

## Standardization of garden cress seeds powder incorporated food products

P. DEEPALAKSHMI\*<sup>1</sup> AND K. KARTHIGA<sup>2</sup>

<sup>1</sup>M.Sc. Student and <sup>2</sup>Assistant Professor

Department of Home Science with Food Biotechnology,  
Fatima College (Autonomous), Mary Land, Madurai (T.N.) India

### ABSTRACT

Garden Cress (*Lepidium sativum*, family – Brassicaceae) has been considered as an important Nutritional and Medicinal plant due to its Health Promoting Properties. It is grown in all parts of India and known as “Common Cress”, “Land Cress”, and “Haliv” etc. Its seeds are rich source of protein, dietary fiber, omega-3 fatty acids, iron and other essential nutrients and phytochemicals. It can be stated that Garden Cress seeds are packed with power of nutrients. The aim of the present study was to standardize various food products viz., Idiyappam, Kozhukattai, Coconut burfi, Sweet Seedai, Ribbon murukku, and Health mix by incorporating roasted Garden cress seeds powder at the level of 5 and 10%, respectively. These food products were evaluated by a panel of judges using score card with nine point hedonic scale rating. The sensory attributes like colour, flavour, texture, consistency, taste and overall acceptability of five per cent Garden cress seeds incorporated food products secured highest scores than 10% garden cress seeds powder incorporated food products. Nutrients like Moisture, Energy, Carbohydrate, Protein, Fat, Crude fibre,  $\beta$  – Carotene, Vitamin C, Calcium, Phosphorus, Iron, Potassium, Magnesium, Zinc and Phytochemical constituents such as Antioxidants, Flavonoids and Polyphenol content were analysed in Garden cress seeds powder, Control and five per cent Garden cress seeds powder incorporated food products viz., Idiyappam, Kozhukattai, Coconut burfi, Sweet seedai, Ribbon murukku and Health mix. The results revealed that the nutrient and phytochemical constituents were high in five per cent garden cress seeds powder incorporated food products than control samples. Hence the developed food products can be recommended for all age groups.

**Key Words :** Constraints, Improved production technology, Socio-economic profile, Suggestions

### INTRODUCTION

Garden cress seeds are small, oval-shaped, pointed and triangular at one end, about three to four mm long, one to two mm wide, reddish brown in colour. A furrow present on both surfaces extending up to two thirds downward, a slight wing like extension present on both the edges of seed. The seed length and width are 298  $\mu$ m and 100  $\mu$ m, respectively (Sreeram *et al.*, 2005).

The seeds constitute the most remarkable concentration of Protein (22-26g/100g), Iron (100mg/100g), and other nutrients like Thiamine (0.59mg/100g), Riboflavin (0.61mg/100g), and Niacin (14.3mg/100g) which can combat malnutrition, anaemia and micronutrient deficiencies. It provides

good amount of calories (454 K cal/100g) and Fat (24.5g/100g). It acts as a memory boosters as it contains essential fatty acids like Arachidic and Linoleic acid. It has a good source of Calcium (377mg/100g), Phosphorus (723mg/100g) and Magnesium (430mg/100g) which helps in normal contraction of muscle and healthy bones. It can be said like Garden cress seeds are packed with power of nutrients (Snehal *et al.*, 2009).

Garden cress has been considered as an important nutritional and medicinal plant in India since the Vedic era (between 500-1700 B.C.). In ayurveda, it is described as hot, bitter, galactagogue and claimed to destroy vata (air) and kapha (phlegm). Seeds contain alpha linolenic acid (30.2 %) which helps to decrease platelet aggregation, total cholesterol, low density lipoprotein (LDL) and triglycerides in human and rats (Steptoe *et al.*, 2006).

Food products developed by incorporating garden cress seeds, could be beneficial for nourishing as well as therapeutic agents due to the presence of various therapeutic properties like hypoglycaemic, hypotensive, fracture healing and anticancerous (Kelvin *et al.*, 2011).

The medicinal importance of garden cress seeds was known to Arab, Albania, Serbia, Greece and India as rubifacient, emenagogue, laxative, tonic, aphrodisiac and diuretic. The seeds are also used in the treatment of anaemia, diarrhoea, bleeding piles and to enhance sexual desire (Agarwal *et al.*, 2008).

Garden cress seeds contain iron content of about 100mg/100g. Thus, it can be used to treat global health problem called Anaemia. Many studies revealed that garden cress seeds possess numerous health benefits and supplementation of different garden cress seeds incorporated products were proved to be beneficial to prevent anaemia (Chowald *et al.*, 2008).

Keeping all these above points in to consideration, the present study was undertaken with the following objectives.

- To formulate Garden cress seed powder incorporated food products.
- To assess the sensory evaluation and nutrient content of the formulated food products.

