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Nutritional Composition of Bitter Gourd Types *(Momordica Charantia L.)*

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Abstract— *Bitter gourd has important role as a source of carbohydrate, proteins, vitamins, minerals and other nutrients in human diet (Ali et al., 2008) which are necessary for maintaining proper health. To assess the chemical and nutritional composition of the selected bitter gourd types in the fresh and dried form, the following parameters were determined i.e. total carbohydrate, protein, dietary fibre, moisture, β carotene, vitamin C, folic acid, calcium, phosphorus, sodium, potassium, iron, manganese, copper and zinc.*

The study revealed that highest protein, moisture, vitamin C and folic acid content were found in Light green big (2.06 g, 90.40 per cent, 98.2 mg and 0.10 µg/ ml respectively). Highest carbohydrate and fibre content was found in light green small (8.22 g and 1.21 g). The amount of beta carotene was found to be highest in nei paval sample (140.03 mcg/100g). In the case of mineral analysis, highest calcium, phosphorus and sodium content were found in light green big (25.44 mg/ 100g and 79.64 mg/100 g 20.12 mg / 100 g respectively). The potassium and iron content was found highest in nei paval (174.46 mg/ 100 g 2.14 mg). Highest manganese, copper and zinc content were noticed in light green big (34.57 mg, 40.17 mg and 90.41 mg/ 100g respectively).

Keywords— Momordica charantia, Bitter gourd, Fresh samples, Light green big.

I. INTRODUCTION

Bitter gourd is very low in calories but dense with precious nutrients. It is an excellent source of vitamins B_1, B_2, B_3, Vitamin C, magnesium, folic acid, zinc, phosphorus, manganese, and has high dietary fiber (Keding and Krawinkel, 2006). It is rich in iron, contains twice the beta-carotene of broccoli, twice the calcium of spinach, and twice the potassium of a banana (Aboa et al., 2008; Wu and Ng, 2008). The vegetable is very low in calories, providing just 17 calories per 100g. Nevertheless, its pods are rich in phytonutrients like dietary fiber, minerals, vitamins and anti-oxidants (Klomann et al., 2010).

Knowledge of the chemical constituent of plants is desirable for the discovery of therapeutic agents and in discovering the actual value of folklore remedies. Traditionally, screening methods have been used to study the pharmacological effects of phytochemical compounds. Plants play a prominent role in maintenance of human health and used as medicine, since ancient times. According to World Health Organization, (WHO) plant extracts are used as folk medicine in traditional therapies of 80 per cent of the world's population (Singh et al., 2012).

Bitter gourd (*Momordica charantia)* is one of the most popular vegetable in South Asia, which belongs to the family *cucurbitaceae*. The Latin name *Momordica* means "to bite" referring to the jagged edges of the leaves, which appear as if they have been bitten. It is regarded as one of the world's major vegetable crops and has great economic importance. Bitter gourd grows in tropical and subtropical areas, including parts of East Africa, Asia, Caribbean, and South America, where it is used not only as a food but also as a medicine. Furthermore, Indians have traditionally used the leaves and fruits as a medicine to treat diabetes, colic and to heal skin sores and wounds (Paul et al., 2009).

Bitter gourd is reported to be a good source of phenolic compounds, which possess potent antioxidant activity (Aminah and Anna, 2011). Fruits are relatively high in proteins, minerals and vitamins and many other nutrients required in the human diet (Ali et al., 2008) which are necessary for maintaining proper health. The present investigation was carried out to quantify the nutrients present in the fresh fruit extract of bitter gourd (*Momordica charantia*) by chemical analysis.

II. MATERIALS AND METHODS

Four types of commercially cultivated bitter gourd viz., light green small, light green big, dark green small, dark green big along with *Nei paval* were selected for the study. First two types were collected from VFPCK, Kalliyoor and the second two types were collected from local market in Trivandrum and *Nei paval* was collected from Madurai, Tamil Nadu. The proximate and nutritional composition of the selected bitter gourd types were carried out.

