forage diets typically contain several times the amount of K present in high grain diets. K is not readily stored and must be supplied daily in the diet [33]. The latter authors indicated that trace mineral concentrations are affected by four interdependent factors:1) the genus, species or variety of crop, 2) type and mineral concentration of the soil, 3) stage of plant maturity, and 4) climatic or seasonal conditions. According to [37] only about 27 percent of the soil sampled had low levels of K or could be considered to be deficient in K. The majority had sufficient reserves of K to meet the requirements of most plants. Concerning micronutrient in forage samples the results revealed that iron concentrations were 83.02, 63.25 & 59.19 ppm for the three sites, respectively; these values were higher than the critical level. These levels were sufficient for the requirements (50 mg/kg) of ruminants for optimal performance [38]. These levels of forage Fe in the present study may support the reports of various researches who found similar concentrations of Fe in Egypt [39]; in Nicaragua [40] and Pakistan [33], this is because mineral content of a plant depends to some extent on the mineral content of the soil [31]. On the other hand, the Mn concentrations in fodder samples were higher than the critical level at site1and site2, while it was lower than this level at site three (Baloza which depend on tap water). Among different sites, narrow variation (11.63 to 28.55 ppm) was observed in case on Zn. Regarding Cadmium concentration, the fodder samples contained high Cd based on the critical level (0.1Vs 0.80 ppm). Cadmium is a highly toxic metal with a natural occurrence in soil, but is also spread in the environment due to human activities. It is easily taken up and accumulated by plants and crops through the root systems and is present in all food [41]. Generally an increase in soil cadmium content will be reflected in a similar increase of cadmium in crop plant tissuez [42]. On the other hand, lead concentration in fodder samples also showed variations among different three sites and recorded 5.76, 4.74& 3.32ppm respectively. The later authors stated that Lead has recently received much attention as a major chemical pollutant of the environment and as a toxic element to plants. It was observed that all the fodder samples contained higher concentration of Pb than the critical level (0.05-0.2ppm) this might be attributed to the higher content of lead in soil samples. The differences of the metal contents in plants depend on the physical and chemical nature of the soil and absorption capacity of each metal by the plant, which is altered by various factors like environmental and human interference, and the nature of the plant [43].

3.3 Mineral Profile of Goats' Milk

The macro and micro nutrient levels in goats' milk samples collected from different sites located at El-Salam Canal area, North Sinai, Egypt are presented in Table 7.

Table 7: Macronutrients and micronutrients of goats' milk from different sites at North Sinai, Egypt

Element / Samples	N	K	P	Fe	Mn	Zn	Cd	Pb
1	30.25^{a}±0.02	1287^{c}±1.16	9.38^{b}±0.20	0.56^{a}±0.004	0.22^{a}±0.001	3.31^{a}±0.0051	0.089^{a}±0.002	0.184^{a}±0.068
2	27.43^{b}±0.01	1349^{b}±1.14	9.50^{b}±0.16	0.43^{b}±0.002	0.19^{b}±0.001	3.08^{a}±0.0021	0.072^{a}±0.003	0.160^{b}±0.025
3	27.26^{b}±0.01	1544^{a}±1.33	10.44^{a}±0.36	0.38^{b}±0.002	0.18^{c}±0.001	1.44^{b}±0.001	0.016^{b}±0.005	0.153^{c}±0.022
MRLs*	36	1500	1210	0.7	0.32	5	0.01	0.02

1: Sahl El-Tina; 2: Gilbana; 3: Baloza; *: Maximum residue limits according to [44].

Means in the column with the same small $^{(a, b)}$ superscript letters indicate no significant (P<0.05) differences between locations.

The results revealed that, variations in mineral content were found among the three locations. Goats' milk samples collected from Sahl El-Tina were characterized with the highest nitrogen (N) (30.25±0.02ppm) residues than that of Gilbana and Baloza. It could be due to that, Sahl El-Tina using depending on El-Salam Canal Canal water and the high amount of the nitrogen fertilizer residues from agricultural drainage water that feed into the canal from the two major agricultural drains (El Serw & Bahr Hadous). Significant differences (p≤0.05) were found between different locations. While, no significant differences (p≤0.05) were found between goats' milk samples collected from Gilbana and Baloza. It is well known that, N is essential for the maintenance of osmotic and fluid balance in the body [45].

There were significant differences (p≤0.05) between different locations in the concentration of K (ppm), Goats' milk samples collected from Baloza had the highest potassium (K) concentration followed by Gilbana and Sahl El-Tina. Regarding, K was the most concentrated of the major metals in soil samples (Table, 5). [46] Reported that the average of Potassium requirement for goats and sheep are 0.50-0.80%. It is well known that, milk is the major source of K and similar concentration of K in goats' milk has been reported by [45].

On the other hand, phosphorus (P) is the most deficient mineral throughout the world and must be supplemented to livestock grazing native forages in order to meet requirements also eighty percent of P in the body is found in the bones and teeth [46]. It could be observed from the data that, there were significant (P≤0.05) differences in P levels between milk samples collected from Baloza in one side and Sahl El-Tina and Gilbana on the other side (Table, 7), being the lowest level in goats' milk samples from Sahl El-Tina (9.38 ppm). In addition, it could be noticed from the presented data and previous results of both soil (Table, 5) and forage (Table, 6) that, phosphorous levels in milk were parallel to soil and forage P.

