

Spiroplasma infection in colonized *Glossina fuscipes fuscipes*: Impact on mass rearing and the Sterile Insect Technique

Kiswend-sida M. Dera, Daouda Tande Barro, Bénéwendé Aristide Kaboré, Fabian Gstöttenmayer, Mouhamadou M. Dieng, Soumaïla Pagabeleguem, Brian L. Weiss, Giulia Fiorenza, Riccardo Piccinno, Anna R. Malacrida, Serap Aksoy, Chantel J. de Beer, Robert L. Mach, Marc J. B. Vreysen, **Adly M. M. Abd-Alla**

37TH GENERAL CONFERENCE OF
THE INTERNATIONAL SCIENTIFIC COUNCIL FOR
TRYPANOSOMIASIS RESEARCH AND CONTROL (ISCTRC)

Seventy three years of AU/ISCTRC 1949

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2025 Soixante-treize ans de l'UA / CSIRLT

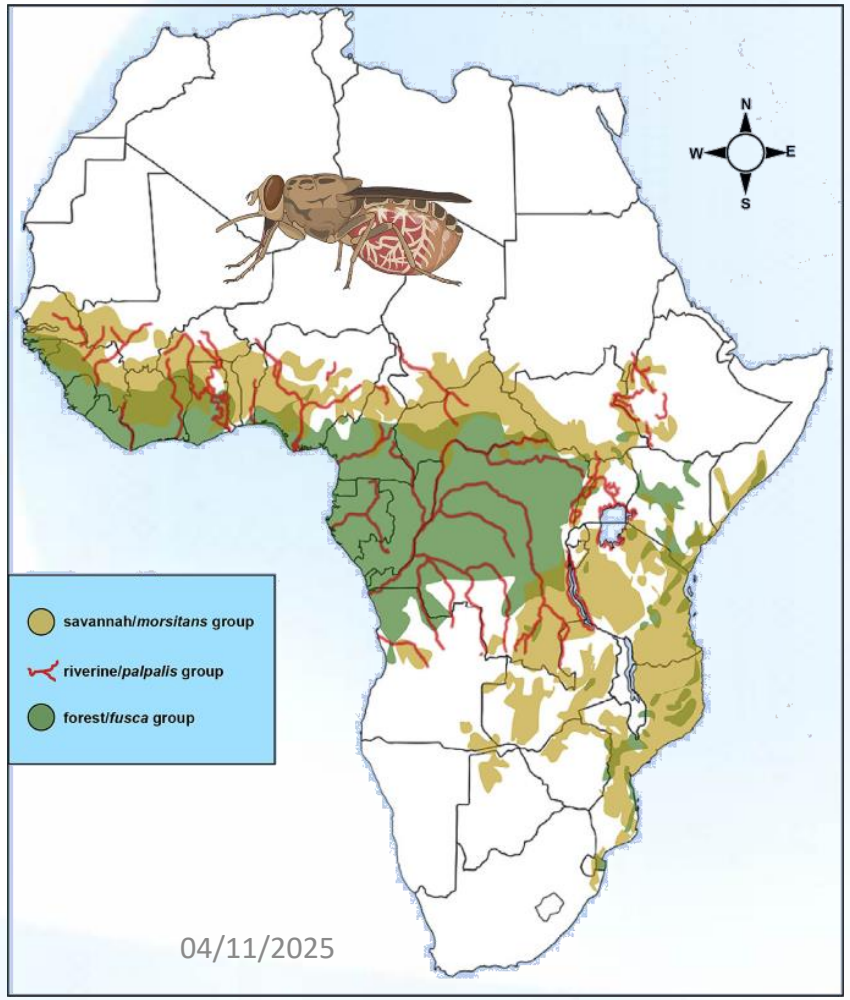
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Introduction Tsetse (*Glossina* spp.)

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Sleeping sickness in humans and animal trypanosomosis or "Nagana" in animal

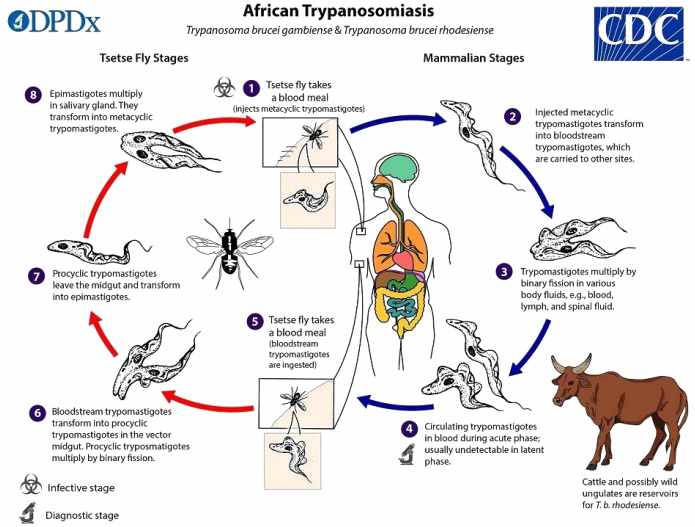
Confined to sub-Saharan Africa



Haematophagous and transmit the trypanosome parasites







- Annual direct production losses in cattle amount between US$6000 million and $12000 million (FAO)
- Animal deaths reach around 3 million (FAO)

