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# Proximate Analysis and Bioactive Composition of Noodles Incorporated with Different Spices

***Dhanavath Srinu[1*], D. Baskaran[2] and S. Ramesh[3]***
*[1]Ph.D. Scholar, Department of Food Processing Technology,*
*College of Food and Dairy Technology-TANUVAS, Chennai-600052, (Tamil Nadu) India.*
*[2]Professor, Department of Livestock Products Technology (Dairy Science),*
*Madras Veterinary College-TANUVAS, Chennai-600007, (Tamil Nadu) India.*
*[3]Professor and Head, Department of Veterinary Pharmacology and Toxicology,*
*Madras Veterinary College-TANUVAS, Chennai-600007, (Tamil Nadu) India.*

*(Corresponding author: Dhanavath Srinu*)*
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**ABSTRACT: The present study was carried out to determine the proximate composition, bioactive compounds, and antioxidant properties of noodles prepared by incorporating selected spices *viz.*, fenugreek, black cumin, coriander, and cinnamon in the form of powders at different equal levels of substitutions (2%, 4%, and 6%). The proximate parameters such as moisture, protein, fat, crude fiber, total ash, and carbohydrate content were determined. The bioactive compounds namely total polyphenols and total flavonoids were determined. The antioxidant properties were determined by DPPH radical scavenging activity and reducing power assay. The spices incorporated noodles were found to have dietary fiber content in the range of 2.14 to 4.24g/100g. The total polyphenol content was found to be in the range of 14.22 to 19.50 mg/g of GAE. The results of the present study revealed that the noodles prepared by incorporating different spices showed good *in-vitro* antioxidant properties.**

**Keywords:** Dietary fibre, fenugreek, flavonoids, noodles, polyphenols.

## INTRODUCTION

Noodles are the most popular food products, which are consumed all over the world because of their convenience, variety, versatility, nutrition, flavor, less cooking time, and palatability (Aydin and Gocmen, 2011). The important ingredients required for noodles preparation are mainly wheat flour, water, and salt. Several varieties of Asian noodles are available nowadays, differing in their ingredients used, processes applied, and the form of the finished products (Crosbie and Ross, 2004). The diversity reflected due to the differences in culture, climate, region, and several other factors (Hou, 2001). The consumption of noodles has increased considerably due to the changes in customer preferences and nutritional awareness (Mahmoud *et al.*, 2012). The nutritional quality of noodles further improved to serve special dietary needs by fortification with numerous components from buckwheat, hull-less barley, rye flour, malted ragi flour, and sweet potato flour (Hatcher *et al.*, 2005; Bilgicli, 2009; Kulkarni *et al.*, 2012). Spices are widely cultivated in India across various states, which promote the opportunity for the development of new products, delivering health benefits along with taste in the functional food market. Hence, the present investigation was undertaken to develop noodles by incorporating selected spices *viz.*, fenugreek, coriander, black cumin, and cinnamon and to evaluate their nutritional, bioactive composition, and antioxidant properties.

## MATERIALS AND METHODS

Spices *viz.*, cinnamon, fenugreek, coriander, black cumin, and salt used in the development of noodles were procured from Sri MRV supermarket, Chennai. Whole-wheat flour utilized in the preparation of noodles was acquired from Chennai roller flour mills, Chennai. The research was carried out in the College of Food and Dairy Technology, a constituent college of Tamil Nadu Veterinary and Animal Sciences University, Chennai.

*A. Preparation of spice incorporated noodles*

Noodles are prepared from whole-wheat flour incorporated with selected spices *viz.*, coriander, fenugreek, black cumin, and cinnamon. The whole wheat flour (1000 g) was weighed and to it, 20 g of salt was added. Then, the grounded spice powders in different equal proportions at 2% (SPIN 1), 4% (SPIN 2), and 6% (SPIN 3) were added, mixed well, and then 300 ml of water was added to form the dough. The unit operations such as conditioning, sheeting, extrusion, cutting, folding, steaming, and drying were carried out for the production of noodles. The control noodles are prepared without the inclusion of spices.

*B. Proximate analysis*

Spice powders incorporated noodles were analyzed for proximate composition *viz.*, moisture, protein, fat, crude fiber, total ash content according to the method described in AOAC, (2006). The carbohydrate content was calculated as described by Muller and Tobin, (1980), total energy by the 'Atwater' factor method as described by Nwabueze, (2007), and total dietary fiber content by the enzyme-gravimetric method as described in AOAC, (2016).

