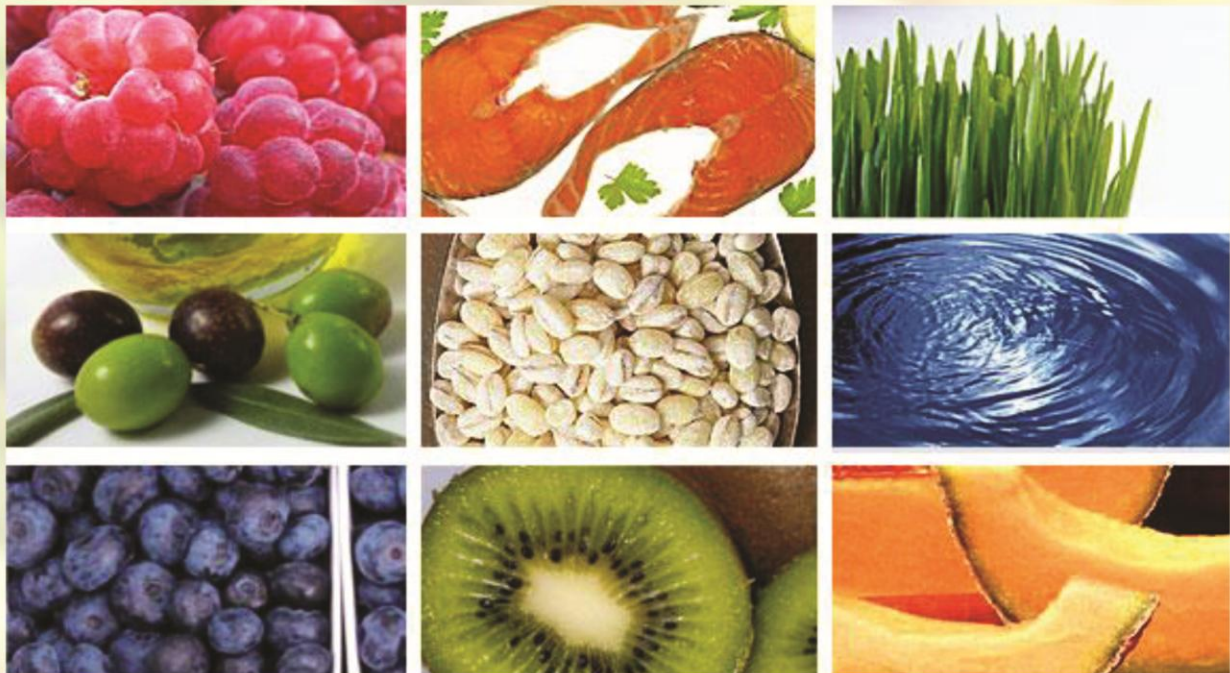


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Research Paper

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SENSORY PROPERTIES OF INNOVATIVE MULTI-NUTRITIONAL COOKIES

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ABSTRACT




Cookies are food products which are consumed by people on a daily basis. The conventional ingredients used in the making are Refined flour, Sugar and Oils/ Butter/ Egg yolks/ Vegetable oil (these are used for cohesion as they are much more viscous than water and evaporate freely at a much higher temperature than water) and they have various ill effects associated with their use. Hence, we have tried to enhance the nutritional qualities of cookies by adding multi-cereal powder, palm sugar, gingelly oil, coconut oil, and butter in conjunction with conventional ingredients and then usual baking procedure was used. After the cookies were prepared sensory analysis was done and the data obtained was interpreted using SPSS software (version- 11.5 for windows). Statistical analysis suggested that cookie I (ingredients- maida, mixed cereal, dalda, coconut oil, gingili oil, palm sugar, powdered sugar, vanilla essence) and cookie H (ingredients- maida, mixed cereal, dalda, butter substitute, palm sugar, powdered sugar, and vanilla essence) were liked by the consumers.