## METHODOLOGY

The present investigation was carried out in the Nutrition Research Laboratory of the Department of Human Nutrition and Nutraceuticals, Fatima College (Autonomous), Madurai. The raw materials were purchased from Departmental stores in Madurai and Garden cress seeds from Amazon online shopping market.

### **Preliminary preparation of selected ingredients :**

The procured raw materials such as Bajra, Rice flakes, Roasted Bengal gram Bengal gram Curry leaves, Coriander leaves, Carrot, Beans, Green chillies, Tomato, Onion, Cumin seed, Omum, Sesame seeds, Almond, Cashew nut, Jaggery and Sugar are cleaned to remove dust, dirt, stones and other foreign materials. Garden cress seeds were roasted at a temperature of 50 °C for five minutes in order to reduce the pungent smell, then it was ground and it is sieved to obtain fine powder. The prepared powder was used to make various products *viz.*, Idiyappam, Kozhukattai, Coconut burfi, Health mix, Sweet seedai and Ribbon murukku.

### **Standardization of garden cress seeds powder incorporated food products :**

Garden cress seeds have high nutritive value and enormous health benefits. It was made into fine powder and incorporated in different products such as Idiyappam, Kozhukattai, Coconut burfi,

Health mix, Sweet seedai and Ribbon murukku .Garden cress seeds were incorporated at the level of 5% and 10% in all the formulated products, respectively. Standardized procedure was followed for all the formulated recipes by Philip (2004).

#### **Development of Garden cress seeds powder incorporated Idiyappam :**

Weighed amount of raw rice was procured, cleaned, washed and soaked for 2 hours. Drain the water well, spread it on a cloth for few minutes and make it into a fine powder, sieve the powdered flour and use it for further preparation. Then add little amount of water and salt to the rice flour and incorporate 5 and 10 per cent roasted garden cress seeds powder and knead into soft dough. When it is warm, extrude the prepared dough in Idiyappam extruder, steam it in idli mold cook for 15 minutes and finally season it. Control, 5 and 10 per cent Garden cress seeds powder incorporated Idiyappam were developed and evaluated for its acceptability.

#### **Development of Garden cress seeds powder incorporated Kozhukattai :**

Weighed amount of raw rice was procured, cleaned, washed and soaked for 2 hours. Drain the water well, spread it on a cloth for three hours and make it into a fine powder. Then sieve the powdered flour and use it for further preparation. Heat oil, add mustard seeds, bengal gram dhal, chopped carrot, beans, green chilli, curry leaves and saute for few minutes. Then add little amount of water and salt to the rice flour and incorporate 5 and 10 per cent roasted garden cress seeds powder. When it is warm, make oval shapes and finally arrange all the prepared Kozhukattai in a greased idli mold and steam cook for 15 minutes. Control, 5 and 10 per cent Garden cress seeds powder incorporated Kozhukattai were developed and evaluated for its acceptability.

#### **Development of Garden cress seeds powder incorporated Coconut burfi :**

Measured quantity of sugar was taken to prepare the sugar syrup in thick single string consistency. Add grated coconut, cardamom, ghee and roasted garden cress seed powder was incorporated at the level of 5% and 10%, respectively. Stir the mixture continuously in medium flame. After it reached the correct consistency, pour the burfi mixture in the greased tray and cut into small pieces. Control, 5 and 10 per cent Garden cress seeds powder incorporated Coconut burfi were developed and evaluated for its acceptability.

#### **Development of Garden cress seeds powder incorporated Sweet seedai :**

Weighed amount of raw rice was procured, cleaned, washed and soaked for 2 hours. Drain the water well, spread it on a cloth for three hours and make it into a fine powder. Then sieve the powdered flour and use it for further preparation. Measured quantity of jaggery was taken to prepare the syrup in thick single string consistency. Add sesame seeds, ghee and incorporated 5% and 10% roasted garden cress seeds powder and knead into soft dough. Make small balls, deep fry at 120° C for 5 minutes and cooled. Control, 5 and 10 per cent incorporated Garden cress seeds powder incorporated Sweet seedai were developed and evaluated for its acceptability.

#### **Development of Garden cress seeds powder incorporated Ribbon murukku :**

Measured quantity of raw rice was procured, cleaned, washed and soaked for 2 hours. Drain the water well, spread it on a cloth for few minutes and make it into a fine powder. Then sieve the powdered flour and use it for further preparation. Add raw rice flour, bengal gram flour, cumin seeds, sesame seeds, omum, butter and incorporate 5 and 10 per cent roasted garden cress powder

and mixed together, as per the proportion of ingredients and make into a soft dough. Extrude the mixture and deep fry it at 180° C for 3 minutes and cooled. Control, 5 and 10 per cent Garden cress seeds powder incorporated Ribbon murukku were developed and evaluated for its acceptability.

**Development of Garden cress seeds powder incorporated Health mix :**

Weighed amount of rice flakes, bajra, roasted bengal gram, almond, cocoa powder and jaggery were taken and 5% and 10% roasted garden cress seeds were grounded into a fine powder. Control, 5 and 10 per cent Garden cress seeds powder incorporated Health mix were developed and evaluated for its acceptability.

