**

**$0.48 \pm 0.05$  (April) mummies per tree**

**Post sanitation counts differed among orchards**

**Range:  $0.06$  to  $2.19$  mummies per tree**

**(in other years range typically  $0.5$ - $5$  mummies)**

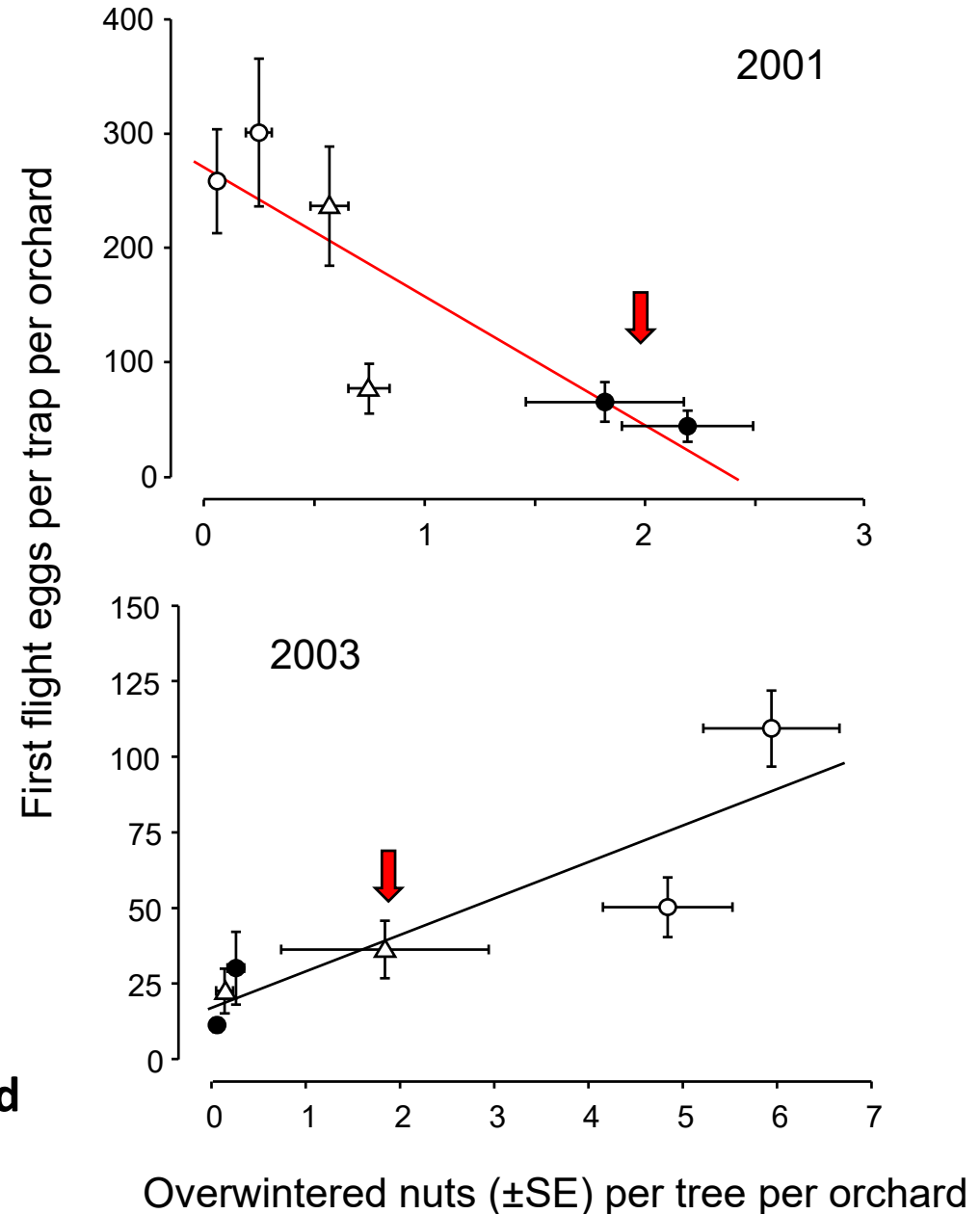
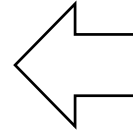
**86 NOW were reared from 1,890 tree mummies**

