



2nd COST CONFERENCE AND MANAGEMENT COMMITTEE (MC) MEETING

**1st -3rd June, 2016
Zagreb, Croatia**

COST ACTION FA1404

**Improving current understanding and research for
sustainable control of the poultry red mite
Dermanyssus gallinae (COREMI)**

FINAL PROGRAMME

and

BOOK OF ABSTRACT



Dear Colleagues,

the Croatian members of the COST Action FA1404 are pleased to host, for the first time here in Zagreb, the 2nd COST conference and Management Committee (MC) Meeting on *Improving current understanding and research for sustainable control of the poultry red mite *Dermanyssus gallinae* (COREMI).*

The role of COREMI project is to collate the knowledge of mite biology, the mite-host relationship and more efficient and sustainable control methods and to coordinate further research work in the area. A more complete understanding of PRM will impact the health, welfare and productivity of the laying hens, but also the other poultry production, and at the end, the public health.

Key note lectures, thematic sessions, and working group's workshops will ensure dynamic and up-to-date two-day program and give you the opportunity to gain new knowledge.

The plenary session will be open to all scientists interested in this topic and will take place in the Hotel WESTIN with the exceptional view on the entire City of Zagreb, while the MC Meeting (for MC members only) will be held at the Faculty of Veterinary Medicine, University of Zagreb.

We are looking forward to meeting you at 2nd COST COREMI Conference, where high quality science and new knowledge meet in relaxed atmosphere.

We wish you a nice stay in Zagreb!

On behalf of the Organizing Committee,

Danijela Horvatek Tomić

*Department of Poultry Diseases with Clinic
Faculty of Veterinary Medicine University of Zagreb*



SCIENTIFIC COMMITTEE

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Elias Papadopoulos (Vice-Chair) EL
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Mul Monique (WG2) NL
Lise Roy (WG3) FR
Antonio Camarda (WG4) IT
Annunziata Giangaspero (STSM) IT

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UNDER THE AUSPICES

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Edited by:

Danijela Horvatek Tomić, CRO

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Lise Roy (WG3), FR
Antonio Camarda (WG4), IT
Annunziata Giangaspero (STSM), IT

Publisher:

University of Zagreb, Faculty of Veterinary Medicine
Heinzelova 55, 10000 Zagreb, Croatia



GENERAL INFORMATION

CONFERENCE VENUE

The Conference will be held at the Hotel WESTIN, Krsnjavoga 1, 10000 Zagreb.

The MC Meeting will be held at the Faculty of Veterinary Medicine, University of Zagreb, Heinzelova 55, 10000 Zagreb.

REGISTRATION

The Registration desk will operate through the Conference, especially during the following hours:

June 1st, 2016: 8:00-9:00

June 2nd, 2016: 8:00-9:00

LANGUAGE

The official languages of the Conference is English.

MEALS

The Welcome cocktail will take place at Rectory building, University of Zagreb, Trg Marsala Tita 14 (map provided) on May 31st, at 19:00.

Lunches will take place in the Hotel WESTIN restaurant.

Dinner will be organised in Restaurant VINODOL, Teslina 10, Zagreb, on June 1st, at 20:00.

All participants are kindly asked to wear their conference badges during scientific sessions and social events.

INFORMATION FOR PRESENTERS

ORAL PRESENTATIONS

Please bring your Power Point presentation on a CD or on a USB Memory stick at the moment of registration or at least 1 hour before the start of your session.

We kindly ask you to prepare 15 minutes long PowerPoint presentations.

The Scientific committee will select three best STSM presentations and the authors will received an award.

POSTER PRESENTATION

The preferred size of the poster is 90 cm width and 120 cm high.

The Organizer will provide the material necessary for mounting the posters.

The posters will be displayed at *Ouverture* room during the entire conference and presenters are kindly requested to dismount their posters at the end of the conference.



The authors should be present by their posters during the Poster session.

Please refer to the Final Programme for the poster number assigned to you and use the board with the same number.

BOOK OF ABSTRACT

All submitted abstracts will be reviewed and published in the Book of Abstracts.

CURRENCY

Official currency in Croatia is Kuna (HRK; kn) (1 euro= aprox. 7,5 kn).

CLIMATE

Late spring temperatures can range from 20 - 30°C, however occasional rainfall cannot be excluded.

TRAVEL INFORMATION

BY PLANE (AIRPORT ZAGREB)

If you are traveling by plane, the **Zagreb International airport Pleso** is located aprox. 20 km from the city centre.

BY CAR

Croatia has excellent highways, connecting Zagreb with surrounding countries. Please look at www.hac.hr/en.

PUBLIC TRANSPORTATION

Please check at www.zet.hr.



FINAL PROGRAM



Tuesday May 31st, 2016

Location: University of Zagreb, Rectory, Trg Marsala Tita 14

19:00 Welcome cocktail

(Welcome addresses by **Prof. Damir Boras**, Rector of the University of Zagreb and **Prof. Alen Slavica**, Vice- Dean for Science and International Cooperation - Faculty of Veterinary Medicine, University of Zagreb)

Wednesday June 1st, 2016

Location: Hotel WESTIN, Krsnjavoga 1, 10000 Zagreb
(Panorama salon, 17th floor)

8:00 – 9:00	REGISTRATION Registration of participants (in front of Panorama salon, 17th floor)
9:00 – 9:30	OPENING CEREMONY Danijela Horvatek Tomić – <i>Local Organizing Committee</i> Zeljko Gottstein – <i>President of WVPA Croatian Branch</i> Estella Prukner-Radovčić – <i>1st Vice-President of WPSA European Federation;</i> <i>President of WPSA Croatian Branch</i> Representative of <i>Ministry of Agriculture, Veterinary and Food Safety</i> <i>Directorate</i> Olivier Sparagano – <i>Chair of the FA1404 COST Action COREMI and President of</i> <i>the Society for Tropical Veterinary Medicine</i>



SESSION 1

What's going on about *Dermanyssus gallinae* diffusion in layer farms?

