International Journal of Statistics and Applied Mathematics 2023; SP-8(5): 766-769

ISSN: 2456-1452
Maths 2023; SP-8(5): 766-769

https://www.mathsjournal.com
Received: 05-07-2023
Accepted: 11-08-2023

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Evaluation of cooking properties of multi-flour noodles

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Abstract
The present research was carried out to study the cooking properties of multi-flours noodles. The noodles were developed by taking different proportion of multi-flours in the ratio of (T_{100}) 100:0:0:0:0, (T_{90}) 90:2.5:2.5:2.5:2.5, (T_{80}) 80:5.0:5.0:5.0:5.0, (T_{70}) 70:7.5:7.5:7.5:7.5, (T_{60}) 60:10:10:10:10 and (T_{50}) 50:12.5:12.5:12.5:12.5 respectively. The cooking properties like cooking yield (%), optimum cooking time (min), water absorption (g/g), swelling index (%) and cooking loss (%) of multi- flours noodles were evaluated. The cooking properties of multi-flours noodles were (T_{50}) 50:12.5:12.5:12.5:12.5 has highest cooking property.

Keywords: Cooking properties, multi-flour, noodles

1. Introduction

Noodles are widely consumed throughout the world and their global consumption is second only to bread. Instant noodles are widely consumed throughout the world and it is a fast growing sector of the noodle industry (Owen, 2001) [16]. This is because instant noodles are convenient, easy to cook, low cost and have a relatively long shelf-life. Wheat flour which is usually used to make instant noodles is not only low in fibre and protein contents but also poor in essential amino acid, lysine. Flour of hard wheat *(Triticum aestivum* L.) is the main primary ingredient (Fu, 2008) [5] and the addition of alkaline salts can help strengthen the structure and hence improve the firmness of the final product (Hou and Kruk, 1998; Kulkarni *et al*., 2012) [6, 12]. The information on final product quality and the factors affecting quality are extremely limited in the scientific literature (Kruger *et al.*, 1998) [11]. The growth of bakery industry is about 10% per annum and the products are increasingly becoming popular among all sections of people (Indrani *et al*., 1997) [10]. Noodles are very thin form mostly made of wheat flour and water, the dough then are sheeted, rolled, cutted, dried and boiled in water. Noodle manufacturing involves sheeting and cutting of dough, which allow slower water addition as compared with other bakery products (Miskelly, 1993; Corke and Bhattacharya, 1999; Gulia *et al*., 2014) [14, 4, 7]. The good quality of noodle is characterized by firm and elastic texture due to wheat flour function as a binding agent during dough formation. People prefer noodles with hard texture, strong and elastic when it is served. Cooked noodles should be free from surface stickiness with a firm, chewy and elastic or resilient bite (Miskelly, 1996; Chang and Wu, 2008) [15, 2]. Among ready-to-eat snacks, biscuits possess several attractive features including wider consumption base, relatively long shelf-life, more convenience and good eating quality (Akubor, 2003; Hooda and Jood, 2005) [1, 8].

2. Materials and Methods

2.1 General discussion

The wheat flour, soybean flour, carrot powder, mushroom composite flours. The cooking properties of multi-flour noodles were analyzed that is, cooking yield (%), optimum cooking time (min), water absorption (g/g), swelling index (%) and cooking loss (%), ae expressed in Table 1.

2.2 Cooking Properties: Cooking yield, Optimum cooking time, Water adsorption, Swelling index and cooking loss.

Table 1: Treatments details

Experimental Parameters	Levels	Description				
Flour	5	Wheat flour (W), Soy bean flour (S), Carrot powder (C), Mushroom flour (M), Apple pomace powder (P)				
Ratio	6	W	S	C	M	P
	T_{100}	100	0	0	0	0
	T_{90}	90	2.5	2.5	2.5	2.5
	T_{80}	80	5	5	5	5
	T_{70}	70	7.5	7.5	7.5	7.5
	T_{60}	60	10	10	10	10
	T_{50}	50	12.5	12.5	12.5	12.5

2.3 Cooking yield (%): Cooking yield was calculated as a percentage of dry cooked noodle weight prior to cooking Li and Vasanthan, (2003) [13].

2.4 Optimum Cooking Time

To determine the cooking time, 5.0 g of noodles were boiled in 300 ml distilled water. Noodles were cooked until disappearance of white core as judged by squeezing between two glass slides. A volume basis and the results were reported as ml/g of dry flour. The experiments were conducted in triplicate.

