Digestive microbiome and parasites' control in autochthonous swine breeds in low input systems by use of plant-derived products

2020

Introduction

- In Romania, swine breeding is an important tradition, the vast majority of pigs being raised in low input systems. Recently an increase in the number of free-range farms has been noticed
- Parasitic and bacterial diseases cause significant economic losses to pigs by loss in production, by immune suppression, and by increased morbidity and mortality in livestock.

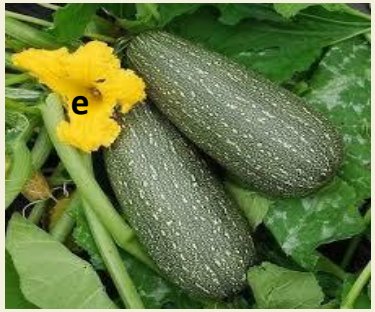
Mangalitza pigs on a free-range farm.

Aim

- The strategies to limit parasites (e.g. *Trichomonas suis, Balantidium coli, Isospora spp., Ascaris suum, Trichocephalus suis, Metastrongylus* spp. and ectoparasites) and bacterial infections and to improve health and welfare, by the experiments on sows and piglets, conducted on low-imput outdoor farms from North Western and Central Romania.

- Achievement of a combined antiparasitic, antimicrobial and immune stimulating effect in sows and piglets from outdoor/low input farms, provided with access to pasture and/or with feed supplements containing medicinal plant or their extracts (e.g. *Compositae*, *Artemisia absinthium*, *Cucurbita pepo*, *Coriandrum sativum*, *Allium sativum,* etc.)

Plants with antiparasitic potential: *a-Calendula officinalis*, b- *Satureja hortensis L*, c- *Coriandrum sativum* , d- *Alium sativum* , e- *Cucurbita pepo*, *f- Artemisia absinthium.*



Materials and methods

First stage

- 30 faecal samples were collected from sows, fattening pigs and suckling piglets - copro-parasitological examination was performed using the following methods: Willis, McMaster, Blagg, Henriksen, and active sedimentation methods as well as faecal cultures.

- oral swabs and blood (on lithium heparine, for serum and on EDTA) were sampled from the same animals and processed by classical microbiological methods (Vitek 2 compact) to identify the bacteriome and also by blast transformation test to quantify the mitogenic response to the same plant extracts

- cultures were prepared from the whole blood using RPMI 16490 mixed as support, dispensed in 96 well plates, incubated at 37C for 48 hours; glucose consumption was calculated based on the glucose residue quantified with orto-toluidine and red spectrophotometrically at 610 nm, d=0.5 cm

- The obtained data was centralized and processed in tables in the form of indicators of prevalence (P = %) and average intensity (I = EPG) – for parasitological parameters, and stimulation indices for the immunological test

