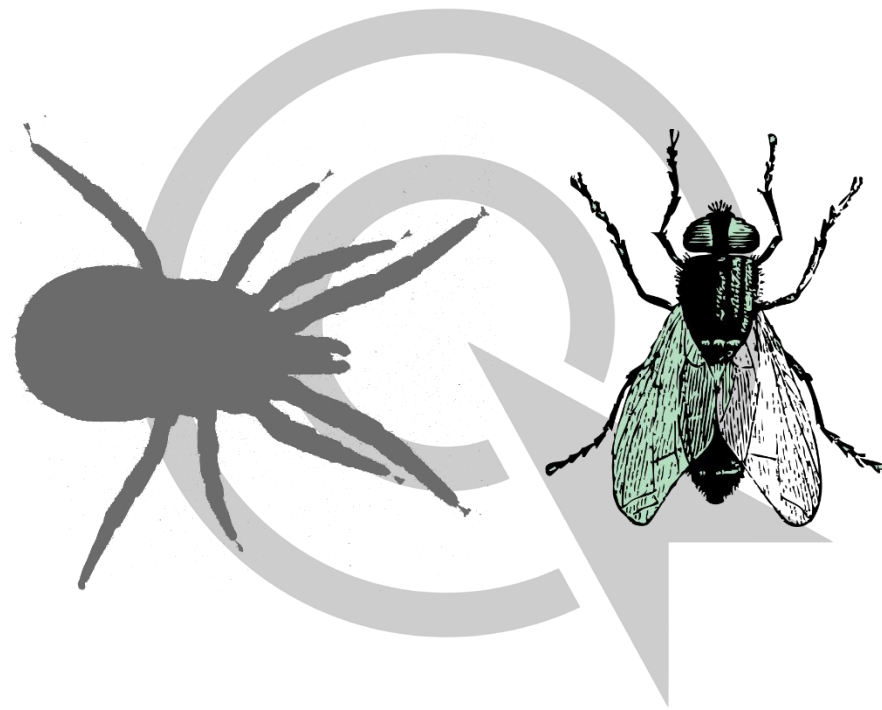




Nor-Mite

In-feed aromatic repellent



△ Our products positioning and applications can vary according to the territories (legislation, production organization, type of breeding, climate...)

SUMMARY

1. The Crime Scene
2. The Usual Suspect: *Dermanyssus gallinae*
3. Nor-Mite: the plant extract-based solution

1.



Red mite impact on production

Red mite infestation may cause:

- Decommissioning of stained eggs and pathogen transmission (protozoa, viruses, bacteria) – V. Moro et al, 2009
- Stress, feathers deterioration – Kilpinen et al, 2005
- Decrease of clutch rate, weight loss and increase of mortality – Kilpinen et al, 2005
- Anemia – Keçeci et al, 2004

130 million €/year in eggs production (EU)



Prevalence of *Dermanyssus gallinae*

Norway	23%
Tunisia	34%
Denmark	50%
United Kingdom	50%
Montenegro	55%
Kenya	60%
Romania	61%
France	65%
Sweden	67%
Italy	74%
Morocco	76%
Netherlands	81%
Japan	85%
Serbia	90%
Poland	100%

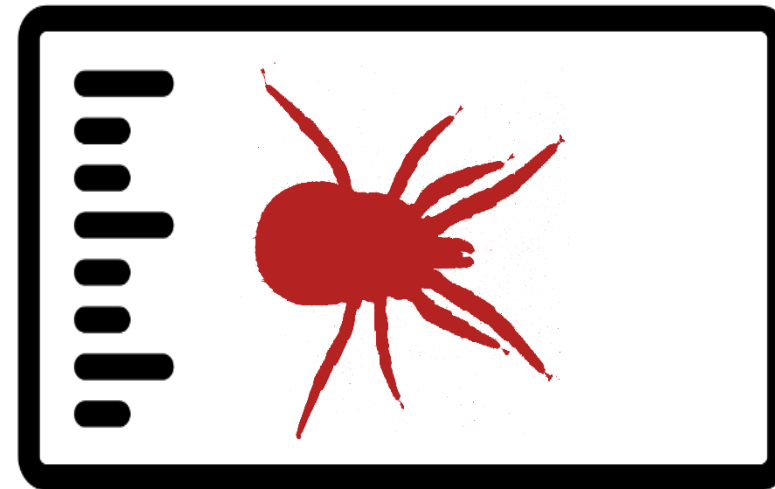
In North America, farms are infested by *Ornithonyssus sylvarium* (fowl mite), an other poultry mite.

