

2019, Sublethal effects of clothianidin, a neonicotinoid insecticide that alters bee behavior and chlorantraniliprole, a bee friendly insecticide, on movement, pollen consumption, reproduction, and hive health

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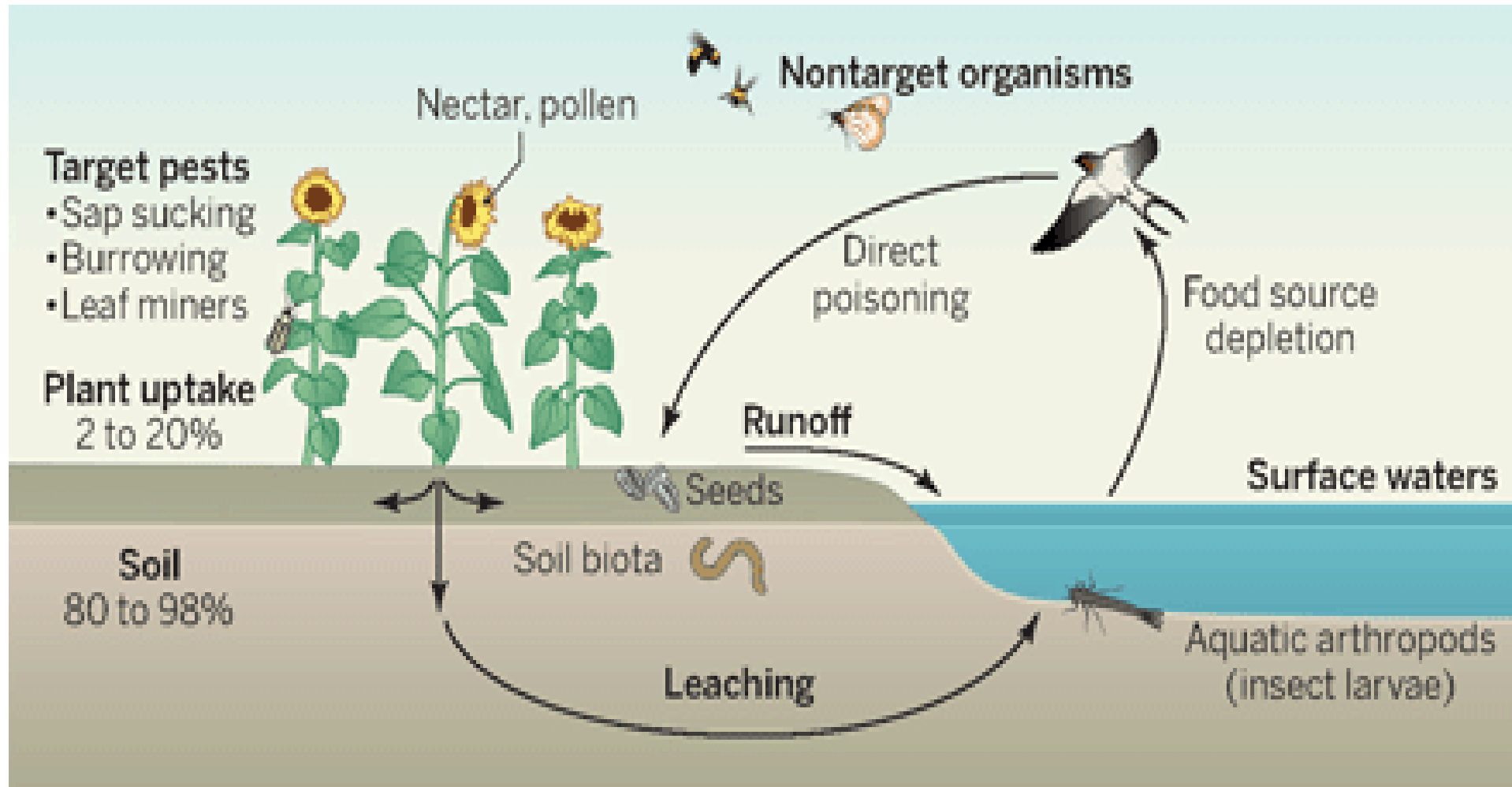


★	Queen	y
★	Worker	34
★	Brood 1	0
★	Brood 2	0
★	Brood 3	33
★	Empty Honey Pot	40
★	Full Honey Pot	129

**Understanding the partial contribution
of pesticides to bee mortality and
developing BMP to mitigate mortality,
IPM is part of BMP**



