- Considerable lower production costs
- More sustainability

Lehr- und Forschungszentrum Landwirtschaft
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Short Report from DG 9-10 Poultry Emissions

Project Nr./Scientific work Nr. 2384

Einflüsse unterschiedlicher Futtermittelrationen auf Emissionen aus der Geflügelhaltung – APC

Influences of different feeding rations on emissions of poultry farming - APC

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Preface

The modern animal production is confronted with huge problems regarding the emissions and the resulting imissions. The problems with neighbours and authorities in procedures for approvals for stables are increasing and getting stronger. Additional in account of different laws in the Districts, especially at problems with neighbours, the authorities can cancel existing permissions.

First time in long time projects are done investigations about the influence of different feed additives for getting substantial results about the possibility of reduction of emissions.

(Smell, Ammonia, manure).

Furthermore will be done a continuous measurement after the industrial emission guidelines – short IED (before IPPC- guidelines), with a selected new measuring instrument, all harmful emissions in the stables to let accept the collected datas throuout Europe. After the investigations are finished it is the goal to admit the used feed additives and by these the possibilities for reduction of emissions in the BAT list (best available techniques).

Material and Methods

Stables for the trials

The place for the trials which is available for the HBLFA has two different special sections for investigations for poultry production. (It has been adapted for poultry in August 2011 from utilisation for pig production before). This allows a variable creation of the two complete identic formed rooms.

The animals were kept on a plan ground. For litter were used wood shavings (from the company Happy Horse) and in DG 10 (second group) were used also straw pellets for comparison.

The size of the sections allows an animal conservation conform filling. Per bay 250 chicken (two bays per section) this gives 1000 chicken per DG (trial)

Animals for the trial

The first animals which were put in the adapted stables were Broiler. In September 2012 was starting the first group. All the one day chicks have been used from the company Geflügelzucht Paulitsch Heinz, Haiden 3, 8552 Eibiswald and all the chicks were vaccinated and the genetic have been Ross.

When the trial was finished, the Broilers were transported to the company Johann Titz Ges.mbH, Rohr a. d. Raab 66, 8330 Feldbach for slaughtering and further processing.

SPECIFIC PART OF THE TRIAL

For the verification of the effects from the APC natural feed additives for reduction of bad smell, ammonia, harmful gases, the performance and the contents of the manure have been put in, in the together four trial bays from HBLFA 1000 chicks in the two trial sections. It has been tested beside the climate (temperature, humidity of the air, speed of the air, harmful gases ect.) smell-emissions, chem. analyses of the manure and all parameters of performance. Because before were different groups tested the two groups of APC have got the numbers DG “9” and “10”.

The in the DG 9 and 10 tested feed additives have the name **“APC add HM/HZ I 0,2% “ and “APC HM/HZ 0,2%**”. By using of **“APC add HM/HZ I 0,2% “** in the first phase should be achieved a better immunity in this time. By using of the APC feed additives should be achieved an improved and increased surface of the mucosa of the intestine and by that an improved utilization of the nutrients. The company APC is using for the production a combination of clay minerals with synergistic effects, herbs and ethereal oils and by a

special physical processing the mentioned effects should be possible. With the combination from the two products, optimal results should be possible.

Feedstuffs

From each feed-phase (chicks-starter, phase II and III) were token samples and have been analysed by the „Weender-Analyses" for the nutrients. The ready feed was produced from a feed factory from the region. (Company Gsellmann). For the control feed was used a feed which usual is used from the farms for Broiler production to get a reasonable relation to the praxis.

The feed for the trial with the additives „ APC HM/HZ 0,2% was in average 1,5% lower in the crude protein and also the level of amino acids and the phosphorus was reduced in the feed for the trial.

Each used feed for the different phases have been analysed by the Weender-Analyses in the institutes own laboratory for all nutrients. (see table 11). These in the lab found contents shows clearly the mentioned differences. With only small deviations are the results the same as on the bag labels. Most clear shown is the mentioned difference in the crude protein.