2.5 Water Absorption (WA %)

The water uptake (%) was considered by Galvez and Resurreccion, (1992) [6].

$$\text{WA}\ (\%) = \frac{\text{Weight of cooked noodle} - \text{Weight of uncooked noodle}}{\text{Weight of uncooked noodles}} \times 100 \quad (1)$$

2.6 Swelling Index

Swelling index after cooking was calculated by the equation.

$$Swelling\ Index\ (SI, \%) = \frac{(W_1 - W_2)}{W_2} \times 100 \quad (2)$$

2.7 Cooking Loss: This is usually quantitatively described by the term ‘‘cooking loss” (Chen *et al.*, 2002) [3]. Total cooking losses, which include solid losses and soluble losses, were calculated with the following equations (DM = dry matter ratio of crude samples):

$$Total\ Cooking\ Loss\ (TCL, \%) = \frac{(5 \times DM - W_2)}{5 \times DM} x100 \quad (3)$$

$$Solid\ Loss\ (SL, \%) = \frac{(W_3) \times 100}{5 \times DM} \quad (4)$$

$$Soluble\ Loss\ (SSL, \%) = \frac{(W_4)\ x\ 100}{5 \times DM} \quad (5)$$

3. Results and Discussion

3.1 Cooking properties of multi-flour noodles

Cooking properties of multi-flour noodles (T_{100}, T_{90}, T_{80}, T_{70}, T_{60}, and T_{50}) were evaluated value in fresh as well as during storage period presented in Table 2.

Table 2: Cooking properties of multi-flours noodles

Cooking properties/ Treatments	Treatments					
	T_{100}	T_{90}	T_{80}	T_{70}	T_{60}	T_{50}
Cooking yield (%)	269.33	273.84	284	289	294.80	297.50
Optimum Cooking Time (min)	5.60	6.40	7.60	8.30	9.60	9.70
Water absorption (g/g)	1.40	1.50	1.60	2.10	2.10	2.20
Swelling index (%)	210.3	213.3	215.26	218.3	222.6	225.30
Cooking Loss (%)	4.30	4.53	5.43	6.36	6.40	7.50

3.2 Cooking yield (%)

The data for variation in cooking yield (%) of multi-flours noodles is presented in Table 2. The cooking yield ranged from 269.33 to 297.50% depending upon the blending ratio. The highest cooking yield was observed for T_{50} (297.50%) and the lowest T_{100} (269.33%) noodles. The cooking yield of noodles was observed for T_{50} (297.50%) followed by T_{60} (294.80%), T_{70} (289.0%), T_{80} (284.0%), T_{90} (273.84%) and T_{100} (269.33%), respectively as shown in Fig.1. The cooking yield of noodles increased with increase in proportions of soy bean, carrot, mushroom and apple pomace powder with wheat flour.

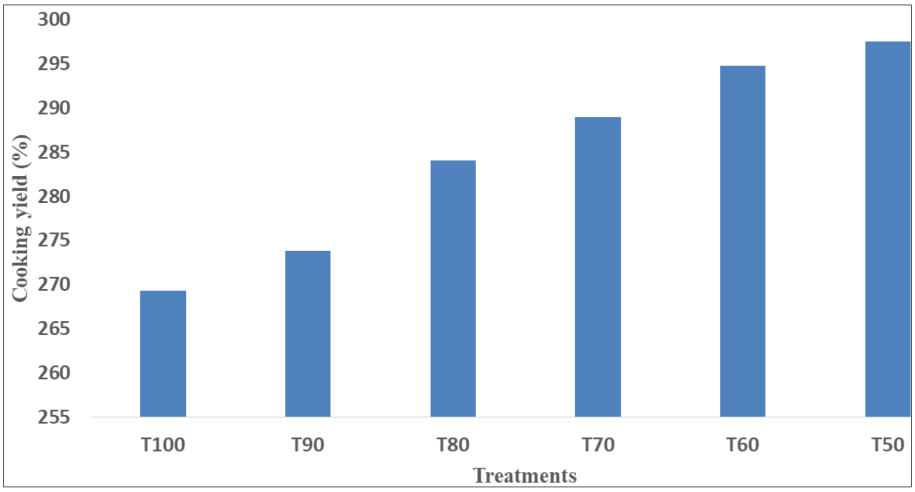

Fig 1: Cooking yield (%) of multi-flour noodles

3.3 Optimum cooking time (min.)

The data for variation in optimum cooking time (min.) of multi fours noodles is presented in Table 2. The optimum cooking time ranged from 5.60 to 9.70 min. depending upon the blending ratio. The highest time for cooking was observed for T_{50} (9.70 min.) and the lowest T_{100} (5.60 min.) noodles as shown in Fig.2. The optimum cooking time was found for noodles T_{50} (9.70 min.) followed by T_{60} noodle (9.60 min.), T_{70} (8.30 min.), T_{80} (7.60 min), T_{90} (6.40 min.) and T_{100} noodle (5.60 min.), respectively. The cooking time increased with increase in proportions of soy bean, carrot, mushroom and apple pomace powder with wheat flours.