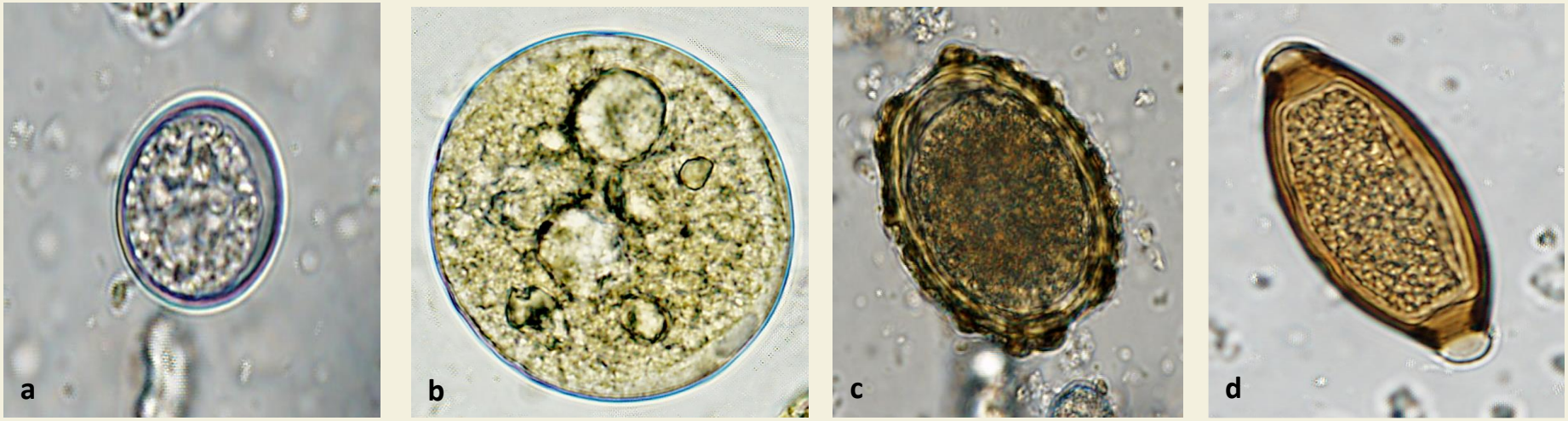
Results

Parasitology

In suckling piglets, only *B. coli* (P = 40%, I = 400 EPG) and *Eimeria spp. /I. suis* (P = 90%, I = 1.000 EPG)

In weaned piglets, *B. coli* (P = 40%, I = 300 EPG), *Eimeria spp. /I. suis* (P = 90%, I = 700 EPG), *A. suum* (P = 70%, I = 200 EPG) and *Trichocephalus suis* (P = 60%, I = 800 EPG)

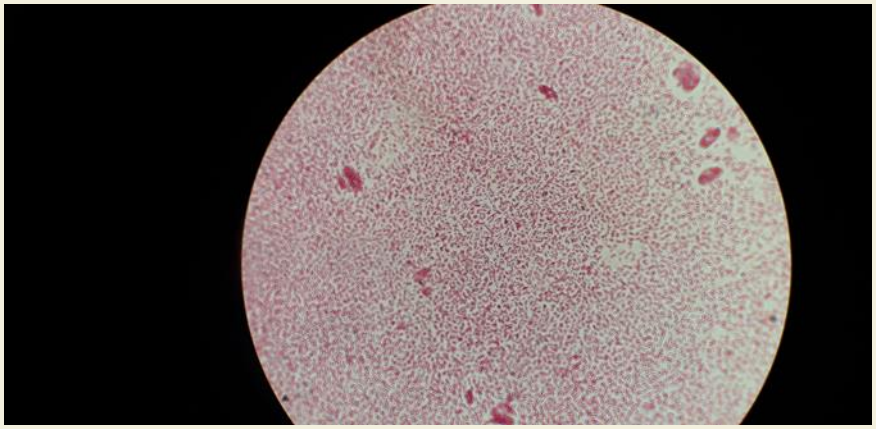
In sows, *B. coli* (P = 30%, I = 200 EPG) and *Eimeria spp. / I. suis* (P = 90%, I = 9.100 EPG) were identified.



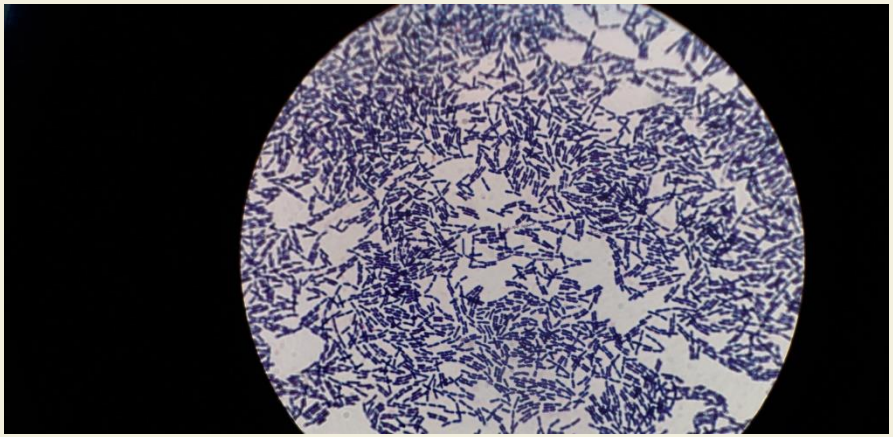
a-*Eimeria/ I. suis*, b- *B.coli,* c-*A. suum*, d-*T. suis.*

Bacteriology

In suckling piglets: *E. coli, Enterobacter cloacae, Kocuria varians, Klebsiella oxytoca, Staphylococcus lentus, Proteus spp., Bacillus spp.*
In sows: *E. coli, Seratia marcescens, Staphylococcus lentus, Proteus spp., Bacillus spp., unidentified*



Proteus spp.



Bacillus spp.

