

## ABSTRACT

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Ayurveda, a Sanskrit word meaning the art and knowledge of living a healthy life, is one of the oldest medicinal literatures and known to be the origin of the entire illness's remedial. India is a country blessed with flora and fauna, having significant medicinal values and the importance of plant products. Among the plant products, fruits, vegetables, and spices are the cheapest and excellent source of nutrients for curing the ailment.

This thesis aims to prepare a healthy drink, from plant products like vegetables, and spices, full of phytonutrients and therapeutic values. Bitter gourd (*Momordica charantia*) and ajwain (*Trachyspermum ammi*) were selected for the present study. Therefore, this thesis starts with optimizing the process parameters for the extraction of phytonutrients from it, and a suitable method was applied to optimize these parameters. After that, membrane based processes were used to purify the extract. A hollow fiber membrane module was used for this purpose. Membrane fouling is a common phenomenon, and it is a major deterrent in the commercialization of membrane processing to an industrial-scale unit. Therefore, an in-depth study of flux decline behavior was also conducted to understand the nature of membrane fouling. Various membrane characterizations were also performed to support the fouling mechanism. These studies will help to design a scalable hollow fiber membrane set-up to clarify the extract of plant products. In the next phase of the thesis, the exhaustive storage studies of the clarified extract were conducted. The novelty of the entire study is that the shelf life of the extract is enhanced and the extract can be stored for four months under the normal refrigerated condition without any external chemicals maintaining the natural flavor, aroma, and nutrient profiles of the original extract. This study is of remarkable importance in extracting the phytonutrients from plant products and scaling up the processing of the extract having a long shelf life.

**Keywords:** Plant products; aqueous extraction; phytonutrients; membrane-based processing; membrane fouling; storage study; shelf life.