Analyses from the used feed

discriptions	chicks starter, APC	chicks starter control	phase I APC	phase I control	phase II APC	phase II control
DM1 g/kg	921,10	924,00	924,20	925,50	923,50	924,80
CRP1 g/kg	**228,10**	**242,80**	**212,60**	**225,30**	**201,10**	**210,30**
RA1 g/kg	51,50	58,90	55,40	60,60	53,40	56,30
OS g/kg T	944,09	936,26	940,06	934,52	942,18	939,12
CA1 g/kg	6,52	7,36	7,36	9,52	7,17	8,69
MG1 g/kg	1,99	2,39	2,39	2,41	2,23	2,17
Ph1 g/kg	**6,75**	**6,75**	**6,75**	**7,05**	**6,57**	**6,73**
K1 g/kg	10,90	10,10	10,10	10,50	9,51	10,00
NA1 mg/kg	1,45	1,43	1,43	1,49	1,50	1,29
MN1 mg/kg	112,50	112,00	112,00	135,50	104,90	91,10
ZN1 mg/kg	113,00	117,00	117,00	136,50	110,00	97,00
CU1 mg/kg	20,10	18,80	18,80	19,20	21,80	18,50

Results

Climate in the stables

The climate consists from different factors like temperature, the relative air humidity, the speed of the air, the contents of harmful gases and dust, the light and the available oxygen of the air. An adult chicken needs 250 litres of *air* in 24 hours.

Harmful gases

Ammonia is developed when bacteria's decomposing uric acid in the excrements in relation to the temperature (GROOT KOERKAMP, 1994). Temperatures above of the optimal level encourage the bacterial activity. The sources of ammonia which are enriching the air of the stables are the easy degradable nitrogen compounds in the excrements.

Increased concentrations of harmful gases are also dangerous for the health of the people!

On account of that are the following recommendations, to keep them in the areas of harmful gases.

- Carbon dioxide (CO2) less than 3500mg.
- Ammonia (NH3): less than 20 ppm

Ammonia

In the following were the existing concentrations of ammonia divided in the phase of chicks starter and the two fattening phases. **In the DG 9 was the highest reduction 52%.** The average level with 4 ppm was very low in both of the bays in this phase. Much more information gives in the DG 9 the last fattening phase with higher average level and **a reduction from near 50%.**

In the DG 10 were the absolute concentrations of ammonia much lower than in the DG 9. The difference was in the outgoing air by -33,62% lower in the trial group. (NH3 av. Trial 1,14ppm, control 1,71ppm), in the area of the animals was a reduction of 22,14% by using the feed additive „APC HM/HZ 0,2% monitored.

Trial 9: (DG 9)

Average ammonia concentrations per fattening phase in ppm in comparison

fattening phase	**NH_3 animal area**		**NH_3 outgoing air**	
	trial	control	trial	control
chicks-starter-phase				
average value	1,16	1,23	1,21	1,31
reduction in %		-5,46		-7,19
fattening phase I				
average value	1,79	3,65	1,85	3,86
reduction in %		-50,81		-52,04
maximal value	10,47	14,87	8,62	21,63
fattening phase II				
average value	7,43	11,63	7,13	13,69
reduction in %		-36,13		-47,94
maximal value	17,97	21,37	16,24	42,42
reduction in %		**- 15,91**		**- 61,72**

Trial 10: (DG 10)

Average ammonia concentrations per fattening phase in ppm in comparison

fattening phase	NH_3 animal area		NH_3 outgoing air	
	trial	control	trial	control
chicks-starter-phase				
average value	1,20	1,35	1,22	2,10
reduction in %		-11,20		-41,85
fattening phase I				
average value	1,01	1,59	1,03	1,26
reduktion in %		-36,34		-18,13
maximalwerte	2,12	3,31	1,97	2,82
fattening phase II				
average value	1,88	1,83	1,27	2,05
reduction in %		2,90		-37,95
maximal value	5,83	2,8	1,90	3,8

Carbon dioxide

The content of carbon dioxide in the air of the stables is a good indicator for the quality of the ventilation. Carbon dioxide is emerging first of all by the breathing of the animals and processes in the manure. By these the content of carbon dioxide is following the level of activity oft the herd and is influenced by the temperature in the stables and above all from the body mass oft the animals.