From Table (7), it could be observed that, the concentration of iron (Fe) varied according to the location (P≤0.05). Based on the presented results, there was significant (P<0.05)

difference between the level of Fe in milk samples among Sahl El-Tina and the two other sites (Gilbana and Baloza), the concentrations were below maximum residue limits. Goats' milk samples collected from Sahl El-Tina was characterized by highest Fe values during the study period. On the other side, Goats' milk samples collected from Gilbana had higher Fe values than that from Baloza; it could be attributed to the presence of Fe concentrations in both of soil and forage (Table 5, 6, respectively). Concerning iron (Fe), it is normally causes slight toxicity, but excessive intake can cause siderosis and damage to organs through excessive iron storage. The concentration of Fe of goats' milk samples collected from the three locations is below the maximum residue limit (0.7) according to [44]. [47] Reported that Fe deficiency is rare in grazing livestock due to a generally adequate content in soil and forages together with contamination of plants by soil. However, milk does not contain enough iron and foliate to meet the needs of growing infants, and the low iron content is one reason that milk are not recommended for infants younger than 12 months old.

Regarding, the results revealed that the mean concentrations of manganese (Mn) of all examined goats' milk samples collected from the different locations were below the maximum residue limits according to [44]. In addition, there were significant ($P \leq 0.05$) differences in Mn levels (ppm) between milk samples among the study locations (Sahl El-Tina, Gilbana, Baloza) being the highest values at Sahl El-Tina (0.22 ppm). [9] Reported that Mn acts as cofactor in several enzyme systems and the high level of heavy metals occurred in fresh milk is mainly explained by the pollution of the environment and feed stuff's accumulated contamination, goats' milk samples recorded 0.27±17ppm Mn.

Considering the concentrations of zinc (Zn), data reveled that, Zn concentration was varied between the study locations, being the lowest contents at Baloza (1.44±0.001ppm) (Table,7). While, the highest concentration was observed at milk samples collected from Sahl El-Tina. Also, Zn values at the three sites were below the maximum residue limits and there were significant ($P \leq 0.05$) differences among the three study locations in the respective milk samples. It is well known that, Zn is an important in stress management, immune response, enzyme systems and protein synthesis [9].

Table (7) shows that, the differences in cadmium (Cd) concentration between milk samples collected from Baloza and the other two sites were significant ($P \leq 0.05$).Among collected goats' milk samples, Sahl El-Tina characterized by the highest Cd concentration. [12] reported that, Cd is an essential nutrient for goats. It affects calcium metabolism and skeletal changes resulting from calcium loss and ends in decrease bone mineral density [48]. The later authors recorded that Cd concentration was 0.03ppm in milk samples from Najran Region in K.S.A.

Concerning of lead (Pb) residues of collected milk samples, the results revealed that mean concentrations were 0.184±0.068, 0.160±0.025 and 0.153±0.022 ppm for Sahl El-Tina, Gilbana and Baloza, respectively. It could be also noticed that, there were significant ($P \leq 0.05$) differences between the levels of Pb in milk samples among the three sites (Table, 7). The detection of residual concentrations of Pb in all milk samples could be due to the contamination of the soil and fodder, which the lactating goats were nourished [49, 50].

Meanwhile, there were variations in micro minerals of goats' milk samples among different study locations. Milk samples collected from Sahl El-Tina and Gilbana regions characterized with the higher residual concentrations of both Cd and Pb than that found of milk samples collected from Baloza. Possible explanation could be due to that, these two locations (Sahl El-Tina and Gilbana) depending on El-Salam Canal water which is suffering from many pollutants such as high levels of minerals and heavy metals, same findings reported by [39, 4]. On the other hand, [51] reported that, Pb values in soil, forage and milk are very low, so there were no hazards of any toxicity of lead for animals and public health, concentrations in milk samples were ranged from 0.018 to 0.050 mg/L which is lower than our results.

Among the trace metals cadmium (Cd) and lead (Pb) were higher than the maximum residues limits according to [44] in all milk samples (Table, 7). Cd and Pb levels of goats' milk samples collected from Sahl El-Tina and Gilbana were parallel to the previous obtained results presented in Tables 5 and 6. Also, water used in these two regions, either to irrigate crops or drinking animals have an important role significantly affected our results. Same observations reported by [48]. More detailed studies are needed.

From the aforementioned results, it could be concluded the examined soil, plants and goats' milk samples from the investigated area (Sahl El-Tina, Gilbana and Baloza) at northern Sinai Governorate, included a high variety of heavy metals residues at Sahl El-Tina and Gilbana, which depending on El-Salam Canal water than that at Baloza. Also, some minerals levels in milk were parallel to soil and/or forage. Therefore, caution should be taken when establishing programs for the use of drainage water as El-Salam canal project. The impact (short or long) of such programs on soil properties, crop and animal production should be carefully assessed. Water, soil, pla nt and biological indicators monitoring programs are required to follow the changes which will take place and adjust policies accordingly. So further deep studies are required for optimum productivity of grazing ruminants, especially goats at these specific regions of Egypt. As well as the monitoring activities for El-Salam canal water and its all branches must be continuing.

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