



Investigation of the effect of alternative management strategies on distribution of Brown Marmorated Stink Bug *Halyomorpha halys* (Hemiptera: Pentatomidae) in commercial hazelnut orchard



Maka Murvanidze – Agricultural University of Georgia

Nino Insaradize – Tbilisi State University

Greg Krawczyk – Penn State University

Aims and Tasks of the research

Main Goal

- Study of distribution and level of damage of *H. halys* in hazelnut orchards using tools of integrated pest management

• Tasks:

- Study of growth and the population dynamics of *H. halys* in unmanaged (control) blocks of hazelnut orchard;
- Comparison of the efficacy of the different management (A&K stations, boarder spray, grower's standard)
- Study of degree of damage of hazelnut caused by *H. halys*;

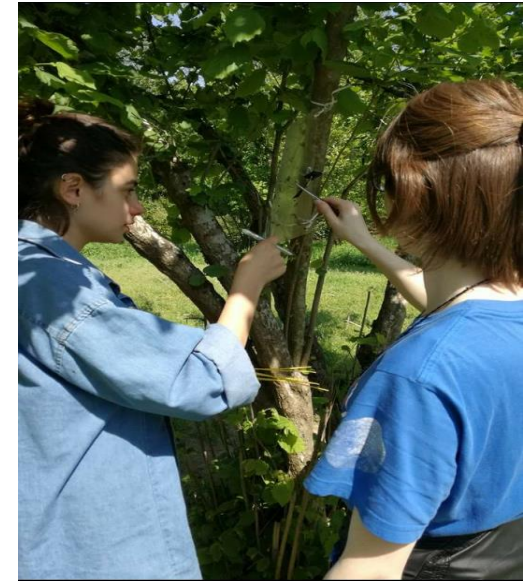
Experiment design



- Yellow stars indicate placement of treated trees
- Green rings indicate placement of sticky traps
- Distance between A&K stations – 100m
- Each A&K station was equipped by 5 lures
- A&K treated tree were placed outside the orchard

Sampling and monitoring

- Installation of sticky traps and A&K stations on April 24
- Periodical replacement of sticky traps and pheromones (according to instructions)
- Weekly monitoring of sticky traps and A & K stations
- Making records
- Taking samples
- Monitoring on CTR and GS blocks from April 28
- Monitoring on A&K and BRD blocks from June 23.



Pesticide application scheme

Date	Where	Pesticide and Dosage
29.04	all blocks	450 l = 3.5 kg Kocide + 800mlg Zonder
15.05	GS 1 - GS 2	400 l = Mistik - 0.5l+ Superkill Forte - 1.5l Lanate (1.5l) + Mistik (0.5l) + Prius (0.8l) + Trend (0.25l) +
31.05	GS 1 - GS 2	400lwater
	CTR 2	Mistik (0.125l) + Prius (0.200l) + Trend (0.065l) + 100l water
11.06	GS 1 - GS 2	Lanate (1.5l) + Mistik (0.5l) + Prius (0.8l) + Trend (0.25l) + 400lwater
18.06	A&K BRD whole	0.1l Zonder + 24l water
22.06	territory	Lanate
25.06	BRD	0.1l Zonder + 24l water
	BRD	0.1l Zonder + 24l water
10.07	GS 1 - GS 2	0.1l Zonder + 24l water
20.07	BRD	0.1l Zonder + 24l water
1.08	BRD	0.1l Zonder + 24l water
8.08	BRD	0.1l Zonder + 24l water
22.08	BRD	0.1l Zonder + 24l water
1.09	BRD	0.1l Zonder + 24l water
9.09	BRD	0.1l Zonder + 24l water