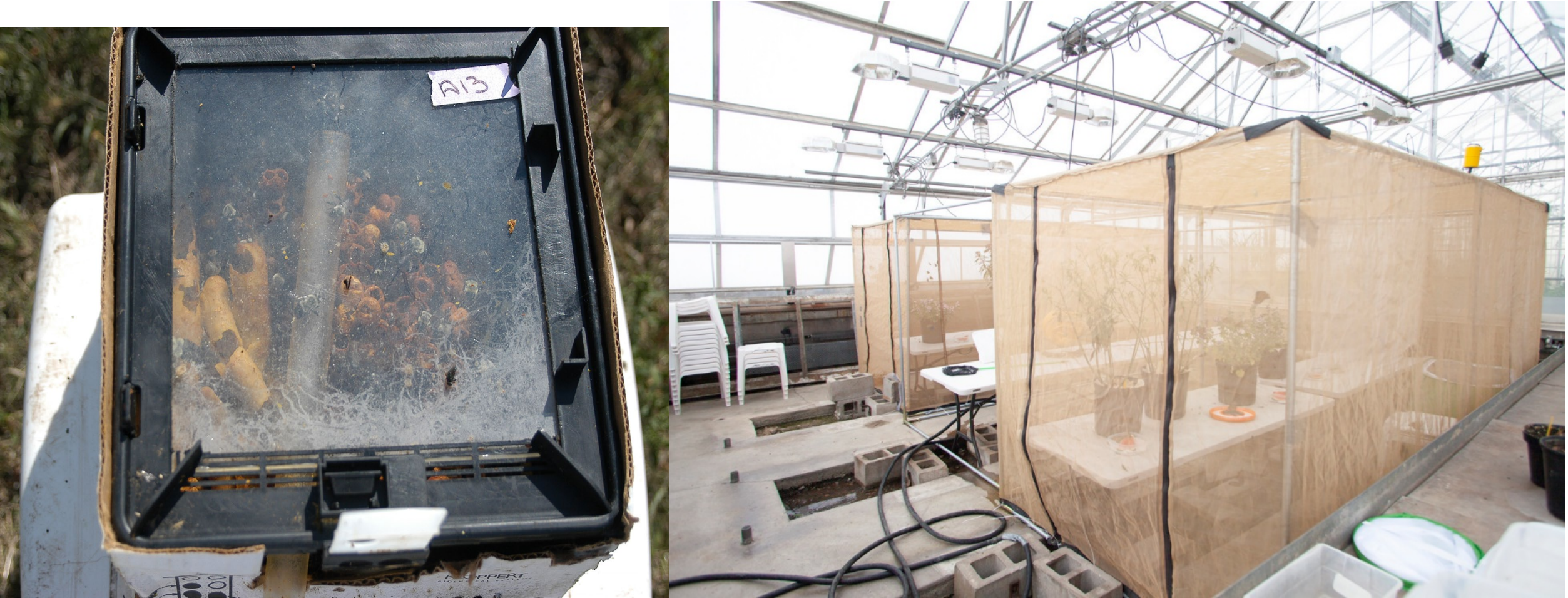
Neonicotinoid birds + bees: Fate of neonicotinoids + pathways of environmental contamination (Sanchez-Bayo 2014 Science)



Why are neonicotinoids so much more toxic to bees compared to other insecticides?

- **Receptors in bees not in mammals**
- **Adjuvants increase toxicity**
- **Alters behavior +foraging at sublethal doses**
- **Water soluble**
- **Binds with soil**

2019, Sublethal effects of clothianidin, a neonicotinoid insecticide that alters bee behavior and chlorantraniliprole, a bee friendly insecticide, on movement, pollen consumption, reproduction, and hive health of the native, common bumblebee *Bombus impatiens*



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I participated in a study with bumble bees in the greenhouse in large tents. Bumbles were assigned to 3 treatments (n=8hives/trt); controls 0 ppb insecticide, clothianidin 20 ppb, and chlorantraniliprole 4ppm.

Clothianidin provide in sugar syrup resulted in decreased movement, pollen consumption, colony weight, bee movement, and brood production.

