ZEARALENON AND ITS EFFECT ON SOWS AND PIGLETS

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Introduction

Mycotoxins are toxic secondary metabolites produced from fungi. They occur in plants and especially on cereals. One category is *fusarium gramminarium* which forms zearalenon (ZON) and deoxynivalenol (DON). The development of mycotoxins is influenced by several environmental conditions. So benefit agronomic arrangements like crop rotation, weather conditions during growth/ harvest of cereals and the hygiene conditions during harvest/storage of cereals the growth of fungi (BUCHELI ET AL., 2005 and SCHNURRBUSCH, 2006).
For swine production the mycotoxin topic is very problematical. So there are ZON caused disease for piglets (e.g. low birth weight, genital-/rectumprolaps), gilts (e.g. retardation of puberties beginning), sows (e.g. enlargement of uterus, cysts on ovaries), boars and fattened pigs (ROTH ET AL. 1990 and SCHNURRBUSCH, 2006).
There are several trails looking to the influence of mycotoxins to pigs (DÄNICKE ET AL., 2005, DÄNICKE ET AL., 2007 and GOYARTS ET AL., 2007). Mostly they had mixtures from DON and ZON in use. So aim of the trail was and is to investigate the action of just one mycotoxin ZON on sows and piglets after a systematically donation.

Material and Methods

In a field study, the effects of ZON in piglets and sows were tested. It was possible to include 12 sows (therefore 107 piglets) in the calculations. The sows are originated from a criss-cross bred female based on "German Landrace" and "German Large White" breeds and are sired by a "Duroc" boar to produce a slaughter generation.
The donation of ZON for 6 sows started on 101th day of gravidity and ends on 20/21th day of lactation. Everyday during the time of gravidity ZON was given in the same dosage of 4,5 mg per sow and day.
After birth the dosage increase in dependency to the feed uptake (after recommendation of the German Agricultural Society) and ranged from 3,75 till 11,25 mg ZON per sow and day.
To look for a transmission from ZON over the milk of sows the piglets were involved in a special cross-fostered system. So piglets from sows getting ZON were transferred to sows without an ZON exposition and vice versa. This generated 4 groups with piglets getting a different ZON influence:

Group1 = no ZON during gravidity and no ZON during lactation ("nGnL")
Group2 = no ZON during gravidity and ZON during lactation ("nGL")
Group3 = ZON during gravidity and ZON during lactation ("GL")
Group4 = ZON during gravidity and no ZON during lactation ("GnL")

Recording of the weight were carried out on the 1st, 7th, 15th and 19th day of life. Also the weights of reproductive organs from sows (uterus, ovaries) and piglets (uterus, ovaries, cervix) were recorded after slaughtering on 20/21th day of lactation. Findings were analysed with Microsoft Excel and Microsoft SPSS.

Results

After SCHNURRBUSCH (2006) birth weights from piglets with an ZON influence should lowering the live weights. Looking to table 1, the trail shows something different. Piglets influenced by ZON („GL" and „GnL") have higher birth weights than piglets without an influence of ZON (Δ„ZON"/„no ZON" = 0,06 kg). There wasn't also an influence detected from ZON during the time of lactation. Comparing piglets weight from all groups at the end of lactation (19th LD) shows the lowest extent for „GL" (5,22 ±1,48 kg) and „nGnL" (5,17 ±1,13 kg).

Table 1.: Comparison of average weight and standard deviation of piglets with different ZON influence, depending on the age of the piglets, year 2007

		"nGnL" (n = 40)	**"nGL" (n = 17)**	**"GL" (n = 31)**	**"GnL" (n = 19)**
weight, 1st day (age)	kg	1.31 ±0.30	1.32 ±0.31	1.32 ±0.29	1.44 ±0.21
weight, 7th day (age)	kg	2.58 ±0.48	2.52 ±0.63	2.66 ±0.68	2.78 ±0.37
weight, 15th day (age)	kg	4.33 ±0.97	4.35 ±0.92	4.44 ±1.24	4.16 ±0.76
weight, 19th day (age)	kg	5.17 ±1.13	5.59 ±1.12	5.22 ±1.48	5.45 ±0.94