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Plate 1. Light green big

Plate 2. Light green small

Plate 3. Dark green big

Plate 4. Dark green small

Plate 5. Nei paval

Protein

The nitrogen content of bitter gourd samples was estimated by micro Kjeldahl's wet digestion method. The nitrogen values were multiplied by the factor 6.25 to get the crude protein content (AOAC, 2000).

Crude fibre

Crude fibre content was determined according to AACC method (2000).

Total carbohydrates

Total carbohydrates were estimated following the anthrone method as described by Sadasivam and Manickam (2008).

Moisture

Moisture content was estimated by the method of A.O.A.C (1990).

β carotene

β carotene was estimated by the method of Sadasivam and Manickam (2008).

Vitamin C

Vitamin C was estimated by the method of Ranganna (2001).

Folic acid

Folic acid was estimated by the method of HPLC. Analytical reversed phase C 18 column was used for the separation. Mobile phase consisting of a mixture of buffer and methanol in the ratio of 96:4 was delivered at a flow rate of 1 ml/ min with UV detection at 210 nm.

Calcium (Ca)

Calcium was estimated by EDTA method suggested by Sadasivam and Manickam (2008).

Minerals

The samples were powdered and digested with concentrated nitric acid in a microwave digester. Minerals such as phosphorus (in spectrophotometer), sodium and potassium (in flame photometer), iron, manganese, copper and zinc content of the digest were estimated in AAS using hydride vapor generator method suggested by Jackson (1973).

III. RESULTS AND DISCUSSION

Table.1: Proximate composition of bitter gourd types

Types	Protein (g/ 100g)	Carbohydrate (g/100g)	Moisture (%/ 100 g)	Fibre (g/100g)
Light green big (LGB)	2.06^{a}	5.71^{c}	90.40^{a}	1.12^{b}

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Light green small (LGS)	1.81[b]	8.22[a]	90.00[b]	1.21[a]
Dark green big (DGB)	1.55[cd]	5.21[e]	86.29[c]	0.91[e]
Dark green small (DGS)	1.61[c]	5.35[d]	85.40[e]	1.02[d]
Nei paval (NP)	1.51[d]	6.11[b]	85.59[d]	1.08[c]
CD (0.05)	**0.069**	**0.019**	**0.021**	**0.016**

Mean values denoted by different letters in the same column are significantly different ($p<0.05$).

Table 1 showed that highest protein content was found in light green big (2.06 g) and was significantly different from other types. The lowest protein content was found in NP (1.51 g) and was on par with dark green big (1.55 g). The protein content of dark green big sample (1.55 g) was on par with dark green small (1.61 g). The protein content of LGB (2.06 g) was significantly different from LGS, DGB, DGS and NP types. Highest carbohydrate content was found in light green small (8.22 g) and significant differences in carbohydrate content were noticed among bitter gourd types. The lowest carbohydrate content was found in DGB type (5.21 g) and was significantly different from LGB, LGS, DGS and NP samples.

Proteins are nitrogen-containing substances that are formed by amino acids. They serve as the major structural component of muscle and other tissues in the body. In addition, they are used to produce hormones, enzymes and haemoglobin (Alibhai et al., 2006). Proteins can also be used as energy. However they are not the primary choice as an energy source. For proteins to be used by the body they need to be metabolized into their simplest form, amino acids. There have been 20 amino acids identified that are needed for human growth and metabolism. Vegetable proteins, when combined to provide for all of the essential amino acids, provide an excellent source for protein considering that they will likely result in a reduction in the intake of saturated fat and cholesterol (Aiking, 2011). A study conducted by Chunduri (2013) on antioxidant and nutritional analysis of edible cucurbitacae vegetables in India revealed that fresh bitter gourd contained 0.96 g protein per 100g. Bitter gourd fruit proteins like momordin, alpha- and beta-momorcharin and cucurbitacin B were also tested for possible anticancerous effects. A chemical analog of these *M. charantia* proteins has been developed, patented, and named "MAP-30"; its developers reported that it was able to inhibit prostate tumor growth (Renuka, 2012). Some of the proteins like alpha- and beta-momorcharins have been reported to inhibit HIV infections (Renuka, 2012).

