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# Development and Nutritional Assessment of Functional Food with Agathi (*Sesbania grandiflora*) Flowers

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**Abstract**

Agathi (*Sesbania grandiflora*) flowers are known for their rich nutritional and bioactive compounds making them an ideal ingredient for developing functional foods. The study was undertaken to develop and evaluate agathi flower-based sandwich fillings. Three formulations of agathi sandwich fillings (FSH1, FSH2, FSH3) were prepared substituting tomato with agathi flowers at 40, 50 and 60 per cent levels respectively, along with a control filling (VSH) containing capsicum, tomato and carrot. The results showed that the FSH3 formulation was best accepted with higher sensory scores for colour (8.57), appearance (8.52), flavour (8.38), taste (8.47), texture (8.66) and overall acceptability (8.61), respectively than the control and other formulations. Proximate analysis revealed that FSH3 has significantly higher moisture (69.85 g), protein (1.6g), ash (2.04g), crude fibre (2.53g), but lower fat (7.25g), carbohydrates (16.71g) and energy (139 Kcal) per 100g compared to control (VSH) sandwich filling. Shelf-life studies were conducted for VSH and FSH3, by analysing changes in moisture content, sensory properties and microbial load (total bacterial count and total mold count) every twelve hours at room temperature. FSH3 demonstrated superior sensory scores and maintained acceptable microbial levels till 24 hours of storage period. Cost analysis indicated the economic feasibility of sandwich filling with agathi flowers. These findings highlighted the potential of agathi flowers to enhance the nutritional profile and sensory attributes of functional foods, supporting their inclusion in health-promoting diets.

*Keywords* : *Sesbania grandiflora,* Agathi flowers, Sandwich filling, Functional food, Sensory evaluation, Nutritional analysis, Shelf-life

In recent years, the demand for functional foods has increased as consumers become more aware of the link between diet and health. These foods provide health benefits beyond basic nutrition and can help reduce the risk of various diseases (Hasler, 2000). Originating in Japan in the 1980s, the concept has since gained global popularity (Mellentin and Heasman, 2014).

*Sesbania grandiflora*, commonly known as agathi, is a fast-growing, medium-sized tree that can reach a height of 10-15 meters and a diameter of up to 30 cm (Kashyap & Mishra, 2012 and Dwivedi *et al*., 2014). This versatile plant has various medicinal properties, with all its parts being beneficial. Agathi flowers have traditionally been used in various culinary applications with a range of health protective properties. The large, butterfly-shaped flowers are a prominent feature of the tree, hanging at the leaf base in clusters of 2-5. These flowers can be white, yellowish, rose pink or red, measuring 5-10 cm in length and about 30 mm wide before opening (Wagh *et al*., 2009). Agathi flowers have demonstrated significant antioxidant activity, reversing oxidative

stress markers in the kidneys due to phenolic compounds and anthocyanins (Kumaravel *et al*., 2011). Agathi flowers also exhibit anti-diabetic potential by inhibiting alpha-amylase, thereby regulating blood sugar levels and reducing blood glucose levels while enhancing antioxidant enzyme activity in diabetic rats (Kothari *et al*., 2017 and Veerabhadrapppa & Raveendra Reddy, 2017). Furthermore, neuroprotective effects were also observed, as the flowers protect brain tissue from oxidative damage induced by chronic cigarette smoke exposure (Ramesh *et al*., 2015). The flowers also demonstrated hepatoprotective properties, improving liver function and antioxidant levels in rats (Pari & Uma, 2003).

These diverse health benefits underscore the potential of agathi flowers as a functional food ingredient aimed at promoting health and preventing diseases. Despite their known benefits, the integration of agathi flowers into modern functional food products remains relatively unexplored. This study intended to bridge this gap by developing and evaluating sandwich fillings with fresh agathi flowers, thereby creating a novel functional food product.

The objective of this study is to formulate sandwich fillings with varying proportions of agathi flowers, assess their sensory evaluation, analyse the proximate composition of the best-accepted formulation and evaluate their shelf-life stability and economic feasibility.

## Material and Methods

The present research was carried out in the Department of Food Science and Nutrition, University of Agricultural Sciences, GKVK, Bengaluru, India. The study was conducted during the academic year 2023-2024.