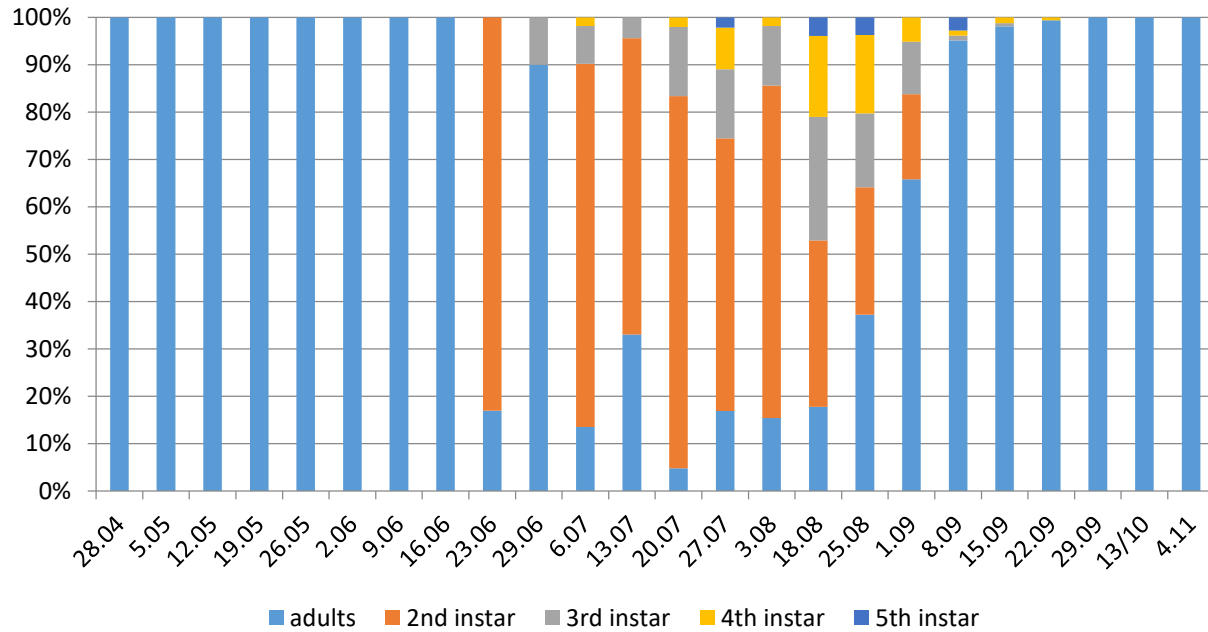
Pesticide descriptions:

- Lanate** - 200g/l metomile - system insecticide
- Mistik** - Tebukonazol 250g/l - system fungicide
- Prius** - Pyrimethanil 400 g/l - grey molt; Trend - 90% water solution of ethoxylated isodecile alcohol – sticker
- Kosaide** - Copper (II) 8% + Hydroxyl 53 – bactericide