Source: own calculations

Comparing the daily gain from piglets (table2) with different ZON influence are shown same tendencies like in weights. Piglets from dam fed ZON had higher gains than piglets from dam without getting ZEA at beginning of lifetime (1^{st}-7^{th} LD). There is a remarkable breakdown of weights from piglets having influence of ZON just during gravidity („GnL“) in the middle of the suckling period (7^{th}-15^{th} LD). An influence of ZON to the development of gains is not shown. Both „pure“ groups („GL“ and „nGnL“) have the lowest gains in average in the last time of suckling period (15^{th}-19^{th} LD).
Additionally, there was an investigation from weights and gains in dependency to the gender and the female based bred.
Higher weights from male piglets were detected on all days of measurements. This was also shown for the average of daily gain. An exception was the last period in suckling time (15^{th}-19^{th} LD). There female piglets got higher gains (Δm/f= 45 g/d). Gender has statistically firmness just on 3^{rd} weight due date and the last gain period.
The dependency to the race shows an advantage of the „German Landrace“ bred.

Their piglets have higher weights in every age (e.g.: ΔLR/$LW_{19th\ LD}$= 0,46 kg). The same tendency was pointed for the daily gains. But a statistical significance was just shown in the first period of suckling time (1^{st} – 7^{th} LD).
Also the weights from reproductive organs were covered. NAUMANN (2006) detected in her dissertation much higher uteri for sows getting ZON in a lower rate than this trail (in some extent over 1000 g). The analysis of this experiment showed also higher uterus weights in average (ΔZONsows/CONsows= 105 g) for sows getting ZON before, but it was not statistically firm. Interestingly the uterus weights in average from the piglets getting ZON during gravidity and lactation („GL“) were with 1,23 ±0,40 g the lowest in comparison to the other groups.
The weights of ovaries („l“/left and “r”/right) from sows with ZON influence were lower than sows not given ZON (Δ“l”/”r”= 0,69/0,62 g). Looking to the piglets there was no tendency in ovarien weight. Reasons were low values in all groups.
As well as the ovaries there are no trends in the cervical weights of piglets (table 3).

Table 2.: Comparison of average daily gain and standard deviation of piglets with different ZON influence, depending on the age of the piglets, year 2007

		“nGnL” (n = 40)	**“nGL” (n = 17)**	**“GL” (n = 31)**	**“GnL” (n = 19)**
daily gain, 1^{st} – 7^{th} day	g/d	181 ±50	171 ±60	191 ±68	191 ±30
daily gain, 7^{th} – 15^{th} day	g/d	219 ±83	229 ±62	223 ±83	173 ±94
daily gain, 15^{th} – 19^{th} day	g/d	211 ±98	311 ±122	196 ±118	321 ±121

Source: own calculations

Table 3.: Comparison of average weight and standard deviation from reproductive organs of sows and piglets with different ZON influence, year 2007

Sows*	**uterus (in g)**	**ovar, left (in g)**	**ovar, right (in g)**
ZON (n=6)	428 ±130	4.22 ±0.80	4.46 ±0.74
CON (n=6)	323 ±58	4.91 ±1.31	5.08 ±0.44
piglets**	**uterus (in g)**	**cervix (in g)**	**ovaries (in g)**
“GnL” (n=5)	1.45 ±0.50	0.18 ±0.08	0.10 ±0.04
“nGL” (n=8)	1.40 ±0.44	0.14 ±0.04	0.08 ±0.02
“GL” (n=10)	1.23 ±0.40	0.13 ±0.03	0.10 ±0.03
“GnL” (n=9)	1.54 ±0.36	0.17 ±0.05	0.10 ±0.02

Source: own calculations
recording datas after slaughtering the sows 22^{th} day of lactation
recording datas after ransferng the piglets $20/21^{th}$ day of life
* recording datas after slaughtering the sows 22nd day of lactation
** recording datas after slaughtering the piglets 20/21st day of life

Conclusion

In reflection of the findings of body weights and the gain depending of different ZON donation there is no influence to the piglets identify. The lowest values of this parameter were shown for group never and always influenced by ZON ("nGnL" and "GL").
There are also no statistical significant differences between the weight of reproductive organs from sows and piglets in dependency to a ZON donation, especially the different development from uterus weight from sows and piglets getting ZON.
It is to be waited for results from testings of bile from sows and piglets, milk and urin from sows to an ZON expose. The is the questions of the possibility of a ZON-transfer the from the mother sow to their piglets during gestation and ZON-transfer from dam to piglets during lactation time.
Also there were histomorphological researches from sows specimens (lifer, kidney and genitals) generated.

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