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Research Article

DETERGENTS FROM SEED DE-OIL CAKE PROTEIN CONCENTRATES

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Abstract

Environment friendly liquid and powder detergents with better technical performance, have been formulated using Pumpkin (*Cucurbita maxima*, cucurbitaceae] and Watermelon [Cucumismelo, cucurbitaceae] seedde oil cake protein concentrates of Central India region, for possibly substituting petroleum based ingredients such as acid slurry. The prepared liquid and powder detergent formulations had good cleaning properties and compared well with commercial detergents. Comparable results have been obtained by using protein concentrates of pumpkin seed followed by watermelonde- oil cakes.

Keywords: detergents, protein concentrates, seed de- oil cakes.

Introduction

Oilcakes are by-products of the vegetable oil extraction industry. An estimated 80 percent of the total oilseeds produced in country is usually crushed to produce oil-meal for food and feed use.. Oil cakes are edible and non-edible. Edible oil cakes have a high nutritional value, have protein content ranging from 15% to 50%, due to which they are mostly used as animal feed or manure. Non-edible oil cakes such as Castor, Karanja, Neem are largely used as organic nitrogenous fertilizers. C/N ratio of oil cakes is usually narrow [1,2]. These can also be used as protein-fortified wheat flour, protein—rich bread, biscuits and confectionary

Pumpkin (3,4) is an annual climber growing up to 5 metres at a fast rate. The seeds can also be ground into a powder and used with cereals in making breads etc After the pumpkin seeds have been pressed to yield oil, a residue of crushed pumpkin seed remains. Work has been reported on Pumpkin seed oil from this laboratory[5,6,7].

Watermelon is cultivated (8) in the temperate and warm regions of the whole world. The rich composition of essential fatty acids contained in watermelon seed oil helps to restore elasticity to the skin. It, therefore, is also a wonderful addition to skin care formulations for all skin types, including dry, oily, acne-prone or maturing skin. Watermelon seed cake is the by-product obtained in the process of cold pressing of watermelon seed kernels.. The seed cake is used as manure and after processing, the seed cake can be used for partial usage in cosmetics and medicinal field.

Oilseed and oilcake proteins [9,10] in have ,in recent years, attracted the attention of biochemists, plant physiologists, physicists, and protein chemists because of their unique properties. Protein is [11] a high molecular weight compound that yield amino acid as their principal hydrolysis product. Proteins are large molecules with reactive groups such as carboxyl and amino, on their surface. The R group can be any one of

the 20 chains and is referred to as a side chain. In general, amino group is basic and the carboxyl group is acidic. Vegetable protein in a number of forms can be produced from defatted oil meals. This field of isolating protein sources from seed de-oiled cakes converting into products suitable for human consumption can be exploited by entrepreneurs

Surfactants, because of presence of hydrophilic and hydrophobic groups, has the tendency of dissolving in water and non-aqueous solvents. Surfactant solutions exhibit properties such as cleaning, foaming, wetting, emulsifying, and solubilizing. Detergents are formulations consisting of surfactant and inorganic or organic substances for improving the functional performance. Some work has been reported on detergents from this laboratory.[12,13].

Liquid detergents are becoming popular in household washing machines because of the advantage of being quickly dispersing in water, has a attractive appearance, perfume and packaging. Other uses include washing for dish, utensils, laundering for synthetic and woolen fabrics, scouring mineral oiled goods of wooden or worsted piece fabrics, shampoos, rug cleaning shampoos etc. They can be produced in simple plant, the diluent being water. Powder detergent is a

formulation comprising the essential constituents (surface active agents) and subsidiary constituents (builders, foam improver and boosters, fillers and auxiliaries).

Materials and Methods

Pumpkin and watermelon seeds were procured from local fruit dealers, dried, decorticated, powdered and extracted by solvent extraction process using n-hexane in the laboratory to yield the de-oiled cakes. The powdered de-oiled cakes were dried and analyzed for characteristics such as crude proteins content [14], moisture content and crude fiber content by the standard methods [15](Table 1). All the chemicals used were of best quality. Standard detergents were purchased from local market.

The cakes were treated with caustic solution(0.5%) in 1:20(w/v) ratio to isolate the proteins concentrates[16,17].The filteredprotein concentrates were collected and used further in detergents.