Chair: Annunziata Giangaspero

Introductory talk	
9:30-10:00	The Poultry Red Mite: an update from UK and Europe <i>Olivier Sparagano, Coventry University, UK</i>
Oral presentations (15+5 min)	
10:00-10:20	Preliminary findings of Poultry Red Mite in Macedonian poultry farms <i>Aleksandar Dodovski, University "Ss. Cyril and Methodius" Skopje, Macedonia</i>
10:20-10:40	Current situation of <i>Dermanyssus gallinae</i> in Republic of Korea <i>William (JongUng) Yoon, FarmCQ team, Biogenoci Co. Ltd., South Korea</i>
10:40-11:00	Poultry Red Mite (<i>Dermanyssus gallinae</i>): known and unknown facts in Turkey <i>Veli Yilgör Cirak, Faculty of Veterinary Medicine, Nilufer, Bursa, Turkey</i>
11:00-11:20	Preliminary survey data on the prevalence of <i>Dermanyssus gallinae</i> and the control strategies employed in non-commercial backyard flocks in the UK <i>Kathryn Bartley, Moredun Research Institute, UK</i>
11:20-11:50	Coffee break (Ouverture salon, 17th floor)

SESSION 2

New and current monitoring and control tools

Chair: Kathryn Bartley

Key note lecture	
11:50 -12:20	Q-Perch, electronic control of red mite <i>Dick van de Ven, Vencomatic Group BV, Netherlands</i>
Oral presentations (15+5 min)	
12:20-12:40	In vitro efficacies of essential oils against the poultry red mite <i>Dermanyssus gallinae</i> <i>Martina Lichovnikova, Mendel University in Brno, Czech Republic</i>
12:40-13:00	Evaluation of alternative method for sampling <i>Dermanyssus gallinae</i> (Acari: <i>Dermanyssidae</i>) in poultry farms <i>Alenka Dovč, University of Ljubljana, Slovenia</i>



13:00-13:20	Monitoring the invasion of <i>Dermanyssus gallinae</i> in flocks of layer hens <i>Sylwia Koziątek-Sadłowska, University of Warmia and Mazury in Olsztyn, Poland</i>
13:20-14:30	Lunch (Restaurant KAPTOL, ground floor) Opportunity for group photo

SESSION 3

Epidemiology of *Dermanyssus gallinae*: towards studies on prevalence of the mite pest itself, resistances and associated pathogens

Chair: Elias Papadopoulos

Oral presentations (10+5 min)	
14:30-14:50	The poultry red mite (<i>Dermanyssus gallinae</i>) as a vector of antimicrobial resistance <i>Igor Stojanov, Scientific Veterinary Institute Novi Sad, Serbia</i>
14:50-15:10	STSM report: Morphological study and molecular identification of <i>Dermanyssus gallinae</i> infesting laying hens in Romania <i>Alexandra Gruianu, Faculty of Veterinary Medicine of Bucharest, Romania</i>
15:10-15:30	Molecular identification by semi-nested PCR of <i>Dermanyssus gallinae</i> in poultry industry in Albania <i>Tana Shtylla Kika, University of Tirana, Faculty of Veterinary Medicine, Tirana, Albania</i>
15:30-15:50	STSM report: Towards the molecular characterization of the channel sodium gene in <i>Dermanyssus gallinae</i> acaricide resistant isolates from Italy <i>Marianna Marangi, University of Foggia, Italy</i>
15:50-16:10	Prevalence of <i>Dermanyssus</i> spp. in exotic pet birds in the district of Setúbal, Portugal <i>Helga Waap, Instituto Nacional de Investigação Agrária e Veterinária, Portugal</i>
16:10-17:00	Coffee break and Poster session (Ouverture Salon, 17th floor) <i>Authors should stand next to the posters during the coffee break.</i>
17:00-18:00	WG 3 individual session (WG 3 – Chair: Lise Roy; Panorama salon, 17th floor)
17:00-19:00	WG 2 individual session (WG 2 – Chair: Monique Mul; Maksimir salon, ground floor)
20:00 -	Social dinner (Restaurant VINODOL, Teslina 10, Zagreb)



Thursday June 2nd, 2016

SESSION 3 - continued

Epidemiology of *Dermanyssus gallinae*: towards studies on prevalence of the mite pest itself, resistances and associated pathogens

Chair: Elias Papadopoulos

Key note lecture	
9:00-9:30	The role of the Red Poultry Mite (<i>Dermanyssus gallinae</i>) as a mechanical vector of avian Influenza A virus <i>Erhard F. Kaleta, Justus-Liebig University, Giessen, Germany</i>

SESSION 4

Future prospects on alternative control of *Dermanyssus gallinae*

Chair: Olivier Sparagano

Key note lecture	
9:30-10:00	Efficacy of synthetic acaricides in Italy during a 7-year period: a survey <i>Nicola Pugliese, University of Bari, IT</i>
Oral presentations (15+5 min)	
10:00-10:20	Research advancing IPM for control of <i>Dermanyssus gallinae</i> in The Netherlands (2004-2016) <i>Monique Mul, Wageningen University, Netherlands</i>
10:20-10:40	Molecular and morphological identification of mites associated with the red poultry mite <i>Eric Palevsky, Newe-Ya'ar Research Center, Agricultural Research Organization, Ministry of Agriculture, Israel</i>
10:40-11:00	<u>STSM report</u>: Assessing the repellent or attractive effect of volatile compounds in <i>Dermanyssus gallinae</i> <i>Athanasios Angelou, University of Thessaloniki, Greece</i>
11:00-11:20	Could enhanced induction of IFN-γ like molecules from chicken macrophages using holocene minerals stimulate the immune response against <i>Dermanyssus gallinae</i> infestation? <i>Bratko Filipič, Institute for Microbiology and Immunology, Medical Faculty, Slovenia</i>
11:20-11:50	Coffee break (Ouverture salon, 17th floor)



SESSION 4 - continued

Future prospects on alternative control of *Dermanyssus gallinae*

Chair: Lise Roy

Oral presentations (15+5 min)	
11:50-12:10	STSM report: Effective implementation of integrated pest management (IPM) for <i>Dermanyssus gallinae</i> in laying hen facilities <i>Monique Mul, Wageningen University, Netherlands</i>
12:10-12:30	What is the potential of an integrated poultry red mite treatment of predatory mites and locally used acaricides in practice? <i>Johan Zoons, Experimental Poultry Centre, Belgium</i>
12:30-12:50	STSM report: Overview of Mesostigmatic communities in layer farms: characterization in terms of morphospecies and sensitivity against deltamethrin <i>Marine El Adouzi, University of Paul-Valéry Montpellier III, France</i>
12:50-14:10	Lunch (Restaurant KAPTOL, ground floor)
14:10-15:10	WG 1 individual session (WG 1 – Chair: Kathryn Bartley; Opera salon, 17th floor)
15:10-16:00	WG 4 individual session (WG 4 – Chair: Danijela Horvatek Tomic; Panorama salon, 17th floor)
16:00-16:30	Closing ceremony
17:00-	City sightseeing



POSTER SESSION

Poster number	Posters
1.	Review of mites and their infections in Slovakia <i>Eva Špitalská, Institute of Virology Biomedical Research Center SAS, Slovakia</i>
2.	Investigations on economics of operational control of <i>Dermanyssus gallinae</i> <i>J.W. van Riel, Wageningen UR Livestock Research, Netherlands</i>
3.	Plant extracts repellent against <i>Dermanyssus gallinae</i> <i>Agathe Labalette, Nor-feed, Beaucouzé, France</i>



Friday June 3rd, 2016

Location: Faculty of Veterinary Medicine University of Zagreb
Heinzelova 55, 10000 Zagreb
(Clinical hall)

Management Committee Meeting
(for MC Members only)

