A STUDY ON THE BENEFITS OF LIVING THINGS DUE TO PHYSICAL CHANGE IN MYANMAR TEA LEAVES

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Abstract

In many parts of the world, tea leaves are used for the health of the human and the growth of plants. The purpose of this paper is to study the concentration of elements that will come from the physical change of tea leaves and its effect on living things. In this study, the tea leaf samples were collected from the Shan state. The content concentration value of tea leaves in three stages of physical change is measured by EDXRF spectroscopy. It can be seen that the major nutrients for humans and plants are potassium and calcium. According to the measured values and calculated results, using a 250 ml cup, humans can drink 3-5 cups of green tea or 2-3 cups of black tea. It helps to reduce type II diabetes, cancer, and heart disease, and to improve the immune system. Not that much, the plants will survive in two weeks due to the supply of waste sludge of tea leaves and will grow for four weeks.

Keywords: Green tea leaves, Black tea leaves, Energy-dispersive X-Ray Spectroscopy (EDXRF).

Introduction

Southeast Asia was the first region to cultivate the green tea plant (Camellia Sinensis) that it is currently cultivated worldwide. Camellia Sinensis is a plant species that is flowering in the area. It is also a species of evergreen shrub [Rolfe J, etal., 2003].

Namh San in northern Shan State, where the Palaung people reside in Myanmar, is the primary tea-producing region. Tea plays an important role as the traditional Myanmar culture of the Myanmar people. The leaves and buds of the tea plant are used to make tea. Tea is the beverage that is most popular in Myanmar and worldwide. It has a pleasant aroma and flavor and has the potential to have a positive effect on mood. Tea is available in white, yellow, green, oolong, dark, and black varieties. Each tea contains aroma, taste, color, and appearance [Karak T, etal., 2010].

Tea has different qualities. Its different qualities distinguish the categories of tea that are the different manners and degrees of oxidation of leaves, stopping the oxidation, forming the tea, and drying time of leaves are involved in producing tea.

The various kinds of tea depend mainly on the age of the leaves at the time of harvest. Also, the quality of the tea varies depending on the element content. Moreover, the elemental composition of the tea also depends on the geographical location and genetic differences, soil composition, the degree of contamination, and climatic conditions [Cambridge M.L., etal., 1900].

The caffeine content in tea has a stimulating effect on humans. Tea is the beverage that is consumed the most globally. In Myanmar, the term for tea is Yay-Nway-Gyan.The main theme of this research is to study the elements contained in the physically changing tea leaves sing EDXRF and to know how much tea the human body needs to drink per day. In addition, the effects of waste on plant survival were also studied.

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Experimental Procedure

Sample Preparation

In this research, the physical change of dried tea leaves was studied. Therefore, there are three kinds of samples such as dried tea leaves, tea leaves with boiling water (yay-nway-gyan) and waste sludge of tea leaves. The contained elements of these samples were measured by using EDXRF.

Figure 1 Energy Dispersive X-rays Fluorescence (EDXRF) spectrometer (EDX-7000)

Preparation for stage I (Two Samples I)

To improve the quality of tea, the tea must be picked within 10 a.m. The picked tea buds in a pan were steamed at a temperature (70 degrees Celsius) for about 2-3 minutes. Then, the tea buds were kneaded by hand until they were rolled. After that, the half of the tea buds are dried in the shade for one hour. The tea buds in the shade will become dried green tea leaves. Some residual tea bud leaves spread on the table for a few hours. When the leaves are coppery in color, the leaves are added to a pan and are roasted at temperature (between 80 degrees Celsius and 100 degrees Celsius) for about 2 to 3 minutes. After roasting, it will become black tea leaves. Each sample I was grinded to make the pellet. And then, the contained elements in the two different kinds of samples I were measured by EDXRF spectrometer.

