

# DEVELOPMENT OF ASPARAGUS (*asparagus officinalis*) BASED CANNED GROUND SOUP MIX

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## INTRODUCTION

*Asparagus officinalis* is an important luxury vegetable crop more popular in Europe and is a good source of vitamins, antioxidant and fiber but is not affordable to everyone. It is a potential vegetable crop to be grown abundantly in Sri Lanka specially Puttlum and Wayamba districts but is inadequately exploited due to its highly perishable nature. As food trends and consumer demand for new products is being diversified, ready to cook products which are enriched with vitamins and that are likely to have health benefits at low cost are vital. The nutritive value of Asparagus, its palatability, easy digestibility, and low cost of production fulfill the emerging demand. In spite of its high nutritional values and high adaptability to the tropical climate Sri Lankans have not exploited this potential to develop a marketable product. Therefore, it is a timely approach to investigate such product development which caters to the emerging demand. Therefore, the objective of this experiment was to produce low cost new soup mix using asparagus to suit the palatability of the Sri Lankan population and to assess its quality.

## METHODOLOGY

The study was conducted at the Industrial Technology Institute, 363, Bauddhaloka Mawatha, Colombo 7. High-quality spears with a butt diameter of 10-20 mm were selected and trimmed to 180 mm length. Prior to weighing, the asparagus were submerged in running water for 5 min and drained for 1 min. Peeled and washed asparagus were blanched for 3 to 4 min in water at 88°C. During the study different textural groups of asparagus which are ground (using muslin cloth, 600 µm test sieve, homemade grinder) and pieces (1.5 mm and 1 inch thickness) forms were used as different treatment combinations with a defined ratio of chicken stock, vegetable stock, corn and other ingredients to select the best textural group of soup mix sample resulted from individual four sub experiments stated in Table 1. Vegetable stock was prepared using cleaned peeled vegetables: carrot 100 g, onion 50 g, cabbage 100 g, leeks 100 g, tomato 50 g were blanched and cut into small pieces, were added with 850 g water and boiled for 30 min. and it was strained. Chicken stock were prepared using cleaned chopped chicken breast of 1 kg was added to 1.86 kg of water and boiled for 45 min. Then it was strained to get clear chicken stock. The corn starch was prepared by adding 50 g of water in to 6.274 g of corn powder. Best textural soups mixed samples were selected by conducting a nine hedonic scale with 15 trained panelists. To avoid layer separation, the selected best sample were subjected to 0.1 % and 0.2 % CMC (Carboxymethyl Cellulose) levels for two flavors (chicken and vegetable) and selected the best level of CMC to get the final recipe of the asparagus soup mixed sample. By conducting a sensory analysis, best soup mix sample was selected.

The best soup mix samples were subjected to heat penetration study (121<sup>0</sup>C, 1.5bar) to obtain the F- value. Best samples were subjected for real trail production by using the F value obtained. Then the samples were subjected to commercial sterility determination as per the SLS 516 part 10. Then the best soup mix samples were subjected for final sensory evaluation and then nutritional analysis was carried for moisture, total fat, protein, crude fiber and ash according to

the methods in AOAC, 1990. At last the least cost analysis was done to the resulted best soup mixed samples compared with the commercial brine asparagus sample. The samples were in triplicate throughout the research. Non parametric data were analyzed using one way ANOVA, Kruskal-Wallis test was conducted at 5% significant level.

Table 01. Treatments of the experiment

| Sub Experiment  | Treatments  |
|---|---|
| Sub Ex 1:-Asparagus Ground, 1”<br>Chunk                                     | T1- Chicken flavor ground asparagus<br>T2-Chicken flavor 1”chunk asparagus<br>T3-Vegetable flavor ground asparagus<br>T4-Vegetable flavor 1”chunk asparagus   |
| Sub Ex 2:-Asparagus Ground,<br>Muslin,600µm                                 | T9-Chicken flavor ground asparagus<br>T10-Chicken flavor muslin strained asparagus<br>T11-Chicken flavor 600µm test sieve asparagus<br>T12-Vegetable flavor ground asparagus<br>T13-Vegetable flavor muslin strained asparagus<br>T14-Vegetable flavor 600µm test sieve asparagus |
| Sub Ex 3:-Asparagus Ground,<br>1.5mm sized pieces                           | T5-Chicken flavor ground asparagus<br>T6-Chicken flavor 1.5mm sized asparagus<br>T7-Vegetable flavor ground asparagus<br>T8-Vegetable flavor 1.5mm sized asparagus  |
| Sub Ex4:-CMC level 0.1%,0.2%<br>Chicken flavor(Carboxy Methyl<br>Cellulose) | T15-Chicken flavor ,0.1%CMC,1.5mm asparagus<br>T16-Chicken flavor ,0.2%CMC,1.5mm asparagus<br>T17-Chicken flavor ,0.1%CMC,ground asparagus<br>T18-Chicken flavor ,0.2%CMC,ground asparagus  |
| Sub Ex5:-CMC level 0.1%,0.2%<br>Vegetable flavor                            | T19-Vegetable flavor,0.1%CMC,ground asparagus<br>T20-Vegetable flavor,0.2%CMC,ground asparagus<br>T21-Vegetable flavor ,0.1%CMC,1.5mm asparagus<br>T22-Vegetable flavor ,0.2%CMC,1.5mm asparagus  |