Tsetse control

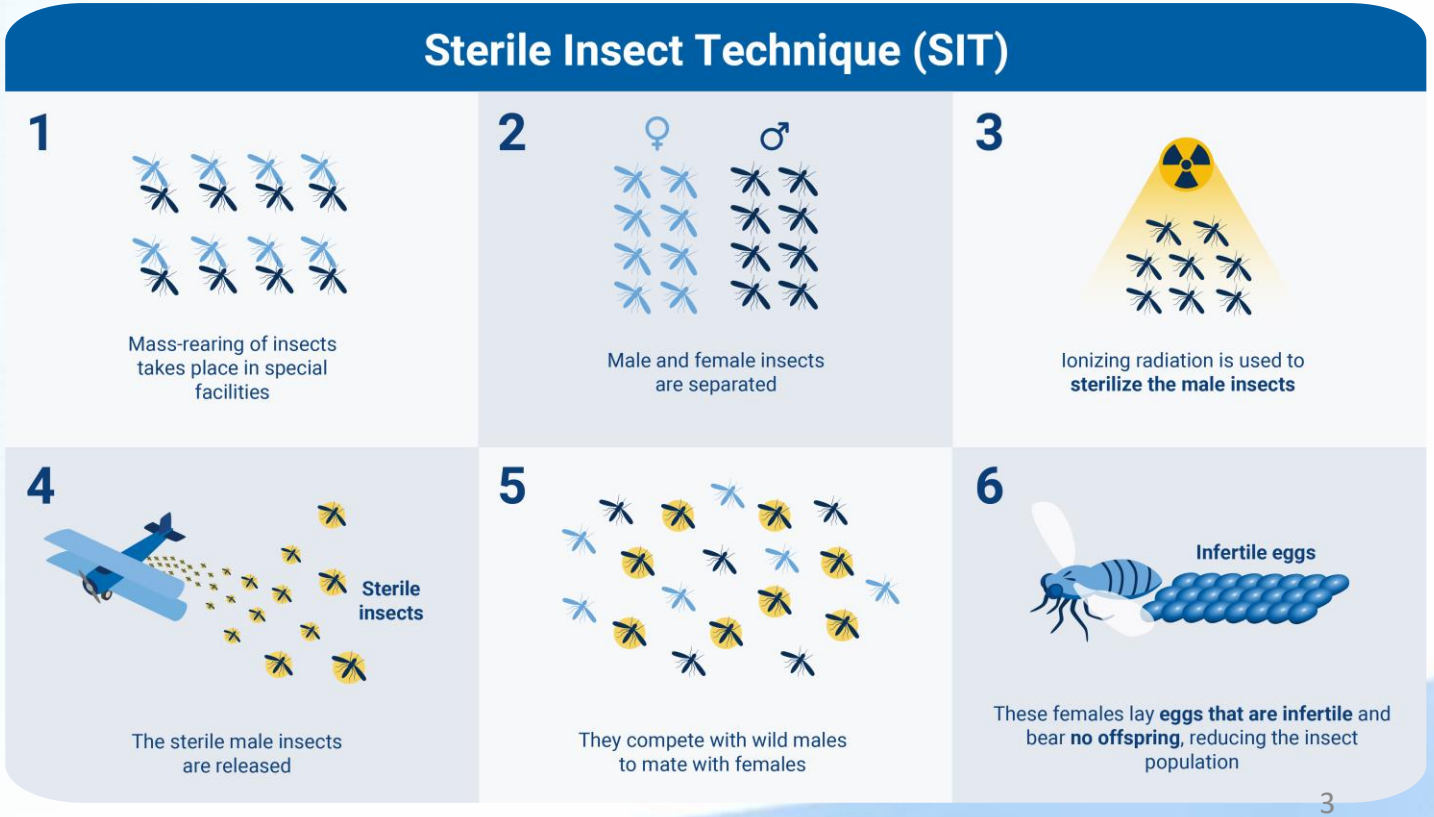
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- Traps
- Insecticide impregnated targets
- Treatment of livestock
- Sterile Insect Technique