**4.5% nut infestation (range  $3.3$  –  $13.5\%$ )**

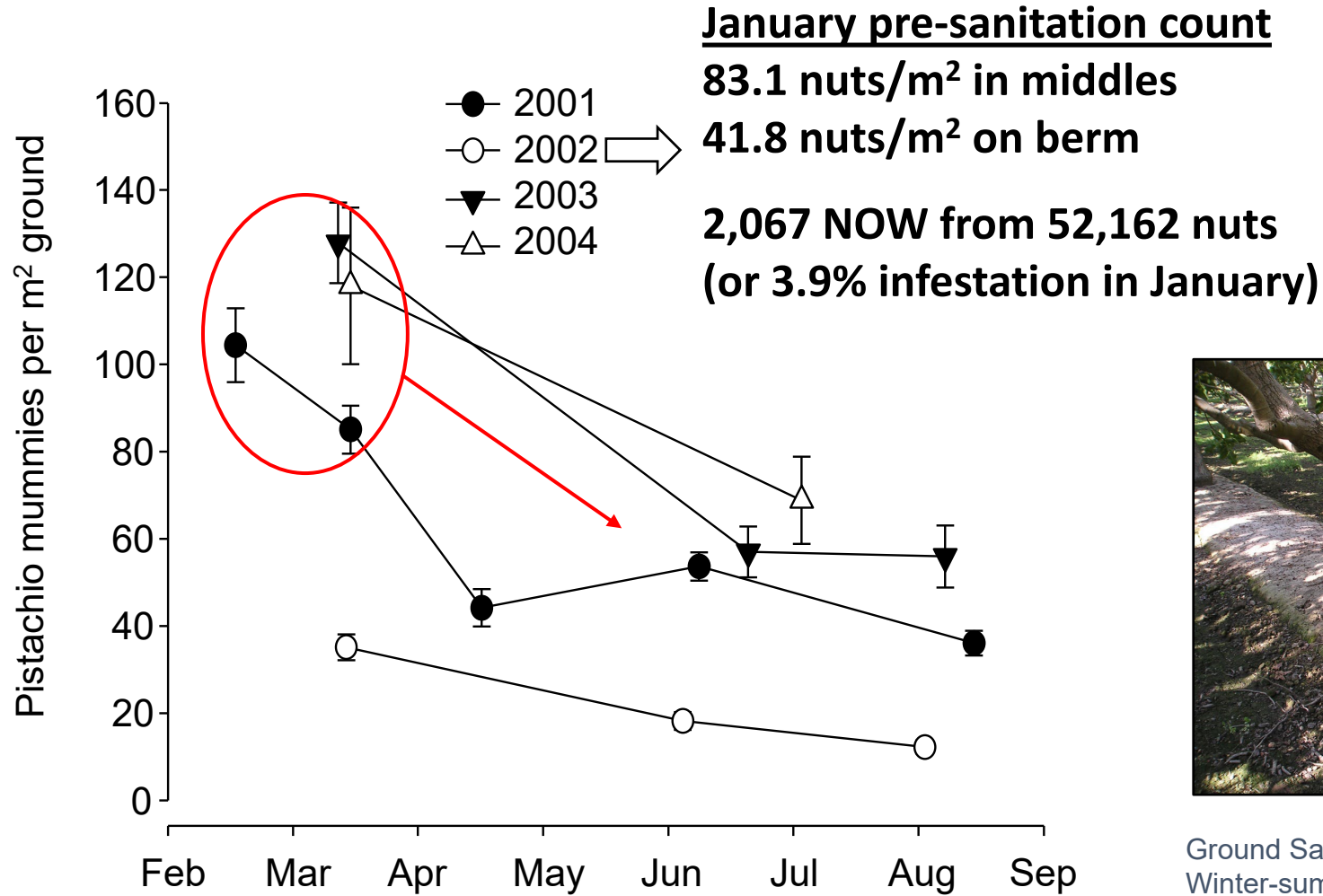
**After nuts were dissected:**

**No NOW in blanks (43.7%) or closed nuts (71.7%)**

**... so  $17.2 \pm 2.9\%$  of open nuts w/ kernel were infested**



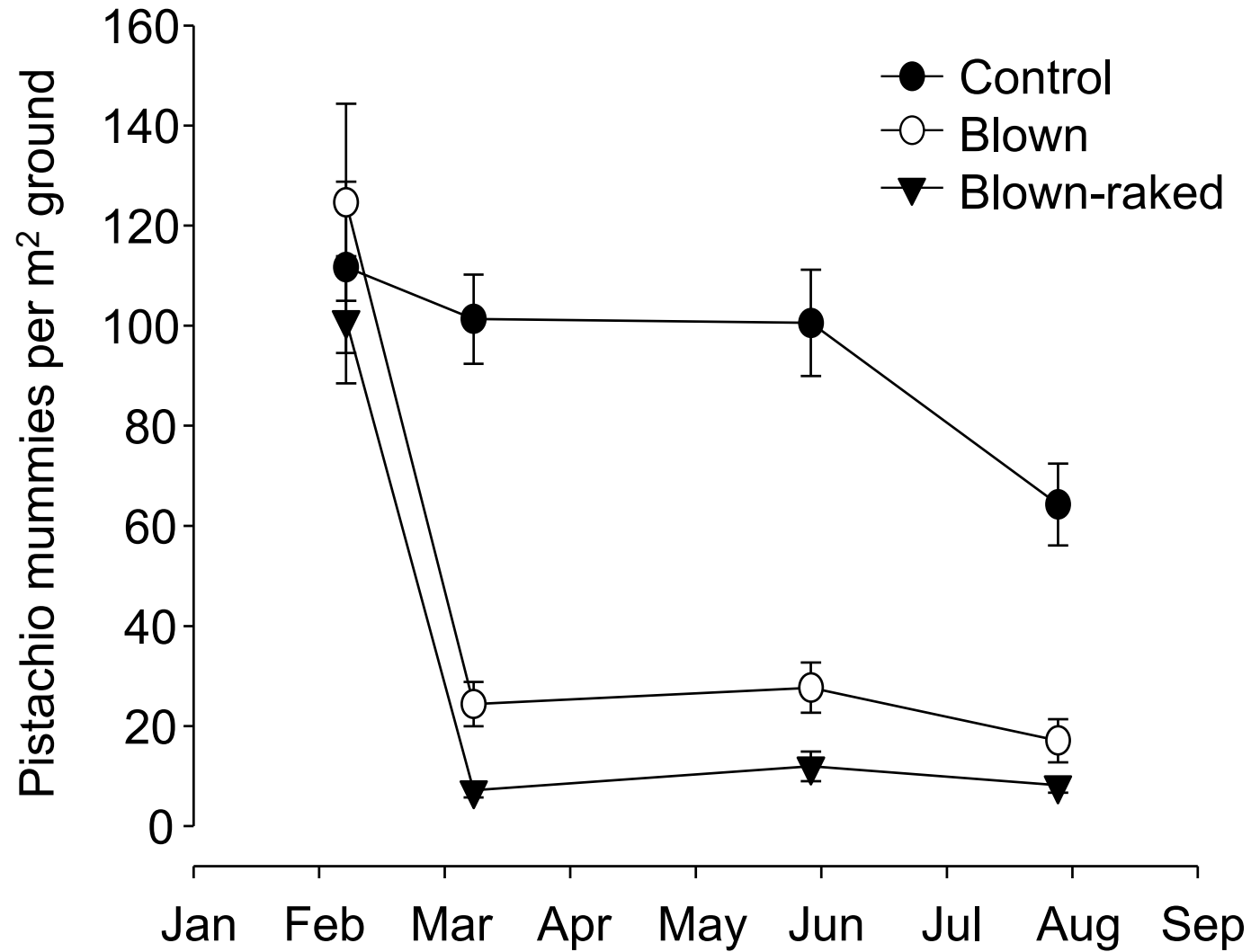
# What is the importance of nuts on the ground?