Highest moisture content was found in Light green big (90.40 per cent) and was significantly different from LGS, DGB, DGS and NP. The lowest moisture content was found in DGS (85.40 per cent) and was significantly different from LGB, LGS, DGB and NP types (Table 1). The moisture content of LGS, DGB and NP samples were 90 per cent/100g, 86.29 per cent/ 100g and 85.59 per cent/ 100g respectively. The fibre content of fresh bitter gourd types differ significantly each other. The fibre content of bitter gourd was found highest in light green small (1.21 g) and lowest in dark green small (0.91 g).The fibre content of LGB, DGS and NP were 1.12 g/ 100g, 1.02 g/ 100g and 1.08 g/ 100g respectively.

Carbohydrates are an important part of our diet since they are the body's primary source of energy. Carbohydrates mainly come from plant foods such as grains, fruits and vegetables. Experts recommend 45 per cent to 65 per cent of our total calories come from carbohydrates (Riboli and Horel, 2003). Most of our carbohydrates should be nutrient dense especially whole grains and fiber containing fruits and vegetables. For example, a balanced diet that is about 2,000 calories should include at least six servings of grains, five servings of vegetables and four servings of fruit daily (Slavin, 2008). The Scientific update also considered the relationship between dietary carbohydrate and cardiovascular disease, disorders of carbohydrate metabolism and cancer (Cummings and Stephen, 2007). A wide range of intakes of carbohydrate-containing foods is acceptable in the context of dietary patterns, which are protective against cardiovascular disease, diabetes and prediabetic states (Elia and Cummings, 2007). Rose et al. (2014) opined that fresh carbohydrate (0.61 g) were present in different cucurbitaceae family. As far as carbohydrate is concerned, cucurbitaceae family are not concerned as a good source of carbohydrate but after dehydration the carbohydrate content of the bitter gourd was comparable with many of the carbohydrate rich cereals and vegetables (Pallavi and Dipika, 2010). Highest carbohydrate content was found in light green small (8.22 g) and significant differences in carbohydrate content were noticed among bitter gourd types. The lowest carbohydrate content was found in DGB type (5.21 g) and was significantly different from LGB, LGS, DGS, NP samples (Table 1).

Reducing the moisture content of food prevents the growth of these spoilage-causing microorganisms and slows down enzymatic reactions that take place within food (Andress and Harrison, 2006). The combination of

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these events helps to prevent spoilage in dried food. According to Islam et al. (2005), moisture level in bitter gourd ranges between 93.5 per cent to 53.3 per cent in different Indian and Chinese varieties.

The term "dietary fibre" is now well accepted by health professionals because of a significant amount of scientific evidence showing that consumption of dietary fibre reduces the risk of developing specific chronic diseases or conditions. Most prominent of these are coronary heart disease, type 2 diabetes, certain types of cancers, as well as obesity (Jones and Varady, 2008). Dietary fibre is an extremely important component of a balanced diet (Jones and Varady, 2008). It has numerous functions in the human body and is also linked to the prevention of many diseases. Vegetables and fruits (any plant product for that matter) contain both soluble and insoluble fibre, but depending on the type and degree of ripeness of vegetable or fruit, the soluble to insoluble fibre ratio may vary. The amount of fibre present in bitter gourd samples was similar to the findings of Bakare et al. (2010). Another study carried out by Aziz et al. (2011) observed that fresh bitter gourd contain 1.8 g fibre in flesh and 1.9 g fibre in the skin.

