Development of functional food products from Sesbania grandiflora flowers and leaves as an immune booster for chemotherapy and dialysis undergoing patients

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Abstract: Cancer and kidney failure are two non communicable, disorders that affects the quality of human life. Prevalence of CKD is 800 per million population (pmp), and the incidence of end-stage renal disease (ESRD) is 150–200 pmp. and the treatment involves the long term dialysis. The projected incidence of patients with cancer in India among males was 679,421 (94.1 per 100,000) and among females 712,758 (103.6 per 100,000). Globally physicians started prescribing nutraceuticals as a suitable immunobooster for these conditions to produce a good therapeutic effect. Plants have been one of the important sources of medicines since the beginning of human civilization. There is a growing demand for plant based medicines, health products, pharmaceuticals, food supplements and cosmetics. Sesbania grandiflora (L) is a multipurpose tree with edible flowers and is a source of one of the medicinal products. The proposal has been made for the functional food product of Sesbania grandiflora targeting chemotherapy and dialysis conditions with improved bioavailability. To validate the above said properties, malted beverage powder formulations of Sesbania grandiflora will be prepared by spray drying technique and will be characterized for size, stability, encapsulation efficiency
Keywords : Sesbania grandiflora, malted beverage powder, Anticancer, nephroprotective, bioavailabilty, oral dosage form.

Introduction

Cancer and kidney failure are two non communicable, disorders that affects the quality of human life. Prevalence of CKD is 800 per million population (pmp), and the incidence of end-stage renal disease (ESRD) is 150–200 pmp. and the treatment involves the long term dialysis. The projected incidence of patients with cancer in India among males was 679,421 (94.1 per 100,000) and among females 712,758 (103.6 per 100,000). Globally physicians started prescribing nutraceuticals as a suitable immunobooster for these conditions to produce a good therapeutic effect. Plants have been one of the important sources of medicines since the beginning of human civilization. There is a growing demand for plant based

medicines, health products, pharmaceuticals, food supplements and cosmetics. Sesbania grandiflora (L) is a multipurpose tree with edible flowers and is a source of one of the medicinal products. S. grandiflora (L) has unique medicinal properties and has been used as a herbal drug for its antibiotic, anthelmintic, anti-tumor and contraceptive properties. Sesbania grandiflora (Linn) belonging to the family Leguminosae contains plenty of sterols, saponins and tannins which are responsible for its various pharmacological properties. The various parts of the plant like roots, bark, leaves, flowers and fruits are known to possess different pharmacological properties. The present study intends to develop a fundamental food product comprising the chemical constituents present in the crude extracts of S. grandiflora (L) or marketed plant powder with special emphasis on their pharmacological actions. Qualitative phytochemical screening will be carried out.

Related work

Table 1. Compares this work with the related work or previous research by other researchers

Previous work	Parameter 1	Parameter 2	Parameter 3
[1] Vijay D. Wagh et al reported Phytochemical, pharmacological and phytopharmaceutics aspects of Sesbania grandiflora (Hadga) : A review.	No	Yes	No
[2] S Sreelatha 1, P R Padma, E Umasankari studied the Evaluation of anticancer activity of ethanol extract of Sesbania grandiflora (Agati Sesban) against Ehrlich ascites carcinoma in Swiss albino mice Anticancer activity of ethanol extract of Sesbania grandiflora (EESG) of both leaves and flowers were evaluated in Swiss albino mice against Ehrlich Ascites Carcinoma (EAC) cell line	Yes	No	No
[3] Araveti Sumana, Esuralla Sreedevi, M. Aruna 2018, Health	Yes	Yes	No

Enhancing Properties of an Edible Flower Sesbania Grandiflora (L) Poir (Agathi) Based Processed Product.			
To estimate the chemical constituents Development of suitable formulation of the functional food supplement To characterize the prepared functional food product To perform stability, biocompatability and bioavailability studies.	Yes	NO	Yes

Method, Experiments and Results

collection of Plant Material

Fresh plants were collected from a place named Kuzhipallam near Parassala, Kerala , India. The leaves were separated, washed under running tap water and shade dried at room temperature. The dried leaves were ground to fine powder using a blender. The powder was preserved in an air tight bottle for further use.

