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Farklı Bölgelerde Yetiştirilen Bazı Patlıcan Türlerinde Amino Asit Miktarlarının Araştırılması

Zulaiha Gidado[1] MUKHTAR[1], Dursun ÖZER[2], Fikret KARATAŞ[1], Sinan SAYDAM[1*]

ÖZET: Bu çalışmada, Türkiye'de (koyu ve açık renkli patlıcan) ve Nijerya'da (White garden egg, bitter apple ve bitter tomato) yetişen patlıcan örneklerinin amino asit içerikleri HPLC ile tayin edildi. Patlıcan örneklerindeki amino asit miktarı 0.02 - 8.41 mg g^{-1} dw arasında bulunmuştur. En düşük amino asit miktarı bitter tomato'da lösin, iken en yüksek miktar ise white garden egg örneğinde lizin olarak belirlenmiştir. White garden egg, bitter apple, dark eggplant, light eggplant ve bitter tomato örneklerindeki toplam amino asit miktarları sırasıyla 54.41±3.90, 44.04±3.46, 43.22±3.23, 33.37±2.58 ve 59.91±4.44 mg g^{-1} dw bulunurken, toplam esansiyel aminoasit miktarı ise sırasıyla 26.36±1.91, 23.30±1.82, 25.00±1.78, 19.31±1.44 ve 27.21±2.03 mg g^{-1} dw olarak bulunmuştur. En düşük toplam esansiyel aminoasit miktarı Türkiye'de yetiştirilen beyaz patlıcan örneğinde 19.31±1.44 mg g^{-1} dw bulunurken, en yüksek Nijerya'da yetiştirilen bitter tomato çeşidinde ise 27.21±2.03 mg g^{-1} dw olarak tespit edilmiştir. Türkiye ve Nijerya'da yetiştirilen patlıcan çeşitlerinin amino asit içeriklerinde gözlenen farklılıklar, genetik yapıları, coğrafi kökenleri ve iklim farkından kaynaklandığı söylenebilir.

Anahtar Kelimeler: Patlıcan esansiyel aminoasit, toplam amino asit, white garden egg, bitter apple, bitter tomato

Amino Acid Contents of Some Eggplant Species Grown in Different Region

ABSTRACT: In this study, amino acid contents of eggplant samples grown in Turkey (dark and light coloured eggplant) and Nigeria (white garden egg, bitter apple and bitter tomato) were determined by HPLC. Amino acid amounts in eggplant samples ranged from 0.02 to 8.41 mg g^{-1} dw. The lowest amount was determined as leucine in dark tomato, while the highest amount was determined as lysine in white garden egg sample. The total amino acid amounts in the white garden egg, bitter apple, dark eggplant, light eggplant and bitter tomato samples were found to be 54.41±3.90, 44.04±3.46, 43.22±3.23, 33.37±2.58 and 59.91±4.44 mg g^{-1} dw. In addition, essential total amino acid contents were found to be 26.36±1.91, 23.30±1.82, 25.00±1.78, 19.31±1.44 and 27.21±2.03 mg g^{-1} dw, respectively. Lowest total essential amino acid content was found in light eggplant (19.31±1.44 mg g^{-1} dw) grown in Turkey, while the highest in bitter tomato sample (27.21±2.03 mg g^{-1} dw) grown in Nigeria. The differences observed in amino acid contents of eggplant varieties grown both in Turkey and Nigeria can be attributed to the differences in their genetic makeup and geographical origins and climate conditions.

Keywords: Eggplant, essential amino acid, total amino acid, white garden egg, bitter apple, bitter tomato

[1] Zulaiha Gidado MUKHTAR (**Orcid ID:** 0000-0002-0726-7299), Fikret KARATAŞ (**Orcid ID:** 0000-0002-0884-027X), Sinan SAYDAM[*] (**Orcid ID:** 0000-0003-1531-5454), Fırat University, Faculty of Science, Department of Chemistry, 23200 Elazig, Turkey

[2] Dursun ÖZER (**Orcid ID:** 0000-0002-7225-8903), Fırat University, Faculty of Engineering, Department of Chemical Engineering, 23200 Elazig, Turkey

*** Sorumlu Yazar/*Corresponding Author***: Sinan SAYDAM, e-mail: ssaydam@firat.edu.tr

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INTRODUCTION

Plants are vital resources with important nutritional, economic and ecological functions. They synthesize both primary and secondary metabolites, especially in their leaves and fruits. Amino acids, which are primary metabolites are essential for metabolic processes and serve to maintain the existence of all life forms (Gürbüz et al., 2018). Amino acids are the building blocks of proteins, and main part of food sources of living things. Amino acids are involved in neurotransmitter and biosynthesis processes in biological systems. For adequate production of protein in the body, it is necessary to take essential amino acids by diet (Davidson, 2019). The level and ratio of amino acids is very important for our body to function properly. In addition to their role in muscle development and repair, amino acids are also used for other purposes in metabolism. All essential amino acids take an important task such as tissue building, energy production, immune function, and absorption of nutrients. Therefore, essential amino acid deficiencies can affect the entire body, including the nervous, reproductive, immune and digestive systems. Since changes in amino acid levels play an important role in the formation of many diseases, replacing their deficiencies is beneficial in the treatment of diseases. Protein synthesis is impaired in body structures where amino acids are low and insufficient (Wu, 2013; Su et al., 2015).