Prevalence: Number of farms where *Dermanyssus gallinae* is present relative to the total number of farms

(Georges et al, 2009) (Sparagano et al, 2009)

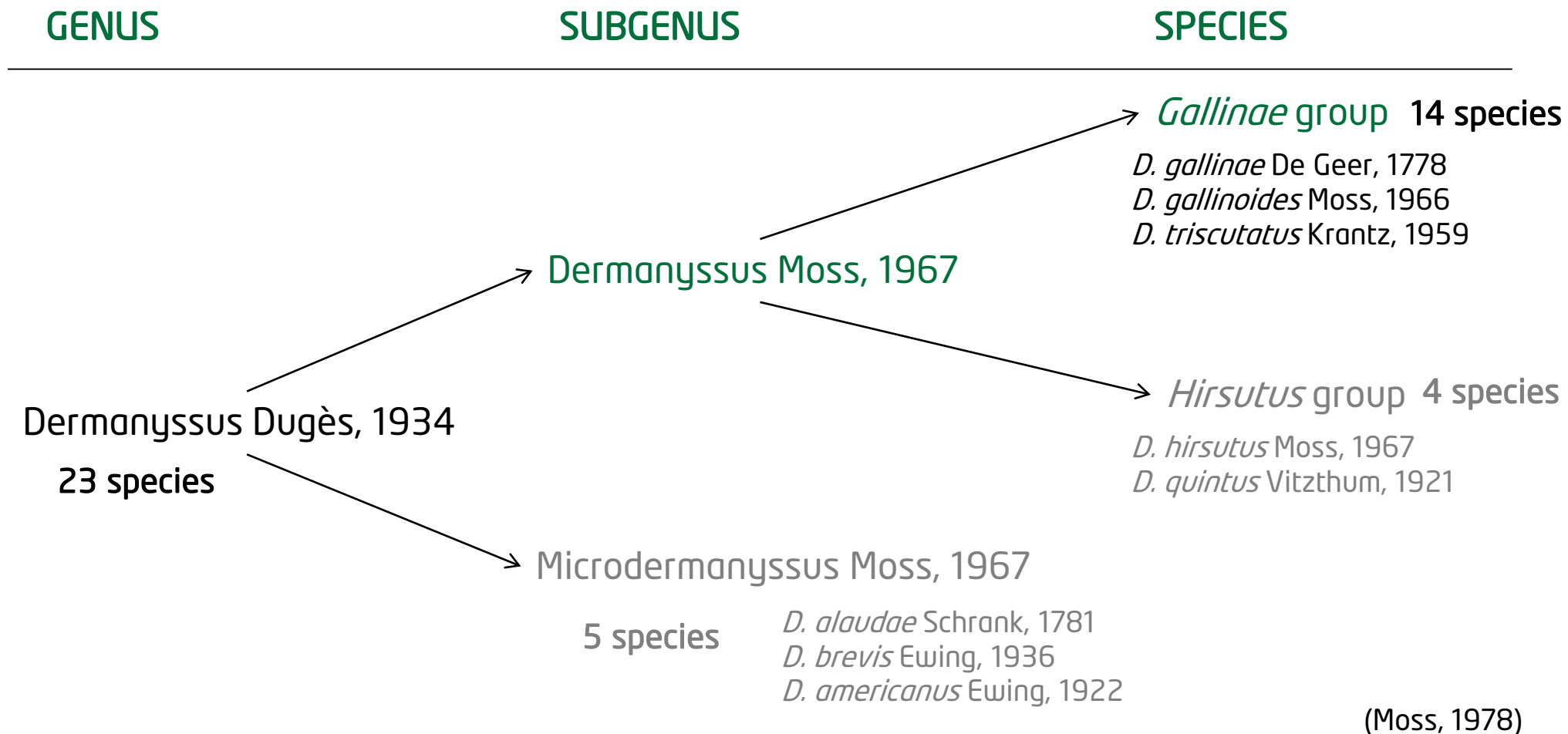
2.

The Usual **Suspect**...