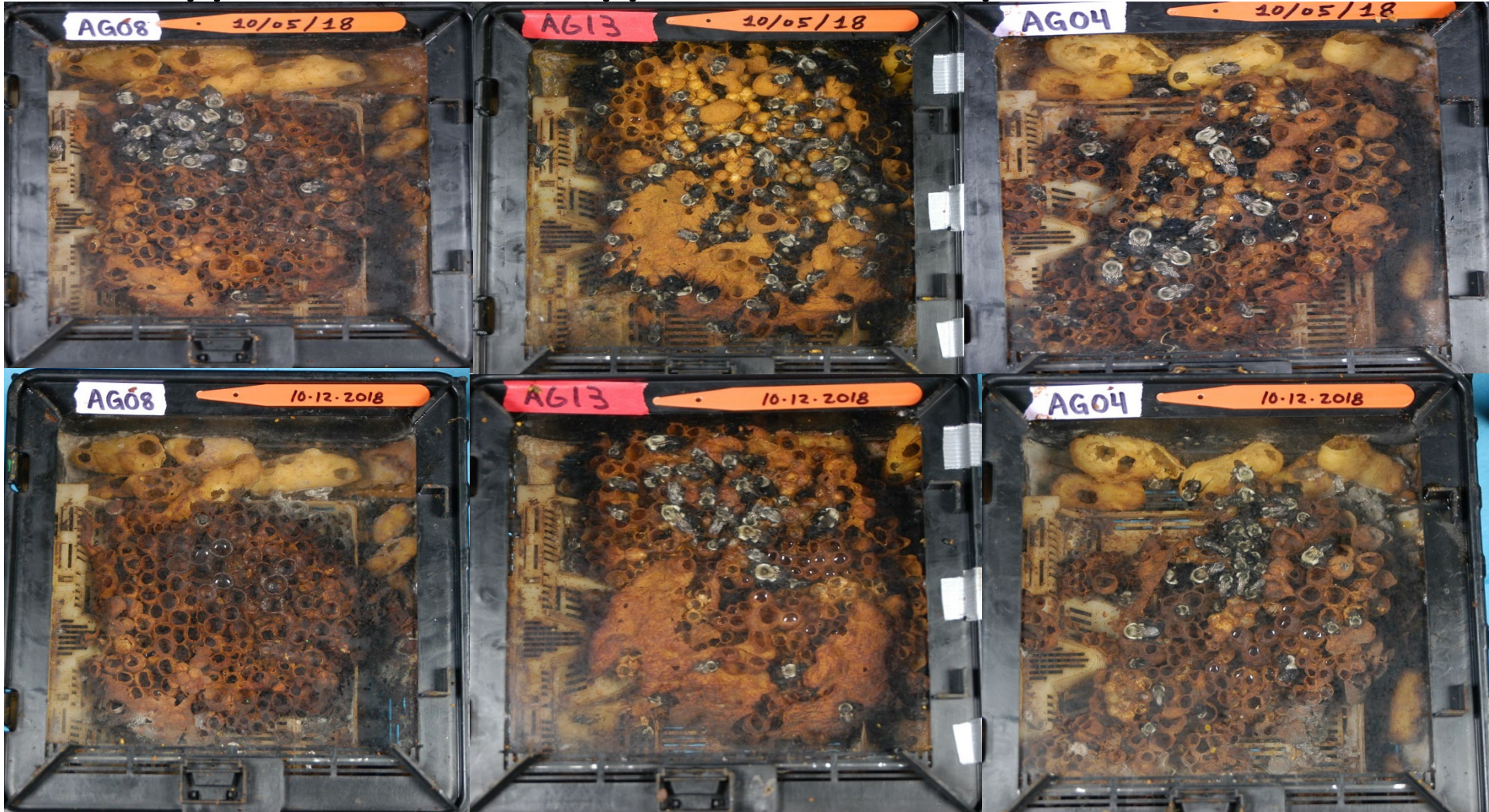
Chlorantraniliprole at 4ppm was no different than controls for all measurements of bee and colony health.

Measuring colony growth thru time



2018 field exp Bumble bees at 2 and 3 wks, clothianidin trts starts to decline at 2 wks, fungus