Eggplant is a highly adaptable, low-maintenance plant that can grow in tropical and temperate climates; It is one of the most phenotypically diverse fruits in the world, with a variety of colours, shapes and sizes (Okmen et al., 2009). Eggplant has a smooth skin in different shades of dark purple, green or black and has the largest fruit size compared to other species, especially wild ones. Solanum melongena L. (fam: Solanaceae), fruit is eaten fresh, raw or cooked and has a spongy texture and can be dried for eating when out of season. Its fruits and leaves are used to flavor and enrich soups and stews. Its fruit and seeds are used for curdling milk and making cheese (Meyer et al., 2012). Eggplant (Solanum melongena L.), also known as melanzana, garden egg, brinjal or patlican in different parts of the world, is an important market vegetable in Asian and Mediterranean countries. While eggplant is widely sold and consumed in global markets, it is still a relatively wild and underutilized fruit in parts of Africa and Asia (Dranca and Oroian, 2016; Cericola et al., 2014). Various cultures use eggplant for traditional treatment of a wide variety of ailments, from diabetes to chest infections and allergies. It has been reported to be rich in fiber, some vitamins, minerals and secondary metabolites (Okmen et al., 2009; Gürbüz et al., 2018). There is limited and fragmented literature on the nutritional composition of a large percentage of eggplant varieties, particularly wild species (Fanzo et al., 2013). It is used for almost all kind of skin treatment including burns, fungal infections, snakebites and sores. Decoctions made from the fruit are used to treat hypertension, diabetes and disorders associated with the liver (Magioli and Mansur, 2005). The ameliorating effect of its extract is linked to the presence of strychnine and anthocyanin and has been demonstrated to effectively lower cholesterol levels in rats and human. Components of its anthocyanin have also shown antioxidant and anti-mutagenic properties (Meyer et al., 2012). The possible role of eggplants in regulation of glucose and lipid metabolism have been investigated, which will have a positive impact on their related metabolic disorders such as diabetes, cardiovascular disease, obesity, hepatic steatosis and inflammation (Plazas et al., 2013a).

The aim of this study is to assess and compare the amino acid profile of fresh fruits of five different varieties of eggplants (light and dark eggplant from Elazig, Turkey, and white garden egg, bitter tomato and bitter apple sampled from Kano, Nigeria).

MATERIALS AND METHODS

Materials

In this study, fresh eggplant fruits were purchased from local markets in Elazig, Turkey (light and dark eggplant) and white garden egg, bitter tomato and bitter apple sampled from Kano, Nigeria in October 2019. Five types of varieties of eggplant (Figure 1) were used, namely, Dark Eggplant fruits, Light Eggplant fruits, Bitter Tomato, Bitter Apple and White Garden egg throughout the experiment. Each sample was washed thoroughly, and stored in the refrigerator at 4 °C until required for further use.

White Garden Egg [Anonim 2022].(1)

Bitter Tomato[Anonim 2022].(2)

Bitter Apple [Anonim 2022].(3)

Dark Eggplant [Anonim 2022].(4)

Light Eggplant [Anonim 2022].(5)

Figure 1 Shows the eggplant varieties sampled for this study and their common names

Determination of amino acids

Hydrolysis of sample: 2.0 gram of homogenised fresh samples were taken into a glass tube then 5.0 mL 6.0 N HCl was added and vortexed thoroughly followed by heating at 110 °C for 24 hours (Kwanyuen and Burton, 2010). Then the samples cooled to room temperature, filtered and the filtrate volume was completed to 10 mL with deionized water.

Derivatization: Standard amino acid solutions were prepared in 0.10 N HCl at different concentrations (1.0 - 5.0 µg mL^{-1}) and 50 µL standard amino acid solutions or hydrolysed samples transferred into a 5.0 mL glass tubes and dried under vacuum at 65 °C. Then 50 µL of reagent 1 [(2: 2: 1 mixture of ethanol: water: Triethylamine (TEA) (v/v)] were added, vortexed and dried under vacuum at 65 °C again. Then 50 µL of reagent 2 [7:1:1:1 mixture of ethanol: water: TEA: phenyl isothiocyanate (PITC) (v/v)] introduced to dried sample and vortexed then left at room temperature for 30 minutes for the complex formation in a dark place. At the end of this period, the samples were dried again under vacuum at 35 °C (Kwanyuen and Burton, 2010) and 1.0 mL eluent A and acetonitrile (ACN) mixture (8: 2 v/v) was added, vortexed then the samples were analysed by HPLC.

