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## Effect of *Aloe barbadensis* and Psyllium husk on sensory quality of vermicelli

**JM Vaghashiya, Dev Raj, SJ Patil, VM Thumar and VD Kalariya**

### Abstract

The present investigation was aimed to study the effect of *Aloe barbadensis* and psyllium husk (isabgol husk) on sensory quality of vermicelli. *Aloe vera* based vermicelli were prepared using seventeen treatment formulations of *Aloe vera* juice (18%, 20%, 22% and 24%), isabgol husk (0%, 0.5%, 1.0% and 1.5%) and wheat flour (100% - % *Aloe vera* juice and % isabgol husk) along with standard formulation (18% water and 82% wheat flour). Prepared vermicelli after cold extrusion were dried in dryer at 50°C temperature for 10 min to remove moisture up to 8 % followed by cooling at room temperature, packing in PP bags and storage at room temperature for six months for periodical study of sensory attributes. The results of the present investigation indicate that the vermicelli prepared using 24% *Aloe vera* juice, 1% isabgol husk and 75% wheat flour (F<sub>13</sub>) was extremely liked on the basis of 9 point Hedonic scale and during six month of storage exhibited minimum changes in sensory attributes.

**Keywords:** *Aloe vera* juice, psyllium husk (Isabgol husk), wheat flour, extruder, vermicelli, sensory attributes and storage

### Introduction

Extruded products are produced by mixing milled wheat, water, eggs (for egg noodles or egg spaghetti), and sometimes, optional ingredients. These ingredients are typically added to a continuous, high capacity auger extruder, which can be equipped with a variety of dies that determine the shape of the product. It is then dried and packaged for market. Vermicelli is an important extruded product with solid rod like structure. It has a good market potential. It also provides significant quantities of complex carbohydrates, proteins, B-vitamins, and iron and is low in sodium, amino acids, and total fat (Douglass and Matthews, 1982) [16]. Recent developments in extruded products include attempts to improve the nutritional properties of the product by the addition of supplements from various nutritional sources *viz.*, *Aloe vera* juices, Isabgol husk, *etc.*

*Aloe vera* (*Aloe barbadensis* Millar) gel/ juices help to improve general immune system, help in prevention of arthritis, diabetes, cancer, maintain stomach acids, constipation, heart burns, regenerate tissues, increase absorption of nutrients and even neutralize toxic elements. The positive effects of the gel are thought to be due to the presence of various compounds such as mannans, anthraquinones, lectins, vitamin C, vitamin B<sub>12</sub>, amino acids, enzymes and the minerals, which supports the immune system and acts as a powerful antioxidant (Chandegara and Varshney, 2013) [13]. Isabgol husk has been used as a natural-fibre laxative (Chan and Wypyszyk, 1988) [12], to lower serum cholesterol levels in hypercholesterolemic patients (Bell *et al.*, 1989) [5] and glycemic and lipid levels in diabetic mice (Watters and Blaisdell, 1989) [43], to affect fecal and colonic microbial metabolism (Costa *et al.*, 1989) [14], and for prophylaxis and treatment of intestinal disorders (Cappel and Rece, 1989). Isabgol husk can be obtained from seeds of the *Plantago* species. Isabgol husk constitutes the main portion derived from the seed. The husk, obtained from the isabgol seed, is composed of both soluble and insoluble fibres (Bijkerk *et al.*, 2004) [8]. The composition of the isabgol husk comprised of 75 % xylose, arabinose and traces of polysaccharides like highly branched acidic arabinoxylan (Fischer *et al.*, 2004) [18].

Isabgol husk have high water-binding capacity and stability at a variety of pH levels and temperatures. It is considered as a food additive for improving shelf life, consumer acceptance and reducing stickiness (Ibuki, 1989) [24]. Isabgol husk can be utilized as an emulsifier, stabilizer and substitute for fat and wheat flour (Giuntini *et al.*, 2003 and Zandonadi *et al.*, 2009) [20, 44]. The inclusion of isabgol husk as a source of fibre in sponge cakes, bread,

regular white pan bread and noodles was reported by Czuchajowska *et al.* (1992) [15]. Its effect on the quality of dough and bread was reported by Nikouzadeh *et al.* (2008) [29] and its use in the production of biscuits reported by Raymundo *et al.* (2014) [34].

