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Eco - Friendly Liquid Detergents from Soy-Bean and Rice Bran De- Oiled Cake Protein Concentrates.

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ABSTRACT

Eco-friendly liquid detergents from Protein concentrates obtained from Soyabean and Rice bran De Oil Cakes (DOC) of Vidarbha region have been formulated for exploring the possibility of substituting petroleum based acid slurry or AOS in detergents to obtain better technical performance by proper formulation.. Final liquid detergent formulation had good cleaning properties comparable with standard liquid detergents. The best liquid detergent was obtained by using protein concentrates of Soyabean DOC.

Keywords: Liquid detergents, Protein concentrates, Soyabean De Oil Cakes, Rice bran De Oil Cakes

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INTRODUCTION

Surfactant refers any substance whose presence in small quantity markedly alters the surface behavior of given system. There are certain solutes which when dissolved very low concentration having starting property of reducing the surface energy of solvent in which they dissolve to an extreme degree. Because of presence of hydrophilic group, a surfactant is more or less readily soluble in water. However, hydrophobic group is repelled by water so that there is a tendency for that portion of molecules to leave aqueous space. These lead to higher concentration, the surface or boundary than in the main body of solution. Surfactant solution exhibits combinations of cleaning, foaming, wetting, emulsifying, solubilising and dispersing properties.

Detergents refer to a combination of surfactant and other substances, inorganic or organic, formulated to enhance functional performance, specially cleaning, over that of surfactant alone. Surfactants have been a topic of study of many workers [1-6].

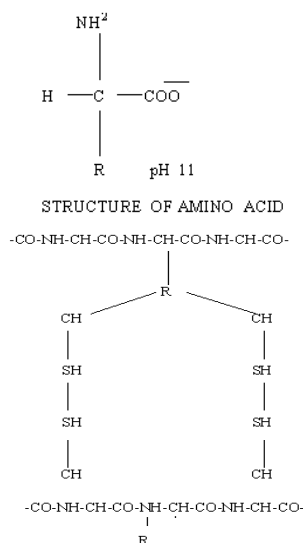
Of recent years, the light -duty liquid detergents have become more sophisticated and liquids have now appeared with builders for heavy - duty washing, both by hand, and more particularly, in household washing machines the advantages being that they can be made in relatively in simple plant and also the diluent is water, which costs very less...To the user, the advantage are that liquids are instantaneously dispersed in water, the material can be perfumed and be given a very attractive appearance and the container a glass or polythene bottle, for example- can be designed in such a way as to catch the eye.

Liquid detergents are generally prepared with the intention for household washing liquid mainly for dish, utensils etc are washing, Light duly laundering for synthetic and woolen fabrics, For scouring mineral oiled goods of wooden or worsted piece fabrics, shampoos, rug cleaning shampoos and other specific applications.

Liquid detergents [7] can be made from a variety of starting materials from similar plants.

A vessel quipped with a slow- speed stirrer is required and the stirrer should be positioned so that it is under the surface of the liquid, so as not to cause foaming. It is however, necessary that the vessel be of a non -corrodible.metal The general requirements of surfactants [8] for formulating liquid detergents are high solubility and cleaning power, stable foaming, less irritation and should be easily bio-degradable.

Protein [9] is high molecular weight compound that yield amino acid as their principal hydrolysis product. Proteins are large molecules with some reactive groups such as carboxyl and amino, on their surface. Protein is composed of structural units called amino acids. Each amino acid consists of amino acids, a carboxyl group, a hydrogen atom and an alkyl or aryl (R) group attached to a carbon atom. 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.



Proteins are available in different varieties of dietary sources including animals, plants origin, and from highly marketed spot supplement industry.

Deoiled seedcake is obtained after extraction of oil from oil seed. Although many varieties of seeds and fruits are cultivated primarily for their oil content, the protein-rich residues left after oil removal represent an immense resource upon which the world's production of animal protein for human consumption largely depends. In the tropics and sub-tropics, It contains several components that are utilised for preparation of value added products. It is expected that the seed cake can be put to use in its raw form as well as by being processed to yield higher value chemicals and other materials. Use of seed cake as a natural organic fertilizer is well known. Its increased use can replace much higher value chemical fertilizer. It also acts as a natural pesticide; increases yield and simplifies plant management. Seed cake can also be put to use for raising heat in a variety of ways from simple briquetting to biogas to producer gas.. De Oiled Cake is used as an organic supplement at the agricultural farms and has tremendous reuse value. Immense demand for De-Oiled Cake is received from global markets, mainly poultry forms and cattle feed manufacturers.