INTRODUCTION

The pleasant taste and texture of cookies makes it a favoured food product of people in all age groups, in addition to this it can be as a good source of protein, carbohydrate, minerals and substantial energy. Cookies with the conventional ingredients-refined flour, dalda and sugar (J L DesRochers, C E Walker and C Wrigley, 2004) have certain ill effects, now in order to overcome them and add some more nutritional value to the cookies this project was taken in which the conventional ingredients were used along with substitutes like Mixed cereal- contains essential fatty acids, B-vitamins, fiber and minerals like magnesium, copper and iron and it prevents of the metabolic syndrome, obesity and associated chronic diseases (IngerBjörck et al, June 2012), palm sugar -a natural low GI sweetener, has several nutrients and it is also a good source of vitamins B1, B2, B3, B6 and C (Why benefits: Overview of results from *in vitro*, animal and human studies in the palm sugar is the next big thing in natural sweeteners, natural news), Gingelly oil: contains

high amounts of polyunsaturated fatty acids, vitamin B, vitamin E, calcium, magnesium, iron, vast antioxidant properties (What are the benefits of gingelly oil? Yale Journal of Biology and Medicine: Effect of Sesame Oil, The World's Healthiest Foods: Sesame Seeds, Journal of Medicinal Food: Influence of Sesame Oil, AyurHelp.com: An Ayurveda Guide for Beautiful Skin, Natural News: Oil Pulling is a Simple, Inexpensive Method to Improve Your Health), Coconut oil- small amounts of vitamins and minerals are present and has antibacterial action (Francis Agyemang-Yeboah), Butter substitute-has balance of omega-3 and omega-6 fats, Conjugated Linoleic Acid (CLA) (T.P. O'Connor, N.M. O'Brien).

MATERIALS AND METHODS – Ingredients (per cookies)

1. Cookie A (control I)	2. Cookie B	3. Cookie C
		
<ul style="list-style-type: none"> •Maida-100g •Dalda-50g •Powdered sugar-50g •Chocolate essence 	<ul style="list-style-type: none"> Maida-100g Dalda-50g Powdered sugar-25g Palm sugar-25g, Chocolate essence 	<ul style="list-style-type: none"> Maida-100g Dalda-10g Butter substitute-40g Powdered sugar-50g, Chocolate essence

<p>4. Cookie D</p>  <ul style="list-style-type: none"> • Maida-100g, Dalda-15g • Coconut oil-10g, Gingelly oil-30 g, Powdered sugar-50g, Chocolate essence 	<p>5. Cookie E</p>  <ul style="list-style-type: none"> • Maida-75g, Mixed cereal-25g • Dalda-50g, Powdered sugar-50g • Chocolate essence 	<p>6. Cookie F</p>  <ul style="list-style-type: none"> • Maida-75, Mixed cereal-25g • Dalda-10g, Butter substitute-60g • Palm sugar-25g, Powdered sugar-25g, Chocolate essence
<p>7. Cookie G</p>  <ul style="list-style-type: none"> • Maida-75g • Mixed cereal-25g • Dalda-20g • Coconut oil-10g • Gingelly oil-30g • Palm sugar-25g • Powdered sugar-25g • Chocolate essence 	<p>8. Cookie H</p>  <ul style="list-style-type: none"> • Maida-75g • Mixed cereal-25g • Dalda-10g • Butter substitute-60g • Palm sugar-25g • Powdered sugar-25g • Vanilla essence 	<p>9. Cookie I</p>  <ul style="list-style-type: none"> • Maida-75g • Mixed cereal-25g • Dalda-20g • Coconut oil-10g • Gingelly oil-30g • Palm sugar-25g • Powdered sugar-25g • Vanilla essence
<p>10. CookieJ (baker's control)</p>  <ul style="list-style-type: none"> • Maida-100g • Dalda-50g • Powdered sugar-50g • Chocolate essence 		