Ground Samples (m<sup>2</sup>)  
Winter-summer, berm-row middles

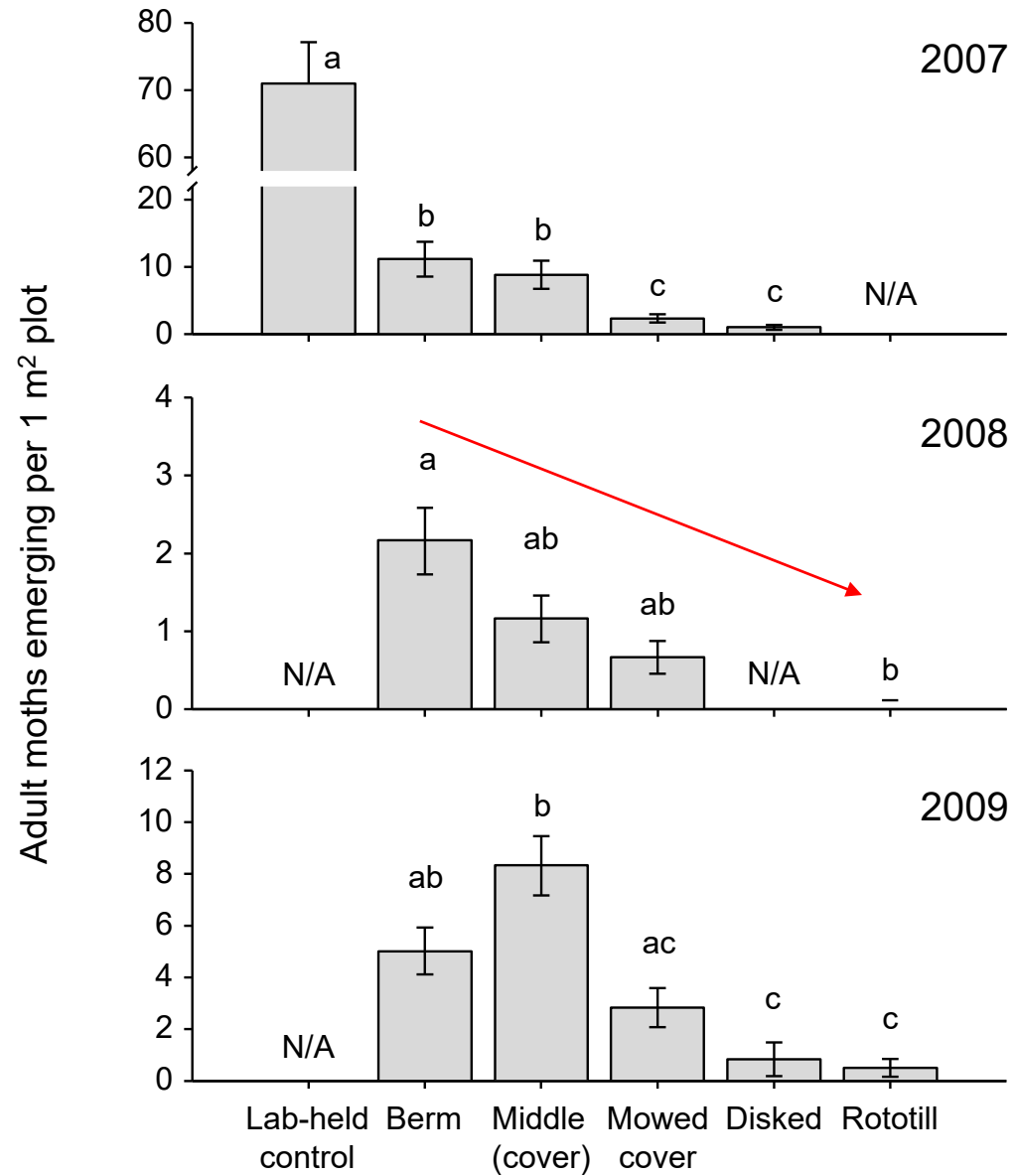


# How do cultural practices impact NOW infestation of ground mummies



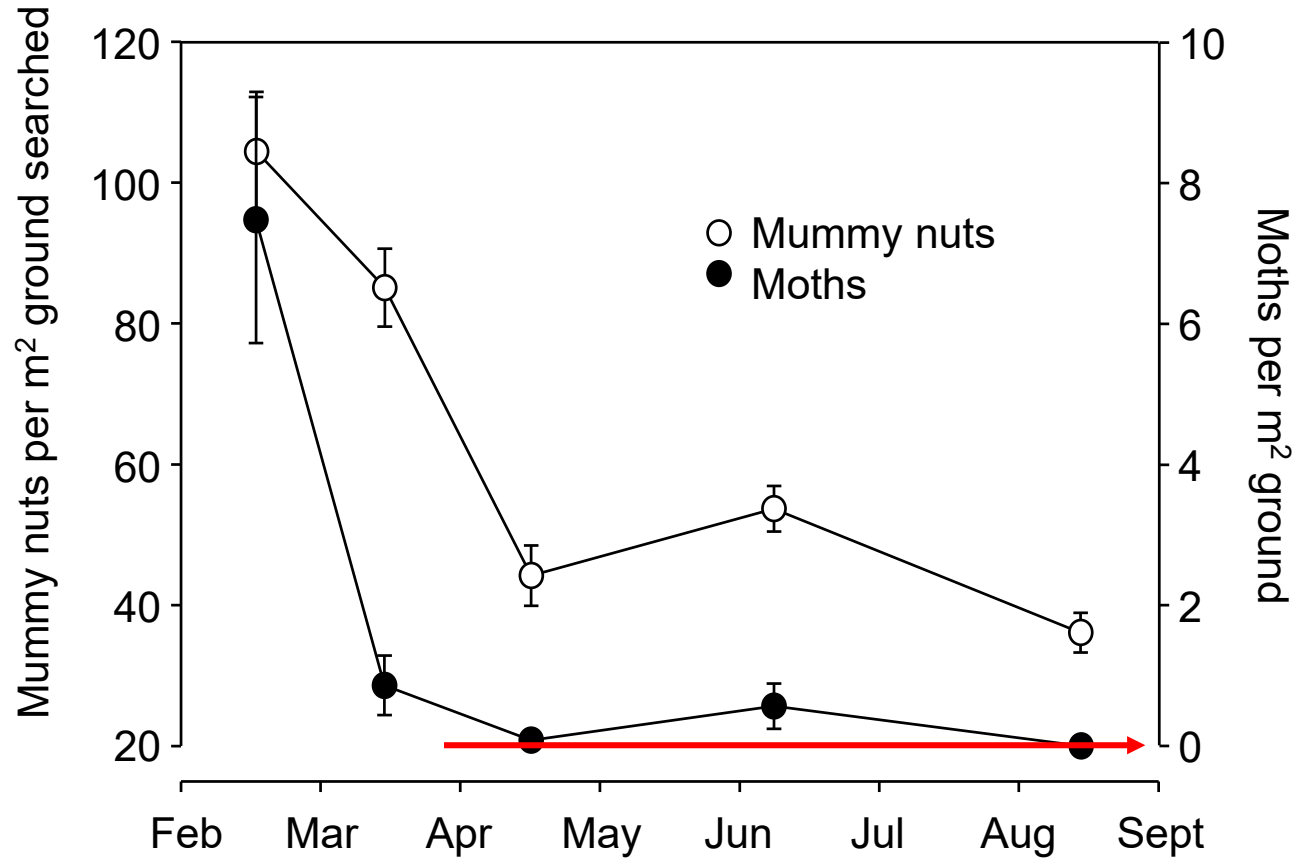
bottom photo from Siegel et al. 2007, Calif. Agricul.