Amino acid analysis: Analysis of amino acid were performed with the modified method of Elkin & Wasynczuk (1987 with Çakmak et al. (2021). by HPLC using Nucleodur 100-5 C18 column (250x4.6

mm, 5µm). Chromatography was carried out at a constant temperature (40 °C) with the mobile phase consisting of eluent A and eluent B mixture with a flow rate of 0.8 mL/minute and absorption was measured at 254 nm. Eluent A is 0.07 M CH_3COONa (pH was adjusted to 6.4 with CH_3COOH) and eluent B is a mixture of ACN and water (60:40 v/v). Gradient program for amino acid analysis was as follows; 0-12 minutes' eluents 90 %A and 10 %B; 12-16 minutes, 70 %A and 30 %B, 16-16.01 minutes, 65 %A, 35 %B, 16.01-25 minutes 50 %A, 50 %B, 25-26 minutes % 100B, followed by 26-35 minutes 90 %A and 10 %B.

Statistical Analysis

All measurements were triplicated and Mean ± Standard deviation was determined. The results were subjected to Variance Analysis by SPSS 10.0 for Windows. Differences between the group's means were analyzed for significance using Tukey-test. The level of statistical significance was expressed as $p<0.05$. Insignificant change was indicated as $p>0.05$.

When the white garden egg samples are compared with other eggplant types (Table 1), the significant difference is shown with the symbol **a**, and the insignificant difference is shown with the symbol **b**. When compared to other types of bitter apple, the significant difference is indicated by the **c** symbol and the insignificant difference is indicated by the **d** symbol. When comparing dark eggplant with other species, the significant difference is indicated by the symbol **e**, and the insignificant difference is indicated by the symbol **f**. Compared to the light eggplant and bitter tomato example, the significant difference is indicated by the symbol **g**, and the insignificant difference by the symbol **h**.

RESULTS AND DISCUSSION

Amino acids are important molecules for all living cells. They are the building blocks of protein and intermediates in metabolic pathways. They also play a pivotal role in metabolism, regulating gene expression, immunity, signal transduction, anti-oxidative responses, growth and cell survival (Wu, 2010). Amino acid amounts in five different eggplant fruits were measured and the results are given in Table 1 and Figure 2-6.

Aspartic acid is an important amino acid in the tricarboxylic acid cycle, triggers metabolic events and the production of signal amino acids by activating defence systems (Sanchez et al., 1998). All the eggplant samples used in this study had measurable amounts of aspartic acid ranging from 0.97 – 4.22 mg g^{-1} (dw), depicting a 4.35-fold range difference. Aspartic acid content in eggplant species given from highest to lowest in bitter tomato > dark eggplant > bitter apple > white garden > light eggplant (Table 1 and Figure 2-6). The bitter tomato had the highest concentration of aspartic acid, while the light eggplant variety sampled had the lowest. Flick et al (1978) reported the aspartic acid values in three different eggplant varieties in the range of 3.27-1.97 mg g^{-1} dw.

Glutamic acid is effective in the carbon and nitrogen cycle of metabolism and is important for proline biosynthesis (Forde and Lea, 2007). In this study, it was determined that the amount of glutamic acid in the samples were between 7.71 – 2.78 mg g^{-1} dw. It was found that White garden egg was the richest in terms of glutamic acid, while the light eggplant was the lowest. According to Ayaz et al. (2015) the amount of glutamic acid in different fresh eggplant fruit varieties were reported to be in between 148.4–298.75 mg/100g FW).

Asparagine promotes nitrogen accumulation and plays an important role in regulating the sugar balance in the cell (Haroun et al., 2010). The asparagine amounts in the samples were found to be in range of 2.99 – 5.36 mg g-1 dw. It was determined that the light eggplant had the lowest concentration, while the bitter tomato had the highest. A study on different varieties of tomato reported asparagine values to range from 21.55 – 42.03 mg/100g DW (Choi et al., 2014).

Table 1. Amounts of amino acids in the five different varieties of eggplant fruits (mg/g dw).

