Analysis of food grains of some districts of Haryana and Punjab, India

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Abstract-The analysis of physiochemical parameters of food grains from different districts of Haryana and Punjab was carried out emphasizing on selenium levels. The parameter like concentration of selenium in different food grains was obtained. The observed results were analyzed with the help of arithmetic mean, standard deviation and mean deviation of the respective food grains. The observed concentration of selenium shows a marked variation in the samples from various districts of Haryana and Punjab.

Keywords: Food grains, various parameters, Haryana and Punjab.

I. INTRODUCTION

Selenium (Se) is an essential micro nutrient for human and animal health, with antioxidant, antiviral and anticancer effects. Selenium also protects cells against the effect of free radicals that are produced during normal oxygen metabolism. It is therefore very important to estimate the level of this element in our food. Cancer prevention appears to require a supra nutritional Se intake, but in some regions Se is declining in food chain and new strategies are needed to increase its intake. It is estimatedthat billions of people are selenium deficient and its amount in plant food may depend on the species of plant, the breed or strain and which part of the plant is eaten. It may also depend on the season or year and the climate, on the type of soil, and cooking. Plant foods are the major dietary sources of selenium in most countries throughout the world. The amount of selenium in soil, which varies by region, determines the amount of selenium in the plant foods that are grown in that soil. In United States, the soils of northern Nebraska and south Dakota have very high levels of selenium and plants grown in that areas accumulate comparatively higher amounts of selenium, and that is why the people living in those regions generally have the highest intake of selenium in the United States. Similar trend is also seen in animals that eat grains or plants that were grown in selenium-rich soils.Since the projections show that the largest population of India is dependent upon the growth of coarse grain production, it was planned to investigate and estimate the nutritional level of this element in our food grains.Some plants growing on seleniferous soils accumulate surprisingly low levels of selenium. White clover (Trifolium repens), buffalo grass (Hilaria belangen) and gramma grass (Bouteloua species) are poor accumulators of the element1. On the other hand, high sulfur-containing plants such as the Crucifera (mustard, cabbage, broccoli, cauliflower) have relatively strong concentrations of selenium.

Hamilton and Beath2-3 have reported on the accumulation of selenium by field crops and vegetables grown in high-selenium soils and Williams etal.4-5 have published data on the selenium contents of wheat and food grains produced in the high-selenium areas of the United States. All of the vegetable and crop species grown in soils containing high levels of selenium contain the element to potentially toxic levels (> 5 ppm). However, Williams et al.4, 5 found that less than 10 % of the wheat and food grain samples grown in the seleniferous areas of the United States had selenium levels in excess greater than 5 ppm.Differences in the accumulation of selenium by plants growing in those soilswhich have low selenium concentrationwas reported by Watkinson6 and Ehlig et al.7-8. Allaway9 found that for soils having moderately low selenium levels, alfalfa accumulates more selenium than red clover. Crops growing on neutral or acid soils absorbed very little selenium and any attempt to increase crop selenium uptake by shifting to some other species was not likely to be successful.Klaus Schwarz, in whose laboratory the essentiality of selenium in animals was discovered, postulated and it was observed that selenium functioned as an essential cofactor at specific sites of intermediate metabolism. Currently, the known biochemical functions of selenium are as a component of the enzyme glutathione peroxides10-11, found in animals, and of

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several bacterial enzymes. The selenium deficiency signs observed in animals can be partially explained by lack of glutathione peroxidase (GSX-Px). This does not eliminate the possibility of other roles of selenium in animals. For example Burk and Gregory have reported a selenium-binding protein of unknown function in rat liver and plasma whose properties are quite distinct from those of GSH-Px. There are relatively small differences among species of forage and feed plants in the accumulation of selenium when they are grown in the seleniferous areas. Hamilton and Beath12-13have described the accumulation of selenium by field crops growing in soil containing a high level of available selenium. Lakin and Byers14and Williams et al.have published an extensive compilation of the selenium content of wheat and food grains produced in and weighed 1g for analysis high-selenium areas of the western United States15. In Canada, Thorvaldson and Johnson16analyzing 230 composites made up from 2,230 samples of wheat from widespread areas of Saskatchewan and Alberta, found an average value of 0.44 ppm selenium, with a maximum of 105 ppm. Robinson17found concentrations between 0.1 and 1.9 ppm selenium in samples of market wheat obtained in various parts of the world.In Canada, Miltimore et al.19found that British Columbia wheat grain had a considerably higher mean selenium concentration than barley and oats. Significantly, higher levels of selenium also occurred in wheat than in grasses and legumes.

