

Low hybrid onion seed yields relate to honey bee visits and insecticide use

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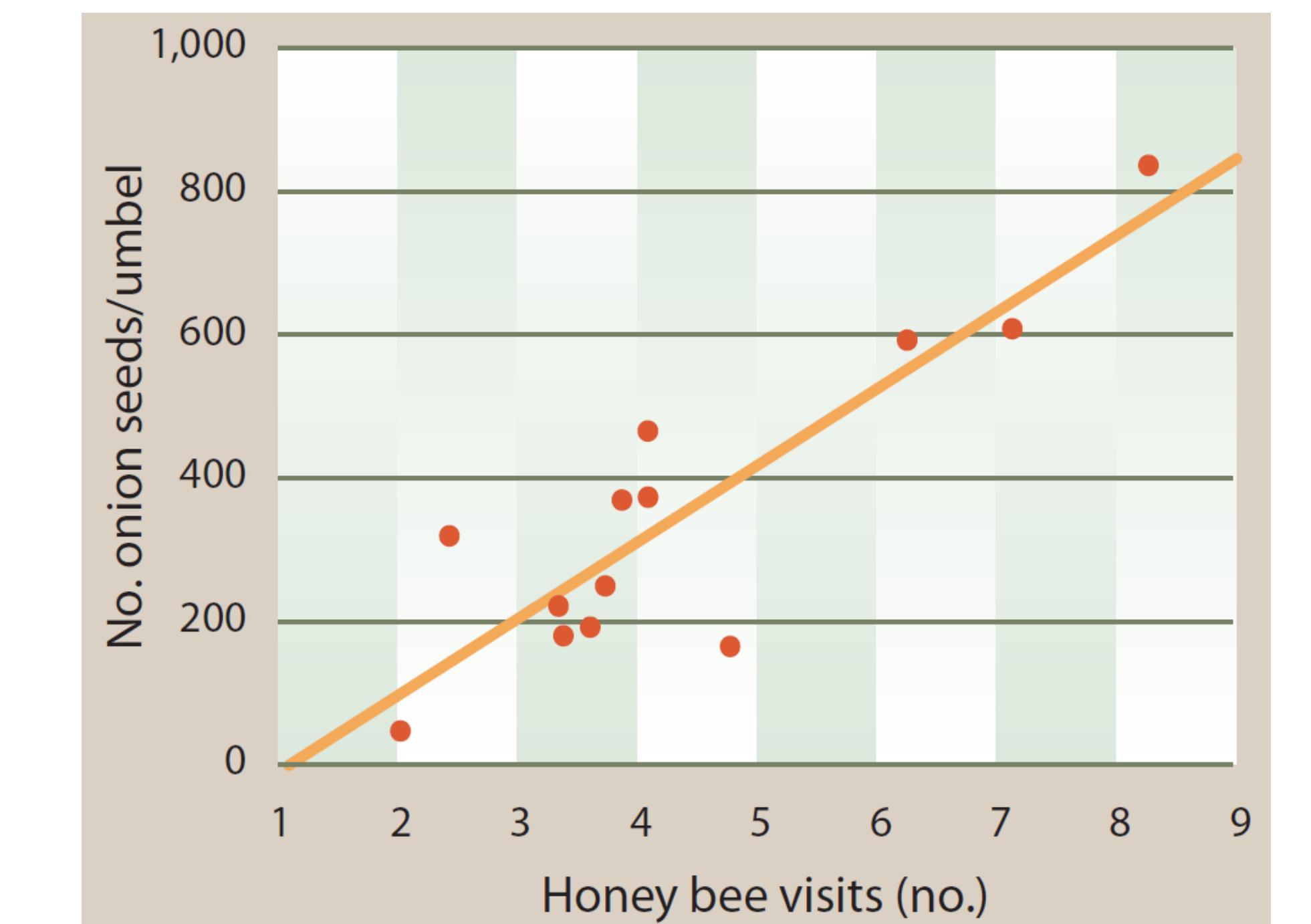
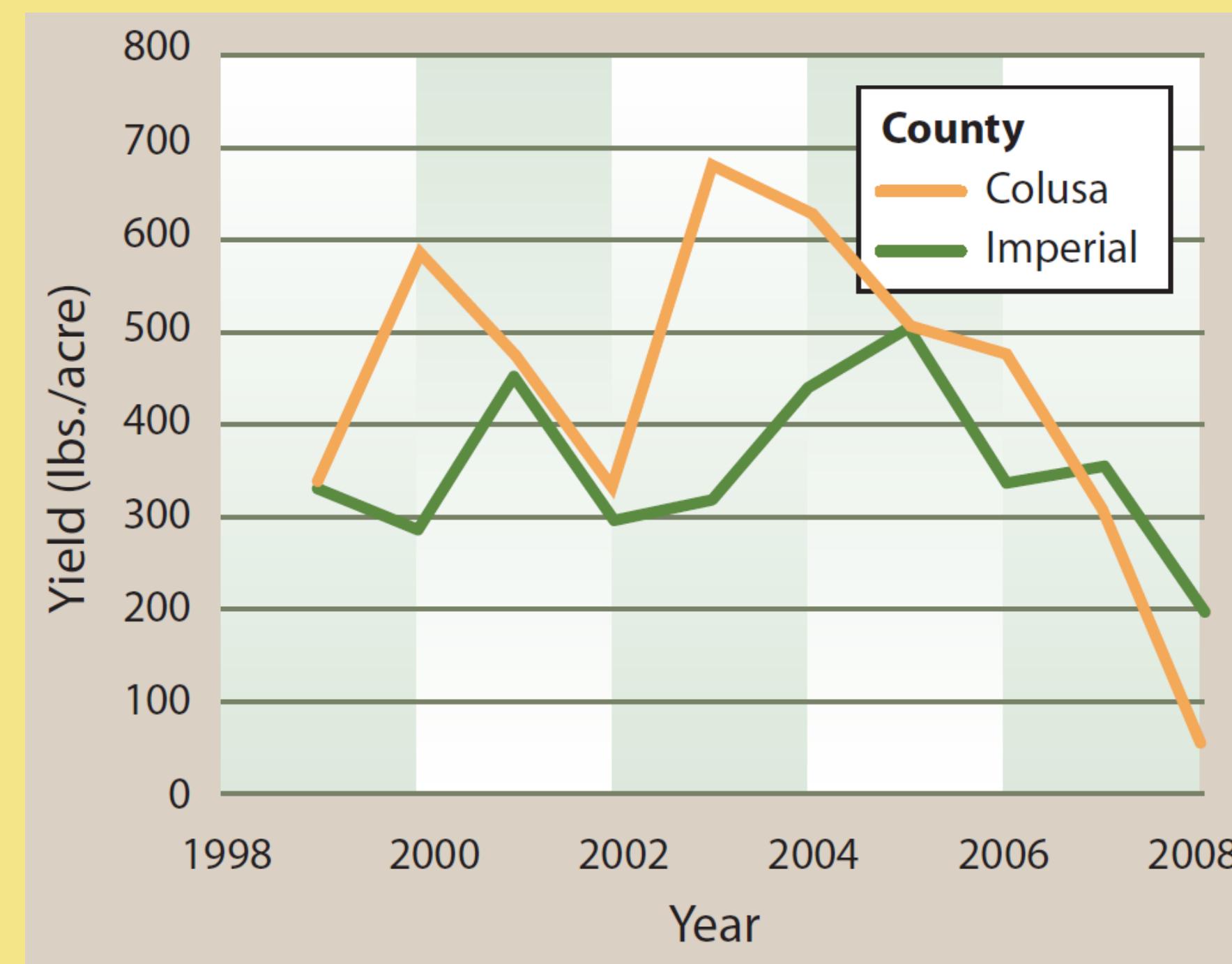
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Introduction