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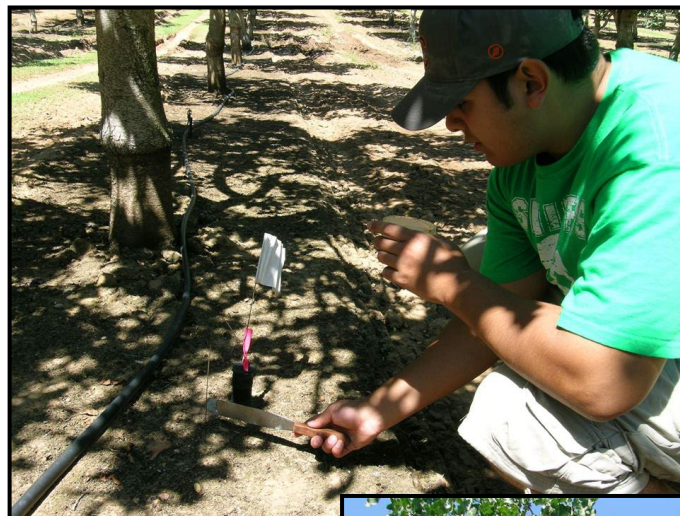
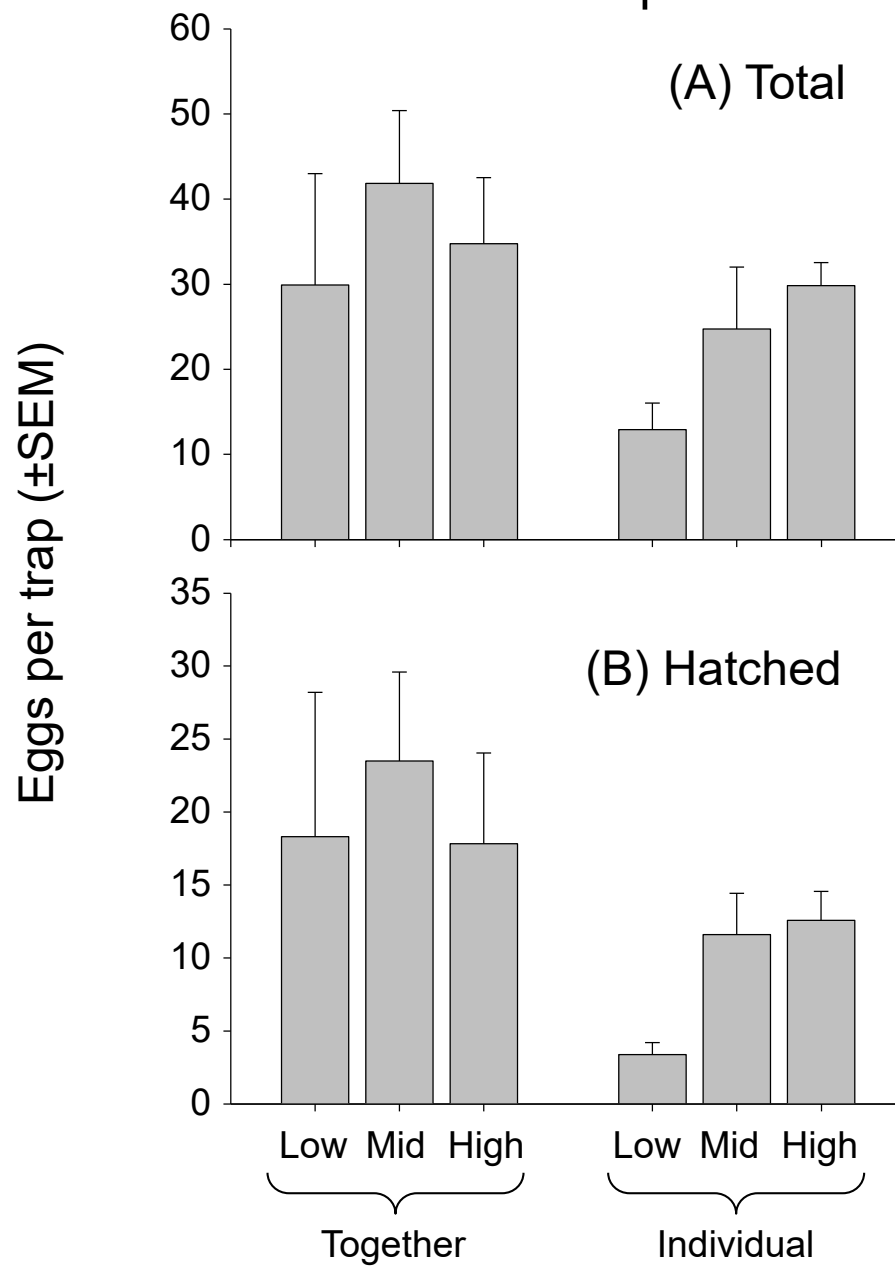