9:00-13:00	Welcome to participants 1. Adoption of agenda 2. Approval of minutes and matters arising of last meeting 3. Update from the Action Chair a. Status of Action, including participating countries b. Action budget status c. STSM status and new applications 4. Promotion of gender balance and of Early Stage Researchers (ESR) 5. Update from the Grant Holder 6. Update from the COST Association 7. Follow-up of MoU objectives a. Progress report of working groups 8. Scientific planning a. Scientific strategy b. Action Budget Planning c. Long-term planning (including anticipated locations and dates of future activities) d. Dissemination planning (Publications and outreach activities) 9. Requests for new members 10. Non-COST applications to the Actions 11. AOB 12. Location and date of next meeting 13. Summary of MC decisions 14. Closing
13:00-14:00	Lunch
14:00-	Departure



BOOK OF ABSTRACTS



THE POULTRY RED MITE; UPDATE FROM UK AND EUROPE

O. A. E. Sparagano¹ and K. Bartley²

¹ Coventry University, UK; ² Moredun Research Institute, UK

In 2015 it was estimated that UK had 36 million laying hens (51% in cages, 47% from free-range (including 2% organic) and 2% from barns) and that 12.2 billion eggs were eaten per year (or 33 million per day or 189 per person/per year in UK) with an estimated sale value of £895 million per year). Consumer opinion is driving the demand for free-range or barn eggs and encouraging farmers to convert their production systems to cage-free. Prevalence data suggests that between 60% and 87.5% of premises are infested. However these data are over 10 years old and the situation since the introduction of enriched cages remains unknown. Any reduction of the egg production due to *Dermanyssus gallinae* could represent hundreds of millions of euros just for production losses not including prevention and treatment costs. Some UK farmers estimate that a 10% improvement in egg production can be achieved with good mite control.

The Health and Safety Executive has published the UK Authorised Biocidal Product Database for Insecticides, acaricides and control of other arthropods following the EU Biocidal Production Regulation (528/2012) with only a few Active Substances being authorised on the UK market. The poultry farmers are usually using Milben Ex, ByeMite, Elector, CBM8 MV, Ficam W, Smite Professional (a degreasant product), Smite Powder (Diatomaceous Earth), Killtec Agro Plus. However HSE is also authorising other groups of products (such as repellents and attractants against insects), which are used by poultry farmers with secondary effects on the poultry red mite.

Keywords: PRM, laying hens, UK and Europe



PRELIMINARY FINDINGS OF POULTRY RED MITE IN MACEDONIAN POULTRY FARMS

A. Dodovski, J. Stefanovska, M. Radeski

*Ss. Cyril and Methodius University in Skopje, Faculty of Veterinary Medicine in Skopje,
Veterinary institute, Macedonia*

Macedonian poultry production is mainly oriented towards eggs production. There are 181 registered layer flocks in 110 farms, differing in biosecurity practice and size (ranging from 2 to 100,000 birds/farm). The large majority of layers are housed in conventional cages while enriched cages have been introduced in only three flocks of three different farms. Currently there are no organic or free-range flocks, neither parent stock flocks. In the past decades, very little efforts have been put to poultry red mite (PRM) studies in Macedonia. Inclusion in Cost action FA1404 COREMI was a trigger to start a research on this topic. The aim of this study was to perform preliminary estimation of the presence of PRM on farm basis in Macedonia, regardless of the infestation levels within a farm. Thirty-two farms laying hen farms, representing all epidemiological regions in the country, were included in the study. The collection of data was based on farm visits (10 farms), carcasses examination (7 farms) and interviews to farmers (15 farms). All farms have applied acaricides at some stage of production cycle. Using this methodology, 22 (69%) of the investigated farms were found positive for the presence of PRM with different infestation levels. This is in agreement with many studies in other European countries, reporting very high prevalence rate, up to 80-90%. Preliminary findings of this study indicate that PRM is a serious threat to poultry industry in Macedonia affecting poultry health and welfare.

Keywords: poultry red mite, layers, presence estimation, Macedonia



CURRENT SITUATION OF *DERMANYSSUS GALLINAE* IN REPUBLIC OF KOREA

Jong Ung Yoon, Hyng Bae Kang, Do Hoon Lee

¹ Biogenoci Co.Ltd, S.Korea

Dermanyssus gallinae is major ectoparasitic disease in layer farm for Asian countries. Due to condensed production system and developing economic situation, red mite problem has been ignored than other infectious poultry disease. South Korea now produce 75mil of layer population, in 1200 farms, infestation rate is more than 94% (internal research). Global warming and humid climate also enhanced infestation. *D. gallinae* infestation is accompany with infectious disease like *Salmonella gallinarum*, fowl pox, coryza and pneumovirus infection.

Most of farms use agricultural insecticide or acaricide without prescription or regulation. Commonly used chemicals are DDVP, cartap, carbaryl, organophosphate, bifenthrin, amitraz, fipronil and neonicotinoids. Treatment failures by inadequate treatment protocols, unregistered products with wrong dilution rate, repeated, long term applications, lead to resistance in mites. We assume pesticides accumulate in poultry meat, organs and/or eggs. There's criteria for residue and MRL for egg and poultry meat but test has not been done (Codex, KFDA annual report).

Some farms try plant extract, essential oils or inert dust for alternative control method.

Basic research for red mite prevalence, chemical resistance and proper regulation and application guide should be done by government or researcher.

Keywords: *Dermanyssus gallinae*, prevalence, pesticide, pest control, country report, poultry disease



POULTRY RED MITE (*DERMANYSSUS GALLINAE*): KNOWN AND UNKNOWN FACTS IN TURKEY

V. Y. Cirak¹, M. Ozuicli¹, L. Aydin¹ and C. Gokbulut²

¹ University of Uludag, Turkey; ² University of Balikesir, Turkey

In Turkey, there are 1113 commercial egg establishments and 3229 poultry houses that are registered to Ministry of Food, Agriculture and Livestock. Laying hen population of Turkey is 98 million (10th place in the world ranking). Turkish Egg Producers Association, established in 2006, is divided into 15 regions and has totally 500 member establishments. The majority of the commercial egg establishments consist of <60.000 layers (52%). 45% harbour between 60.000 and one million, and 3% consist of one - three million layers. In most of these premises, the layers are housed in conventional cages. To a lesser extent, tiered/barn and semi-intensive systems are also present. In recent years, free range production is also increasing.

Although there is no scientific data on its prevalence, the poultry red mite (PRM; *Dermanyssus gallinae*) is thought to be highly prevalent in Turkish layer houses according to various personal communications with establishment owners/farmers. Only a few case reports or treatment trials are reported. There are no officially registered chemicals against PRM. Extra-label use of different chemical compounds is a common practice. The used compounds are as follows: Permethrin, phoxim, tetramethrin, alfa-cypermethrin, propoxur, macrocyclic lactones (?), etc. Some biological and biophysical products like plant extracts/essential oils and silica powders, respectively, are also used.

Recently, a small-scale project has been started by our group to collect data on the prevalence of PRM in Bursa and related provinces. Additionally, another part of this project deals with the determination of residue levels in eggs of some chemicals, registered in several EU-countries, that are used against PRM.