Species / Amino acid	White Garden Egg	Bitter Apple	Dark Eggplant	Light Eggplant	Bitter Tomato
Aspartic acid	1.75±0.15	2.28±0.20 [a]	3.02±0.25 [a c]	0.97±0.071 [a c e]	4.22±0.36 [a c e g]
Glutamic acid	7.71±0.52	3.54±0.29 [a]	3.21±0.27 [a d]	2.78±0.24 [a c e]	7.39±0.51 [b c e g]
Asparagine	4.22±0.36	3.31±0.27 [a]	3.27±0.25 [a d]	2.99±0.24 [a d f]	5.36±0.41 [a c e g]
Serine	1.67±0.15	1.32±0.12 [a]	1.75±0.15 [b c]	1.60±0.14 [b c f]	2.18±0.19 [a c e g]
Glycine	1.82±0.16	3.93±0.25 [a]	1.53±0.12 [a c]	1.39±0.11 [a c f]	4.58±0.36 [a c e g]
Glutamine	1.32±0.10	0.93±0.08 [a]	0.78±0.06 [a c]	0.72±0.06 [a c f]	1.22±0.09 [b c e g]
Histidine	6.91±0.46	6.90±0.47 [b]	6.84±0.48 [b d]	4.70±0.34 [a c e]	8.40±0.70 [a c e g]
Arginine	0.24±0.01	0.10±0.007 [a]	0.10±0.007 [a d]	0.09±0.006 [a d f]	0.09±0.006 [a d f h]
Threonine	2.38±0.20	1.21±0.18 [a]	3.01±0.26 [a c]	2.75±0.23 [b c f]	2.94±0.24 [a c f h]
Alanine	2.49±0.20	2.28±0.19 [b]	1.50±0.11 [a c]	1.35±0.10 [a c f]	2.98±0.10 [a c e g]
Proline	0.44±0.03	0.16±0.01 [a]	0.26±0.02 [a c]	0.23±0.02 [a c f]	0.17±0.01 [a d e g]
Leucine	0.26±0.02	0.09±0.006 [a]	0.18±0.01 [a c]	0.12±0.008 [a c e]	0.02±0.001 [a c e g]
Methionine	2.63±0.22	3.10±0.26 [b]	3.71±0.24 [a c]	1.89±0.16 [a c e]	5.04±0.30 [a c e g]
Tyrosine	1.77±0.16	1.47±0.11 [a]	1.02±0.07 [a c]	0.93±0.07 [a c f]	2.42±0.20 [a c e g]
Valine	3.25±0.25	1.41±0.10 [a]	0.92±0.07 [a c]	0.61±0.05 [a c e]	0.39±0.03 [a c e g]
Cysteine	1.86±0.16	1.52±0.12 [a]	1.88±0.16 [b c]	1.10±0.08 [a c e]	2.18±0.18 [b c f g]
Phenylalanine	0.47±0.03	2.33±0.19 [a]	2.44±0.19 [a d]	2.83±0.22 [a c f]	2.41±0.19 [a d f g]
Tryptophan	1.81±0.15	1.36±0.10 [a]	1.00±0.07 [a c]	1.62±0.13 [a c e]	1.69±0.14 [a c e h]
Lysine	8.41±0.57	6.80±0.51 [a]	6.80±0.45 [a d]	4.70±0.30 [a c e]	6.12±0.42 [a d f g]
Total AA:	54.41±3.90	44.04±3.46 [a]	43.22±3.23 [a d]	33.37±2.58 [a c e]	59.91±4.44 [b c e g]
Essential AA:	26.36±1.91	23.30±1.82 [b]	25.00±1.78 [b d]	19.31±1.44 [a c e]	27.21±2.03 [b c f g]

