Introduction
Potato is a cool-season vegetable that ranks with wheat and rice as one of the most important staple crops in the human diet around the world. The English word potato comes from Spanish patata (the name used in Spain). The Spanish Royal Academy says the Spanish word is a compound of the Taínobatata and the Quechua papa (potato). The name potato originally referred to a type of sweet potato although the two plants are not closely related; in many of the chronicles detailing agriculture and plants, no distinction is made between the two. Its Binomial name is Solanum tuberosum (BBS, 2018).

Potato is one of the major and popular food items around the world (Solanum tuberosum) because of its high nutrient content as well as for its easy cultivation procedures (Ross, 1986; Douches et al., 2004; Rytelet et al., 2011). Production of potatoes at larger scale is necessary to convene the nutritional demands of huge population in developing countries like Bangladesh (Douches et al., 2004; Hoque, 2000). More than 3000 species of potato have been found in a large plant family of Solanaceae. In volume of fresh product, the potato ranks first among the world's most important food crops. It is grown in almost all countries of the world (BBS, 2018). In many countries, including those of Europe, America, and Canada, potato is the staple food. Nearly 90% of the potato crop of the world is grown in Europe. In the last 2-3 decades, production of potato in Bangladesh has increased with the cultivation of high yielding varieties (BBS, 2018). Although the growing conditions are excellent, because of lack of desirable market, farmers do not like to grow more potatoes. Only a negligible portion of the total production is exported, while a substantial amount of seed potatoes is still

Abstract
In Bangladesh, nutritional study of potatoes remains unknown and if done, the data are not scientifically documented. Still now their nutritional information as well as health benefits are unexploited to people of the country. That’s why, the study has undertaken to analyze the nutritional compositions and documentation for Diamant variety (BARI Alu 7) collected from the different locations of Bangladesh as a first initiation. Among the different samples, the nutritional composition of Chuadanga and Dorshana samples were noticeably diverse with starch content, crude fiber, β-carotene, vitamin-C content, total phenolics and minerals content. Results obtained from this study showed, the range of starch content, crude fiber content, β-carotene content and total phenolics content varied from 25.03 to 31.03%, 16.11 to 21.04 mg/100 g, 20.19 to 23.27 μg/100 g, 8.51 to 11.43 mg/100 g and 42.85 to 44.91 mg/100 g respectively. In case of minerals K, Ca, Fe, P and Zn are riches and varied from 180 to 189.0 mg/100 g, 0.23 to 0.29 mg/100 g, 0.02 to 0.06 mg/100 g, 0.21 to 0.25 mg/100 g and 8.99 to 10.79 mg/100 g respectively. However, the variety diamant (BARI Alu 7) may be the potential source of minerals and nutrition that may play a vital role to reduce the chronic and acute health diseases as well as nutrient deficiency disease in human health.

Key words: Diamant potato, Phytochemical compounds, physiochemical characteristics, minerals content
imported.

Because of the nutritional benefit, vegetables are being increasingly consumed and included in our daily meals almost every day (Zeppet al., 1998; Southon, 2000; Wargovich, 2000; Hraboveskaet al., 2013). In case of potato, they are a good source of energy with an abundance of protein, fiber and minerals as potassium. They are rich in starch, which represents more than 50% of the carbohydrate components. Seasons, crop management and localities affect the starch content. For example, a water deficit during growth reduces the content (Degras, 1998). During storage, the starch content decreases due to its conversion into sugars. Sugars variations are important between varieties and even within the same cultivar depending on the stage of maturation. Sucrose is usually predominant and is mainly accompanied by fructose and glucose. However, the potato has a low glycemic index, about 50 (Joseph, 2006; FAOSTAT, 2007) making it a suitable food for diabetic or overweight people. Potatoes are extremely rich in vitamin A and in particular in carotenoids; one of the major constituents is β-carotene. Total carotenoids range from trace to above 9 mg/100g (Hagenimana et al., 1999). Anthocyanins, numerous in purple or dark purple varieties, are diluted in the large tubers from the periphery to the center (Lemos et al., 2012). Carotenoids are responsible for the orange to cream color. The color intensity is correlated with the content of β-carotene (Hagenimana et al., 1999). Potassium is the most plentiful mineral and such as anthocyanins (Laurie et al., 2012), its concentration decreases are close to the center.

As food item, potato is primarily used as a vegetable in Bangladesh, although in many countries of the world it constitutes the staple food and contributes more than 90% of the carbohydrate food source. In Bangladesh, although the principal use of potatoes is to make potato curry along with fish, meat, and eggs, there exists a great diversity in the consumption of potatoes. Notable among potato-based food items are the boiled potato, fried potato, mashed potato, baked potato, potato chop, potato vegetable mix, potato singara, potato chips, French fry etc. In recent years, bakeries and fast food shops have started preparing a wide variety of potato-based dishes (BBS, 2018).