20 ppb clothianidin 4ppm chlorantraniliprole control



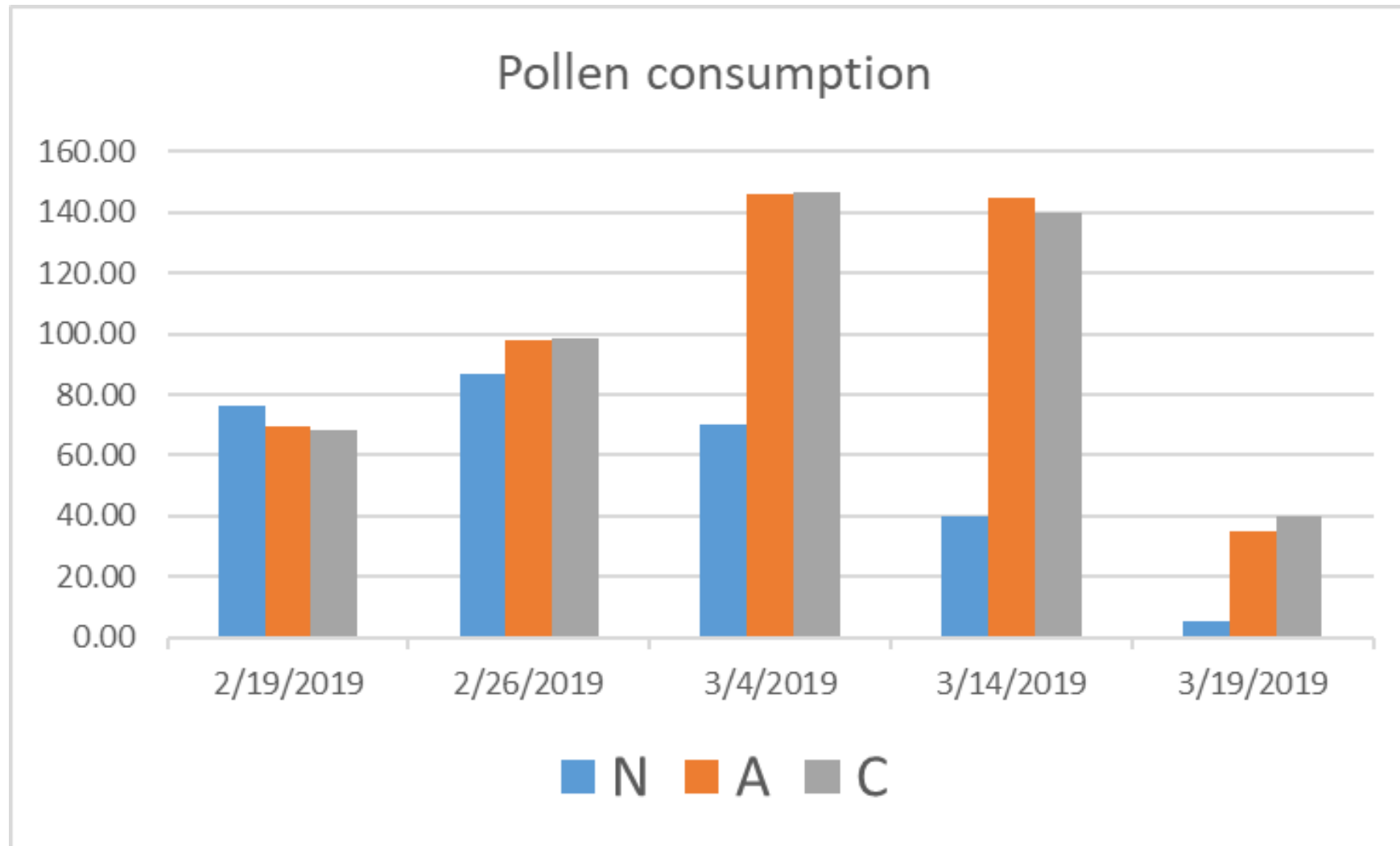
Bumblebee (8/trt) pollen consumption (g) over time

clothianidin treatment eat less pollen over time

n= blue, clothianidin, class neonicotinoid, highly toxic to bees

A= orange, chlorantraniliprole, a bee friendly insecticide

c= grey, control



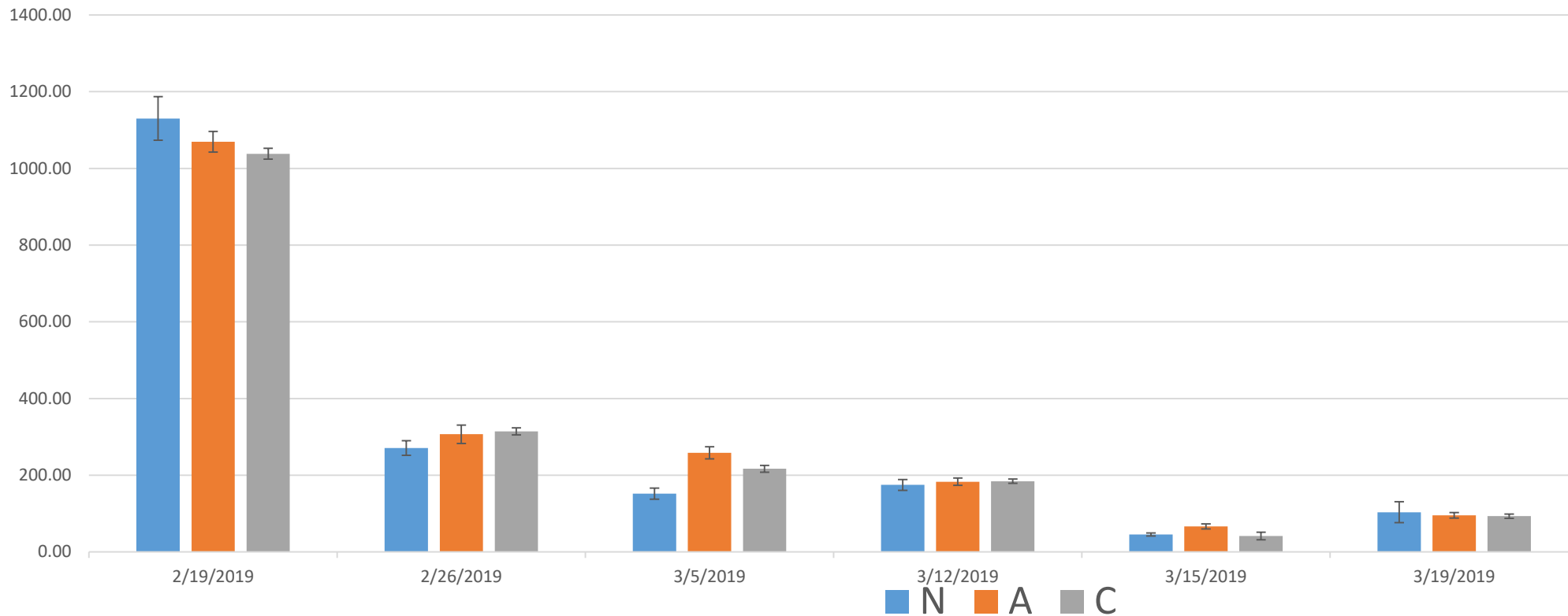
Bumblebee (8/trt) sugar syrup consumption (g) over time clothianidin treatment eat similar amounts over time