**Organoleptic evaluation :**

Garden cress incorporated food products viz., Idiyappam, Kozhukattai, Coconut burfi, Health mix, Sweet seedai and Ribbon murukku were prepared by incorporating garden cress seeds powder at the level of 5% and 10%, respectively. It was evaluated by a panel of judges using score card with nine point hedonic scale rating.

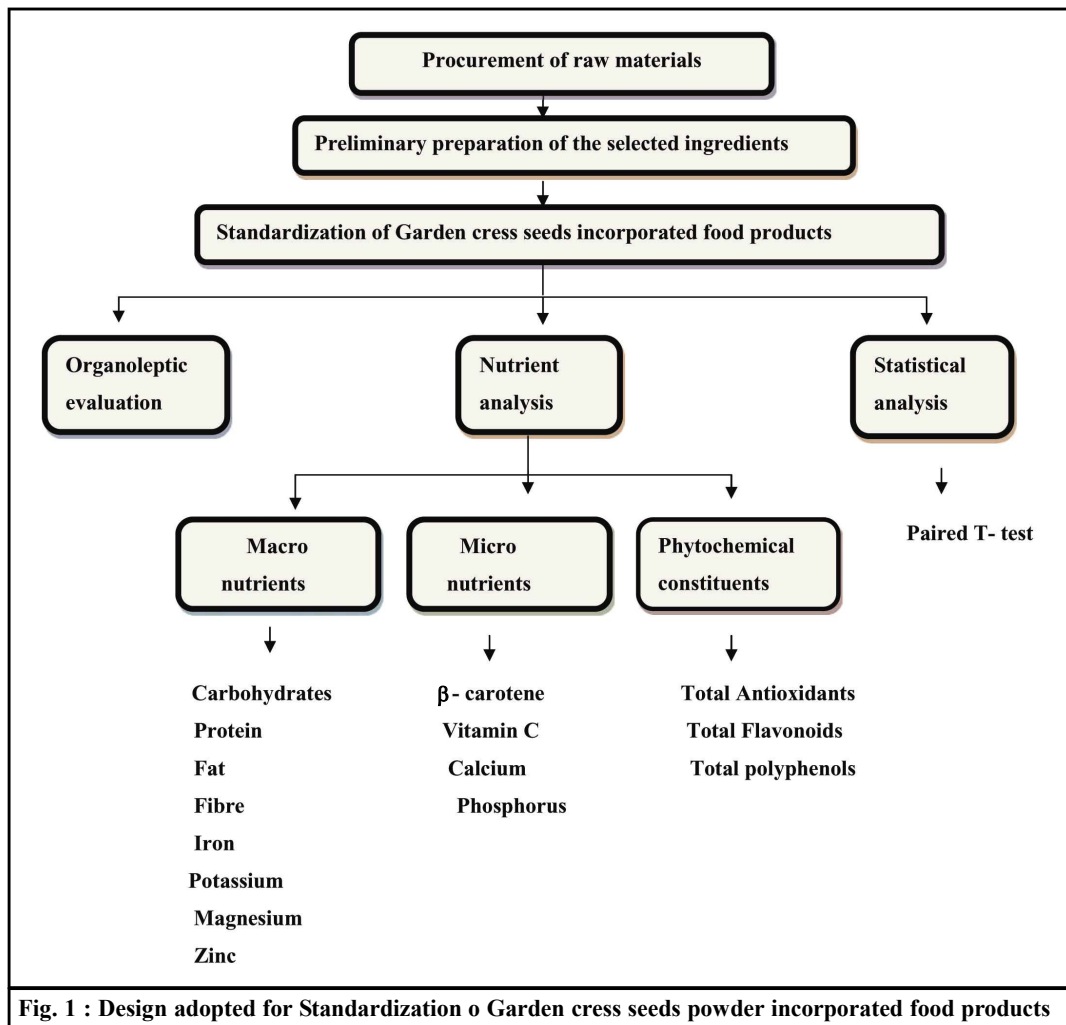


Fig. 1 : Design adopted for Standardization o Garden cress seeds powder incorporated food products

**Nutrient analysis :**

The development and evaluation of control and 5% Garden cress seeds powder incorporated food products were subjected to nutrient analysis namely Energy, Protein, Fat, Carbohydrate, Crude fibre, Calcium, Phosphorous, Magnesium, Iron, Vitamin C,  $\beta$ -carotene, Zinc, Moisture and Ash content, Polyphenols, Flavonoids, Antioxidants and Phytic acid .

**Statistical analysis :**

The results obtained in the Nutrient analysis of the control and garden cress seeds powder incorporated products were statistically analysed by using paired T- test.

The design adopted for the “Standardization of Garden cress seeds powder incorporated food products” are shown in Fig. 1.

