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# Monitoring and control of pest mirid species in the UK using sex pheromones

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# Damage to UK horticultural crops



- *Lygus rugulipennis*  
European tarnished  
plant bug  
(strawberry, raspberry,  
cucumber)



- *Lygocoris pabulinus*  
Common green capsid  
(apple, pear,  
blackcurrant,  
raspberry)



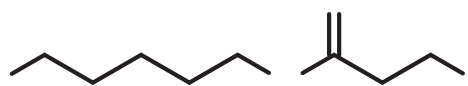
# Mirids are common and polyphagous

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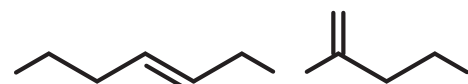


- Sporadic and unpredictable
  - Damage at low densities
  - Natural enemies (e.g. *Peristenus*) do not maintain populations at low levels, no biocontrols
  - Sampling methods unsuitable for growers
  - Controlled with broad-spectrum insecticides - not IPM compatible (e.g. WFT in strawberry!)
  - Serious damage in organic crops
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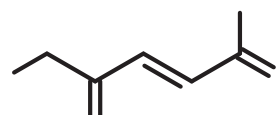
# Pheromones of *Lygus* species



hexyl butyrate (HB)



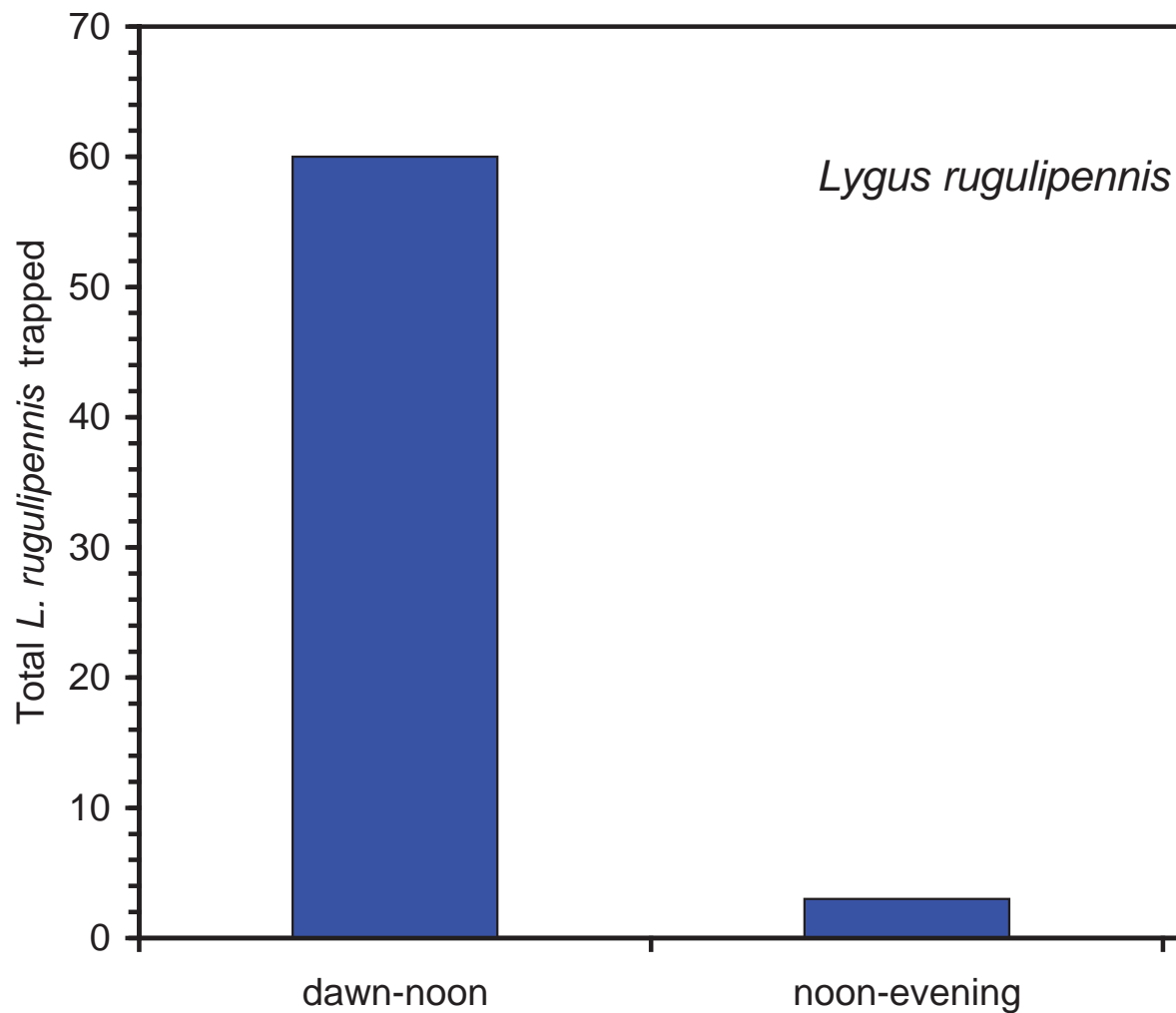
(*E*)-2-hexenyl butyrate (E2HB)



(*E*)-4-oxo-2-hexenal (KA)

- ◆ Produced in metathoracic glands
- ◆ Used both for “defence” and as pheromones
- ◆ Ketoaldehyde difficult to stabilise and dispense
- ◆ Research goes back > 30 years (Gueldner and Parrott, 1978)
- ◆ No satisfactory attraction in field