Soy-bean oil cake

It is produced from seeds of a very nutritive culture of soy in the process of oil production. Soya DOC is a product of extracting of oil from seeds of a soya during extrusion-pressing.. The oil cake has a high exchange energy, contains a lot of fiber, oil, mineral substances. The amino-acid structure of a soya oil cake is close to fibers of an animal origin. Soy-bean oil cake is the most quality plant raw material for production of combined foddors and is a protein base of the foddors. It is recommended to include up to 35 % of soy-bean oil cake to main ration of all types of agricultural animals, birds, and fishes. Soy-bean protein by its biological properties is close to proteins of animal origin and due to this is well digested by organism of animals. Soy-bean oil cake contains significant amount of protein and energy that allows to compose a ration with high content of proteins and energy without use of other expensive foddors.

Rice Bran De Oiled Cake

It is completely dry as these are obtained after the oil is extracted from it. There are rich in many nutrients thus in high demand for feeding dog, fish, horse, pig, other cattle. Besides, DOC contains digestible fiber as well as minerals and vitamins suitable for the improving the health of cattle. After crude oil has been extracted from Rice Bran, DOC obtained. It is widely used in manufacture of Cattle Feed, Fish Feed, Dog Feed, Chicken Feed, Horse Feed, Pig Feed, As a fuel for boilers, ingredients of poultry and cattle feeds. The De Oiled Rice Bran is widely used as feeding materials for animals as it is high in nutritional content. Benefits include Rich in proteins, Low in fats, Rich in the valuable amino acids, Low fiber content and having adequate metabolic energy

EXPERIMENTAL TECHNIQUES

Sources of Materials

The De oil cakes(DOC) were procured from local oil industries in Nagpur and nearby areas of Vidarbha region.. The chemicals used were of AR quality. Standard liquid detergents were purchased from local market.

The DOC were analyzed for Total Crude Proteins content [10], Moisture content, and Crude Fibers content by the standard methods [11].

Table 1: Analysis Of DOC

DOC	Total Crude Proteins content (%)	Moisture content (%)	Crude Fibers content (%)	Moisture content (%)
Soyabean	48.5	11.1	6.3	8.6
Rice bran	18.3	12.4	12.2	6.3

For the isolation and analysis of proteins concentrates from DOC [12], they are treated with an aqueous solution of NaOH (0.5% solution) in the ratio of 1:20(w/v,DOC/alkali).. The mixture of cake and alkali is heated at temperature of 50⁰ C over a period of 3hrs. Then the mixture is cooled and filtered by a cloth to remove residue .Filtrate The liquor containing protein and soluble carbohydrate" has a disagreeable odor which is removed to a greater extent by treating the liquor with maleic anhydride (10 %) to pH alkaline.The liquor is then neutralized to a pH of 8-8.5 by adding aqueous solution of citric acid (50:50).The liquor is brought to isoelectric point (Ph 4.5 -5.2) by adding cone. Hydrochloric acid The liquor (concentrates) is then filtered and protein is collected from the filter cloth and used in detergent.

Protein concentrates are analyzed for Moisture content, pH, Viscosity ,% solids and Acid value by standard methods [13,14]

Table 2: Analysis of seed DOC protein concentrates

DOC	Moisture content%	pH	Solids %	Acid value
Soybean	4.6	5.1	95.3	1.1
Rice bran	7.5	5.5	96.3	1.0

The Formulation of Liquid Detergents is given in Tables 3 and 4.

Table 3: Formulation of Liquid Detergents from Soybean DOC

Code: SBL

Sr.No	Material	SBL ₁ (%)	SBL ₂ (%)	SBL ₃ (%)	SBL ₄ (%)
1	Protein Concentrate	--	15	20	25
2	Sodium lauryl sulphate	05	05	05	10
3	Sodium lauryl ethersulphate	15	-	05	05
4	Alpha olefin sulphonate	05	05	05	05
5	Sodium Sulphate	05	05	05	05
6	Urea	05	05	05	05
7	Sorbitol	10	10	10	10
8	PVA	10	10	10	10
9	Sodium hydroxide	As reqd.	As reqd.	As reqd.	As reqd.
10	Water	Balance	Balance	Balance	Balance
TOTAL :-		100	100	100	100