**RESULTS AND DISCUSSION****Acceptability of Control and Garden cress seeds powder incorporated Idiyappam :**

Idiyappam was prepared by incorporating roasted Garden cress seeds powder at the level of 5 and 10%, respectively and the acceptability for each sensory attributes is discussed in Table 1.

Table 1 : Mean scores obtained for the overall acceptability of Control and Garden cress seeds powder incorporated Idiyappam						
Sensory attributes	Colour	Flavour	Texture	Taste	Overall acceptability	Overall mean scores
Control	8.2	8.1	7.8	8.2	8.1	8.1
GCSP11	8.4	8.2	8.8	8.7	8.2	8.5
GCSP12	8	7.8	7.5	8.3	8	7.9

GCSP11-5% Garden cress seeds powder incorporated Idiyappam

GCSP12-10% Garden cress seeds powder incorporated Idiyappam

**Acceptability of Control and Garden cress seeds powder incorporated Kozhukattai :**

Kozhukattai was prepared by incorporating roasted Garden cress seeds powder at the level of 5 and 10%, respectively and the acceptability for each sensory attributes is discussed in Table 2.

Table 2 : Mean scores obtained for the overall acceptability of Control and Garden cress seeds powder incorporated Kozhukattai						
Sensory attributes	Colour	Flavour	Texture	Taste	Overall acceptability	Overall mean scores
Control	8.1	8.1	8.1	8	8	8.1
GCSPK1	8.2	8.3	8.2	8.2	8.5	8.3
GCSPK2	8	8	8	8	8	8

GCSPK1- 5% Garden cress seeds powder incorporated Kozhukattai

GCSPK2-10% Garden cress seeds powder incorporated Kozhukattai

**Acceptability of Control and Garden cress seeds powder incorporated Coconut burfi :**

Coconut burfi was prepared by incorporating roasted Garden cress seeds powder at the level of 5 and 10%, respectively and the acceptability for each sensory attributes is discussed in Table 3.

**Table 3 : Mean scores obtained for the overall acceptability of Control and Garden cress seeds powder incorporated Coconut burfi**

Sensory attributes	Colour	Flavour	Texture	Taste	Overall acceptability	Overall mean scores
Control	8	8.1	8.1	8.4	8.5	8.2
GCSPICB1	8.2	8.2	8.4	8.5	8.7	8.4
GCSPICB2	8	8	8.1	8.2	8.4	8.1

GCSPICB1-5 %Garden cress seeds powder incorporated Coconut burfi

GCSPICB2-10%Garden cress seeds powder incorporated Coconut burfi

**Acceptability of Control and Garden cress seeds powder incorporated Sweet seedai :**

Sweet seedai was prepared by incorporating roasted garden cress seeds powder at the level of 5 and 10%, respectively and the acceptability for each sensory attributes is discussed in Table 4.

**Table 4 : Mean scores obtained for the overall acceptability of Control and Garden cress seeds powder incorporated Sweet seedai**

Sensory attributes	Colour	Flavour	Texture	Taste	Overall acceptability	Overall mean scores
Control	8.2	8.2	8	8.1	8.4	8.2
GCSPISS1	8.4	8.8	8.2	8.4	8.2	8.4
GCSPISS2	8	8	7.9	7.8	8	7.9

GCSPISS1- 5%Garden cress seeds powder incorporated Sweet seedai

GCSPISS2-10%Garden cress seeds powder incorporated Sweet seedai

**Acceptability of Control and Garden cress seeds powder incorporated Ribbon murukku:**

Ribbon murukku was prepared by incorporating roasted Garden cress seeds powder at the level of 5 and 10%, respectively and the acceptability for each sensory attributes is discussed in Table 5.

**Table 5 : Mean scores obtained for the overall acceptability of Control and Garden cress seeds powder incorporated Ribbon murukku**

Sensory attributes	Colour	Flavour	Texture	Taste	Overall acceptability	Overall mean scores
Control	8	8.1	8	8.2	8.2	8.1
GCSPIRM1	8.4	8.4	8.2	8	8.3	8.3
GCSPIRM2	8.1	8	8	7.9	8	8

GCSPIRM1- 5 % Garden cress seeds powder incorporated Ribbon murukku

GCSPIRM2-10 % Garden cress seeds powder incorporated Ribbon murukku

**Acceptability of Control and Garden cress seeds powder incorporated Health mix :**

Health mix was prepared by incorporating roasted garden cress seeds powder at the level of 5 and 10%, respectively and the acceptability for each sensory attributes is discussed in Table 6.

The results revealed that 5% Garden cress seeds powder incorporated food products secured highest scores in all the sensory attributes, which was more or less equal to that of the control sample followed by 10% Garden cress seeds powder incorporated food products .