*C. Estimation of bioactive compounds*

**(i) Estimation of total phenols.** The total phenolic content in the samples was carried out according to the method described by Chun *et al.*, (2003) with some modifications. Gallic acid (4 mg/100 ml) was considered as phenolic standard. Different concentrations (10 µg, 20 µg, 30 µg, 40 µg, 50 µg) of gallic acid were taken. The test sample contained 200 µl of 80% methanol extract of different samples. This volume was made up to 3 ml with deionized water and then to it, 250 µl of Folin-ciocalteu reagent (FCR) and 750 µl of $Na_2CO_3$ solution was added. Then, the whole solution was vortexed and incubated for 8 minutes at room temperature. To the whole solution, distilled water (1 ml) was added. Then, the mixture of solutions was incubated for about 2 hours in dark at room temperature. Absorbance was taken at 765 nm and compared against the standard gallic acid. The total phenolic content in the methanol extract of different samples was expressed as gallic acid equivalents (GAE).

**(ii) Estimation of total flavonoids.** The total flavonoid content in samples was determined according to the method described by Lin and Tang (2007). The sample extract (2 ml, 0.3 mg/ml) in methanol was mixed with aluminium chloride hexahydrate (0.1 ml, 10%), potassium acetate (0.1 ml, 1 M), and deionized water (2.8 ml). The above solution was kept for incubation for 40 minutes at room temperature. Then, the absorbance of the reaction mixture was determined spectrophotometrically at 415 nm. Quercetin (10 mg/100 ml) was considered as flavonoid standard. The total flavonoid content in the methanol extract of different samples was expressed as Quercetin Equivalents (QE).

*D. Estimation of antioxidant activity*

(i) DPPH radical scavenging activity. The effect of DPPH radical scavenging activity on samples was determined according to Blois, (1958) with the modification described by Brand-Williams *et al.*, (1995). A 100 µM solution of DPPH in methanol was prepared and extracts of different samples (50, 100 µl) containing 0.5 to 1 mg GAE were mixed with 1 ml of DPPH solution, the mixture was shaken vigorously and left in dark for 20 minutes at room temperature. The absorbance was measured at 517 nm. The percentage inhibition of the DPPH radical by the samples was calculated as follows:

$$\% \text{ Inhibition} = \frac{\text{Absorbance of the control } (A_o) - \text{Absorbance of the sample } (A_s)}{\text{Absorbance of the control } (A_o)} \times 100$$

**(ii) Reducing power assay.** The reducing power of the samples was determined according to the method given by Yen and Chen, (1995). The extracts of different samples (50, 100 µl) containing 50 to 100 mg of GAE were made up to 500 µl with 0.2 M phosphate buffer (pH 6.6) and mixed with 1 ml of potassium ferricyanide (0.1%) and the mixture was incubated at 50ºC for 20 minutes. Trichloroacetic acid (TCA) (500 µl, 10%) was added to the reaction mixture and centrifuged at 8,000 rpm for 10 minutes. The supernatant obtained mixed with equal volume of distilled water. Then, ferric chloride (300 µl, 1%) was added and the absorbance was measured at 700 nm.

*E. Statistical analysis*

All the experiments were carried out in six replicates and results are expressed as Mean ± SE. The statistical analysis was performed by ANOVA using SPSS®20.0 software for Windows (Snedecor and Cochran, 1994).

## RESULTS AND DISCUSSION

*A. Proximate Analysis*

The proximate composition of spice powders incorporated noodles (SPIN) is presented in Table 1. On analysis, no significant differences ($P > 0.05$) were observed in moisture content for control (5.50%), SPIN 1 (5.85%), SPIN 2 (6.08%), and SPIN 3 (6.37%). It was observed that the carbohydrate content found decreased from 77 to 75% in spices incorporated noodles.