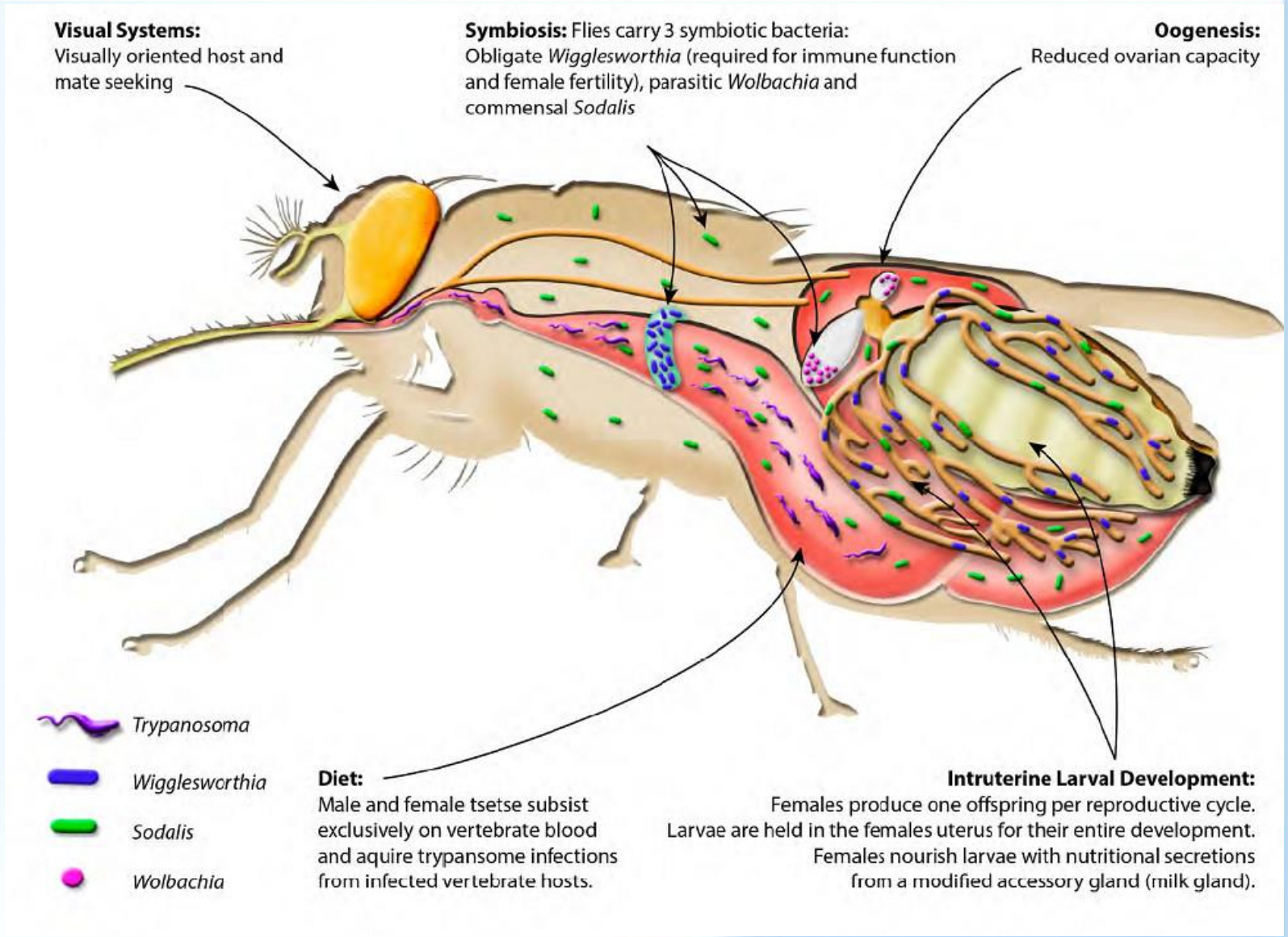






Introduction: Symbionts of tsetse flies

Mutualistic - Parasitic



Attardo et al 2018.

Introduction: *Spiroplasma*

- helical bacteria without cell wall in class of Mollicutes
- **Plant pathogen**, symbiont in many arthropods
  - **Male-killing** phenotype in *Drosophila*
  - Protective effect in *D. hydei*, *D. neotestacea*



Ramond 2016

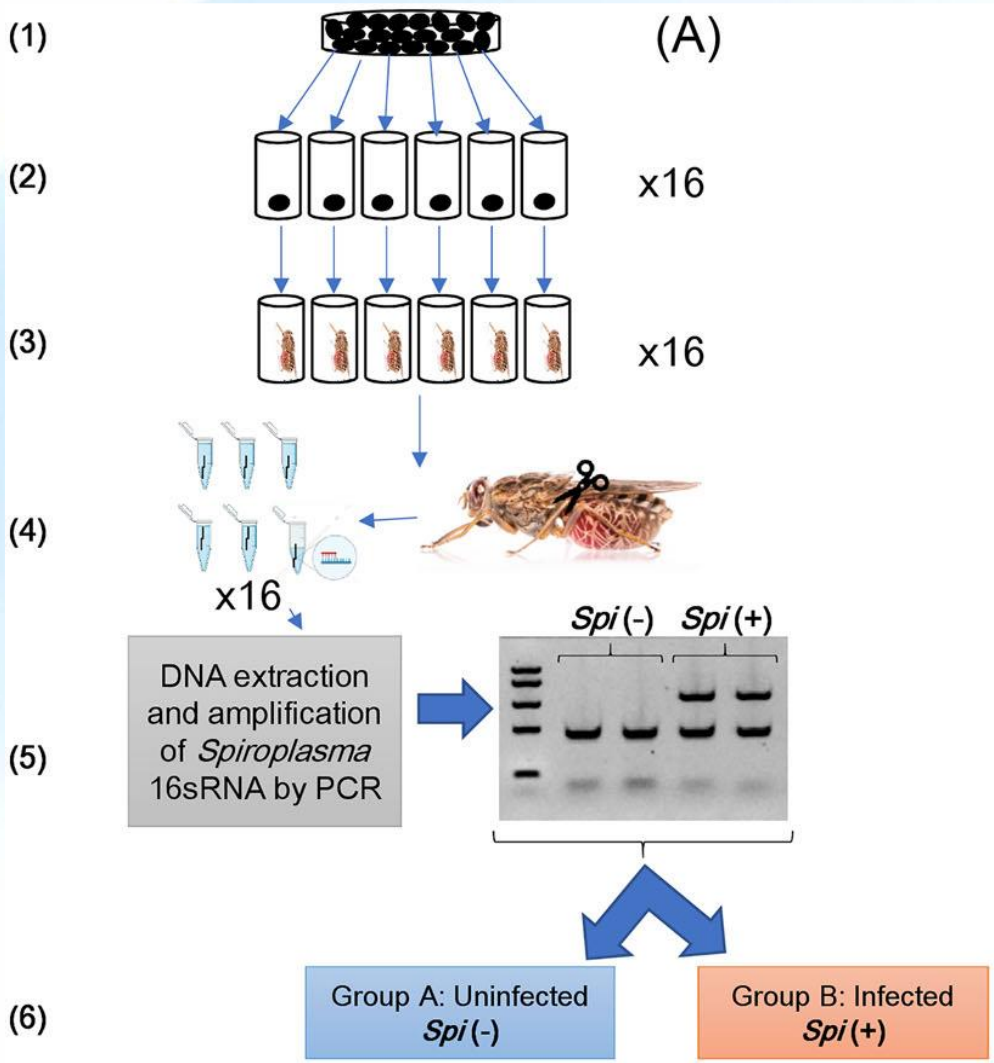
Glossina spp.