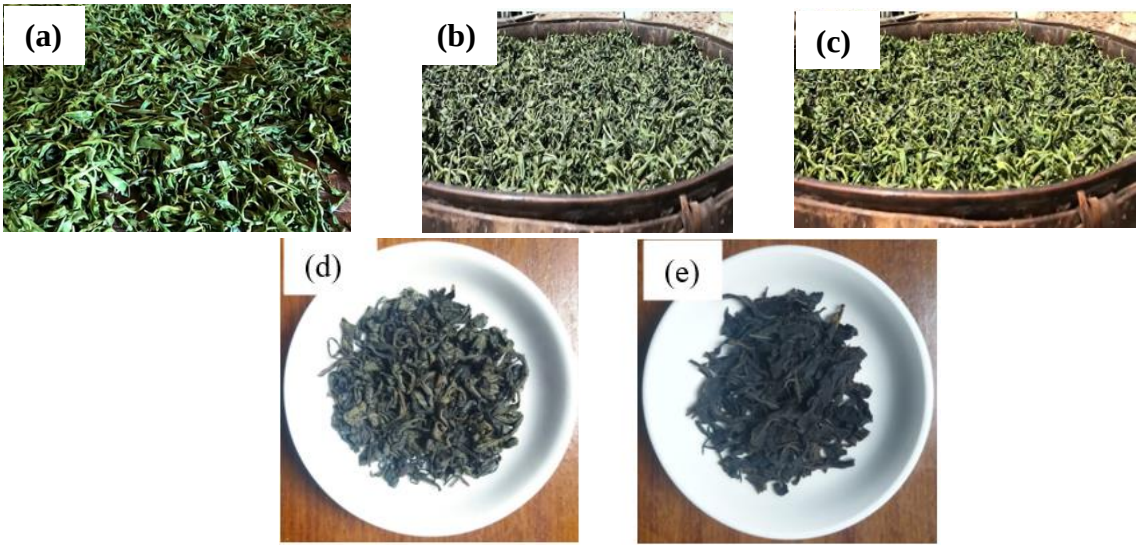

Figure 2 (a) Tea buds and leaves picked from the tea plant (b) Tea buds in the shade (c) After roasting the tea buds at a temperature (between 80°C and 100°C) (d) Green tea leaves (e) Black tea leaves

Preparation for stage II (Two Samples II)

One cup is added to a few teaspoons of dried green tea leaves and another cup is added to a few teaspoons of dried black tea leaves Subsequently, the two cups were filled with boiling water and covered with a lid for 10 minutes. The resulting raw material is Yay-Nway-Gyan. These samples were poured into two cups of the sample chamber in the EDXRF spectrometer. Then the two cells were shielded with mylar film. After that, the content of elements in the two samples II was measured with the EDXRF spectrometer.

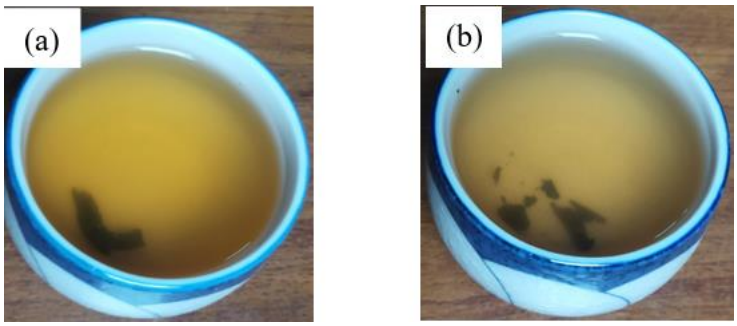

Figure 3 (a) Green tea Yay-Nway-Gyan (b) Black tea Yay-Nway-Gyan

Preparation for stage III (Two Samples III)

The waste sludge of tea leaves (waste of tea leaves) from yay-nway-gyan was collected. It was dried. After that, each sample III was grinded to make the pellet. Then, the content of elements in its tea leaves were measured with the EDXRF spectrometer.