Keywords: *Dermanyssus gallinae*, prevalence, laying hens, Turkey



PRELIMINARY SURVEY DATA ON THE PREVALENCE OF *DERMANYSSUS GALLINAE* AND THE CONTROL STRATEGIES EMPLOYED IN NON-COMMERCIAL BACKYARD FLOCKS IN THE UK

K. Bartley; H. W. Wright, A. J. Nisbet
Moredun Research Institute, Edinburgh, UK

There has been a surge (27% increase from 2010 to 2013) in UK households keeping backyard hens for non-commercial egg production. Undoubtedly the blood feeding ectoparasite, the poultry red mite (PRM), is present in UK backyard flocks; however, the severity of the situation and the controls employed remains unclear. The aim of this survey was to gather preliminary data from hobby-keepers to understand their awareness of PRM, PRM prevalence and controls/prevention measures employed.

During the Royal Highland Show (2013) we carried out 47 face to face interviews with people visiting the poultry tent. 45 respondents were hobby-keepers with backyard flocks ranging from 2 to 300 birds, housed primarily (98%) in traditional wooden coops. A high percentage (88.9%) of respondents were aware of PRM and 60% confirmed that they currently have or have had PRM in the past. Of those with current or past PRM infestations (n=24), 75% rated the infestation as a low severity, 25% as medium severity and none as severe.

Generic 'mite powder' was the most common PRM control or prevention measure used (60%), followed by hygiene treatments (45%), 'red mite spray' of unknown content (17.5%), acaricide spot-on treatment (10%) and replacement housing/furnishings (7.5%). A variety of unusual treatment practices were employed by 25% of respondents, of which, some were potentially dangerous. These data highlight the unregulated nature of the UK backyard flocks and the need for a better understanding of safe poultry husbandry practices and the potential risk for food safety and human health in the hobby-sector.

Key words: backyard flocks, UK, red mite control, prevalence, food safety, husbandry



Q-PERCH, ELECTRONIC CONTROL OF RED MITE

Dick van de Ven
Vencomatic Group

To develop a red mite proof housing system the Vencomatic Group increased its effort to reduce the amount of hiding places for mites. Despite this effort current aviary systems remain complex, which motivated the company to find a sustainable pest control method that could be integrated in the housing system. The aim was to develop a method that would eradicate red mite without the use of chemical and/or biological components that would be durable and wouldn't lead to immunity amongst red mite. During the last 5 years the Q-Perch has been developed to meet these requirements. The system consists of a perch which is equipped with electrical barriers to prevent the mites from reaching the poultry resting on the perches. During the night the mites will look for a meal and have to cross the electrical barrier to reach it, when the mite makes contact with both conducting parts of the barrier a current will flow through the mite and electrocute it. The Q-perch has been implemented in several test locations where it managed to achieve promising results, as well as raising some interesting questions about the behaviour of red mite.

Keywords: Q-Perch, mite control, electrical barrier, sustainable



IN VITRO EFFICACIES OF ESSENTIAL OILS AGAINST THE POULTRY RED MITE *DERMANYSSUS GALLINAE*

I. Radsetoulalova and M. Lichovnikova
Mendel University in Brno, CZ

The aim of this study was to test the effectiveness of essential oils against the poultry red mite, *Dermanyssus gallinae*, by glass vial bioassay. Six oils (derived from cinnamon, lavender, clove buds, skin of Brazilian oranges, peppermint and rosemary) were tested at concentrations of 0.5, 0.25, 0.12, 0.06 and 0.03 $\mu\text{L}/\text{cm}^2$. The solutions were spread at the bottom of the vial and then evaporated. Mites collected on farm (max 2 days of storage) were placed in the vials ($n=10$ to 20). All movable mites were used regardless of the stage of their development. The mortality of the exposed mites was measured after 24 h. The experiment was repeated twice, always three vials per each concentration and oil were used. All the oils reduced *D. gallinae* survival. The average mortality in negative control was 2.5%. The highest mortality was observed with cinnamon and clove buds at concentrations 0.5 and 0.25 $\mu\text{L}/\text{cm}^2$ (cinnamon 100 and 95% resp., clove buds 85 and 100% resp.). On the other hand the lowest mortality was observed with rosemary and peppermint at the same concentrations (rosemary 26 and 20% resp., peppermint 27 and 25% resp.). The mortality in lavender and Brazilian oranges were 73 and 53% at concentration 0.5 $\mu\text{L}/\text{cm}^2$. The results suggest that certain essential oils may make effective botanical pesticides against *D. gallinae*.

Keywords: cinnamon, lavender, clove buds, Brazilian oranges, peppermint, rosemary



EVALUATION OF ALTERNATIVE METHOD FOR SAMPLING *DERMANYSSUS GALLINAE* (ACARI: DERMANYSSIDAE) IN POULTRY FARMS

Alenka Dovč¹, Neva Šemrov², Aleksandra Vergles Rataj¹, Renata Lindtner Knific¹, Majda Nemec¹, Tajda Trbovšek³, Zala Bradaševac³, Olga Zorman Rojs¹

¹ University of Ljubljana, Veterinary Faculty, Ljubljana, Slovenia; ² VET.AM.JATA d.o.o., PE Pivka, Košana Pivka, Slovenia; ³ University of Ljubljana, Veterinary Faculty, Ljubljana, Slovenia (student of 4th year study)

Until now many different traps and devices for trapping the chicken mite, *Dermanyssus gallinae* have been evaluated. Traps made from rectangular pieces of 3 mm thick corrugated cardboard as well as traps made from corrugated paper, crumpled toilet paper or “taquaril” bamboo straw traps seemed to be useful for mite catching. For the effectiveness evaluation of such traps two to ten days are usually needed.

In our study two methods for monitoring the infestation with *Dermanyssus gallinae* in four broiler breeder flocks were compared. In the first part of the experiment classical plastic containers filled with crumpled toilet paper were used. Traps were put beneath the grating or in nests for two to seven days but the number of trapped mites was very small. We decided to conduct the experiment by using two type of traps. In one group of traps self-heating pads containing Sodium Acetate activated to produce exothermic reaction were put in the commonly used traps, left overnight for about 6 to 8 hours and collected. Simultaneously common traps were used. Both methods were conducted in all four flocks under the same conditions.

Both methods were compared by counting the number of trapped mites. The results were significantly better when heating traps were used. Obviously mites like warm, dark places. For monitoring the infestation rate of chicken mites in poultry houses traps containing self-heating pads proved to be more useful.