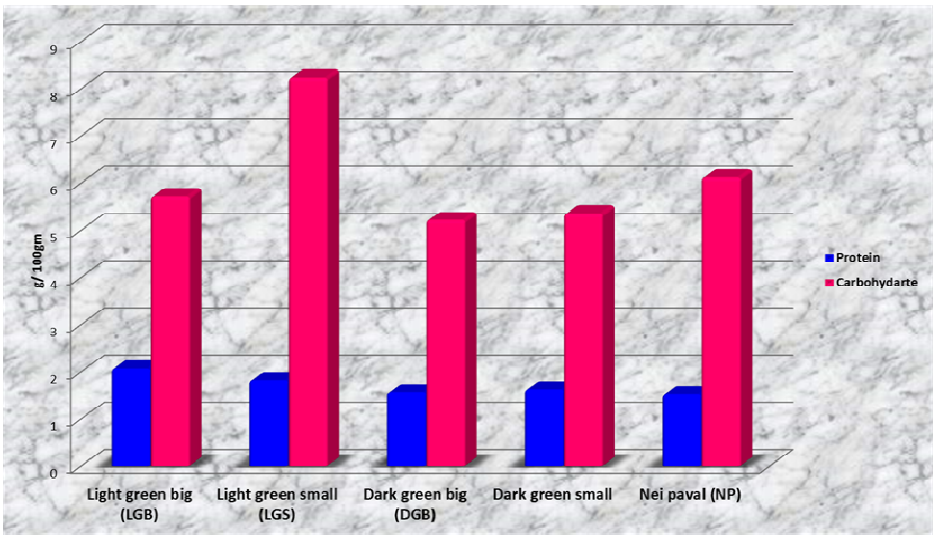

Fig.1: Protein and carbohydrate contents of bitter gourd types

Table.2: Vitamin content of bitter gourd types

Types	Beta carotene (mcg/ 100 g)	Vitamin C (mg/ 100 g)	Folic acid (µg/ 100 mg)
Light green big (LGB)	136.17^{d}	98.20^{a}	0.10^{a}
Light green small (LGS)	136.10^{e}	98.10^{b}	0.08^{b}
Dark green big (DGB)	139.20^{c}	97.90^{d}	0.04^{c}
Dark green small (DGS)	139.81^{b}	97.92^{c}	0.02^{d}
Nei paval (NP)	140.03^{a}	97.91^{c}	0.02^{d}
CD (0.05)	**0.019**	**0.013**	**0.088**

Mean values denoted by different letters in the same column are significantly different ($p<0.05$).

Carotene protects plant cells against the destructive effects of ultra violet light. β-carotene is an antioxidant. Numerous observational studies have found that people who ingest more carotenoids or more fruits and vegetables have a reduced risk of several chronic diseases including, cancer, cardiovascular disease, age-related macular degeneration and cataract (Olson, 1999). A study conducted by Nagarani et al. (2014) reported that 61.8 µg beta carotene was present in the cucurbitacae fruits.

The statistical analysis of the data revealed that there exists a significant difference in beta carotene of bitter gourd types. The beta carotene content was found highest in *nei paval* (140.03 mcg/ 100g) (Table 2). The data also revealed that lowest beta carotene content was found in light green small samples (136.10 mcg/100g). In this study, the highest vitamin C content was noticed in LGB type (98.20 mg) and was significantly different from the LGS, DGB, DGS and NP types. The vitamin C content of DGS (97.92 mg) and NP (97.91 mg) types were on par with each other. The results revealed that there was a significant difference in folic acid content of bitter gourd

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types. The folic acid content of bitter gourd was found least in dark green small and neipaval sample (0.02 µg/ml,) where as it was found maximum in light green big (0.10 µg/ml). The folic acid content of DGS fresh type (0.02 µg/ml) was on par with NP fresh (0.02 µg/ml) (Table 2).