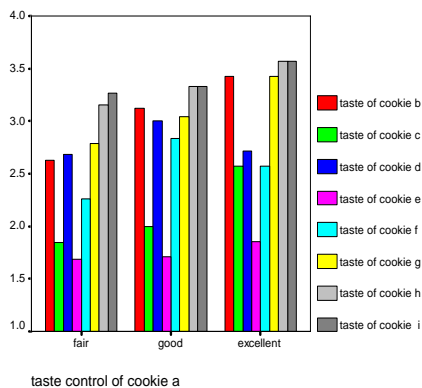
Although 10 different types of cookies were made but the procedure for baking them was same and as follows:

1. The flour was first mixed with sugar and essence.
2. Then to the above mixture oil substitutes were added and the dough was made.
3. The cookies were given shape and baked at 150 degree Celsius for 10-15 minutes.

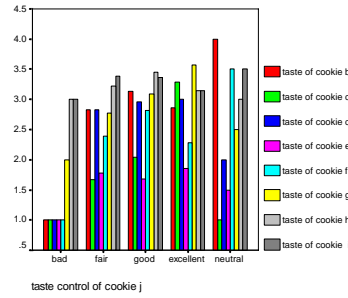
After the cookies were made sensory analysis of 50 people in age group between 18-22 was done and the data obtained was analysed by SPSS software (11.5 version).

GRAPHS

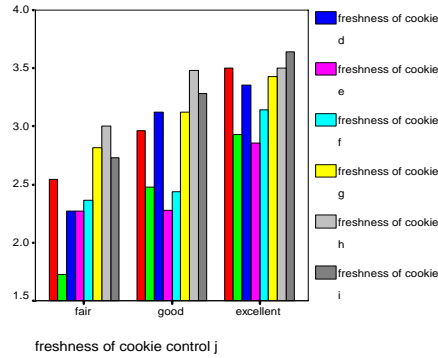
Clustered graphs



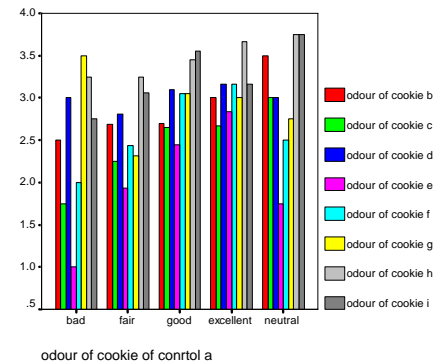
When cookie A was taken as control then most of the people said that cookie h and cookie I was excellent in taste.



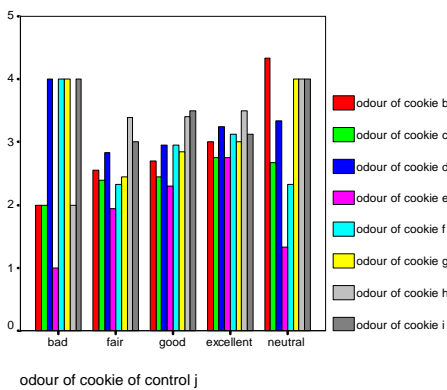
When taste of cookie j was taken as a control then most people said that cookie g was excellent.



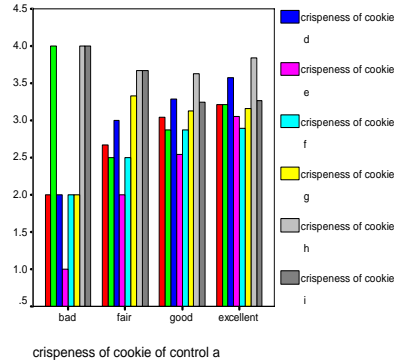
When freshness of cookie j was taken as a control then most people said that freshness of cookie I was excellent.



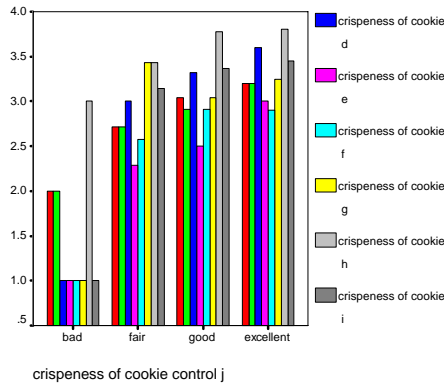
When odour of cookie a was taken as control then most people sad that the odour of cookie h was excellent.



