

Karela, a Plant with Many Properties

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Abstract – Karela is one of the most popular vegetables in tropical regions, particularly in Asia. This plant is grown for the first time in the Kahiir vill, Konarak City, Sistan and Baloochestan Province. Fruits are warty, sometimes smooth, yellowish green to dark green, when ripped it is yellow and orange. This plant has lots of properties. Fruits are rich in polypeptide P, insulin and vegetables charantin, which reduces blood sugar. Fruit and leaves contain Granulated that destroy cancer-causing substances chemically and slow their activity. Oleic acid is the most sensible fatty acid found in Karela fruits; in addition, Karela fruit and seed can be used traditionally as anti- HIV virus medicinal herb, ulcers, inflammations and tumors. Karela contains biologically active phytochemical substances, triterpenes, proteins and steroids. Jelly balls contain Karela seeds, which are inside the fruit and are very sweet.

Keywords – Diabetes, Insulin, Karela, Medicinal Herb, Oleic Acid.

I. INTRODUCTION

Free radicals are known as a major cause of chronic and degenerative diseases including aging, cardiovascular disease, inflammation, stroke, diabetes and cancer. Active oxygen species include free radicals such as superoxide anion, hydroxyl radical, hydrogen peroxide and oxygen cause cellular damage and initiate peroxidation of unsaturated fatty acids in biological membranes. Tissue damage by active oxygen may damage DNA, proteins and oxidation important enzymes in the human body. These events can lead to the creation of free radicals and finally the disease. Recently, natural foods and food - derived antioxidants such as vitamins and phenolic phytochemicals have attracted much attention, since they are known as chemicals protective against oxidative damage (Amira et al, 2013). Karela Latin name is *Momordica Charantia* from *Cucurbitaceae* family. Karela looks like a cucumber with some warts on the surface of fruit. In addition, it is a diverse vegetable and has multi-dimensional applications. All parts of the plant are bitter like its -2-fruit and the bitterness is also due to quinine. Karela immature and green fruit has a good flavor (tart) but when it matures completely and becomes yellow and red it is bitter, so Karela is typically used in the immature stage (Noorzaee, 2009). Karela contains biologically active phytochemical substances, triterpenes, proteins and steroids. Karela fruit and seed can be used traditionally as anti- HIV virus medicinal herb, ulcers, inflammations and tumors (Ortigao, M., Better, M., 1992 & Akihisa et al, 2007). Diabetes is the most common endocrine disorder and represents a global health problem. Diabetes is specified with chronic hyperglycemia due to the absolute or relative lack of insulin or insulin action. When blood

sugar levels cannot solely be controlled through diet, weight loss, exercise and oral medications, the primary treatment for patients with type 1 and also type 2 diabetes is insulin. Diabetes mellitus cause metabolic disorders and hyperglycemia resulting from defects in insulin secretion, insulin action or both (Celia et al, 2003).

II. KARELA FOOD AND MEDICINAL USE

Karela is generally used as food and medicine. Raw fruits are used as food, leaves and young stems are directly used as vegetable or salad and /or as pickles and they will also be used as sodden. In addition, we can prepare tea, soup and spices from the medicinal herb.

Nutritional Value per 100g piece of Karela is expressed in the following table 1:

Table 1. Karela nutritional value (Noorzaee, 2009).

Energy (KJ)	250
Water (g)	83-92
Fiber (g)	0.8-1.7
Fat (g)	0.2-1
Carbohydrates (g)	4-10.5
Protein (g)	1.5-2
Calcium (mg)	20-23
Zinc (mg)	0.1
Manganese (mg)	16
Potassium (mg)	216
Vitamin C (mg)	88-96
Thiamine (mg)	0.05
Riboflavin (mg)	0.03
Niacin (mg)	0.04

Bitter melon is a powerful nutrient-dense plant composed of a complex array of beneficial compounds. These include bioactive chemicals, vitamins, minerals and antioxidants, which all contribute to its remarkable versatility in treating a wide range of illnesses. The fruits contain high amounts of vitamin C, vitamin A, vitamin E, vitamins B₁, B₂ and B₃, as well as vitamin B₉ (folate). The caloric values for leaf, fruit and seed were 213.26, 241.66 and 176.61 Kcal/100g respectively. The fruit is also rich in minerals including potassium, calcium, zinc, magnesium, phosphorus and iron, and is a good source of dietary fiber. Medicinal value of bitter melon has been attributed to its high antioxidant properties due in part to phenols, flavonoids, isoflavones, terpenes, anthroquinones, and glucosinolates, all of which confer a bitter taste (Baby, J., 2013). The other major compound that has been isolated from the seeds of bitter melon is a glycol alkaloid known as vicine. This pyrimidine nucleoside has been shown to

induce hypoglycemia in non-diabetic fasting rats by intraperitoneal administration. However, vicine found in fava bean has been shown to induce favism, an acute disease characterized by hemolytic anemia, in individuals with a hereditary loss of the enzyme glucose-6-phosphatedehydrogenase (Basch, WE., 2003). Although there have been no reports on favism induced by bitter melon, individuals susceptible to the disease should avoid eating the fruit. Further studies are required to ensure the safety and efficacy of using vicine to treat hyperglycemia (Baby, J., 2013).