Till date, no efforts have been made nor reported in literature for utilization of *Aloe vera* with isabgol husk for preparation of *Aloe vera* based vermicelli. Thus, nutritional and medicinal properties of *Aloe vera* juice and isabgol husk can be exploited for preparation of *Aloe vera* based vermicelli.

## Material and Methods

Mature leaves of *Aloe vera* were procured from Medicinal

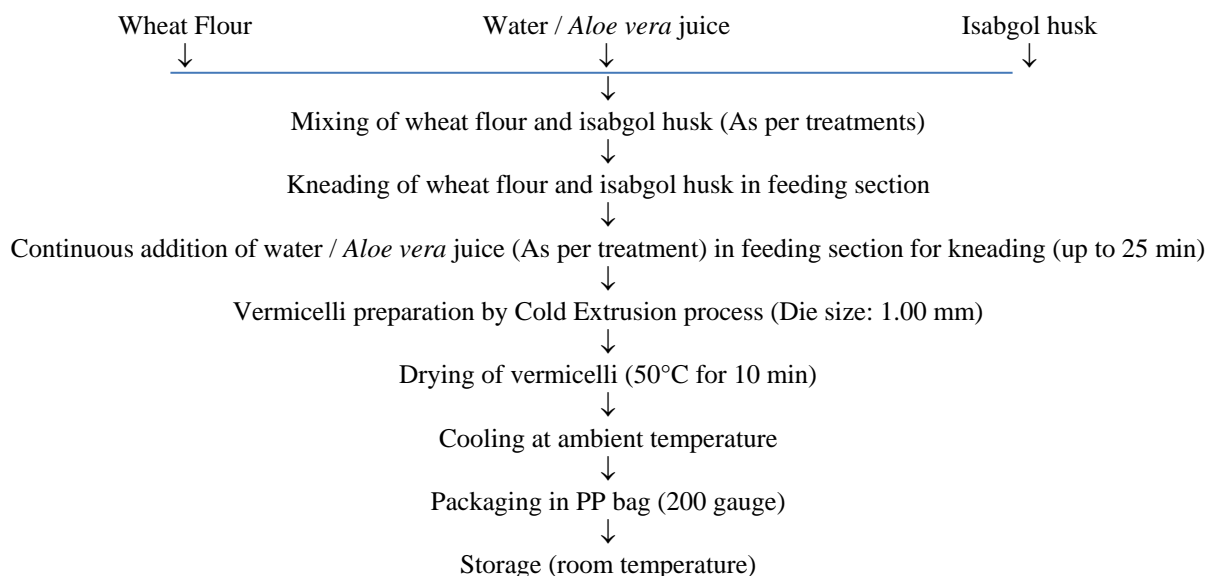
and Forest Plant Nursery, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari and M/s Govindbhai, *Aloe vera* grower, Gariyadhar, Bhavnagar and brought to Department of Post Harvest Technology, ASPEE College of Horticulture and Forestry, NAU, Navsari. *Aloe vera* leaves were analyzed for various physico-chemical characteristics and then used for further experimentation. Wheat flour and isabgol husk used for preparation of *Aloe vera* based vermicelli were procure from Navsari market and were also analyzed for various parameters prior to experimentation. After proximate analysis, raw materials were prepared for utilization under experiment.