However, the potato serves as cheap and alternate source of nutrients and are useful for inclusion in the human diet for their beneficial health effects and to improve overall nutritional status of functional food. Bangladesh Agricultural Research Institute (BARI) has developed 79 potatoes varieties but still now, physicochemical studies are meager. Therefore, an attempt has taken to study the physico-chemical and nutritional characteristics of Diamant variety (BARI Alu-7).

**Materials and Methods**

**Sample collection**

The potato samples, Diamant (BARI Alu-7), was collected from the different parts of Bangladesh namely Chuadanga, Alomdanga, Jibon Nagar, Damurhuda and Dorshona. After collection. it was carried out at Vegetable Technology Research Section, Bangladesh Council for Science and Industrial Research (BCSIR), Dhaka to analyse the nutrient composition. Then the samples were made three analytes (as replication) for analysis of every nutrient constituent.

**Protein (%):** Protein was determined according to the Kjeldhal Method.

**Vitamin-C (%):** Vitamin-C content was determined according to the Rangana (1991).

**Ash (%):** National Food Safety Standard (GB
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5009.4-2010), Peoples Republic of China.

Lipid (%): Lipids were extracted according to the method of described by the Ellong et al. (2014).

Total Sugar (%) and starch: Total sugar and starch was determined according to the Hatanaka and Kobara (1980).

β-Carotene (mg/μg): It was determined according to AOAC (2004) method.

Moisture content (%): National Food Safety Standard (GB 5009.3-2010), Peoples Republic of China.

Titrable acidity (%): It was determined according to the method of Rangana (1991).

pH (%): It was determined using digital pH meter (Delta 320, China).

Determination of total phenolic content
The total concentration of phenolics (TPH) in crude methanol extracts were determined according to the Folin-Ciocalteu methods (Ough and Amerine, 1988) with gallic acid as the standard and expressed (mg) as gallic acid equivalent (GAE)/g of extract.

Determination of total flavonoid
Total flavonoid content was determined according to the method of Zhishen et al. (1999) with slight modification of Hossain et al. (2013).

Determination of micronutrient
Ca and Mg were determined by KCl extractable method, K, Cu, Fe, Mn and Zn were determined by NaHCO₃ extraction followed by AAS reading. P was determined by Bray and Kurtz method while S was determined by turbidimetric method with BaCl₂.

Results and Discussion
The macro and micro nutrient composition of Diamant potato (BARI Alu-7) collected from five locations are presented in Table 1 and Table 2, respectively.

Moisture content (%): Moisture generally refers to the presence of water in a produce. A product with less amount of moisture is better as it translate into a longer shelf life. Table 1 shows, moisture content of the fresh potatoes ranged from 72.94 to 78.78 % in potatoes where it means that potatoes of the five locations had higher moisture content. The results are an agreement with the findings of Irish potato by Ogunjobiet al. (2005).

Protein content (%): Protein is an essential nutrient. It plays an important role in cellular maintenance, growth and functioning of the human body. The protein ranged of potatoes in the selected areas from 2.65 to 3.71%. The highest protein content was found in Alomdanga’s potato (3.71%) where the lowest was recorded in Damurhuda (2.65%). The variation of the protein content might be due to different soil characteristics. On the other hand, the increase in average mass and the accumulation of starch may contribute to lower protein content (Rodrigues et al., 2016).

Fat content (%): All foods contain certain amounts of fat. The fat component adds richness of flavor and contributes to a smooth texture. Here all samples show a low fat content (0.05 to 0.07%) (Table 1). These results are an agreement with the previous findings of Aina et al., (2009) who reported that sweet potato like other roots and tubers is known for its low-fat contents.

Ash content (mg/g): Ash content depends on type of food and determination method employed (Cecchi, 2003). Ash contents of all samples varied from 10.43 to 13.02%.

Starch content (%): The starch content ranged from 55.03 to 61.03% (dry basis) respectively. The lower starch content of potato sample was recorded in Damurhuda sample whereas the highest position of starch content was recorded in
Chuadanga sample. However, the starch content of our all collected samples were higher comparatively than the mean value reported by Rodrigues et al. (2016) for some cultivars of fresh sweet potatoes, of 23.9% (DW). This higher starch content of potato may be used as gruel and soup in the food industry or as a raw material in many areas including textile, pharmaceutical and paper industries where biopolymers are widely used (Muir and O’ Dea, 1992).