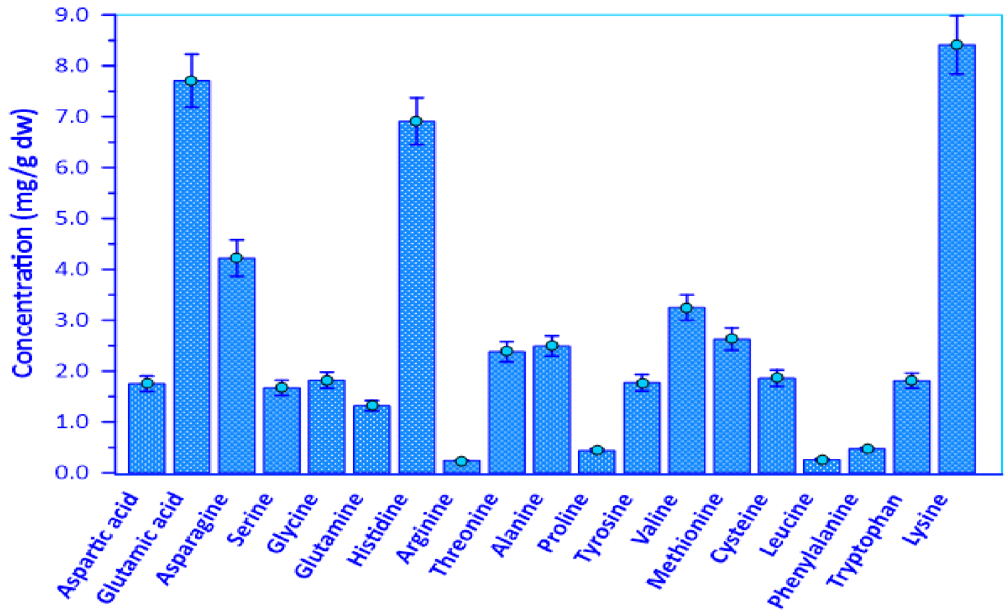

Figure 2. Amino acid content of white garden egg

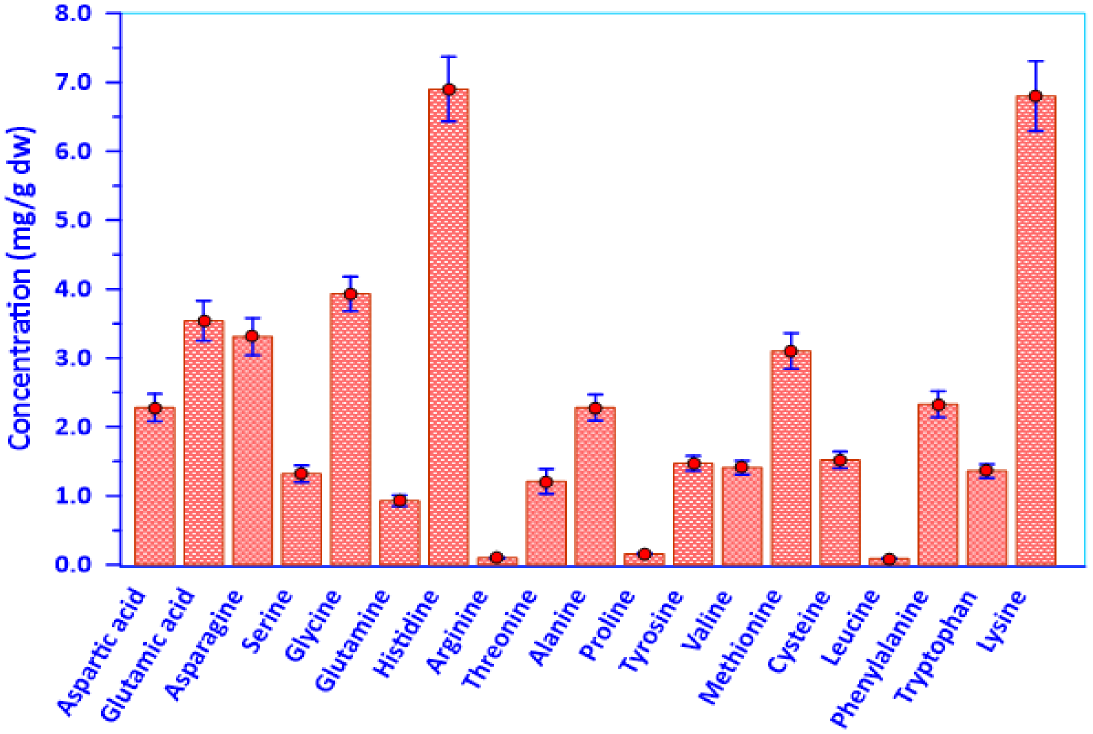

Figure 3. Amino acid content of bitter apple

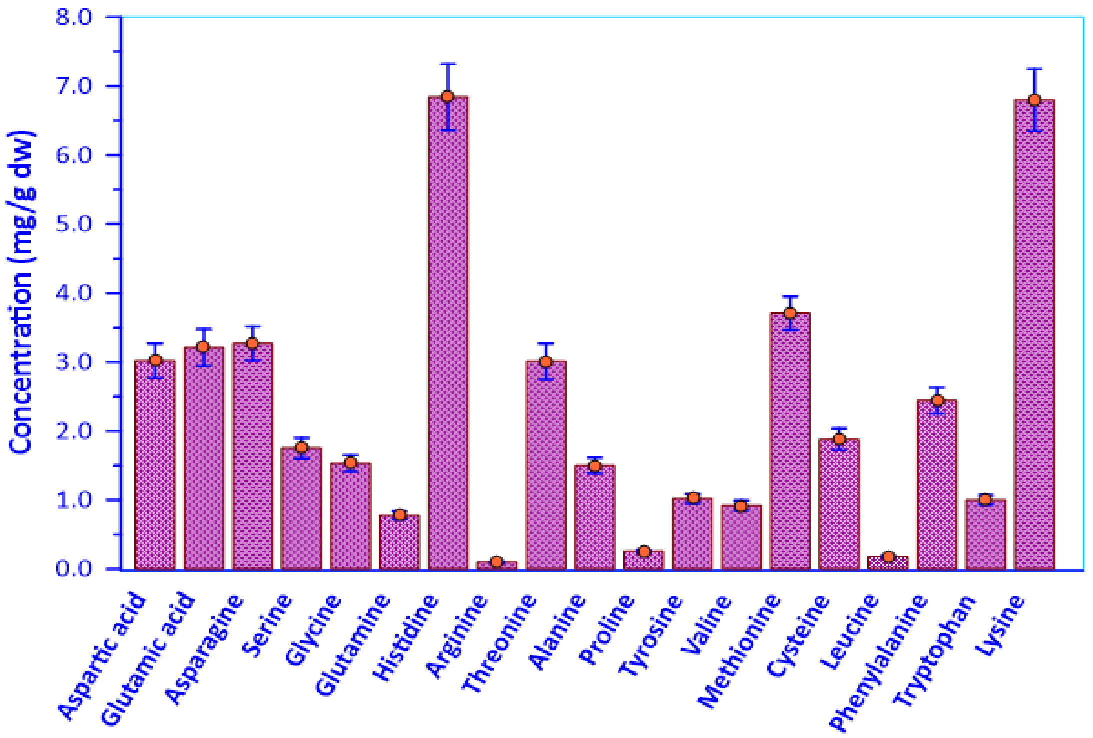

Figure 4. Amino acid content of dark eggplant

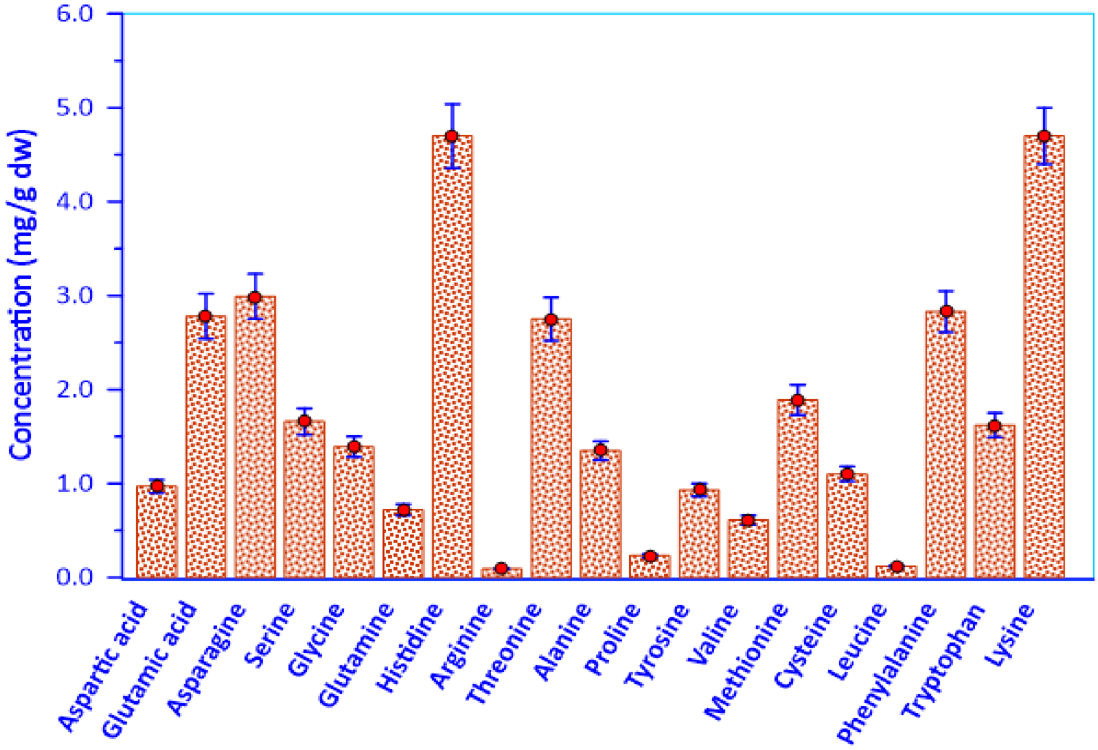

Figure 5. Amino acid content of light eggplant

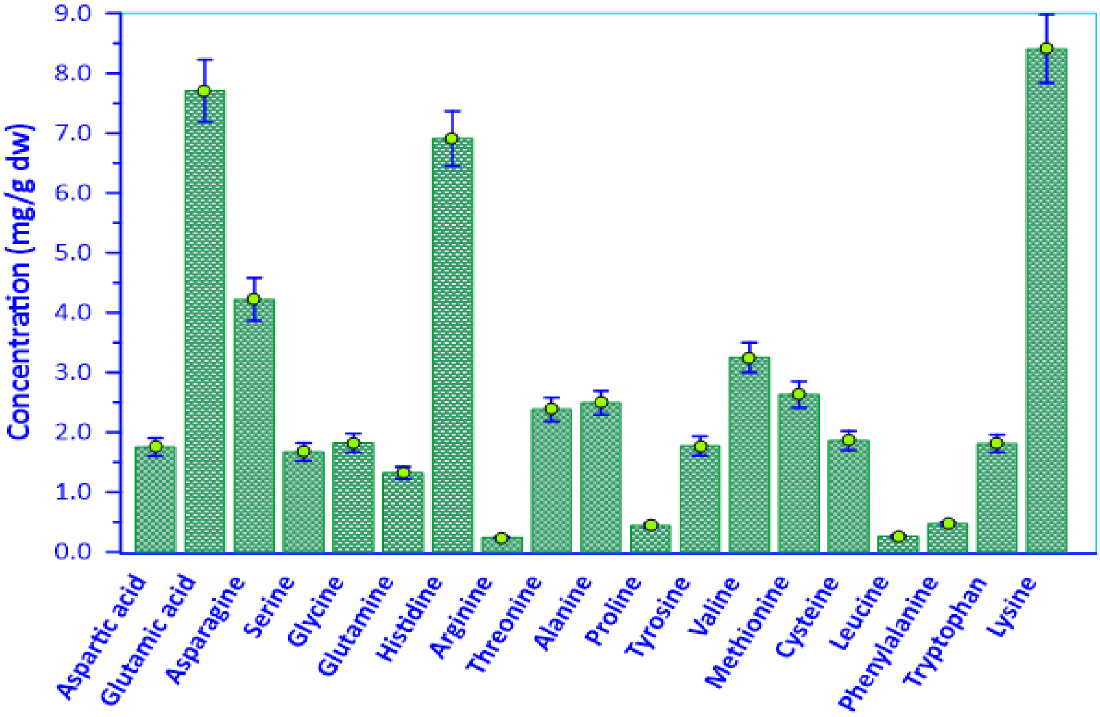

Figure 6. Amino acid content of bitter tomato

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Asparagine promotes nitrogen accumulation and plays an important role in regulating the sugar balance in the cell (Haroun et al., 2010). The asparagine amounts in the samples were found to be in range of 2.99 – 5.36 mg g^{-1} dw. It was determined that the light eggplant had the lowest concentration, while the bitter tomato had the highest. A study on different varieties of tomato reported asparagine values to range from 21.55 – 42.03 mg/100g DW (Choi et al., 2014).

Serine and glycine amino acids have been reported to be metabolic regulators that promote tumor cell growth (Gorska-Ponikowska et al., 2017). It was observed that the amount of serine in eggplant samples varied between 1.32 – 2.18 mg g^{-1} dw, while the amount of glycine varied between 1.39-4.58 mg g^{-1} dw. While the highest amounts of serine and glycine were found in bitter tomato, the lowest amounts were found in bitter apple and light eggplant samples, respectively (Table 1 and Figure 3, 5, 6). Bakar et al. (2021) reported that the amounts of serine and glycine in black myrtle fruits were 2.8 and 1.8 mg g^{-1} dw, respectively.