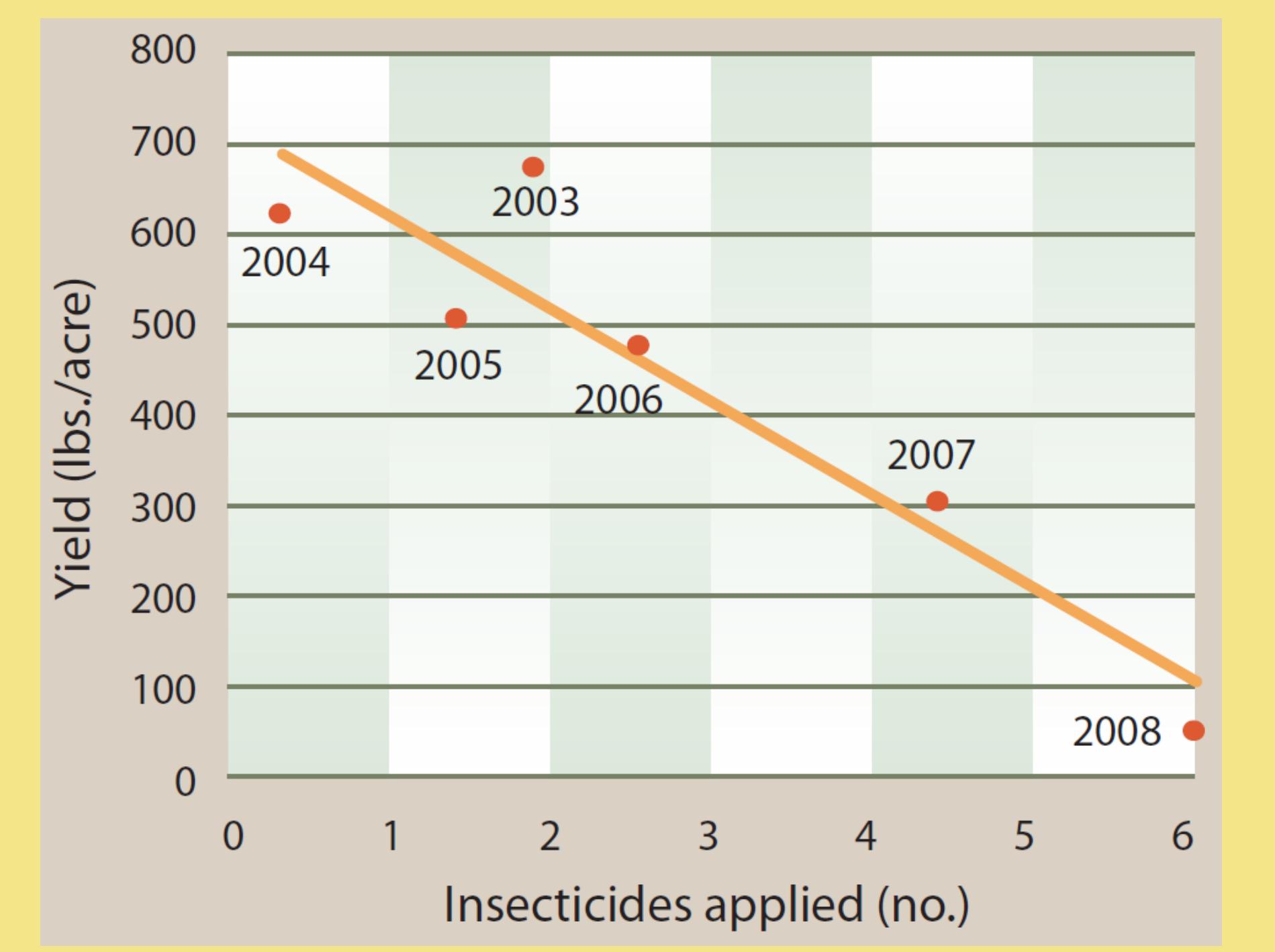
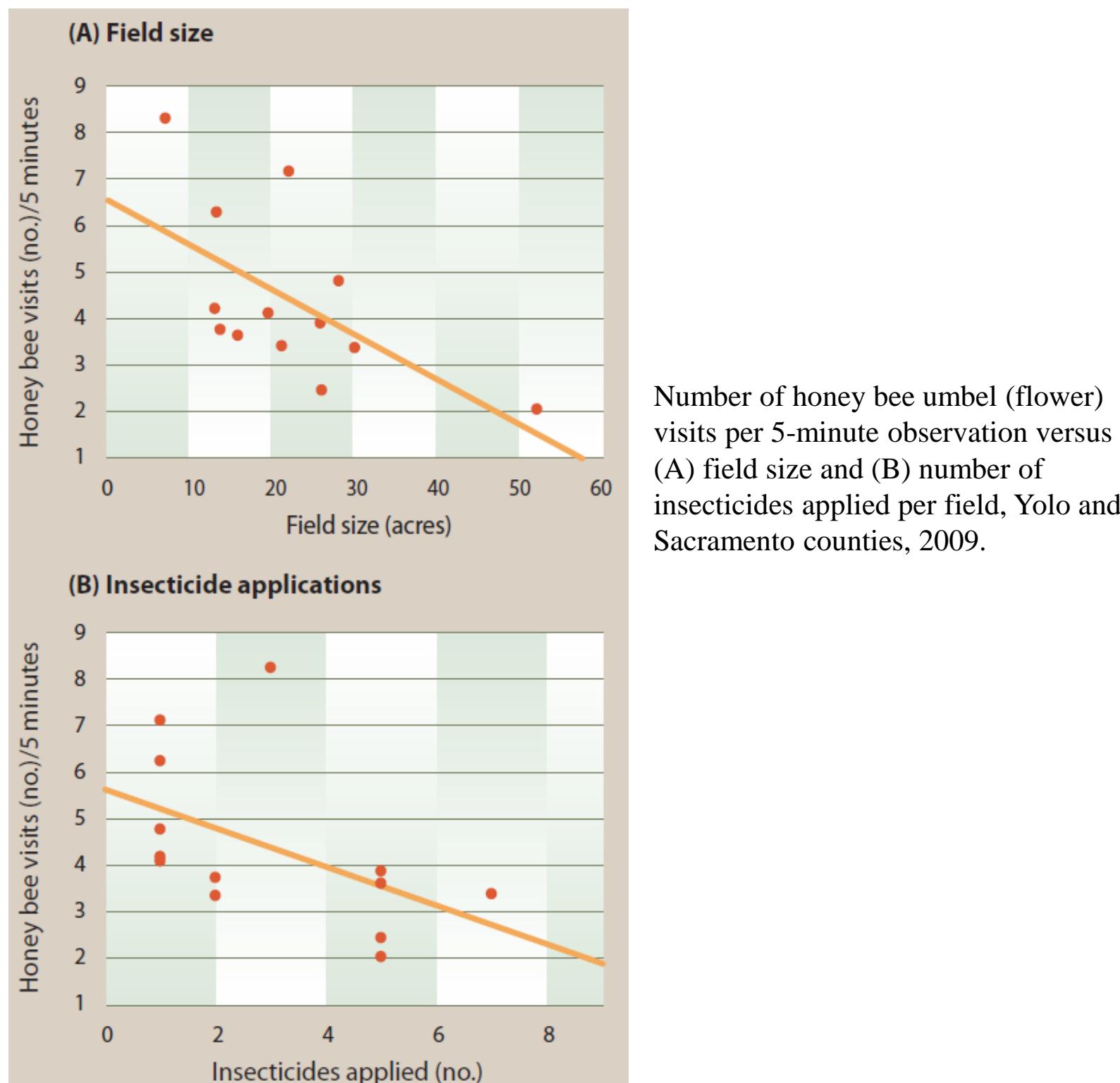
Onion thrips, previously considered of minor importance to hybrid onion seed production in California, vector the newly introduced iris yellow spot virus, a serious pathogen of onions that can cause significant yield losses. Insecticide use to control onion thrips has increased in onion seed fields, coincident with a steep decrease in yields, especially in Colusa Co. We examined a number of possible contributing factors and found a strong positive correlation between honey bee activity and onion seed set, indicating that a lack of pollination may be contributing to the reduced yields. In addition, honey bee visits to onion flowers were negatively correlated with the number of insecticides applied per field and field size. Reduced onion seed yields in recent years could be associated with the increased insecticide use that may be repelling or killing honey bees, important pollinators of this crop.