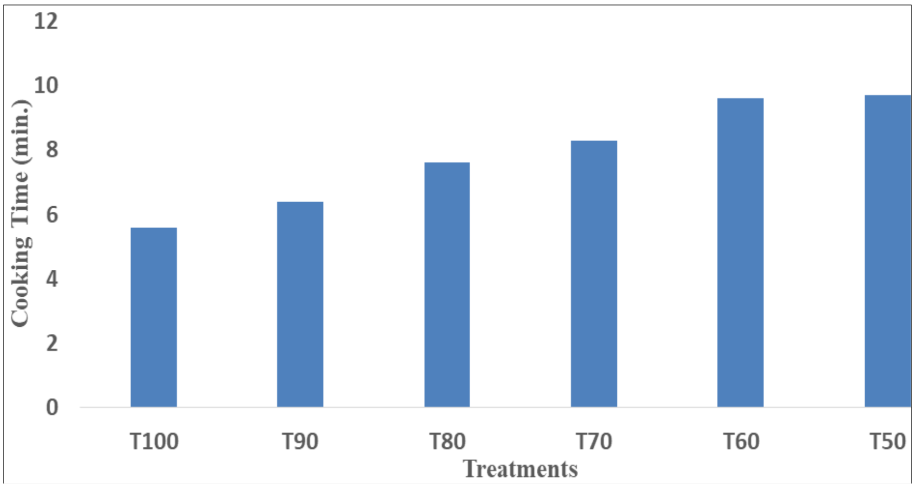

Fig 2: Cooking time (min.) of multi-flour noodles

3.4 Water absorption

The data for variation in water absorption (g/g) of multi flour noodles is presented in Table 2. The water absorption ranged from 1.40 to 2.20 g/g depending upon the blending ratio. The highest water absorption was observed for T_{50} (2.20 g/g) and lowest T_{100} (1.40 g/g) noodles. The water absorption was found for noodles T_{50} (2.20 g/g) followed by T_{60} (2.10 g/g), T_{70} (2.10 g/g), T_{80} (1.60 g/g). T_{90} (1.50 g/g) and T_{100} (1.40 g/g), respectively. as shown in Fig.3. The water absorption of noodles increased with increase in proportions soy bean, carrot, mushroom and apple pomace powder with wheat flour.

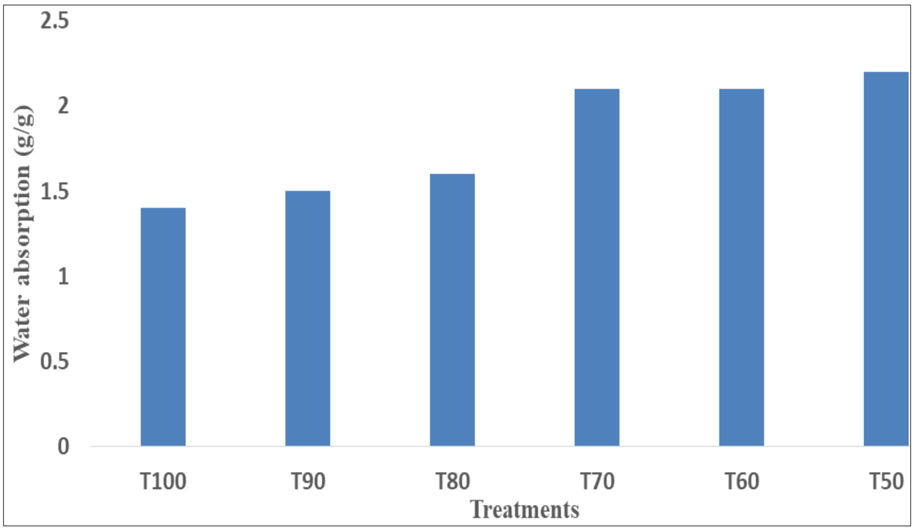

Fig 3: Water absorption (g/g) of multi-flour noodles

3.5 Swelling index (%)

The data for variation in swelling index (%) of multi flours noodles is presented in Table 2. The swelling index ranged from 210.30 to 225.30% depending upon the blending ratio. The highest swelling index was observed for T_{50} (227.12%) and lowest T_{100} (211.11%) noodles. The swelling index was found for noodles T_{50} (225.30%) followed by T_{60} (222.60%), T_{70} (218.30%), T_{80} (215.26%) T_{90} (213.30%) and T_{100} (210.30%), respectively as shown in Fig.4. The swelling index of noodles increased with increase in proportions of soy bean, carrot, mushroom and apple pomace powder with wheat flour.