### Procurement of Raw Materials

Agathi (*Sesbania grandiflora*) flowers were collected from the horticulture garden, UAS, GKVK, Bangalore. Petals were separated from the flowers and washed. Additional raw materials needed for the product were procured from local vendors of Bangalore, India.

### Standardization of Sandwich Filling with Fresh Agathi Flowers

The control sandwich filling was prepared with capsicum, tomato and carrot. Three formulations of sandwich fillings were prepared using different proportions of agathi flowers *i.e.,* F1 (40%), F2 (50%), F3 (60%) by substituting the tomato and keep other ingredients at constant level (Table 1). The preparation process followed for making all formulations of sandwich fillings is given in Fig. 1 and the final output of products are shown in plate 1.

### Sensory Evaluation of Developed Functional Foods

The sensory attributes of the formulated *Sesbania grandiflora* incorporated functional food products were analysed by 30 semi-trained panel members using a 9-point hedonic scale at the Food Science and Nutrition Department, UAS, GKVK, Bangalore. The panel members were asked to score sensory characteristics according to their importance in evaluating the acceptability of different treatments.

**Table 1**

**Composition of Sandwich Filling Formulations**

| Ingredients | VSH (g) | FSH1 (g) | FSH2 (g) | FSH3 (g) |
|---|---|---|---|---|
| Flowers | - | 40 | 50 | 60 |
| Tomato | 30 | 30 | 20 | 10 |
| Capsicum | 30 | - | - | - |
| Carrot | 10 | - | - | - |
| Onion | 10 | 10 | 10 | 10 |
| Fresh coconut | 5 | 5 | 5 | 5 |
| Green chilli | 1.5 | 1.5 | 1.5 | 1.5 |
| Curry leaves | 2 | 2 | 2 | 2 |
| Ginger garlic paste | 1.5 | 1.5 | 1.5 | 1.5 |
| Red chilli powder | 1.5 | 1.5 | 1.5 | 1.5 |
| Turmeric | 0.5 | 0.5 | 0.5 | 0.5 |
| Salt | 2 | 2 | 2 | 2 |
| Seasonings | 1 | 1 | 1 | 1 |
| Oil | 5 | 5 | 5 | 5 |

*Note* : VSH- Vegetable Sandwich; FSH1- Sandwich filling with 40% agathi flowers; FSH2- Sandwich filling with 50% agathi flowers; FSH3- Sandwich filling with 60% agathi flowers