Onion seed yields have declined significantly in recent years in Colusa County, where the crop plays a small but important role in the rural economy. Above, a honey bee visits an onion umbel.



This study found that the number of insecticides applied and field size were the strongest predictors of honey bee activity and onion seed yields.



Conclusion

The strong positive correlation between honey bee activity and onion seed set indicates that a lack of pollination may be contributing to reduced yields. Onion flowers are well known to be unfavorable to honey bees. Their unattractiveness may lie in the high level of potassium in onion nectar and limited nectar rewards. Onion floral resources can vary by genotype, with some onion varieties being more attractive to honey bees than others (in part due to a higher sucrose content), as well as by environmental factors, including field and weather conditions. For example, under higher temperatures, as onion nectar increases in viscosity it becomes less preferred by honey bees.

The negative correlation that we found between honey bee activity and number of insecticides applied per field site (including tank mixes with more than one insecticide) suggests that insecticide use to control onion thrips control may be affecting crop pollination and seed set, perhaps by killing or repelling honey bees. This would help explain the significant yield declines in Colusa County during the past 5 years, which occurred concurrently with an increase in insecticide use. However, to confirm a causal relationship, more information is needed on the specific effects of different classes of insecticides on honey bee activity. In addition, cultivar choice can play a role in honey bee activity and needs to be further investigated with respect to pesticide use and bee activity.

Our study suggests that growers should exercise caution when using insecticides, applying them only when needed as opposed to preemptively, to better protect both wild and honey bee pollinators. Also, the negative correlation between field size and honey bee activity suggests that spreading honey bee colonies around onion fields rather than grouping them may increase honey bee activity and pollination in larger fields.

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