**Nutrient analysis of Garden cress seeds powder, Control and 5% Garden cress seeds powder incorporated food products :**

The sensory scores were found to be high in 5% Garden cress seeds powder incorporated

**Table 6 : Mean scores obtained for the overall acceptability of Control and Garden cress seeds powder incorporated Health mix**

Sensory attributes	Colour	Flavour	Consistency	Taste	Overall acceptability	Overall mean scores
Control	8.2	8.2	8.1	8.2	8	8.1
GCSP1HM1	8.2	8.5	8.5	8.4	8.4	8.4
GCSP1HM2	8	8	8.1	8	7.5	7.9

GCSP1HM1-5% Garden cress seeds powder incorporated Health mix

GCSP1HM2-10 %Garden cress seeds powder incorporated Health mix

food products than 10% Garden cress seeds powder incorporated food products. Hence, 5% Garden cress seeds powder incorporated food products were selected for Nutrient and Phytochemical analysis.

#### Nutrient analysis of Garden cress seeds powder :

The nutrient content of Garden cress seeds powder is given in Table 7.

**Table 7 : Nutrient content of GCSP**

Sr. No.	Nutrients	GCSP
1.	Moisture (g %)	7.2
2.	Energy (K cal)	26
3.	Carbohydrate (g)	10.2
4.	Protein (g)	3.3
5.	Fat (g)	4.6
6.	Crude fibre (g)	3.2
7.	$\beta$ – carotene ( $\mu$ g)	15.8
8.	Vitamin C (mg)	2.4
9.	Calcium (mg)	18.62
10.	Phosphorus (mg)	29.65
11.	Iron (mg)	6.72
12.	Potassium (mg)	69.13
13.	Magnesium (mg)	17.22
14.	Zinc (mg)	1.01

GCSP- Garden cress seeds powder

The Moisture, Energy, Carbohydrate, Protein, Fat, Crude fibre,  $\beta$ – Carotene, Vitamin C, Calcium, Phosphorus, Iron, Potassium, Magnesium and Zinc content of Garden cress seeds powder (100g) were 7.2g % , 26Kcal, 10.2g, 3.3g, 4.6g, 3.2g, 15.8 $\mu$ g, 2.4 mg, 18.62 mg, 29.65mg, 6.72mg, 69.13 mg, 17.22 mg and 1.01mg, respectively.

Phytochemical constituents of Garden cress seeds powder is given in Table 8.

**Table 8 : Phytochemical constituents of GCSP**

Sr. No.	Phytochemical constituents	GCSP
1.	Antioxidants (mmol)	6.41
2.	Flavonoids (mg CAE/gm)	5.35
3.	Polyphenols (mg GAE/gm)	4.82

GCSP- Garden cress seeds powder

The Phytochemical constituents such as Antioxidants, Flavonoids and Polyphenol content of Garden cress seeds powder (100g) were 6.41mmol, 5.35mg CAE/gm and 4.82mg GAE/gm, respectively.

Ahila and Sharma (2014) conducted a experimental study on nutrient analysis of three and seven per cent Garden cress seeds powder and reported that it contains 5.6 mg of Iron, 345.5mg of Potassium, 75.8 mg of Calcium and 3.4 mg of Zinc in three per cent and 8.2 mg of Protein, 67.8 mg of Phosphorus and 15.5 mg of Magnesium in seven per cent Garden cress seeds powder.

#### Nutrient analysis of Control and Garden cress seeds powder incorporated food products:

The nutrient content of the Control and Garden cress seeds powder incorporated food products are given in the Table 9 and 10.

Table 9 : Nutrient content of Control and Garden cress seeds powder incorporated food products							
Sr. No.	Nutrients	Control	GCSPIII	Control	GCSPIK1	Control	GCSPICB1
1.	Moisture (g%)	15.6	10.2	18.9	23.4	15.6	19.2
2.	Energy (K cal)	289	293	281	286	495	498
3.	Carbohydrate (g)	62.1	64.0	56.5	57.1	48.7	52.7
4.	Protein (g)	10.6	13.2	6.1	7.4	7.1	9.4
5.	Fat (g)	1.6	1.9	1.2	1.8	23.4	27.2
6.	Crude fibre (g)	3.4	4.2	1.5	2.1	2.7	2.9
7.	$\beta$ – carotene ( $\mu$ g)	405.0	408.3	840.9	935.8	69.2	73.3
8.	Vitamin C (mg)	12.1	13.5	16.7	18.5	3.4	3.9
9.	Calcium (mg)	77.62	80.01	78.32	89.54	15.71	34.23
10.	Phosphorus (mg)	162.03	187.06	195.01	207.02	159.32	180.56
11.	Iron (mg)	7.62	11.08	5.32	9.08	2.32	6.62
12.	Potassium (mg)	296.23	303.72	308.62	356.34	287.23	297.36
13.	Magnesium (mg)	39.52	56.58	39.56	56.53	36.94	58.82
14.	Zinc (mg)	1.36	1.54	1.38	1.55	2.81	4.74
	Paired 'T' test	S	S	S	S	S	S
	Sign(2- tailed)	0.01		0.04		0.03	