Ascorbic acid is one of the important and essential vitamins for human health. It is needed for many physiological functions in human biology. Fresh fruits, vegetables and also synthetic tablets supplement the ascorbic acid requirement of the body (Frei and Traber, 2004). However, stress, smoking, infections and burns deplete the ascorbic acid reserves in the body and demands higher doses of ascorbic acid supplementation. Based on available biochemical, clinical and epidemiological studies, the current RDA for ascorbic acid is suggested to be 100–120 mg/day to achieve cellular saturation and optimum risk reduction of heart diseases, stroke and cancer in healthy individuals (Frei and Traber, 2004). In view of its antioxidant property, ascorbic acid and its derivatives are widely used as preservatives in food industry. Many health benefits have been attributed to ascorbic acid namely antioxidant, anti-atherogenic and anti-carcinogenic activity. A study conducted by Dey et al. (2006) noticed highly significant differences among the genotypes for ascorbic acid and it ranged between 60.20 mg to 122.07 mg/100 g of fresh weight with a population mean of 82.14mg/100g of fresh weight. Singh and Sagar (2013) reported that Pusa hybrid-2 varieties are good source of vitamin C (77.56 mg). According to Aziz et al. (2011) bitter gourd contains 120.22 mg of vitamin C in flesh and 108.66 mg in skin.

Folic acid is necessary for the growth and repair of every cell in the body. Folic acid is needed for the growth and repair of hair, skin and nails (Walls et al., 2007). Folic acid is an essential B vitamin; therefore, everyone needs it in order to stay in good health. Folic acid is water soluble, therefore it passes through the body very quickly. Other than being needed to create and regenerate cells in the body, it also has protective effects. Studies revealed that folic acid reduces the risk of certain cancers, cardiovascular diseases including coronary heart disease and stroke, and cognitive diseases or mental conditions such as Alzheimer's disease, age-related dementia or cognitive decline and depression (Huang et al., 2007). The results are in tune with the studies carried out by Bakare et al. (2010). According to Chunduri (2013), cucurbitacae vegetables seen in India contained fair amount of folic acid and it ranged between 0.23 mg to 1.76 mg.

Table.3: Mineral content of bitter gourd types

Types	Calcium (mg/ 100 g)	Phosphorus (mg/ 100 g)	Sodium (mg/ 100 g)	Potassium (mg/ 100 g)	Iron (mg/ 100 g)	Manganese (mg/ 100 g)	Copper (mg/ 100 g)	Zinc (mg/ 100 g)
Light green big (LGB)	25.44^{a}	79.64^{a}	20.12^{a}	154.67^{d}	0.68^{d}	34.57^{a}	40.17^{a}	90.41^{a}
Light green small (LGS)	24.11^{b}	44.35^{c}	19.86^{b}	149.96^{e}	1.52^{b}	29.15^{b}	36.13^{b}	84.30^{b}
Dark green big (DGB)	22.78^{d}	62.43^{b}	4.13^{e}	171.59^{c}	0.45^{e}	22.74^{c}	34.75^{c}	72.45^{c}
Dark green small (DGS)	22.79^{d}	39.24^{e}	4.37^{d}	172.88^{b}	1.11^{c}	19.39^{d}	30.10^{e}	70.14^{d}
Nei paval (NP)	22.91^{c}	39.75^{d}	5.94^{c}	174.46^{a}	2.14^{a}	18.41^{e}	30.81^{d}	60.04^{e}
CD (0.05)	**0.029**	**0.388**	**0.031**	**0.999**	**0.037**	**0.056**	**0.277**	**0.018**

Mean values denoted by different letters in the same column are significantly different ($p<0.05$).

Different minerals have different benefits, so no mineral can be termed as more beneficial or less beneficial than another. All minerals, even trace ones, are critical for the proper functioning of the body. Most of the minerals aid in body metabolism, water balance, and bone health, but they can participate in hundreds of other small ways to effectively boost health as well (Wargovich, 2000).

