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PHYTOCHEMICAL SCREENING AND EVALUATION OF ANTIOXIDANT EFFICACY OF SELECTED CULINARY MICROGREENS

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ABSTRACT

Microgreens are seedlings of herbs and vegetables that are harvested at the emergence of two cotyledonary leaves. They are functional foods whose consumption is increasing regularly because of their high sustenance. They are a group of fresh produce that are rich in phytochemicals as well as secondary metabolites such as carotenoids, ascorbic acid and polyphenols. However the genetic diversity of microgreens in phytonutrients has yet to be discovered. The present study focuses on the antioxidant activity of the selected culinary microgreens belonging to the families *Fabaceae* and *Brassicaceae.*

Keywords: Functional foods; Sustenance; Phytochemicals; Secondary metabolites; Phytonutrients.

INTRODUCTION

Microgreens are seedlings of herbs and vegetables that are harvested at the emergence of two cotyledonary leaves. They are plant based functional foods that are considered as the “New Superfood”. These superfoods include seedlings of vegetables, herbs or other plants that improves the nutritional value of human diet. They are small in size and have an intense flavour, crunchy texture, a vivid colour and also shows a very interesting beneficial properties for human health that makes them an opportunity for both pharmaceutical market and food industry. Therefore, they can be used as an ingredient in salads, sandwiches and soups that helps in enhancing their texture, colour and flavour. They also can be used in main dishes as edible garnish to brighten up the dishes

Another important aspect of microgreens is that they can be used as an alternative to the conventional food resources since their production is fertilizer and pesticide free. They can be grown in any growth medium with minimum requirements. They also offer opportunity to increase the sustainability of vegetable production. Since the production of greens is an easy process as they only need water, light and a substrate to grow on and due to their high nutritional value, it can replace other food sources, thus preventing the over-exploitation of

natural resources.

Scientific data's regarding the exact phytochemical content and nutritional value of microgreens are not available though they have been claimed a nutritionally beneficial. Limited studies have revealed the higher levels of vitamins, minerals and other phytonutrients in the young seedlings than in the mature plants. The present study focuses on the analysis of antioxidant activity of the selected 5 culinary microgreens belonging to the family *Fabaceae* and *Brassicaceae.*

MATERIALS AND METHODS

1) *Collection of seeds*
2) *Soaking of seeds*
3) *Preparation of the growth medium* –Aluminium foil tray filled with normal garden soil
4) *Sowing of seeds*
5) *Harvesting*

PREPARATION OF THE EXTRACT:

The powdered greens of each species were weighed to 1g and introduced to 25ml acetone. Acetone extraction was carried out by magnetic stirrer and filtered. After the extraction process, extract along with the solvent is evaporated to dryness to obtain the residue. Dried residue scraps out and weighed and the residue was solubilized in 80% acetone for getting final concentration of 1mg/ml. Extracts were stored for further studies.

The extract of the selected microgreens were tested for phytochemical screening and antioxidant assay test. Preliminary phytochemical screening was conducted by different tests. Antioxidant assay was carried out by two methods, namely DPPH assay and reducing antioxidant power assay (FRAP).

PHYTOCHEMICAL SCREENING:

(Raaman, 2006; Kokate et al., 2001).

ANTIOXIDANT ACTIVITIES:

- DPPH RADICAL SCAVENGING ACTIVITY – (Moraes-de-Souza et al., 2008).
- MODIFIED FERRIC ION REDUCING ION REDUCING ANTIOXIDANT POWER (FRAP) ASSAY – (Pulido et al., 2000).

RESULTS

1) *Phytochemical screening:*

	GREEN GRAM	BENGAL GRAM	COWPEA	FENUGREEK	MUSTARD
ALKALOIDS	+	+	+	+	+
CARBOHYDRATES	-	-	-	-	-
GLYCOSIDES	+	+	+	+	+
SAPONINS	-	-	-	-	-
FLAVONOIDS	+	+	+	+	+
TANNINS	-	-	-	-	-
PHENOLS	-	-	-	-	-
PROTEINS	+	+	+	+	+
AMINO ACIDS	-	-	-	-	-
STARCH	-	-	-	-	-

Table: 1- Phytochemical screening of the selected 5 microgreens

2) *Antioxidant activities:*

a) DPPH RADICAL SCAVENGING ACTIVITY:

Sl. No:	Sample concentration (µg/mL)	Absorbance at 517nm				
		Green gram	Bengal gram	Cowpea	Fenugreek	Mustard
1	20	9.55 ± 0.001	9.27 ± 0.0005	9.16 ± 0.0005	9.03 ± 0.002	9.3 ± 0.001
2	40	13.9 ± 0.001	22.1 ± 0.001	16.76 ± 0.001	14.3 ± 0.0005	17.7 ± 0.0005
3	60	31.3 ± 0.001	41.8 ± 0.0005	33.59 ± 0.001	31.2 ± 0.001	30.9 ± 0.001
4	80	44.98 ± 0.001	58.2 ± 0.002	50.48 ± 0.001	45.4 ± 0.001	47.4 ± 0.0005
5	100	72.5 ± 0.0005	66.94 ± 0.001	60.46 ± 0.0005	54.7 ± 0.001	64.93 0.001