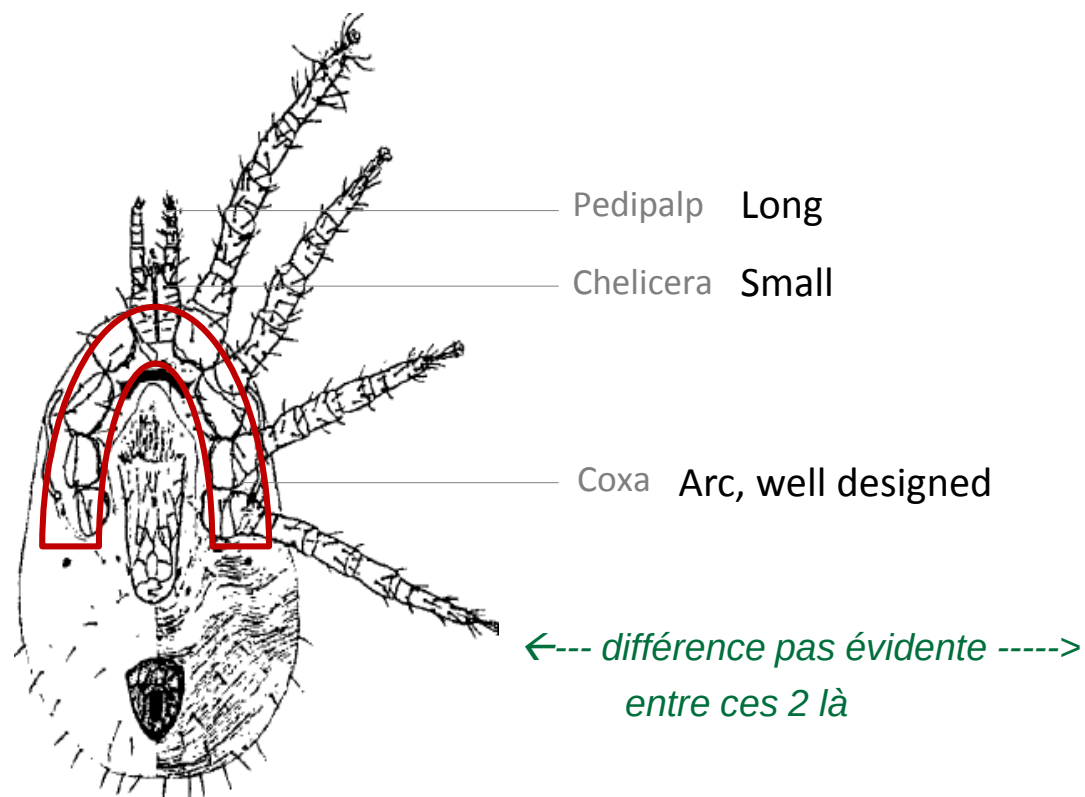


Dermanyssus gallinae

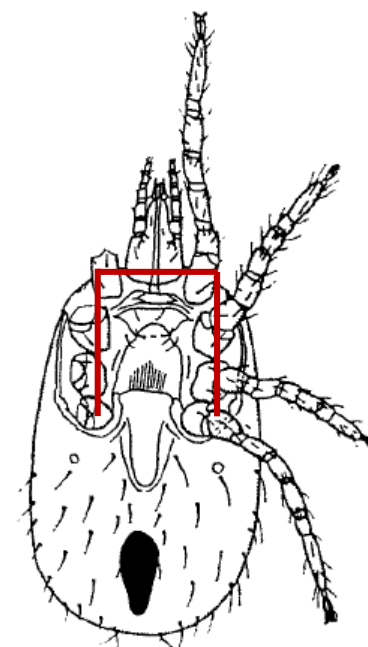
Red mite (*Dermanyssus gallinae*) hematophagous and bird's parasite – met in laying hens



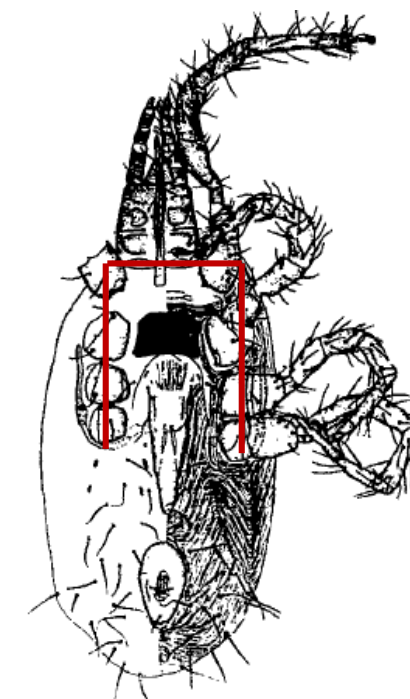
How to recognize *D. gallinae*?