**Table 1: Nutritional composition of spice powders incorporated noodles.**

| Parameters | Moisture (%) | Protein (%) | Fat (%) | Crude fibre (%) | Total ash (%) | Carbohydrate (%) | Total dietary fibre (%) | Energy (kcal/100 g) |
|---|---|---|---|---|---|---|---|---|
| **Control** | 5.50±0.304$^{a}$ | 11.80±0.092$^{a}$ | 0.55±0.023$^{ab}$ | 0.29±0.012$^{a}$ | 2.55±0.195$^{a}$ | 79.32±0.480$^{c}$ | 1.78±0.031$^{a}$ | 369.43±1.710$^{b}$ |
| **SPIN 1** | 5.85±0.199$^{a}$ | 12.60±0.270$^{b}$ | 0.52±0.019$^{a}$ | 0.61±0.074$^{b}$ | 2.76±0.196$^{ab}$ | 77.67±0.376$^{bc}$ | 2.14±0.022$^{b}$ | 365.72±1.411$^{ab}$ |
| **SPIN 2** | 6.08±0.270$^{a}$ | 12.94±0.023$^{b}$ | 0.67±0.032$^{bc}$ | 0.66±0.021$^{b}$ | 2.91±0.232$^{ab}$ | 76.74±0.430$^{ab}$ | 3.35±0.013$^{c}$ | 364.74±1.527$^{ab}$ |
| **SPIN 3** | 6.37±0.288$^{a}$ | 13.12±0.176$^{b}$ | 0.72±0.043$^{c}$ | 0.92±0.022$^{c}$ | 3.68±0.305$^{c}$ | 75.20±0.393$^{a}$ | 4.24±0.065$^{d}$ | 359.76±1.713$^{a}$ |
| **F-value** | 1.873$^{NS}$ | 12.149** | 9.743** | 41.799** | 4.328* | 16.693** | 880.566** | 6.241** |

Data expressed as Mean ± SE; n=6; NS - Non-significant ($P > 0.05$); * - Significant difference ($0.01 < P \leq 0.05$); ** - Highly significant difference ($P \leq 0.01$); Different superscripts within the same column differ significantly.

The variations found in the quantity of nutritional composition of developed noodles might be attributed to the addition of spices in different levels of substitution.

*B. Bioactive compounds of spices incorporated noodles*

The bioactive composition of different spice powders incorporated noodles (SPIN) is presented in Table 2. The total phenolic content was found to be higher in the

developed noodles, which ranged from 14.22 to 19.50 mg/g of GAE compared to control (12.62 mg/g of GAE). The beneficial effects of polyphenols are mainly attributed to their antioxidant properties since they can act as chain breakers or radical scavengers (Rice-Evans, 2001). The flavonoid content was also found to be higher and ranged from 72.28 to 85.89 mg/g of quercetin compared to control (66.34 mg/g of quercetin). The differences in values found between developed noodles for polyphenols, and flavonoids might be due to the increased level of inclusion of spices.

**Table 2: Bioactive composition of spice powders incorporated noodles.**

| Bioactive compounds | Total phenolics (mg/g of GAE) | Total flavonoids (mg/g of Quercetin) |
|---|---|---|
| **Control** | 12.62±0.140[a] | 66.34±0.260[a] |
| **SPIN 1** | 14.22±0.227[b] | 72.28±0.301[b] |
| **SPIN 2** | 16.52±0.126[c] | 78.57±0.223[c] |
| **SPIN 3** | 19.50±0.114[d] | 85.89±0.371[d] |
| **F-value** | 356.262** | 814.915** |

Data expressed as Mean ± SE; n=6; ** - Highly significant difference ($P \leq 0.01$); Different superscripts within the same column differ significantly

*C. Antioxidant activities of spices incorporated noodles*

The antioxidant activities analyzed by DPPH free radical scavenging and reducing power capacity, both at 50 µl and 100 µl concentration of the control and spice powders incorporated noodles (SPIN) were illustrated in Fig. 1 and 2 respectively. DPPH radical scavenging activity showed an increasing trend in 50 µl as well as in 100 µl concentration. The % inhibition of DPPH of developed noodles was found to be ranging from 36 to 44%, 51 to 64% in 50 µl and 100 µl concentrations, respectively. The reducing power in developed noodles also showed an increasing trend in both the 50 µl and 100 µl concentrations. The reducing power of compounds relates to their electron transferability and may, therefore, serve as a significant indicator of their antioxidant activity (Meir *et al.,* 1995).