## RESULTS AND DISCUSSION

Table 2. Sensory analysis of Asparagus soup ground form Vs 1 inch chunk pieces

| Sample      | Colour | Appearance | Taste | Texture | Aroma | Acceptability |
|-------------|--------|------------|-------|---------|-------|---------------|
| T1          | 8      | 7          | 7     | 7       | 7     | 7             |
| T2          | 7      | 7          | 7     | 6       | 7     | 6             |
| T3          | 7      | 7          | 7     | 7       | 6     | 6             |
| T4          | 5      | 6          | 6     | 6       | 6     | 6             |
| Probability | 0.010  | 0.003      | 0.079 | 0.299   | 0.288 | 0.022         |

Qualitative data of different soup mixed were illustrated in the Table2. Colour, appearance and overall acceptability were significantly different at  $P < 0.05\%$ . Higher the ranks in the treatments better the results. T1 and T3 treatments scored high ranks for colour, appearance, taste, texture

and overall acceptability. Thus, ground chicken and vegetable flavored samples were selected for further analysis and chunk samples were rejected.

Table 3. Sensory analysis of Asparagus soup ground with muslin strain Vs 600µm sieve

| Sample      | Colour | Appearance | Taste | Texture | Aroma | Overall Acceptability |
|-------------|--------|------------|-------|---------|-------|-----------------------|
| T9          | 7      | 7          | 8     | 8       | 7     | 8                     |
| T10         | 7      | 7          | 7     | 6       | 6     | 6                     |
| T11         | 7      | 7          | 7     | 6       | 6     | 6                     |
| T12         | 6      | 7          | 7     | 7       | 6     | 7                     |
| T13         | 6      | 6          | 6     | 5       | 5     | 5                     |
| T14         | 6      | 6          | 6     | 6       | 6     | 6                     |
| Probability | 0.018  | 0.103      | 0.004 | 0.000   | 0.069 | 0.003                 |

Sensory analysis resulted Table 3 was conducted to select the best ground form of soup mix. According to the Table 3, colour, taste, texture and acceptability were significantly different at  $P < 0.05$ . T9 and T12 samples were highly scored for texture and overall acceptability. Thus, grounded chicken flavored (T9) and vegetable flavored (T12) were selected for next sensory analysis.

Table 4. Sensory analysis of Asparagus soup mix (ground Vs 1.5 mm piece)

| Sample      | Colour | Appearance | Taste | Texture | Aroma | Overall acceptability |
|-------------|--------|------------|-------|---------|-------|-----------------------|
| T5          | 7      | 6          | 7     | 6       | 7     | 7                     |
| T6          | 7      | 6          | 7     | 6       | 7     | 7                     |
| T7          | 7      | 7          | 7     | 7       | 7     | 7                     |
| T8          | 7      | 6          | 6     | 6       | 6     | 6                     |
| Probability | 0.502  | 0.239      | 0.035 | 0.062   | 0.467 | 0.031                 |

Sensory analysis resulted Table 4 was conducted to select either ground or piece forms in order to increase the palatability of the consumer. Even though the results of taste and acceptability were significant at  $P < 0.05$  but the appearance of the soup mixed were not significantly different at  $P < 0.05$ . Thus, ground form and piece 1.5 mm pieces forms were selected for the further sensory studies.

Table 5. Sensory analysis of Asparagus chicken flavor (CMC at 0.1 % Vs 0.2% levels)

| Sample      | Colour | Apperance | Taste | Thickness | Aroma | Overall acceptability |
|-------------|--------|-----------|-------|-----------|-------|-----------------------|
| T15         | 8      | 7         | 7     | 7         | 7     | 7                     |
| T16         | 8      | 8         | 8     | 7         | 7     | 7                     |
| T17         | 8      | 7         | 7     | 8         | 6     | 7                     |
| T18         | 8      | 78        | 7     | 8         | 6     | 8                     |
| Probability | 0.640  | 0.532     | 0.690 | 0.046     | 0.288 | 0.872                 |

Table 6. Sensory analysis of Asparagus vegetable flavor (CMC at 0.1 % Vs 0.2% levels)

| Sample      | Colour | Apperance | Taste | Thickness | Aroma | Over all Acceptability |
|-------------|--------|-----------|-------|-----------|-------|------------------------|
| T19         | 7      | 7         | 8     | 7         | 7     | 7                      |
| T20         | 8      | 7         | 8     | 7         | 7     | 7                      |
| T21         | 7      | 7         | 7     | 7         | 7     | 7                      |
| T22         | 7      | 7         | 8     | 7         | 7     | 7                      |
| Probability | 0.992  | 0.919     | 0.196 | 0.500     | 0.976 | 0.905                  |