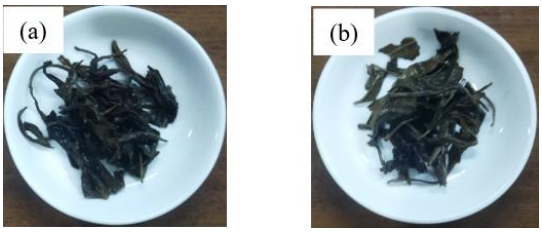

Figure 4 Waste sludge of (a) green tea leaves, and (b) black tea leaves

Results and Discussion

Results

The elemental concentration of the two kinds of tea leaves in physical change is shown in Table 1, and Table 2 shows the calculated values of the elements in a (250 ml) cup of yay-nway-gyan depending on the measured values.

Table 1 Measurement data of the elemental concentration (w%) for the two kinds of tea leaves in the physical change

Samples	Concentration (w%)								
	Potassium (K)	**Calcium (Ca)**	**Phosphorus (P)**	**Sulfur (S)**	**Manganese (Mn)**	**Iron (Fe)**	**Copper (Cu)**	**Zinc (Zn)**	**Silicon (Si)**
Sample I (green tea leaves)	0.740	0.131	0.108	0.079	0.018	0.006	0.002	0.001	n.d
Sample I (black tea leaves)	0.289	0.049	0.049	0.043	0.019	0.005	0.002	0.002	0.160
Sample II (green tea)	0.025	0.011	n.d	n.d	0.001	0.002	0.001	n.d	n.d
Sample II (black tea)	0.011	0.006	n.d	0.013	n.d	0.002	0.002	n.d	0.160
Sample III (waste sludge of green tea leaves)	0.020	0.006	n.d	n.d	0.001	0.001	0.002	n.d	n.d
Sample III (waste sludge of black tea leaves)	0.008	0.003	n.d	n.d	0.001	0.001	0.002	n.d	0.160

n.d = not detected

Table 2 The calculated values of the elements included in the tea (yay-nway-gyan)

Elements	Green tea (per cup) (mg)	Black tea (per cup) (mg)	Green tea (2 cups) (mg)	Black tea (2 cups) (mg)	Green tea (3 cups) (mg)	Black tea (3 cups) (mg)	Green tea (4 cups) (mg)	Black tea (4 cups) (mg)	Green tea (5 cups) (mg)	Black tea (5 cups) (mg)
K	0.0100	0.0213	0.0200	0.0426	0.0300	0.0639	0.0400	0.0852	0.0500	0.1065
Ca	0.0044	0.0116	0.0088	0.0232	0.0132	0.0348	0.0176	0.0464	0.022	0.058
S	-	0.0254	-	0.0508	-	0.0762	-	0.1016	-	0.127
Mn	0.0004	-	0.0008	-	0.0012	-	0.0016	-	0.0020	-
Fe	0.0008	0.0039	0.0016	0.0078	0.0024	0.0117	0.0032	0.0156	0.0040	0.0195
Cu	0.0004	0.0039	0.0008	0.0078	0.0012	0.0117	0.0016	0.0156	0.0020	0.0195
Si	-	0.3120	-	0.6240	-	0.9360	-	1.2480	-	1.5600