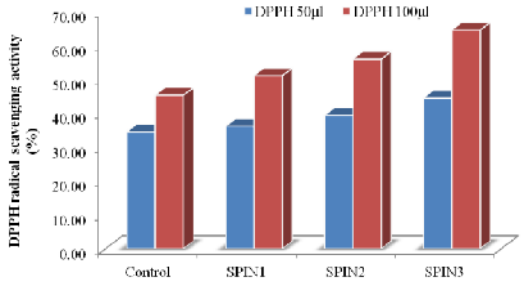


**Fig. 1.** DPPH radical scavenging activity of spice powders incorporated noodles.

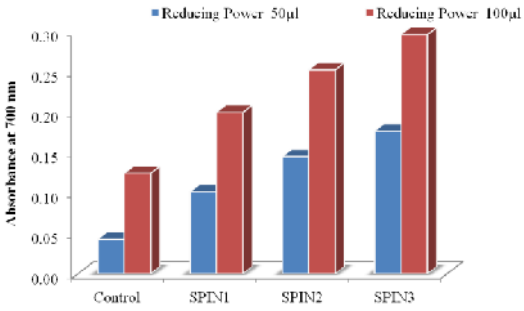


**Fig. 2.** Reducing power capacity of spice powders incorporated noodles.

## CONCLUSION

Noodles were prepared by incorporating selected spices *viz.,* fenugreek, black cumin, coriander, and cinnamon in the form of powders at different equal levels of substitution at 2%, 4%, and 6% and studied for their proximate, bioactive composition, and antioxidant properties. The results of the study revealed that the developed noodles showed good *in-vitro* antioxidant properties and possess a good amount of dietary fibre content. Further, studies will be carried out in *in-vivo* or animal models to confirm the health benefits of spices incorporated noodles.

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**Conflict of interest.** The authors declare no conflict of interest pertaining to this manuscript.

## REFERENCES

AOAC (2006). Official Methods of Analysis of AOAC International, 18th edition. Association of Official Analytical Chemists, Gaithersburg, MD.

AOAC (2016). Official Methods of Analysis of AOAC International, 20th edition. Association of Official Analytical Chemists, Rockville, Maryland, USA.

Aydin, E., & Gocmen, D. (2011). Cooking quality and sensorial properties of noodle supplemented with oat flour. *Food Science and Biotechnology*, *20*(2): 507-511.

Bilgicli, N. (2009). Effect of buckwheat flour on cooking quality and some chemical, antinutritional and sensory properties of eriste, Turkish noodle. *International Journal of Food Sciences and Nutrition*, *60*(sup4): 70-80.

Blois, M. S. (1958). Antioxidant determinations by the use of a stable free radical. *Nature*, *181*(4617): 1199-1200.

Brand-Williams, W., Cuvelier, M. E., & Berset, C. L. W. T. (1995). Use of a free radical method to evaluate antioxidant activity. *LWT-Food Science and Technology*, *28*(1): 25-30.

Chun, O. K., Kim, D. O., & Lee, C. Y. (2003). Superoxide radical scavenging activity of the major polyphenols in fresh plums. *Journal of Agricultural and Food Chemistry*, *51*(27): 8067-8072.

Crosbie, G. B., & Ross, A. S. (2004). Noodles| Asian wheat flour noodles. *In:* Wrigley, C., (Ed.), Encyclopedia of grain science, Oxford, UK: Elsevier Ltd., pp. 304-312.

Hatcher, D. W., Lagasse, S., Dexter, J. E., Rossnagel, B., & Izydorczyk, M. (2005). Quality characteristics of yellow alkaline noodles enriched with hull-less barley flour. *Cereal Chemistry*, *82*(1): 60-69.

Hou, G. (2001). Oriental noodles. *Advances in Food and Nutrition Research*, *43*: 141-193.

Kulkarni, S. S., Desai, A. D., Ranveer, R. C., & Sahoo, A. K. (2012). Development of nutrient rich noodles by supplementation with malted ragi flour. *International Food Research Journal*, *19*(1): 309-313.

Lin, J. Y., & Tang, C. Y. (2007). Determination of total phenolic and flavonoid contents in selected fruits and vegetables, as well as their stimulatory effects on mouse splenocyte proliferation. *Food Chemistry*, *101*(1): 140-147.

Mahmoud, E. A., Nassef, S. L., & Basuny, A. M. (2012). Production of high protein quality noodles using wheat flour fortified with different protein products from lupine. *Annals of Agricultural Sciences*, *57*(2): 105-112.

Meir, S., Kanner, J., Akiri, B., & Philosoph-Hadas, S. (1995). Determination and involvement of aqueous reducing compounds in oxidative defense systems of various senescing leaves. *Journal of Agricultural and Food Chemistry*, *43*(7): 1813-1819.

Muller, H. G., & Tobin, G. (1980). Nutrition and food processing: Croom Helm Ltd. *London. UK.*

Nwabueze, T. U. (2007). Nitrogen solubility index and amino acid profile of extruded African breadfruit (*T. africana*) blends. *Nigerian Food Journal*, *25*: 23-35.

Rice-Evans, C. (2001). Flavonoid antioxidants. *Current Medicinal Chemistry*, *8*(7): 797-807.

Snedecor, G. W., & Cochran, W. G. (1994). Statistical methods, 8th edition, IOWA State University Press, USA.

Yen, G. C., & Chen, H. Y. (1995). Antioxidant activity of various tea extracts in relation to their antimutagenicity. *Journal of Agricultural and Food Chemistry*, *43*(1): 27-32.

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