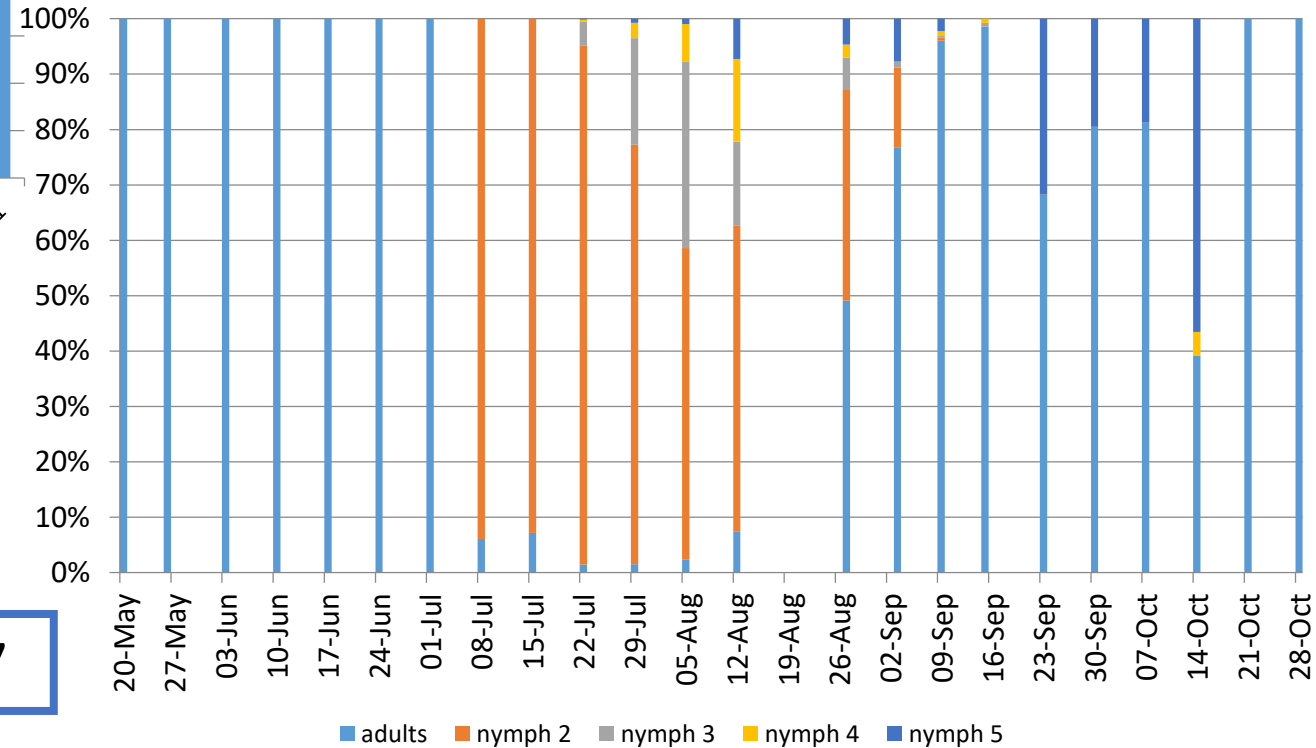
Evaluation of hazelnut quality

- Hazelnut quality was monitored twice on each plot within one month interval – June 30 and July 24 (the day before harvest)
- On **A&K** and **BRD** plots hazelnuts were picked from 50 trees in total, while 25 trees were located in the perimeter of the orchard and 25 – in its interior
- From each tree 10 hazelnuts were randomly collected, which makes 1000 hazelnut from each block
- On **CTR** and **GS** blocks four trees were monitored with two trees in the perimeter and two – in the interior of each block.
- From each tree 10 hazelnuts were randomly collected, which makes 160 hazelnuts in total.