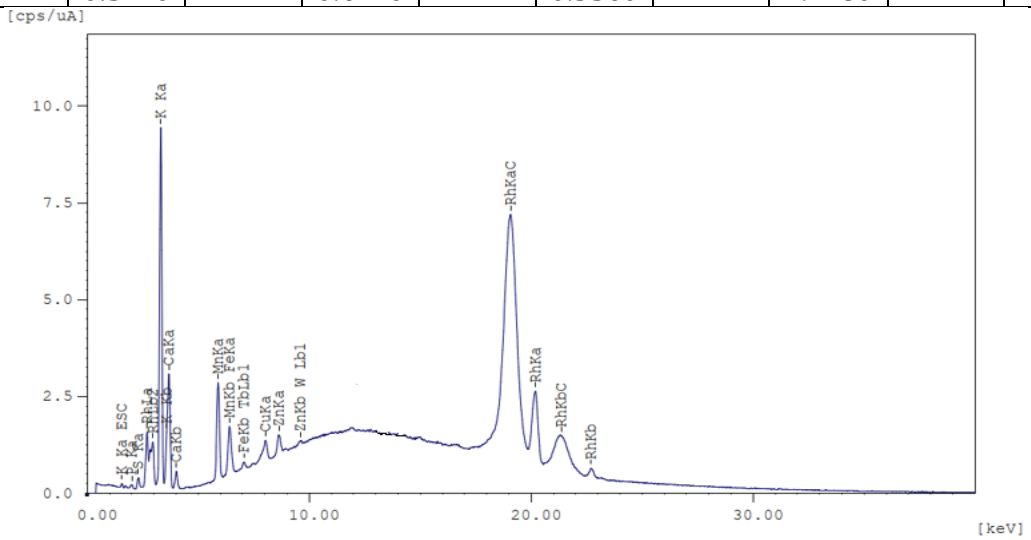

Figure 5 Measurement spectrum for sample I (Green tea leaves)

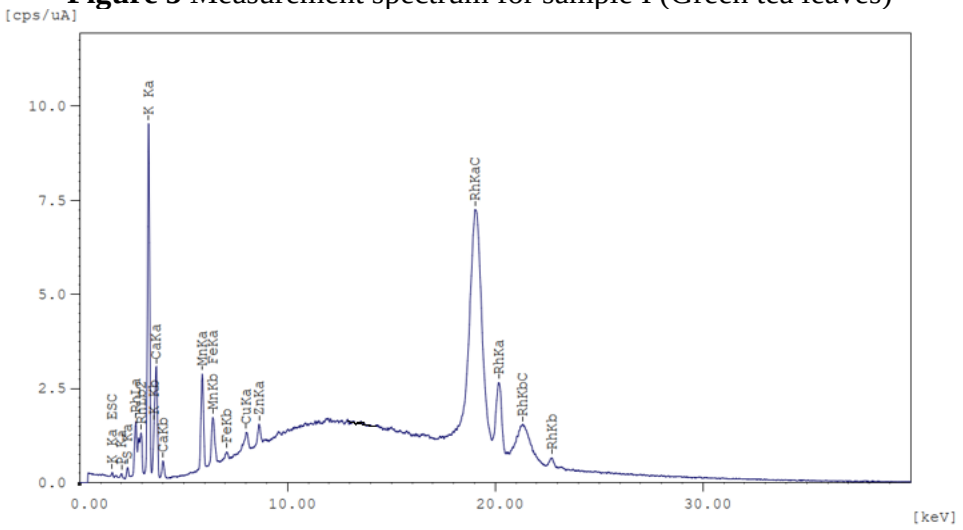

Figure 6 Measurement spectrum for sample I (Black tea leaves)

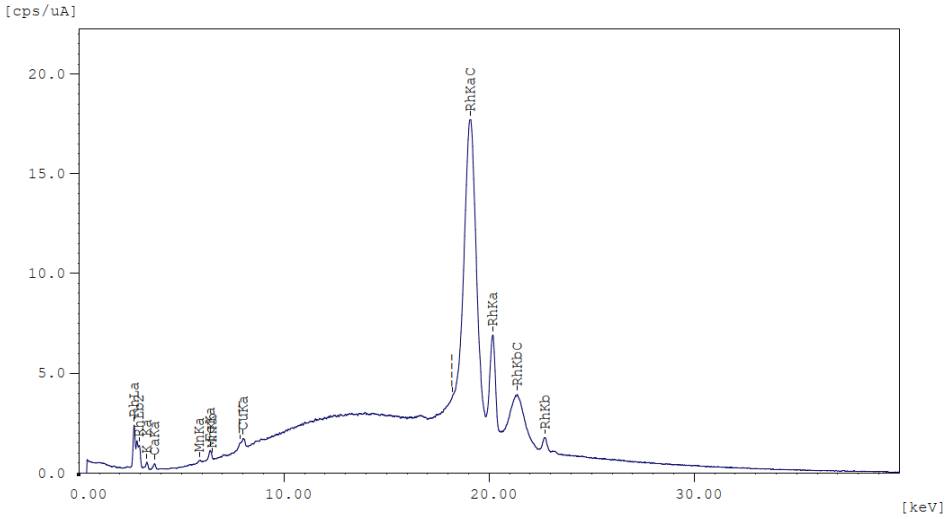

Figure 7 Measurement spectrum for sample II (Green tea yay-nway-gyan)