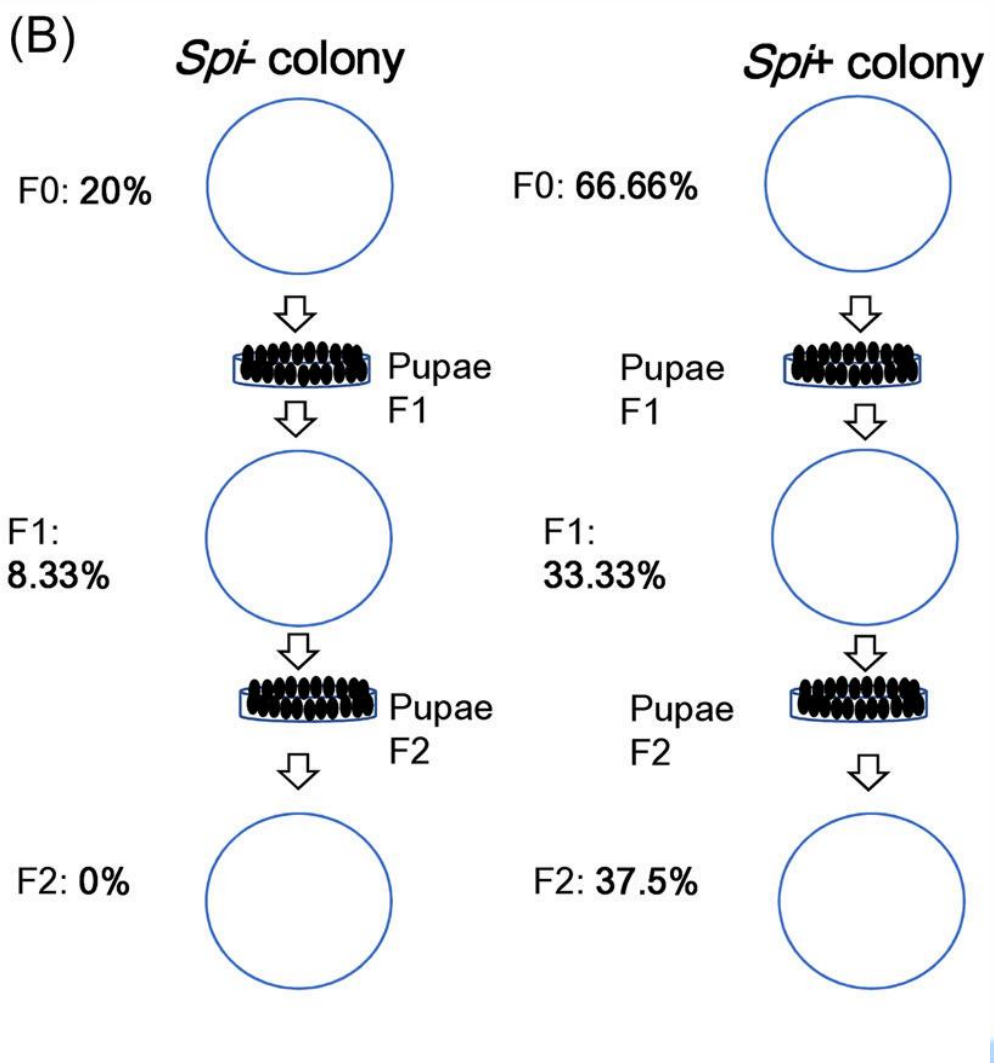
Fusca group	Morsitans group	Palpalis group
G. brevipalpis	*G. austeni*	*G. caliginea*
G. fusca fusca	*G. longipalpis*	***G. fuscipes fuscipes***
G. fuscipleuris	*G. morsitans*	*G. fuscipes m*
G. hanningtoni	*G. Pallidipes*	*G. fuscipes q*
G. longipennis	*G. swynnertoni*	*G. pallicera newsteadii*
G. medicorum		***G. Palpalis Palpalis***
G. nashi		***G. tachinoides***
G. nigrofusca		
G. schwetzi		
G. severini		
G. tabaniformis		
G. vanhoofi		

Spiroplasma **is present in wild and laboratory populations of *G. fuscipes fuscipes*, *G. tachinoides* and *G. palpalis palpalis* (Doudoumis 2017).**

Spiroplasma is present in wild and laboratory populations of *G. fuscipes fuscipes* and *G. tachinoides* (Doudoumis et al.,2018)

Establishment of *Glossina fuscipes fuscipes* subcolonies based on *Spiroplasma* prevalence





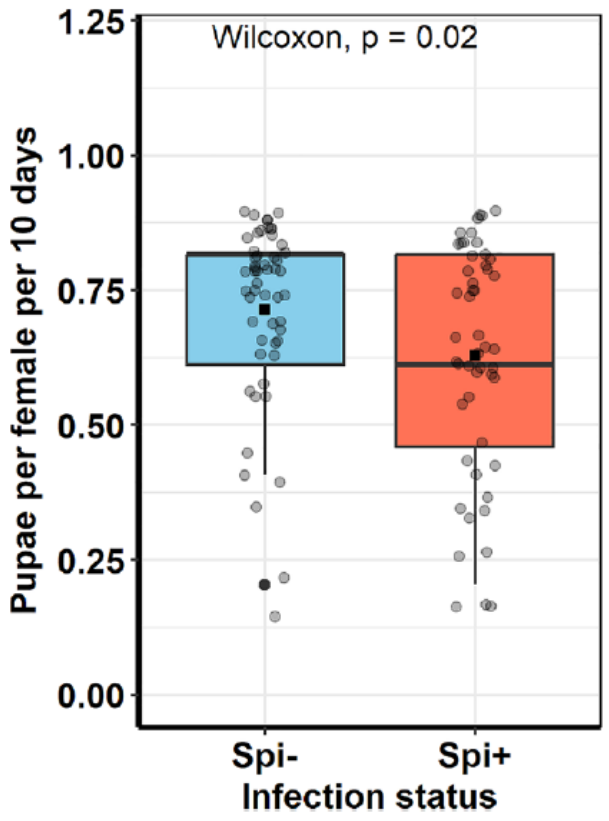
Assess the impact of Spiroplasma on the performances of G. f. fuscipes colony

