SUMMARY & CONCLUSION

Pineapple is a tropical fruit, it contains a proteolytic enzyme bromelain, which helps in the digestion of protein. Pineapple can prevent blood clot formation because of its bromelain content. Pineapple's nutrients include calcium, potassium, fiber, and vitamin C. It is low in fat and cholesterol. Vitamin C is the body's primary water soluble antioxidant, against free radicals that attack and damage normal cells. It is also a good source of vitamin B₁, vitamin B₆, copper and dietary fiber. Pineapples provide an ample supply of vitamin C too, a commonly known antioxidant that protects the body from free radical damage and boosts the immune system. Vitamin C helps build and repair bodily tissue and promotes wound healing. The body uses vitamin C to help metabolize fats and cholesterol, absorb iron, and synthesize amino acids and collagen. Collagen is one of the primary building blocks of skin, cartilage and bones. Vitamin C also decreases the severity of colds and infections. The fruit are used for making jam, jelly, cheese, marmalade, syrup, squash, juice, R.T.S and Beverages which are of great demand in national and international markets.

Keeping in view the importance of Mint, Ginger, Cardamom, Clove, Tulsi powder added Pineapple jam, Pineapple jelly, Pineapple cheese in post harvest technology the present investigation entitled “Value addition of pineapple based food products” was undertaken with the following objectives.

- To analyze the chemical properties of the prepared value added products.
- To asses the Organoleptic characteristics of value added products.
- To find out the shelf life of the prepared products.
- To work out the economics of the prepared products.

The experiment was conducted in the Department of Foods and Nutrition, Ethelind School of Home Science and Department of Horticulture, Sam Higginbottom Institute of Agriculture Technology & Sciences (Deemed to be University) Allahabad. Pineapple, sugar, citric acid, butter, mint, ginger, tulsi, cardamom, clove were purchased from the local market of Allahabad. Value added pineapple jam, pineapple jelly, pineapple cheese were prepared by different types of cooking methods. The different treatments replicated in this study were-

Summary and Conclusion
Pineapple Jam

- $T_0$ (100 g pineapple jam)
- $T_1$ (100 g pineapple jam + 1% mint powder)
- $T_2$ (100 g pineapple jam + 1% tulsi powder)
- $T_3$ (100 g pineapple jam + 1% ginger powder)
- $T_4$ (100 g pineapple jam + 1% clove powder)
- $T_5$ (100 g pineapple jam + 1% cardamom powder)

Pineapple Jelly

- $T_0$ (100 g pineapple jelly)
- $T_1$ (100 g pineapple jelly + 1% mint powder)
- $T_2$ (100 g pineapple jelly + 1% tulsi powder)
- $T_3$ (100 g pineapple jelly + 1% ginger powder)
- $T_4$ (100 g pineapple jelly + 1% clove powder)
- $T_5$ (100 g pineapple jelly + 1% cardamom powder)

Pineapple cheese

- $T_0$ (100 g pineapple cheese)
- $T_1$ (100 g pineapple cheese + 1% mint powder)
- $T_2$ (100 g pineapple cheese + 1% tulsi powder)
- $T_3$ (100 g pineapple cheese + 1% ginger powder)
- $T_4$ (100 g pineapple cheese + 1% clove powder)
- $T_5$ (100 g pineapple cheese + 1% cardamom powder)

The controls and experimental treatments were replicated four times and in each replication the samples were tested for pH, TSS, acidity, total sugar, reducing sugar, non reducing sugar, ascorbic acid, moisture and ash. A panel of five judges evaluated the Organoleptic properties. Microbiological analysis was done with the help of yeast and mould count and bacterial count. Nutrient composition was done with the help of (C. Gopalan). The data were statistically analyzed by using Randomized Block design (RBD), Analysis of variance technique, their cost ratio were calculated from the cost of raw materials used and the results obtained are summarized in the following paragraph.
Chemical Properties

Pineapple Jam

The highest pH was recorded in treatment $T_5$ (3.69) cardamom powder added pineapple jam and lowest pH was found in treatment $T_0$ (3.25) mint powder added pineapple jam.

The highest TSS was noticed in treatment $T_3$ (68.1) ginger powder added pineapple jam and lowest TSS was found in treatment control $T_0$ (64.15).

The highest acidity observed in treatment $T_4$ (0.65) mint powder added pineapple jam and lowest acidity was found in treatment control $T_0$ (0.60).