Table 3 showed that highest calcium content was found in light green big (25.44 mg/ 100 g). The lowest calcium content was found in dark green big (22.78 mg) and DGS (22.79) and both of them were on par with each other and

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they were significantly different from LGB, LGS and NP. There was a significant difference in phosphorus content of bitter gourd fresh samples. Highest phosphorus content was noticed in light green big (79.64 mg). The phosphorus content of LGS, DGB, DGS and NP fresh types were 44.35 mg/ 100g, 62.43mg/ 100g, 39.24mg/ 100g and 35.75mg/ 100g respectively. Data on sodium content revealed a significant difference among the bitter gourds types at five per cent level. The sodium content was found highest in light green big (20.12 mg/ 100g) while it was found lowest in DGB (4.13 mg). The statistical analysis of the data revealed that there exists a significant difference in potassium content of fresh bitter gourd types. In fresh bitter gourd types, the potassium content ranged between 149.96 to 174.46 mg. The potassium content was found highest in *Nei paval* samples (174.46 mg/ 100g respectively) where as the lowest content of potassium was found in light green samples (149.96 mg/ 100g). Table 3 revealed that highest iron content was found in fresh neipaval (2.14 mg) and was significantly different from other types. The lowest iron content was found in DGB type (0.45 mg). All the five fresh bitter gourd samples were significantly differ in their iron content. In this study, the highest manganese content was noticed in LGB (34.57 mg) and was significantly different from LGS, DGB, DGS and NP fresh samples. The lowest manganese content was noticed in NP (18.41 mg). Highest copper content was found in Light green big (40.17 mg) and was significantly different from LGS, DGB, DGS and NP types. The lowest copper content was found in DGS (30.10 mg) and was significantly different from LGB, LGS, DGB and NP. The copper content in bitter gourd samples of fresh LG, DG and NP were 36.13 mg/100g, 34.75 mg/ 100g and 30.81 mg/ 100 g respectively. Data on zinc content (Table 3) revealed that there was a significant difference among the bitter gourds types at five per cent level. The zinc content was found highest in light green big samples (90.41 mg/ 100g respectively) while it was found lowest in NP fresh type (4.13 mg).

Minerals in the diet are required for proper growth and good health. Those needed in macro, or major quantities are calcium, phosphorus, potassium, sulphur, sodium, and chlorine, and those needed in micro (trace) amounts are iron, iodine, copper, cobalt, chromium, manganese, selenium, zinc, fluorine, and molybdenum. The cucurbitaceae and many other vegetables are excellent sources of minerals, particularly of calcium, phosphorus, magnesium, potassium, iron, sodium, and most of these minerals are present in the available form (Abuye et al., 2003). Calcium also boosts bone health (prevents osteoporosis), relieves arthritis, improves dental heath, and relieves insomnia, menopause, premenstrual syndrome, and cramps. Furthermore, it is important in preventing or treating obesity, colon cancer, acidity, heart diseases, and high blood pressure (Wargovich, 2000). The results are in line with the studies carried out by Bakare et al. (2010). A study conducted by Lucky et al. (2012) on quantitative analysis of different methanol extracts of cucurbitacae family reported an amount of 16.80 mg of calcium. Phosphorus is integral in reducing muscle weakness, improving bone health, boosting brain function, correcting sexual weakness, aiding in dental care, and optimizing body metabolism (Wargovich, 2000). The study supports the findings of Chunduri (2013) who had reported an amount of 17.33 mg of phosphorus in bitter gourd samples analyzed.

Sodium is a widely used mineral preventing sunstroke, improving brain function, relieving muscle cramps, and preventing premature aging. According to Bakare et al. (2010) bitter gourd is a good source of sodium. The study conducted by Lucky et al. (2012) on quantitative analysis of different methanol extracts of cucurbitacae family coincide with present findings and reported an amount of 16.80 mg of sodium in the samples analyzed. Sodium content ranged between 2.40 to 120 mg in different cucurbitacae fruis (Nagarani et al. 2014). According to Gopalakrishnan and Kalaiarasi (2014), considerable amounts of sodium were present in cucurbitacae fruits.