Phenology of BMSB on unmanaged orchards

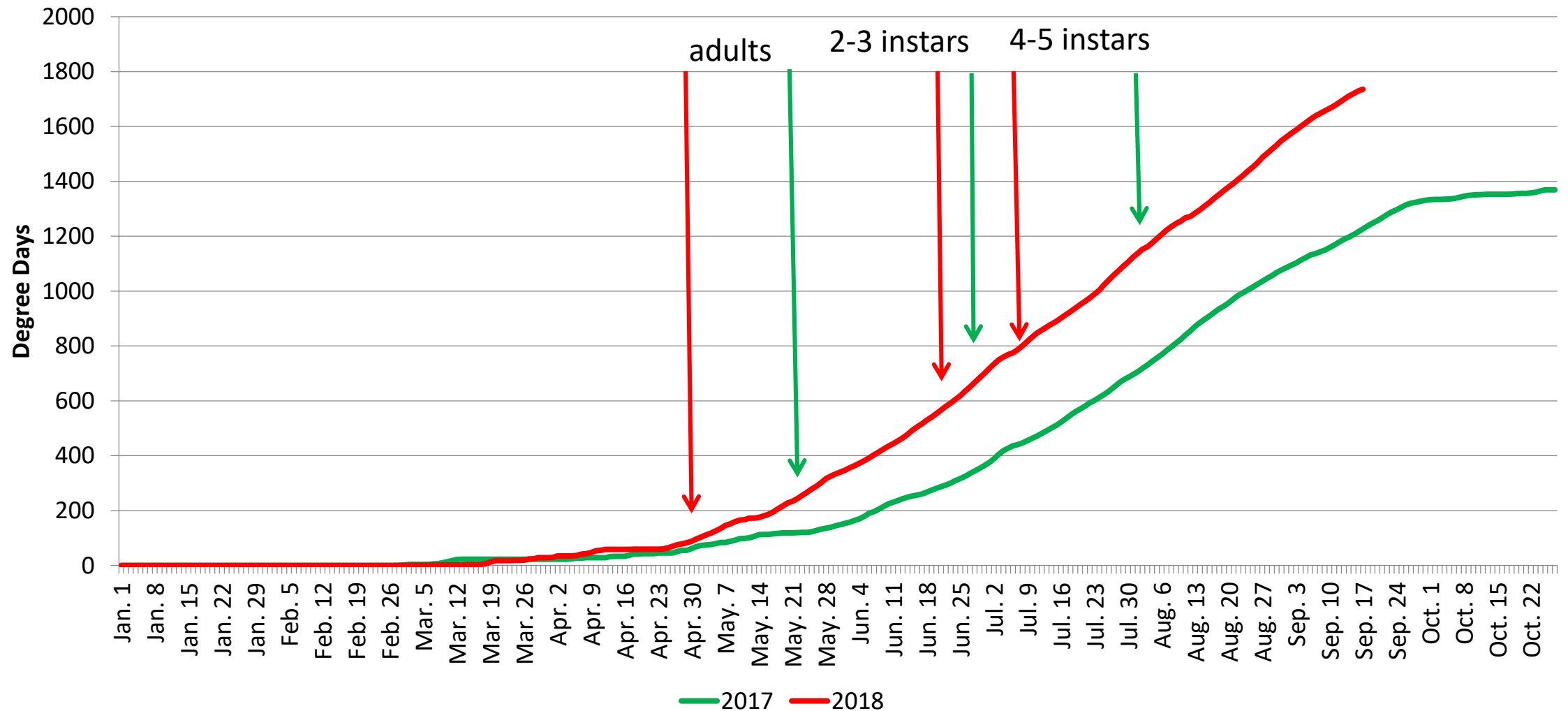


2018

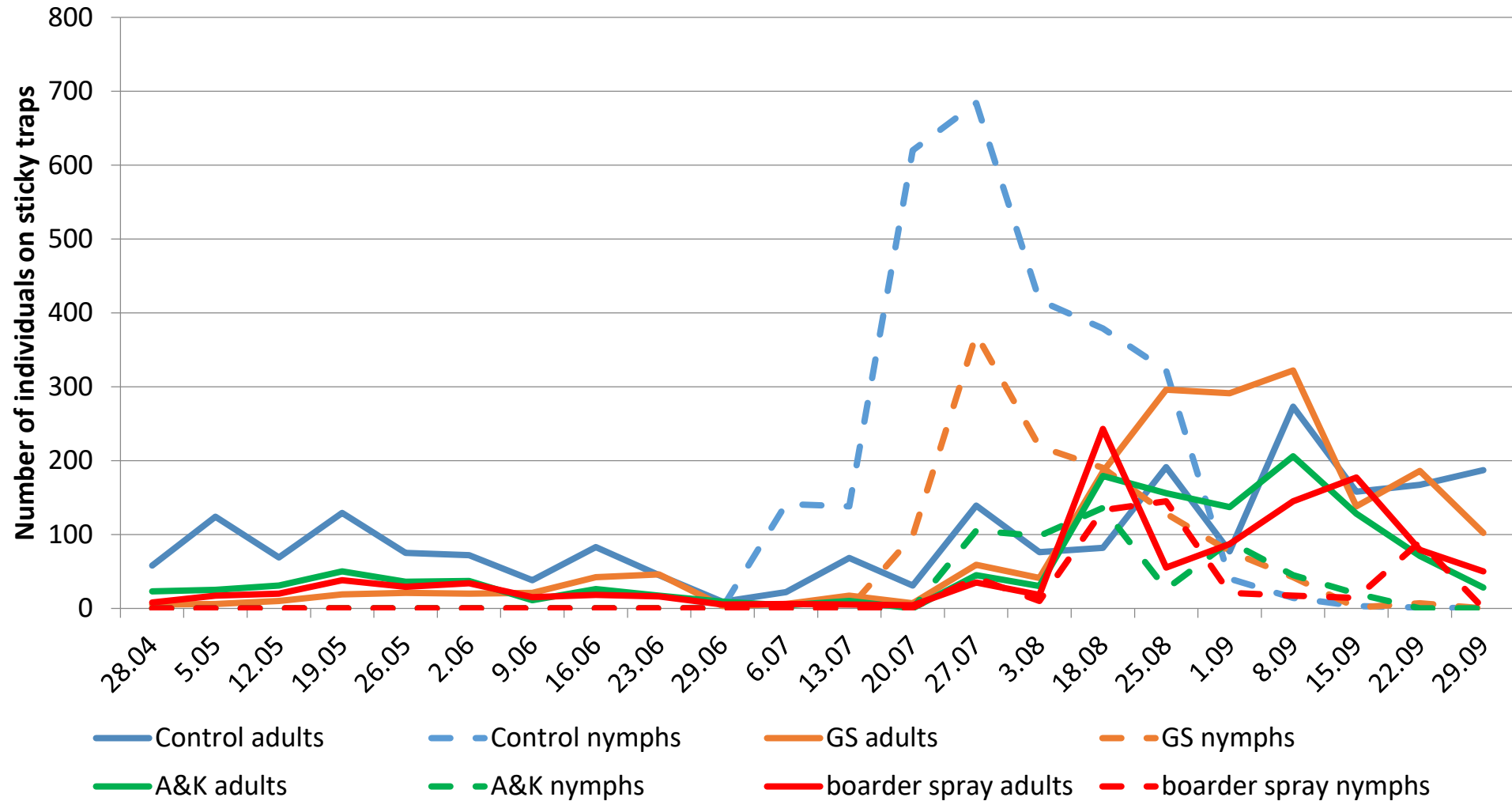


2017

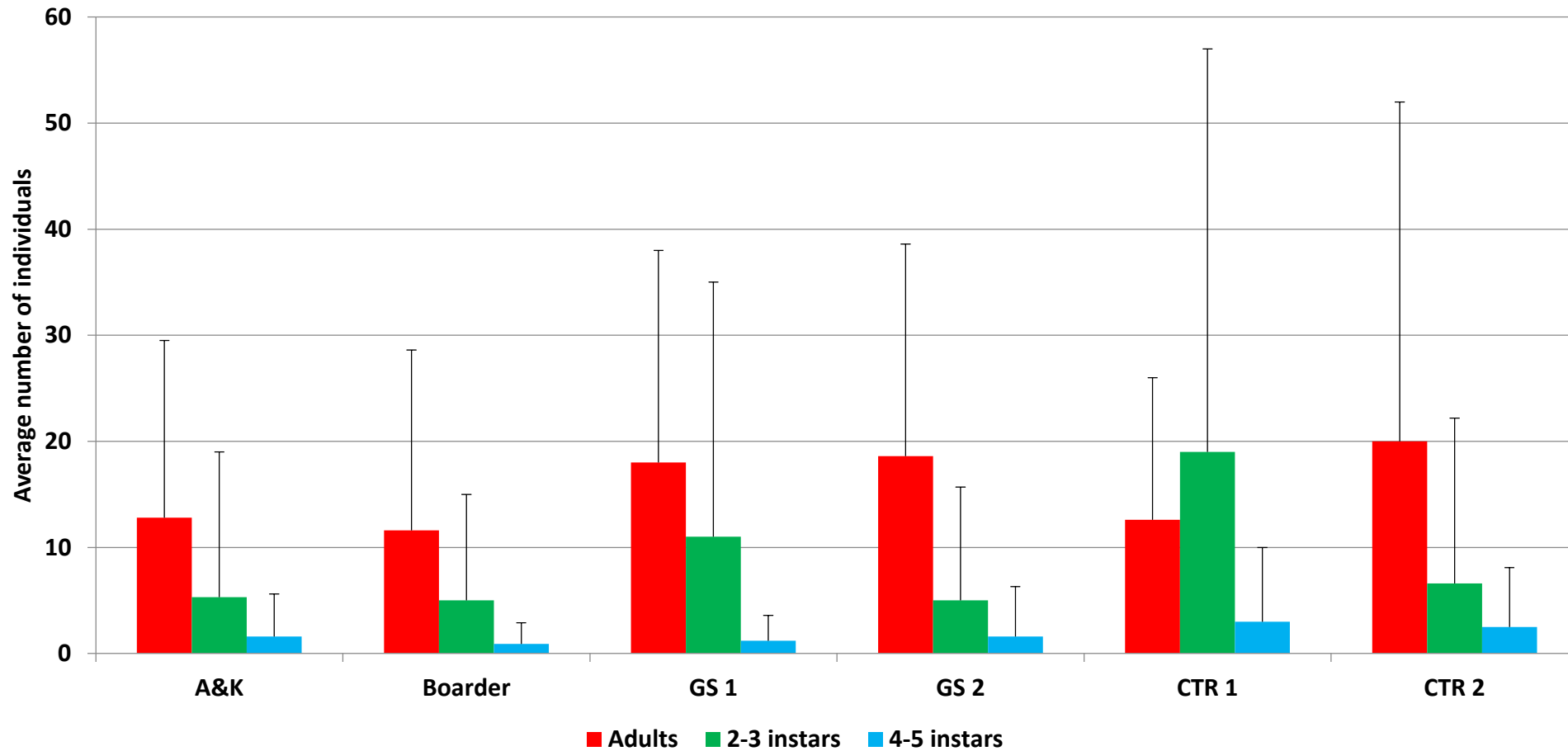
Phenology of BMSB on unmanaged orchards