Key words: Poultry red mite, *Dermanyssus gallinae*, sampling trap, evaluation



MONITORING THE INVASION OF *DERMANYSSUS GALLINAE* IN FLOCKS OF LAYER HENS

Rajmund Sokół, Sylwia Koziątek-Sadłowska

*Department of Parasitology and Invasive Diseases, Faculty of Veterinary Medicine,
University of Warmia and Mazury in Olsztyn, Poland*

Massive invasions of *Dermanyssus gallinae* in industrial poultry farms remain a serious problem, especially in caged layer hen farms, despite intensive research. Regular monitoring of *D. gallinae* population dynamics is important to reduce mite population, thus, paper tube-trap system was developed. Rolled paper tube-traps with the size of 1 cm (diameter) x 20 cm (length) are fixed in laying hen houses at 1 trap/1000 hens. Traps are collected into 900-ml jar after 1- 2 weeks and replaced by new ones at the same pattern and location (number of traps, place and height of attachment) and then placed overnight in a freezer to immobilize *D. gallinae*. The total content of all traps is poured onto a 2-centimeter grid paper. Developmental forms are counted in each square into 3 groups: eggs, nymphs and larvae, adults. The result is summed up. In case of a large number of mites (innumerable), content of traps is mixed and weighed and only one gram is used for counting (number of mites= number of mites/gram x total content of traps weight). A big advantage of this method is the reproducibility of results and it can be universally applied by breeders on their own. The method facilitates the assessment of the population size and structure; helps define the dates and the need for conducting subsequent mite removal procedures; or even assess the effectiveness of the substance used. It can also be helpful for scientific purposes related to *D. gallinae* population studies.

Keywords: *Dermanyssus*, poultry red mite, paper tube-traps, mite population monitoring, caged rearing system



THE POULTRY RED MITE (*DERMANYSSUS GALLINAE*) AS A VECTOR OF ANTIMICROBIAL RESISTANCE

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The poultry red mite (PRM) *Dermanyssus gallinae* is the causative agent of ectoparasitosis causing health and economic problems in poultry. Direct damages can occur when, depending of abundance of parasites, their hematophagous diet weakens the birds. On the other hand, PRM has the potential ability to transmit, as vectors, different pathogenic bacteria and viruses, and to contribute to the spread of infections. In addition to the aforementioned bacteria, saprophytic and conditionally pathogenic microorganisms that PRM can carry on and/or inside, may contain genes conferring resistance to certain antimicrobial drugs. In this way PRM can also participate in the transmission of resistant strains within or outside the farm. It can be said that the finding of PRM is a part of a production problem which is linked to technopathy. However, the emergence and spread of antimicrobial resistance is also to be considered as technopathy or could be an indicator of the presence of technopathy. In our study, we would like to determine bacteria that can be found on PRM, with the aim to detect whether the isolated pathogens are resistant to antibiotics and to detect possible multidrug resistance. We analyzed samples of PRM collected from 2 farms with multiple objects. Four isolated species (*Escherichia coli*, *Enterobacter sp.*, *Citrobacter sp.*, and *Pseudomonas aeruginosa*) were tested for antimicrobial susceptibility. In all the tested strains, resistance to amoxicillin, ampicillin, and colistin were detected, while the resistance to tetracycline, doxycycline, and some of the aminoglycosides were partial.

Keywords: *Dermanyssus gallinae*, antimicrobial resistance



MORPHOLOGICAL STUDY AND MOLECULAR IDENTIFICATION OF *DERMANYSSUS GALLINAE* INFESTING LAYING HENS IN ROMANIA

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Dermanyssus gallinae (Mesostigmata: Dermanyssidae) is a blood-feeding ectoparasite with a high prevalence in poultry farms in Europe, causing important economic losses. The present study was aimed to perform morphological and molecular characterization of *D. gallinae* infesting laying hens in 3 farms in Southern Romania. The morphological identification of the mites was carried out by using specific keys. The main morphological criteria used for identification were: the genitoventral shield of parasite posteriorly rounded with one pair of seta; the sternal shield wider than longer; the anal shield with three setae. All the collected mites were morphologically identified as *D. gallinae*. All mites morphologically identified as *D. gallinae* were subjected to molecular analysis by two PCRs, targeting the nucleotide sequence of ribosomal internal transcribed spacers (ITS) and the mitochondrial cytochrome oxidase subunit I (*cox1*). The reactions returned a single band for each sample of *D. gallinae*, whose length was 750 bp and 500 bp for of ITS-and *cox1*-targeting PCR, respectively. In order to obtain the DNA for sequencing, DNA cloning was carried out by using a specific plasmid vector (*E.coli*). The recombinant plasmids were extracted for sequencing and further phylogenetic analysis will be performed. Altogether, the findings represent a basis for further studies for a better understanding of the epidemiology of red mites infestation in different types of laying hens farms in Romania.

Key words: *Dermanyssus gallinae*, morphological study, molecular characterization, *cox I*, ITS region, Romania.

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MOLECULAR IDENTIFICATION BY SEMI-NESTED PCR OF *DERMANYSSUS GALLINAE* IN POULTRY INDUSTRY IN ALBANIA

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In the present work a total of 5 groups of poultry red mites were investigated. The samples were collected in as many poultry farms (layers and broilers) of Albania using the Cardboard method. The mites were previously microscopically identified as *Dermanyssus gallinae* by using the morphological keys, and then they were investigated by two semi-nested PCRs (snPCR) targeting the internal transcribed spacer (ITS) of the ribosomal gene region and the mitochondrial cytochrome oxidase subunit I gene (COI). The snPCR guarantees high specificity and sensitivity and both targets allowed to get amplicons consistent with *D. gallinae*' sequences.

These results are the first step for further studies, i.e. investigating/exploring the nucleotidic diversity among *D. gallinae* population present in poultry farms in Albania, which may allow a better understanding of the mite population genetics, as well as highlight epidemiological aspects.

Keywords: *Dermanyssus gallinae*, Albania, poultry farms, ITS gene, COI gene



TOWARDS THE MOLECULAR CHARACTERIZATION OF THE CHANNEL SODIUM GENE IN *DERMANYSSUS GALLINAE* ACARICIDE RESISTANT ISOLATES FROM ITALY

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In the last years, acaricide resistance in populations of *Dermanyssus gallinae* was recurrently suspected. This might be attributed to the genetic variability of the acaricide target genes. Data on target coding genes and the possible polymorphisms involved in such resistance remains completely unexplored in *D. gallinae*.

In order to investigate mutations in the gene coding the pyrethroid's target, we screened the literature on pyrethroid resistance and the GenBank database to identify mutations in other Acari and run molecular experiments to sequence the right portions of the voltage gated sodium channel gene (VGSC). Seventy-three sequences of the VGSC gene from several species of Acari belonging to Tetranychidae, Sarcoptidae, Varroidae and Ixodidae families were downloaded from Nucleotide-GenBank. After sequence alignment, the VGSC sequence from domain II to IV was split into 3 different parts in order to design primer pairs able to amplify largely overlapping fragments, for subsequent Sanger sequencing.

Highest nucleotide variations were observed among acarine VGSC. A total of 26 primer pairs were designed using Primer BLAST program and different amplicons were sequenced. None of the obtained sequences were related to the *D. gallinae* sodium channel gene suggesting that the gene is very different even between *D. gallinae* and the most closely related mite species available in the GenBank (*Varroa destructor*). Further experiments are ongoing. Once the gene will be molecularly characterized, the *D. gallinae* populations -with contrasted susceptibility to pyrethroids-, will be tested in order to estimate the frequency of mutations related to acaricide resistance.