**Table 1:** Detail of treatment formulations used for preparation of *Aloe vera* based vermicelli.

Formulation No.	Treatment details
F <sub>1</sub>	Water 18 % + 82 % Wheat flour (Control)
F <sub>2</sub>	<i>Aloe vera</i> juice 18 % + 82 % Wheat flour
F <sub>3</sub>	<i>Aloe vera</i> juice 20 % + 80 % Wheat flour
F <sub>4</sub>	<i>Aloe vera</i> juice 22 % + 78 % Wheat flour
F <sub>5</sub>	<i>Aloe vera</i> juice 24 % + 76 % Wheat flour
F <sub>6</sub>	<i>Aloe vera</i> juice 18 % + 0.5 % Isabgol husk + 81.5 % Wheat flour
F <sub>7</sub>	<i>Aloe vera</i> juice 20 % + 0.5 % Isabgol husk + 79.5 % Wheat flour
F <sub>8</sub>	<i>Aloe vera</i> juice 22 % + 0.5 % Isabgol husk + 77.5 % Wheat flour
F <sub>9</sub>	<i>Aloe vera</i> juice 24 % + 0.5 % Isabgol husk + 75.5 % Wheat flour
F <sub>10</sub>	<i>Aloe vera</i> juice 18 % + 1.0 % Isabgol husk + 81.0 % Wheat flour
F <sub>11</sub>	<i>Aloe vera</i> juice 20 % + 1.0 % Isabgol husk + 79.0 % Wheat flour
F <sub>12</sub>	<i>Aloe vera</i> juice 22 % + 1.0 % Isabgol husk + 77.0 % Wheat flour
F <sub>13</sub>	<i>Aloe vera</i> juice 24 % + 1.0 % Isabgol husk + 75.0 % Wheat flour
F <sub>14</sub>	<i>Aloe vera</i> juice 18 % + 1.5 % Isabgol husk + 80.5 % Wheat flour
F <sub>15</sub>	<i>Aloe vera</i> juice 20 % + 1.5 % Isabgol husk + 78.5 % Wheat flour
F <sub>16</sub>	<i>Aloe vera</i> juice 22 % + 1.5 % Isabgol husk + 76.5 % Wheat flour
F <sub>17</sub>	<i>Aloe vera</i> juice 24 % + 1.5 % Isabgol husk + 74.5 % Wheat flour

*Aloe vera* based vermicelli were prepared using different proportion of *Aloe vera* juice, isabgol husk and wheat flour. Water was used in standard formulation for preparation of vermicelli and kept as control. A total of seventeen different treatment formulations as detailed in Table 1 were used for preparation of vermicelli. Vermicelli of different formulations were prepared using Dolly extruder by kneading the entire ingredient as per treatment combinations (Table 1) in feeding

section of extruder followed by cold extrusion. Extruded vermicelli were dried in dryer at 50°C temperature for 10 min to remove moisture up to 8 % followed by cooling at room temperature, packing in 200 gauge PP bags and storage at room temperature for six months for periodical analysis. Principal steps used for preparation of vermicelli are given in Figure 1.



**Fig 1:** Principal steps used for preparation of *Aloe vera* based vermicelli

Sensory evaluation for *Aloe vera* based vermicelli was evaluated during different storage intervals to assess the

consumer's acceptance for the products. *Aloe vera* based vermicelli were evaluated for colour, texture, taste, flavour

and overall acceptability. The prepared samples of vermicelli were evaluated for sensory qualities on the basis of 9 point Hedonic scale according to the method of Amerine *et al.* (1965) [2]. Sensory panelists (7-10 members) comprised of faculty members and post graduate students of Department of Post Harvest Technology, NAU, Navsari (Gujarat) were used for sensory analysis throughout the entire period of storage.

## Results and Discussion

The physico-chemical characteristics of fresh *Aloe vera*, isabgol husk and wheat flour are presented in Table 2. Results for physico-chemical parameters are in line with the observations made by Raj *et al.* (2017) [31] Jain (2016) [25], Vaghashiya (2015) [41], Ahlawat *et al.* (2014) [1], Elbandy *et al.* (2014) [17], Hamid *et al.* (2014) [22], Ramachandran and

Nagarajan (2014) [33], Tiwari and Deen (2014) [39], Chandegara and Varshney (2013) [13], Sasi *et al.* (2013) [35] and Boghani *et al.* (2012) [9] for *Aloe vera* juice; Kamaljit *et al.* (2011) [26], Beikzadeh *et al.* (2016) [4], Qaisrani *et al.* (2014) [30] Marlett and Fischer (2003) [28] and Guo *et al.* (2008) [21] for isabgol husk; Fistes *et al.* (2014) [19], Kamaljit *et al.* (2011) [26], Hrusková and Machova (2002) [23], Shenoy and Prakash (2001) [36] and Boyacioglu and D'apponia (1994) [10] for wheat flour.