# What is the importance of nuts on the ground during the summer?



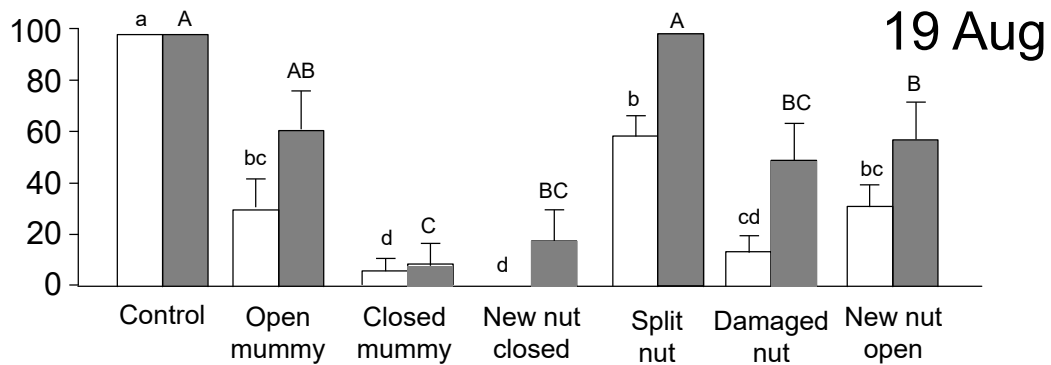
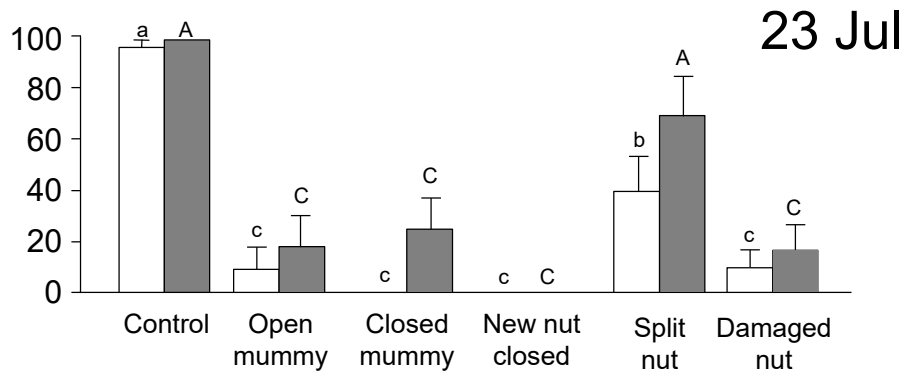
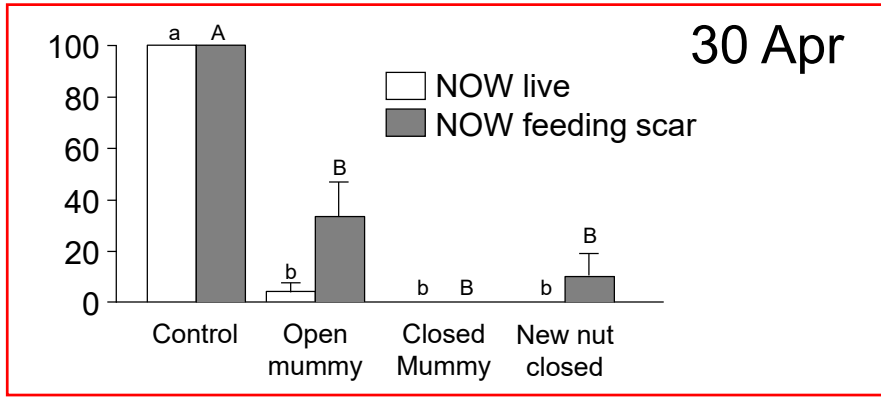
# What is the importance of nuts on the ground during the summer?