Potassium can correct low blood sugar, regulate blood pressure, prevent heart diseases, increase water flow in the body, alleviate muscle disorders and cramps, boost brain function, manage diabetes, correct kidney disorders, and manage arthritis (Wargovich, 2000). As a vasodilator, it reduces the tension in the blood vessels, and ensures the proper distribution of oxygen to vital organ systems, thus protecting against cardiovascular diseases. The results of the present study are in accordance with the study carried out by Nagarani et al. (2014). Bakare et al. (2010) opined that bitter gourd is a good source of potassium. A study conducted by Ali et al. (2008) reported that bitter gourd contained 142 mg of potassium content.

Iron is a key element of haemoglobin formation, body metabolism, muscle activity, anaemia, brain function, immunity, insomnia, restless leg syndrome, and the regulation of body temperature (Oyarzun et al., 2001). The results are in agreement with the studies carried out by Blessing et al. (2010) who had observed that the amount of iron present in cucurbitacae family ranged between 0.001 mg to 0.136 mg. Talukdar et al. (2014) reported that cucurbitacae fruits contained 5.04 mg of iron. Nagarani et al. (2014) had reported 1.8 mg of iron content in cucurbitacae samples. A study conducted by Gayathri (2014) had reported that dried bitter gourd powder contained 0.45 mg of iron.

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Manganese plays an important role in the management of body metabolism, osteoporosis, reducing fatigue, reproduction, sprains, inflammation, brain function, and epilepsy (Oyarzun et al., 2001). The findings of the present study are in line with the results of Gopalakrishnan and Kalaiarasi (2014).

Copper improves brain function, soothes arthritis, helps in skin care, eliminates throat infections, corrects haemoglobin deficiency, prevents heart diseases, and boosts immunity (Matkovic, 2007). Copper is necessary for nerve metabolism, nerve transmission, many enzyme reactions, blood vessels, fighting inflammation, cholesterol levels, absorption of other minerals such as iron, and cardiovascular health in general (Oyarzun et al., 2001). The results are in accordance with the study carried out by Ali et al. (2008). A study conducted by Gopalakrishnan and Kalaiarasi (2014) reported that cucurbitacae fruits are good source of copper. The above results are in accordance with the study carried out by Bakare et al. (2010).

Zinc is an essential component of more than ten important enzymatic functions of the body, and without zinc, the body will quickly lose overall function and results in a number of health concerns, including an inability to heal wounds, store insulin, fight off disease, develop proper growth patterns, as well as defend against a variety of skin infections (Chanoine, 2003). The study is in conformity with the findings of Ali et al. (2008) who had reported that cucurbitacae fruits contained good amount of zinc (33 mg). A study conducted by Bello et al. (2014) in different cucurbitacae fruits showed good amount of zinc. The results corroborates with the study carried out by Gopalakrishnan and Kalaiarasi (2014).