## Sensory attributes of vermicelli and storage stability

Effect of different formulations on sensory attributes of prepared vermicelli has been explained under following captions:

**Table 2:** Physico-chemical parameters of *Aloe vera* juice, Isabgol husk and Wheat flour used for preparation of vermicelli

Sr. No	Physico-chemical parameters	<i>Aloe vera</i> juice	Isabgol husk	Wheat Flour
1	Moisture content (%)	99.10	9.83	8.68
2	Acidity (%)	0.028	0.045	0.117
3	TSS (°B)	0.70	6.50	18.75
4	Total Sugars (%)	0.618	0.674	2.125
5	Reducing sugars (%)	0.298	0.293	0.282
6	Non-reducing sugars (%)	0.304	0.362	1.751
7	Fibre (%)	0.071	5.282	1.450
8	Starch (%)	-	29.85	64.80
9	Calcium (mg/100g)	33.96	13.10	8.50
10	Sodium (mg/100g)	35.70	31.64	6.43
11	Potassium (mg/100g)	58.51	74.78	32.72

**Colour:** Perusal of data pertaining to effect of different treatment formulations on colour score (9 point Hedonic scale) of *Aloe vera* based vermicelli during 6 month storage has been presented in Table 3. Data shows that among different formulations, the mean colour score of vermicelli (F) varied significantly between 8.01 and 8.63, with maximum colour score in vermicelli which were prepared using 24 % *Aloe vera* juice + 1 % isabgol husk + 75 % wheat flour (F<sub>13</sub>) statistically at par with formulations F<sub>17</sub>, F<sub>9</sub> and F<sub>12</sub> and minimum in vermicelli prepared using 18 % water + 82 % wheat flour (F<sub>1</sub>) statistically at par with formulations F<sub>2</sub>, F<sub>6</sub> and F<sub>10</sub>. Similarly, Bhatt *et al.* (2015) [17] reported significantly better colour of product with 3 % *Aloe vera* juice in comparison to other combination. During six months storage, the mean colour score of vermicelli (S) decreased significantly from 8.57 to 8.19 (S<sub>1</sub> to S<sub>3</sub>). Six month storage of vermicelli prepared using different formulations resulted minimum decrease (8.77 to 8.49) in colour score of vermicelli which were prepared using formulation F<sub>13</sub> (24 % *Aloe vera* juice + 1 % isabgol husk + 75 % wheat flour) and maximum decrease (8.26 to 7.77) in F<sub>1</sub> (18 % Water + 82 % wheat flour). However, interactions of formulations and storage (FS) were found to have non-significant effect. Ramachandran (2014) [32] reported papaya powder samples showed significantly lower *a\** values compared to 3 % and 4.5 % AG enriched papaya powders under ambient storage condition.

**Taste:** Perusal of data pertaining to effect of different treatment formulations on taste score (9 point Hedonic scale) of *Aloe vera* based vermicelli during 6 month storage has been presented in Table 3. Data shows that among different formulations, the mean taste score of vermicelli (F) varied significantly between 7.83 and 8.49, with maximum taste score in vermicelli which were prepared using 24 % *Aloe vera* juice + 1 % isabgol husk + 75 % wheat flour (F<sub>13</sub>) statistically

at par with formulations F<sub>17</sub>, F<sub>16</sub> and F<sub>12</sub> and minimum in vermicelli prepared using 18 % water + 82 % wheat flour (F<sub>1</sub>) statistically at par with formulations F<sub>2</sub>. Similar results were found by Kaur *et al.* (2015) [27] in products viz., Dalia, Dal, Mix vegetable, Chutney using *Aloe vera*. Dalia, Dal, Mix vegetable, Chutney were acceptable at 20 % level of *Aloe vera*. With increase in level of supplementation of *Aloe vera* organoleptic scores decreased due to bitter taste, fibrous and slimy texture. During six months storage, the mean taste score of vermicelli (S) decreased significantly from 8.52 to 7.90 (S<sub>1</sub> to S<sub>3</sub>). Six month storage of vermicelli prepared using different formulations resulted minimum decrease (8.72 to 8.28) in taste score of vermicelli which were prepared using formulation F<sub>13</sub> (24 % *Aloe vera* juice + 1 % isabgol husk + 75 % wheat flour) and maximum decrease (8.22 to 7.43) in F<sub>1</sub> (18 % Water + 82 % wheat flour). However, interactions of formulations and storage (FS) were found to have non-significant effect.