Extraction

A total of 40 g of Sesbania grandiflora leaves and 40 g of Sesbania grandiflora flowers were separately immersed in 250 mL and 250 mL of 70% acetone, respectively, in conical flasks. The mixtures were allowed to macerate for 48 hours at room temperature with occasional agitation. Following the extraction period, the solutions were filtered using Whatman No. 1 filter paper to remove residues and the resulting filtrates were concentrated under vacuum. The dried extracts were used for further studies. Essential oil was obtained using Clevenger distillation apparatus. A dried grounded leaves (30 g) was mixed with 500 mL purified water and submitted to extraction for 4 h at 120 °C.

Encapsulation efficacy

Further, acetone extract and essential oil of S. grandiflora were encapsulated using 3 different wall materials : gum Arabic (GUM_E), skim milk (SKIM_E), sodium caseinate (SOD_CAS_E).

A sum of 20% (w/v) of each single encapsulant was mixed with purified water . at 22–25 °C and left for 12 h. After that, all the mixtures were stirred using magnetic stirrer (MSH-20A, Witeg, Wertheim, Germany) for 30 min at 25 °C. The solutions with dissolved encapsulants were mixed with E. ciliata ethanolic extract (50 mL) and essential oil (10 µL) mixture. All the prepared mixtures were homogenized for 5 min at 4000 rpm using IKA T18 digital Ultra-Turrax homogenizer (Staufen, Germany). The mixtures

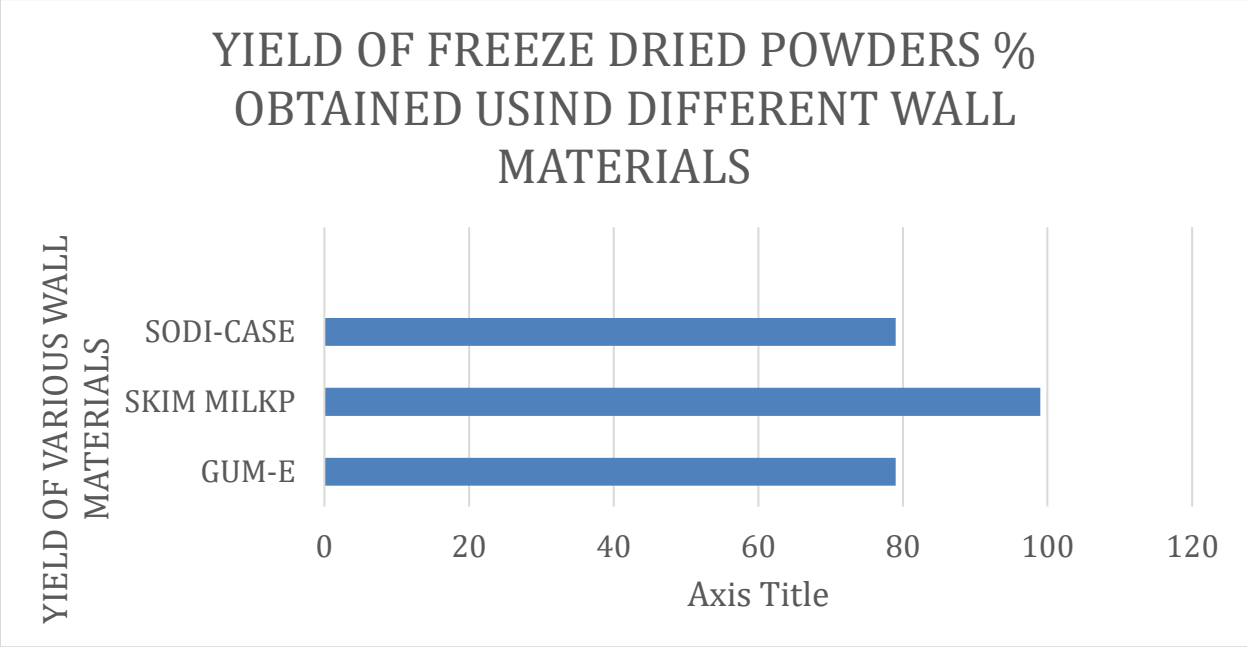
were frozen in the laboratory freezer FORMA™ 88,000 Series (Thermo Scientific, Waltham, MA, USA) at −80 °C for 24 h before the freeze-drying process. Finally, frozen samples were freeze-dried using laboratory freeze-dryer (LyoQuest Telstar, Wertheim, Germany) at −50 °C 0.05 mbar for 24 h. The freeze-dried powders were collected, packed in foil bags and stored in a dessicator prior to other analysis