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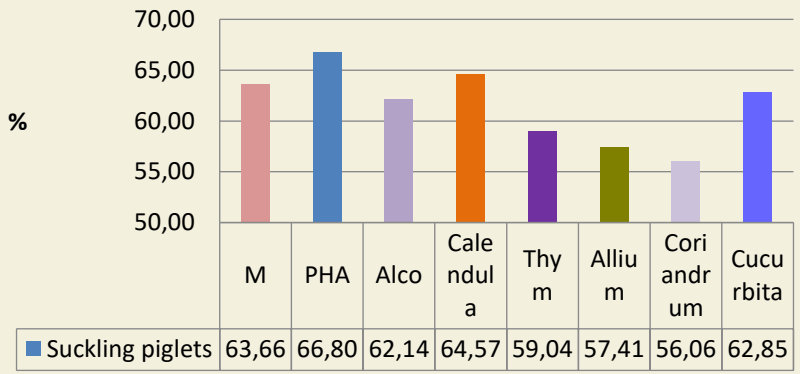
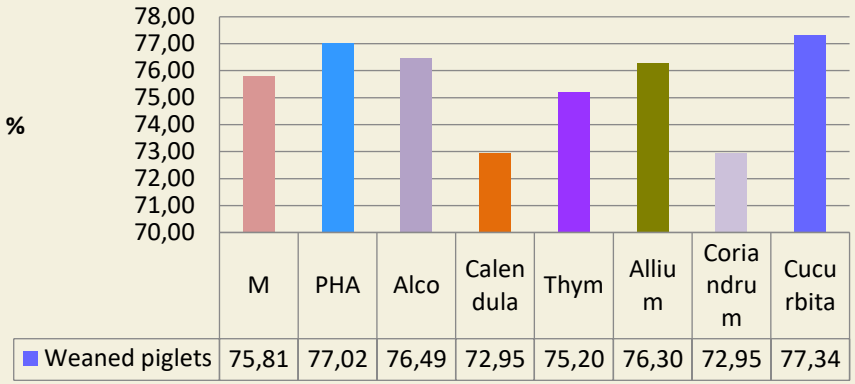
Immunology

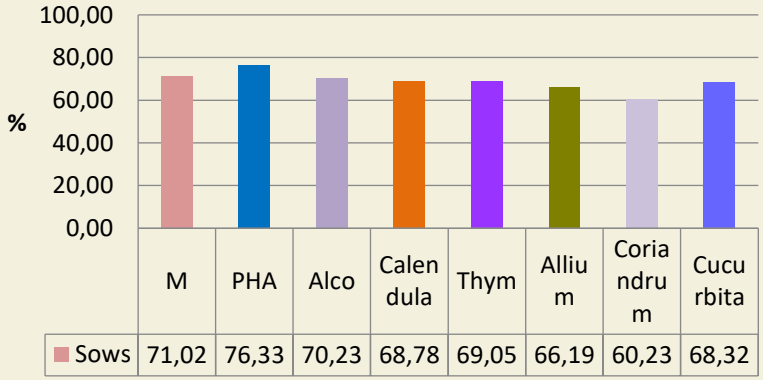
Suckling piglets



Weaned piglets



Sows



T test (p values) suckling piglets - sows

M	PHA	Alco	Calend	Thym	Allium	Coriand	Cucurbita
0.07	0.02	0.02	0.15	0.0035	0.05	0.28	0.10

T test (p values) piglets – weaned piglets

M	PHA	Alco	Calendula	Thym	Allium	Coriandrum	Cucurbita
1.6E-05	1.7E-03	1.6E-06	1.8E-02	2.3E-06	1.6E-06	2.0E-04	2.2E-04

T test (p values) weaned piglets - sows

M	PHA	Alco	Calendula	Thym	Allium	Coriandrum	Cucurbita
0.1982	0.8285	0.0066	0.0359	0.0071	0.0013	0.0003	0.0001

Conclusions

- Pigs raised on this free-range farm, had associated infections with *A. suum*, *T. suis, B. coli* and *Eimeria spp. / I. suis*.
- Prevalence and average intensity had high values but clinically, the pigs were asymptomatic
- Healthy sows and piglets shared a variety of bacteria, most of them holding a potential pathogenicity (*E. coli, Enterobacter, Staphylococcus*) with no clinical signs present
- The immune stimulating activity of the plant essential oils depended on their taxonomy but also on the age of the pigs (Calendula and Cucurbita in suckling piglets, Cucurbita in weaned piglets, none in sows)

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Thank you for your attention!