Importance, Nutrient content and Factors Affecting Nutrient content of Potato

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Crop Importance:

Potato (Solarium tuberosum) are a source of both food and income in the growing countries of the world which can change greatly the food security ensuring capacity of countries as result of high productivity per unit area and time in relation to other crops. In addition, high prospects for growth of the market for fresh potatoes (Scott et al. 2000); make the commodity fundamental for rural development particularly in countries where there is dramatically increase in cereal purchase costs.

Potato is among the worlds’ crops produced for staple food. It is commonly produced for its tuber (under ground modified stem) that mainly contains carbohydrates. The tuber part of potato is the widely adapted edible potato product which is rich in vitamin-C according to FAO (2008). It also contains high quality protein and Substantial amount of essential vitamins, minerals and terrace elements (Horton and Sawyer, 1985). The protein of potato has high biological value than proteins of cereals and comparable with that of milk and fish (Girma and Ravishanker, 2008). The biological value of mixture of egg and potato is higher than the egg alone. Hence, potato can be supplement of meat and milk products for improving their taste, lowering energy intake and reducing food cost. The presence of vitamins and minerals make this crop preventive crop from some diseases caused by deficiencies of those vitamins and minerals available in the edible food item of potato. It also contains dietary fibers that can prevent constipation through increasing the bulk of the stool, and decreasing absorption of dietary cholesterol and there by lower plasma LDL cholesterol (PNFHB, 2009-12). It also helps protect from colon polyps and cancer.

In addition, potato crop is higher yielding than other crops per unit area and time or season. It has wider climatic zones for production. Potato is a multipurpose crop that produces carbohydrate-rich food which is highly popular worldwide and served in a variety of ways. According to Zehra (2011) harvested fresh potato tubers contain about 80% water and 20% dry matter while about 60 to 80 percent of the dry matter is starch. On a dry weight basis, the protein content of potato is similar to that of cereals and is very high in comparison with other roots and tubers (Zehra, 2011). Potatoes are rich in several micronutrients (Lutala dio and Castaldi, 2009). The potato is also a moderate source of iron, and its high vitamin C content promotes iron absorption. According to FAO (2008) potato is a good source of vitamins B1, B3 and B6 and minerals such as potassium, phosphorus and magnesium, and contains folate, pantothenic acid and riboflavin. Potatoes also contain dietary antioxidants, which may play a part in preventing diseases related to ageing, and dietary fiber, which benefits health (FAO, 2008). Though potato has these and other importance, it is cultivated by blanket recommendation nitrogen rates application and even without application of potassium...
fertilizer. But the crop requirement of potassium is higher than N and P rates. According to Bansal and Trehan (2011) report potato crop is a heavy feeder of soil potassium as it removes 1.5 times the amount of nitrogen and 4-5 times the amount of phosphate. It is landed property that use of appropriate potassium rates can increase the productivity of potato crop significantly and boost the contribution of the crop to food security. Significantly increase in leaf potassium (K) content was indicated with applied K and showed positive correlation with tuber yield and negative correlation with frost score (Shahid and Moinuddin, 2001). On the other hand, potassium deficient potato crop is found less resistance to diseases and other pests, frost damage, low yielder and poor quality which even though varying with variety (Shahid and Moinuddin, 2001). As the base of food need of human is satisfied based on utilisable nutrient, varietal nutrient assessment is found to be fundamental in order to maximize productivity of varieties per hectare through selecting more nutritive variety for production and verify the variety for the character.