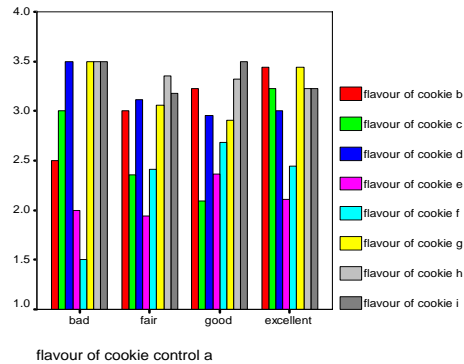
When odour of cookie j was taken as control most people said that cookie h had excellent odour.



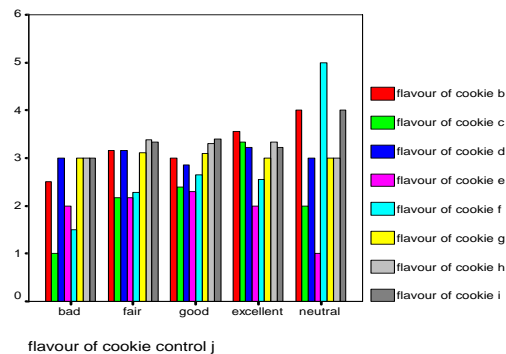
When crispness of cookie was taken as a control the most people said that cookie h had the excellent crispiness.



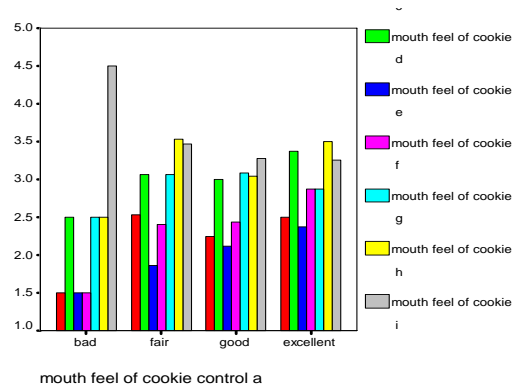
When crispness of cookie j was taken as control then most people said that cookie h had excellent crispiness.



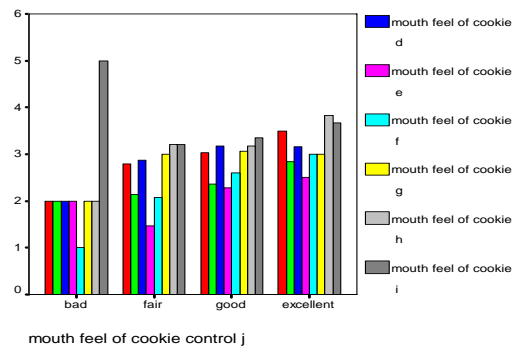
When flavor of cookie was taken as control then most people said that flavor of cookie b and cookie g was excellent.



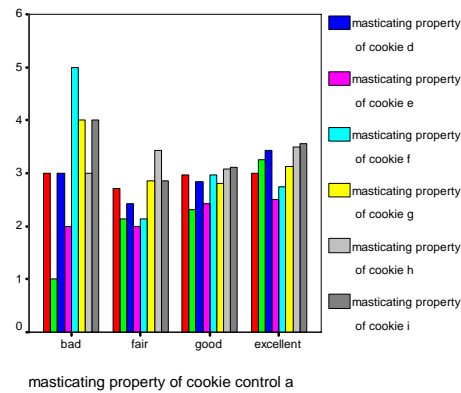
When flavor of cookie j was taken as a control most people said that flavor of cookie f was excellent.