3.6 Cooking loss (%)

The data for variation in cooking loss (%) of composite flours noodles is presented in Table 2. The cooking loss ranged from 4.30 to 7.50% depending upon the blending ratio. The highest cooking loss was observed for T_{50} (7.50%) and lowest T_{100} (4.30%) noodles. The cooking loss was found for noodles T_{100} (7.50%) followed by T_{60} (6.40%), T_{70} (6.36%), T_{80} (5.43%), T_{90} (4.53%) and T_{100} (4.30%) respectively, as shown in Fig.5. The cooking loss of noodles increased with increase in proportions of soy bean, carrot, mushroom and apple pomace powder within wheat flour.

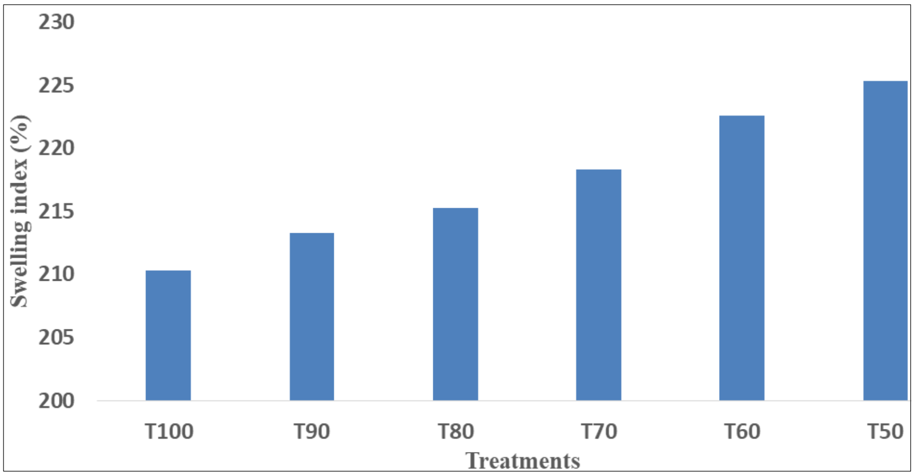

Fig 4: Swelling index (%) of multi-flour noodles

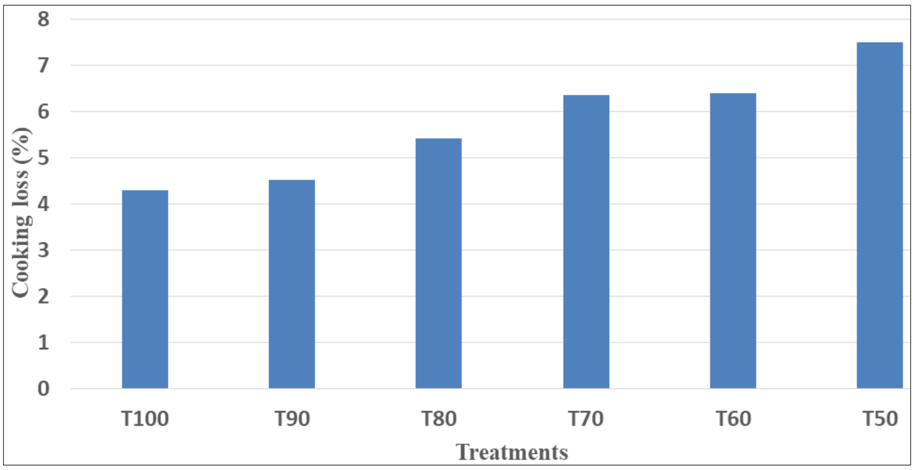

Fig 5: Cooking loss (%) of multi-flour noodles

4. Conclusion

In this research the cooking properties of multi-flour noodles were analyzed that is, cooking yield (%), optimum cooking time (min), water absorption (g/g), swelling index (%) and cooking loss (%) were increased with increase in the incorporation of other flours with wheat flour. The result showed that the T_{50} has highest cooking properties compared to others.

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