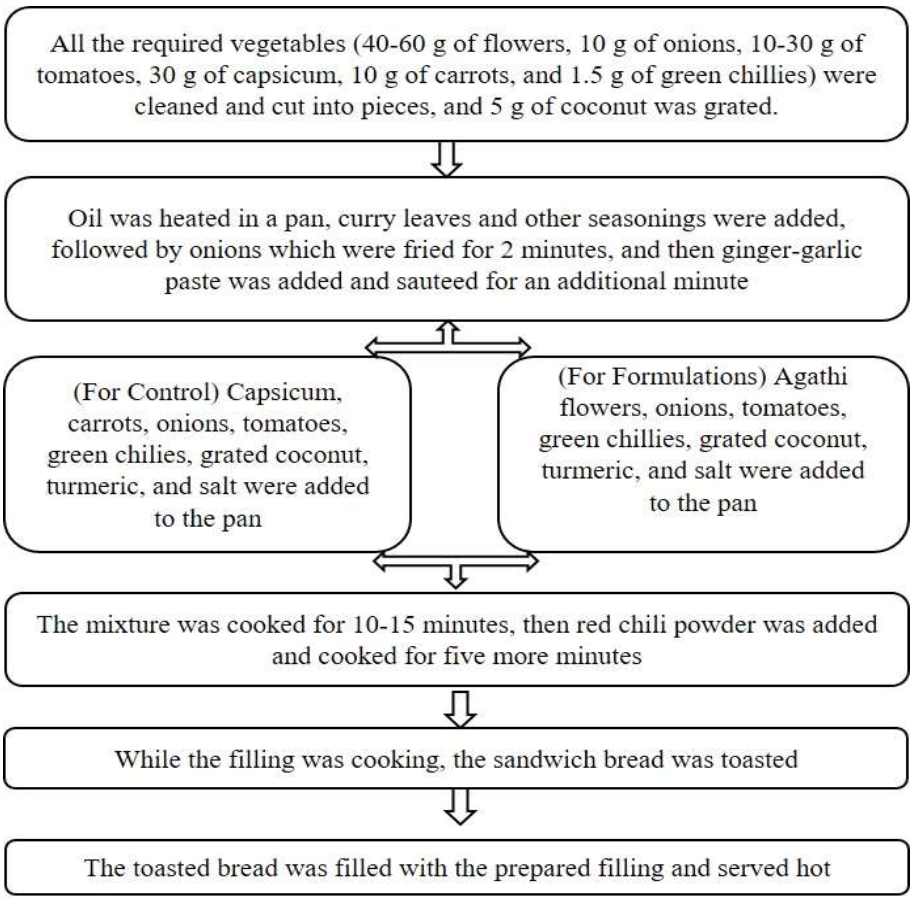


Fig. 1 : Flow chart for the preparation of sandwich filling formulations


Plate 1 : Formulations of sandwich fillings

For the sensory evaluation, the sandwich fillings were served with toasted bread to simulate actual consumption conditions and the core research focuses on the development and evaluation of the sandwich fillings. The mean scores for all characteristics were obtained and statistically analyzed.

*Nutritional Analysis* : Standardised Association of Official Agricultural Chemists (AOAC, 2005) protocols were used for analysing nutritional parameters such as moisture, protein, fat, as hand crude fibre. The carbohydrate content of the samples was determined utilizing the difference method. Additionally, the energy content was computed using the factorial method.

*Shelf-life Study of best Accepted Products* : The best accepted product by the sensory panel and the control were stored in steel boxes at room temperature. The changes in moisture content, sensory characteristics and microbial load were studied every 12 hours. Microbial analysis of the products was carried out as per the standard method by using Nutrient Agar (NA) for total bacterial count (TBC) and rose bengal agar for total mold count (TMC) (Tambekar *et al*., 2009).

**Calculation of Production Costs**

The cost calculation for both control and the best accepted functional food products entailed a thorough evaluation. The production cost was calculated by including the expenses of raw materials, processing costs, overhead charges which cover both operational and indirect expenses, labour costs, machinery operation costs and the addition of a profit margin.

**Statistical Analysis**

All the results were presented as mean ± standard deviation (SD). Independent samples t-tests were used for two-group comparisons and ANOVA with Duncan's multiple range test (DMRT) for multiple group comparisons (Rao, 2018). Statistical analyses were performed using SPSS 20.0 (IBM, USA).

## Results and Discussion

**Evaluation of Sensory Scores**

The sensory evaluation of sandwich fillings with different levels of agathi flowers (FSH1, FSH2, FSH3) along with control sandwich filling (VSH) revealed significant differences in sensory attributes. Table 2 and Fig. 2, represent the sensory scores for colour, appearance, flavour, taste, texture and overall acceptability of different formulations.

A significant difference was observed in the sensory scores of colour ($p \leq 0.01$), appearance ($p \leq 0.01$), taste ($p \leq 0.01$), texture ($p \leq 0.01$) and overall acceptability ($p \leq 0.01$) among the different formulations, while no

**Table 2**

**Sensory scores of sandwich fillings**

| Treatments | Colour | Appearance | Flavour | Taste | Texture | Overall Acceptability |
|---|---|---|---|---|---|---|
| VSH | 8.19 ± 0.51 $^{ab}$ | 8.09 ± 0.57 $^{ab}$ | 8.14 ± 0.79 $^{a}$ | 7.57 ± 0.59 $^{a}$ | 7.66 ± 0.79$^{a}$ | 7.95 ± 0.58$^{a}$ |
| FSH1 | 7.95 ± 0.80 $^{a}$ | 8.00 ± 0.63 $^{a}$ | 8.04 ± 0.80 $^{a}$ | 8.09 ± 0.83 $^{ab}$ | 7.90 ± 0.87$^{a}$ | 8.00 ± 0.77$^{a}$ |
| FSH2 | 8.33 ± 0.73 $^{ab}$ | 8.28 ± 0.56 $^{ab}$ | 8.14 ± 0.35 $^{a}$ | 8.23 ± 0.62 $^{b}$ | 8.19 ± 0.67$^{ab}$ | 8.14 ± 0.57$^{ab}$ |
| FSH3 | 8.57 ± 0.59 $^{c}$ | 8.52 ± 0.51 $^{c}$ | 8.38 ± 0.49 $^{a}$ | 8.47 ± 0.67 $^{c}$ | 8.66 ± 0.48$^{c}$ | 8.61 ± 0.52$^{c}$ |
| F-value | 3.23 ** | 3.54 ** | 1.02 $^{NS}$ | 6.48 ** | 8.54** | 5.11 ** |
| SE (m) | 0.14 | 0.12 | 0.14 | 0.15 | 0.14 | 0.13 |
| CD | 0.41 | 0.34 | N/A | 0.42 | 0.41 | 0.38 |