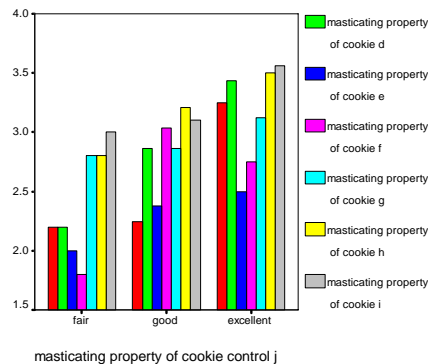
When mouth feel of cookie was taken as a control then most people said that mouth feel of cookie h was excellent.



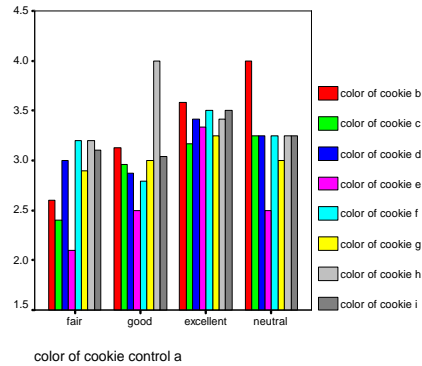
When mouth feel of cookie j was taken as control then most people said that cookie h was excellent.



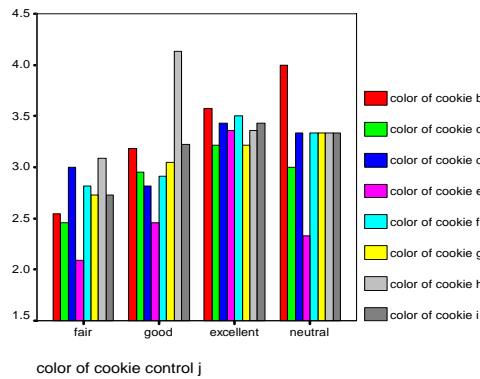
When masticating property of cookie was taken as control then most people said that cookie i was excellent.



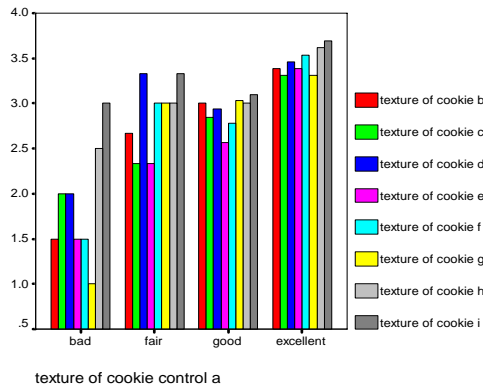
When masticating property of cookie j was taken as control then cookie i was considered excellent by most of the people.



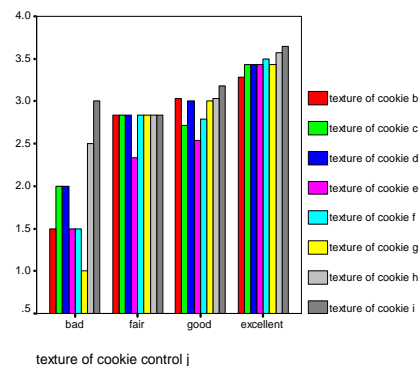
When color of cookie was taken as control then most of the people said that color of cookie b was excellent.



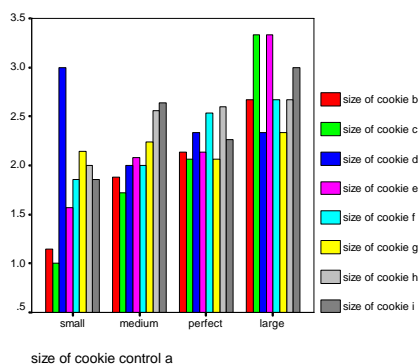
When cookie j was taken as control then most of the people said that cookie b was excellent in color.