*Orinthonyssys
sylviarum*



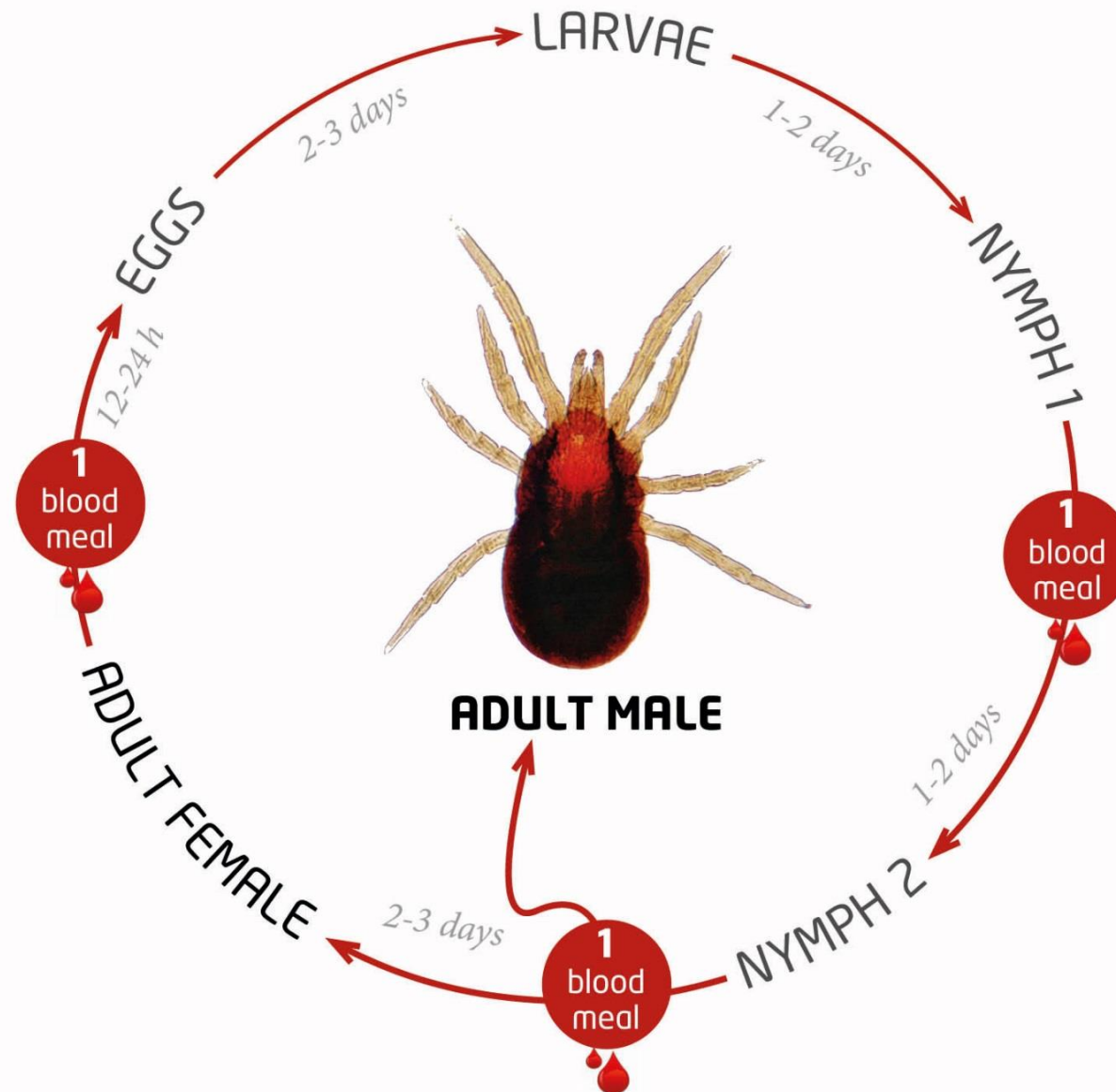
*Liponyssoides
sanguineus*



Adult: ≈ 1mm (Robert 2013), black, grey or white and red after lunch (Hoy 2011)

(L. Roy, 2006; G. Bon, 2006)

THE RED MITE LIFE CYCLE



> A high capacity of proliferation

- **Blood meals** are necessary for metamorphosis and laying
- Males & nymphs can live up to 9 months without eating

Nordenfors, 1999

A high reproductive capacity

- **A LOW FERTILITY...**

Coupling + blood meal = clutch

Average: 23 eggs/female

- **BUT A FAST GROWTH**

1 egg → female ready to lay in 1-2 weeks

→ Farm totally invaded: + 400 % of *D. gallinae* population in 42 days
(Meyer-Kühling et al, 2007)

(Olivier & Hutcheson, 1988)

Eat, Run & Hide!

- Do not live on the host but in the nest
- In contact with the host just to eat, mainly at night (Sparagano et al, 2014), from 30 min to 1h30.
- Quick return in the bedding, gaps and cracks to digest and to lay...



Agglutination behaviour

(L. Roy, 2009)

3. Nor-Mite

The **plant extract**-based solution

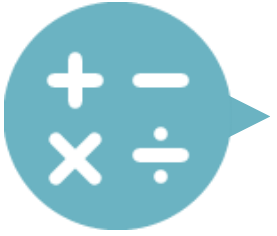
Product description



Mineral feed containing aromatic substances used in animal feed. These components confer repellent properties against some arthropods (*Lucilia caesar*, *Dermanyssus gallinae*) to the feed.



