Chapter 5

SUMMARY AND CONCLUSION

5.1 Summary
The present study was focussed on to assess the effect and interactions of processing variables on physicochemical, functional, textural, color and sensory properties of chicken meat patties cooked by oven and microwave methods. The central composite design was applied to study the effects of independent variables (olive oil and FTP/FBP) on dependent variables. The independent variables used in this study were olive oil (5-15%) and freeze-dried tomato powder (1-8%) in one study and olive oil (5-15%) and freeze-dried beetroot powder (1-5%) in another study. These independent variables were also assessed to obtain the optimum level of ingredients for each cooking method. Instrumental hardness and overall acceptability were selected as responses for optimization of processing variables. The optimized patties were validated and analyzed for physicochemical, functional, textural, color, microbial, oxidation and sensory properties along with control (prepared with animal fat and no FTP/FBP).

It was found that olive oil and freeze-dried tomato powder (FTP) significantly increased cooking yield and emulsion stability of oven cooked patties. Olive oil was found to have an insignificant effect (p>0.05) on emulsion stability of microwave cooked patties. FTP addition decreased pH of oven and microwave cooked patties, however, pH of patties was not affected by olive oil. Olive oil and FTP had a positive effect on the moisture content of oven and microwave cooked patties, however, at the quadratic level insignificant effect of olive oil was observed on the moisture content of microwave cooked patties. An increased addition of FTP favorably affected moisture retention of patties but the effects were weakened by the incorporation of olive oil. Olive oil formulated patties resulted in the highest decrease in diameter whereas FTP decreased reduction in diameter of patties. However, at interaction level, olive oil and FTP had a non-significant effect on reduction in diameter of microwave cooked patties. FTP had a positive effect and olive oil was found to have a non-significant effect on the gain in height of patties. The addition of FTP significantly reduced shrinkage in meat patties. Olive oil addition had negatively affected shrinkage of oven and microwave cooked meat patties. The findings for L* and a* values of patties demonstrated a significant decrease and increase, respectively by increasing the levels of FBP. On the other hand, olive oil increased L* and b* values and decreased a* values of patties. The values for textural
parameters of oven and microwave cooked patties were decreased by the addition of olive oil and FTP, however, olive oil had an insignificant effect on the hardness of microwave cooked patties. FTP addition adversely affected the sensory characteristics of the cooked patties. Nevertheless, the acceptable score was observed for all sensory characteristics.

Similarly, olive oil and freeze-dried beetroot powder (FBP) addition affected physicochemical, functional, textural, color and sensory properties of chicken meat patties cooked by oven and microwave methods. The results showed that olive oil and FBP had a positive effect on cooking yield and emulsion stability of microwave cooked patties. In contrast, the negative effect of olive oil was observed on cooking yield of oven cooked patties. FBP increased cooking yield and emulsion stability of patties. pH of patties was slightly decreased by increasing the FBP level. Insignificant effect (p > 0.05) of olive oil was observed in pH. The moisture content of patties was decreased as the levels of independent variables increased. Moisture retention properties of patties were decreased by olive oil and increased by FBP addition. It was observed that olive oil addition had a positive effect on reduction in diameter and gain in height of microwave cooked patties whereas the opposite was true for FBP addition. In both cooking methods, it was observed that FBP reduced shrinkage of patties. However, shrinkage of patties was increased by the addition of olive oil. L* and b* values of patties were significantly increased by increasing the levels of olive oil, whereas FBP had a negative effect on L* and b* values at linear and quadratic levels. FBP increased a* values of oven and microwave cooked patties. Olive oil decreased the redness values of patties. Patties formulated with olive oil and FBP affected textural properties of patties and were enhanced at specific amounts of olive oil and FBP. The patties formulated with lower level of FBP and the higher level of olive oil was more acceptable with respect to taste, juiciness, color and overall acceptability.

The optimum formulation of FTP enriched chicken patty was 9.59% olive oil and 4.6% FTP for oven cooked patties and 9.84% olive oil and 4.4% FTP in case of microwave cooked patties. Similarly, the optimum formulation for oven cooked FBP enriched chicken patty was 10.93% olive oil and 2.74% FBP and in case of microwave cooked FBP enriched patties, optimum formulation was 10.17% olive oil and 2.36% FBP.

Control, optimized oven and microwave cooked chicken patties were studied for functional, physicochemical, nutritional, color, textural, oxidative rancidity, microbial and sensory properties. Significantly lower moisture content was observed in oven-cooked FTP enriched
meat patties as compared to control samples. Highest protein, ash and crude fiber content were found in FTP enriched patty samples as compared to control. Oven and microwave cooked patties enriched with FTP had lower pH in comparison to samples which were prepared by animal fat only. A significant difference was observed in emulsion stability of oven and microwave cooked samples. Significant increased hardness was observed in oven cooked samples as compared to microwave cooked samples. Significantly lower L* and higher a* values were found in microwave cooked samples compared to oven cooked samples. Microwave cooked samples showed highest shrinkage percentage than oven cooked samples. Similar results were observed for physicochemical, nutritional, color and dimensional properties of oven and microwave cooked FBP enriched patties. Furthermore, the storage stability of FTP/FBP enriched patties was improved by significant reduction in microbial counts. Lipid oxidation was also reduced which further increased stability during the shelf-life of patties. Highest TBARS values were observed in patties prepared with chicken fat only. The microbiological quality of patties prepared with animal fat decreased significantly as compared to FTP/FBP enriched patties. It was observed that optimized patties had a shelf life of 20 days at 5±1 °C.

5.2 Conclusion and recommendations
We conclude that olive oil and freeze-dried tomato or beetroot powder can be successfully incorporated at optimized levels without any negative impact on the physicochemical and sensory attributes of the chicken meat patties. The incorporation of olive oil as an animal fat replacement did not appear to have any adverse effect on the technical side of the patty making process. Addition of optimized levels of FTP & FBP increased emulsion stability, cooking yield, water retaining capacity, sensory properties and decreased shrinkage of patties. Using tomato and beetroot products as a source of lycopene and betalain respectively, their acidic characteristics will lower the pH value resulting in reduced growth of microorganisms. In that way tomato and beetroot products added to meat patties can completely or partially replace the use of nitrite and act as a source of natural color, preventing rancidity and reducing the microbiological activity. Therefore, utilization of these derivatives as natural antioxidants and antimicrobials in meat products could improve the quality and therefore can serve the meat industry in manufacturing functional and healthier meat products which could meet the consumer demands.