



Green Solutions to protect our Environment and Saving the Planet's Water

CASE STUDY DECEMBER 2015

WATER ANALYSIS TRIAL: Poultry Farm using Puresan Pro[®]

A person may not sell the products of a sterilizing plant unless they conform with the specifications set by the Registrar in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No.36 of 1947).

- 1. Water samples were received from a farm situated in the coastal area of Kwa-Zulu Natal. The farmer is a poultry farmer and the farm is primarily an abattoir, and distribution facility.**
- 2. A brief synopsis of the requirements for any Poultry farm is included irrespective of whether an abattoir is on site.**

Table 1 - Drinking water quality guidelines for poultry

Table 2 – Upper and Lower Limits for Bacteria in Chicken Abattoir

- 3. Only two samples were selected for the trial, these being from the River source and the Abattoir reservoir.**
- 4. The samples were submitted to an accredited laboratory for efficacy determination of the Puresan Pro[®]. (The kill test dilutions were carried out at the Laboratory).**
- 5. The water quality analysis results from KZN Farm are presented in the following.**

Table 3 - Chemical Analysis River Water

Table 4 - Bacterium Analysis River Water

Table 5 - Bacterium Analysis Reservoir Water

Water is a critical nutrient that receives little attention until a problem arises. Not only should producers make an effort to provide water in adequate quantity, they should also know what is in the water that will be flowing through the water lines to be used in evaporative cooling systems and consumed by the birds.

General Water Quality Conditions

While poultry drinking water does not have to be pure, heavily contaminated water is undesirable.

In an abattoir contaminated water will in turn cause innumerable problems with illness and disease to those who consume the poultry product.

Water quality should be of concern to all poultry operations. Water contaminants could create equipment problems that would either restrict the amount of water available for consumption or the effectiveness of the evaporative cooling and fogging systems. Poor water quality could also result in leaky water nipples inside the house, which will wet litter and lead to increased ammonia production. Poor litter quality and high ammonia can result in reduced performance and liveability.

Even if the water source has a low bacteria level, poultry may be exposed to the microorganisms that grow in waterers or drinkers. Because these organisms can develop very rapidly, waterers should be cleaned properly each day

Bacteria:

Bacteria levels should be kept to a minimum (see Table 1).

Upper and Lower Limits for Generic E. coli testing in Chickens (see Table 2).

Chlorination has been successful in poultry operations if the residual chlorine level in the drinking waterers is at least 1 milligram per liter (mg/l). However once the water is exposed to the air, the dissolved chlorine quickly dissipates. The problem experienced is to measure the residual chlorine as soon as possible after sampling.

Salmonella bacteria has shown to be particularly resistant to Chlorine with levels of 200ppm required to get a 4/5 kill result.

This however leaves both a smell and taste in the chicken meat and thus the general dosage is only 20-50ppm with the resultant requirement for vigilance to avoid food poisoning.

Campylobacter is found most often in food, particularly in chicken. Food is contaminated when it comes into contact with animal faeces. Any raw poultry could contain *Campylobacter*.

WATER QUALITY GUIDELINES

Table 1 - Drinking water quality guidelines for poultry

Adapted from T.A. Carter and R.E. Sneed, Drinking water guidelines for poultry. Poultry Science and Technology No. 42, North Carolina State University

Contamination or characteristic	Level considered average	Maximum acceptable level	Remarks
Bacteria			
Total bacteria	0/ml	100/ml	0/ml is desirable
Coliform bacteria	0/ml	50/ml	
Nitrogen compounds			
Nitrate	10 mg/l	25 to 45 mg/l	Levels from 3 to 20 mg/l affect performance
Nitrite	0.4 mg/l	4 mg/l	
pH			
pH	6.8 to 7.5	--	A pH of less than 6.0 is not desirable. Levels below 6.3 may degrade performance
Total hardness			
Total hardness	60 to 180	--	Hardness levels
Naturally occurring chemicals			
Calcium	60 mg/l	--	Levels as low as 14 mg/l may be detrimental if the sodium level is higher than 50 mg/l
Chloride	14mg/l	250 mg/l	
Copper	0.002 mg/l	0.6 mg/l	Higher levels produce a bad odor and taste
Iron	0.2 mg/l	0.3 mg/l	Higher levels produce a bad odor and taste
Lead	--	0.2 mg/l	Higher levels are toxic
Magnesium	14 mg/l	125 mg/l	Higher levels have a laxative effect. Levels >50 mg/ml may affect performance if magnesium and chloride levels are high.
Sodium	32 mg/l	--	Levels above 50 mg/l may affect performance if the sulfate or chloride level is high
Sulfate	125 mg/l	250 mg/l	Higher levels have a laxative effect. Levels >50 mg/l may affect performance if magnesium and chloride levels are high.
Zinc	--	1.50 mg/	Higher levels are toxic

WATER QUALITY GUIDELINES

FSIS Compliance Guideline: Modernization of Poultry Slaughter Inspection Microbiological Sampling of Raw Poultry