The Moisture, Energy, Carbohydrate, Protein, Fat, Crude fibre,  $\beta$  – Carotene, Vitamin C, Calcium, Phosphorus, Iron, Potassium, Magnesium and Zinc content of Control Idiyappam were 15.6g%, 289Kcal, 62.1g, 10.6g, 1.6g, 3.4g, 405.0 $\mu$ g, 12.1mg, 77.62mg, 162.03mg, 7.62mg, 296.23mg, 39.52mg, 1.36mg and in 5% Garden cress seeds powder incorporated Idiyappam (GCSPIII1), it was 10.2g%, 293Kcal, 64.0g, 13.2g, 1.9g, 4.2g, 408.3 $\mu$ g, 13.5mg, 80.01mg, 187.06mg, 11.08mg, 303.72mg, 56.58mg and 1.54mg, respectively.

The Moisture, Energy, Carbohydrate, Protein, Fat, Crude fibre,  $\beta$  – Carotene, Vitamin C, Calcium, Phosphorus, Iron, Potassium, Magnesium and Zinc content of Control Kozhukattai were 18.9g%, 281Kcal, 56.5g, 6.1g, 1.2g, 1.5g, 840.9 $\mu$ g, 16.7mg, 78.32mg, 195.01mg, 5.32mg, 308.62mg, 39.56mg, 1.38mg and in 5% Garden cress seeds powder incorporated Kozhukattai (GCSPIK1), it was 23.4g%, 286Kcal, 57.1g, 7.4g, 1.8g, 2.1g, 935.8  $\mu$ g, 18.5mg, 89.54mg, 207.02mg, 9.08mg, 356.34mg, 56.53mg and 1.55mg, respectively.

The Moisture, Energy, Carbohydrate, Protein, Fat, Crude fibre,  $\beta$  – Carotene, Vitamin C,



Table 10 : Nutrient content of Control and Garden cress seeds powder incorporated food products							
Sr. No.	Nutrients	Control	GCSPISS1	Control	GCSPIRM1	Control	GCSPIHM1
1.	Moisture (g%)	9.8	7.3	8.5	6.3	12.1	15.3
2.	Energy (K cal)	402	408	410	425	352	364
3.	Carbohydrate (g)	75.2	78.0	58.6	59.8	66.3	68.2
4.	Protein (g)	7.8	9.2	10.5	13.2	8.0	10.6
5.	Fat (g)	8.0	12.3	18.5	20.4	4.9	5.6
6.	Crude fibre (g)	1.2	1.9	2.6	3.8	1.6	1.9
7.	$\beta$ – carotene ( $\mu$ g)	12.3	15.4	137.2	188.3	15.7	18.5
8.	Vitamin C (mg)	4.2	4.5	4.8	5.2	3.5	3.8
9.	Calcium (mg)	270.31	325.05	242.93	248.62	65.23	78.52
10.	Phosphorus (mg)	209.65	215.93	265.34	273.07	207.39	220.92
11.	Iron (mg)	5.92	8.35	7.56	10.63	10.21	14.54
12.	Potassium (mg)	349.87	356.73	278.53	281.37	278.26	281.03
13.	Magnesium (mg)	15.09	21.54	64.51	67.63	67.33	72.57
14.	Zinc (mg)	2.87	3.39	3.41	4.22	1.28	1.44
	Paired 'T' test	S	S	S	S	S	S
	Sign(2- tailed)		0.02		0.04		0.01

Calcium, Phosphorus, Iron, Potassium, Magnesium and Zinc content of Control Coconut burfi were 15.6g%, 495Kcal, 48.7g, 7.1g, 23.4g, 2.7g, 69.2 $\mu$ g, 3.4mg, 15.71mg, 159.32mg, 2.32mg, 287.23mg, 36.94mg, 2.81mg and in 5% Garden cress seeds powder incorporated Coconut burfi (GCSPICB1), it was 19.2g%, 498Kcal, 52.7g, 9.4g, 27.2g, 2.9g, 73.3  $\mu$ g, 3.9mg, 34.23mg, 180.56mg, 6.62mg, 297.36mg, 58.82mg and 4.74mg, respectively.

The Moisture, Energy, Carbohydrate, Protein, Fat, Crude fibre,  $\beta$  – Carotene, Vitamin C, Calcium, Phosphorus, Iron, Potassium, Magnesium and Zinc content of Control Sweet seedai were 9.8g%, 402Kcal, 75.2g, 7.8g, 8.0g, 1.2g, 12.3 $\mu$ g, 4.2mg, 270.31mg, 209.65mg, 5.92mg, 349.87mg, 15.09mg, 2.87mg and in 5% Garden cress seeds powder incorporated Sweet seedai (GCSPISS1), it was 7.3g %, 408Kcal, 78.0g, 9.2g, 12.3g, 1.9g, 15.4  $\mu$ g, 4.5mg, 325.05mg, 215.93mg, 8.35mg, 356.73mg, 21.54mg and 3.39mg, respectively.