**Flavour:** Perusal of data pertaining to effect of different treatment formulations on flavour score (9 point Hedonic scale) of *Aloe vera* based vermicelli during 6 month storage has been presented in Table 4. Data shows that among different formulations, the mean flavour score of vermicelli (F) varied significantly between 7.72 and 8.28, with maximum flavour score in vermicelli which were prepared using 24 % *Aloe vera* juice + 1 % isabgol husk + 75 % wheat flour (F<sub>13</sub>) statistically at par with formulations F<sub>17</sub>, F<sub>16</sub> and F<sub>9</sub> and minimum in vermicelli prepared using 18 % water + 82 % wheat flour (F<sub>1</sub>) statistically at par with formulations F<sub>2</sub>. During six months storage, the mean flavour score of vermicelli (S) decreased significantly from 8.29 to 7.82 (S<sub>1</sub> to S<sub>3</sub>). Six month storage of vermicelli prepared using different formulations resulted minimum decrease (8.45 to 8.11) in flavour score of

**Table 3:** Effect of formulations on colour and taste score of *Aloe vera* based vermicelli during storage

Formulations* (F)	Colour (9 point Hedonic scale)				Taste (9 point Hedonic scale)			
	Storage (S)			Mean (F)	Storage (S)			Mean (F)
	Initial (S <sub>1</sub> )	3 month (S <sub>2</sub> )	6 month (S <sub>3</sub> )		Initial (S <sub>1</sub> )	3 month (S <sub>2</sub> )	6 month (S <sub>3</sub> )	
F <sub>1</sub> : Control	8.26	8.01	7.77	8.01	8.22	7.85	7.43	7.83
F <sub>2</sub> : A <sub>18</sub> +W <sub>82</sub>	8.36	8.14	7.92	8.14	8.37	8.02	7.61	8.00
F <sub>3</sub> : A <sub>20</sub> +W <sub>80</sub>	8.52	8.32	8.10	8.31	8.43	8.09	7.70	8.08
F <sub>4</sub> : A <sub>22</sub> +W <sub>78</sub>	8.61	8.43	8.23	8.42	8.55	8.23	7.85	8.21
F <sub>5</sub> : A <sub>24</sub> +W <sub>76</sub>	8.69	8.52	8.33	8.51	8.62	8.31	7.95	8.29
F <sub>6</sub> : A <sub>18</sub> +I <sub>0.5</sub> +W <sub>81.5</sub>	8.41	8.20	7.99	8.20	8.40	8.07	7.70	8.06
F <sub>7</sub> : A <sub>20</sub> +I <sub>0.5</sub> +W <sub>79.5</sub>	8.54	8.34	8.14	8.34	8.45	8.14	7.79	8.13
F <sub>8</sub> : A <sub>22</sub> +I <sub>0.5</sub> +W <sub>77.5</sub>	8.65	8.48	8.29	8.47	8.59	8.29	7.97	8.28
F <sub>9</sub> : A <sub>24</sub> +I <sub>0.5</sub> +W <sub>75.5</sub>	8.74	8.57	8.38	8.56	8.67	8.38	8.07	8.38
F <sub>10</sub> : A <sub>18</sub> +I <sub>1</sub> +W <sub>81</sub>	8.43	8.23	8.03	8.23	8.46	8.15	7.82	8.14
F <sub>11</sub> : A <sub>20</sub> +I <sub>1</sub> +W <sub>79</sub>	8.58	8.38	8.19	8.38	8.48	8.19	7.90	8.19
F <sub>12</sub> : A <sub>22</sub> +I <sub>1</sub> +W <sub>77</sub>	8.69	8.54	8.36	8.53	8.64	8.36	8.09	8.36
F <sub>13</sub> : A <sub>24</sub> +I <sub>1</sub> +W <sub>75</sub>	8.77	8.64	8.49	8.63	8.72	8.47	8.28	8.49
F <sub>14</sub> : A <sub>18</sub> +I <sub>1.5</sub> +W <sub>80.5</sub>	8.42	8.23	8.04	8.23	8.45	8.16	7.88	8.16
F <sub>15</sub> : A <sub>20</sub> +I <sub>1.5</sub> +W <sub>78.5</sub>	8.59	8.41	8.22	8.41	8.50	8.22	7.97	8.23
F <sub>16</sub> : A <sub>22</sub> +I <sub>1.5</sub> +W <sub>76.5</sub>	8.68	8.50	8.33	8.50	8.65	8.38	8.15	8.39
F <sub>17</sub> : A <sub>24</sub> +I <sub>1.5</sub> +W <sub>74.5</sub>	8.75	8.61	8.44	8.60	8.71	8.44	8.22	8.46
Mean (S)	8.57	8.39	8.19		8.52	8.22	7.90	
	S.Em.±	C.D. at 5%	C.V. %		S.Em.±	C.D. at 5%	C.V. %	
Formulation (F)	0.08	0.22	2.75		0.08	0.23	2.93	
Storage (S)	0.03	0.08			0.03	0.08		
Interaction FS	0.12	NS	2.43		0.11	NS	2.41	

