

# Comparison of Nutritional and Chemical Parameters of Soymilk and Cow milk

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**Abstract**—Cow milk, is a product of the mammary gland and soymilk is a beverage made from soybeans; it is the liquid that remains after soybeans are soaked. In this research effort, we compared nutritional parameters of this two kind milk such as total fat, fiber, protein, minerals (Ca, Fe and P), fatty acids, carbohydrate, lactose, water, total solids, ash, pH, acidity and calories content in one cup (245 g). Results showed soymilk contains 4.67 grams of fat, 0.52 of fatty acids, 3.18 of fiber, 6.73 of protein, 4.43 of carbohydrate, 0.00 of lactose, 228.51 of water, 10.40 of total solids and 0.66 of ash, also 9.80 milligrams of Ca, 1.42 of Fe, and 120.05 of P, 79 Kcal of calories, pH=6.74 and acidity was 0.24%. Cow milk contains 8.15 grams of fat, 5.07 of fatty acids, 0.00 of fiber, 8.02 of protein, 11.37 of carbohydrate, 4.27 of lactose, 214.69 of water, 12.90 of total solids, 1.75 of ash, 290.36 milligrams of Ca, 0.12 of Fe, and 226.92 of P, 150 Kcal of calories, pH=6.90 and acidity was 0.21%. Soy milk is one of plant-based complete proteins and cow milk is a rich source of nutrients as well. Cow milk is containing near twice as much fat as and ten times more fatty acids do soymilk. Cow milk contains greater amounts of mineral (except Fe) it contain more than three hundred times the amount of Ca and nearly twice the amount of P as does soymilk but soymilk contains more Fe (ten time more) than does cow milk. Cow milk and soy milk contain nearly identical amounts of protein and water and fiber is a big plus, dairy has none. Although what we choose to drink is really a matter of personal preference and our health objectives but looking at the comparison, soy looks like healthier choices.

**Keywords**—Soymilk, cow milk, nutritional, comparison.

## I. INTRODUCTION

THE soy is a low cost source of protein that has been consumed in Asian nations for many centuries. The rapid growing population of the developing countries is facing acute shortage of protein, soy bean is rich protein content and contains fiber, below is a list of regular sources [3]:

- Edamame or soybeans – soybeans are the least processed form of soy protein. Available in most grocery stores, they can be purchased in fresh, frozen or roasted forms. These beans can be eaten alone, like peas or added to salads and stir-fries.
- Tofu – curdling soymilk with a coagulant makes tofu or bean curd. Available in both soft and firm forms, tofu can be used in a variety of recipes to partially replace either meat or dairy products. Due to the common use of calcium sulfate as the curdling agent, tofu can also be a good

source of calcium.

- Soymilk – soymilk is another high-quality source of soy protein that is an alternate of dairy animal milk and available in variety of forms, including plain, vanilla, chocolate and... it can be used to replace milk added to coffee, tea or cereal.

Human beings are the only species to consume milk past childhood. We are also the only species to consume the milk of another species. There are some great nutritional benefits to milk, for example milk naturally contains a readily absorbable form of calcium and has higher quality protein than soy milk. But, at about the age of four, most people around the world begin to lose the ability to digest lactose, the carbohydrate found in milk. This results in a condition known as lactose intolerance that causes unpleasant abdominal symptoms, including stomach cramps, flatulence and diarrhea. Lactose intolerance is reality for 75% of the world population. Even though consuming dairy is unnatural and problematic for many people. However, there are many people who cannot drink cow milk because of a milk allergy or out of a values choice like vegan. Soymilk is a healthy drink and is important for people with above problems and had been the first production ever prepared and consumed by human since long ago. Soymilk not only provides protein but also is a source of carbohydrate, lipid, vitamins and minerals [5].

In this research effort, we compared nutritional and chemical parameters of this two kind milk such as total fat, fiber, protein, minerals, fatty acids, carbohydrate, lactose, water, total solids, ash, pH, acidity and calorie.

## II. MATERIALS AND METHODS

Soybean grains obtained from Iranian Agriculture Research Center (Tabriz, Iran) and from the market. Soymilk was prepared by grinding soybean grains in an oscillator by adding calculated quantity of water. The slurry obtained was diluted so that 100g of soybean could produce 800 ml soymilk [7], [8]. The slurry so obtained was also homogenized in a homogenizer at 1450 rpm and 8000 psi pressure.

