CHAPTER – 7

SUMMARY AND CONCLUSION

The outcome of the present research investigation undertaken is on the formulated rice based vegetable supplemented functional instant soup mix, which may provide a variety to soup in diet and also provide enhanced nutrition.

Through present study efforts were made to find out variability and relationship between paddy cultivars of various economically important cultivars using Principal Component Analysis (PCA) a multivariate classification techniques. Considering the characteristic variations among physical and optical properties existed among twenty two paddy cultivars. The identified long grain paddy cultivars such as Muchhal, Pusa 1121, Shabnam, Sugandha and Usha showed greater potential in terms of physical attributes as compared the other cultivars due to significant dimensional variations. The effect of shelling and milling on physical and optical properties of promising Indian long paddy varieties Pusa 1121, Muchhal, Sugandha, Shabnam and Usha were evaluated. The promising basmati rice varieties Pusa 1121 was found to be the longest grain associated with the substantially more loss of grain during milling as compared to other long grain rice varieties. Therefore, selection of paddy variety Pusa 1121 as most milling susceptible paddy variety was considered and further assessed for the grinding characteristics of broken rice.

The rice broken of selected Pusa 1121 has been used to make the flour by different grinding methods (dry grinding, wet grinding and semidry grinding). Rice flour obtained through various grinding methods showed significant differences in
physico-chemical, morphological and pasting properties. The grinding process reduces the rice flour particle size and affected the particle distribution characteristics significantly. The different grinding methods results variations in pasting characteristics of rice flours and found rice flour contributes more viscosity than corn flour. Moreover, dry grinding method for making the rice flour was found optimal based on the pasting behavior. The dry ground rice flour of Pusa 1121 variety is thus planned to use in the soup mix instead of corn starch as one of the functional nutritive ingredient.

The selected vegetables (carrot, peas and drumstick leaves) were used as the ingredient to meet the requirement of vegetable supplementation in the development of functional instant soup mix. Several pre-processing treatments such as sizing, blanching, freezing, thawing and salt treatments have been tried for the selected peas and carrot in order to obtain the usable forms to be used in the soup mix. *Moringa oleifera* leaves were dried at the isothermal dehydration conditions of 50 to 80°C, with an equal temperature interval of 10°C. The blanched dehydrated leaves were compared with the untreated dried leaves in powdered form. *Moringa oleifera* leaf powder as obtained at the dehydration temperature of 60°C without any treatment reflected better acceptability, which was further improved on fractionation using 150 BSS sieve (0.104mm) and the fine fractionated moringa leaf powder has been considered as an important functional material to enrich the soup with therapeutic values.

The different processing treatment applied for the preparation of dehydrated carrot and green peas revealed better physico-chemical properties. Among all the processing treatments, pricked blanched frozen dehydrated carrot and green peas treated with 1% NaCl solution showed superior quality characteristics with
enhanced rehydration characteristics, which may find the usage in various food products especially during the off-season. Further, presence of significant concentration of antioxidants and total phenol content may account for various health benefits on its use.

Fat is one of the important components of soup as described in the present study. The study led to the conclusion that not only the quantity and the availability oil may be considered for the edible use but the proportion of fatty acids is also critical to be decided for the types of oil to be used in the consumption. As per cited literature, no single available oil fulfills the nutritional recommendations laid down by the American Heart Association (AHA). Therefore, blending of oil has been tried to develop by following the AHA recommendations. As blending altered the fatty acids composition of saturated fatty acid, mono unsaturated fatty acid and poly unsaturated fatty acid to a desired level of (SFA:MUFA:PUFA::1:1:1) and thus resulted in a significant change in physico-chemical characteristics. The development and preparation of the model oil blend was accomplished with the cost minimisation as an objective function applying the linear programming method.

Further, the developed and characterized ingredients of soup (rice flour, vegetable and oil blend) were used in different proportions as per the identified limits to fix the level of ingredients and optimise using statistical optimization technique (Response Surface Methodology, RSM) for the development of instant soup mix. Response surface methodology an efficient statistical optimization technique can effectively be applied in the development and optimization of sensory acceptable instant soup. Twenty formulations were prepared by mixing three basic ingredients: rice flour (RF; 3-7g), moringa leaf powder (MLP; 0-1.2g) and blended oil (BO; 0-1g) and the prepared mixture were cooked to make soup and analyzed for both in powder
and soup form for physical characteristics (particle size, bulk density and cake strength) and sensory characteristics as applicable. Sensory acceptability was assessed in terms of four response variables (sensory color, mouthfeel, flavor and overall acceptability) by the panelists using a 9-point hedonic rating scale. For each response, second order polynomial models were developed using multiple linear regression analysis. Generation of contour graphs provides the effective in unraveling the associated complexities towards the extent of ingredients usage. Optimum conditions were found as Rice flour, Moringa leaf powder and Blended oil in the ratio of 5.537:0.890:0.526. Under the optimum conditions, the experimental values of ingredients were in agreement with predicted responses, thus indicating suitability of the developed model in prediction purposes.

Characterization of optimized instant soup mix was carried out on the basis of microstructure, physical, chemical, rheological, optical, advanced analytical characteristics, cost analysis and reconstitution behavior of rice based vegetable supplemented functional instant soup mix. The mean sensory scores have reflected that the sensory acceptable soup could be obtained as all sensory parameters were found to have above the minimum 7 sensory scores on 9 point hedonic scale. The minor changes towards sensory parameters during storage were found but the product remained acceptable till the storage period of six months.