# Males attracted to females at dawn

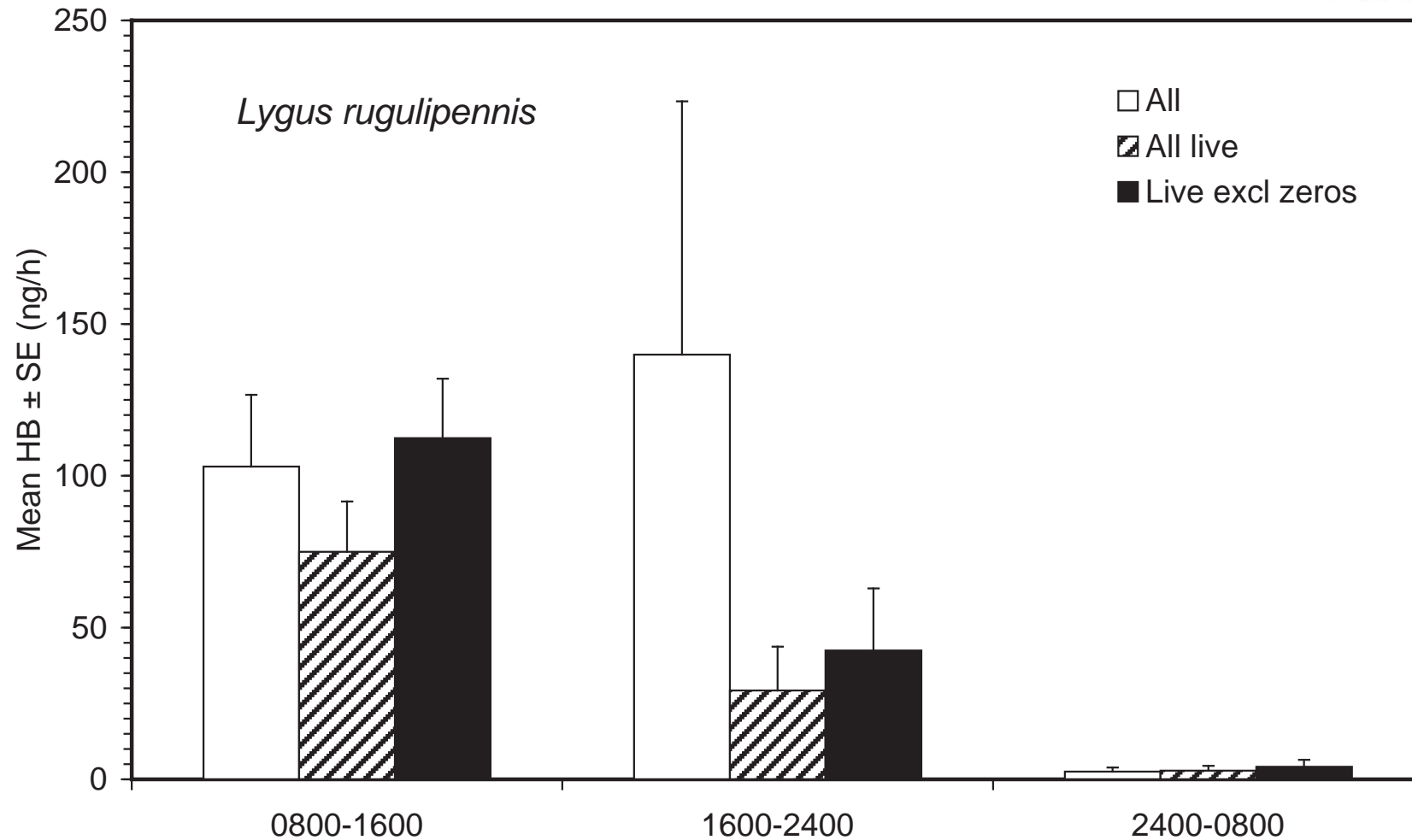


# Air entrainment



- Collected pheromone from single, undisturbed virgin females and males at different times of day