\*A: *Aloe vera* juice %; I: Isabgol husk %; W: Wheat flour %  
Control: 18% Water + 82 % Wheat Flour

vermicelli which were prepared using formulation F<sub>13</sub> (24 % *Aloe vera* juice + 1 % isabgol husk + 75 % wheat flour) and maximum decrease (8.03 to 7.41) in F<sub>1</sub> (18 % Water + 82 % wheat flour). However, interactions of formulations and storage (FS) were found to have non-significant effect.

**Texture:** Perusal of data pertaining to effect of different treatment formulations on texture score (9 point Hedonic scale) of *Aloe vera* based vermicelli during 6 month storage has been presented in Table 4. Data shows that among different formulations, the mean texture score of vermicelli (F) varied significantly between 7.53 and 8.54, with maximum texture score in vermicelli which were prepared using 24 % *Aloe vera* juice + 1 % isabgol husk + 75 % wheat flour (F<sub>13</sub>) statistically at par with formulations F<sub>8</sub> and F<sub>9</sub> and minimum in vermicelli prepared using 18 % *Aloe vera* juice + 1.5 % isabgol husk + 80.5 % wheat flour (F<sub>14</sub>) statistically at par with formulations F<sub>10</sub> and F<sub>15</sub>. Bhatt *et al.* (2015) [17] reported increase in softness of pasta with the increase in amount of *Aloe vera* in supplemented pasta. Similarly, Bhargawa *et al.* (2014) [6] reported that chapatti supplemented with *Aloe vera* juice resulted considerable improvement in texture of chapattis as compared to control chapattis. This might be ascribed to the presence of glucomannan in *Aloe*, which is a polysaccharide (Singh and Singh, 2009) [38]. The addition of psyllium to straight-grade flour (WF) and whole

wheat flour (WWF) improved the objective texture of Arabic flat bread (pita bread) in the laboratory, as well as during pilot scale production in a commercial bakery (Sidhu *et al.*, 2005) [37]. During six months storage, the mean texture score of vermicelli (S) decreased significantly from 8.49 to 7.70 (S<sub>1</sub> to S<sub>3</sub>). Six month storage of vermicelli prepared using different formulations resulted minimum decrease (8.80 to 8.35) in texture score of vermicelli which were prepared using formulation F<sub>13</sub> (24 % *Aloe vera* juice + 1 % isabgol husk + 75 % wheat flour) and maximum decrease (8.12 to 7.02) in F<sub>14</sub> (18 % *Aloe vera* juice + 1.5 % isabgol husk + 80.5 % wheat flour). However, interactions of formulations and storage (FS) were found to have non-significant effect.

**Overall acceptability:** Perusal of data pertaining to effect of different treatment formulations on overall acceptability score (9 point Hedonic scale) of *Aloe vera* based vermicelli during 6 month storage has been presented in Table 5. Data shows that among different formulations, the mean overall acceptability score of vermicelli (F) varied significantly between 7.90 and 8.49, with maximum overall acceptability score in vermicelli which were prepared using 24 % *Aloe vera* juice + 1 % isabgol husk + 75 % wheat flour (F<sub>13</sub>) statistically at par with formulations F<sub>9</sub>, F<sub>17</sub>, F<sub>12</sub> and F<sub>8</sub> and minimum in vermicelli prepared