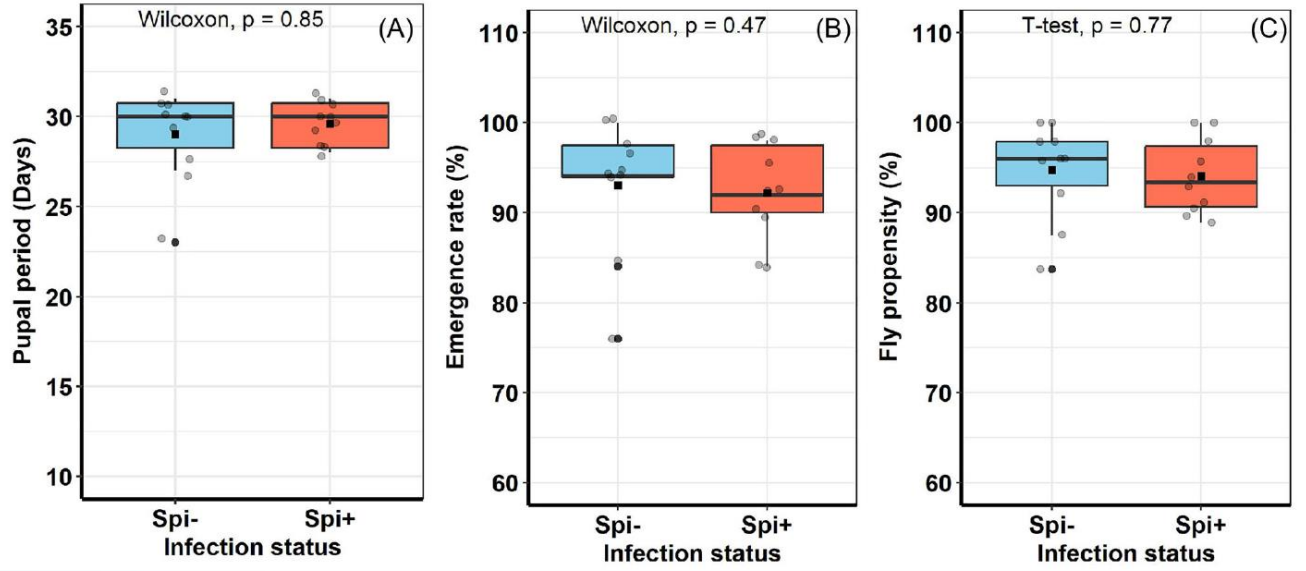
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Parameters assessed:

1. **Overall prevalence and dynamics of *Spiroplasma* in *Gff* colonies**
2. **Adult emergence**
3. **Flight propensity**
4. **Pupal period**
5. **Pupal size**
6. **Female fecundity**
7. **Mating competitiveness under field cage conditions**
8. **Insemination rate**

Assess the impact of *Spiroplasma* on the performances of *G. f. fuscipes* colony



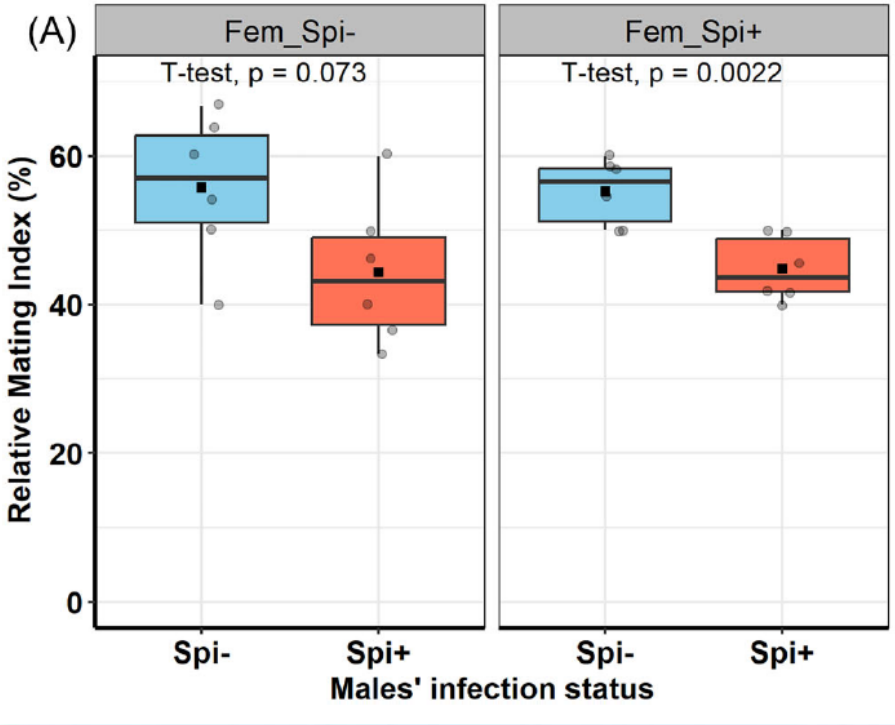


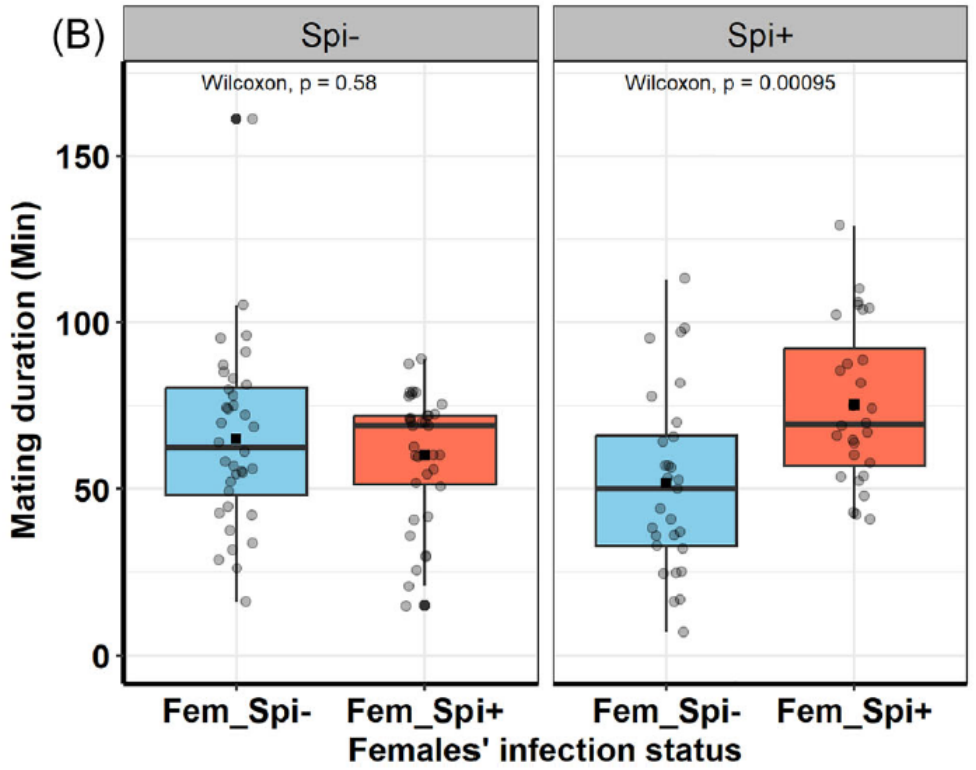
Spi+ Gff females produced significantly fewer pupae per 10-d period (pf10d) when compared with their *Spi*– counterparts.