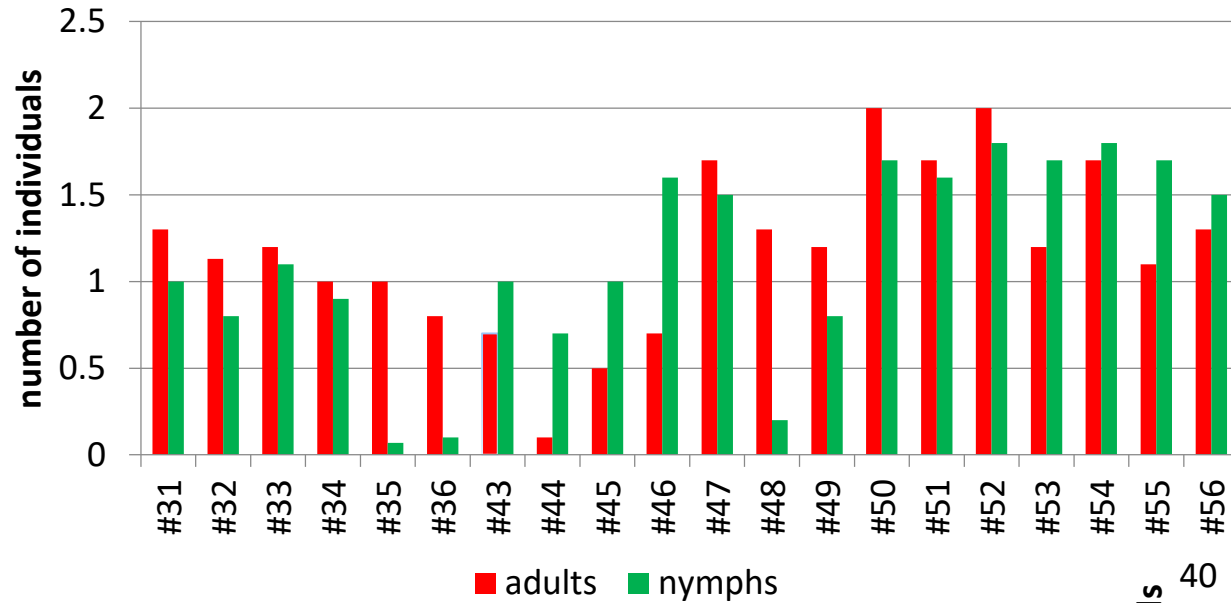
Numbers of BMSB adults and nymphal instars in managed and unmanaged blocks



Average numbers of *H. halys* adults and nymphal instars in plots with different management strategies.