# Time of release of pheromone components coincides with attractiveness of virgin females



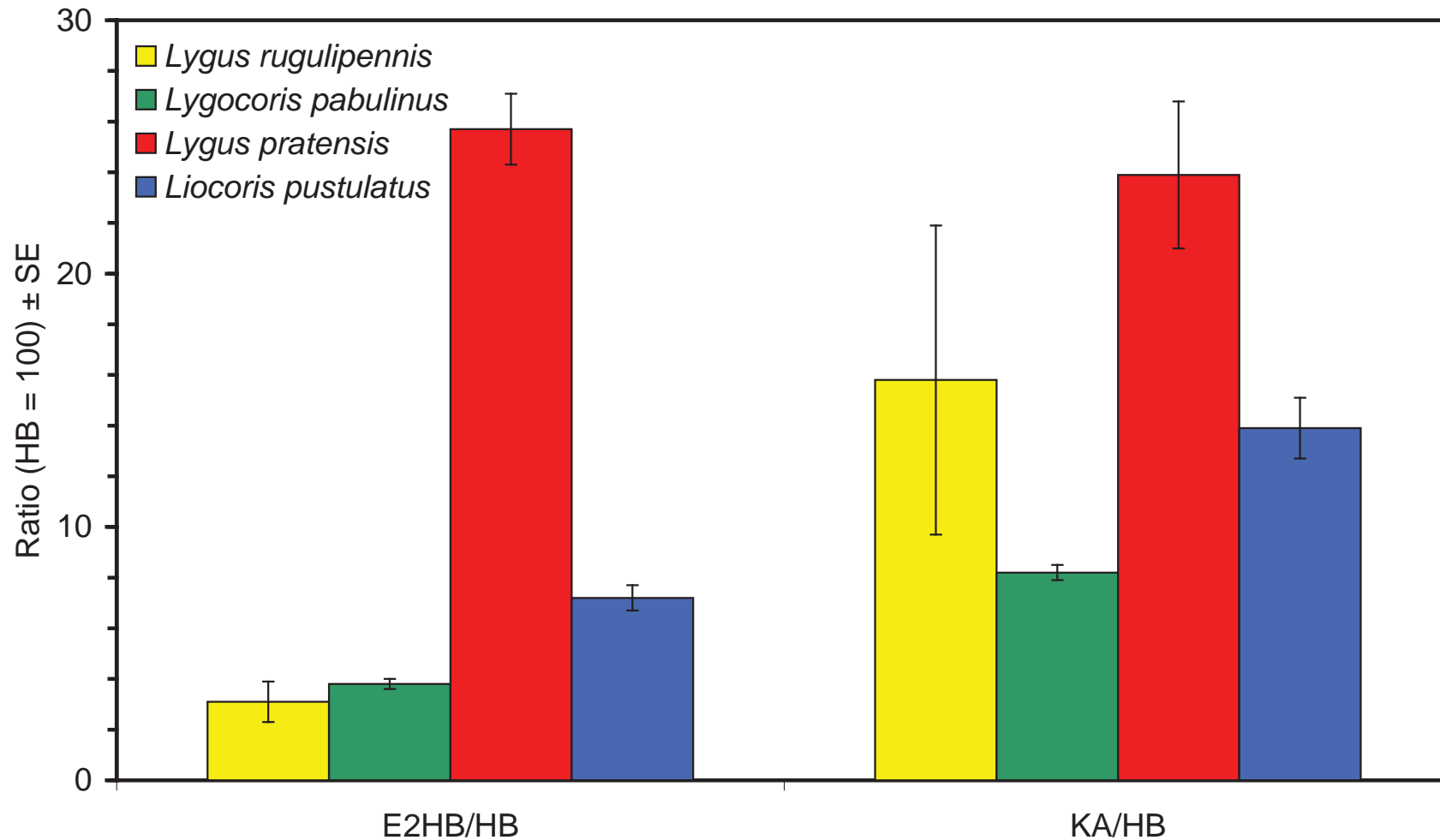
- Very different ratio – E2HB and KA much lower!