The amount of selenium in a plant-derived food varies largely with its protein content and with the area of the country in which it is grown20. The concentration of selenium in the milk, eggs and meat of animals is influenced by the level of selenium in the plant material they consume21. In North American diets, cereals are the dominant food of plant origin for supplying selenium, with much of the cereal consumption in the form of bread. The United States and Canadian wheat crops are produced primarily in selenium-adequate regions and this result in moderately high average concentrations of the element in wheat-related foods in both countries22. Meat and fish are also good sources of selenium for humans, whereas most fruits and vegetables provide little selenium. Higgs et al.23 concluded that ordinary cooking techniques did not appear to result in major losses of selenium from most foods.

II. EXPERIMENTAL

2.1 Sampling of Food grains

Different types of food grains were collected from the different areas. From one site four samples of wheat, mustard, bajra and rice were collected. The food grain samples were collected from the same area from where the soil samples were taken. The collected food grains were dried and weighted 1g for analysis. The digested samples were analyzed for selenium with the help of atomic absorption spectrophotometer with hydride generation. The level of selenium found in different food grains taken from different areas whose soils have also been analyzed for selenium is reported.

2.2 Digestion of Food grains

1 g of food grain was weighted and transferred into digestion flask. In the digestion flask, 10 ml of nitric acid was added and then matter was solely heated to 90^0C. The flask was hold in the heating block until half of the volume disappeared, then 0.5 ml of perchloric acid and 1ml of sulfuric acid were added and digestion was continued to following temperature program

- at 90^0C flask was held for one hour
- temperature was increased slowly (approximately 10 minutes) to 100^0C and held up to 30 minutes.
- temperature was increased slowly to 120^0C and held for 20 minutes when sulfuric acid only was left over and digestion of acid was finished.

Reduction of selenium (VI) to selenium (IV) was performed by 5 ml of 6 M hydrochloric acid to the residual digestion solution and by heating the flask at 80^0C for 30 minutes and flask was cooled at room temperature. The digested solution was diluted to 25 ml distilled water and 10 ml of that solution was used for analysis.

2.3 Atomic Absorption Spectrophotometer (AAS)

Atomic Absorption Spectrophotometer, ECIL model-AAS 4129 (PC-based) was used for analysis of the elements. It consists of the following accessories.

2.4 Hollow cathode Light Sources

It consists of a hollow cathode held inside a glass envelope containing an inert gas (Ne) under reduced pressure. The internal surface of the cathode is coated with a compound of the element of interest. When an electric discharge created between anode and cathode, material metal is sputtered off the wall of the cathode. Interaction between the electrons and ions formed in this discharge with atom vaporized from the cathode causes excitation, which is turn leads to the emission of the analyte's atomic line spectra. Although Hollow cathode lamps are widely used for the majority of the elements that can be determined by the atomic absorption spectrophotometer.

III. RESULTS AND DISCUSSION

Values of Se in the food grains in some districts of Haryana and Punjab were obtained. The average levels of selenium in wheat grown in Rohtak district was found to be 107 ppb, for bajra 129ppb and for mustard it was 104 ppb for rice and similar trends for Sonepat district show obviously that the levels of selenium in their food grains grown are lowest in comparison to other district of Haryana. On the other hand, district Mahendergarh, Hisar and Jind had comparatively higher levels of soil selenium and thus have higher values of this element in their food grains. The Jind district has high value of Se in wheat, whereas Sonepat and Rohtak districts have minimum level of Se in wheat. Similarlyin bajra level of Se is highest in Mahendergarh and lowest in the Chandigarh and Sonepat. In mustard Narnaul and Jind districts have highest level of Se concentration and Hisar and Rohtak districts have lowest level of Se concentration Whatever, we could analyses for some districts, we observed almost similar trends in correlationship between soils and food grains grow on those soils for Punjab. The overall mean levels of selenium in some coarse grains like mustard, Haryana has high Se level than Punjab. It also observed that mustard is a better source and accumulator for selenium in comparison to other coarse grains. During 1950's, very low selenium areas were also found, where grazing animals, pigs and poultry suffered from selenium deficiency diseases.

IV. CONCLUSION

It is clear that the district that had comparatively higher levels of selenium in their soils also had usually the higher levels of selenium in the food grains grown in those areas. It was also observed that mustard is a better source and accumulator for selenium in comparison to other coarse grains. We caneasily see a marked inferiority accorded to 'coarse' grains including millets like bajra, barley and sorghum all over the country. We also have seen from our results thatover food grains are quite poor in selenium levels, which is one of the most important micro-nutrient of the present day.We propose that government agencies should promote the production of those coarse cereals, which are suited to our dry lands, as they are more nutritious. Soil scientists should be promoted to take care of our lands so that their fertility is maintained. Immediate policy intervention is needed to put the well-suited coarse grains according to the soils, in the same footing in the market as are wheat or rice.

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