EFFECTS OF DEOXYNIVALENOL ON GROWTH PERFORMANCE OF PIGLETS AND GROWING TURKEYS

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Introduction

Deoxynivalenol (DON) is a fusariotoxin produced mainly by *Fusarium graminearum* and *F. culmorum* and may be found on wheat which is an important feedstuff for European feeds. Numerous references of the literature report that DON reduced feed consumption of piglets (D'Mello et al, 1999 ; Dänicke et al, 2000 ; Grosjean et al ; 2003), it has no adverse effect on feed intake and growth of broiler chickens up to 5000 µg/kg (Dänicke et al ; 2002) whereas its effects on the growth performance of turkeys are not well known. In order to validate the ideas that DON is more problematic in pig than in poultry and that turkey reacts to DON as for broiler, two trials were carried out on piglets (trial 1) and turkeys (trial 2) with wheat-based diets.

Material and methods

The same batch of contaminated wheat was used in both trials. It was highly contaminated since it contained near 6000 µg/kg; it also contained 100 µg ZEN /kg.

Trial 1. Crossbred piglets P76 x Naïma were weaned at day (d) 27. After weaning, 24 castrated males and 24 females from a first band and 24 castrated males and 24 females from a second band (3 months later) were used to compare four diets between d41 and d69. They were housed in individual stalls. They were weighted at d41, d55 and d69. At d41, they weighted 11.5 kg on average.

The four diets have different DON content (0, 720, 1440 and 2880 µg DON /kg). Diets were formulated to have the same protein content (CP = 180 g/kg diet) and the same net energy level (NE=9.6 MJ/kg diet). They were given pelleted and *ad libitum*. Feeders were weighted every 2 or 3 days. Water was available *ad libitum*.

Trial 2. Male turkeys BUT9 were individually housed (with 24 replicates per treatment). They were used to compare three treatments – each of them composed of a wheat-based diet for a first period coming from d21 to d42 and another wheat-based diet for a second period coming from d42 to d63. They were weighted at d21, d42 and d63.

In diets used in period 1, DON contents were respectively 0, 2412 and 4885 µg/kg; in diets used in period 2, DON contents were 0, 2436 and 5208 µg/kg. Diets were formulated to have the same protein content (CP = 255 for the first period and 220 g/kg for the second period) and to have the same apparent métabolisable energy (AMEn=11.9 MJ/kg for the first period and 12.3 MJ/kg for the second period). They were given pelleted and *ad libitum*. Feeders were weighted at d21, d23, d42 and d63. Water was available *ad libitum*.

Résults

Feed was the less consumed as its DON content was high, and differences between diets appeared very soon after the beginning of the trial (2 days) – results not presented here).

Growth performance of piglets is presented in table 1. From d41 to d55, feed intake (FI) and body weight gain (BWG) were significantly reduced with diets containing 1440 and 2880 µg DON/kg, but not with the diet containing 720µg DON/kg. Feed conversion ratio (FCR) did not significantly differ between diets.
From d55 to d69, FI was reduced with the contaminated diets, but the difference with the control diet was significant only with the more contaminated diet. BWG reflect intake levels. FCR did not significantly differ between diets.

During the whole period (from d41 to d69), FI and BWG were reduced with the contaminated diets, but the differences with the control diet were significant only with the more contaminated diet. FCR was not affected by the diet DON content**.**

Growth performance of turkeys is presented in table 2, excepted comparison of feed intakes during the first 2 days because no difference was observed on this period. From d21 to d42, there was no significant difference in feed intake, body weight gain (BWG) and feed conversion ratio (FCR) between the three treatments.

From d42 to d63, there was no significant difference of feed intake between the three diets; BWG of turkeys receiving diets with contaminated wheat were higher than the BWG obtained with the control diet ($p<0.01$). FCR obtained with diets containing contaminated wheat were better than FCR obtained with the control diet ($p<0.05$).
During the whole period (d21 to d63), FI did not vary significantly between treatments. BWG of turkeys receiving diets containing contaminated wheat were higher than those obtained with control diet ($P<0.05$). FCR obtained with diets containing contaminated wheat was slightly better than that obtained with the control diets.

Discussion - Conclusion

In piglet feeding, DON reduces feed intake. The magnitude of the feed intake decrease agrees with the literature data (Dänicke et al, 2001). The response is significant with high DON content in feed and a trend is shown with low content. The heterogeneous distribution in the wheat and therefore in the feed probably explains why the response is not significant with low DON content in the feed. It is careful to consider that the effect of DON on feed intake is linear. Growth rate is reduced

with DON as a consequence of feed intake decrease and feed conversion ratio is not affected in the range of DON contents which were studied here.

In turkey feeding, DON has no adverse effect with contents which may be considered as high (5000 µg/kg diet). This result agrees with previous results (Morris et al, 1999; Hamilton et al, 1985. Manley et al, 1988). It can be concluded that turkeys are no more sensitive to DON than broiler chickens.

References

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Table 1 : Growth performance of piglets (trial 1)

Estimated DON content (µg/kg)	0	720	1440	2880	P	RSD
From d41 to d55						
Feed intake (g/d)	989 ^{a}	983 ^{a}	919 ^{ab}	820 ^{bc}	***	128
Body weight gain (g/d)	723 ^{a}	748 ^{a}	689 ^{ab}	627 ^{b}	***	104
Feed conversion ratio	1.37	1.31	1.34	1.31	NS	0.07
From d55 to d69						
Feed intake (g/d)	1425 ^{a}	1347 ^{a}	1356 ^{a}	1150 ^{b}	**	175
Body weight gain (g/d)	845	768	819	686	$	
Feed conversion ratio	1.69	1.76	1.66	1.69	NS	0.12
From d41 to d69						
Feed intake (g/d)	1207 ^{a}	1165 ^{a}	1137 ^{a}	985 ^{b}	**	139
Body weight gain (g/d)	784 ^{a}	758 ^{a}	754 ^{a}	657 ^{b}	*	85
Feed conversion ratio	1.54	1.53	1.51	1.50	NS	0.06

$^{a\ b}$ Values with different superscripts differ significantly (P<0.05), RSD: residual standard deviation
$: interaction band x diet

Table 2 : Growth performance of turkeys (trial 2)

Estimated DON content (µg/kg)	0	2412/2436	4885/5208	P	RSD
From d21 to d42					
Feed intake (g/d)	136	134	130	NS	14
Body weight gain (g/d)	82	83	80	NS	10
Feed conversion ratio	1.65	1.61	1.63	NS	0.10
From d42 to d63					
Feed intake (g/d)	252	247	248	NS	20
Body weight gain (g/d)	121 ^{b}	132 ^{a}	125 ^{ab}	<0.01	11
Feed conversion ratio	2.10 ^{a}	1.96 ^{b}	2.00 ^{b}	<0.05	0.16
From d21 to d63					
Feed intake (g/d)	194	195	189	NS	15
Body weight gain (g/d)	102 ^{b}	107 ^{a}	103 ^{ab}	<0.05	8
Feed conversion ratio	1.92 ^{a}	1.82 ^{b}	1.85 ^{ab}	<0.05	0.11

$^{a\ b}$ Values with different superscripts differ significantly (P<0.05), RSD: residual standard deviation