Keywords: *Dermanyssus gallinae*, Channel Sodium gene, acaricides resistance, pyrethroids

This work was supported by COST Action FA1404 (COREMI) within a STSM visit of Marianna Marangi at the Université P. Valéry Montpellier, France (supervisor: Lise Roy) and funded by L.A.I.F.F. Project n. 47, "PO Puglia FESR- 2007-2013, Asse I, Linea 1.2. Accordo di Programma Quadro in materia di Ricerca Scientifica. Intervento "Reti di Laboratori Pubblici di Ricerca" (Responsible: A. Giangaspero).



PREVALENCE OF *DERMANYSSUS* SPP IN EXOTIC PET BIRDS IN THE DISTRICT OF SETÚBAL, PORTUGAL

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The present survey was carried out to determine the prevalence of *Dermanyssus* spp. in exotic pet birds in the district of Setúbal, Portugal. Samples were collected from a total of 217 birds, including Atlantic canaries (*Serinus canaria*; $n=147$), zebra finches (*Taeniopygia guttata*; $n=6$), star finches (*Neochmia ruficauda*; $n=2$), long-tailed finches (*Poephila acuticauda*; $n=2$), Gouldian finches (*Chloebia gouldiae*; $n=6$), Bengalese finches (*Lonchura striata domestica*; $n=5$), budgerigars (*Melopsittacus undulatus*; $n=24$), cockatiels (*Nymphicus hollandicus*; $n=6$), lovebirds (*Agapornis* spp; $n=15$), African grey parrots (*Psittacus erithacus*; $n=2$), Bourke's parrots (*Neophema bourkii*; $n=1$) and rose-ringed parakeets (*Psittacula krameri*; $n=1$). Mites were captured directly from different parts of the body of birds and with corrugated cardboard traps placed at the bottom of cages and in nests. Traps were removed after 8 days, placed into bags and frozen during 24h for parasite inactivation. Mites of the genus *Dermanyssus* were identified in 8 canaries (5.4%; 95%CI 2.8-10.4), 8 finches (38.1%; 95%CI 20.8-59.1) and 1 lovebird (6.7%; 95%CI 1.2-29.8). The mesostigmatid mite *Ornithonyssus sylviarum* was identified in 47 canaries (32.0%; 95% CI 25.0-39.9%), 3 finches (14.3%; 95%CI 5-34.6), 1 budgerigar (4.2%; 95%CI 0.7-20.2) and 1 lovebird (6.7%; 95%CI 1.2-29.8). Prevalence of *Dermanyssus* spp. was significantly lower in birds kept in regularly disinfected premises and was not associated with sex, age, body condition and ectoparasite treatment. The finding of *Dermanyssus* spp. and *O. sylviarum* in several bird species kept indoors, underlines the need to alert veterinary practitioners, bird owners and breeders in order to effectively prevent and control these zoonotic ectoparasites.

Keywords: prevalence, *Dermanyssus* spp., exotic birds, Portugal



EFFICACY OF SYNTHETIC ACARICIDES IN ITALY DURING A 7-YEAR PERIOD: A SURVEY

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The control of *Dermanyssus gallinae* is one of the most challenging issues that farmers and operators have to face. Despite alternative measures have been developed in the last few years, the almost universal approach remains the pharmacological treatment. However, synthetic drug efficacy is often impaired by the insurgence of acaricide-resistant populations of mites. The scenario is further complicated by the very limited range of available products to be used in presence of animals, and therefore it is presumable that many farmers might use non-authorized products.

In the light of this, the efficacy of amitraz and lambda-cyhalothrin has been evaluated. Specifically, the susceptibility of 85 mite samples, collected from as many Italian poultry farms since 2008, was determined *in vivo* according to Thing and Muggleton (1998). Both drugs are not authorized for use in presence of animals.

The average efficacy of lambda-cyhalothrin and amitraz was 56% and 74%, respectively, with a clear raise of resistance of the tested groups since 2012.

For both the acaricides, only a slight improvement of efficacy was observed with higher concentrations.

On aggregate, the efficacy rate of amitraz and lambda-cyhalothrin was quite variable, suggesting that the best approach for the effective treatment of *D. gallinae* in poultry farms should be tailored taking into account factors such as the level of infestation and the susceptibility of the specific mite populations infesting the environments. Therefore, an integrated approach should be advisable, including alternative measures, turnover of drugs, control of microclimate and strict respect of the basic hygienic rules.

Keywords: acaricide, susceptibility; amitraz, lambda-cyhalothrin



RESEARCH ADVANCING IPM FOR CONTROL OF *DERMANYSSUS GALLINAE* IN THE NETHERLANDS (2004-2016)

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In The Netherlands, egg producing farmers have become increasingly aware of the negative effects of the poultry red mite *Dermanyssus gallinae* (PRM) since 1990. The product board for poultry and eggs financed a literature study to get an overview of the negative effects of PRM and methods to control this pest. A questionnaire was sent to investigate the severity of PRM as a pest in laying hen facilities in The Netherlands. These studies revealed the complexity and the costs to control PRM in the Dutch laying hen facilities. Consequently, the Dutch poultry farmers and the ministry of Economic affairs jointly decided to invest in scientific research to produce knowledge and technical means that can be used by industry and farmers to control PRM in practice. The following scientific research was conducted and the main results will be presented:

- Measures were determined to prevent introduction and spread of PRM in laying hen facilities,
- An automated mite detection sensor was designed and validated,
- A PRM population dynamics model was developed which, together with an economic model and an algorithm, give farmers advise on the best economic optimum time for treatment against PRM in laying hen facilities,
- Candidates for predators for biological control of PRM were found and tested under semi practical circumstances on control efficacy,
- Attracting volatiles were sought and the efficacy of entomopathogenic fungi were tested for the development of an attract-and-kill strategy for PRM.

Keywords: egg production, PRM control, IPM, Netherlands



MOLECULAR AND MORPHOLOGICAL IDENTIFICATION OF MITES ASSOCIATED WITH THE RED POULTRY MITE

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Predatory mites are widely used for the control of plant feeding mites. However, information on the ecology of acarine predators and alternative prey found in association with mites attacking poultry and their potential for biological control is very limited. Studies conducted at the end of the last century and the beginning of this century have demonstrated that mites of the families Cheyletidae and Laelapidae prey on the red poultry mite, *Dermanyssus gallinae* and small scale production of these biocontrol agents is currently being performed. As these were pioneering studies, it can be expected that additional species from these families and others will be identified as biocontrol agents of *D. gallinae*. To enhance our understanding of the mite communities associated with poultry mites, we will conduct a training school on the morphological and molecular taxonomy of acarine families associated with *D. gallinae* at the Faculty of Agriculture of the Hebrew University, in Rehovot, Israel during September 11th-16th, 2016. Prior to this training school, mites collected by COST action FA1404 members in 2015 and 2016 were imaged, placed individually in micro-plates in 95% ethanol and sent to Canada for DNA barcoding. Following their return, they will be identified by expert taxonomists and a key for their identification will be prepared. The training school will include slide preparation and species identification with the prepared key using phase contrast light microscopy coupled with the relevant DNA barcoding tools.