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TABLE I  
 NUTRITIONAL COMPOSITION OF SOYMILK AND COW MILK (PER 1 CUP)

	Fat (gr)	Fatty acid (gr)	Fiber (gr)	Protein (gr)	Carbohydrate (gr)	Lactose (gr)	Ca (mgr)	Fe (mgr)	P (mgr)	Calories (Kcal)
Soymilk	4.67	0.52	3.18	6.73	4.43	0	9.8	1.4	120.05	79
Cow milk	8.15	5.07	0	8.02	11.37	4.27	290.36	0.12	226.92	150

TABLE II  
 CHEMICAL COMPOSITION OF SOYMILK AND COW MILK (PER 1 CUP)

	Water (gr)	Total solids (gr)	Ash (gr)	pH	Acidity (%)
Soymilk	228.51	10.4	0.66	6.74	0.24
Cow milk	214.69	12.9	1.75	6.9	0.21

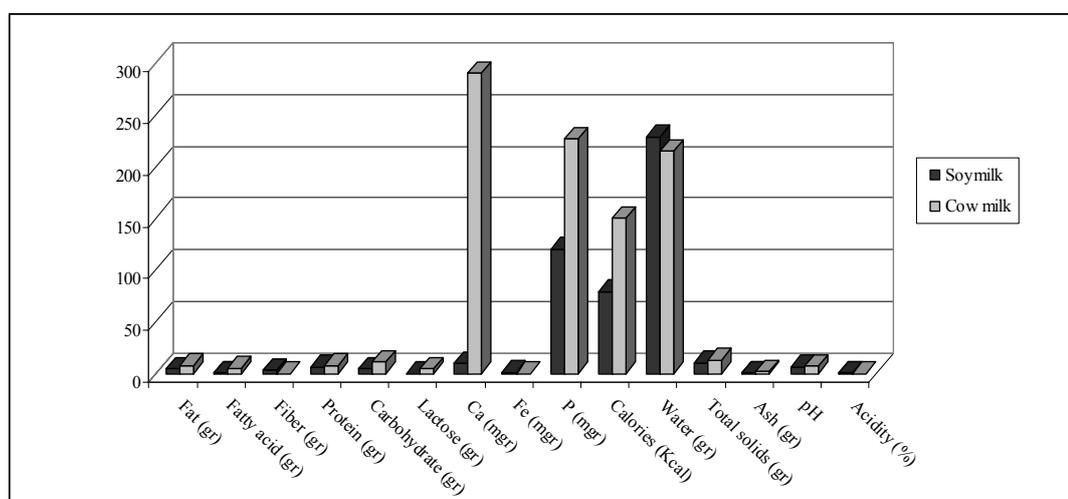


Fig. 1 Comparing the nutritional and chemical qualities between soymilk and cow milk (per 1 cup)

The homogenizer soymilk was pasteurized at 80<sup>o</sup>C for 15 minute and then cooled to 25<sup>o</sup>C [8]. Cow milk obtained from dairy farm and market cow milk pasteurizes according HTST (the HTST systems heat the media from ambient, 22<sup>o</sup>C temperature to 102<sup>o</sup>C. The systems hold the media at this temperature for a minimum of 10 seconds and then cool the media to 37<sup>o</sup>C).

Then, one cup (245gr) of soymilk and cow milk were analyzed using Gerber method and gas-liquid chromatography for total fat and fatty acids, chemical reactions for fiber and mineral (Ca, Fe and P), macro kjeldahl method for protein, HPLC and Lane-Eynons method for carbohydrate and lactose, autoclaving and dry ashing for water content, total soluble solids and ash amount. Calories, pH and acidity calculated too [1], [2].

### III. RESULTS

Result obtained from analyzes showed soymilk contains 4.67 gram of fat, 0.52 of fatty acids, 3.18 of fiber, 6.73 of protein, 4.43 of carbohydrate, 0.00 of lactose, 228.51 of water, 10.40 of total solids and 0.66 of ash, 9.80 milligrams of Ca, 1.42 of Fe and 120.05 of P, also 79 Kcal of calories, pH = 6.74 and acidity was 0.24%. Cow milk contains 8.15 grams of

fat, 5.07 of fatty acids, 0.00 of fiber, 8.02 of protein, 11.37 of carbohydrate, 4.27 of lactose, 214.69 of water, 1.75 of ash, 12.90 of total solids, 290.36 milligrams of Ca, 0.12 of Fe and 226.92 of P, also 150 Kcal of calories, pH = 6.90 and acidity was 0.21% (Tables I and II).

There is a higher amount of fat (almost twice) fatty acids (almost ten times). Protein, carbohydrate (almost three time), lactose, total solids, ash (almost twice), Ca (almost three hundred time), P (almost twice), calories (almost twice) and pH in the cow milk than in the soymilk (Fig. 1).