Spiroplasma infection status does **not impact**

- Length of the *Gff* pupal stage and
- Emergence rate (%) of adults and
- Flight propensity

Mating competitiveness of Gff Spi– and Spi+ females and males under field cage conditions

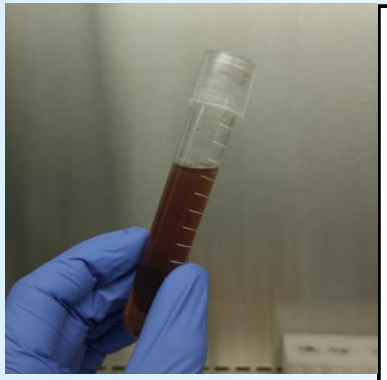




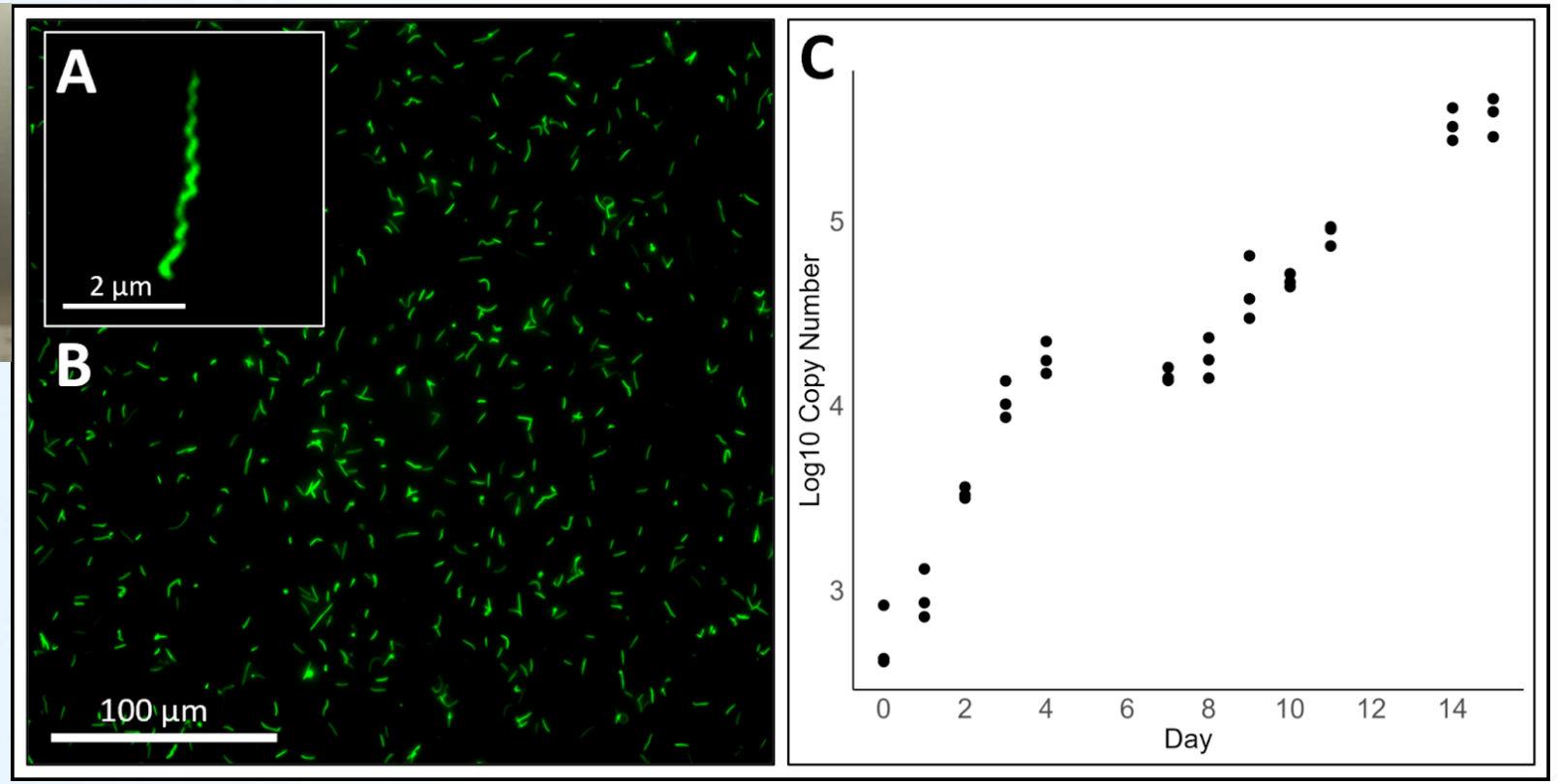
- Mating latency is lower when couple from the same infection status are mating and last longer
- ***Spiroplasma* infection reduce significantly the mating competitiveness in field cage conditions**

Females' status	Males' status	N[1]	PM[2] (%)	RMI[3] (%)	Mating latency (Minutes ± SD)	Mating duration (Minutes ± SD)
Spi-	*Spi-*	120	54.2 (65/120)	55.4 (36/65)	33.08 ± 16.20	60.88 ± 05.96
	Spi+	120		44.6 (29/65)	46.01 ± 16.20	54.45 ± 15.85
Spi+	*Spi-*	120	52.5 (63/120)	55.6 (35/63)	43.88 ± 30.35	58.48 ± 33.08
	Spi+	120		44.6 (28/63)	29.76 ± 07.66	73.53 ± 31.50

