DEVELOPMENT OF A LOW COST WHEY PROTEIN CONCENTRATE ENRICHED INSTANT POWDER MIX

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CERTIFICATE

This is to certify that the thesis entitled **"DEVELOPMENT OF A LOW COST WHEY PROTEIN CONCENTRATE ENRICHED INSTANT POWDER MIX"** submitted in partial fulfilment of the requirements for the award of the degree of **DOCTOR OF PHILOSOPHY** in **LIVESTOCK PRODUCTS TECHNOLOGY** to the **TAMIL NADU VETERINARY AND ANIMAL SCIENCES UNIVERSITY, CHENNAI-51**, is a record of bonafide research work carried out by **LANDE VINAY SURESH,** under my supervision and guidance and that no part of this thesis has been submitted for the award of any other degree, diploma, fellowship or other similar titles or prizes and that the work has not been published in part or full in any scientific or popular journals or magazine.

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ABSTRACT

Title	:	**DEVELOPMENT OF A LOW COST WHEY PROTEIN CONCENTRATE ENRICHED INSTANT POWDER MIX**
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The present study was made to develope a low cost whey protein concentrate enriched instant powder mix. The process of preparation was standardized with WPC at 0, 0.5, 0.75 and 1 per cent, cocoa powder at 2, 4 and 6 per cent and milk powder at 2, 4 and 6 per cent. The optimum levels of WPC, cocoa powder and milk powder were 1, 6 and 6 per cent respectively. The inlet temperature of spray dryer was also standardized with 165 ± 5^0C, 170 ± 5^0C and 175 ± 5 ^{0}C and optimum inlet temperature was found at 175 ± 5 ^{0}C. The different types of instant powder mixes were prepared by spray drying and termed as treatment 1 (T1), treatment 2 (T2) and treatment (T3). The liquid mix prepared for spary drying with various treatments, T1 contained ingredients such as rice extract added WPC (1 %), vitamin A (2500 IU) and iron (10 mg), for T2 - it contained

rice extract added WPC (1 %), vitamin A (2500 IU), iron (10 mg) and cocoa powder (6 %) and for T3 – added WPC (1 %), vitamin A (2500 IU), iron (10 mg), cocoa powder (6 %), milk powder (6 %) and rice extract. The physico-chemical properties, microbiological counts and organoleptic evaluation of different instant powder mixes were studied. Storage study was carried out up to 90 days by using different packaging material viz., glass bottle (GB), plastic bottle (PB) and polypropylene pouch (PP) at room temperature (37 ^{0}C).

Higher scores for colour, taste, flavour and overall acceptability of spray dried powder were noticed for higher inclusion level of cocoa powder (6%) and milk powder (6 %).

Moisture per cent of various instant powder mixes –T1, T2 and T3 did not differ significantly.

There was highly significant difference in total plate count (cfu × 10^2 per gm) of various instant powder mixes –T1, T2 and T3 but within the acceptable limit of the Codex or the ICMSF.

Coliform count and yeast and mould count were totally absent in T1, T2 and T3 which also meets the required standards of BIS.

Various instant powder mixes - T1, T2 and T3 were reconstituted with water, skim milk and orange juice found to be significantly different in which treatment 3 scored higher for colour, taste, flavour and overall acceptability amongst all.

Loose bulk density was observed highly significant between T1, T2 and T3 and amongst them T3 was found to be highest. There was no significant difference found between various packaging materials. During storage period of 90 days, significant differences in loose bulk density was noticed and tend to increase as storage period increases

Packed bulk density was found to be highly significant between T1, T2 and T3 and there is no significance difference between packaging materials. It was found to be decreasing, but slowly, during as storage period increases.

Cohesion index between treatments was found to be highly significant with easy flowing and free flowing properties and the packaging materials did not show any significant difference. Significant difference was observed during storage period of 90 days and as storage period increases cohesion index also increased gradually which resulted in decreased flowability.

Caking was not observed in between treatments, packaging materials and during storage periods

Total plate count between treatments was found to be highly significant up to 120 days which were within the acceptable limit. There was no significant difference in between various packaging materials up to 60 days afterward it shows influence of packaging material on total plate count. During storage period of 120 days there was highly significant difference at room temperature which reveals that as storage period increases total plate count decreases gradually.

There was no change in colour in various treatments stored in various packaging material at room temperature up to 90 days.

The per cent of moisture, protein, fibre, fat and total ash of various treatments for duration of 90 days did not differ significantly.

There was highly significant difference in vitamin A and iron content content of various treatments up to 90 days, as storage period increase, the vitamin A content and iron content decreases.

T3 showed better acceptability in terms of physico-chemical, organoleptic property and microbial counts within limit during storage period of 90 days and hence T3 was chosen as the best treatment.