Table 4: Formulation of Liquid Detergents from Rice bran DOC

Code: RBL

Sr.No	Material	RBL ₁ (%)	RBL ₂ (%)	RBL ₃ (%)	RBL ₄ (%)
1	Protein Concentrate	05	10	15	20
2	Sodium lauryl sulphate	15	05	05	-
3	Sodium lauryl ethersulphate	-	05	05	05
4	Alpha olefin sulphonate	05	05	05	05
5	Sodium Sulphate	05	05	05	05
6	Urea	05	05	05	05
7	sorbitol	10	10	10	10
8	PVA	10	10	10	10
9	Sodium hydroxide	As reqd.	As reqd.	As reqd.	As reqd.
10	Water	Balance	Balance	Balance	Balance
Total		100	100	100	100

Preparation of Liquid Detergents

The composition of selected liquid detergent are given in Table 3 and Table 4 .Required amount of the ingredient given were taken in 500 ml beaker and homogenized by running the stirrer for about half an hour until a clear solution of liquid detergent was obtained. Then was filtered to obtain clear liquid solution was packed in superior grade air tight container.

Testing and Analysis

1 %sample of the liquid detergent formulated and the standard market samples were analyzed for the determination of Solids%, Moisture%, Alcohol Soluble and Alcohol Insoluble, %, pH, Viscosity, Surface Tension, Foam Height and Detergency(Soil removal) %by standard methods [15-19,20].The results are given in Table-5 and Table- 6.

Table-5: Analysis of Liquid Detergents from Soyabean DOC

Characteristic	Sample				
	SBL ₁	SBL ₂	SBL ₃	SBL ₄	Standard
Solids %	45.5	66.6	66.6	50.6	54.2
Moisture%	44.4	33.4	36.3	30.5	45.2
Alcohol Soluble %	95.8	98.6	98.2	98.5	92.2
Alcohol Insoluble %	4.2	1.4	1.8	1.5	7.8
pH	7.1	7.5	7.5	7.6	7.6
Surface Tension (dyne / cm)	25.2	30.8	24.6	32.2	42.9
Foam Height ,mm(after 15 min)	380	770	600	490	430
Detergency %	54	53	55	58	53

Table 6: Analysis of Liquid Detergents from Ricebran DOC

Characteristic	Sample				
	RBL ₁	RBL ₂	RBL ₃	RBL ₄	Standard
Solids %	62.4	55.7	45.3	56.5	54.2
Moisture%	54.5	35.5	45.4	67.4	65.2
Alcohol Soluble %	93.7	97.5	96.4	95.4	92.2
Alcohol Insoluble %	6.3	2.5	3.6	4.6	7.8
pH	7.3	7.2	7.1	7.1	7.6
Surface Tension (dyne / cm)	34.8	39.6	48.6	37.5	42.9
Foam Height mm(15 min)	660	590	680	990	430
% Detergency	55.4	52.3	57.3	58.9	53

DISCUSSION

The extraction of the protein is a low cost process, and most importantly this rich source of protein does not compete with proteins obtained from other food crops such as soy and wheat.

Using Protine concentratesof DOC, 8 -liquid detergent samples were prepared. The systematic analysis of this liquid detergent was carried out and the results compared with commercial liquid detergent available in market. It is observed that the prepared liquid detergent was at par with the commercial product.

Liquid detergent prepared had good foam stability, detergency, pH, surface tension and viscosity. From the formulations given and analysis results (Table5 –Table6) it can be observed that. In case of Soybean cake, the best formulation is SBL4, which compared well with standard liquid detergent except in case of alcohol soluble content.

In case of Rice bran cake, the best formulation is RBL4 which compared well with standard liquid detergent except in case of moisture content.

With a view to utilize and impart value addition protein concentrates from de-oiled cakes, liquid detergents were produced to assess the feasibility of its use for commercial use in association non-petroleum sources.

Protein concentrates have demonstrated their utility as an active ingredient of liquid detergent. All the prepared compositions of liquid detergents have comparable performance to commercial one with respect to detergency percentage and surface tension. Foaming property also gets increased. All liquid detergents made from protein concentrates gave comparable percent detergency compared to that of commercial liquid detergents. Main ingredients of liquid detergents are natural in origin hence, prepared liquid detergent compositions can be economic and ecofriendly.

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