**Table 4:** Effect of formulations on flavour and texture score of *Aloe vera* based vermicelli during storage.

Formulations* (F)	Flavour (9 point Hedonic scale)				Texture (9 point Hedonic scale)			
	Storage (S)			Mean (F)	Storage (S)			Mean (F)
	Initial (S <sub>1</sub> )	3 month (S <sub>2</sub> )	6 month (S <sub>3</sub> )		Initial (S <sub>1</sub> )	3 month (S <sub>2</sub> )	6 month (S <sub>3</sub> )	
F <sub>1</sub> : Control	8.03	7.71	7.41	7.72	8.43	7.95	7.74	8.04
F <sub>2</sub> : A <sub>18</sub> +W <sub>82</sub>	8.16	7.87	7.60	7.88	8.40	7.84	7.52	7.92
F <sub>3</sub> : A <sub>20</sub> +W <sub>80</sub>	8.21	7.93	7.68	7.94	8.72	8.23	8.00	8.32
F <sub>4</sub> : A <sub>22</sub> +W <sub>78</sub>	8.28	8.02	7.79	8.03	8.59	8.18	8.02	8.26
F <sub>5</sub> : A <sub>24</sub> +W <sub>76</sub>	8.32	8.07	7.85	8.08	8.45	8.01	7.81	8.09
F <sub>6</sub> : A <sub>18</sub> +I <sub>0.5</sub> +W <sub>81.5</sub>	8.19	7.92	7.68	7.93	8.36	7.78	7.43	7.86
F <sub>7</sub> : A <sub>20</sub> +I <sub>0.5</sub> +W <sub>79.5</sub>	8.26	8.00	7.78	8.01	8.50	7.97	7.69	8.05

F <sub>8</sub> : A <sub>22</sub> +I <sub>0.5</sub> +W <sub>77.5</sub>	8.33	8.09	7.88	8.10	8.76	8.34	8.16	8.42
F <sub>9</sub> : A <sub>24</sub> +I <sub>0.5</sub> +W <sub>75.5</sub>	8.38	8.16	7.97	8.17	8.64	8.26	8.11	8.34
F <sub>10</sub> : A <sub>18</sub> +I <sub>1</sub> +W <sub>81</sub>	8.21	7.96	7.73	7.97	8.21	7.60	7.21	7.67
F <sub>11</sub> : A <sub>20</sub> +I <sub>1</sub> +W <sub>79</sub>	8.32	8.09	7.88	8.10	8.40	7.85	7.55	7.93
F <sub>12</sub> : A <sub>22</sub> +I <sub>1</sub> +W <sub>77</sub>	8.37	8.15	7.95	8.16	8.62	8.11	7.86	8.20
F <sub>13</sub> : A <sub>24</sub> +I <sub>1</sub> +W <sub>75</sub>	8.45	8.27	8.11	8.28	8.80	8.47	8.35	8.54
F <sub>14</sub> : A <sub>18</sub> +I <sub>1.5</sub> +W <sub>80.5</sub>	8.22	7.98	7.77	7.99	8.12	7.45	7.02	7.53
F <sub>15</sub> : A <sub>20</sub> +I <sub>1.5</sub> +W <sub>78.5</sub>	8.31	8.08	7.88	8.09	8.28	7.66	7.26	7.73
F <sub>16</sub> : A <sub>22</sub> +I <sub>1.5</sub> +W <sub>76.5</sub>	8.38	8.16	7.96	8.17	8.45	7.86	7.49	7.93
F <sub>17</sub> : A <sub>24</sub> +I <sub>1.5</sub> +W <sub>74.5</sub>	8.44	8.24	8.06	8.24	8.53	8.01	7.74	8.09
Mean (S)	8.29	8.04	7.82		8.49	7.98	7.70	
	S.Em.±	C.D. at 5%	C.V. %		S.Em.±	C.D. at 5%	C.V. %	
Formulation (F)	0.07	0.19	2.48		0.07	0.21	2.72	
Storage (S)	0.03	0.07	2.32		0.03	0.08	2.63	
Interaction FS	0.11	NS			0.12	NS		

\*A: *Aloe vera* juice %; I: Isabgol husk %; W: Wheat flour %  
Control: 18% Water + 82 % Wheat Flour

Using 18 % water + 82 % wheat flour (F<sub>1</sub>) statistically at par with formulations F<sub>2</sub>, F<sub>6</sub> and F<sub>10</sub>. Bhatt *et al.* (2015) [17] reported significantly higher sensory score of pasta product supplemented with 3 % *Aloe vera* juice in comparison to other combination. Similarly, Kaur *et al.* (2015) [27] observed that products *viz.*, Dalia, Dal, Mix vegetable, Chutney were acceptable when supplemented with 20 % *Aloe vera*. Sidhu *et al.*, (2005) [37] reported that psyllium husk used either into straight grade wheat flour (WF) and whole wheat flour (WWF) could produce high fibre pita bread, which was not only lighter in crumb color and softer in texture, but was also more acceptable to the consumers. During six months storage, the mean overall acceptability score of vermicelli (S) decreased significantly from 8.47 to 7.91 (S<sub>1</sub> to S<sub>3</sub>). Six month storage of vermicelli prepared using different formulations resulted minimum decrease (8.69 to 8.31) in overall acceptability score of vermicelli which were prepared using formulation F<sub>13</sub> (24 % *Aloe vera* juice + 1 % isabgol