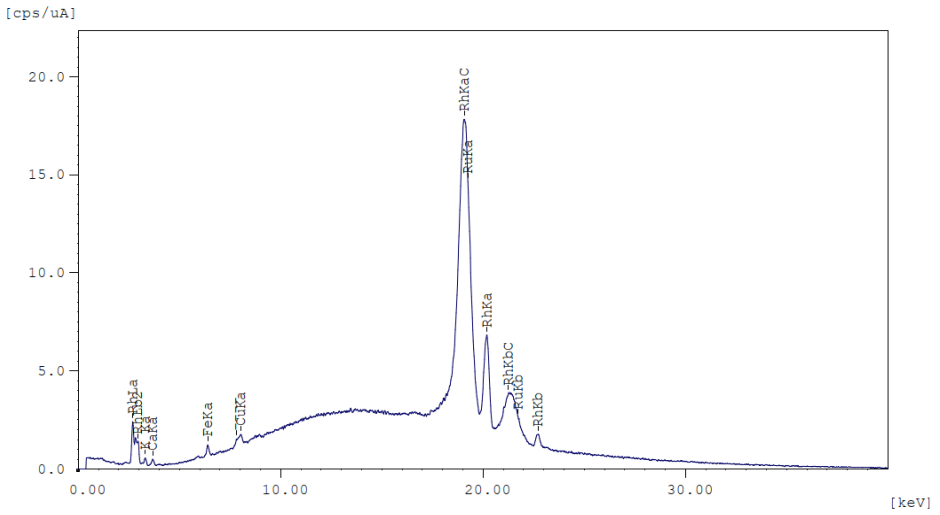

Figure 8 Measurement spectrum for sample II (Black tea yay-nway-gyan)

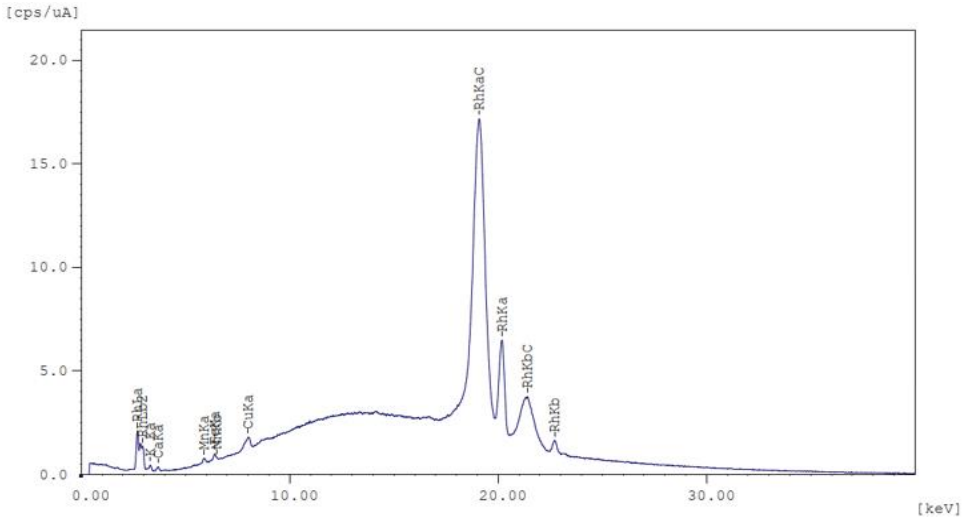

Figure 9 Measurement spectrum for sample III (Waste sludge of green tea leaves)