According to the Table 5, thickness of the soup sample was significantly different at  $P < 0.05$ . But the overall acceptability of the samples were not significant at  $P < 0.05$ . Hence low level of CMC 0.01 % was selected as the best level for thickening the soup mixed in chicken flavored samples. As per the Table 6 of vegetable soup, none of the parameter of organoleptic properties were not significant at  $P < 0.05$ . Thus, low level of CMC which is 0.1 % was selected as the best level of CMC.

Table 7. Heat penetration study of Asparagus soup mix samples

| Parameter          | T17 at 1/3 depth | T17 at 1/2 depth | T15 at 1/2 depth | T15 at 1/3 depth | T19 at 1/2 depth |
|--------------------|------------------|------------------|------------------|------------------|------------------|
| T(time in min.)    | 55               | 59               | 47               | 51               | 59               |
| T <sup>0</sup> C   | 118.95           | 118.8            | 119              | 119              | 118.95           |
| Cumulative F value | 4.89025          | 4.5791           | 4.9126           | 4.8574           | 5.0455           |

As illustrated in the Table 7, F value was calculated for the T15, T17, T19 and T21. Due to layer separation both Asparagus 1.5 mm piece chicken (T15), vegetable flavor (T21) soup mix were rejected. As per to the calculation, the come up time was 16 min and the processing time was 43 min. and others two samples of Asparagus ground chicken (T17) and vegetable ground flavor (T19) were subjected for real trail production.

Table 8. Commercial sterility of the soup mix sample

| Sample                 | Aerobic plate count | pH  |
|------------------------|---------------------|-----|
| Chicken ground (T17)   | Negative            | 5.5 |
| Vegetable ground (T19) | Negative            | 5.5 |

Based on the results in the Table 8, aerobic plate count was negative and no changes in pH was observed. Therefore samples were suitable for consumption. According to the Table 8 none of the parameter was not significant at  $P < 0.05$ . At last, ground chicken and vegetable flavored samples were selected as best recipe for asparagus soup mix samples and results were illustrated in Table 9.

Table 9. Final sensory analysis of Asparagus soup mix

| Sample      | Colour | Appearance | Thickness | Taste | Aroma | Overall acceptability |
|-------------|--------|------------|-----------|-------|-------|-----------------------|
| T17         | 7      | 7          | 8         | 7.5   | 7.5   | 7.5                   |
| T19         | 7      | 7.5        | 8         | 7.5   | 7.5   | 7.5                   |
| Probability | 0.094  | 0.910      | 0.705     | 0.650 | 0.880 | 0.791                 |

Table 10 illustrated the comparison of nutrient content of prepared Asparagus soup and the commercial brine asparagus. It shows that prepared asparagus soup contains higher protein, fat contain than the asparagus in brine. It shows that adding of the soup ingredients like fresh milk, butter, vegetable and chicken has improved the amount of protein and fat content in the soup mix. As per the Table 10 illustrated 400 ml of asparagus soup cost is Rs. 199.00 cheaper than the commercial brine product available in the market which is of price Rs. 334.00 for 270 drained weight.

Table 10. Nutritional Value of Asparagus soup

| Nutrient    | Quantity (Dry basis %) | Commercial product (Asparagus in Brine %) |
|-------------|------------------------|---|
| Moisture    | 19.5                   | -   |
|             | 91.81(wet)             | -   |
| Total fat   | 17.5                   | 0   |
| Protein     | 19.25                  | 0.91                                      |
| Ash         | 10.8                   | -   |
| Crude fiber | 2.2                    | 3.6                                       |

Table 11. Cost analysis of Raw material

| Raw material      | Cost Rs per litre | Cost Rs per can (400ml) |
|-------------------|-------------------|-------------------------|
| Asparagus( 327g)  | 343/-             | 132/-                   |
| Fresh milk(327ml) | 36/-              | 14/-                    |
| Stock(327ml)      | 77/-              | 39/-                    |
| Butter(8g)        | 12/-              | 5/-                     |
| Spices            | 22/-              | 9/-                     |
| <b>Total cost</b> | <b>490/-</b>      | <b>199/-</b>            |

## CONCLUSIONS/RECOMMENDATIONS

This study characterized the physical properties of asparagus with other ingredients for the production of good quality soup mix. Soup mix contains 327 g of asparagus in ground form with level of 0.1 % CMC with chicken or vegetable flavor were acceptable in overall quality. It shows that through value addition the nutritional composition could be improved as well as the production cost could be minimized.

## REFERENCES

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