Crude fiber (mg/100 g): The crude fiber content of different potatoes samples was ranged from 16.11 to 21.04 mg/100 g or 0.016 to 0.021 g/100 g respectively (Table 1) whereas it is in different millets ranged from 3.6 to 9.8 g/100 g and 0.2 to 1.2 g/100 g for rich, wheat, bajra and sorghum (NIN, 2007). However, the results indicate that the lower amount of crude fiber presents in potato than the millet, rice, wheat, bajra and sorghum. It is also noteworthy that cereals contain higher amount of crude fiber than others where it may contribute to lower the body weight, reduce one’s risk for heart disease, diabetes and some cancers. It is also important for digestive health too (Saleh et al., 2013; Molla, 2016).

Total carbohydrate content (g/100 g): Carbohydrates are a source of energy. They are one of the basic food groups and are important to a healthy life. The study shows that total carbohydrate content of Chuadanga, Alpmdanga, Jhibonnagar, Damurhuda and Dorshana fresh samples were 84.41%, 85.13%, 85.89%, 86.0% and 83.11% respectively (Table 1). The fresh samples for potatoes demonstrated that the amount of carbohydrate content is almost similar to sweet potatoes (85.8 to 90.17%), reported by Rodrigues et al. (2016).

Titrable acidity (%): Acid value of a product is related to its shelf life. For the product, the value should not be more than two (according to Indian standard). Here the Table 1 show, the acidity of the fresh samples was ranged from 0.021 to 0.031%. In case of location wise samples, the higher acid value was recorded in Alomdanga samples compared to others.

pH: The pH of the different samples was ranged from 6.49 to 6.63 (Table 1). The lower content of pH was recorded for Chuaadanga, Alomdanga, Damurhuda and DorshonanJibon Nagar sample. It indicates that the lower pH of the Chuaadanga, Alomdanga, Damurhuda and Dorshonamight be due to inverse relation with the increased of acidity (Table 1).

β-carotene (µg/100g): β-carotene content of the different samples was statistically difference and ranged from 20.19 to 23.27 µg/100g (Table 1). Among the different samples, the Chuadanga sample had the highest β-carotene content than the other samples. The Alomdanga, Jibon Nagar, Damurhuda and Dorshona samples were little bit yellow colored and that’s why may be had lower β-carotene content than Chuaadanga sample. The results are partially supported by the findings of Ellong et al. (2014).

Vitamin-C (mg/100g): Vitamin C content of potato was statistically significant and ranged from 8.51 to 11.43 mg/100 g respectively (Table 1). The Chuaadanga and Dorshana sample had the highest vitamin-C content. A 100 g portion covered 48% of the recommended daily allowance (RDA) of the world Health Organization (2004).

Lipid (g/100 g): The lipid content of the different samples was ranged from 0.100 to 0.14% where thy were statistically insignificant (Table 1). The values obtained from all the samples were almost closely relation with each other.

Total polyphenols (mg/100g): All samples of potatoes had polyphenols contents 44.50, 43.53, 42.85, 43.61 and 44.91 mg/100 g respectively (Table 1). Dorshana and Chuaadanga samples had
the highest content of total polyphenols with 44.50 and 44.91 mg/100 g although there were statistical differences. These studies indicate that polyphenols have high free-radical scavenging activity, which helps to reduce the chronic diseases such as cardiovascular disease, cancer and age-related neuronal degeneration (22). These results on the potatoes are interesting from the scope of polyphenols in the field of health. Now it would be very interesting to determine the antioxidant activity of potato extract and quantify the specific polyphenols to conclude.

Total sugar and reducing (%): It is interesting that no total and reducing sugar content was found in all samples (Table 1). These results might be due to analysis of the fresh samples soon after collection instead of keeping in storage condition.