# Attraction to synthetic lure

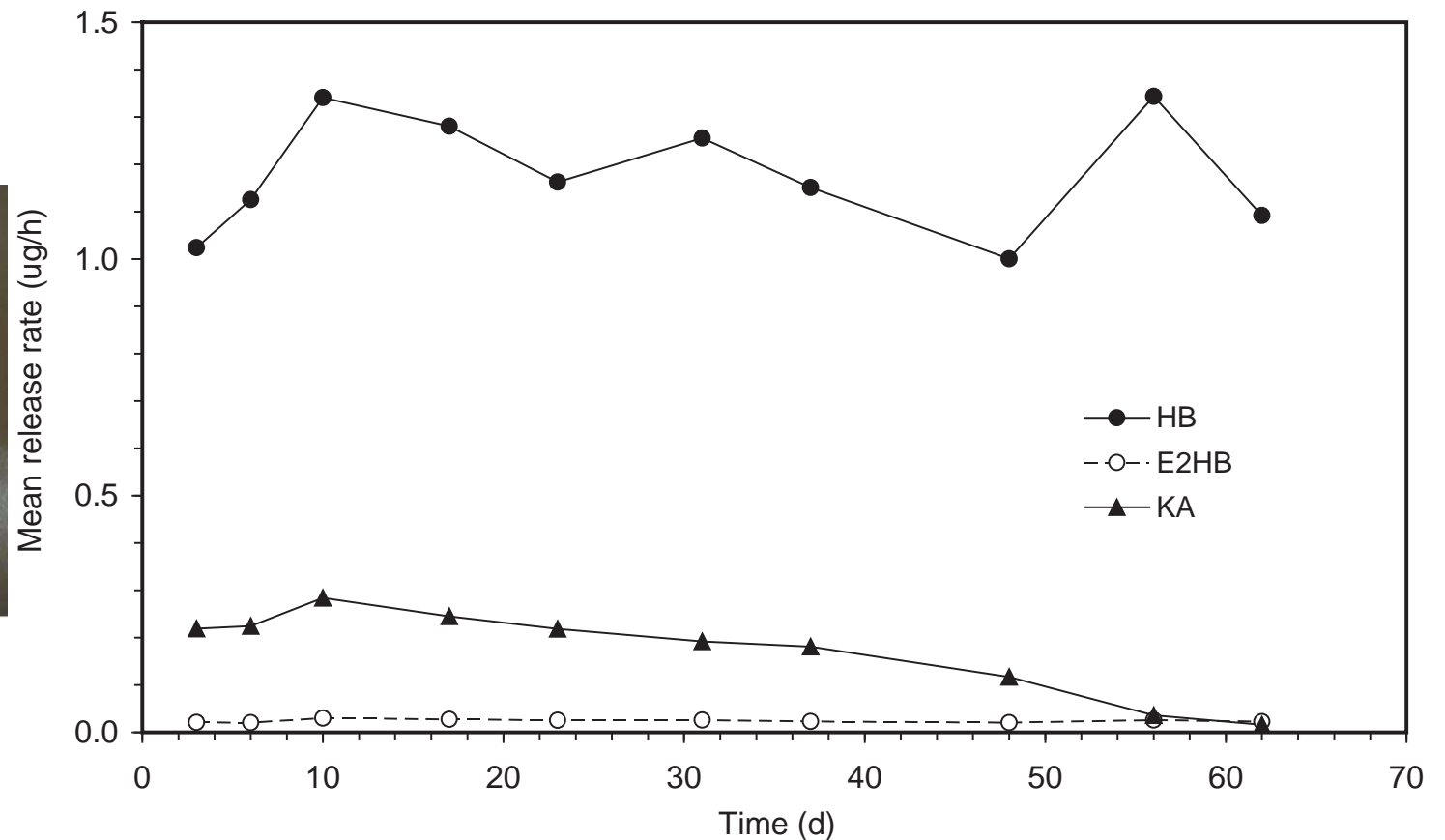




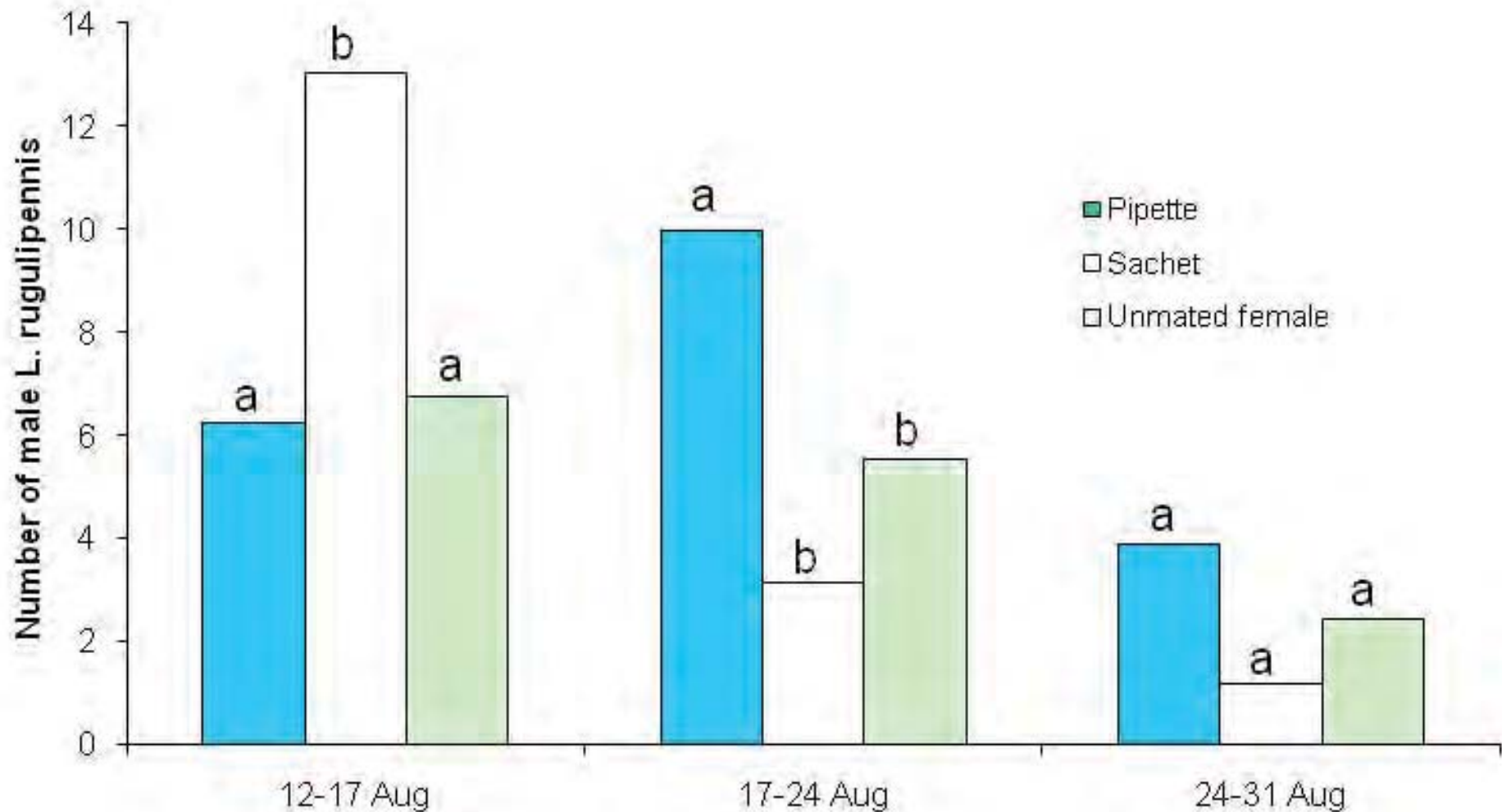
# Relative amounts of components species-specific