The highest ash was recorded in treatment $T_4$ (0.29) clove powder added pineapple fruit and lowest ash was found in treatment control $T_0$ (0.263).

The highest moisture was recorded in treatment $T_1$ (22.8) mint powder added pineapple jam, and lowest moisture was observed in treatment control $T_0$ (22.03).

The highest total sugar was observed in treatment $T_4$ (68.7) clove powder added pineapple jam and lowest total sugar was found in treatment control $T_0$ (68.05).

The highest reducing sugar was observed in treatment $T_4$ (27.9) clove powder added pineapple jam and lowest reducing sugar was found in treatment control $T_0$ (27.05).

The highest non-reducing sugar was recorded in treatment $T_2$ (37.2) powder added pineapple jam and lowest non-reducing sugar was found in treatment $T_1$ (36.7) mint powder added pineapple jam.

The highest ascorbic acid was found in treatment $T_1$ (7.85) mint powder added pineapple jam and lowest ascorbic acid was found in treatment control $T_0$ (7.07).

Pineapple Jelly

The highest pH was recorded in treatment $T_4$ (3.38) clove powder added pineapple jelly and lowest pH was found in treatment $T_0$ (3.15) mint powder added pineapple jelly.

The highest TSS was observed in treatment $T_5$ (66.4) ginger powder added pineapple jelly and lowest TSS was noted in treatment control $T_0$ (64.25).

The highest acidity was found in treatment $T_4$ (0.67) cardamom powder added pineapple jelly and lowest acidity was noticed in treatment control $T_0$ (0.615).
The highest ash was recorded in treatment \( T_2 \) (0.29) tulsi powder added pineapple jelly and lowest ash was found in treatment control \( T_0 \) (0.255).

The highest moisture was noted in treatment \( T_1 \) (22.7) mint powder added pineapple jelly and lowest moisture was recorded in treatment control \( T_0 \) (21.65).

The highest total sugar was observed in treatment \( T_4 \) (63.8) clove powder added pineapple jelly and lowest total sugar was found in treatment control \( T_0 \) (63.05).

The highest reducing sugar was recorded in treatment \( T_4 \) (25.8) clove powder added pineapple jelly give and lowest reducing sugar was found in treatment control \( T_0 \) (25.06).

The highest non-reducing sugar was observed in treatment \( T_3 \) (38.4) powder added pineapple jelly and lowest non-reducing sugar was found in treatment \( T_5 \) (37.7) mint powder added pineapple jelly.

The highest ascorbic acid was recorded in treatment \( T_1 \) (8.85) tulsi powder added pineapple jelly and lowest ascorbic acid was found in treatment control \( T_0 \) (8.06).

**Pineapple Cheese**

The highest pH was found in treatment \( T_3 \) (3.5) clove powder added pineapple cheese and lowest pH was noted in treatment \( T_0 \) (3.15) mint powder added pineapple cheese.

The highest TSS was noticed in treatment \( T_1 \) (69.1) ginger powder added pineapple cheese and lowest TSS was found in treatment control \( T_0 \) (66.3).

The highest acidity was recorded in treatment \( T_4 \) (0.67) cardamom powder added pineapple cheese and lowest acidity was found in treatment control \( T_0 \) (0.618).

The highest ash was observed in treatment \( T_4 \) (0.3) tulsi powder added pineapple cheese and lowest ash was found in treatment control \( T_0 \) (0.263).

The highest moisture was recorded in treatment \( T_1 \) (22.7) mint powder added pineapple cheese, and lowest moisture was found in treatment control \( T_0 \) (22.1).

The highest total sugar was found in treatment \( T_2 \) (68.8) tulsi powder added pineapple cheese and lowest total sugar was observed in treatment control \( T_0 \) (68.08).

The highest reducing sugar was recorded in treatment \( T_5 \) (27.7) cardamom powder added pineapple cheese and lowest reducing sugar was found in treatment control \( T_0 \) (27.13).

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Summary and Conclusion
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The highest non-reducing sugar was found in treatment T₂ (41.4) tulsi powder added pineapple cheese and lowest non-reducing sugar was observed in treatment T₁ (40.7) mint powder added pineapple cheese.

The highest ascorbic acid was recorded in treatment T₁ (7.75) mint powder added pineapple cheese and lowest ascorbic acid was found in treatment control T₀ (7.08).