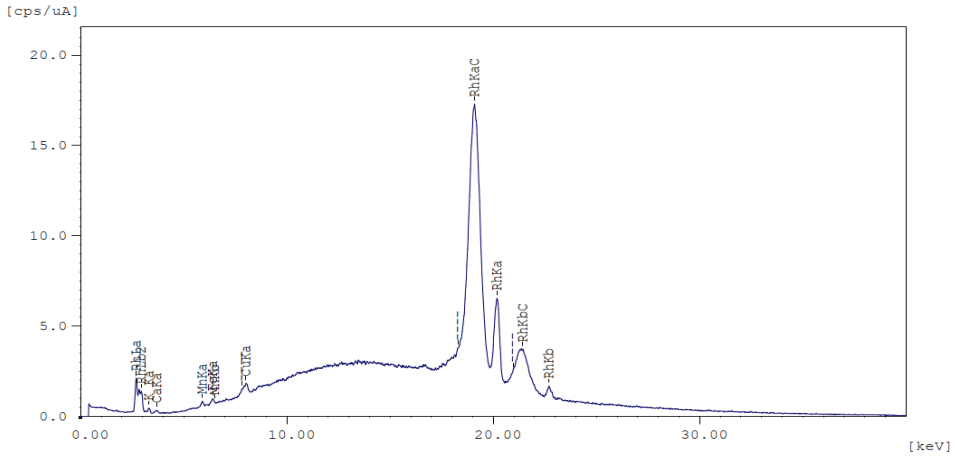

Figure 10 Measurement spectrum for sample III (Waste sludge of black tea leaves)