APPEARANCE: White fine powder



INCLUSION RATES: 500 gr/ton of complete feed, at the beginning of the production

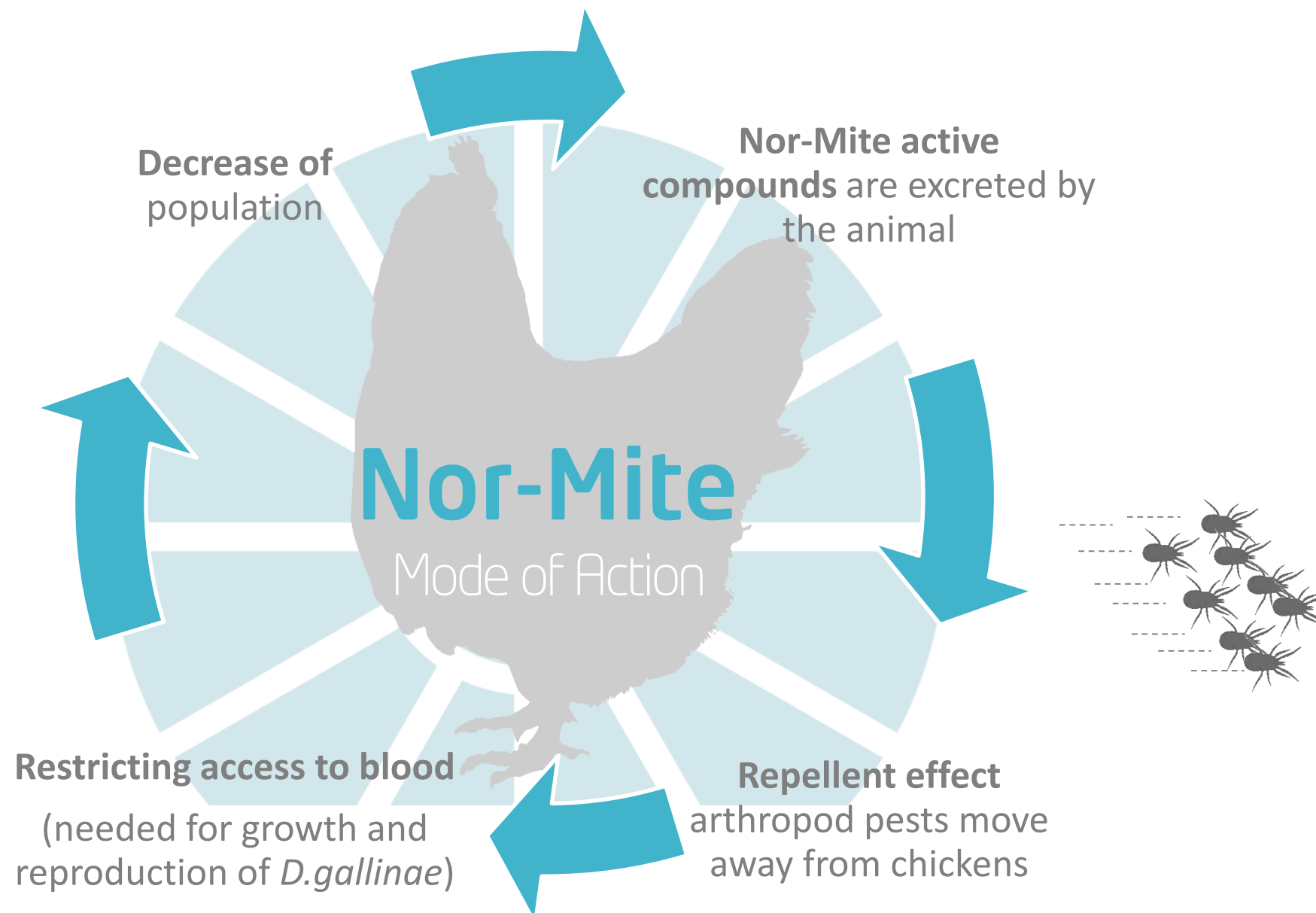


ACTIVE COMPOUNDS: Aromatic formulation of plant extracts *Eugenia caryophyllus* (clove) and *Cymbopogon nardus* (lemongrass).



STABILITY: 24 months, in an unopened packaging, in a dry and cool place.





Trial results *in vitro*

Methodology

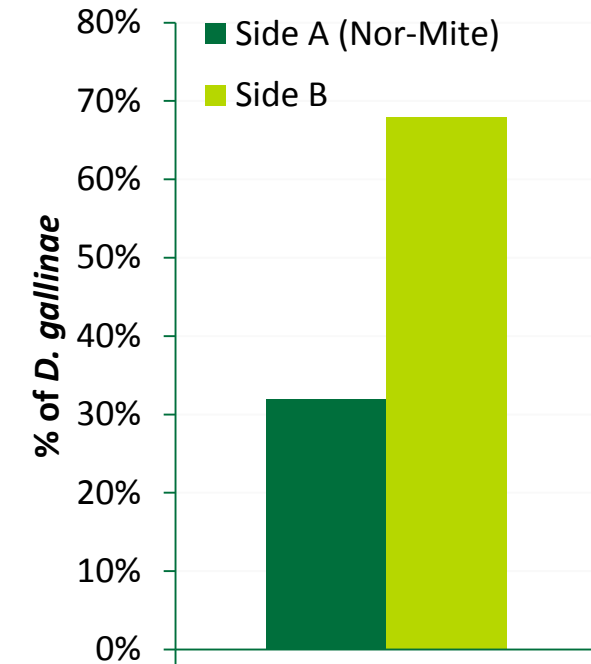
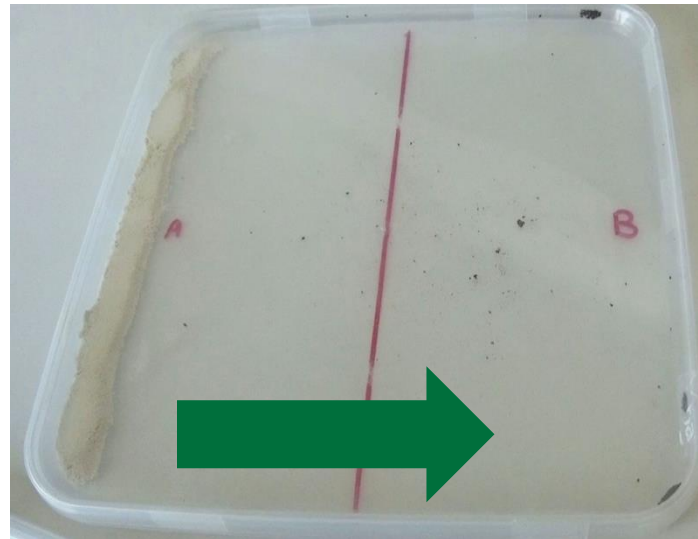
Plastic boxes divided in 2 parts

