

Study on nutrient content of micronutrient seasoning powder prepared from bovine internal organs and indigenous plants

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ABSTRACT

Micronutrient seasoning powder was investigated as a source of micronutrient fortification for school meal. Major objectives of this investigation are i) to develop micronutrient seasoning powder prepared from bovine internal organs as well as from native Mongolian plants, ii) to determine chemical composition and mineral content of seasoning powders with varying composition, iii) to investigate the effect of cooking processes on mineral content of test meals with seasoning powder, and iv) to evaluate sensory characteristics of seasoning powders. Two types of micronutrient seasoning powder were developed. They are i) bovine organs based seasoning powder in three ($n=3$) different ratios of spleen:liver:heart, i.e. 25:50:25, 40:40:20 and 30:60:10, in combination with onion and garlic mixture ii) Plant powder (*Rhodiola roseae* and *Fagopyrum tataricum* in 50:50 ratio) in three forms, namely, dry powder with direct mixing, dried powder prepared from water (aqueous) extract and ethanol extract, with or without the addition of vitamin C.

Mineral (Ca, Cu, K, Fe, Mg, Mn, Na, P and Zn) content was analyzed using inductively coupled plasma atomic emission spectrometry (ICP-AES). The result indicated that Mg, Mn and K content was high in plant powder, whereas, bovine internal organ powder had higher content of Fe, Zn, Cu, P, Na. Mineral content was the highest in bovine organ based powder when ratio of spleen, liver and heart was 25:50:25. For the plant water extract powder had higher Mn, K, P, Zn and Na content, while the level of all other minerals was higher in directly mixed powder.

Compared to recommended mineral intake 1g of seasoning powder made from bovine internal organs Fe concentration (8.72mg) can cover up to 87% of 4-6 year old children and more than 100% of 7-14 year old children's standard Fe intake and other minerals can be cover specific percent of recommended intake. According to intake by age group, the amount of Fe in seasoning powder can be adjusted.

To study the effect of cooking (thermal processing) on minerals, seasoning powders were processed by 4 different methods, namely, *boiling*, *steaming*, *roasting* and *frying*. Using all cooking methods several types of common school meals were prepared with seasoning powders: soup, sauce, cutlet, mantuun buuz (steamed flour with meat filling=on Japanese nikuman), budaatai huurga (fried dish with cooked rice, meat and vegetables) and dried fruit juices were prepared. The effect of cooking on mineral content of seasoning powders in the entire test meals were higher compared to control test meal ($P<0.05$). Retention of minerals was relatively more during roasting as compared to other methods. Generally, P, K, Fe, Cu and Zn content were statistically significant ($P<0.05$) between seasoning powder and cooked test meal.

Sensory evaluation indicated that bovine organs based seasoning powder had desirable taste, aroma and color for every meal. Presence of onion and garlic in the powder is responsible for the above observation. Among plant powders, most convenient variant was water extraction powder of plant with vitamin C, particularly when added to dried fruit juice.

The study revealed that micronutrient seasoning powders prepared from bovine internal organs with addition of onion garlic mixture improved mineral content especially iron and nutritional value of meals, besides enhancing sensory attributes. This powder appears to be a valuable source of minerals and other micronutrients fortification for school meal. The further frame of the work vitamin estimation, animal based and population based study will be continued.

Key words: *micronutrient seasoning powder, bovine internal organs, indigenous plants, nutrient content, mineral estimation, school meal, cooking process, sensory evaluation*