(VAN DEN WEGHE, 1993).

The average values have reached in the DG 9 for the control 1.732 ppm and for the room of the trial 1.543 ppm. **A potential of reduction from -16,49% has been detected in the outgoing air from the room of the trial!**

In the DG 10 were the feed additives APC again very effective. In measurements of the outgoing air was found a reduction of – 54,45% for the advantage of the trial group! ($CO2_{MW}$ trial = 744ppm, $CO2_{MW}$ control = 1.637ppm).

Emissions

For the calculation of the emissions were token the concentrations of substances of gases and smells in the outgoing air. Because in the both bays were the same conditions have been done analog measurements from the throe flowing outgoing air in the chimney.

The data's of performance for the correction of the life gain are based on the results of weighting.

Emissions of ammonia

In general the data's remain valid in the international comparison very good. In the literature of Germany is calculated for holding free-range chicken an average factor for emissions of 0,0353kg NH3 pro place and animal per year (DÖHLER, et.al., 2002).

Trial 9: (DG 9)

The ammonia emissions per kg gain, per animal (in average 1.700 g gain), per fattening place and reductions

	control	trial	diff. in %
emissions chick-starter-phase g/kg daily gain	0,07	0,06	12,41
emissions fatt.-phase I g/kg daily gain	0,66	0,31	52,24
emissions fatt.-phase II g/kg daily gain	35,68	6,95	80,52
emissions in total g/kg daily gain	2,23	1,08	51,39
emissions g/animal 1.600-2.000g weight	4	2	2g
emissions kg/animal place/year	**0,027**	**0,013** **- 51,85%**	**0,014kg**

Trial 10: (DG10)

Ammonia emissions per kg gain, per animal (in average 1.700 g gain), per fattening place and reductions

	control	trial	diff. in %
emissions chick-starter-phase g/kg daily gain	0,26	0,14	45,62
emissions fatt.-phase I g/kg daily gain	0,08	0,06	27,14
emissions fatt.-phase II g/kg daily gain	0,15	0,11	30,92
emissions in total g/kg daily gain	0,22	0,14	35,61
emissions g/animal 1600-2000 g	0,37	0,24	0,13g
emissions kg/animal place/year	**0,003**	**0,002** **- 33,3%**	**0,001kg**

Emissionen of smells

For the **emissions of smells** concludes similar results as at the ammonia with a total **reduction of -40%** by a calculation in GE/s*GVE (units of smell*units of large animal). It is to take note that because of the very good conditions in the stables the measured results were 10 times below the official mentioned factors for emissions in the field of smells.

Trial 9: (DG9)

Emissions in GE/s*GVE (units of smell*unit of large animal) for both of the sections in comparison

	control	trial	tiff. %
chicks-starter-phase	0,02	0,03	29,27
fatt.-phase I	0,59	0,20	-65,90
fatt.-phase II	0,42	0,25	-41,48
in total	**0,43**	**0,17**	**-60,37**

Trial 10: (DG 10)

Emissions in GE/s*GVE (units of smell*unit of large animal) for both of the sections in comparison

	control	trial	diff. in %
chicks-starter-phase	0,12	0,09	-29,25
fatt.-phase I	0,61	0,40	-34,61
fatt.-phase II	0,59	0,75	26,17
in total	**0,44**	**0,34**	**-23,17**

Results of performance

The one day chicks were housed in the trial 9 in average with a weight of 45,3 g and the one day chicks in the trial 10 were housed with 42,21 g. After all the chicks were weighted weekly and after the final weight of the animals was checked, it was possible to calculate the gain of each bay (group).