- Side A: with Nor-Mite (0,5g)
- Side B: without Nor-Mite

Approximately 37-115 mites/box, 3h at 20°C

68% of the mites

moved to the B compartment ($p < 0.01$)



How severe is the infestation?



How to quantify mite pressure?

- 1 trap /1000 hens in the henhouse for a 24h period at the beginning and at the end of the trial.
- Traps are collected and frozen to facilitate the mites counting.

(Bon, *et al.* 2003)

How to quantify fly pressure?

- Adhesive tape with an attractive odor to trap flies.
- 1 trap/1000 hens is placed during 24h at the beginning and at the end of the trial period, and removed for counting
- Flies stuck on the tape are counted after trap collection.

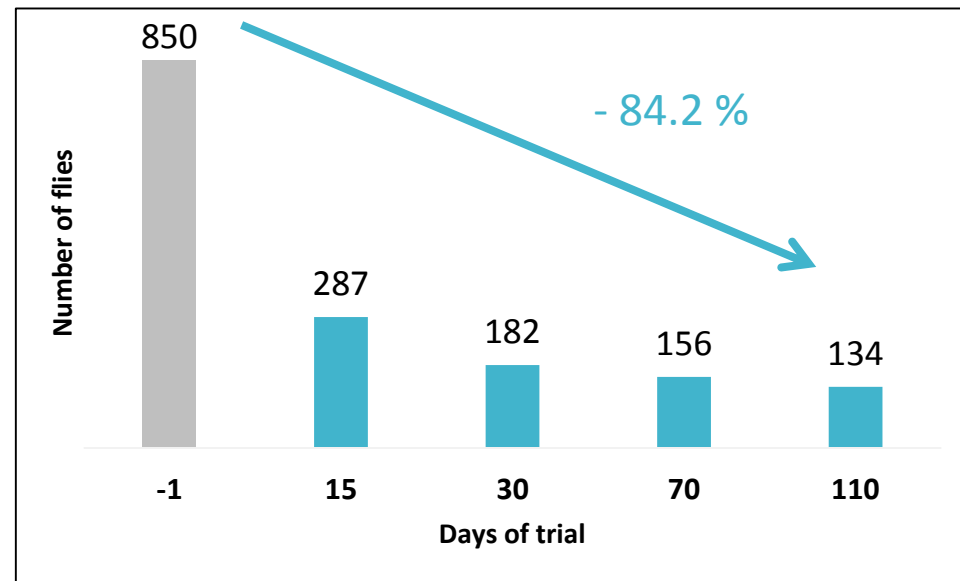
Trial results on red mites and flies

Pest Species		Dosage	Pests enumeration				Results and remarks
Red Mites	Trial 1: 4500 hens	500 ppm in complete feed, for a 2 weeks period	D-1		D+16		The decrease of <i>D.gallinae</i> were respectively 83 and 84% . Qualitative results (blood stained eggs)
	1380		234				
	521		84				
Flies	Trial 1: 60000 hens	500 ppm in complete feed	D-1	D+30	D+70	D+110	The decrease of flies were respectively 87,5 and 84,2%
	2160		326	284	270		
	Trial 2: 35000 hens		850	182	156	134	