*Note* : VSH- Vegetable Sandwich; FSH1- Sandwich filling with 40% agathi flowers; FSH2- Sandwich filling with 50% agathi flowers; FSH3- Sandwich filling with 60% agathi flowers. Values are expressed as mean ± SD. Values having different superscripts in the same columns are statistically significant (p d" 0.01), ** Significant at p d" 0.01 level; NS- Non-significant; N/A- Not available

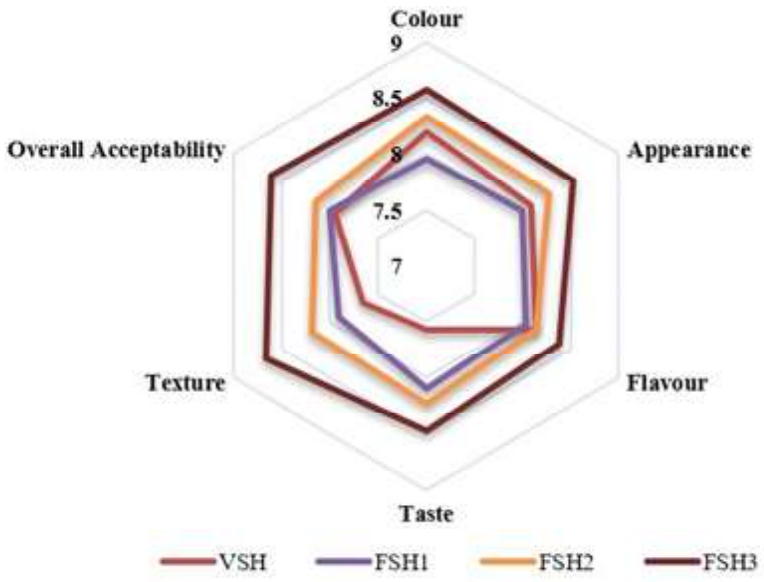


Fig. 2 : Sensory scores of sandwich fillings with different proportions of agathi flowers

significant difference was found in flavour (NS). Specifically, FSH3, the sandwich filling with 60 per cent agathi flowers, achieved the highest scores in all sensory attributes: colour (8.57), appearance (8.52), flavour (8.38), taste (8.47), texture (8.66) and overall acceptability (8.61). This indicates a strong preference for the FSH3 formulation over control and other formulations, may be due to the balanced enhancement of visual appeal, taste and texture provided by the higher proportion of agathi flowers. Comments in the sensory score card revealed that the FSH3 formulation had good sensory scores compared to other formulations because as the proportion of flowers increased, the crunchiness and palatability improved.

The control filling (VSH), which consisted of capsicum, tomato and carrot, received lower scores in comparison to FSH3 but remained moderately accepted with an overall acceptability score of 7.95. FSH1 and FSH2, with 40 and 50 per cent agathi flower incorporation received intermediate scores (8.00 and 8.14 respectively), reflecting a gradual increase in sensory appeal with higher agathi flower content.

The observed trend aligns with previous studies on functional foods, where higher incorporation of nutrient-dense ingredients such as agathi flowers tends to improve sensory attributes and overall acceptability. For instance, studies on quinoa incorporation in nachos showed that by increasing the level of functional ingredients, sensory properties such as colour, texture and overall acceptability were enhanced (Patiballa and Ravindra, 2022).

**Proximate Composition of Sandwich Fillings**

The proximate composition revealed that agathi flowers sandwich (FSH3) significantly influenced the nutritional profile compared to the control filling (VSH). Table 3, represented the proximate composition of the sandwich fillings.

