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Formulation, development, and analysis of protein rich Spirulina capsules

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Spirulina is a cyanobacterium that grows in fresh water, which has a distinct amount of proteins and provides many health benefits like minimizing cholesterol, blood glucose, fatty liver, and anaemia, and regulates immune functions. *Spirulina platensis* and *Spirulina maxima* are the two most consumed species. Therefore, this study was aimed to cultivate and harvest Spirulina to develop an easily consumable capsule from dried Spirulina according to procedures developed by SAP Enterprise Pvt. Ltd. Furthermore, physical, chemical, microbial, and shelf-life parameter tests were carried out to determine the quality of the final product. The Spirulina powder used to fill the empty capsules was blue green in colour with a small green spiral shaped microscopic view and a characteristic algae smell. The moisture content (%) of dried Spirulina powder in capsules was 7.73 ± 0.02. The average weight (mg) of an empty capsule was 96.5 ± 0.5, and an average weight of a capsule with Spirulina powder (mg) was 564 ± 18. Disintegration time (minutes) and loss on drying (%) were 9.5±3.8 and 7.8 ± 0.1, respectively. Crude protein (Nx6.25) percent by mass was 61.9 ± 4.1. Chromium was detected as 0.06 mg/kg and other heavy metals (*i.e.*, As, Pb, Hg, Cd) were not detected in the end product by ICP-MS. The metals and non-metals (mg/kg) Fe, Na, Ca, Mn, Mg and P were 355 ± 11, 1431 ± 150, 49.5 ± 2.1, 998.7 ± 6.2, 497.2 ± 4.7 and 803 ± 10, respectively, and are considerably high. Vitamin A, B1, C, E and niacin (mg/100 g) present in the capsules were 45.4 ± 3.3, 7.35 ± 0.58, 255 ± 9, 6.1 ± 0.7 and 12.7 ± 1.1, respectively. Microbiological test results indicate the absence of pathogens (*i.e.*, Salmonella, *E. coli*) and aerobic plate count (APC), yeast and mould count (Y&M), and coliform count (cfu/g) were 50 ± 4, 20 ± 11 and <3 respectively. During the storage period of 24 months, the blue green colour had slightly changed and there was no change in its characteristic smell. The available protein content of the capsules had reduced to 60.0 ± 3.2 % during storage. APC and Y&M count has increased when compared to the initial sample but did not exceed the specification throughout the storage period.

Keywords: Spirulina, cyanobacteria, capsules, crude protein, shelf-life

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