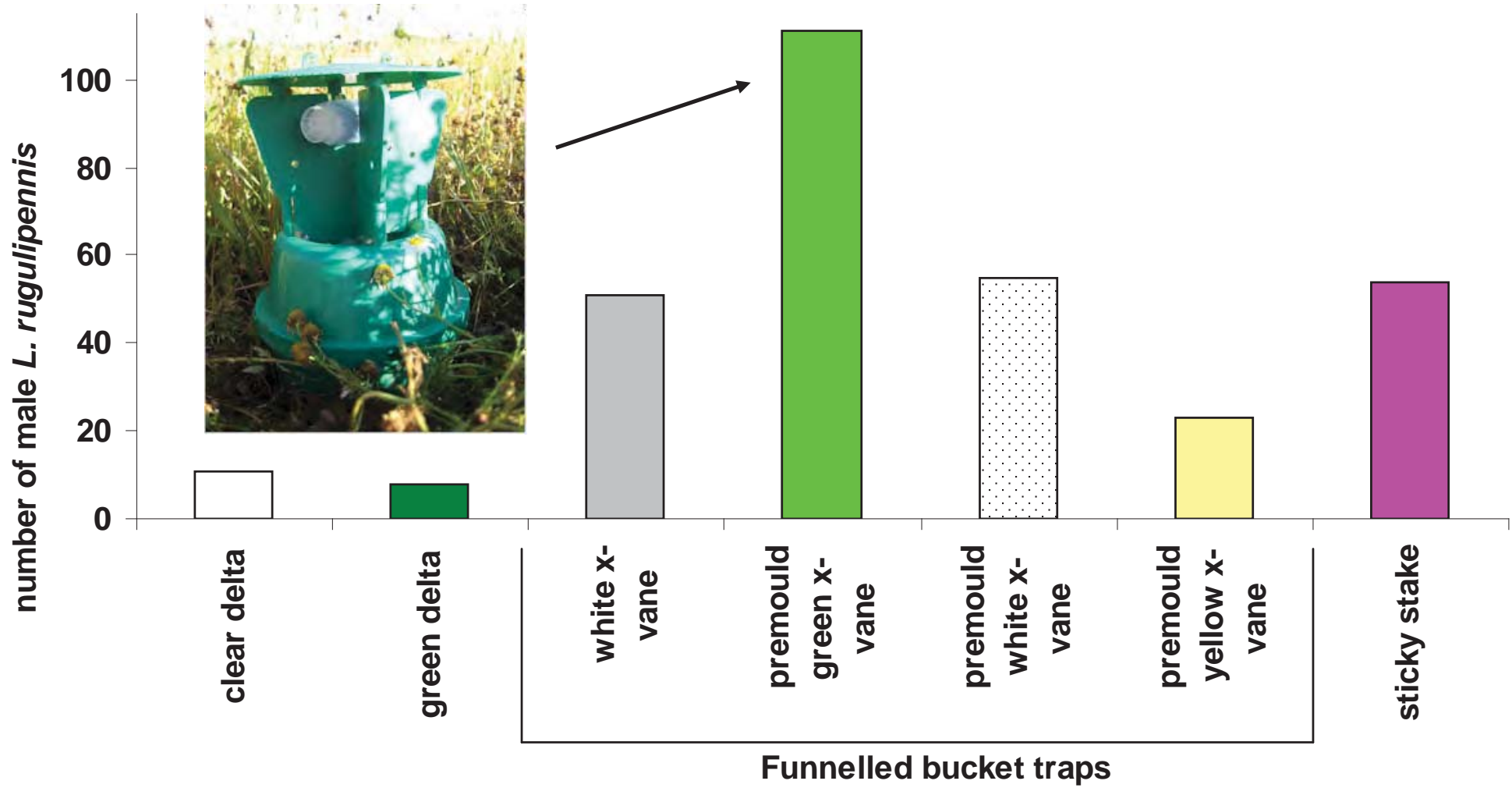
# Pipette tip dispensers provide sustained release of all three components at appropriate rate