husk + 75 % wheat flour) and maximum decrease (8.32 to 7.66) in F<sub>2</sub> (18 % *Aloe vera* juice + 82 % wheat flour). However, interactions of formulations and storage (FS) were found to have non-significant effect. Veena *et al.* (2014) [42] reported higher score for sensory parameter of vermicelli when stored in polyethylene covers than the samples stored in corrugated paper boxes.

### Conclusion

The findings summarized above indicate that the vermicelli can be prepared by using 24 % *Aloe vera* juice, 1 % isabgol (psyllium) husk and 75 % wheat flour. The prepared vermicelli can be stored successfully for a period of six months in PP bags at room temperature. Thus, the developed technologies can commercially be explored by food processing industry for the production of quality *Aloe vera* based vermicelli.

**Table 5:** Effect of formulations on overall acceptability score of *Aloe vera* based vermicelli during storage

Formulations* (F)	Overall acceptability (9 point Hedonic scale)			
	Storage (S)			Mean (F)
	Initial (S <sub>1</sub> )	3 month (S <sub>2</sub> )	6 month (S <sub>3</sub> )	
F <sub>1</sub> : Control	8.24	7.88	7.59	7.90
F <sub>2</sub> : A <sub>18</sub> +W <sub>82</sub>	8.32	7.97	7.66	7.98
F <sub>3</sub> : A <sub>20</sub> +W <sub>80</sub>	8.47	8.14	7.87	8.16
F <sub>4</sub> : A <sub>22</sub> +W <sub>78</sub>	8.51	8.22	7.97	8.23
F <sub>5</sub> : A <sub>24</sub> +W <sub>76</sub>	8.52	8.23	7.99	8.25
F <sub>6</sub> : A <sub>18</sub> +I <sub>0.5</sub> +W <sub>81.5</sub>	8.34	7.99	7.70	8.01
F <sub>7</sub> : A <sub>20</sub> +I <sub>0.5</sub> +W <sub>79.5</sub>	8.44	8.11	7.85	8.13
F <sub>8</sub> : A <sub>22</sub> +I <sub>0.5</sub> +W <sub>77.5</sub>	8.58	8.30	8.08	8.32
F <sub>9</sub> : A <sub>24</sub> +I <sub>0.5</sub> +W <sub>75.5</sub>	8.61	8.34	8.13	8.36
F <sub>10</sub> : A <sub>18</sub> +I <sub>1</sub> +W <sub>81</sub>	8.33	7.99	7.70	8.01
F <sub>11</sub> : A <sub>20</sub> +I <sub>1</sub> +W <sub>79</sub>	8.45	8.13	7.88	8.15
F <sub>12</sub> : A <sub>22</sub> +I <sub>1</sub> +W <sub>77</sub>	8.58	8.29	8.07	8.31
F <sub>13</sub> : A <sub>24</sub> +I <sub>1</sub> +W <sub>75</sub>	8.69	8.46	8.31	8.49
F <sub>14</sub> : A <sub>18</sub> +I <sub>1.5</sub> +W <sub>80.5</sub>	8.30	7.96	7.68	7.98
F <sub>15</sub> : A <sub>20</sub> +I <sub>1.5</sub> +W <sub>78.5</sub>	8.42	8.09	7.83	8.11
F <sub>16</sub> : A <sub>22</sub> +I <sub>1.5</sub> +W <sub>76.5</sub>	8.54	8.23	7.98	8.25
F <sub>17</sub> : A <sub>24</sub> +I <sub>1.5</sub> +W <sub>74.5</sub>	8.62	8.33	8.12	8.36
Mean (S)	8.47	8.16	7.91	
	S.Em.±	C.D. at 5%	C.V. %	
Formulation (F)	0.08	0.23	2.92	
Storage (S)	0.03	0.09	2.76	
Interaction FS	0.13	NS		

\*A: *Aloe vera* juice %; I: Isabgol husk %; W: Wheat flour %  
Control: 18% Water + 82 % Wheat Flour

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