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Research paper

Therapeutic Benefits of Commercially Available Gourd Family in Improvement and Sustainability of Human Health

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Abstract

Cucurbit family are a fruit producing plants with 130 genera and 800 species and it is one of the genetically discrete groups of food plants such as pumpkin, cucumber, squash, gourd and melon. Cucurbit family provide an important dietary fibre, β-carotene (pro-vitamin A), potassium and vitamin C. Consuming dietary fibre regularly can prevent diabetes mellitus, obesity and cardiovascular disease. Pumpkin (*cucurbita maxima*) is widely cooked as desserts in Malay cuisines. 60-80% content of polysaccharides in pumpkin pulp functions as anti-tumour, anti-diabetic, hypolipidemic, and immune-stimulating activities. Winter melon (*Benincasa hispida*) is a source of water soluble polysaccharides, vitamin C while the taste is pleasant, sub acid and aromatic juicy flesh; a great source of functional food production and can be stored up a year. Rockmelon (*Cucumis melo L*) has nutritional value namely carbohydrates, ascorbic acid, folic acid and potassium while the seeds are rich in oil and protein, and the compounds of this fruit are functioning to prevent cancer, fighting depression, dandruff, ulcers and stimulate the immune system. The red flesh of watermelon (*Citrulus lanatus*) has anti-carcinogenic compounds. Cucurbit fruits have blood glucose lowering properties and the active ingredient has been shown to be polysaccharides; able to modulate the immune system, anti-tumour, decrease inflammation and act as hypoglycaemic agent.

Keywords: *Benincasa hispida; Cucurbit; Dietary fiber; Polysaccharides; Pumpkin; Rock melon; Watermelon*

1. Introduction

There are five sub families of Cucurbit; *Fevillaeae, Melothrieae, Cucurbitaceae, Sicyoideae, and Cylanthereae*. The main cultivated generas namely *Cucurbita L*., *Cucumis L*., *Citrullus L*., *Lagenaria L*., and *Luffa L*. The *Luffa L*. is found in the sub family *Cucurbitaceae* and *Sechium L*., found in the sub-family *Sicyoideae*. These cultivated generas are different by genetic barriers and can be analysed based on morphological characteristics [1]. The other cucurbit plants for production are cucumber, melon, squash and pumpkins.

Cucurbitaceae family is one of the most genetically discrete groups of food plants and planted in areas with tropical regions [2]. Cucurbit characteristics are frost-sensitive, drought-tolerant, and outraged to wet and poorly drained soils. Cucurbit fruits are fleshy, edible and pericarp and the taste of this pericarp usually sweet namely rock melon, water melon, honeydew, another one is starchy which are gourds, pumpkins, and squashes [3]. Cucurbits can be planted worldwide with approximately 130 genera and 800 species [4].

Cultivated cucurbits are varying in fruit characteristics although those are similar in ground development and root habit such as, summer squash are eaten during immature while watermelon during mature. Squash-baked, cucumbers-pickled and eaten as salad, watermelon-candied, while melon eaten as dessert. Seeds and flowers of squash and pumpkin and chayote's root are consumed by humans. Apart from food purposes, bottle gourd had been used for bottles, utensils, drinking containers, smoking pipes, musical instruments, gourd craft decoration, masks and floats for fish nets; the mature fibre from loofah fruit can be used as a sponge for personal hygiene, filtration and household cleaning [5].

In China, *cucurbita moshata* has been used as a traditional medicine and healthy food as they believed it is good for spleen and lungs [6]. Cucurbits exhibit medicinal properties, traditional medicine particularly the Chinese, and Ayurvedic systems uses various parts of cucurbit including its seeds and flesh [4]. Traditional medicinal polysaccharides have been showed towards physiological properties namely tumour growth inhibition, wound healing, immunomodulation and hypoglycaemic effects [7]. Cucurbit family is between 200 plants to have blood glucose lowering properties. Between several cucurbit extracts, its active ingredients is polysaccharides as found in pumpkin [8] which interacts with organisms that cause a change in biological activity. Polysaccharides are able to modulate the immune system through the stimulation of macrophages, an anti-tumour effects, decrease inflammation, hypoglycaemic agent [9]. Polysaccharides is a good medicine as they are often eaten in the diet and unlikely to be harmful to the patients [10].