### Micronutrient characteristics

Table 1. Proximate analysis of macronutrient composition in selected areas

<table>
<thead>
<tr>
<th>Nutritional composition</th>
<th>Areas</th>
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<tbody>
<tr>
<td></td>
<td>Chuadanga</td>
</tr>
<tr>
<td>Moisture content (%)</td>
<td>72.94±3.04a</td>
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<tr>
<td>Protein (%)</td>
<td>3.60±0.56</td>
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<tr>
<td>Fat (%)</td>
<td>0.06±0.02</td>
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<tr>
<td>Ash (mg/g)</td>
<td>13.02±0.02d</td>
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<tr>
<td>Starch (%)</td>
<td>61.03±0.03e</td>
</tr>
<tr>
<td>Crude fiber (mg/100g)</td>
<td>21.04±0.02e</td>
</tr>
<tr>
<td>Total carbohydrate (g/100g)</td>
<td>84.41±0.02c</td>
</tr>
<tr>
<td>Titrable acidity (%)</td>
<td>0.021±0.00a</td>
</tr>
<tr>
<td>pH</td>
<td>6.5±0.05a</td>
</tr>
<tr>
<td>β-carotene (µg/100g)</td>
<td>23.27±0.03e</td>
</tr>
<tr>
<td>Vitamin-C (mg/100g)</td>
<td>11.33±0.03d</td>
</tr>
<tr>
<td>Lipid (g/100g)</td>
<td>0.13±0.03</td>
</tr>
<tr>
<td>Total polyphenols</td>
<td>44.50±0.03d</td>
</tr>
<tr>
<td>Total sugar (%)</td>
<td>0.00</td>
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<td>Reducing sugar (%)</td>
<td>0.00</td>
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Table 2. Proximate analysis of micronutrient composition in selected areas of Bangladesh

<table>
<thead>
<tr>
<th>Nutritional composition (mg/100g)</th>
<th>Areas</th>
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<tbody>
<tr>
<td></td>
<td>Chuadanga</td>
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<tr>
<td>K</td>
<td>187.0±2.00</td>
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<tr>
<td>Cu</td>
<td>0.25±0.02</td>
</tr>
<tr>
<td>Mn</td>
<td>0.19±0.02</td>
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<tr>
<td>Ca</td>
<td>0.28±0.02</td>
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<tr>
<td>Mg</td>
<td>0.133±0.003</td>
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All the micronutrient content of the potato samples was statistically insignificant except phosphorous (P) and zinc (Zn) (Table 2). The highest content of potassium (K), calcium (Ca), Magnesium (Mg), sulfur (S) and zinc (Zn) was recorded in Dorshona sample where the copper (Cu), manganese (Mn), iron (Fe) and phosphorous (P) was found higher in Chuadanga samples. The potassium (K), copper (Cu), manganese (Mn), calcium (Ca), magnesium (Mg), iron (Fe), phosphorous (P), sulfur (S) and zinc (Zn) content varied from 180 to 189 mg/100 g, 0.19 to 0.25 mg/100 g, 0.16 to 0.19 mg/100 g, 0.23 to 0.29 mg/100 g, 0.102 to 0.135 mg/100 g, 0.02 to 0.06 mg/100 g, 0.21 to 0.25 mg/100 g, 0.01 to 0.05 mg/100 g and 8.99 to 10.79 mg/100 g respectively (Table 2).
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<tbody>
<tr>
<td>Fe</td>
<td>0.06±0.02</td>
<td>0.03±0.02</td>
<td>0.02±0.01</td>
<td>0.04±0.02</td>
<td>0.05±0.02</td>
</tr>
<tr>
<td>P</td>
<td>0.25±0.00d</td>
<td>0.23±0.00b</td>
<td>0.22±0.00a</td>
<td>0.21±0.00a</td>
<td>0.24±0.00c</td>
</tr>
<tr>
<td>S</td>
<td>0.04±0.02</td>
<td>0.01±0.00</td>
<td>0.02±0.01</td>
<td>0.03±0.02</td>
<td>0.05±0.02</td>
</tr>
<tr>
<td>Zn</td>
<td>10.71±0.02c</td>
<td>9.07±0.03b</td>
<td>9.11±0.02b</td>
<td>8.99±0.01a</td>
<td>10.79±0.02d</td>
</tr>
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Eco-friendly Agril. J.
The daily micromineral requirements of an adult man are as follows: 10–15 mg iron/day, 12–15 mg zinc/day and 2–3 mg copper/day (Berdanier, 1998; Smolin and Grosvenor, 2000; Wildman and Medeiros, 2000). The potato, to some extent, can meet the daily requirement of these minerals.

Conclusion
This study is the first to investigate nutritional characteristic of Diamant potato (BARI Alu 7) in Bangladesh. Results show that the variety contains higher nutritional compounds especially high amount of starch, crude fiber, β-carotene and total polyphenols. The starch content may be utilized in food industry, textile, paper mills and pharmaceuticals industries as a raw materials. Fiber content may play an important role to minimize the increasing body weight. Polyphenols content of the variety may have higher free radical scavenging activity that may play a role to reduce the all kinds of CVDs diseases like certain cancer, stroke, acute liver injury and age-related degeneration. Our limitations were to investigate the nutritional studies and comparison of all 79 BARI released potatoes varieties. So, further study needs to compare the nutritional and phytochemical compounds of all BARI released potatoes varieties (total 79 varieties) as documenting the nutritional profile.

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