Table 2

Upper and Lower Limits for Bacteria in Chicken Abattoirs

Raw Poultry	Lower limit of Marginal range (m)	Upper limit of Marginal range (M)	Number of Samples tested (n)	Maximum number permitted in the Marginal range
E.Coli	1×10^2 cfu/ml	1×10^3 cfu/ml	13	3

Carcases of broilers	Satisfactory + result	Unacceptable	Number of Samples tested (n)	Maximum number permitted Positive result
Salmonella	5/50	>5/50	50	5

Mechanically Separated Meat	Lower limit	Upper limit	Min Number of Samples	Of the 5 samples
Aerobic Colony Count	$< 5 \times 10^5$ cfu/g	$< 5 \times 10^6$ cfu/g	5	3 must be in lower range

Mechanically Separated Meat	Lower limit	Upper limit	Min Number of Samples	Of the 5 samples
E.Coli	$< 5 \times 10^1$ cfu/g	$< 5 \times 10^2$ cfu/g	5	min of 3 must be in lower range

Meat Preparations Area	Lower limit	Upper limit	Number of Samples tested (n)	Of the 5 samples
E.Coli	5×10^2 cfu/g	5×10^3 cfu/g	5	min of 3 must be in lower range

Test Results for KZN Poultry Farm

The following results are from the KZN Poultry farm. Initial tests were taken for Chemical analysis.

Microbiological tests were done on samples before and after the addition of Puresan Pro[®].

The strength ability and efficacy of the diluted Puresan Pro[®] is seen from the kill test.

Table 3

Samples Taken from River Water Source for Chemical Analysis

TABLE 3 Chemical Analysis River Water			Sample Identification	
Analysis	Unit	Lab No Sample ID Method	EC-15-04204 River Water	EC-15-04205 Reservoir Water
Free Chlorine *	mg/L as Cl ₂	MM-029	n/a	0.10
Biochemical Oxygen Demand *	mg/L as O ₂	MM-FW017	n/a	1.24
Chemical Oxygen Demand	mg/L as O ₂	MM-009	n/a	14.6
pH	pH units	MM-005	7.90	7.91
Total dissolved solids @ 180°C	mg/L	MM-018	310	332
Temperature *	°C	Potentiometric	22.0	22.1
Total suspended solids (0.45µm)	mg/L	MM-007	n/a	7

Table 4

Samples taken for Bacterium, from river water source, before and after treatment with Puresan Pro[®]

Dilution :- 100µl per 500ml sample

TABLE 4 Bacterium Analysis River Water			Sample Identification	
Analysis	Unit	Lab No Sample ID Method	EM-15-02994 River Water 1	EM-15-02995 River Water 2 (Kill Test - Add 100ul Puresan Pro per 500ml Sample)
Heterotrophic Plate Count	CFU/mL	MM-MIC001	12450	755
Faecal coliforms	CFU/100mL	MM-MIC003	290	<1
Pseudomonas aeruginosa	CFU/100mL	MM-MIC006	2000	350
E. coli	CFU/100mL	MM-MIC003	261	<1
Total Coliforms	CFU/100mL	MM-MIC002	1900	<1

Table 5

Samples taken for Bacterium, from river water source, before and after treatment with Puresan Pro[®]

Dilution :- 200µl and 400µl per 500ml sample

TABLE 5 Bacterium Analysis Reservoir Water			Sample Identification		
Analysis	Unit	Lab No Sample ID Method	EM-15-02996 Reservoir Water	EM-15-02997 Reservoir Water (Kill Test - 200ul Puresan Pro per 500ml Sample)	EM-15-02998 Reservoir Water (Kill Test - 400ul Puresan Pro per 500ml Sample)
Heterotrophic Plate Count	CFU/mL	MM-MIC001	405000	75	67
Faecal coliforms	CFU/100mL	MM-MIC003	110	<1	<1
Pseudomonas aeruginosa	CFU/100mL	MM-MIC006	160000	60	40
Salmonella spp. *	CFU/100ml	MM-MIC008	Present	Absent	Absent
E. coli	CFU/100mL	MM-MIC003	66	<1	<1
Total Coliforms	CFU/100mL	MM-MIC002	29000	<1	<1

CONCLUSION

The test with PureSan Pro returned results beyond the accepted norms and well within in operating requirements for poultry. The recommendation is to do further tests at lower dilution rates to improve costs.

The specifications for various bacteria are included in the documents further on in this study

The following information is taken from articles to more clearly define indicator organisms in poultry as well as the bacterium limits permitted on the Poultry Farm.

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DEPARTMENT OF AGRICULTURE No. R. 153 24 February 2006 MEAT SAFETY ACT (ACT No.40 OF 2000) POULTRY REGULATIONS

REGULATIONS GOVERNING MICROBIOLOGICAL STANDARDS FOR FOODSTUFFS AND RELATED MATTERS UPDATED



Our Vision Green Solutions to protect our Environment

Chris de Lange.

Cell: +27 (0) 84 505 2026

Email: Chris@consume-it.co.za

Robert Brown

Cell: +27 (0) 72 144 2221

Email: robert@consume-it.co.za



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