Pumpkin (*Cucurbita moschata*)

The pumpkins in Malaysia are originated from species *Cucurbita moschata* and *Cucurbita moschata duchesne*. Among the locals, they are known as *labu manis* and *labu loceng*. *Labu loceng* is available only in Kedah while *labu manis* is planted in almost every states in Malaysia. The shape of *labu manis* is sphere while *labu loceng* is like a bell. The colour of young fruit is green

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and the mature is pale yellow. The storing of pumpkin is more than 6 months if wax is not removed. It has water soluble vitamins such as B_1, B_2, niacin and vitamin C, minerals namely potassium, manganese, copper while seed has high vitamin E.

The content of Vitamin A is 8 µg/g–16 µg/g and keeps increasing after three months storage [11]. Pumpkin powder recorded 7.10% protein, 3.10% fat, 1.80% moisture, 5.70% ash and 82.30% carbohydrate, respectively (Md Nor, 2013).
Several bioactive molecules namely proteins, peptides, polysaccharides, sterols and para-aminobenzoic acid are available in seeds, flesh, and leaves [12]. Pumpkin pulp is rich in carbohydrate especially polysaccharides (60-80%) and functioning as anti-tumour, anti-diabetic, hypolipidemic, and immune-stimulating activities [13].

The polysaccharide extracted from *C. moshata* caused a significant, non-competitive inhibition of α-glucosidase at concentrations of 0.7-0.9 mg/mL tested in an enzymatic reaction [14]. In addition, the powdered pumpkin has shown significant hypoglycaemic properties in human type 2 diabetes sufferers due to the polysaccharide components [15]. The functions of protein-bound polysaccharides are through lowering blood glucose concentrations, increase serum insulin levels and improving glucose tolerance in rats which have been treated with alloxan and destroys their β cells and it induces diabetes.

However, this effect may have been due to the antioxidant nature of the polysaccharide protecting the pancreatic β cells [16]. A clinical study has been done towards 30 patients with Type II Diabetes (T2DM), they were treated with polysaccharide granules from pumpkin. From the result urination and blood tests, compared to the control group, their condition were improved and this showed that polysaccharides from pumpkin are capable in controlling glycaemia [17].

Winter melon (*Benincasa hispida*)

According to Index of Nutritional Quality (INQ), winter melon is valued as a high quality vegetable [2]. This fruit is regularly eaten by Chinese and Indian households due to its pleasant taste, sub acid and aromatic juicy flesh. Winter melon has several names such as *Kundur* (Malay), *Bhuru Kolu* or *Safed Kolu* (Gujarati), *Petha* (Hindi), *Kushamanda* (Sanskrit), *donggua* (Chinese), *Fak kio* (Thailand), *Calabaza china* or *Calabaza blanca* (Spanish), *Kondol* (Philippines), and *Bleego* (Indonesian) while English names; winter melon, ash gourd, ash pumpkin, white gourd, white pumpkin, gourd melon, tallow gourd, wax gourd and Chinese watermelon or Chinese preserving melon [18].

Winter Melon is originated from South-East Asia and has been cultivated last 2000 years [2]. Several researches have been done on the biologically active components of winter melon species and its antioxidant activity works on different tissues which are liver and brain [19]. Winter melon has vitamin C and riboflavin contents, nutrients; organic acids, natural sugars, amino acids, vitamins and mineral elements [2]. Moreover, there is significant amount of gallic acid present in it [20]. Winter melon is a source of water-soluble polysaccharides, is known as arabinogalactans, followed with alcohol insoluble residues from winter melon fruits which contain high amounts of homogalacturonan [21].

Natural sugars that present are glucose and fructose; when the fruit matured, the level of glucose reduced from 0.9% to 0.5%, while fructose is 0.8% to 0.5% [22]. In China, India, Nepal, Cuba and Southeast Asian regions, the mature winter melon fruits have been added as additional ingredients in soup also in the preparations of other dishes [18]. In Korea, winter melon is consumed to treat diabetic complications [23]. Winter melon is anti-mercurial, antidote for alcohol poisoning, laxative, diuretic and can cure internal haemorrhages and constipation, anti-obesity, anti-inflammatory, anti-diarrhoeal, anti-pyretic, anti-compulsive [24], anti-ulcer and diuretic [2].