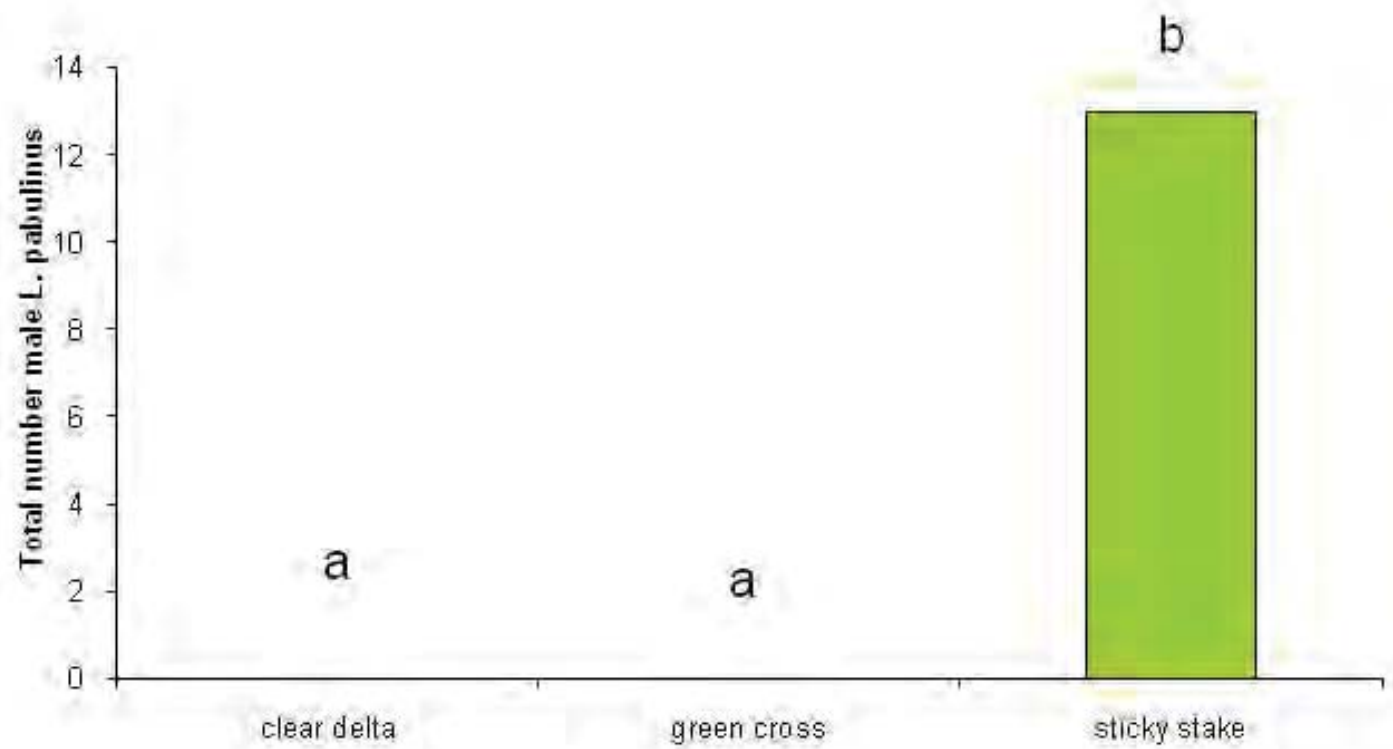
# Pipette tip dispensers provide sustained attraction in field $\geq$ attractiveness of female



# Trap design



# Trap design



# Different trap designs for different species

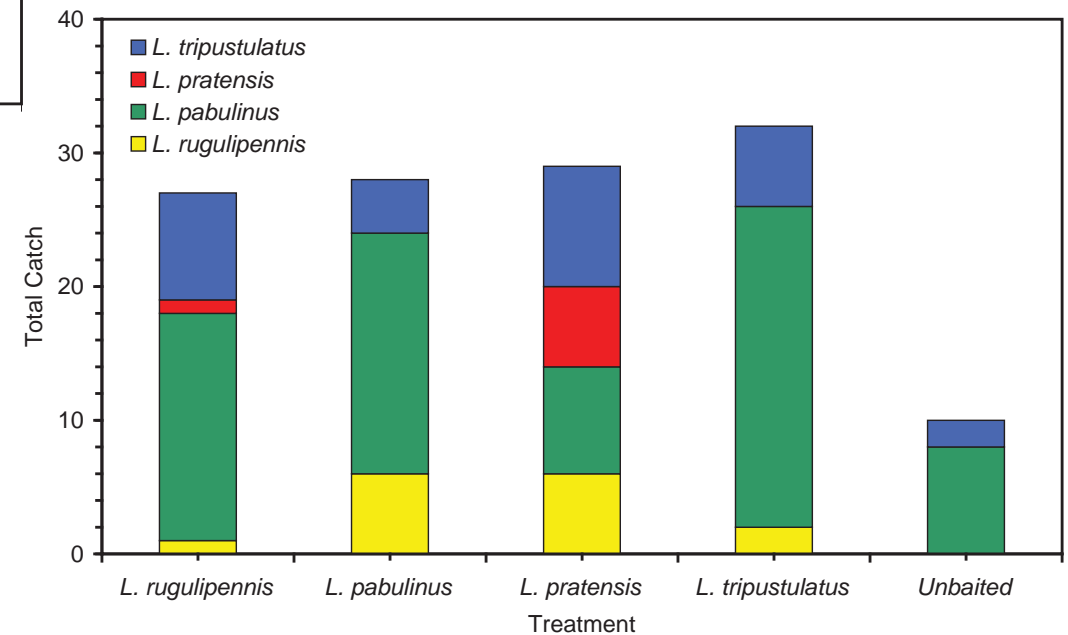
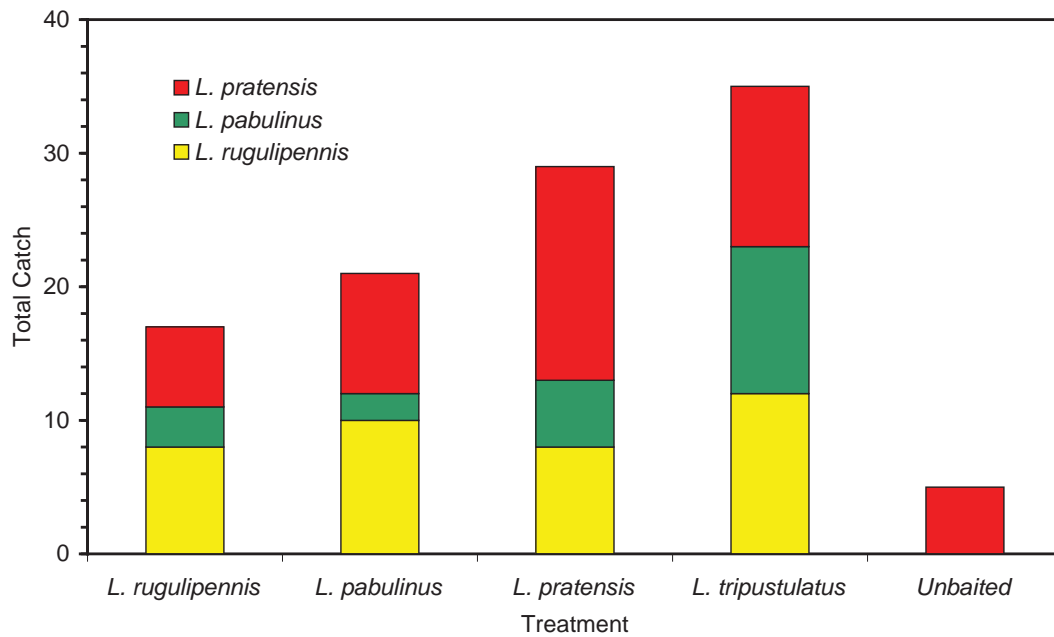