### IV. DISCUSSION

The major difference between soymilk and cow milk is that one is derived from a plant and the other from an animal. Although ethical, hypothetical or debatable issues frequently arise when discussing this subject, this answer is going to deal strictly with the nutritional differences between these to kind of milk. Cow milk, as with all other animal based foods, is a complete protein. It supplies people with all the necessary amino acids to form proteins. All cow milk contains (almost) 8 grams of protein and 12 gram of carbohydrate and is a rich source of other nutrients as well. One cup can provides adults with 30 percent of their daily calcium needs and about 50

percent of their vitamin B<sub>12</sub> and riboflavin requirements [6]. Often it's fortified with vitamin D to facilitate the absorption of calcium. Vitamin A is usually added to milk as well. Depending on the selection cow milk can have a significant amount fat. Lactose, the primary carbohydrate in cow milk, poses a digestive problem for some people. These folks are deficient in the lactose enzyme that's needed to break down. This milk sugar causing gas, bloating and diarrhea after consuming some forms of dairy products. The solution is to purchase products with the lactose already broken down, to take the enzyme in the form of a pill or drops or to find a substitute for these foods [6]. Soymilk is not technically milk but a beverage made from soybeans. It is the liquid that remains after soybeans are soaked, finely ground and then strained, since it doesn't contain any lactose, soymilk is suitable for lactose intolerant folks. It's also popular cow milk substitute for vegetarians since it's based on a plant source. Soy foods are the only plant – based complete proteins, one cup of soymilk contains almost 7 grams of protein, 4.5 grams of carbohydrate, 4.5 grams of fat and no cholesterol. Although soymilk supplies some B vitamins, it's not a good source of B<sub>12</sub> nor does it provide a significant amount of calcium [9]. Nowadays manufacturers have offered fortified versions of soy beverages. These beverages may include calcium and vitamins E, B<sub>12</sub> and D among other nutrients. Soymilk and cow milk have similar protein content with close amino acid make up, as for the nine essential amino acids in protein necessary for sustaining life, cow milk and soymilk contain nearly identical amounts except sulfur containing amino acids which are deficient in soymilk [4]. There are also mineral differences among cow milk and soymilk. Soy beverages provide more iron than cow milk, soymilk also contains more magnesium, copper and manganese than dose cow milk. In order to absorb calcium, one needs magnesium, copper also aids in bone formation. Soymilk contains twelve times the amount of copper as doe's cow milk. Soy milk contains 42 times the amount of manganese as doe's cow milk, manganese is also needed for bone formation [4], however, soy is deficient in many other key nutrients and fiber is a big plus and dairy has none.

#### V. CONCLUSION

Although what we choose to drink is really a mater of personal preference and our health objectives but looking at the comparison, soy looks like healthier choices because it scores low in calories, carbohydrate, fat and fatty acid and is important for people who are allergic to cow milk protein and lactose.

#### REFERENCES

- [1] AACC, *Approved methods of American Association of Cereal Chemist.*, Inc. St. Paul: Minnesota: USA, 2000.
- [2] AOAC, *Official methods of analysis.* Association of Official Analytical Chemists, Alington, D.C.: USA, 2000.
- [3] K. Cesario, F. Steinberg, and SH. Zidenberg-cherr, *Nutrition and health info-sheet*, Dept. of Nutrition, University of California: USA, 2004.

- [4] P. Chaiwanon, P. Puwastien, A. Nitithamyong, and P. P. Sirichakwal, "Calcium fortification in soybean milk and in vitro bioavailability," *J. Food Comp. Anal.*, vol. 13, pp. 319-327, 2000.
- [5] J. T. Chien, and H.E. Snyder, "Detection and control of soymilk astringency," *J. Food Sci.*, vol. 48, pp. 438-440, 1983.
- [6] S. Clark, *Comparing milk: human, cow, goat & commercial infant formula*, Dep. of Food Science and Human Nutrition, Washington State University: USA, 2007.
- [7] U. Kapoor, I. C. Datta, M. A. Quadri, and H. S. Kushwah, "Note on the chemical analysis and acceptability of soymilk," *Ind. J. Agri. Sci.*, vol. 47, pp. 475-760, 1977.
- [8] S. Rehman, H. Navaz, M. M. Ahmad, S. Hussain, A. Murtaza, and S.H. Shahid, "Physico-chemical and sensory evaluation of ready to drink soy-cow milk blend," *Pak. J. Nutr.*, Vol. 6, no. 3, pp. 283-285, 2007.
- [9] F. Yazici, V. B. Alvarez, M. E. Mangio, and P. M. T. Hansen, "Formulation and processing of a heat stable calcium-fortified soymilk," *J. Food Sci.*, vol. 62, pp. 535-538, 1997.