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2. AIM AND SCOPE OF THE STUDY

Processing of foods is becoming more sophisticated and diverse in response to the growing demand for quality foods. Consumers today expect food products to provide, among other things, convenience, variety, adequate shelf life, caloric content, reasonable cost and environmental soundness. Strategies to meet these demands include modification to existing food processing techniques and the adoption of novel processing techniques. Among the processing techniques, drying is one of the oldest methods used by mankind from the ancient time. Generally, heat solvent or mechanical force is used in the drying process. The removal of moisture prevents the growth and reproduction of microorganism causing decay and minimise many of the moisture mediated deteriorative reactions. It brings about substantial reduction in weight and volume, minimise packing cost and enable the storability of the product under ambient conditions. However, drying process also affect the quality of the final product in a complex manner. Various intrinsic and extrinsic factors are found to be responsible for quality changes during drying. Intrinsic factors include bound water content of the product, dissolved solute concentration, types of tissue forming the structural frame work of the product, treatments given for drying. Extrinsic factor include, drying technique, equipment, drying temperature and other drying conditions. Each drying method has some characteristic drying parameters, which can be regulated to get a desirable quality product. The effect of these factors on microorganism and enzymes in foods is also a major concern during drying, although the main purpose of drying is preservation. Each drying methods
has some characteristics drying parameters, which can be regulated to get a desirable quality products. It has been reported that the pre-processing treatments, moisture transport and drying rate at which the material is dried are related to the quality properties of the dried products, viz., colour, texture, density, porosity and sorption characteristics. So the same raw material might end up as a completely different product depending on the type of drying method and conditions applied. However, major problems encountered in freeze-dried juice powders continue to be their extreme hygroscopicity, which ultimately affects the products in many ways especially during storage in unfavourable climatic conditions. Apart from these, during production and handling of freeze-dried carbohydrate rich foods like juice powder exhibited varying degrees of hygroscopicity. In food system, certain components like low molecular weight carbohydrates and protein hydrolysates have been reported to alter the caking phenomena and glass transition phenomena.

The physical state of foods is one of the factors determining states of chemical reactions. Solids in foods particularly juice powders exist in an amorphous metastable state or crystalline state depending on the composition, processing and storage conditions. Several workers have related the physical stability of amorphous foods to their Tg. The glassy state of amorphous materials is considered to be stable below their Tg due to high viscosity. Above Tg free volume and mobility of molecules is increased due to low viscosity. As a result of this amorphous materials enters the rubbery state and the viscosity is decreased drastically. Due to this, physical and chemical properties of the products are affected. Hence Tg of amorphous foods
determines their stability and water activity (a_w) values can be used to manipulate both Tg and material behaviour under various storage conditions. Understanding of water sorption behaviour and its relationship to Tg provides a valuable tool to control material behaviour during processing and subsequent storage for the determination of food packaging requirements. Hence, Tg is the most representative parameter to assess the quality and stability of processed foods. However juices are rich source of carbohydrates, minerals, acids and pigments apart from pectin and other cellulosic materials. The role of these materials apart from process variation on the development of caking related changes with respect to thermal behaviour have not been reported in the literature. Although considerable work has been carried out else where to understand the mechanism of caking and to prevent the caking phenomena, no satisfactory report has been cited so far in this regard. Hence the present investigation is proposed to identify the main causes for hygroscopicity development and thermal behaviour with respect individual constituents and processing variations. Another main objective of the studies are to control/arrest hygroscopicity, using additives and conversion of amorphous sugar to a stable crystalline sugar without affecting the quality.

Generally herbs are the aromatic plants used in various culinary preparations. Traditionally herbs are subjected shade or sun drying. However to avoid cross contamination and for quick drying, herbs are dried in a heated air stream. Colour fixation and blanching are some of the pre-treatments generally followed during the dehydration of greens and vegetable. However these treatments are not suitable for certain aromatic fragile herbs like, pudina
and coriander. Various workers have studied the effect of drying temperature, drying time and air velocity on the retention of certain quality parameter. So the present investigation was taken up to evaluate the effect of certain pre-treatments on the quality of herbs.

High quality, instant rehydration, weight reduction and structural intact are some of the major advantages of low sugar containing fibrous solid foods like vegetables. Hot air drying is one of the most suitable cost effective methods for drying the vegetables. But hot air dried product suffers from various heat abused changes like case hardening, shrinkage, poor rehydration and nutrient retention. Freeze drying method is considered to be the best method to get a quality end product at par with fresh produce. However freeze-drying is expensive compared to other drying methods due to long drying time and high operational and equipment cost. Several workers have suggested various combination techniques for drying of foods to reduce drying cost and energy expenditures in addition to quality improvement. However use of initial freeze-drying and hot air drying to reduce energy, drying time and to improve the quality of the product was not reported in the literature. Hence the present investigation was also aimed to study the effect of combination drying involving an initial partial freeze drying followed by terminal hot air drying to improve the quality of the vegetables like carrot, potato and onions.
With the above objectives, the present study was planned as follows:

1) Effect of individual constituents on hygroscopicity related changes such as free flowability, water activity and glass transition temperature and crystallization behaviour in a freeze dried simulated model system as well as juice powders will be studied.

2) The process induced variations on certain individual constituents and their effect on caking induced physical and chemical changes in juice powders and other dehydrated foods will be examined.

3) To study the effect of bulk reduction on the keeping quality of freeze dried juice powders with respect to compression characteristics, vitamin C retention and hygroscopicity during storage.

4) Effect of controlled crystallization on appearance, flavour, solubility and hygroscopicity in freeze dried mango juice powder will be evaluated.

5) Effect of additives and other suitable bulking agents on thermal, crystallization and hygroscopic behaviour of freeze dried pine apple juice powder will be studied.

6) To study the effect of bulk reduction on the physico chemical properties of freeze dried juice powders.

7) Effect of residual moisture content, relative humidity and storage temperature on caking related problems in juice powders will be evaluated.
B. 1) To identify suitable combination drying technique to reduce freeze-drying cost, energy, time, and to improve the quality of dehydrated products.

2) To determine the critical moisture removal through sublimation for hot air drying to minimise quality changes and also to save energy and drying time during combination drying process.

3) To study the effect of combination drying technique on the physicochemical characteristic of vegetables like carrot, pumpkin and onions.

C. 1) To evaluate suitable blanching techniques for freeze drying of shrimps.

2) To identify suitable pre-treatment to improve the rehydration properties of freeze-dried shrimps.

3) To study the effect of pre-treatment and drying conditions on the quality and stability of herbs with respect to chlorophyll retention.

4) To determine the critical moisture content and water activity for the stability of herbs.