Assessing the Chemical Status of Water from Wells Which Supply Farms Located on Romania's Territory. Part II

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Bulletin UASVM Animal Science and Biotechnologies 73(2)/ 2016

Print ISSN 1843-5262; Electronic ISSN 1843-536X

DOI:10.15835/buasvmcn-asb: 12155

ABSTRACT

The study was performed in 63 wells which belong to the decentralized system from 5 counties from Romania: AB- 7 wells, BZ-6 wells, CJ-33 wells, MS-1wells, SJ-6 wells taking into account chemical parameters: nitrites (SR ISO 6777:1996), nitrates (SR ISO 7890:1-1998), the report nitrates/nitrites in accordance with L. 458/2002. Results reveals values of NO_2 : $0.32 \pm 0.08 \text{ mg/dm}^3$ AB, $0.23 \pm 0.08 \text{ mg/dm}^3$ BZ, $0.33 \pm 0.05 \text{ mg/dm}^3$ CJ, $0.23 \pm 0.03 \text{ mg/dm}^3$ MS, $0.09 \pm 0.02 \text{ mg/dm}^3$ SJ, and NO_3 : $35.71 \pm 7.53 \text{ mg/dm}^3$ AB, $48.66 \pm 5.92 \text{ mg/dm}^3$ BZ, $23.54 \pm 2.82 \text{ mg/dm}^3$ CJ, $19.63 \pm 4.64 \text{ mg/dm}^3$ MS, $31.16 \pm 5.12 \text{ mg/dm}^3$ SJ which, theoretically include the waters in terms of two parameters in drinking water and good chemical states, but, individual samples in terms of nutrient regime presents exceedance influenced by poor cleaning, hygienisation and disinfection of wells.

Keywords: cow, drinking water, NO_2 , NO_3

INTRODUCTION

Purpose of this paper was to identify the degree of cleanliness or pollution 63 wells from five counties located in SE, NW-eastern and Romania center: Alba (AB localization: central part of Romania 7 wells), Buzau (BZ- localization: SE 6 wells), Cluj (CJ localization: west central 33 wells), Mures (MS localization: central - northern 11 wells), Salaj (SJ - localization: northwest 6 wells)], used as a source of drinking water for cattle, related by the presence of biogenic elements based on nitrogen NO_2 - intermediate form and NO_3 - final form. Impurification with nitrates can have telluric nature, by using of fertilizers based on nitrogen (Harty, 2012) or poor sanitation and failure to comply hygiene and sanitary conditions or location of wells (Iacob *et al*, 2012). Nitrite levels in water which are over 4 ppm may be toxic to cattle (Grant, 1993).

MATERIALS AND METHODS

In this part, were followed: determination of nitrites (SR ISO 6777:1996), nitrates (SR ISO 7890/1:1998), report NO_3 and NO_2 in accordance with L. 458/2002. Study was conducted on a number of 63 wells located in the territory of five counties from Romania: AB, BZ, CJ, MS, SJ, results being compared with allowed limits and those for animals farm requirements, using as statistical tests accepted: non parametric test Krushall-Wallis and comparing the values after a value established (Fisher's Test).

RESULTS AND DISCUSSION

By point of view of NO_2 parameter, 48 (76.19%) from samples attest good chemical status of water from which: 61.90% (39 samples) having under 0.3 mg/dm^3 , 14.29% (9 samples) between $0.3\text{-}0.5 \text{ mg/dm}^3$, while, in 23.81% (15)

Tab.1. The percentage of samples conform and non-conform at parameters: NO₂, NO₃ and the report NO₃/NO₂