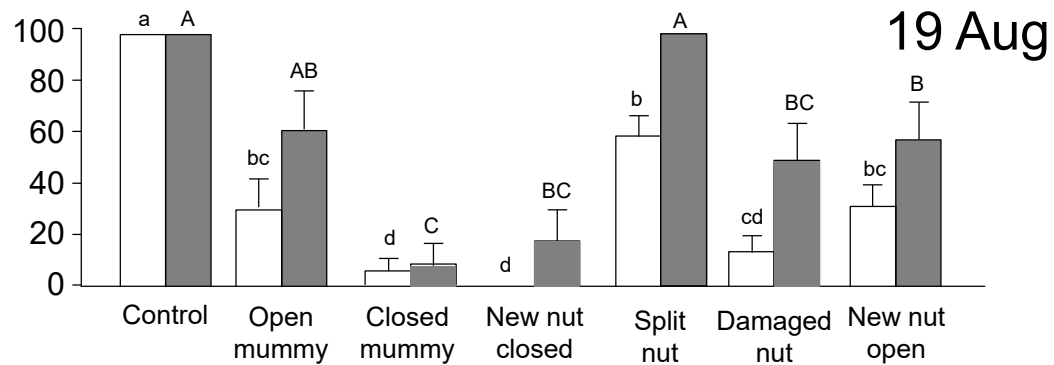
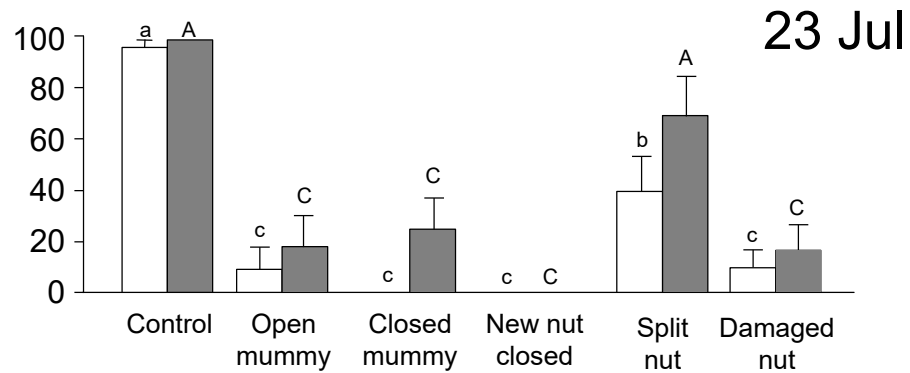
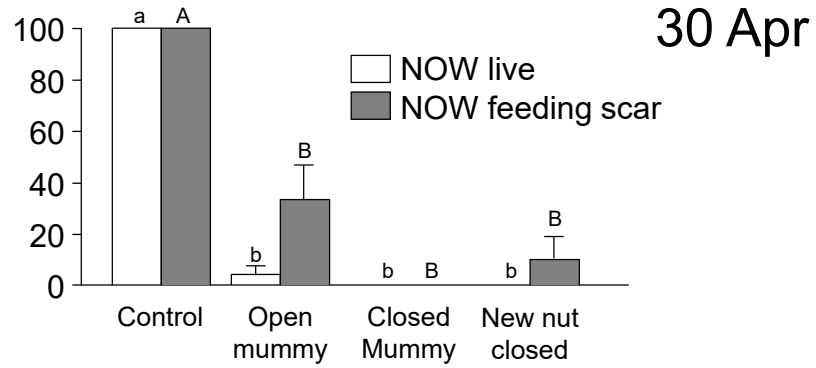
# What is the importance of nuts on the ground during the summer?