In vitro culture of *Spiroplasma*

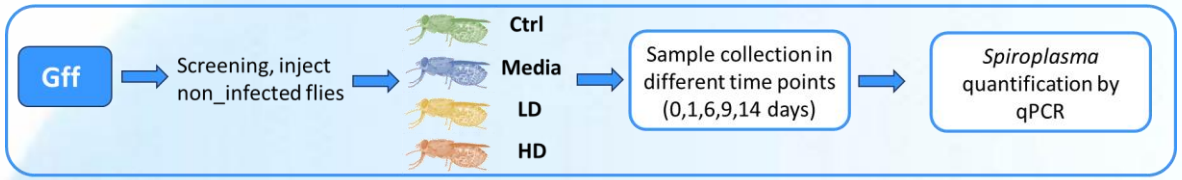


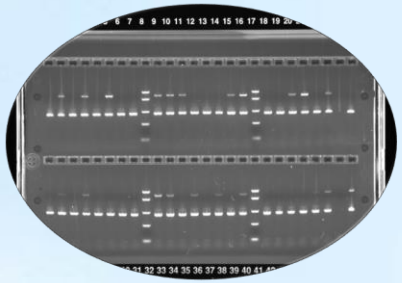
Spiroplsama **identity was confirmed by the complete genome sequence**