Notably, FSH3, the formulation with the highest agathi flower content (60%), exhibited a statistically significant increase ($p \leq 0.01$) in moisture (69.85g/100g), protein (1.60g/100g), crude fiber (2.53g/100g) compared to the control (VSH). Ash content (2.04g/100g) in FSH3 also showed a significant difference ($p \leq 0.05$) compared to VSH. Conversely, FSH3 displayed a statistically significant decrease ($p \leq 0.01$) in fat content (7.25g/100g), carbohydrates (16.71g/100g) and energy (139 kcal/100g) than the control filling. These results demonstrated the nutritional enhancement achieved by incorporating agathi flowers into the sandwich fillings. These findings aligned with studies on

**TABLE 3**

**Proximate composition of sandwich fillings**

| Treatments | Moisture | Protein | Fat | Ash | Crude fibre | CHO# | Energy## |
|---|---|---|---|---|---|---|---|
| VSH | 65.79 ± 0.34 | 1.35 ± 0.03 | 7.44 ± 0.08 | 1.70 ± 0.15 | 2.42 ± 0.02 | 21.27 ± 0.42 | 158 ± 0.97 |
| FSH3 | 69.85 ± 0.23 | 1.60 ± 0.02 | 7.25 ± 0.02 | 2.04 ± 0.02 | 2.53 ± 0.03 | 16.71 ± 0.20 | 139 ± 1.04 |
| t-value | 16.92 ** | 10.15 ** | 3.98 ** | 3.74 * | 4.37 ** | 16.65 ** | 23.02 ** |

*Note :* VSH- Vegetable sandwich filling; FSH3- Sandwich filling with 60% agathi flowers. Values expressed as mean ±standard deviation of three determinations. CHO- Carbohydrates. #- Calculated by difference method.
##- Determined by computation.** - Significant at 0.01 per cent level, *- Significant at 0.05 per cent

composite flour mixes, where the addition of nutrient-rich ingredients enhanced the nutritional profile (Rani and Jamuna, 2023).

**Shelf-life Study**

**Effect of Storage on Moisture Content**

The moisture content of the sandwich fillings was significantly affected by storage time, as illustrated in Table 4. FSH3, which had 60 per cent agathi flowers, exhibited a higher initial moisture content (69.85 g/100 g) compared to the control filling (VSH) with 65.79 g/100 g. Over the storage period, the moisture content increased in both formulations, with FSH3 increased to 71.54 g/100 g and VSH to 67.23 g/100 g after 24 hours. The increase in moisture content was statistically significant ($p \leq 0.01$) at each time point for both formulations. The increase in moisture content during storage may be attributed to the absorption of moisture from the surrounding environment during storage.

**TABLE 4**

**Effect of storage on moisture content of sandwich fillings**

| Storage time | Moisture content (%) | |
|---|---|---|
| | VSH | FSH3 |
| 0th hour | 65.79 $^{a}$ ± 0.34 | 69.85 $^{a}$ ± 0.23 |
| 12th hour | 66.49 $^{b}$ ± 0.06 | 70.62 $^{b}$ ± 0.03 |
| 24th hour | 67.23 $^{c}$ ± 0.52 | 71.54 $^{c}$ ± 0.09 |
| F-value | 37.88 ** 98.53 | ** |
| SE (m) | 0.11 | 0.08 |
| CD | 0.41 | 0.30 |

*Note :* VSH- Control Vegetable sandwich filling, FSH3- Sandwich filling with 60% agathi flowers. Values expressed as mean ±standard deviation of three determinations.Values having different superscripts in the same columns are statistically significant ($p \leq 0.01$). ** - Significant at 0.01 per cent level

**Effect of Storage on Sensory Properties**

The sensory properties of sandwich fillings with agathi flowers (FSH3) and the control vegetable filling (VSH) were evaluated over a storage period of 24 hours (Table 5).

For the control vegetable sandwich filling (VSH), significant changes in sensory properties were observed throughout the storage period. Colour scores declined drastically from 8.19 at 0 hours to 4.28 at 24 hours ($p \leq 0.01$), indicating a clear deterioration in the visual appeal of the product. Similarly, appearance scores dropped from 8.09 to 4.09 ($p \leq 0.01$), and flavour scores decreased from 8.14 to 3.23 ($p \leq 0.01$). Texture also exhibited notable reductions, with scores declining from 7.66 to 4.04 ($p \leq 0.01$). Overall acceptability significantly reduced from 7.95 at 0 hours to 3.61 at 24 hours ($p \leq 0.01$). However, taste scores were only evaluated up to 12 hours due to safety concerns, as the microbial load crossed the permissible limits after that point.