The Moisture, Energy, Carbohydrate, Protein, Fat, Crude fibre,  $\alpha$  – Carotene, Vitamin C, Calcium, Phosphorus, Iron, Potassium, Magnesium and Zinc content of Control Ribbon murukku were 8.5g%, 410Kcal, 58.6g, 10.5g, 18.5g, 2.6g, 137.2 $\mu$ g, 4.8mg, 242.93mg, 265.34mg, 7.56mg, 278.53mg, 64.51mg, 3.41mg and in 5% Garden cress seeds powder incorporated Ribbon murukku (GCSPIRM1), it was 6.3g%, 425Kcal, 59.8g, 13.2g, 20.4g, 3.8g, 188.3  $\mu$ g, 5.2mg, 248.62mg, 273.07mg, 10.63mg, 281.37mg, 67.63mg and 4.22mg, respectively.

The Moisture, Energy, Carbohydrate, Protein, Fat, Crude fibre,  $\alpha$  – Carotene, Vitamin C, Calcium, Phosphorus, Iron, Potassium, Magnesium and Zinc content of Control Health mix were 12.1g%, 352Kcal, 66.3g, 8.0g, 4.9g, 1.6g, 15.7 $\mu$ g, 3.5mg, 65.23mg, 207.39mg, 10.21mg, 278.26mg, 67.33mg, 1.28mg and in 5% Garden cress seeds powder incorporated Health mix (GCSP IHM1), it was 15.3g%, 364Kcal, 68.2g, 10.6g, 5.6g, 1.9g, 18.5  $\mu$ g, 3.8mg, 78.52mg, 220.92mg, 14.54mg, 281.03mg, 72.57mg and 1.44mg, respectively.

The phytochemical content of the Control and Garden cress seeds powder incorporated food products are given in the Table 11 and 12.

The Phytochemical constituents such as Antioxidants, Flavonoids and Polyphenol content of

Phytochemical constituents	Control	GCSPIII1	Control	GCSPIK1	Control	GCSPICB1
Antioxidants (mmol)	18.31	25.23	12.34	15.43	14.38	18.44
Flavonoids (mg CAE/gm)	13.55	19.37	15.56	20.65	15.59	19.66
Polyphenols (mg GAE/gm)	14.39	20.12	13.71	17.17	16.71	21.16
Paired 'T' test	S	S	S	S	S	S
Sign (2- tailed)		0.03		0.04		0.01

Phytochemical constituents	Control	GCSPISS1	Control	GCSPIRM1	Control	GCSPIHM1
Antioxidants (mmol)	13.68	18.23	12.68	18.26	12.62	18.26
Flavonoid(mg CAE/gm)	16.59	19.66	14.57	17.65	15.56	19.65
Polyphenols (mg GAE/gm)	18.71	21.18	18.73	23.17	18.71	21.17
Paired 'T' test	S	S	S	S	S	S
Sign( 2- tailed)		0.03		0.01		0.02

Control Idiyappam were 18.31 mmol, 13.55mg CAE/gm and 14.39mg GAE/gm and in 5% Garden cress seeds powder incorporated Idiyappam (GCSPIII1), it was 25.23 mmol, 19.37 mg CAE/gm and 20.12 mg GAE/gm, respectively.

The Phytochemical constituents such as Antioxidants, Flavonoids and Polyphenol content of Control Kozhukattai were 12.34 mmol, 15.56mg CAE/gm and 13.71mg GAE/gm and in 5% Garden cress seeds powder incorporated Kozhukattai (GCSPK1), it was 15.43 mmol, 20.65 mg CAE/gm and 17.17 mg GAE/gm, respectively.

The Phytochemical constituents such as Antioxidants, Flavonoids and Polyphenol content of Control Coconut burfi were 14.38 mmol, 15.59mg CAE/gm and 16.71mg GAE/gm and in 5% Garden cress seeds powder incorporated Coconut burfi (GCSPICB1), it was 18.44mmol, 19.66mg CAE/gm and 21.16 mg GAE/gm, respectively.

Dhekshan *et al.* (2013) conducted a study on physicochemical, sensory, microbial evaluation and development of garden cress seeds incorporated Bhujia. The nutrients present in the formulated product were 18 g of Carbohydrate, 1.7 g of Protein, 1.5 g of Fibre and 4.3 mg of Iron, respectively.

Kirthi *et al.* (2013) conducted a study on development, nutrient and antioxidant analysis of three per cent garden cress seeds incorporated Puttu. The nutrients present in the formulated puttu were 4 g of Protein, 5 mg of Iron, and 12.8 mg GAE/gm of Antioxidant, respectively.