*Lygus rugulipennis*

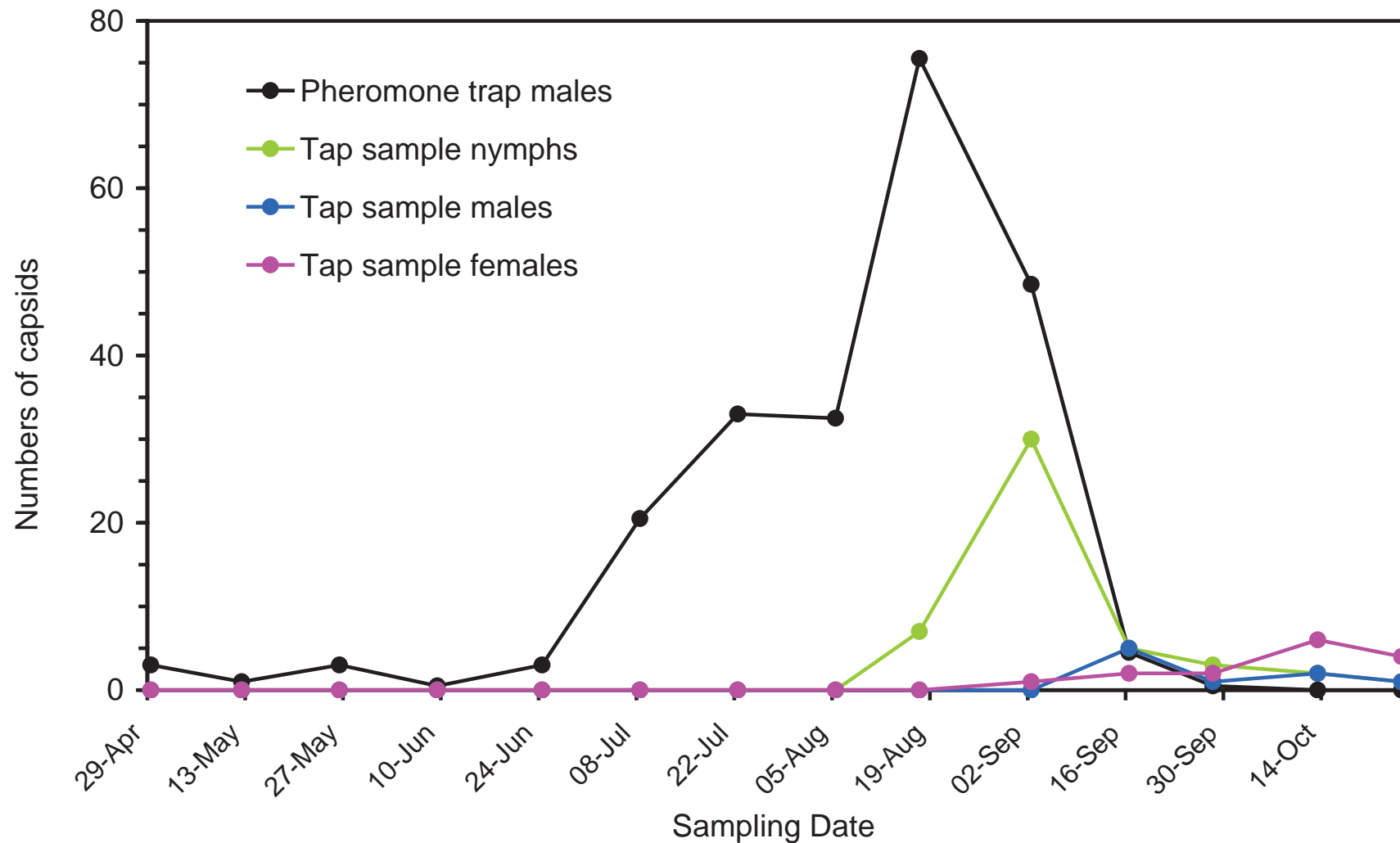


*Lygocoris pabulinus*

# Blends not so specific in field trapping



# Pheromone traps provide sensitive early warning of infestation





# Traps now commercially available



Recommendations for the use of the European tarnished plant bug (*Lygus rugulipennis*) pheromone trapping system



**Species Name**  
*Lygus rugulipennis* (Family: Miridae)  
European Tarnished Plant Bug (ETPB)

**Identification**  
ETPB is 5.0-6.0mm long, broad bodied, dark brown/red-black in colour, usually with a white 'V' shaped mark behind its head (Figure 1). Adults are capable of flight, nymphs which are green with small spots on the back, are wingless.