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Beehappy consumption



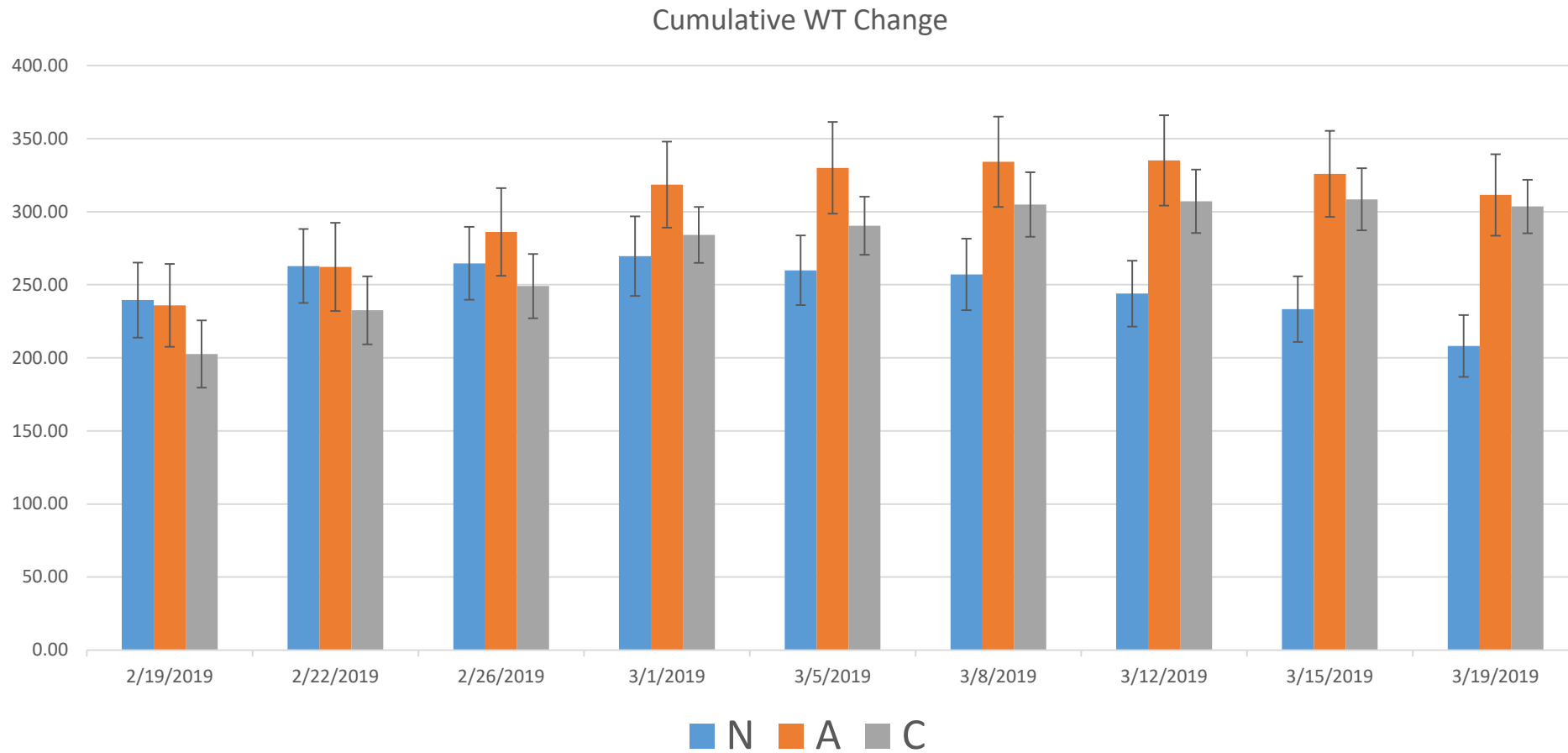
Bumblebee (8/trt) colony weight (g) over time