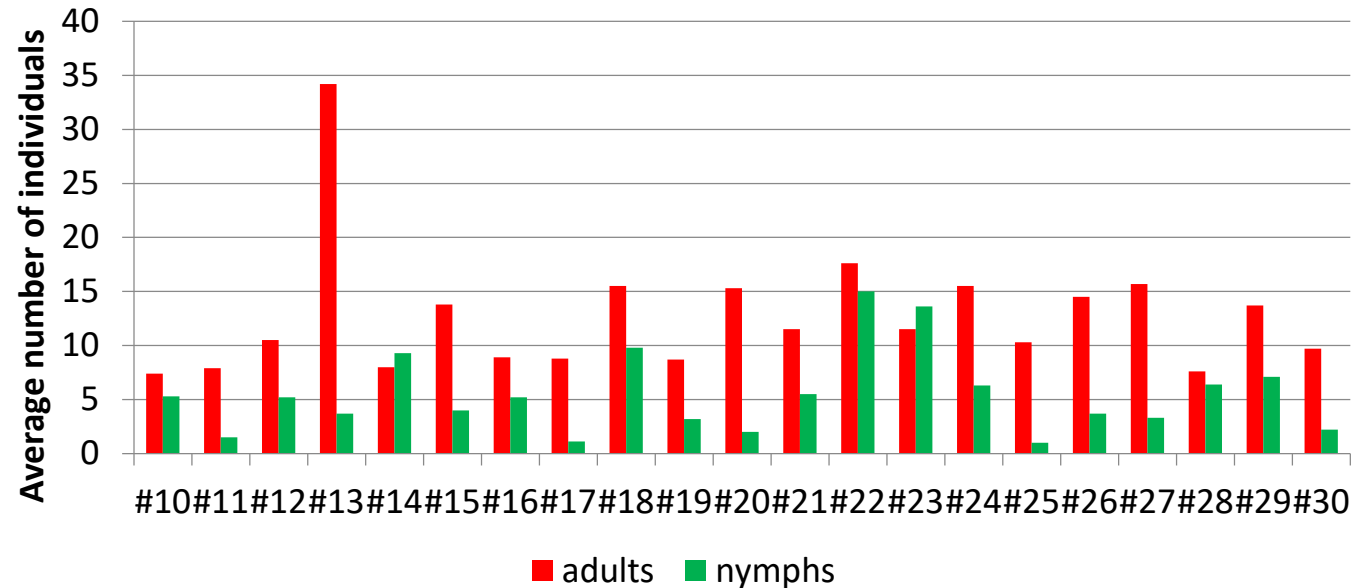


Numbers of individuals of *H. halys* per trap

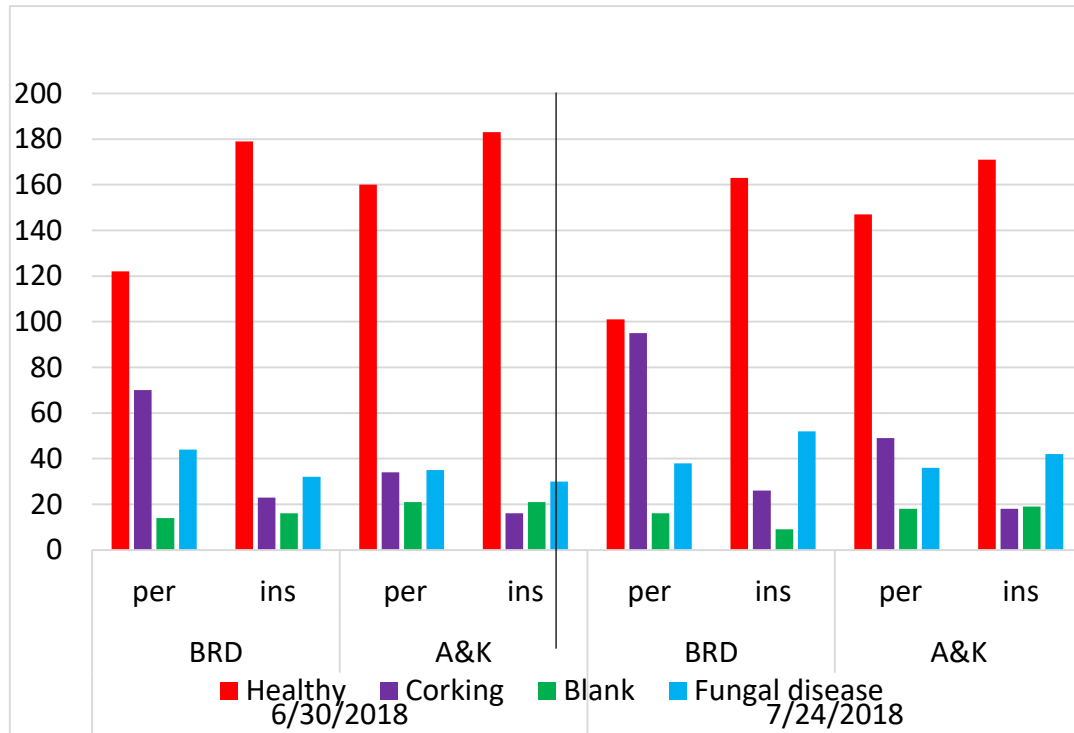


Number of *H. halys* adults and nymphal instars on A&K stations and A&K sticky traps. Data were log transformed. Traps 