The sandwich filling with 60 per cent agathi flowers (FSH3) followed a similar trend in sensory scores over the storage period. Colour scores decreased from 8.57 at 0 hours to 3.76 at 24 hours ($p \leq 0.01$), while appearance scores dropped from 8.52 to 3.38 ($p \leq 0.01$). Flavour scores declined from

**Table 5**

**Effect of storage on sensory properties of sandwich fillings**

| VSH - Storage hours | Colour | Appearance | Flavour | Taste | Texture | Overall Acceptability |
|---|---|---|---|---|---|---|
| 0th hour | 8.19 ± 0.51 | 8.09 ± 0.53 | 8.14 ± 0.79 | 7.57 ± 0.59 | 7.66 ± 0.79 | 7.95 ± 0.58 |
| 12th hour | 7.04 ± 0.58 | 6.90 ± 0.43 | 6.66 ± 0.57 | 6.80 ± 0.51 | 6.76 ± 0.43 | 6.90 ± 0.62 |
| 24th hour | 4.28 ± 0.46 | 4.09 ± 0.62 | 3.23 ± 0.70 | - | 4.04 ± 0.38 | 3.61 ± 0.66 |
| F-value | 308.20 ** | 304.97 ** | 274.65 ** | 19.69 ** | 230.04 ** | 271.60 ** |
| SE (m) | 0.11 | 0.11 | 0.15 | 0.12 | 0.12 | 0.13 |
| C.D | 0.32 | 0.33 | 0.43 | 0.34 | 0.35 | 0.38 |
| FSH3- Storage hours | Colour | Appearance | Flavour | Taste | Texture | Overall Acceptability |
| 0th hour | 8.57 ± 0.59 | 8.52 ± 0.51 | 8.38 ± 0.49 | 8.47 ± 0.67 | 8.66 ± 0.48 | 8.61 ± 0.49 |
| 12th hour | 6.80 ± 0.40 | 6.76 ± 0.43 | 6.19 ± 0.74 | 6.61 ± 0.49 | 6.85 ± 0.35 | 6.57 ± 0.50 |
| 24th hour | 3.76 ± 0.70 | 3.28 ± 0.46 | 3.38 ± 0.49- | | 3.19 ± 0.40 | 3.23 ± 0.43 |
| F-value | 369.48 ** | 671.35 ** | 374.36 ** | 102.08 ** | 936.27 ** | 668.42 ** |
| SE (m) | 0.12 | 0.10 | 0.13 | 0.13 | 0.09 | 0.10 |
| C.D | 0.35 | 0.29 | 0.36 | 0.37 | 0.25 | 0.29 |

*Note* : VSH- Control Vegetable sandwich filling, FSH3- Sandwich filling with 60 per cent agathi flowers.
Values expressed as mean ± standard deviation.** - Significant at 0.01 per cent level

8.38 to 3.38 ($p \leq 0.01$). Texture and overall accept ability also showed significant reductions, with texture scores decreasing from 8.66 to 3.23 and overall acceptability dropping from 8.61 to 3.23 ($p \leq 0.01$). As with VSH, taste scores were only evaluated up to 12 hours due to safety concerns, as the microbial load exceeded permissible limits beyond this point.

Despite showing an overall decline in sensory qualities, FSH3 generally maintained better scores than VSH in the earlier stages of storage (0 to 12 hours). However, by 24 hours, the control filling (VSH) scored higher in attributes such as appearance, taste, texture and overall acceptability compared to FSH3, indicating that the control filling retained better sensory qualities at the later stage of storage.

**Effect of Storage on Microbial Population**

The microbial population in vegetable sandwich filling (VSH) and sandwich filling with 60 per cent agathi flowers (FSH3) was monitored at 0, 12 and 24 hours, with both Total Bacterial Count (TBC) and Total Mold Count (TMC) recorded (Table 6).