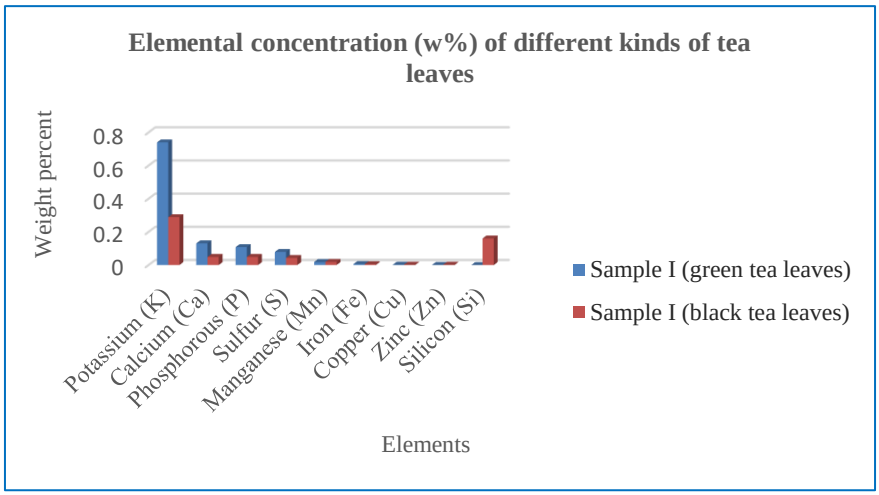

Figure 11 Elemental concentration (w%) of the two kinds of tea leaves

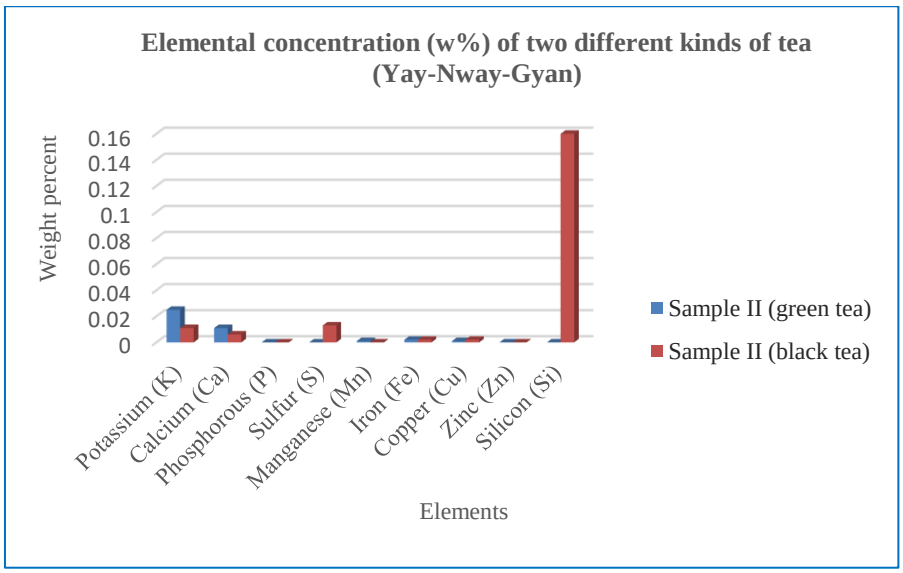

Figure 12 Elemental concentration (w%) of the two kinds of tea (Yay-Nway-Gyan)

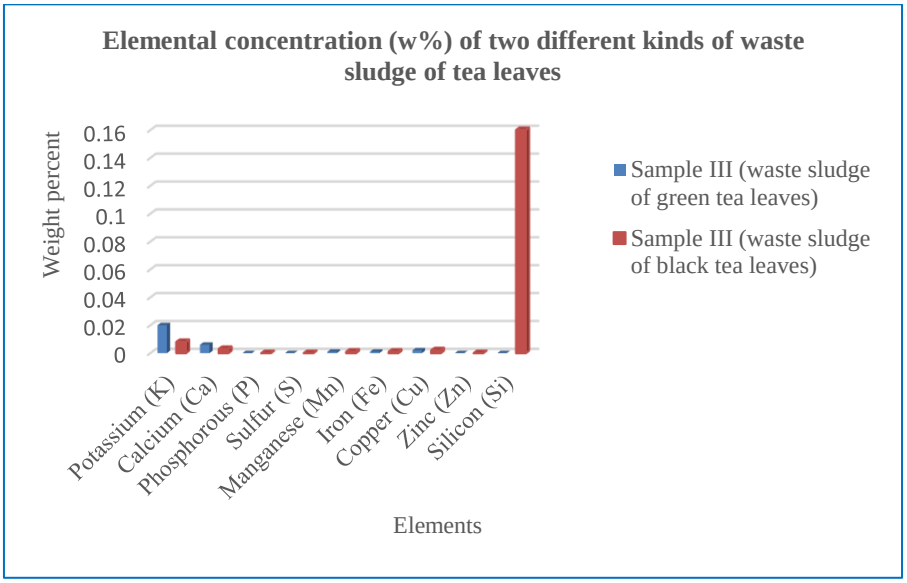

Figure 13 Elemental concentration (w%) of the two kinds of waste sludge of tea leaves

For the EDXRF spectrum of sample I (green tea leaves), the qualitative results that K, Ca, P, S, Mn, Fe, Cu, and Zn were contained as shown in Figure 5. Figure 6 shows that the spectrum of black tea leaves contain K, Ca, P, S, Mn, Fe, Cu, Zn, and Si.

From Figures 7 and 8, it can be seen that green yay-nway-gyan contains K, Ca, Mn, Fe, and Cu, while black yay-nway-gyan contains K, Ca, S, Fe, Cu, and Si.

Figure 9 shows that K, Ca, Mn, Fe, and Cu were observed in the qualitative results provided by the EDXRF spectrum for the waste sludge of green tea leaves. The qualitative results such as K, Ca, Mn, Fe, Cu, and Si can be found in the waste sludge of black tea leaves EDXRF spectrum in Figure 10.

Figure 11 – Figure 13 show the respective graph of the elemental concentration of the two kinds of tea leaves in the physical change.