For the exact calculation of the feed conversion ratio were the numbers of animals, within calculating of mortality divided in the different phases. In both of the trials was found more feed intake of the trial groups.

Trial 9: (DG 9)

Development of weight in gram per animal and feed conversion ratio (live weight: used feed)

		trial APC		control	
	date	**bay 1**	**bay 2**	**bay 3**	**bay 4**
housing	12.10.2012	45,2	44,4	45,7	45,9
day of slaught.	13.11.2012	1.724,0	1.651,0	1.650,5	1.501,8
	average daily gain	52,5	50,2	50,2	45,5
			Ø 51,4g (+ 6,8%)		**Ø 47,9g**
	feed conv. ratio 1:	1,59	1,62	1,66	1,82
			Ø1,61 (-7,5%)		**Ø 1,74**
duration:	32 days				

Trial 10: (DG 10)

Development of weight in gram per animal and feed conversion ratio (live weight: used feed)

		trial APC		control	
	date	**bay 1**	**bay 2**	**bay 3**	**bay 4**
housing	20.11.2012	42,66	42,408	42,068	41,704
day of slaught.	20.12.2012	1.417,0	1.417,0	1.174,1	1.341,5
	average daily gain	45,8	45,8	37,7	43,3
			Ø 45,8g (+ 11,6%)		**Ø 40,5g**
	feed conv. ratio 1:	1,59	1,59	1,77	1,54
			Ø1,59 (-4,2%)		**Ø 1,66**
duration:	30 days				

Mortality

The documentation was done by a page of control for the poultry fattening.

		trial APC		control	
		DG 9	**DG 10**	**DG 9**	**DG 10**
mortality	in pieces	12	6	20	7
	in percent	2,4%	1,2%	3,8%	1,4%

The lower mortality is a **reduction of 33%!**

Manure

Each time in the phase of starter, fattening phase one and fattening phase two (each time at the end of the phase) were token samples of the manure. (mixture of litter and excrements) from all of the bays and after a homogenisation analysed in the laboratory.

With higher contents of dry matter in the feed of the trial groups were also found higher contents of Mg and potassium. The contents of Ca were lower in the trial feed. The contents of P were higher in the starter phase and they were increased in the following phases but they were below of them from the control groups.

In general have been achieved by using **„APC HM/HZ 0,2%“** for the most important parameter – **phosphorus, nitrogen and ammonium-nitrogen** – independent from the used litter **in all the phases a reduction.**

CONCLUSION:

" APC HM/HZ 0.2%" , natural feed additives from Agrar Production and Consulting have been investigated in two groups in repetition for the possibilities **to reduce ammonia and other bad gases and smell and possible effects on the performance in broiler production.**

With an IEP- direction accepted technology of measurement, which measures continuously bad gases and additional more parameters, like bad smell, **the APC HM/HZ 0.2%** **should be added on the list BAT (best available techniques)**

- **Considerable lower Production costs**
- **More Sustainability**

On account of these results of the investigations it is desirable to take the APC additives in the list of BAT, because they are excellent qualified to reduce ammonia and bad smell in the Broiler production. In evidence of a reduction of 35% ammonia in average indicates to point for that!

Approximately 10% of the effects are the result from the reduction of the input of crude protein and 25% are the result from the APC feed additives. This reduction of protein is also an effect from these feed additives because they cause a better absorption of this nutrient. **This is shown very clear by the better performance.**

The results of bad smell were similar. **The reduction in both repetitions in average has been 37%.** Interesting was also, that the usage from straw pellets have reduced the N- contents in the litter.

The results of the investigations are showing clearly, that the APC nat.add. are an alternative method to reduce the emissions of the Broiler production and therefore an alternative to the exhausted air cleaning.

The investigated feed additives are in general a measure step for the reduction of emissions in the Broiler production and an alternative for cleaning the outgoing air.