clothianidin treatment has less weight over time

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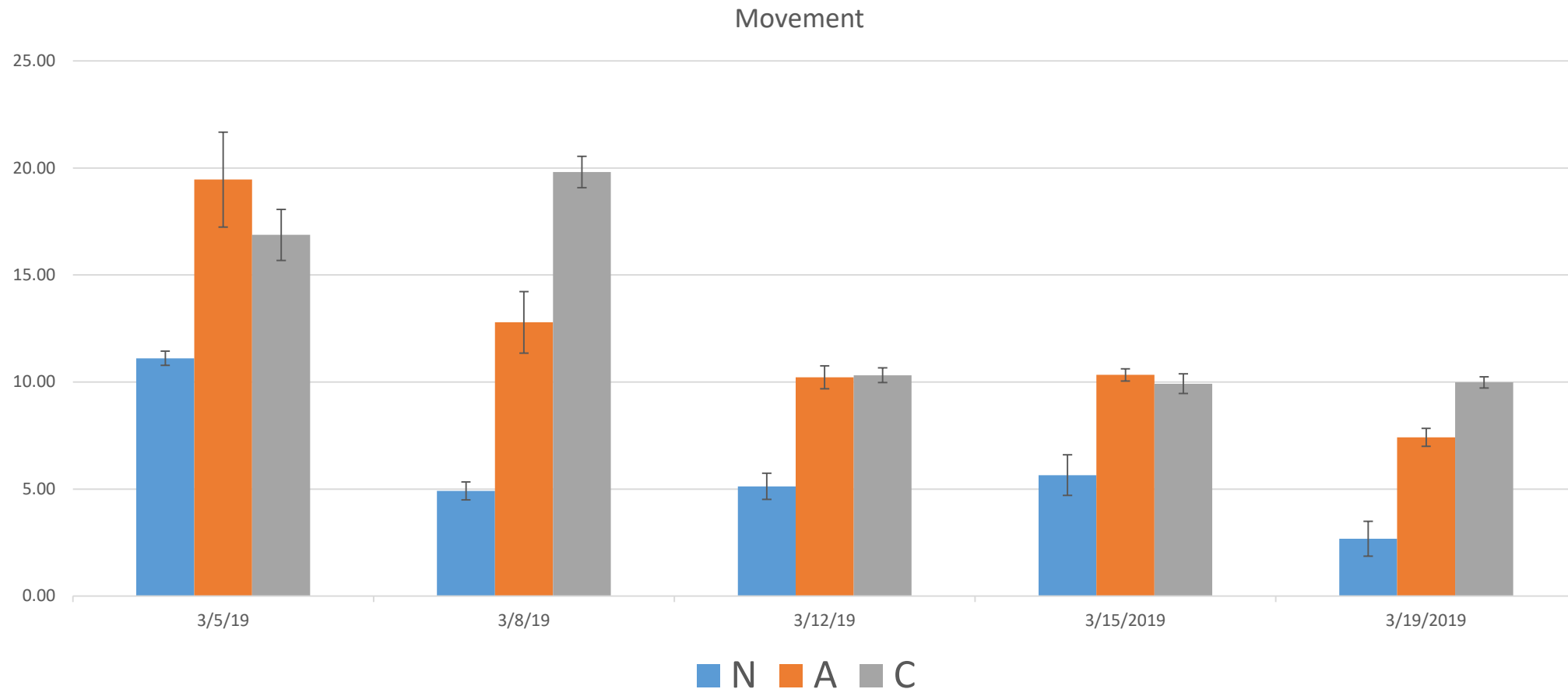
Bumblebee (8/trt) colony movement over time