Moisture content: The moisture content of the freeze-dried powders was measured by estimating the powder's weight loss after oven drying at 105 °C, until a constant weight was obtained
solubility : One gram of the sample was mixed with 25 mL of purified water for 5 min, using a magnetic stirrer MSH-20A (Witeg, Germany) at 300 rpm (25 °C). The mixture was transferred to a tube and centrifuged at 3000× g for 10 min at 25 °C, using centrifuge SIGMA3-18KS (Steinheim, Germany). A total of 20 mL of supernatant was transferred to a pre-weighed Petri dish and dried overnight in an oven at 105 °C. The solubility (%) of freeze-dried powder was calculated as the percentage of dried supernatant in relation to the amount of microcapsules by the equations:
Solubility =Residue after drying/Theoretical residue after drying× 100%

RESULTS

Phytochemical screening

Phytoconstituents	Leaf extracts	Flower extracts
Flavonoids (Alkaline reagent test)	+	+
Sterols (Liebermann Burchard test)	-	+
Alkaloids (Dragendroff's Test)	+	+
Saponins (Froth Test)	+	+
Phenols (Ferric Chloride Test)	-	-



Solubility and Moisture

MOISTURE	SOLUBILITY
GUM –E 8%	90%
SKIM MILK-E 3.8%	80%
SOD CASE 5.5%	50%

Discussions

The phytochemical screening done. Leaf extracts contain alkaloids flavanoids and saponins. Flower extracts additionally flower extracts contained sterols. Among the different wall materials used Skim milk powder showed maximum yield. Gum Arabic showed maximum solubility.

Conclusions

1. To estimate the chemical constituents in Development of suitable formulation of the functional food supplement To characterize the prepared functional food product. To perform stability, biocompatability and bioavailability studies

2. A functional food product was developed and formulation studies carried out. Skim milk powder was the best wall materials.
3. In vitro and invivo studies were unable to carry out due to time limit.

References

1) Araveti Sumana, Esuralla Sreedevi, M. Aruna 2018, Health Enhancing Properties of an Edible Flower Sesbania Grandiflora (L) Poir (Agathi) Based Processed Product. Indian Research Journal of Pharmacy and Science vol 17(2018), pp. 1439-1448.

2) Aruna Mesa & Sumana Araveti, 2017, Functional quality, sensorial and shelf life characteristics of Agathi (Sesbania grandiflora (L). Poir leaves enriched breads. Functional Foods in Health and Disease, vol 7(6), pp 429-441

3) G. Rachel & A. S. Priscilla, 2020, 'comparative screening and characterization of antiosteoporotic activity of sesbania grandiflora (l) poir crude leaf extract and its nanoparticle formulation on saos-2 cell lines'. International journal of Pharmaceutical sciences and research'. Vol. 11(12), pp 6371-6381.

4) Kanitta Jiraungkoorskul & Wannee Jiraungkoorskul, 2015, Sesbania grandiflora: new nutraceutical use as antidiabetic'. International Journal of Pharmacy and Pharmaceutical Sciences Vol 7(7), pp 26-29.

5) Krasaekoopt, Wunwisa Kongkarnchanatip & Areeya, 2005, 'Anti- microbial Properties of Thai Traditional Flower Vegetable Extracts'. AU J.T. 9(2), pp.71-74.

6) Krishna P. Laladhas, Vino T. Cheriyan, Vineshkumar T. Puliappadamba, Smitha V. Bava, Rajesh G. Unnithan, Parvathy L. Vijayammal & Ruby John Anto, 2010, A novel protein fraction from Sesbania grandiflora shows potential anticancer and chemopreventive efficacy, in vitro and in vivo. J Cell Mol Med, vol 14(3), pp 636-46.

7) Luana Fernandes & Elsa Ramalhosa, 2017, 'Edible flowers: A review of the nutritional, antioxidant, antimicrobial properties and effects on human health'. Journal of Food Composition and Analysis. Volume 60, pp. 38-50.

8) Nadhila B. Prabawati, Viki Oktavirina, Miguel Palma &Widiastuti Setyaningsih, 2021, Edible Flowers: Antioxidant Compounds and Their Functional Properties. Horticulturae, vol 7(4), pp 66.