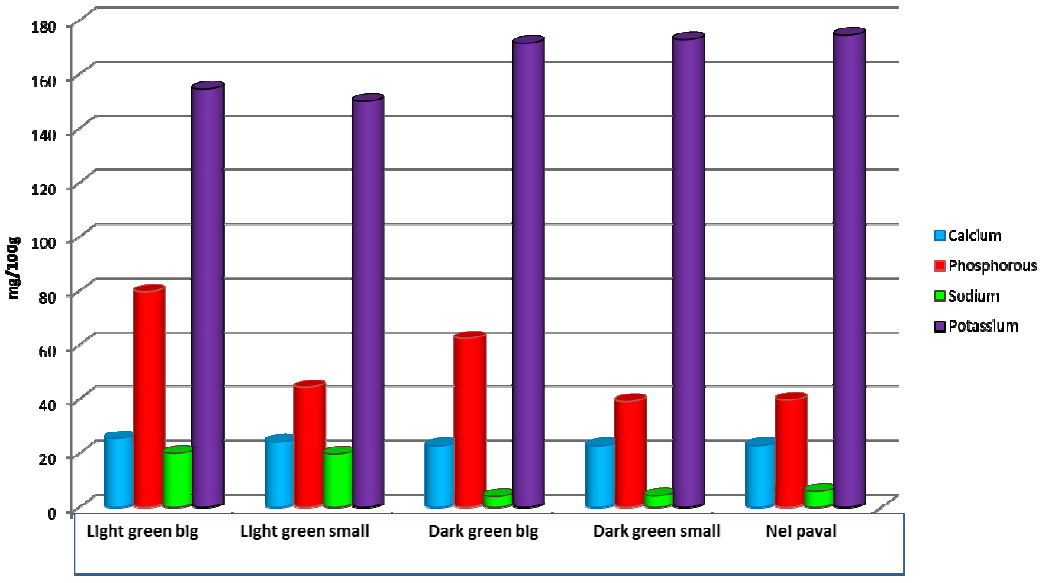

Fig.2: Major mineral contents of the bitter gourd types

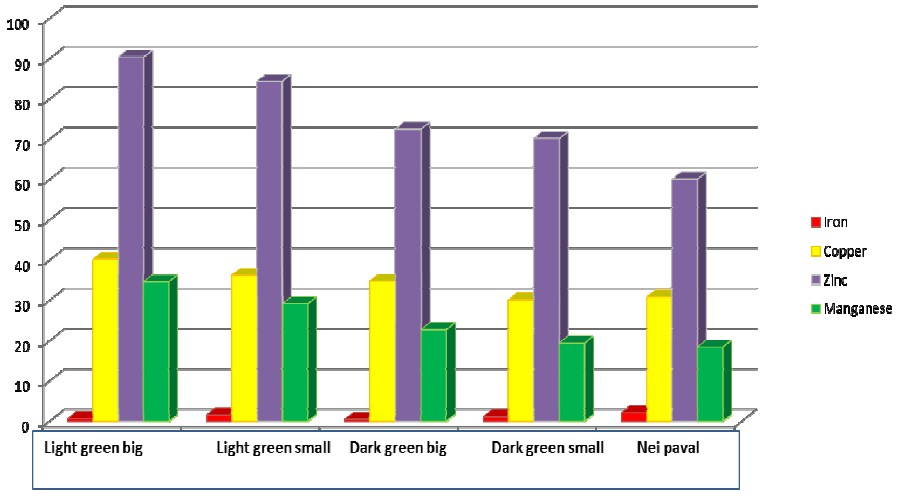

Fig.3: Trace mineral contents of the bitter gourd types

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IV. CONCLUSION

The highest protein content was found in light green big type (2.06 g). Highest carbohydrate content was found in light green small type (8.22 g). The carbohydrate content of bitter gourd types was significantly different from each other. The fibre content of bitter gourd was found highest in light green small (1.21 g and 20. 31g respectively). Highest moisture content was found in light green big (90.40 per cent) bitter gourd type. The statistical analysis of the data revealed that there exists a significant difference in beta carotene of all the fresh bitter gourd types. The beta carotene content was found highest in *nei paval* (140.03 mcg/ 100g). The highest vitamin C content was noticed in LGB fresh (98.20 mg) and was significantly different from the LGS, DGB, DGS and NP. The vitamin C content of DGS (97.92 mg) and NP (97.91 mg) were on par with each other. Folic acid content was found maximum in light green big bitter gourd samples (0.10 µg/ ml).

In the case of mineral analysis, highest calcium, phosphorus and sodium content was found in light green big (25.44 mg/ 100g, 79.64 mg and 20.12 mg/ 100g respectively). The potassium and iron content was found highest in n*ei paval* (174.46 mg and 2.14 mg respectively). Highest manganese, copper and zinc content were noticed in light green big (34.57 mg 40.17 mg and 90.41 mg/ 100g respectively). Due to the presence of good amount of vitamins, minerals and phytochemical bitter gourd can be utilized for preparing many herbal formulations which can cure diseases with no adverse effects.

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