**Organoleptic Properties**
**Pineapple Jam**

The highest score of colour and appearance was recorded in treatment T₁ (8.85) mint powder added pineapple jam and the lowest score was found in treatment T₄ (7.2) clove powder added pineapple jam respectively, making it quite obvious that the addition of one percent mint in pineapple jam showed the best result for colour and appearance.

The highest score of taste and flavour was observed in treatment T₁ (8.83) mint powder added pineapple jam and lowest score was noticed in treatment T₄ (7.3) clove powder added pineapple jam respectively, making it quite obvious that the addition of one percent mint in pineapple jam showed the best result for taste and flavour.

The highest score of body and texture was recorded in treatment T₂ (8.65) tulsi powder added pineapple jam and lowest score was found in treatment T₅ (8.08) cardamom powder added pineapple jam respectively, making it quite obvious that the addition of one percent tulsi in pineapple jam showed the best result for body and texture.

The highest score of overall acceptability was recorded in treatment T₁ (8.75) mint powder added pineapple jam and lowest score was found in treatment T₄ (6.8) clove powder added pineapple jam respectively, making it quite obvious that the addition of one percent mint in pineapple jam showed the best result for overall acceptability.
Pineapple Jelly

The highest score of colour and appearance was recorded in treatment T₁ (8.75) mint powder added pineapple jelly and the lowest score was found in treatment T₄ (6.7) clove powder added pineapple jelly respectively, making it quite obvious that the addition of one percent mint in pineapple jelly showed the best result for colour and appearance.

The highest score of taste and flavour was recorded in treatment T₁ (8.8) mint powder added pineapple jelly and lowest score was noticed in treatment T₄ (7.3) clove powder added pineapple jelly respectively, making it quite obvious that the addition of one percent mint in pineapple jelly showed the best result for taste and flavour.

The highest score of Body and texture was recorded in treatment T₂ (8.3) and lowest score was found in treatment T₃ (6.1) cardamom powder added pineapple jelly respectively, making it quite obvious that the addition of one percent mint in pineapple jelly showed the best result for body and texture.

The highest score of Overall acceptability was recorded in treatment T₁ (8.7) mint powder added pineapple jelly and lowest score was observed in treatment T₄ (7.2) clove powder added pineapple jelly respectively, making it quite obvious that the addition of one percent mint in pineapple jelly showed the best result for overall acceptability.

Pineapple Cheese

The highest score of Colour and appearance was recorded in treatment T₁ (8.8) mint powder added pineapple cheese and the lowest score was observed in treatment T₄ (6.9) clove powder added pineapple cheese respectively, making it quite obvious that the addition of one percent mint in pineapple cheese showed the best result for colour and appearance.

The highest score of taste and flavour was recorded in treatment T₁ (8.45) mint powder added pineapple cheese and lowest score was found in treatment T₄ (6.9) clove powder added pineapple cheese respectively, making it quite obvious that the addition of one percent mint in pineapple cheese showed the best result for taste and flavour.
The highest score of body and texture was recorded in treatment $T_1$ (8.65) and lowest score was found in treatment $T_4$ (7.1) cardamom powder added pineapple cheese respectively, making it quite obvious that the addition of one percent mint in pineapple cheese showed the best result for body and texture.

The highest score of overall acceptability was recorded in treatment $T_1$ (8.43) mint powder added pineapple cheese and lowest score was observed in treatment $T_4$ (7.2) clove powder added pineapple cheese respectively, making it quite obvious that the addition of one percent mint in pineapple cheese showed the best result for overall acceptability.

**Microbiological properties**

**Pineapple Jam**
Yeast and mould count and total bacterial count in value added pineapple jam, showed that no growth was found in treatment $T_2$ (Tulsi), $T_3$ (Ginger), and $T_4$ (clove). And very low growth was observed in treatment $T_0$ (control), $T_1$ (Mint) and $T_5$ (cardamom) ranged between 1-2 cfu/ml of sample after 120 days which is negligible and they can be considered safe for consumption.

**Pineapple Jelly**
Yeast and mould count and total bacterial count in value added pineapple jelly, showed that no growth was found in all the treatment. It is therefore concluded that all the treatment was fit for consumption till 180 days.