Morphology of in vitro *Spiroplasma*, high density culture and growth kinetics

Assess the infectivity of cultured *Spiroplasma on G. f. fuscipes adults*

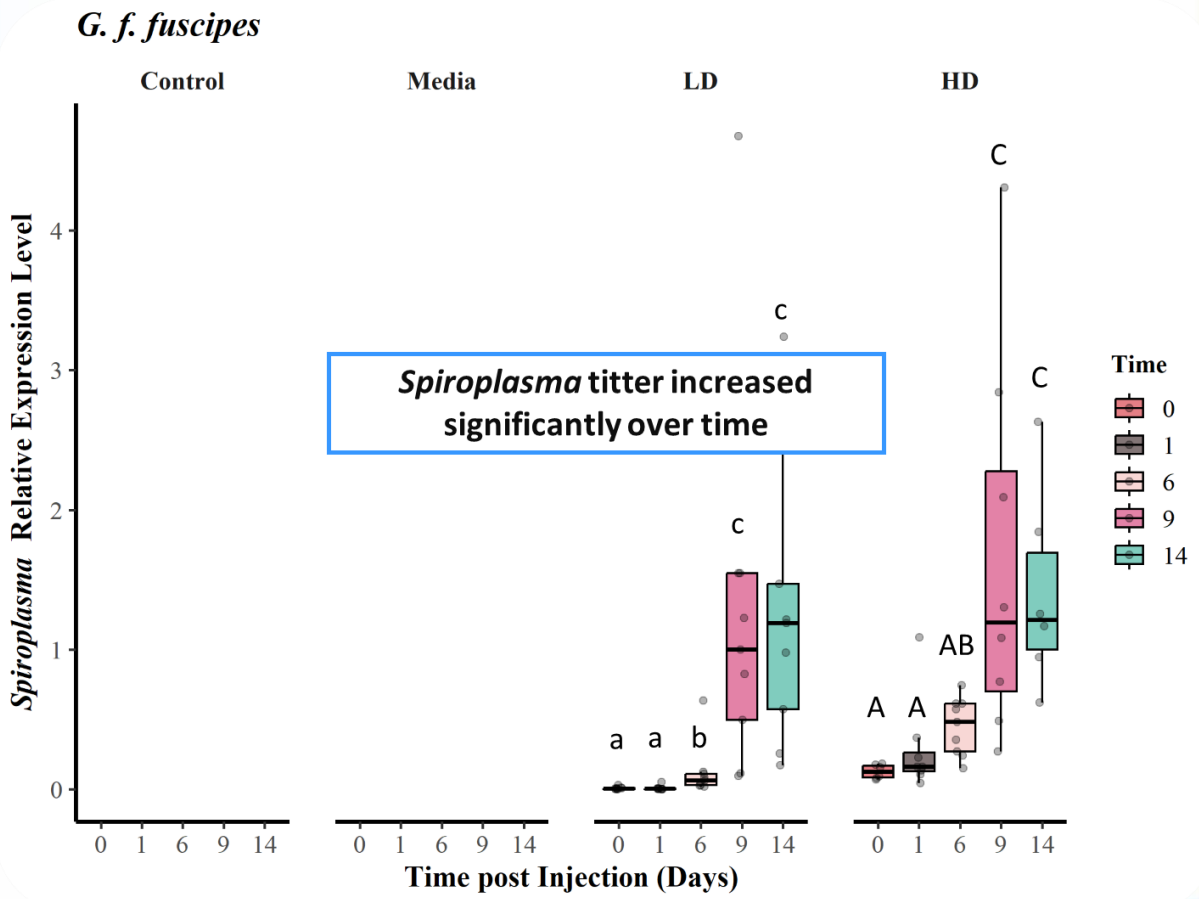






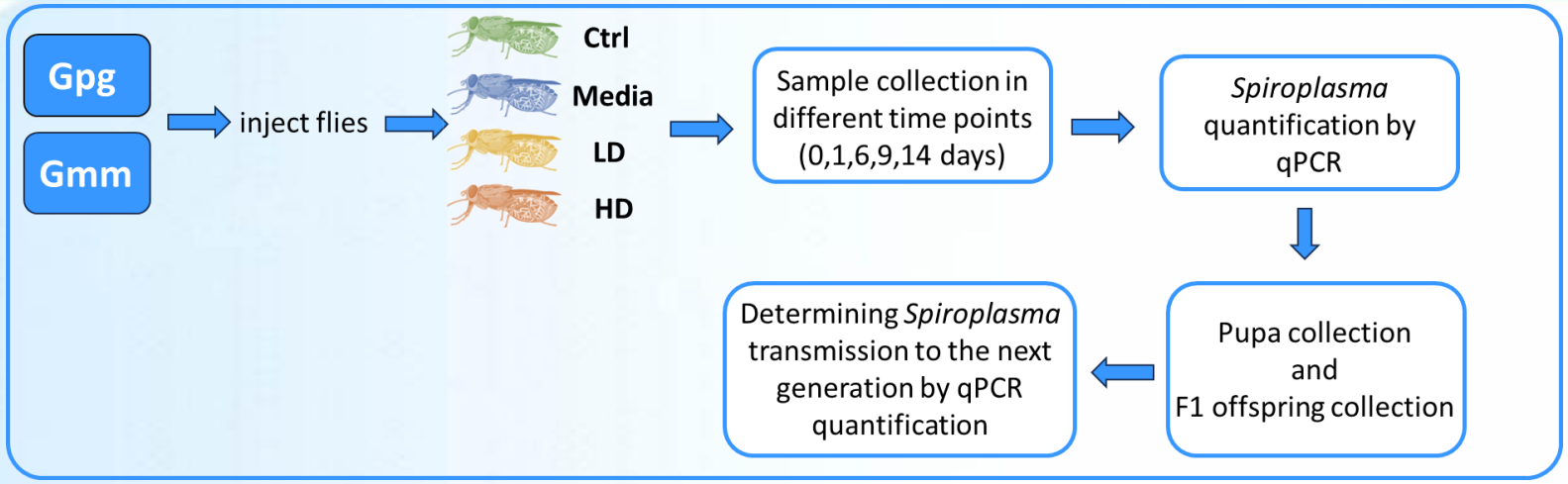


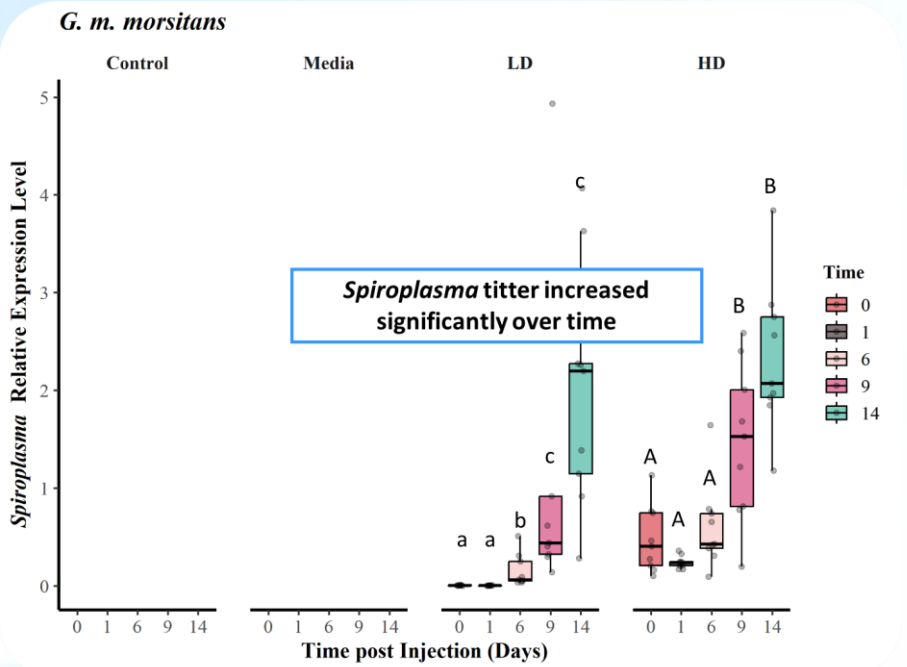
- **In vitro cultured *Spiroplasma* can infect and multiply in Gff adults**

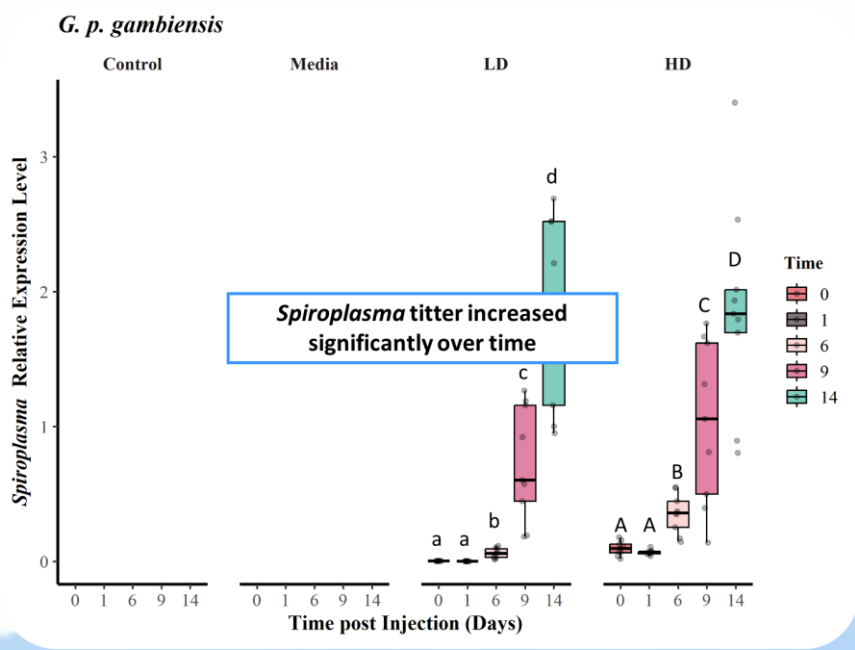


Determine the dynamics and factor(s) controlling *Spiroplasma* infection in tsetse species

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Conclusion

1. The presence of *Spiroplasma* did not negatively influence the **pupal period**, **adult emergence rate**, nor **flight propensity**. However, a significant negative impact on **productivity**

2. Pupae collected from the *Spi+* colony were lighter as compared with those from the *Spi–* colony.

3. The presence of *Spiroplasma* may potentially reduce the overall mating competitiveness of the flies.

4. The reduction in female fecundity may be attributed to *Spiroplasma* potentially competing with pregnant females for essential nutrients, including triacylglycerides (TAG), which are crucial for larval development

5. Culture *Spiroplasma* can induce infection in Gff, Gpg and Gmm.

Thank you



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