**Table 6**

**Effect of storage on microbial population of sandwich fillings**

| Storage hours | VSH | | FSH3 | | Safety status |
|---|---|---|---|---|---|
| | TBC ($\times 10^2$cfu/g) | TMC ($\times 10^2$cfu/g) | TBC ($\times 10^2$cfu/g) | TMC ($\times 10^2$cfu/g) | |
| 0 hours | 0.00 | 0.00 | 0.00 | 0.00 | Safe |
| 12 hours | 6.60 ± 0.52 | 0.50 ± 0.40 | 8.54 ± 0.98 | 0.65 ± 0.71 | Safe |
| 24 hours | 52.3 ± 1.25 | 1.60 ± 0.72 | 66.8 ± 1.52 | 2.40 ± 1.05 | Unsafe |

*Note* : VSH- Control Vegetable sandwich filling; FSH3- Sandwich filling with 60% agathi flower;
TBC- Total Bacterial Count; TMC- Total Mold Count

At 0 hours, no microbial growth was detected in either formulation, confirming the initial safety of the sandwich fillings. Both the VSH and FSH3 fillings were free from microbial contamination immediately after preparation, indicating that the ingredients and preparation methods were microbiologically safe. By 12 hours, there was a notable increase in microbial population. VSH exhibited a TBC of $6.60 \times 10^2$ cfu/g and a TMC of $0.50 \times 10^2$ cfu/g, while FSH3 showed slightly higher values, with a TBC of $8.54 \times 10^2$ cfu/g and a TMC of $0.65 \times 10^2$ cfu/g. Despite this increase, the microbial counts for both formulations remained within the permissible limits set by the Food Safety and Standards Authority of India (FSSAI) for thermally processed foods (TBC: $1 \times 10^3$ cfu/g, TMC : $1 \times 10^2$ cfu/g) (Anonymous, 2018). Therefore, both sandwich fillings were considered micro biologically safe at the 12-hour mark.

**Production Cost of Sandwich Fillings**

The total raw material cost for the control filling (VSH) is INR 5.27, while for the FSH3 filling, it is INR 9.07 (as shown in Table 7).

Including processing costs at 20 per cent, overhead charges at 30 per cent and a profit margin of 15 per cent, the total production cost for 100g of control filling comes to INR 9, whereas the FSH3 filling costs INR 15. The slightly higher cost of FSH3 is primarily due to the inclusion of 60g of agathi flowers, priced

**TABLE 7**

**Production cost of sandwich fillings**

| Ingredients (g) | Rate/Kg (Rs.) | VSH | | FSH3 | |
|---|---|---|---|---|---|
| | | Quantity used (g) | Cost (Rs.) | Quantity used (g) | Cost (Rs.) |
| Flowers | 100 | 100 | - | 60 | 6 |
| Tomato | 30 | 30 | 30 | 10 | 0.3 |
| Capsicum | 50 | 50 | 30 | - | - |
| Carrot | 30 | 30 | 10 | - | - |
| Onion | 83 | 50 | 10 | 10 | 0.5 |
| Fresh coconut | 50 | 50 | 5 | 5 | 0.25 |
| Green chilli | 40 | 40 | 1.5 | 1.5 | 0.06 |
| Curry leaves | 100 | 100 | 2 | 2 | 0.2 |
| Ginger garlic paste | 80 | 80 | 1.5 | 1.5 | 0.12 |
| Red chilli powder | 200 | 200 | 1.5 | 1.5 | 0.3 |
| Turmeric | 150 | 150 | 0.5 | 0.5 | 0.07 |
| Salt | 10 | 10 | 2 | 2 | 0.02 |
| Seasonings | - | - | 1 | 1 | 0.5 |
| Oil | 150 | 150 | 5 | 5 | 0.75 |
| Total | 5.27 | 9.07 | | | |
| Processing cost (20%) | 1.05 | 1.81 | | | |
| Overhead charges (30%) | 1.58 | 2.72 | | | |
| Profit (15%) | 0.79 | 1.36 | | | |
| Cost of product | 8.69 | 14.96 | | | |
| Round off to | Rs. 9/- | Rs. 15/- | | | |

*Note* : VSH- Vegetable sandwich filling; FSH3- Sandwich filling with 60% agathi flowers

at INR 4, contributing to the increased total cost compared to the control.

The FSH3 formulation, which contained 60 per cent agathi flowers, not only enhanced the nutritional profile by significantly increasing protein, crude fiber, carbohydrates and energy content, but also maintained superior sensory qualities over time compared to the control filling. Despite a slight increase in production cost, the enhanced nutritional and sensory attributes justify the value. The study also recommends the development of such food formulations as an inclusion in healthy food basket. Thus, the study exhibited the significant potential of incorporating agathi (*Sesbania grandiflora*) flowers into sandwich fillings as a functional food ingredient.

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