Keywords: biocontrol, predatory mites, soil mites, food-web engineering, barcoding



ASSESSING THE REPELLENT OR ATTRACTIVE EFFECT OF VOLATILE COMPOUNDS IN *DERMANYSSUS GALLINAE*

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The poultry red mite (PRM), *Dermanyssus gallinae*, is the most important hematophagous hematophagous pest of domestic poultry, at least in Europe. Its particular habits (spends its life in the environment, not on host) make control a tricky issue. During this study, we adapted and validated a behavioural test protocol to assess the biological activity of volatile compounds in terms of repellency or attractiveness in *D. gallinae*. This was processed in an olfactometer device with glass Y-tubes. A gentle flow with differently odour-loaded airs in each of the two arms of the Y was produced. Adult PRM females were released at the base of the Y-tube, thus concomitantly exposed to two different odour sources (choice tests). To assess the test functioning, we checked that consistent and repeated mite behaviours might be recorded with five different substances as odour sources (ammonia, lactic acid, eugenol, feathers and droppings). Two different kinds of choice test were carried out: (1) odour-loaded air vs clean air (repellent, attractive, or neutral odour), (2) two different odour-loaded airs in order to compare the preference of the mites. During this experiment the response of 100 mites was assessed, generating a few preliminary results. Eugenol had a strong repellent effect and there was a notable attraction of the mites to odours from feathers and droppings. This study provides a test allowing for assessment of the potential repellent or attractive effects of different molecules that could be used to improve the control of PRM. This was a first step towards setting up a further larger scale experiment.

Keywords: choice test, volatile organic compounds, poultry red mite, behaviour

The test development was processed in the framework of a Short Term Scientific Mission (STSM fund by the COST action COREMI) in November, 15th – 28th 2015. The Host for this STSM was Dr. Lise Roy (Center for Evolutionary and Functional Ecology, Montpellier, France).



**COULD ENHANCED INDUCTION OF IFN – γ LIKE MOLECULES FROM CHICKEN
MACROPHAGES USING HOLOCENE MINERALS STIMULATE THE IMMUNE RESPONSE
AGAINST *Dermanyssus gallinae* INFESTATION?**

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It was reported that strong electric impulses can induce an IFN- α like protein from human leukocytes/ macrophages. Similarly the porcine leukocytes induce the IFN- α like molecule after infection with Sendai virus and electric impulses. Infestation of chickens with *Dermanyssus gallinae* stimulates the production of Th1 cytokines (IFN γ etc) and these may be important in generating a natural immune response. We undertook a series of *in vitro* experiments to see if IFN- γ like responses could be improved with Holocene minerals. An improvement of IFN- γ like molecules production by addition of Holocene minerals to the LCL preparation in feed could enhance the resistance against the effect of infestation with *Dermanyssus gallinae*. The ChIFN- γ like molecules were measured by AP assay on CoMA (Chicken macrophage cell line) and ChIFN- γ (40.000 IU/ml) as standard. Samples were analyzed by RP-HPLC and measured at 280/214 nm. The following results of the *in vitro* experiments were obtained: (1) LCL alone gave 6372 IU/ml, (2) 10% PBS gave 10316 IU/ml (3) 10% PBS + LCL give 48028 IU/ml. In addition we tested different Holocene minerals and theirs 10% PBS washout to enhance the IFN – γ like production *in vitro*. So, Sample 3 (Sand from Koprivnica) in combinations: 10% PBS (3) + LCL give 86212 IU/ml. It can be concluded that 10% PBS washout of different Holocene minerals enhance in a different way the LCL induction of ChIFN- γ like molecules depends from the composition of the Holocene minerals.



EFFECTIVE IMPLEMENTATION OF INTEGRATED PEST MANAGEMENT (IPM) FOR *DERMANYSSUS GALLINAE* IN LAYING HEN FACILITIES

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An STSM was carried out to acquire knowledge on the implementation of Integrated Pest Management (IPM) in general and more specific in laying hen facilities against *Dermanyssus gallinae* to identify the scientific knowledge necessary for an effective implementation of IPM for *D. gallinae* in layer farms. It was identified that various IPM definitions are available in the literature. Because of the current EU legislation on IPM, nowadays only applied in plant protection but most likely also going to be applied to biocidal products in the future, the definition of the EU Directive 2009/128/EC is used as a guideline. In this Directive IPM is described in eight steps. To identify the level of adoption of IPM in both Finland and The Netherlands, the structure as suggested by Benbrook was used. It was determined that level one of IPM was not reached in both countries due to lack of structured monitoring or scouting of *Dermanyssus gallinae*. The participants of the STSM discussed methods contributing to the on-farm implementation of IPM for *Dermanyssus gallinae*.

Keywords: *D. gallinae*, laying hens, IPM

This work was supported by COST Action FA1404 (COREMI) within a STSM visit of Monique Mul at the Natural Resources Institute (LUKE), Finland (Supervisors: Irene Vänninen and Dr. T. Tuovinen)



WHAT IS THE POTENTIAL OF AN INTEGRATED POULTRY RED MITE TREATMENT OF PREDATORY MITES AND LOCALLY USED ACARICIDES IN PRACTICE?

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Previous research at UGENT showed promising results for the combination of predatory mites and locally used acaricides (milbemectine and amitraz). In this project the applicability in practice of such integrated pest management is investigated. Not only will the efficacy of the treatment, but also the financial costs and workload for the farmer be evaluated.

The layer house of the Experimental Poultry Centre contains 12 climate and light independent compartments (enriched cages and aviaries). 31000 hens were housed. In each housing type the combination of predatory mites/milbemectine and predatory mites/amitraz was tested as well as each treatment on its own. Predatory mites are released in the houses in cultivating bottles of which half of them is replaced every month. The acaricides are applied locally. PVC pipes are filled with impregnated rolled cardboard. The PRM population is carefully monitored on a weekly base. Both a visual score (Mite Monitoring System) and a counting of PRM in cardboard traps are performed to maintain an overview of the (changes) in population. In addition, the predatory mite population is monitored weekly.

After 3 months, only the enriched cages suffered from PRM. However, it was very clear that the compartments with only predatory mites and only acaricides scored very high counts of PRM. It was also in these compartments the infestation with PRM started. At the moment that the lights in the compartments were dimmed for the prevention of feather pecking, an increase in all compartments was seen. However, the compartments with the combination treatments did not show as many highest scores (4) on the visual evaluation and did not have counts > 20.000 as found in the compartments with the single treatments. To date, the combination of predatory mites and milbemectine showed better results in controlling the PRM infestation compared to the combination predatory mites/amitraz.