Glutamine is decreases under stress conditions and it acts as a marker that regulates nitrogen metabolism in the cell (Miflin and Habash, 2002). As it can be seen in Table 1 and Figure 2-6, the glutamine concentration is listed highest to lowest as white garden > bitter tomato > bitter apple > dark eggplant > light eggplant. İmo et al. (2019) reported that the amounts of serine and glycine in eggplant samples were 3.63 and 4.00 mg/100 g dw, respectively.

Histidine is necessary for the neurotransmitter histamine, the production of red blood cells and the formation of the myelin sheath (Nelson and Cox, 2013). The amount of histidine in eggplant varieties varies between 4.7 and 8.40 mg g^{-1} dw the highest concentration was observed in bitter tomato, while the lowest concentration was observed in light eggplant species (Table 1 and Figure 2-6). Amadi et al. (2013) reported that the amount of histidine in some eggplant species was in between 10.97 - 18.02 mg/100g FW.

Arginine is involved in the synthesis of growth hormone and strengthening the immune system (Nelson and Cox, 2013). The amount of arginine in eggplant species varies between 0.09 and 0.24 mg g^{-1} dw and highest arginine was observed in white garden egg (Table 1 and Figure 2-6). Mori et al. (2013) stated that arginine values in different eggplant varieties were given between 4.50 and 23.08 mg/100g FW.

Threonine is an essential part of structural proteins such as collagen and elastin, and has a role in fat metabolism and immune function, and also helps in the synthesis of glycine and serine (Olgun et al., 2016). Bakar et al. (2021) reported that the amounts of threonine in white and black myrtle fruits were 1.2 and 1.9 mg g^{-1} dw, respectively.