The protein concentrates thus obtained, were analyzed for moisture content, pH, % solids ,acid value and protien content% by standard methods (18,19) (Table 1)

Table 1. Analysis of seed de-oiled cakes and protein concentrates

Characteristic	Pumpkin seed		watermelon seed	
	DOC*	DOCPC**	DOC	DOCPC
Moisture content (%)	9.5	5.4	7.7	4.4
Crude proteins(%)	36.6	42.0	26.8	36.5
Crude fibre content (%)	7.6	--	34.5	--
Solids(%)	--	94.6	--	95.6
Acid value	--	1.3	--	1.4
pH	--	6.5	--	7.0

*DOC means de-oilcakes ,DOCPC** means de-oilcake protein concentrates

Formulation of liquid and powder detergents

Table 2 shows the composition of liquid and powder detergents For liquid detergents, the given amount of the ingredients were taken in a beaker and stirred for 30 minutes till a clear and transparent liquid detergent solution was obtained which was filtered and packed in air tight packaging

For powder detergents, the various ingredient powders are mixed properly in a tray. Then liquid ingredients and foam booster are then added and the mass is mixed thoroughly. This mixture is then poured in to a mixer. The homogeneous mass obtained was kept in open for drying. After complete drying, the mass is ground again in a mixer to get homogeneous detergent powder.

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Table 2 Formulation of Liquid and Powder detergents

ingredient	Liquid detergent %	Powder detergent %
Seed de-oilcake protein Concentrates	11	27
Sodium lauryl sulphate	08	--
Urea	04	--
Sorbitol	01	--
Sodium Hydroxide	02	--
Alpha olefin sulphonate	05	3
Acid Slurry	--	5
Sodium Carbonate	--	46
Sodium meta silicate	--	5
STPP	--	4
EDTA	--	1
Perfumes/color	1	1
Water	q.s.	q.s.
TOTAL	100	100

Analysis of liquid and powder detergents

0.5 % solution of formulated liquid detergents, along with commercial samples, were analyzed for solids%, moisture%, alcohol soluble %, pH, surface tension, foam volume t and detergency % (on cotton) by standard methods

[20,21,22]. All the formulated powder detergents were analyzed for the determination of alcohol soluble %, surface tension, solids %,moisture %, foam volume and detergency % by standard methods[23-25].The results are recorded in Table - 3.

Table 3 Analysis of detergents from seed de-oil cake protein concentrates

Characteristic	De-oiled cake protein concentrates				Market sample		
	Pumpkin		Watermelon		LD (for 0.5% concn.)	PD (for 1.0% concn.)	
	LD* (for 0.5% concn.)	PD** (for 1.0% concn)	LD (for 0.5% concn.)	PD for 1.0% concn.)			
Alcohol Soluble %	93.1	94.2	94.0	93.6	97.5	95.5	
Ph	7.5	--	7.6	--	7.5	--	
Moisture %	--	14.2	--	15.1	--	14.9	
Solids %	--	94.7	--	94.0	--	96.2	
Surface Tension dynes/	40.7	27.2	41.7	28.7	37.1	23.9	
Detergency %	81.0	84.4	80.0	83.8	85.4	87.7	
Foam vol.(ml.)	00 min	43	240	41	230	51	360
	15min	38	210	33	200	46	330

*LD means liquid detergent, **PD means powder detergent

Results

Pumpkin and watermelon de-oil cakes found in the Central India region have been analysed for percent total crude proteins content, percent moisture content and percent crude fibres content(Table 1).

Pumpkin DOC showed the highest proteins content(36.6%) followed by watermelon (26.8%).Crude fibres content varied from 7.6to34.5%.

Analysis of protein concentrates isolated from the two seed DOC for moisture content% , pH, protein content ,solids % and acid value is also shown in Table 1.

Discussion

Formulation of liquid and powder detergent samples were prepared from (Table 2)using seed DOC protein concentrates. The analysis of the detergents (Table 3)was carried out and the results compared with commercial liquid and powder detergent samples.

Liquid and powder detergent prepared had good foam stability, detergency, pH and comparable surface tension. From the formulations given and analysis (Table 3),it can be observed that the best formulation was obtained from pumpkin DOC which compared well with standard liquid detergent. It is observed that the properties of prepared liquid and powder detergents nearly equaled that of the commercial product

It has been shown that protein concentrates have their utility as an active ingredient of detergents. All the prepared compositions of detergents had comparable performance to commercial one with respect to detergency percentage and surface tension. Foaming property also gets improved.

It is concluded that the isolation of the protein is a low cost process and does not require highly skilled personnel. With a view to utilize and impart value addition protein concentrates from de-oiled cakes, liquid and powder detergents were produced to assess the feasibility of its commercial use in association non-petroleum and eco-friendly sources. Main ingredients of liquid detergents are natural in origin hence, prepared liquid detergent compositions can be economic and eco-friendly.

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