

Biological Control of Potential Toxigenic Fungi in Straw Used as Bedding Material for Swine

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Abstract. Straw is commonly used in swineherds as bedding or litter material with a positive impact on the environment and animal welfare. Straw, including seemingly good quality may contain high number of moulds and may thus represent a health risk both for the farmer and the pigs, especially pregnant sows and piglets (newborn pigs to weaning ones). The toxigenic fungi as *Fusarium*, *Chaetomium*, *Stachybotrys*, *Penicillium* and others cause decreases in feed intake, slow growth rate, fertility disturbances, early abortions and can suppress the immune system affects the gastro-intestinal tract. The aim of this study is a screening of the potential toxigenic fungi in the bedding straw from the swine biobase of USAMV Cluj and the testing of some tinctures, which can have a fungistatic effect against these fungi.

Keywords: moulds, swine bedding straw, toxigenic fungi, tinctures, plant extracts

Introduction. Straw is commonly used in swineherds as bedding or litter material with a positive impact on the environment and animal welfare. In addition to function as bedding or liter material considerable amounts of straw may also be consumed by the pigs. Straw, including seemingly good quality may contain high number of moulds and may thus represent a health risk both for the farmer and the pigs, especially pregnant sows and piglets (newborn pigs to weaning ones). Fertility disturbances/irregularities and early abortions are well known problems in swineherds, and fungi and mycotoxins are considered to be a possible cause of such problems (Christensen *et al.*, 2008). The toxigenic fungi as *Fusarium*, *Chaetomium*, *Stachybotrys*, *Penicillium* and others cause decreases in feed intake, slow growth rate, fertility disturbances and early abortions and can suppress the immune system and affects the gastro-intestinal tract.

Aims and Objectives. The aim of this study is a screening of the potential toxigenic fungi in the bedding straw from the swine biobase of USAMV Cluj and the testing of some tinctures which can have a fungistatic effect against these fungi.

Materials and Methods. In our research we've picked samples of straw from the swine bedding and we've isolated the existing fungi on PDA medium. For the control with tinctures the isolated fungi were inoculated on PDA medium that contained the extract using the poison food technique. The center of each test plate was inoculated with a 1 mm size plug and incubated for 9 days on PDA at 25±2°C. The fungistatic effect of the extracts was established by examining the presence or the absence of the colony growth. The diameters of the colonies were measured and in order to establish the growth inhibition of the fungus it was calculated the surfaces of the colonies that appeared on the treated plates using the ellipse area formula. The results obtained were expressed as inhibition percentage of mycelia growth compared with the dimensions of the control colony. We've tested 10 hydroalcoholic plant

extracts (*Calendula officinalis*, *Aristolochia clematidis*, *Satureja hortensis*, *Symphytum officinale*, *Sambucus nigra*, *Aloe arborescens*, *Allium sativum*, *Urtica dioica*, *Capsella bursa-pastoris*, *Thymus sp.*) and propolis tincture in three different concentrations (4%, 6%, 8%).

Results and Discussions. Our study showed a large amount of fungi from different genres such as *Penicillium*, *Anthromycopsis*, *Chaetomium*, *Alternaria*, *Stachybotrys*, *Acrotheca*, *Martindalia*, *Rhizopus* and *Fusarium*. Some of these fungi are potential toxigenic.

We applied the tinctures on three potential toxigenic fungi *Chaetomium sp.*, *Fusarium sp.* and *Penicillium sp.* The inhibition development of the fungi colonies by the applied tinctures is presented in Table 1.

Tab. 1

The inhibition percent of the fungi colonies development – the 9th day

Tinctures Concentration	<i>Chaetomium sp.</i>			<i>Fusarium sp.</i>			<i>Penicillium sp.</i>		
	4%	6%	8%	4%	6%	8%	4%	6%	8%
<i>Calendula officinalis</i>	95.75	96.00	96.48	0.00	8.39	85.94	78.89	90.84	94.35
<i>Aristolochia clematidis</i>	97.75	98.44	99.94	3.33	3.33	37.00	70.78	81.30	91.16
<i>Satureja hortensis</i>	96.00	96.94	99.68	25.08	37.00	93.75	92.99	92.71	95.32
<i>Symphytum officinale</i>	96.48	96.48	99.23	0.00	0.00	78.32	93.27	86.49	87.27
<i>Sambucus nigra</i>	96.13	98.11	97.84	0.00	0.00	0.00	84.85	86.49	85.69
<i>Aloe arborescens</i>	93.43	94.21	99.06	0.00	0.00	0.00	75.32	77.56	87.32
<i>Propolis</i>	100.00	100.00	100.00	93.75	96.48	100.00	95.32	100.00	100.00
<i>Allium sativum</i>	0.00	0.00	0.00	0.00	0.00	0.00	73.08	78.39	81.77
<i>Urtica dioica</i>	0.00	0.00	98.59	0.00	0.00	0.00	71.94	80.83	89.13
<i>Capsella bursa-pastoris</i>	0.00	0.00	0.00	0.00	0.00	0.00	65.92	69.61	86.89
<i>Thymus sp.</i>	0.00	0.00	91.91	0.00	0.00	0.00	52.31	69.00	72.51

We can notice the effect over 90% against *Chaetomium sp.* of the all the hydroalcoholic extracts tested with the exception of *Allium sativum* and *Capsella bursa-pastoris*. The tinctures of *Urtica dioica* and *Thymus sp.* had effect only in concentration of 8%. Against *Penicillium sp.* all the plant extracts were efficient in different degrees above 52.31% - *Thymus* 4%. At higher concentration, for example 8%, all the tinctures inhibited the fungus colonies development in percentages from 72.51% *Thymus* to 94.35% *Calendula*. The development of the *Fusarium* colonies was inhibited only by few plant extracts the best results were obtained at the treatments with extracts of *Satureja* (93.75%), *Calendula* (85.94%), and *Symphytum* (78.32%) in concentration of 8%.

Regarding the effect of the tinctures against all the fungi the highest inhibition percentage was obtained with propolis tincture in all concentrations. Only this tincture inhibited 100% the development of all the colonies.

Conclusion. The fungistatic effects of the extracts indicate the importance of some plant species as a possible natural source of fungicidal material. Antifungal activity was confirmed in all the plants tested, although the results showed that different plant extracts varied in their effectiveness in inhibiting the mycelia growth of the tested pathogen.

Among the 11 tinctures tested, the propolis tincture and the hydroalcoholic extracts from *Calendula officinalis* and *Satureja hortensis* were the most effective against all the fungi potential toxigenic -*Chaetomium*, *Fusarium* and *Penicillium*- found in the bedding straw from the swine biobase of UASVM Cluj.

REFERENCES

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