Alanine is involved in regulation of intracellular pH, reduction and regulation of nitrogen-dependent metabolic events during stress (Kalefetoğlu and Ekmekçi, 2005). The amounts of alanine in eggplant species are listed as bitter tomato > white garden egg > bitter apple > dark eggplant > light eggplant. The amount of alanine in eggplant species grown in Nigeria was found to be higher than those grown in Turkey (Table 1, Figure 2-6). Imo et al. (2019) found the amount of alanine in eggplant to be 3.84 mg/100g DW.

Proline, leucine and methionine are involved in cell wall growth and stress adaptation. In addition, Leucine is involved in protein synthesis, muscle repair, blood sugar regulation, wound healing and growth hormone production, while methionine has an important role in metabolism and detoxification (Joshi et al., 2010). The highest proline and leucine were observed in white garden egg. On the other hand, highest amount of methionine was found in bitter tomato (Table 1 and Figure 2-6). Amadi et al. (2013) reported that the amount of proline in fresh eggplant species ranged from 9.56 to 12.47 mg/100g. Imo et al. (2019) reported that the level of leucine and methionine in eggplant in between 1.86 - 8.92 and 0.88 mg/100g DW respectively.

Tyrosine plays a triggering and catalysing role in the formation of metabolic events which related to the defence of the organism against stress conditions (Ghelis, 2011). While the amount of tyrosine in eggplant species grown in Nigeria was found to be in between 1.47-2.42 mg g^{-1} dw, whereas 0.93-1.02 mg g^{-1} dw in those grown in Turkey (Table 1). Bakar et al. (2021) reported that the amounts of tyrosine in white and black myrtle fruits were 1.1 and 1.5 mg g^{-1} dw, respectively.