Nutrient content in relation to other crops
Carbohydrate: H₂O accounts for about 70-80% of a typical potato tuber, though this percentage can vary significantly depending on the type of potato (NVP, 2012). The rest of the potato is mostly starch. According to Zehra (2011) harvested fresh potato tubers contain about 80% water and 20% dry matter while about 60 to 80 percent of the dry matter is starch depending on variety and growing condition. Potato also contains small amounts of simple sugars, which are important for developing the golden-brown color of fried and roasted potatoes. Potatoes are very high in starch, and have a high glycemic index (the only vegetable with a higher one is parsnips) (Laura, 2011). This is another way of saying that the carbohydrate in potatoes is rapidly turned into sugar and absorbed into the blood. Potato contains about 17% starch and it is one of the best natural sources of starch (NVP, 2012). Sprouting potato leads to conversion of starch into sugar and green which contain poisonous substance Solanine hence you should avoid eating sprouted potatoes. The starch content of potato is highly affected by variety while a little less affected by environment (Lamberti et al., 2004). According to same source, impact of variety at the total starch variability is 65% and an environmental condition is 19% while the share of variety and environment interaction is 14%. Carbohydrate content in potatoes depends on a variety and physiological state of tubers, while the presence of carbohydrates may change during tuber development and during the time of storage (Vreugdenhil et al., 2007). According to Bojanska et al. (2008) the carbohydrate content of mature tuber at storing temperatures from 10 to 20°C, is starch. But other sugars are taking small amount share (Knowels et al. 2009, Zhang et al., 2002). So the varieties carbohydrate content assessment in relation to nitrogen fertilizer and potassium rates is important for breeding, production and Variety verification for the character by growing in same growing condition. It is also required for maximizing productivity of carbohydrate per area and time through allowing the selection better carbohydrate containing variety for production.

Protein: Potato contains 2% high quality protein and a good carbohydrate to protein ratio. When compared with rice and cereals, it has higher lysine content and lower concentrations of other amino acids such as cysteine. Potato is not only source of high energy food but also source of high quality protein (Horton and Sawyer, 1985). According to Tally (1983) the crude protein and percentage nitrogen content was found to be improved by fertilization. The potato protein content quality is greater than grain protein quality (Cooke, 1975). The quality of protein from wheat, maize and bean is definitely lower than that of potato (Beruge et al., 1979). Potato protein quality composition greater than the protein content of other crops due to possession of essential amino acid good for human nutrition(Berga et al.,1994). Horton and Sawyer (1985) reported protein content of potato is also easily digestible as it is primarily Albumin and to a lesser extent, globulins composition. The quality of the protein is variable considerably based on growing condition and variety difference (Beruge et al., 1979). So that due to breeding and productivity advantage, varieties’ protein content potential have to be assessed under the same growth condition having different levels of nitrogen and potassium as the two works on different physiological and anatomical activities; nitrogen increasing succulence while potassium increasing strength of the plant in addition to investigating their collective effect on nutrient content, yield and disease reaction.
Fats: Fat content potato is very low, as is, consequently, the occurrence of fat-soluble vitamins. Both the flesh and the skin of a potato contain dietary fibre, though (unsurprisingly) there’s a greater concentration in the skin. Fat content differ with Variety. In experiment of Gumul et al. (2011) different varieties produced different amount of fat, starch, carbohydrate and fiber. The fibers from potato food are a useful dietary fiber that can control constipation. Potato is low in fat - but preparing and serving potatoes with high fat ingredients raises the caloric value of the dish (PND, 2008). According to USDA (2011) the fat content of 100g of potato is 0.1g and potato fat is lower than other crops like maize, rice, wheat, soybean, cassava and yam but a little bit higher than sweet potato. Varieties fat content investigation is also important like protein, carbohydrates and other essential elements investigations for the advantage of digestibility and indigestibility of fat available as well as ranking them in their order of importance for the two types of fats.