43-56 show A&K stations out of the orchard

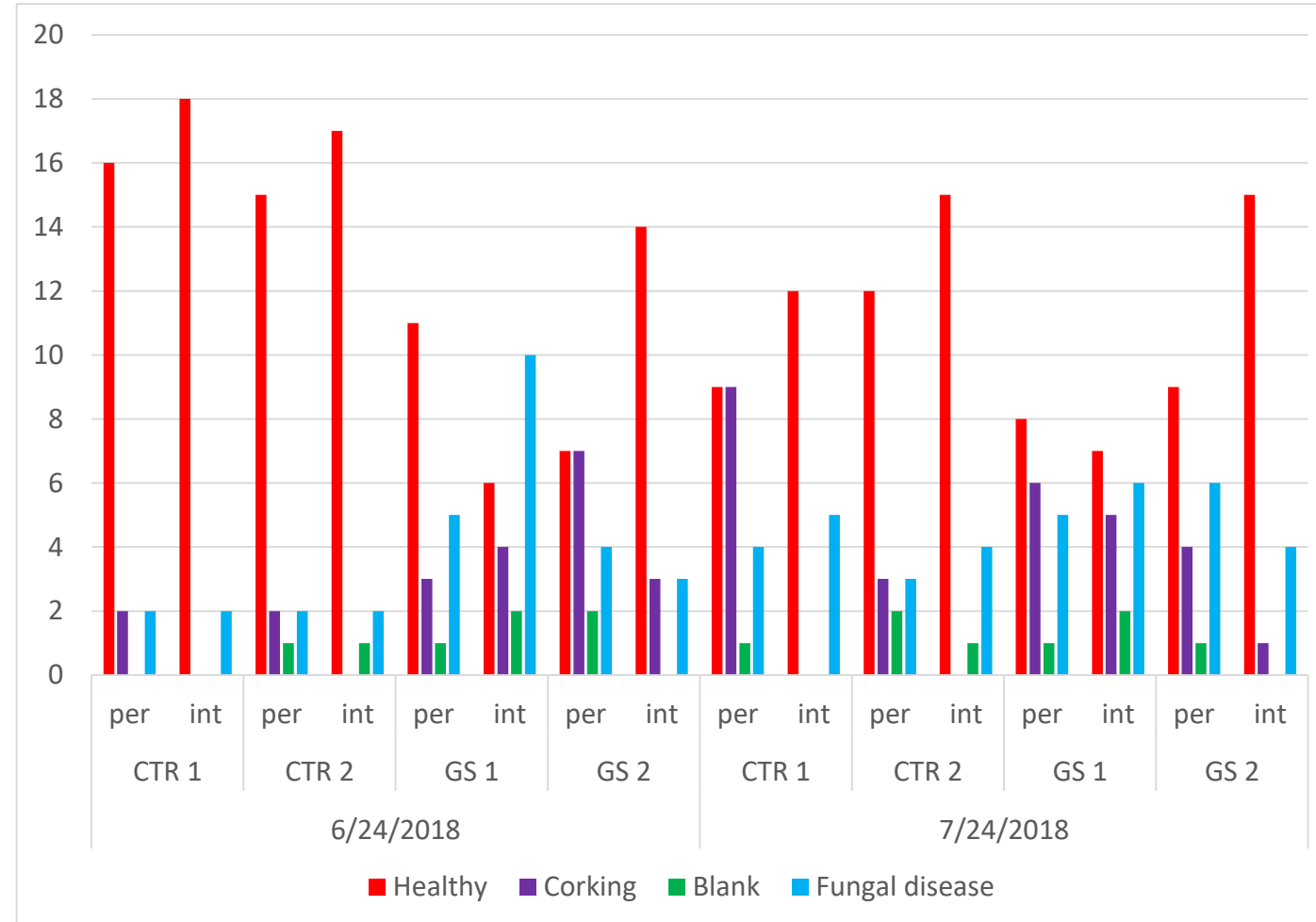
Average number of *H. halys* adults and nymphal instars per trap on GS and CTR plots. Traps 11, 12, 16, 19, 20, 21, 28, 29, 30 are located in the interior of blocks