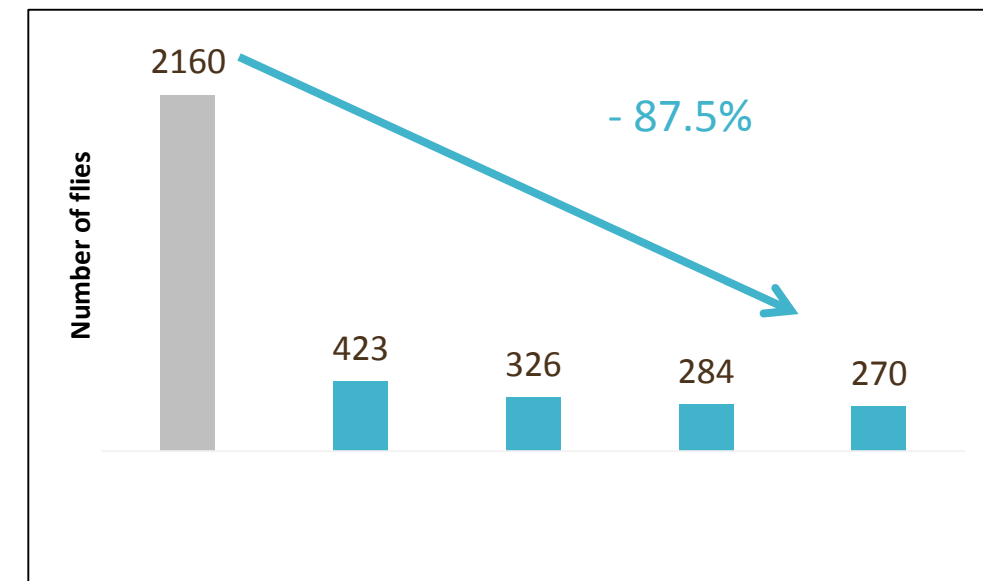
Arthropods are enumerated with traps (1 trap/1000 hens), during 24 hours at the beginning and the end of the trial.