NOW survivorship and feeding



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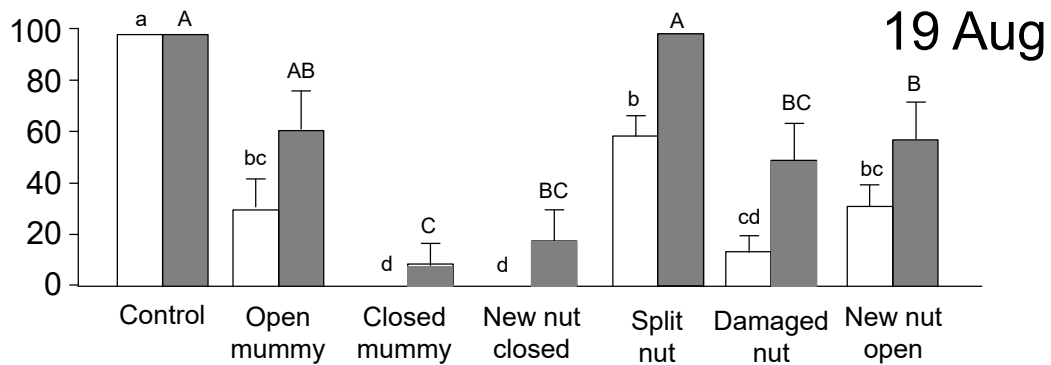
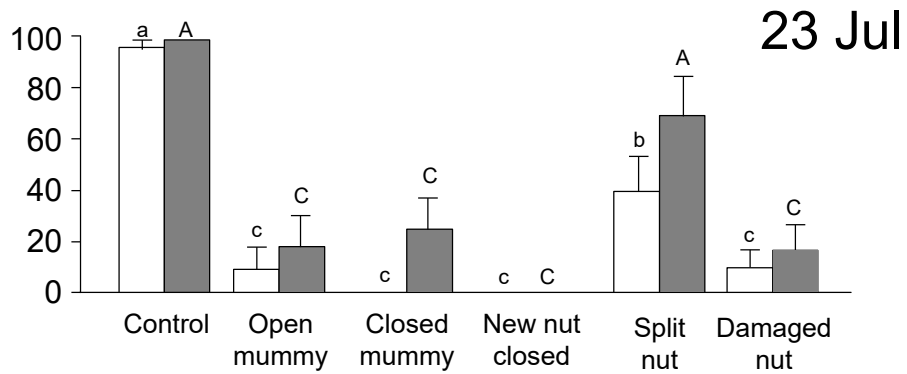
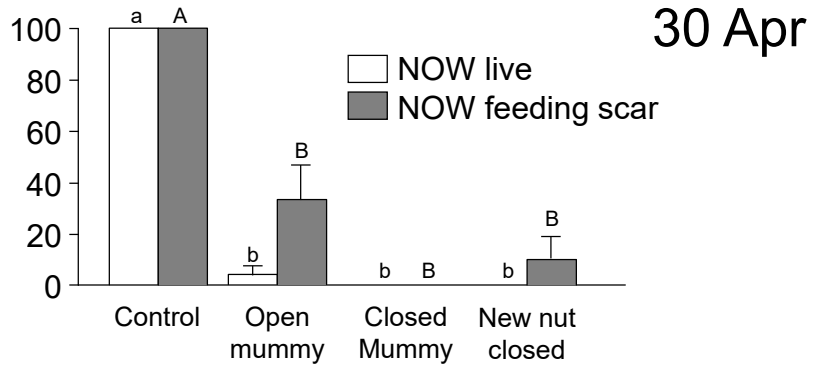
NOW survivorship and feeding





# What is the importance of nuts on the ground during the summer?

NOW survivorship and feeding



# Conclusions

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- 1) Sanitation in pistachio is important should be a key part of NOW control as it impacts first flight as well as NOW in-season survival; it may be more difficult than in almonds to get to <2 nuts per tree – and labor costs may be an issue.
- 2) Factors impacting NOW infestation of mummies include: % blanks and closed nuts, ground vs tree, berm vs middles, distance from source of NOW (e.g., unsanitized fields, previous fall insecticides (not discussed).
- 3) Mummies can be used by NOW during the summer – probably a low percentage.
- 4) Practices that move nuts to row middles and destroy nuts lower NOW load.



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