Table :2- DPPH radical scavenging activity of the selected 5 microgreens

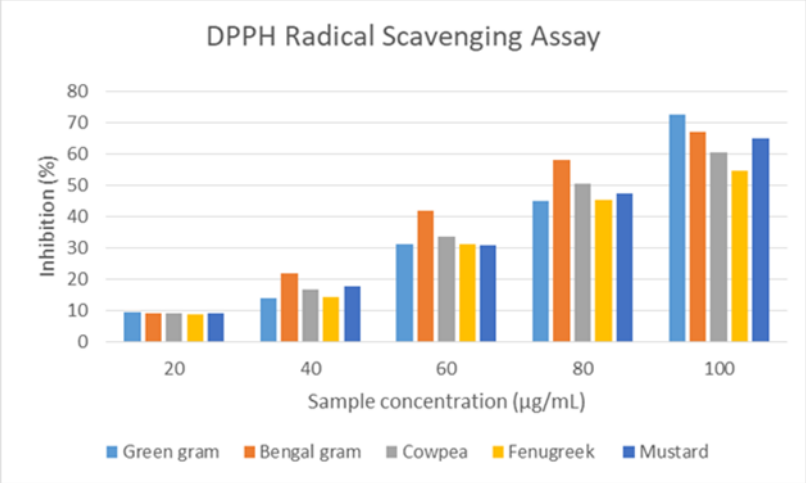

Fig:1-Comparison of DPPH radical scavenging activity of selected microgreens

b) MODIFIED FERRIC ION REDUCING ION REDUCING ANTIOXIDANT POWER (FRAP) ASSAY:

Sl. No:	Sample concentration (µg/Ml)	Absorbance at 700nm				
		Green gram	Bengal gram	Cowpea	Fenugreek	Mustard
1	20	17.35 ± 0.001	19.82 ± 0.0005	18.87 ± 0.0005	17.95 ± 0.0005	19.9 ± 0.001
2	40	19.2 ± 0.0005	21.15 ± 0.001	19.7 ± 0.002	19.96 ± 0.001	24 ± 0.0005
3	60	30.45 ± 0.001	27.4 ± 0.001	26.25 ± 0.001	27.4 ± 0.001	28.5 ± 0.002
4	80	40.16 ± 0.001	47.88 ± 0.0005	34.03 ± 0.001	37.5 ± 0.0005	38.6 ±0.0005
5	100	53.7 ± 0.001	63.06 ± 0.001	45.9 ± 0.001	57.2 ± 0.0005	65.6 ± 0.0005

Table :3- FRAP Assay of the selected 5 microgreens

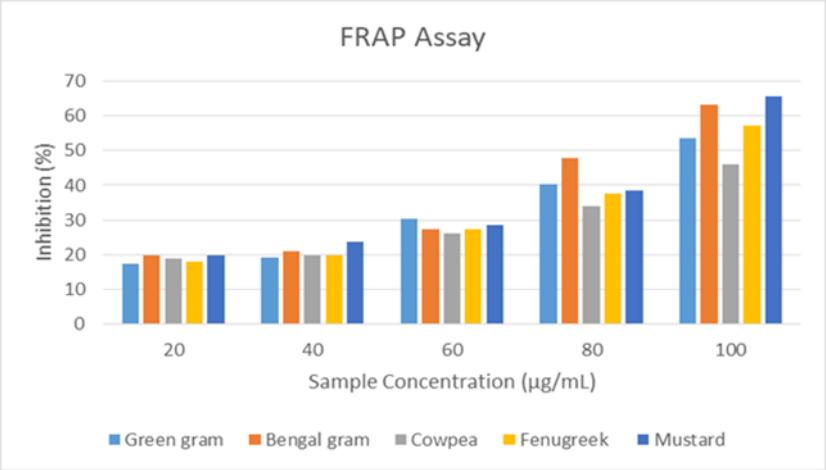

Fig:2- Comparison of FRAP assay of selected culinary microgreens

DISCUSSION

The preliminary phytochemical screening was carried out in acetone extracts of the five different microgreens namely, green gram, bengal gram, cowpea, fenugreek and mustard. Qualitative tests conducted in the extracts showed the presence of alkaloids, glycosides, flavonoids and proteins.

DPPH radical scavenging activity of acetone extract analysed at different concentrations such as 20,40,60,80 and 100 µg/mL revealed that, the radical scavenging activity of the sample increases with increase in the concentration of the extract. The graph reveals that green gram shows highest antioxidant potential than the other samples, followed by Bengal gram, mustard, cowpea and fenugreek.

Ferric ion reducing potential (FRAP) of acetone extract analysed at different concentrations such as 20,40,60,80 and 100 µg/mL revealed that, there is a gradual increase in the absorbance of the sample with increasing concentrations. This corresponds to an increase in the ferric ion reducing power of the extract. . The graph reveals that mustard shows highest antioxidant potential than the other samples, followed by Bengal gram, fenugreek, green gram and cowpea.

Earlier studies on microgreens were conducted on *Brassicaceae* species that contain several bioactive compounds with a favourable nutritional profile which include polyphenols, carotenoids, anthocyanins, ascorbic acid, total and reducing sugars, and antioxidant capacity. Because of their high nutritional value, microgreens can be perceived as a better alternative to conventional food resources.

Studies were also conducted by other workers on microgreens which indicates that microgreens can be regenerated after first harvest thus enabling multiple harvest from the same seeds. Hence, steady supply of crops are obtained without successive planting and no special care or treatment need to be provided for their growth. It also reduces the amount of seeds and substrates utilized for the cultivation and thereby reduces the overall expenditure.

CONCLUSION

Cultivation of microgreens is a sustainable and cost-effective practice which offers large -scale production of leafy vegetables without destructing the ecosystem. Depletion of natural resources can be controlled by growing microgreens with multi-nutritional values; which can be used as an alternative to conventional food supplement. This preliminary study regarding the phytochemical screening and antioxidant activity of microgreens indicates that large scale production of nutrient rich food resources can be carried out with minimum requirements.

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