In conclusion, an integrated pest management of predatory mites and locally used acaricides showed promising results when applied under practical condition. However, these results need to be confirmed under spring and summer conditions and the practical application needs some refinement.

Keywords: Poultry red mites, integrated pest management, (predatory mites, local acaricides)



OVERVIEW OF MESOSTIGMATIC COMMUNITIES IN LAYER FARMS: CHARACTERIZATION IN TERMS OF MORPHOSPECIES AND SENSITIVITY AGAINST DELTAMETHRIN

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Due to the nidicolous habits of the Poultry Red Mite (PRM), biological control by mite natural enemies is among the most promising alternative control means. Up to now, the introduction of a few predatory mite species has been tested. Because of complex interactions in ecosystems, it is not unlikely that suppressor effects by particular multi-species assemblages be higher than by a few species. In order to help improving natural pest control mechanisms against PRM, we recently initiated a study dedicated, in the longer term, to identify assemblages with a suppressive potential on PRM naturally dwelling in farm microhabitats. For such a purpose, we started to (1) document the taxonomic composition of mesostigmatic communities of layer buildings, (2) estimate the sensitivity of dominant morphospecies to commonly used insecticides.

The mesostigmatic communities from 6 French farms and 3 Polish farms were characterized in terms of morphospecies and Molecular Operational Taxonomic Units (MOTUs) and two morphospecies were subjected to sensitivity bioassays with deltamethrin. Mesostigmatic mites were recovered from the manure of every farm. Twelve morphospecies were recorded, of which two were largely recurrent. A morpho-molecular analysis showed that most of the defined morphospecies were belonging to the same MOTU. Barcoded mites will be used for the development of an identification key for the upcoming COST Training School, to take place in Israel, Sept. 2016. All French populations of the two most abundant and recurrent morphospecies revealed to be highly sensitive to deltamethrin (Polish populations untested). This information could be of a particular interest in the perspective of an integrated pest management (IPM) program.

Keywords: *Dermanyssus gallinae*, conservation biological control, poultry, mesostigmatid communities, pesticide sensitivity

The Polish farms were sampled upon a Short Term Scientific Mission (STSM) funded by the COST action COREMI in November, 2nd – 6th 2015. The Host for this STSM was Dr. Tomasz Cencek (National Veterinary Research Institute, Poland).



REVIEW OF MITES AND THEIR INFECTIONS IN SLOVAKIA

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The mite superfamily Dermanyssoidea is the most ecologically diverse group of Mesostigmata. Parasitic and non-parasitic species can be found in large numbers in the nests and burrows made by their vertebrate hosts. Some of species of mites occasionally infest man, and some may transmit diseases to humans. Mites have been found to transmit rickettsial agents such as *Rickettsia akari*, *Orientia tsutsugamushi* and they can contain *Anaplasma* spp., *Bartonella* sp., *Spiroplasma* sp., *Wolbachia* sp., and other unclassified Rickettsiales. *Dermanyssus gallinae* is of the greatest economic and veterinary importance among the studied species because it occurs worldwide and is closely associated with domesticated birds. The most frequent infestation was found in the nests of *Columba livia* f. *domestica*, *Passer montanus*, as well as in buildings hosting *Gallus gallus* var. *domesticus*. Among the wild birds, *D. gallinae* is more frequently found in the nests of birds that are common in synanthropic and urban habitats. A unusual finding was on a dung beetle, *Geotrupes stercorarius*.

Mites removed from trapped rodents belong to species of Laelapidae and species of Trombiculidae. Rickettsial DNA was found in 32.46 % of pools of mites. *R. helvetica* was identified in *L. agilis*, *H. nidi*, *H. zachvatkini* and *K. štorkáni* and *R. monacensis* in *H. zachvatkini*.

The study was financially supported by the project VEGA No.: 2/0061/13 .

Keywords: mite, Slovakia, *Rickettsia* spp.



INVESTIGATIONS ON ECONOMICS OF OPERATIONAL CONTROL OF *DERMANYSSUS GALLINAE*

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Dermanyssus gallinae (red mite) is a haematophagous ectoparasite affecting the health and welfare of laying hens across Europe. In 2005, Dutch layer farmers estimated the costs of a *Dermanyssus gallinae* infestation in laying hen facilities as € 0.43 per laying hen per flock including the treatment costs. If this cost were to be factored across the estimated 600 million laying hens in the EU, the cost of *D. gallinae* infestation would be approximately €250 million per year. Whilst it is clear that *D. gallinae* can have a major impact on cost of production, there are no reports about the economic effect related to mite infestation level. The scientific literature reports only a few experiments in which the egg production and mortality of hens is related to different mite infestation levels. Other literature, mainly sourced from the industry, is often confidential or not well documented. Moreover, the effect of a *D. gallinae* infestation on the health and production of laying hens may be influenced by a number of factors including the resilience level of the flock. However, in order to determine the optimal time, for both efficacy and economics, methodology to determine threshold levels of infestation in an operational (online) setting would be a valuable step to support monitoring tools. During the STSM the different types of costs were evaluated as to the degree of usefulness for modelling economics losses due to a mite infestation level in an operational model. The results suggest that both the reversible and irreversible damage to hens should be taken into account. Future work will explore the time dependent relation between mite infestation and hen productivity.

Keywords: economics, methodology, threshold levels, monitoring, operational model, decision support



PLANT EXTRACTS REPELLENT AGAINST *DERMANYSSUS GALLINAE*

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Some feed grade (Reg. 1831/2003) plant extracts are repellent for arthropods such as *Cymbopogon nardus* or *Eugenia caryophyllus* essential oils. Moreover, the substances ingested by the hens are rapidly absorbed and excreted. For this use, a mineral feed (Reg. 767/2009) composed of plant extracts such as *Cymbopogon nardus* and *Eugenia caryophyllus* and containing a rate of crude ash > 40% was developed. The aim of this study is to verify if the formulation is repellent against *Dermanyssus gallinae*. In order to verify the repellent effect of a blend from plant extracts such as *Eugenia caryophyllus* and *Cymbopogon nardus*, we used 0.5g of the mineral feed (Nor-Mite®). In order to exacerbate the effect the dose was 8 times higher than for the hens. 0.5g was disposed in 12 plastic boxes (13.5cm x 11cm) separated in 2 compartments. The side A contained the mineral feed and the side B was empty. Then, between 37 and 115 poultry red mites were randomly disposed in each box to study their behavior when exposed to the product. The number of mites in each zone was recorded and the results were statistically analyzed by Anova using R version 3.2.2. The computation revealed that 68% of the poultry red-mites were positioned on the side B, away from the product, after the 3 hours period at room temperature. Moreover, the statistical analysis revealed that the mite repartition was significantly different ($p < 0.01$). In this trial conditions, the mineral feed composed of plant extracts, such as *Eugenia caryophyllus* and *Cymbopogon nardus*, significantly impacts the behavior of the poultry red mite, demonstrating its repellent effects.

Key-words: Repellent, plant extracts, red mites, mineral feed



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