Preethi *et al.* (2012) conducted a study on formulation of three per cent germinated garden cress seeds incorporated Pudding and the nutrients present in the formulated product were 6.8 g of Protein, 5.2 g of Crude fibre, 7.3 mg of Iron, and 327.65 mg of Potassium, respectively.

The Phytochemical constituents such as Antioxidants, Flavonoids and Polyphenol content of Control Sweet seedai were 13.68 mmol, 16.59mg CAE/gm and 18.71mg GAE/gm and in 5% Garden cress seeds powder incorporated Sweet seedai (GCSPISS1), it was 18.23 mmol, 19.66 mg CAE/gm and 21.18 mg GAE/gm, respectively.

The Phytochemical constituents such as Antioxidants, Flavonoids and Polyphenol content of Control Ribbon murukku were 12.68 mmol, 14.57mg CAE/gm and 18.73mg GAE/gm and in 5% Garden cress seeds powder incorporated Ribbon murukku (GCSPIRM1), it was 18.26 mmol, 17.65 mg CAE/gm and 23.17 mg GAE/gm, respectively.

The Phytochemical constituents such as Antioxidants, Flavonoids and Polyphenol content of Control Health mix were 12.62 mmol, 15.56mg CAE/gm and 18.71mg GAE/gm and in 5% Garden cress seeds powder incorporated Health mix (GCSPH1M1), it was 18.26 mmol, 19.65 mg CAE/gm and 21.17 mg GAE/gm, respectively. The statistical analysis of data revealed that there was a significant difference between the control and 5% garden cress seeds incorporated food products.

Nippet was formulated by incorporating three per cent germinated garden cress seeds and the nutrients were analysed. The nutrients present in the developed nippet were 20.3 g of Carbohydrates, 7.2 g of Protein, 2.17 mg of Zinc, 34.76 mg of Magnesium, respectively (Jenifer *et al.*, 2009).

Sweet appam was developed by incorporating five per cent roasted garden cress seeds and the nutrients present in the formulated product were 8.2 g of Protein, 78.09mg of Calcium, 5.21 mg of Iron, 477.98 mg of Potassium, respectively (Shravan *et al.*, 2010).

Dubey *et al.* (2014) conducted a study on Utilization of dehydrated herbs in the formulation of value added Rice flakes mix. The nutrients present in the formulated product were 8.7 mg of Iron, 23 mg GAE/gm of Flavonoids and 15.6 mg RE/gm of Polyphenols, respectively.

## REFERENCES

- Agarwal, N., Srivastava, K. and Aseer, P. (2008). Therapeutic importance of Garden cress seeds. *J. Nutri. & Food Technol.*, **14**(1): 340-343.
- Chowald, C., Kensiya, J. and Karif, M. (2008). Nutrient composition of Garden cress seeds and its effect on Anaemia. *J. Food Chem.*, **21**(3): 806-812.
- Dubey, M., Pramodha, S. and Lakshmi (2014). A study on development and analysis of sprouted garden cress seeds powder incorporated Rice flakes mix. *J. Food Sci. & Agric.*, **6**(4): 139–149
- Jenifer, F., Shwetha, A., Celine, Jenika, G and Purni (2009). Nutrient analysis of garden cress seeds incorporated Nippet. *J. Food Sci. & Nutri.*, **11**(6): 177–181.
- Kelvin, Y., Fareedha, S. and Reena (2011). Therapeutic Properties of garden cress seeds. *American J. Med. Sci.*, **17**(3): 400 - 405.
- Kirithi, S.M, Kasabe, Archana and Anita, A. (2013). A study on clinical efficacy and nutrient analysis of *Lepidium sativum* seeds in treatment of various diseases and development of Puttu. *Iran J. Pharmacol.*, **5**: 55–65.
- Philip, E.T. (2004). *Modern cookery : For Teaching and the Trade (Sixth Edition)*. Orient Blackswann publishers, pp. 455-507.
- Preethi, J., Padma, Anees, F., Gopal and (2012) conducted a study on formulation and nutrient analysis of germinated garden cress seeds incorporated Sandwich. *The Open Nutraceuticals J.*, **9**(5): 87-89.
- Shravan, L., Hilda, Subiksha and Thaniska (2011). Nutrient analysis of garden cress seeds incorporated products. *J. Food Sci. & Technol.*, **15**(6): 145–148.
- Snehal, S.K., Yahya, Mossa, JS., Ageel and Rafatullah.U. (2009). Nutrient composition of *Lepidium sativum*. *Internat. J. Phytomedicine*, **3**(1): 155 -159.
- Sreeram, H., Helena and Rinja, F. (2005). Garden cress seeds its production and distribution. *J. Food Sci. & Agric.*, **16**(5): 177–181.
- Stephoe, N., Seelin, J. and Sugathi, K. (2006). Garden cress seeds in Vedic era and its nutritional importance. *J. Food Technol.*, **5**: 55-56.

\*\*\*\*\*