**Pest status and damage**

A sporadic pest of many fruit crops and glasshouse salad crops including strawberry (Figure 2), raspberry, cucumber and pepper. ETPB feeds by puncturing plant tissues and sucking sap causing malformation of fruits and shoots and stunting of new growth. Damage may occur any time from May-September.

**Generations**

There are up to 3 generations per season, depending on location and climate.

**Trap**

A green cross-vane funnel trap is recommended. If not already pre-assembled, attach cross vanes and lid to funnel section of the trap. Add approx. 50ml of water (with a drop of detergent) into bucket. Wire through the holes at the top of cross vanes and on trap into ground. The base of the trap should be at ground level. Place lure, point down, through the hole in the basket at the top of the trap. The lure will extend into the space between the cross vanes (Figure 3). NB: Only adult male capsids are attracted to the traps.



**Trapping Season**

The traps should be in place from May, when the first generation of adults normally appear, and maintained until the end of the season (May-October). It should be noted that the exact time of insect emergence will vary with location and season. In protected crops ETPB may occur earlier.

**Trap placement and density for monitoring**

In outdoor crops traps should be placed towards the edges of fields (Figure 4), particularly where bordered by weedy areas or areas known to be a source of ETPB in previous seasons. For cucumber crops, place in a weedy area outside the glasshouse (Figure 5). Two traps should be sufficient to monitor up to 2 hectares of a uniform plantation. Higher numbers are recommended in the case of irregular fields, or in problematic areas where damage has occurred in the past.



**Change of lures and trap servicing**

Check traps (Figures 6 & 7) and renew water and detergent weekly. Lures should be stored in a refrigerator and changed every 4 weeks. Keep cross vanes clear of dirt and foliage and ensure the hole in the funnel is not blocked. It is not necessary to remove the wire when checking the trap. Simply lift the trap slightly and unscrew the bucket to view the contents.



**Observations and Data Recording**

Catches should be recorded once per week on a record sheet.

**Threshold**

For outdoor crops apply a product effective against capsids 2 weeks after a trap catch of 10 adults per trap (or a steep rise in numbers). In cucumber the trap gives a 7-10 day warning of capsids entering the glasshouses.

**Selectivity**

The lure will also attract the common green capsid, but this is more effectively monitored for using a blue sticky trap.

Recommendations for the use of the common green capsid (*Lygocoris pabulinus*) pheromone trapping system



**Species Name**  
*Lygocoris pabulinus* (Family: Miridae)  
Common Green Capsid (CGC)

**Identification**  
CGC is 5.0-6.5mm long, bright green and slimmer than the European tarnished plant bug. The green colour fades after the capsid has died. It has long legs and antennae (Figure 1). Adults are capable of flight, but the bright green nymphs (no spots on back) are wingless. NB: nymphs are not attracted to traps.

**Pest status and damage**

A sporadic pest of many fruit crops including apple, strawberry (Figure 2), blackcurrant (Figure 3), cane fruit (especially blackberry and raspberry), grapevines, some hardy ornamental varieties and vegetable crops (e.g. beans and celery). CGC feeds by puncturing plant tissues and sucking sap, causing malformation of fruits and shoots and stunting of new growth. Damage may occur any time from May-October especially under protection.



**Generations**

There are up to 3 generations per season, depending on location and climate.

**Trap**

Push the wooden holder through the holes in the blue sticky card to form a cylinder and push into the ground in an area clear of vegetation (so insects can fly onto the trap). Remove outer paper cover. Attach the lure using a twist tie at the top of the trap, ensuring that the lure is hanging point down towards the centre of the blue sticky (Figure 4). NB: Only adult male capsids are attracted to the traps.



**Change of lures and trap servicing**

Renew the sticky card and holder weekly. Lures should be stored in a refrigerator and changed every 4 weeks.

**Observations and data recording**

Catches should be recorded once per week on a record sheet.

**Threshold**

Apply a product effective against capsids 2 weeks after a trap catch of 10 adults per trap, or when a trap catch rises steeply.

**Selectivity**

The lure will also attract the European tarnished plant bug, but this is more effectively monitored using a funnel trap.

**Trapping season**

Place the traps in the plantation before the first adults appear and maintain them until the end of the season. This is usually from April to October, but possibly earlier in protected crops. It should be noted that the exact time of insect emergence will vary with location and season.

**Trap placement and density for monitoring**

The traps should be placed towards the edges of fields (Figure 5), particularly where bordered by hedgerows, areas of nettles etc. Two traps should be sufficient to monitor up to 2 hectares of a uniform plantation. Higher numbers are recommended in the case of irregular fields, or in problematic areas where damage has occurred in the past.

This trapping system was developed by a Delta HortLINK Project (H2 0106) which included the following partners: Berry Gardens Growers Ltd, HDC, GARDENERS, East Malling Research, Natural Resources Institute, East Malling Trust, East Malling Ltd, Cucumber Growers Association and Dorcas J Moor. Design and print funded by HDC on behalf of the consortium.



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# Conclusions

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- Lygus species use 3 components in female sex pheromones
  - Females produce species-specific blends, but males respond to wider range of blends
  - Species-specificity ensured by other, non-chemical factors – e.g. time of pheromone production
  - Pipette tip dispensers - effective dispensing system for pheromone components in field, including (E)-4-oxo-2-hexenal
  - Trap design critical: conventional designs not suitable
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