Fig.1. Karela ripe fruit

Research has shown that Karela extract can decline blood sugar (Karunanayake, EH. Tennekoon, KH., 2003). Karela can also be used to reduce glucose levels in diabetics. Although hypoglycemic agents and insulin used to treat diabetes, have complications such as weight gain, gastrointestinal and liver function disorders. Since natural medicines are safer than other ones, so they are more efficient (Mohammady et al, 2012). It has been observed that Karela juice has the capability to reduce blood sugar in animals, as an experimental diabetic, and also in human in both type 1 and 2 diabetes. Scientists have identified

three groups of compounds in Karela, which are responsible for reducing blood sugar, sitosterol glucoside, and stigmasterol glucoside is one that can be potentially replaced by insulin treatment (Gadang, 2011). Another compound, polypeptide p (plant insulin), was found in Karela seeds and fruits that is so similar to insulin, so it can be effective in the treatment of type 1 diabetes. The third compound is alkaloid that is effective in reducing blood sugar. Compounds known as oleanolic acid glycosides can be effective in glucose tolerance of type 2 diabetes (Choudhary, 2012). Karela juice treatment leads to decline blood glucose levels, improve body weight and glucose tolerance. Karela juice can inhibit intestinal absorption of glucose through stimulating glucose uptake by skeletal muscle cells. In addition, the plant juice leads to maintain β -cells and their function, adjust systolic blood pressure, modulates xenobiotic metabolism and oxidative stress (Celia et al, 2003). Karela has also anti-cancer properties. Karela is extremely useful in treating diabetes. Substances can be found in Karela that lead to the activation of AMPK, which is a protein that helps regulate glucose uptake (a process which has been impaired in diabetic patients) (Tan et al, 2008; Viridi et al, 2003; Shetty et al, 2005; Krawinkel, MB., Keding, GB., 2006; Miura, 2001). Ripe fruit (Fig.1) and green fruit (Fig. 2) are shown in the following figures:



Fig.2. Karela green fruit

The plant contains several biologically active compounds including momordicin I, momordicin II, and cucurbitacin B. The plant also contains several active glycosides including momordin, charantin, charantosides, goyaglycosides, momordicosides and other terpenoid compounds including momordicin, momordicosides, momordicilin, momordenol, momordol and also contains cytotoxic proteins (inactive ribosomes) such as momorcharin and momordin (Ortigao, M., Better, M., 1992). Two compounds of α -eleostearic acid (from seeds) and 15, 16 dihydroxy- α -eleostearic fruit acid (from fruits) are derived from Karela, which lead to induce apoptosis of cancer cells in vitro (Kobori et al, 2008). A diet containing 0.01 % Karela oil (0.006 % eleostearic) prevents from azoxymethane stimulation, which causes colon cancer in mice (Kohno, 2004). The researchers found that Karela extract eliminates breast cancer cells and inhibits their proliferation. Karela is used as a medicine for the treatment of gastrointestinal diseases in Togo traditional medicine and Karela extracts has shown activities against the spiral nematode worm *Caenorhabditis elegans in vitro* (Beloin et al, 2005). In Togo, the plant is traditionally used against viral diseases such as chickenpox and measles. Karela leaf extract was examined *in vitro* and showed activities against herpes simplex virus. Experiments show that compounds in Karela are effective for the treatment of HIV infection (Jiratchariyakul, 2001).

III. CONCLUSION

Proteins, Glycosides, saponins, and minerals (iron, phosphorus, and potassium) abound in Karela. Furthermore, oleanolic acid, momordicin, cucurbitanoids, charantin and insulin are found in Karela.

In addition, there are large amounts of vitamin A, vitamin C and beta-carotene in Karela. In traditional medicine, Karela fruit, leaves, seeds, and roots are used to treat flatulence, wounds, bacterial infections, high blood pressure, fever, and inflammation. Moreover, the extensive studies are conducting on the anticancer effects of this plant.

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