Discussion

Potassium (K), and calcium (Ca) of the essential macro-minerals elements and phosphorus (P), sulfur (S), manganese (Mn), iron (Fe), copper (Cu), Zinc (Zn), and silicon (Si) of the trace elements were found in these physical changes. Potassium can be seen as the most abundant element in all three stages of physical change, and the second most abundant element is calcium.

About 80 percent of the total potassium in the body was present in muscle cells, and the remaining 20 percent in bone, the liver, and red blood cells was contained. Potassium is easily soluble in water and reacts quickly and then it can help in many metabolic processes and also helps regulate the nervous system and heart rate in humans. In addition, it reduces the occurrence of diseases such as type II diabetes, cancer, and heart disease. The potassium element for the plant is indispensable to plant growth and plays a role in photosynthesis, water regulation,

enzyme activation, and stomata function. Potassium deficiency can stunt plant growth, reduce yield and quality. Calcium element is also stored in bone and capillaries. Calcium can help the communication of nerve systems between cells, and hormone release and can also protect blood clots, and muscle contraction. And also, Calcium is a vital nutrient for plant growth and development that has an impact on cell wall formation, membrane function, enzyme activity, hormone signaling, and the resistance of the disease.

Phosphorus is a crucial element for all living things. The creation of DNA (**deoxyribonucleic acid**), cell membranes, and bone and teeth in humans requires it. Similarly, food production cannot proceed without phosphorus as it is one of the three nutrients (nitrogen, potassium, and phosphorus) used in fertilizer for plants. The average person takes in around 900 mg of sulfur per day is used, that it can get protein. But, if a lot of sulfur is used, it can cause serious vascular damage in the veins of the brain, the heart, and the kidneys, and also can cause fetal damage and congenital effects. Similarly, plants require sulfur as an essential nutrient to form important enzymes and plant proteins. But it is needed in very low amount for the plant.

Manganese also provides the metabolism of cholesterol and carbohydrates for humans. It is also an essential element for the plants. It can used in the Photosynthesis process, enzyme activity, cell division, and elongation. Iron is a vital component of almost all living things, from micro-organisms to humans. All three stages of the samples contain iron. It contributes to the human hemoglobin, which is the red coloring agent of the blood that transports oxygen through the human body. Plants also need iron in small amounts as it is a micronutrient. It is involved in the manufacturing process of chlorophyll and is required for certain enzyme functions.

Copper content supports nutrients for humans and plants. But copper is dangerous if it exceeds the limit value. Zinc helps the human body's immune system. Zinc supports a plant micronutrient. Also, it supports the components of proteins and acts as a functional, structural, or regulatory cofactor of a large number of enzymes. Silicon is found mainly in connective tissues and skin. It is required for bone and connective tissue health for humans. Silicon is essential for plant growth. It supports improving plants' mineral uptake.

In this study, it will be found that the two main mineral elements for humans, such as potassium, and calcium, are needed to protect against disease, and these elements for plants can support plant survival and plant nutrition. And, the trace elements for humans can also support metabolism and for plant growth can also support plant survival and plant nutrition.

According to Table 2, green tea yay-nway-gyan does not contain elements Si and S that are harmful to humans. Mn is contained in this tea, but its content is only the amount needed for metabolism. Black tea contains elements Si and S that are harmful to humans. But, the amount of these two elements was found to be low. However, excessive exposure to certain trace elements can pose a danger to both the human body and the plant.

Conclusion

It concluded that green tea leaves are often considered better for health than black tea leaves. Especially, black tea leaves, if it is aged or stored for a long time, may undergo further

chemical changes that can affect the potassium content. Based on the measurement results of the elements in the yay-nway-gyan, the calculated values are 3-5 cups of green tea per day and 2-3 cups of black tea per day. By taking yay-nway-gyan, it makes cells that do not respond to insulin work properly again and by doing so, the blood sugar level decreases. Not that much, the waste sludge of tea leaves is fed to a testing plant with less nutrients, its plant will become plant survival during two weeks and then it will grow for four weeks.

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