County	KWt NO ₂ mg/dm ³		Fisher's test. Value of NO ₂ , no. and % of samples for different range (mg/dm ³)			County	KWt NO ₃ mg/dm ³		Fisher's test. Value of NO ₃ , no. and % of samples for different range (mg/dm ³)			$\frac{NO_3}{50} + \frac{NO_2}{3} \leq 1$ L.458/2002 Drinking water law	
	No.S. (%)	X ± sem	Under 0.3	Between 0.3-0.5	Up to 0.5		X ± sem	Under 50	Up to 50	P value	KWt X ±sem	No.S, limits exceed ≤1	
AB	7	11.11	0.32 ±0.08	4 57%	2 29%	1 14%	AB	35.71 ±7.53	6 86%	1 14%	0.14 ns	0.82 ±0.14	1 14%
BZ	6	0.23	5 83.83%	0 0 %	1 16.66%		BZ	48.66 ±5.92	3 50%	3 50%	0.10 ns	1.00 ±0.11	3 50%
CJ	33	0.33	16 48.48%	4 12.12%	13 39.39%		CJ	23.54 ±2.82	30 91%	3 9%	0.002 es	0.55 ±0.06	3 9%
MS	11	0.23	8 72.72%	3 27.27%	0 0%		MS	19.63 ±4.64	10 91%	1 9%	0.09 nqs	0.41 ±0.09	1 9%
SJ	6	0.09	6 100%	0 0%	0 0%		SJ	31.16 ±5.12	6 100%	-	-	0.65 ±0.09	0 0%
T.	63	100	39 61.90%	9 14.29%	15 23.81%				55 87%	8 13%	-		
KWt, KW = 3.065 P=0.5469, ns			Fisher's test P < 0.0001, es.			Fisher's test P < 0.0001, es.			KWt, P=0.054,vs				

Legend:Alba (AB), Buzau(BZ), Cluj (CJ), Mures (MS), Salaj(SJ), Kruskal-Wallis Test (KWt), No samples (No.S.), Total (T), not significant (ns), extremely significant (es), not quite significant (nqs), very significant (vs)

the aquifer is considered to be polluted: 0.55-0.91 mg/dm³ (table 1). The mean values/ counties fall in standards for drinking water, but, individual values designate poor chemical status as follows: AB: 4 samples taken from the same number of wells (0.65-0.8 mg/dm³), BZ: 1 sample: 0.55 mg/dm³; CJ: 8 samples: 0.63-0.91 mg/dm³. In MS the chemical status is good: 0.1-0.45 mg/dm³ for all samples; the same situation was found in SJ: 0.1-0.31 mg/dm³. Concerning the „guide for completing the inspection notes concerning animal protection and welfare”; for 3 point, the limits have to be 0.3 mg/dm³, therefore, 38.10% (24 samples) indicates poor water quality. Although the mean/county does not indicate nonconformities from point of view of the chemical status of water in relation to the parameter NO₃, are found significant differences (*P<0.05) between the mean of the analyzed samples from BZ (48.66±5.92 mg/dm³: min. value - 35.00 – max. value: 73.00 mg/dm³) compared with those from CJ (23.54±2.82 mg/dm³: min. value - 8.00 – max. value: 66 mg/dm³) and MS (19.63±4.64 mg/dm³: min. value - 10.00 – max. value: 33.00 mg/dm³).

There is a sinuous curve of individual values, poor chemical status in terms of this parameter were recorded at one wells in AB (73 mg/dm³),

3 wells (50%) BZ (53-73 mg/dm³), 9% from wells (3) in CJ (58-66 mg/dm³), 1 wells (9%) in MS (63 mg/dm³). In SJ none of the samples not present overrun at this parameter. In terms of

report $\frac{NO_3}{50} + \frac{NO_2}{3} \leq 1$ were found areas where the aquifer, is polluted. One samples from AB exceeds the limit: 1.55; nonconformities are registered in BZ at 50% from samples. In CJ 3 samples (9%) are considered to have poor chemical status. In SJ were not found exceeding compared to the reference limit. To groundwater level, in 2013, 2014 most exceedances of the thresholds were found at NO₃ parameter (Moldovan *et al.*, 2014, Bogzianu, 2015).

CONCLUSION

In terms of nutrient regime, the overruns are influenced by poor cleaning, hygienisation and disinfection of wells.

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