Vitamins and minerals: Potatoes are rich in several micronutrients (Lutala dio and Castaldi, 2009), especially vitamin C when eaten with its skin (FAO, 2008) and a single medium sized potato of 150 g provides nearly half daily adult requirement (100 mg). The potato is also a moderate source of iron, and its high vitamin C content promotes iron absorption. According to FAO (2008) potato is a good source of vitamins B1, B3 and B6 and minerals such as potassium, phosphorus and magnesium, and contains folate, pantothenic acid and riboflavin. Potatoes also contain dietary antioxidants, which may play a part in preventing diseases related to ageing, and dietary fiber, which benefits health (FAO, 2008). The level of Vitamin C decreased with length of storage and cooking, especially if potatoes are peeled earlier (McElwain, 2011). According to McElwain( 2011) potato food contains B complex vitamins, especially B1, B6 and niacin as well as other minerals such as magnesium, phosphorous, and rich in potassium. But potatoes have less Sodium and trace elements, from aluminums to zinc, and its iron content can contribute significantly to daily requirements.

In addition to vitamins and minerals, potatoes also contain a mixture of phytochemicals with antioxidant potential, most notably carotenoids and anthocyanins (Brown et al. 2001, 2004).

Anthocyanins are found in the greatest quantities in purple and red potatoes while carotenoids are found largely in yellow and red potatoes, although small amounts are also found in white potatoes (Brown et al. 2004). Wu et al. (2004) examined total antioxidant capacity (TAC) in more than 100 different foods, including fruits, vegetables, nuts, dried fruits, spices, cereals, and other foods. In addition, the researchers measured total phenolic content of these foods to evaluate their contribution to total antioxidant capacity. Potato varieties vitamin and mineral content investigation is also good for selecting promising variety for production and breeding programs. From these it is important to quantify the vitamin and mineral content of varieties cultivated in the country for their quality and verify them according to the amount they contain to recommend for breeding purpose and promote high containing varieties not only from nutritional aspect but also health ensuring advantages.

Factors affecting nutritional content of Potatoes

Variety: - The nutritional content of the potato varieties are variable with the genetic makeup of the variety under cultivation. According to Gumul et al. (2011) different varieties produced different amount of protein, fat, starch, carbohydrate, ash and biologically active compounds: polyphenols, flavonoids, and fiber. The starch content of potato is a varietal characteristic and environment (Lamberti et al., 2004) and proportion of variety contribution to the total starch variability is 65% and environmental conditions is 19% while the share of variety and environment interaction is 14%. Carbohydrate content in potatoes depends on a variety and on physiological state of tubers (Vreugdenhil et al., 2007). It is easy to understand difference in nutrient content with varietal difference. From these it is important to quantify the nutritional content of varieties cultivated in the country for their quality and verify them according to the amount they contain to recommend for breeding purpose and promote high containing varieties for production.

Growing condition:-Growth condition is not only determining nutrient content but also determines the type of crop to be grown. As indicated in Lamberti et al. (2004) nutrient content is varietal characteristic and environment. The share of variety at the total starch variability is 65%, the share of
environmental conditions is 19% and the share of variety and environment interaction is 14%. It is possible to improve crude protein and nitrogen percentage by fertilization (Tally, 1983). The quality of protein is also variable with growing condition and variety (Beruge et al., 1979). Growing condition is also one crucial factor to be considered while dealing about nutrient content in terms of both quantity and quality.

**Preparation methods:** - Since the starch in raw potato cannot be digested by humans, they are prepared for consumption by boiling (with or without the skin), baking or frying. Each preparation method affects potato composition in a different way, but all reduce fibre and protein content, due to leaching into cooking water and oil, destruction by heat treatment or chemical changes such as oxidation. The most common method of potato preparation worldwide is boiling and it causes a significant loss of vitamin C, especially in peeled potatoes (FAO, 2008). Frying for a short time in hot oil (140°C to 180°C) results in high absorption of fat and reduces mineral and ascorbic acid content significantly. According to FAO (2008) in formation baking causes slightly higher losses of vitamin C and lower losses of other vitamins and minerals than boiling. Preparation method is one of important factors that can significantly affect nutrient content.

**Reference:**


Health's Disease and Condition content is reviewed by our Medical Review Board.


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