Estimation of hazelnut quality on experimental plots

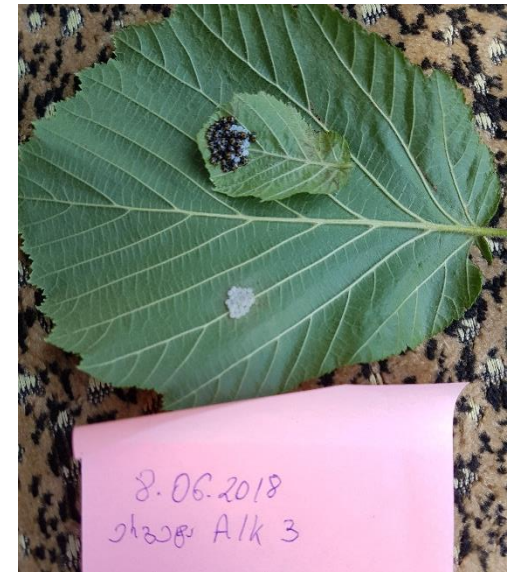


Healthy kernels – increase from perimeter to interior
 Corking damage – decrease from perimeter to interior
 Fungal diseases – higher in perimeter (but not always)
 Blank kernels – no difference



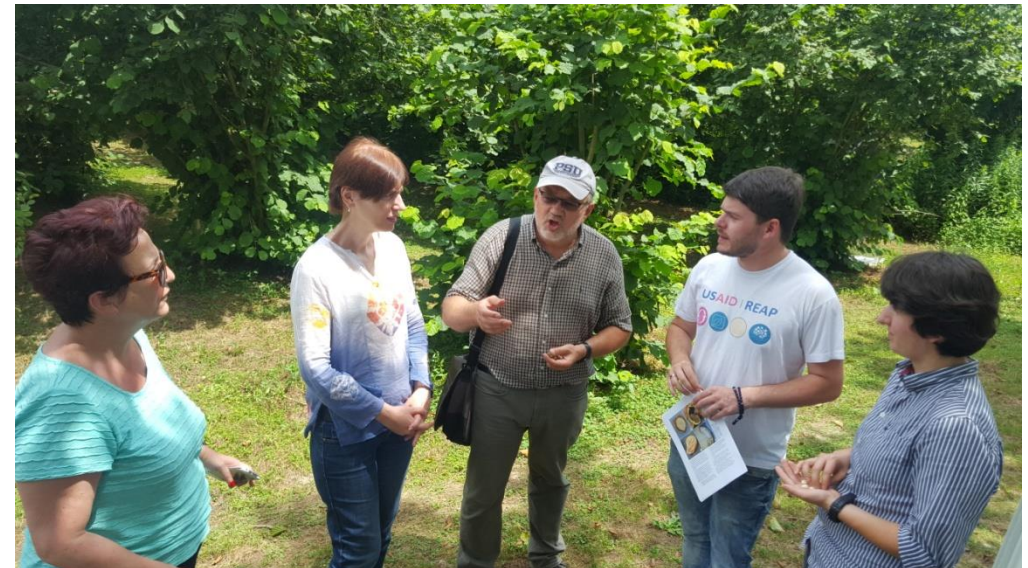
Summary

- First BMSB adults appeared in orchards on 28 April
- From the end of April to 23.06 only the adults were found
- First eggs were found on 8.06 by visual observation
- First 2nd instars were found on CTR1 at 23.06.2018
- Finding of 2nd instar nymphs to the end of September supports earlier statement on minimum two generations of *H. halys* in Georgia
- A&K approach has been showed to be very effective in killing of high number of stink bugs through the growing season showing better effectiveness compared to the Grower's standard application scheme ($p < 0.05$)
- Application of pesticides around the perimeter of the hazelnut orchard protected the interior much better than Grower's standard scheme ($p < 0.05$) and slightly better than A&K approach
- Our investigation confirmed *H. halys* as a perimeter driven insect by showing higher per trap captures on the borders of orchards compared to the interior
- BMSB damage on hazelnut decreased from boarder to the interior of orchard



Acknowledgements

- USAID/REAP project
- Tbilisi State University
- National Food Agency
- Marika Kodua
- Demetre Lipartia and Revaz Shonia



Thanks for your attention !