Therefore, Asian communities have been using winter melon fruit for the treatment of ulcer, epilepsy, diabetic complications, hypertension, nervous disorders and Alzheimer disease in their traditional medicinal system [25]. Winter melon oil extracted from seeds is shown to be good for the brain and capable to cure syphilis [26].

Rockmelon (*Cucumis melo L.*)

Rockmelon is a commercially important crop in some countries and harvested in all temperate regions of the world due to its good adaptation to soil and also climate [27]. Its family is found in temperate region of Africa, Central Asia and Mediterranean [28]. Rock melon or also known as muskmelon is a popular fruit due to its sweet, juicy flesh, pleasant aroma and eaten during summer [27]. In Malaysia, rock melon is a well-known fruit especially '*Golden Langkawi*' with striking golden yellow colour. Rock melon is enriched with nutritional value such as carbohydrates; water can be obtained from the fruit flesh while the seeds are rich in oil and protein [29].

The natural sugars in rock melon are sucrose, glucose and fructose [30]. Rock melon seeds contain 50% fat, 28% protein, 2-7% fibre, 3.6% ash and 8.2% carbohydrate [31]. Cucurbitacin-β, Li and Zn are predominant compounds in rock melon which give function in preventing cancers, fighting depression, dandruff, ulcers and stimulating the immune system [32]. Rockmelon contain Vitamin C which functions as a water soluble antioxidant in the human body, keeping the immune system healthy by reducing cold, prevent from bacterial infections and protect the human body from free radical damage [33]. Although it has low fat, sodium, vitamin E, folic acid, Fe and Ca; essential nutrients still can be found namely potassium, β-carotene and vitamin C [32].

Watermelon (*Citrulus lanatus*)

There was 95.8% composition of moisture, 0.2g of protein, 0.2g of fat, 3.3g of carbohydrate, 11g of calcium, 1mg of vitamin C and 16kcal of energy was present in this watery fruit [34]. In addition, watermelon is a good source of Vitamin B, especially B_1, B_6 and minerals; K and Mg. One hundred grams of watermelon provides 8.1mg of Vitamin C and 569 IU vitamin A, corresponding to 13.5% of the daily value (DV) for vitamin C and 11.38% of the DV for vitamin A [35]. Essential fatty acids such as palmitic, stearic, oleic, and linoleic of watermelon seeds constituted more than 80% fatty acids content of oil [36].

Urease, a rich source of enzyme can be found in watermelon seeds, functions as a diuretic and helps in treating chronic or acute eczema [37]. In other watermelon part, the rind which contain vitamin A, C, B_6 and essential minerals such as Mg and K functions in relaxing blood vessels and treating erectile dysfunction. Citrulline, which is the non-protenious amino acid, has shown significant antioxidant effect which prevents the body from free-radical damage. During conversion to another amino acid, Arginine is released and it is important to protect heart, circulatory system and immune system [38].

2. Conclusion

Cucurbit plants are consumed by human since ages due to their healthy and medicinal uses and also the other parts of plants. Carotene, protein and carbohydrate merely polysaccharides of pumpkin reveal functions as anti-tumour, anti-diabetic, hypolipidemic, and immune-stimulating activities. Winter melon is a source of organic acids, natural sugars, amino acids, gallic acid, arabinogalactans as water-soluble polysaccharides followed with

alcohol insoluble residues which contain high amounts of homogalacturonan while the natural sugars are glucose and fructose. Compounds in rock melon namely cucurbitacin-β, Li, and Zn are functioning in preventing cancers, fighting depression, dandruff, ulcers and stimulating the immune system. Watermelon has nutritional values through its carotene content; vitamin C and vitamin A thus needed by human body to neutralise free radicals. Watermelon has a good source of Vitamin B; B_1 and B_6, K and Mg while palmitic acid, stearic acid, oleic acid, and linoleic acid can be found in watermelon seeds. Soluble and insoluble fibres such as cellulose, pectin and inulin can provide indirect benefits as prebiotics. Therefore, there is necessitate to investigate the pharma-nutritional properties among the gourd family as an alternative functional food ingredients that capable to reduce severity of particular diseases.

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