**Pineapple Cheese**
Yeast and mould count and total bacterial count in value added pineapple cheese, showed that no growth was observed in treatment $T_2$ (Control), $T_3$ (Ginger), and $T_4$ (Clove). And very low growth was found in treatment $T_0$ (control), $T_1$ (Mint) and $T_5$ (cardamom) ranged between 1-2 cfu/ml of sample after 120 days which is negligible and they can be considered safe for consumption.
**Nutritive Value**

The nutrient estimation of energy and carbohydrate showed that $T_4$ (clove) had the maximum energy and carbohydrate content of jam, jelly and cheese where as the minimum energy and carbohydrate content showed that $T_0$ (control) of jam, jelly and cheese. The protein estimation of the each products showed that $T_3$ (ginger) had maximum protein content and $T_0$ (control) had the minimum protein content respectively. The calcium content showed that $T_4$ (clove) had the maximum calcium content of each product and $T_0$ (control) had the minimum calcium content of each product. The estimation of iron showed that $T_2$ (tulsi) had the maximum iron content of each product where as the $T_0$ (control) had the minimum iron content of each product respectively. The phosphorus estimation of each product showed that $T_5$ (cardamom) had the maximum phosphorus content where as $T_0$ showed the minimum phosphorus content of each product. The estimation of fibre of each product showed that $T_5$ (cardamom) had maximum fibre content and $T_0$ (control) had minimum fibre content of each product respectively.

**Cost of the Products**

**Pineapple Jam**

The treatment $T_5$ (153.99) cardamom powder added pineapple jam gave highest cost and lowest cost was found in treatment $T_0$ (139.99).

**Pineapple Jelly**

The treatment $T_5$ (157.49) cardamom powder added pineapple jelly gave highest cost and lowest cost was observed in treatment $T_0$ (143.49).

**Pineapple Cheese**

The treatment $T_5$ (183.74) cardamom powder added pineapple cheese gave highest cost and lowest cost was recorded in treatment $T_0$ (169.74).
CONCLUSION

• Keeping in view the results obtained, it may be concluded that Pineapple fruit possess good amount of nutritional value and rich in ascorbic acid and minerals. Pineapple products had prepared by mixing one percent (Mint /Basil /Ginger /Clove /Cardamom) powder.

• The analyzed chemical property of prepared pineapple products there were significantly increase in content of pH, acidity, total sugar, reducing sugar, ash and moisture and decrease in TSS, non reducing sugar and ascorbic acid.

• One percent mint powder (T_1) and one percent basil powder (T_2) added pineapple products were having excellent taste, colour, texture and overall acceptability.

• Where as products having one percent clove powder (T_4), one percent ginger powder (T_3) and one percent cardamom powder (T_5) had better shelf life of the products.

• Nutrient composition of pineapple products jam, jelly and cheese had higher energy, protein, carbohydrate, calcium, iron, phosphorus and fibre content as compared to control.

• On the basis of benefit cost ratio basil powder (T_2) and mint powder (T_1) value added pineapple products were more economical as compared to clove powder (T_4), cardamom powder (T_5) and ginger powder (T_3) value added pineapple products.

• Hence, the fruit can be highly considerable in beverages industry and can be exploited for nutraceutical food products since the fruit found to have enough nutritional potential.
RECOMMENDATIONS

• These findings will be helpful from therapeutic point of view for people suffering from digestive problems because Pineapple is a digestive aid and a natural Anti-Inflammatory fruit (Joy, 2010).

• A group of sulfur-containing proteolytic (protein digesting) enzymes (bromelain) in a pineapple aid digestion. Bromelain has demonstrated significant anti-inflammatory effects, reducing swelling in inflammatory conditions such as acute sinusitis, sore throat, arthritis and gout and speeding recovery from injuries and surgery. Pineapple enzymes have been used with success to treat rheumatoid arthritis and to speed tissue repair as a result of injuries, diabetic ulcers and general surgery. Pineapple reduces blood clotting and helps remove plaque from arterial walls. (Joy, 2010).

• Pineapple fruits are primarily used in three segments, namely, fresh fruit, canning and juice concentrate with characteristic requirements of size, shape, colour, aroma and flavour.

(www.kau.edu/prsvkm/Html/PineapplesectorinKerala.htm 2010).

• Value added pineapple products is canned product and is improve an variety of canned products. Since, it is easy to prepare. It can be also kept up to more than 180 days and be recommended for off season and where pineapple is not grown.

• On the other hand it will be helpful from economic point of view for those people who come under economically weaker section because of adding Mint powder ($T_1$) and Basil powder ($T_2$), the cost of the product can considerably below taking in account products flavour and medicinal values & more profit can be earned through value addition.