Trial results on fly density

Trial 1: 35.000 hens
84.2 % less flies

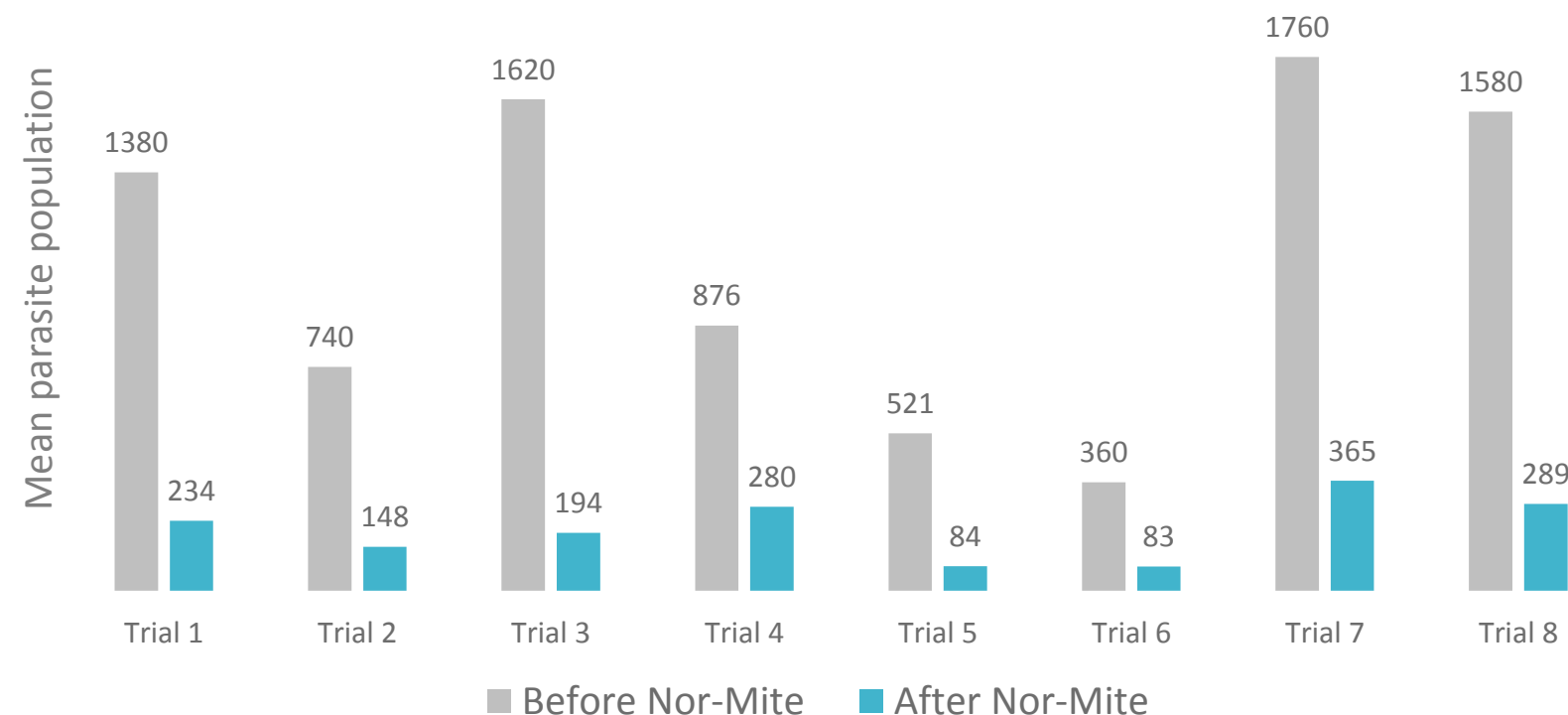


Trial 2: 60.000 hens
87.5 % less flies



➔ Effect visible after 15 days

Trial results on red mites



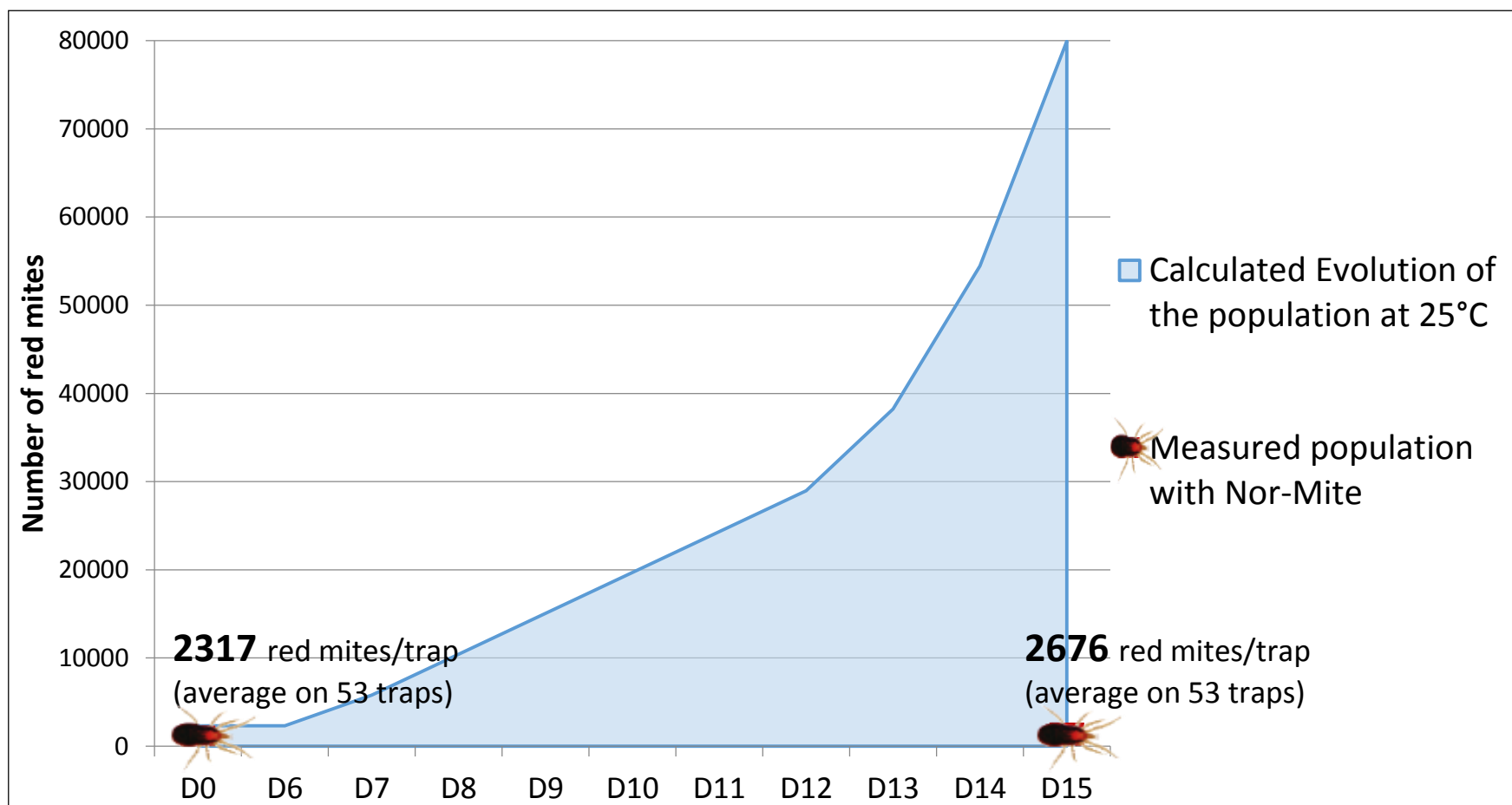
Trial	1	2	3	4	5	6	7	8
Number of hens	4500	6000	4300	3600	4800	5500	4500	3000

➔ In the whole 2-week trials, we observed a decrease on mite population ranges between **68%** and **88%**, with an average of **81%** ($p < 0.01$).

Trial results on red mites

Set up: 60 000 laying hens - 24,7°C - 65,5% relative humidity

Under optimal conditions (25°C, 70-85% humidity), the life cycle of red mites lasts 7 days (Tucci et al, 2008)



After 15 days of use of Nor-Mite, this population evidenced a stagnation with around 2700 adult mites per trap, without significant difference between the initial and final number of red mites (Wilcoxon $p > 0.05$).

NOR-MITE CONCLUSION

- Effective repellent to control flies and mites population
- Results are observed after a short period
- Easy to use in-feed solution
- Qualitative and quantitative results in eggs production
 - Reduction of the number of blood stained eggs (testimony)
 - Improvement of the clutch rate (testimony)
- Supports animal welfare