Valine helps promote regeneration and muscle growth, it is also involved in energy production. It plays an important role in preventing the degradation of growth-related enzymes under stress conditions and reducing the amount of free oxygen-based radicals in the cell (Singhl and Shaner, 1995). The amount of valine in eggplant samples is found in the order from highest to lowest as white garden egg, bitter apple, dark eggplant, light eggplant, bitter tomato (Table 1, Figure 2-6). Valine concentration in eggplant reported by Imo et al. (2019) as 5.36 mg/100g DW.

Cysteine plays a role in the development of anabolic and catabolic events in living organisms and acts as a stimulant in response to mechanisms under stress conditions (Kalefetoğlu and Ekmekçi, 2005). As can be seen in Table 1 and Figure 2-6, the highest amount of cysteine was found in the bitter tomato, while the lowest amount was observed in the light eggplant sample. Bakar et al. (2021) stated that the amount of cysteine in white myrtle fruits was 1.1 mg g^{-1} dw.

Phenylalanine is the precursor of neurotransmitters and plays a complementary role in the production of other amino acids, the structure and function of proteins and enzymes (Nelson and Cox, 2013), The amount of phenylalanine in eggplant samples varies between 0.47 and 2.83 mg g^{-1} dw, partially, the amount of phenylalanine in eggplant samples grown in Turkey is higher than eggplant samples grown in Nigeria.

Tryptophan plays an important role in regulating cell development and defence responses. It is the precursor of serotonin, melatonin and neurotransmitter biomolecules (Zemanova et al., 2017). The amount of tryptophan in eggplant species varies between 1.00-1.81 mg g^{-1} dw, with the lowest amount was found in dark eggplant species produced in Turkey.

Lysine has an important role in increasing the resistance of the cell against abiotic and biotic stresses, glutamic acid production, protein synthesis, hormone and enzyme production and calcium absorption (Azevedo and Lea, 2001). The amount of lysine in the eggplant samples can be listed from highest to lowest as white garden egg, bitter apple = dark eggplant, bitter tomato, light eggplant (Table 1).

The amounts of lysine, phenylalanine and tryptophan in the fresh celery sample are 27.51 and 14 mg/100g, respectively, the amounts in cauliflower are reported to be 160, 101 and 39 mg/100g (Nelson and Cox, 2013), The total amino acid content in the eggplant samples were listed as bitter tomato > white garden egg > bitter apple > dark eggplant > light eggplant.

Zhou et al. (2019), in their study using Nitraria tangutorum Bobr pulp and peel, reported that total essential amino acids ranged between 44.39-53.51 mg g^{-1} dw and total non-essential amino acids ranged 65.65-71.41 mg g^{-1} dw.

According to the Food and Agriculture Organization and the World Health Organization, a good protein source should have a total essential amino acid/total amino acid ratio should be above 40%, and a total essential amino acid/total non-essential amino acid ratio above 60% (Zhou et al., 2019). Total essential amino acid/total amino acid ratio in bitter tomato, white garden egg, bitter apple, dark eggplant, and light eggplant samples were 45, 51, 53, 58, and 58 percent, respectively, while total essential amino acid/total non-essential amino acid ratio were 83, 105, 112, 137 and 137 percent. From these results, it can be said that the eggplant samples examined are a good protein source.

The daily total amount of essential amino acids for an individual weighing 70 kg is given as 12.88 g (Joint WHO/FAO/UNU (2007). According to WHO, a person consuming 100 g dry eggplant a day can get 20, 18, 19, 15 and 21 percent of daily essential amino acids intake from white garden egg, bitter apple, dark eggplant, light eggplant and bitter tomato respectively.

As it can be seen in Table 1 and Figure 2-6, the lowest total and essential amino acid content was found in light eggplant grown in Turkey, while the highest in bitter tomato sample grown in Nigeria. The statistical comparison of amino acids in eggplant samples grown in Turkey and Nigeria is shown in Table 1 with the letters explained in the statistical part.

The differences in amino acid contents of eggplant varieties grown both in Turkey and Nigeria can be attributed to the differences in their genetic makeup, geographical origins and climate.

CONCLUSION

Amino acid levels in eggplant samples ranged from 0.02 to 8.41 mg g^{-1} dw. While the lowest amount was determined as leucine in dark tomato, the highest amount was observed as lysine in white garden egg sample. Total amino acid amounts in the white garden egg, bitter apple, dark eggplant, light eggplant and bitter tomato samples were 54.41±3.90, 44.04±3.46, 43.22±3.23, 33.37±2.58 and 59.91±4.44 mg g^{-1} dw, respectively. The essential total amino acid contents were 26.36±1.91, 23.30±1.82, 25.00±1.78, 19.31±1.44 and 27.21±2.03 mg g^{-1} dw, respectively. Lowest total and essential amino acid level was found in light eggplant grown in Turkey, while the highest in bitter tomato sample grown in Nigeria.

Conflict of Interest

The authors declare that there is no known competing financial interests or personal relationships that could have influence on the work reported in this paper.

Author's Contributions

The authors declare that they have contributed equally to the article.

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