clothianidin treatment has less movement over time

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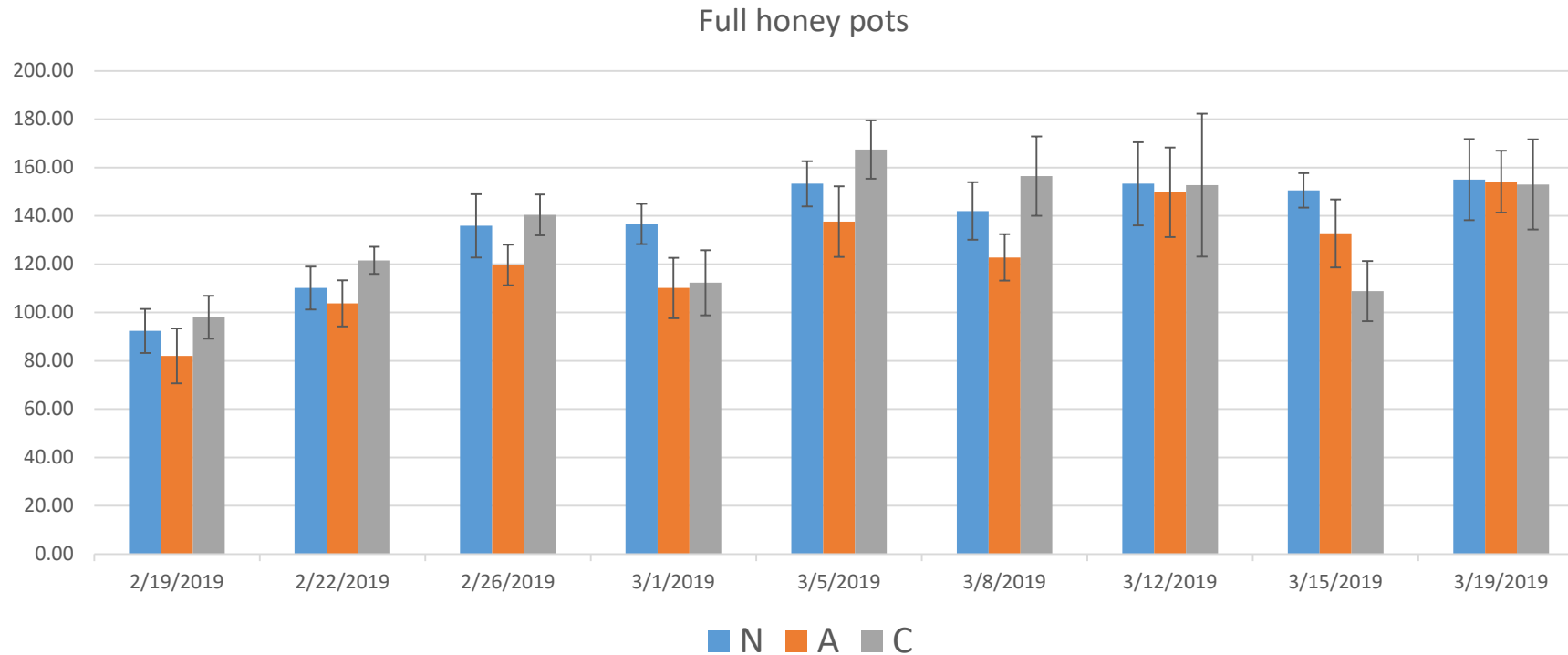
Bumble bee (8/trt) full honey pots over time

all treatments not different over time

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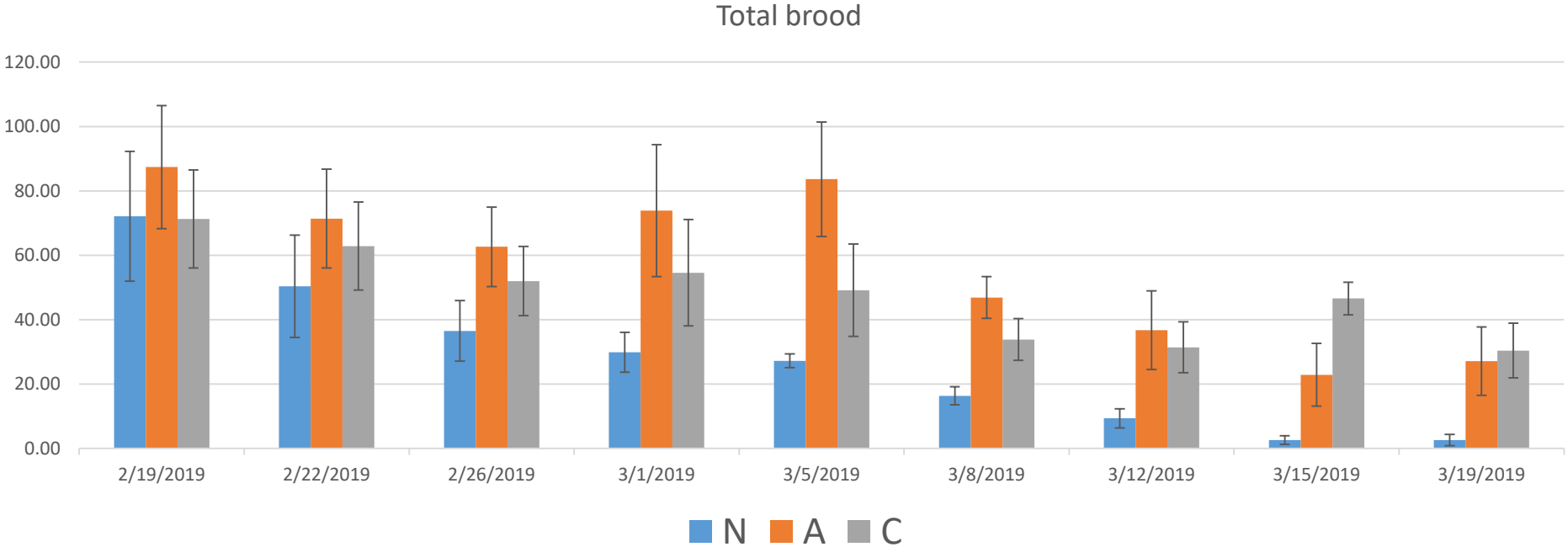
c= grey, control



