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Assessing the nitrate content in livestock drinking water of Namakkal district in Tamil Nadu

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ABSTRACT

A study has been carried out to estimate the level of nitrate content level in different sources of water subjected to livestock feeding. Approximately, 1160 water samples were collected from Namakkal districts comprising 15 blocks and in each block two village were selected. The nitrate was analyzed by using kit method. The Nitrate level showed that 84.3% of samples had 10-50 ppm, 25.5% had 51-100 ppm, 4.1% had 101-300 ppm, and 0.2% had above 300 ppm and 20.1% had traces of nitrate content respectively. From the result analysis, it has been suggested that water samples below100 ppm of nitrate after storing 1 or 2 days should be suitable for the consumption for dairy cattle.

Keywords: *Dairy animals, Fertilizer, Nitrate Toxicity, livestock, Water, Methylene Blue*

INTRODUCTION

All other chemicals used were of analytical grade and the highest purity available from commercial sources, and doubly distilled water was used in the preparation of all solutions in the experiments. Hydrochloric acid solution (0.1N Hcl) was prepared by 10 ml HCL in 1L Distilled water. Acetic acid (20%) was prepared by 20 ml Acetic acid in 80 ml distilled water. Bray's indicator prepared by 100g barium sulfate (BaSo4), 10g manganese sulfate (MnSo4.H2O), 2g Zinc (metallic Zn), 75g citric acid, 4g sulfanilic acid, 2g 1-naphthylamine is mixed. The bray's indicator is stored in a blackened bottle away from light.

Collection of water samples

The numbers of water samples were collected based on the propionate random sampling from the Namakkal districts area. The Namakkal district area was around 3363.00 Km2 [3]. In Namakkal district, 1160 water samples were collected from different villages by using stratified random sampling/Multi-stage random sampling (Table-1). The source of water samples commonly from Bore Water, Well Water, River Water and Sewage Water were collected for the estimation of Nitrate. Nitrate content was estimated using the kit method.

Water Sources	Well	Bore Well	Bore/Well	River Water	Sewage Water
Total=1160	266	258	206	227	203

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Analysis of Nitrate

Nitrate content was estimated by colorimetric method and measured at a wave length of 520nm [4]. Cattle-fed water Samples were taken in 1ml test tube and add 1ml of (20%) acetic acid and 0.5g of Brays indicator for the determination of nitrate. The pink color was observed and compared with score card value. The pink color formation was due to the reduction of nitrate to nitrite by zinc and manganese sulfate. The reaction was then followed by the diazotization of a sulfonic acid with nitrate ion and subsequently coupled with 1-napthyl amine to form pink color.

Results and Discussion

Totally 1160 water samples were collected from different sources. Among them, 266 were from Well water samples, 258 from Bore Well samples, 206 from Bore/Well samples, 227 from River water samples and 203 from Sewage water samples. The different sources of water samples collected were listed in figure-1.

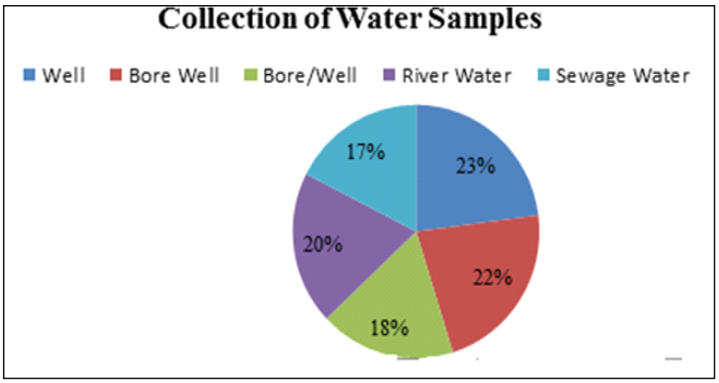

Fig.1 Collection of water samples in Namakkal District

Nitrate estimation of water samples

The nitrate content was estimated from different water samples Table-1. The result showed that nitrate concentration wasfound to be varying between samples. Among 1160 water samples in Namakkal district, 84.3% of samples had 10-50 ppm, 25.5% had 51-100 ppm, 4.1% had 101-300 ppm, 0.2% had above 300 ppm and 20.1% had traces of nitrate content. The results are summarized in Table -2.

Table-2 Nitrate estimation of water samples in Namakkal District

Water Sources	Nitrate content (ppm) Total					
	Trace	10-50	51-100	101-300	>300	Total
Well	32	207	20	05	02	266
Bore Well	19	177	51	11	--	258
Bore/Well	14	111	73	08	--	206
River Water	94	123	08	02	--	227
Sewage Water	15	109	69	10	--	203
Total	**174**	**727**	**221**	**17**	**02**	**1160**

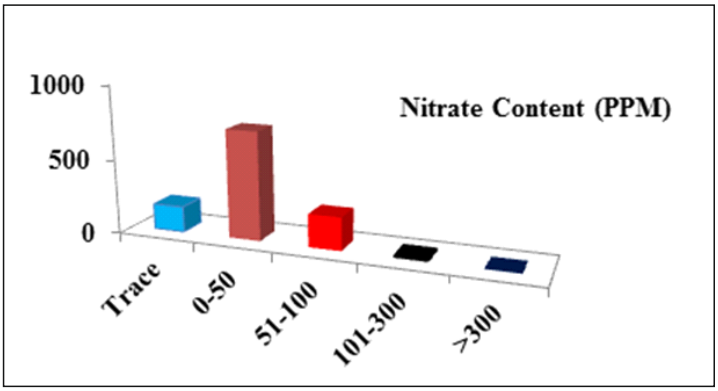

Fig.2 Nitrate estimation of water samples in Namakkal District

The water samples which had >100 ppm nitrate content has related to incidences of nitrate toxicity and death of dairy animal [5]. The water gets high- risk source of nitrates through water from deep wells fed by soil water from highly fertile soils, condensed water from ventilating shafts in piggeries due to higher ammonia levels in the air, fluids draining from silos containing materials which is rich in nitrates and water contaminated by fertilizer, animal wastes or decaying organic matter may also be a source of toxic levels of nitrate. Marginally toxic level of nitrate present in water and feed when combined to give cattle can also lead to poisoning. Livestock breeding could also affect consuming water samples above 100 ppm nitrate content [1].

In this present study, very few samples were recorded above 100 ppm nitrate content. This might be due to the source of water from ponds, shallow wells or streams that collect drainage from manure, highly fertilized fields or industrial waste. Deep wells are usually safe sources of water [6]. In this study bore well/well collected from different sites were found to be predominantly below 100 ppm which illustrates that bore well waters are usually safe sources of water [1].These waters should be safe for livestock and prevent nitrate poisoning [3].

Conclusion

Hence, it can be concluded that in general screening for nitrate content in different water samples where the farmer follows indiscriminate use of fertilizers or excess application of urea/poultry manure to the agricultural field, so that to prevent nitrate toxicity incidence in dairy cattle and extension work on managemental guidelines of nitrate toxicity in dairy animals also necessary to the farmers.

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