Bumble bee (8/trt) total brood over time

clothianidin treatment has less total brood over time

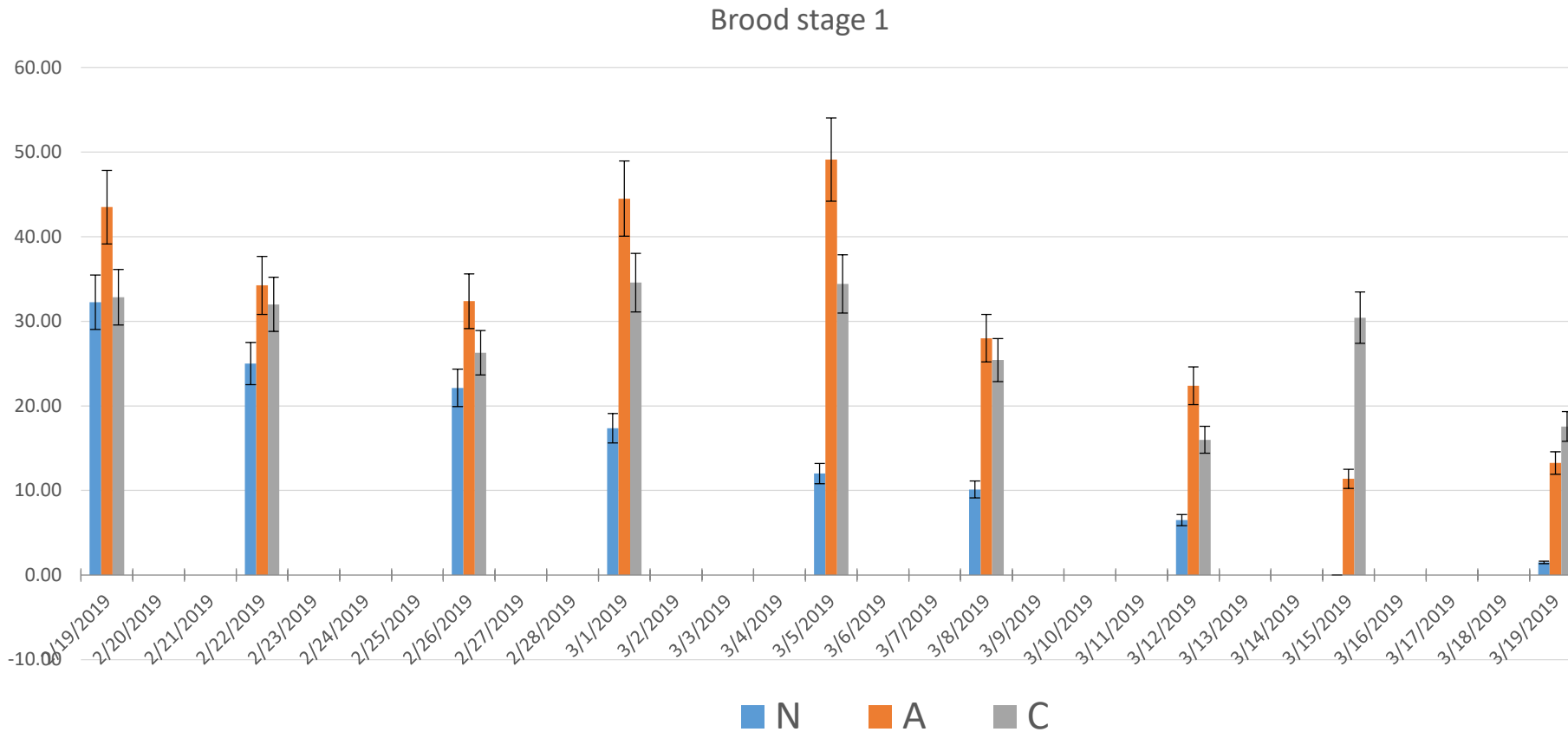
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Bumblebee (8/trt) brood stage 1 over time

clothianidin treatment has less stage 1 young brood over time

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bumblebee research