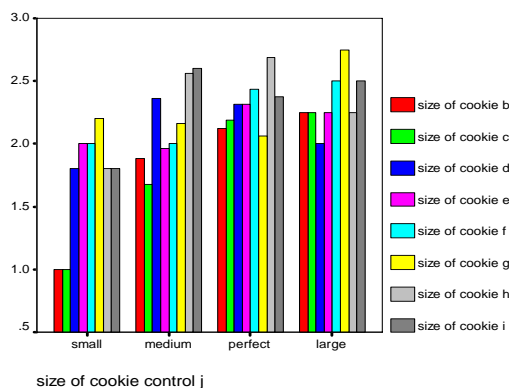
When cookie A was taken as control then most of the people said that cookie h and cookie I was excellent in texture.



When cookie J was taken as control then most of the people said that cookie h and cookie I was excellent in texture.



When cookie A was taken as control then most of the people said that cookie c and cookie e was excellent in size.



When cookie j was taken as control then most of the people said that cookie g was excellent in size.

One way ANNOVA

		Sum of Squares	df	Mean Square	F	Sig.
Taste of cookie b	Between Groups	4.220	2	2.110	2.433	.099
	Within Groups	40.760	47	.867		
	Total	44.980	49			
Taste of cookie c	Between Groups	2.739	2	1.370	1.524	.228
	Within Groups	42.241	47	.899		
	Total	44.980	49			
Taste of cookie d	Between Groups	1.186	2	.593	.640	.532
	Within Groups	43.534	47	.926		
	Total	44.720	49			
Taste of cookie e	Between Groups	.159	2	.080	.134	.875
	Within Groups	27.921	47	.594		
	Total	28.080	49			
Taste of cookie f	Between Groups	3.448	2	1.724	1.663	.201
	Within Groups	48.732	47	1.037		
	Total	52.180	49			
Taste of cookie g	Between Groups	2.169	2	1.085	2.571	.087
	Within Groups	19.831	47	.422		
	Total	22.000	49			
taste of cookie h	Between Groups	.926	2	.463	.612	.547
	Within Groups	35.574	47	.757		
	Total	36.500	49			
taste of cookie i	Between Groups	.488	2	.244	.296	.745
	Within Groups	38.732	47	.824		
	Total	39.220	49			

Null hypothesis- The taste of all cookies is same with respect to control cookie a. Since, none of the value is matching. Null hypothesis is rejected.

		Sum of Squares	df	Mean Square	F	Sig.
Taste of cookie b	Between Groups	7.032	4	1.758	2.085	.099
	Within Groups	37.948	45	.843		
	Total	44.980	49			
Taste of cookie c	Between Groups	16.597	4	4.149	6.578	.000
	Within Groups	28.383	45	.631		
	Total	44.980	49			
Taste of cookie d	Between Groups	5.265	4	1.316	1.501	.218
	Within Groups	39.455	45	.877		
	Total	44.720	49			
Taste of cookie e	Between Groups	.839	4	.210	.346	.845
	Within Groups	27.241	45	.605		
	Total	28.080	49			
Taste of cookie f	Between Groups	6.701	4	1.675	1.658	.177
	Within Groups	45.479	45	1.011		
	Total	52.180	49			
Taste of cookie g	Between Groups	4.856	4	1.214	3.187	.022
	Within Groups	17.144	45	.381		
	Total	22.000	49			
Taste of cookie h	Between Groups	1.077	4	.269	.342	.848
	Within Groups	35.423	45	.787		
	Total	36.500	49			
Taste of cookie i	Between Groups	.494	4	.124	.144	.965
	Within Groups	38.726	45	.861		
	Total	39.220	49			

Null hypothesis- The taste of all cookies is same with respect to control cookie j. Since, none of the value are matching. Null hypothesis is rejected.

		Sum of Squares	df	Mean Square	F	Sig.
Freshness of cookie b	Between Groups	9.647	2	4.823	14.785	.000
	Within Groups	15.333	47	.326		
	Total	24.980	49			
Freshness of cookie c	Between Groups	11.887	2	5.943	11.433	.000
	Within Groups	24.433	47	.520		
	Total	36.320	49			
Freshness of cookie d	Between Groups	12.671	2	6.336	13.961	.000
	Within Groups	21.329	47	.454		
	Total	34.000	49			
Freshness of cookie e	Between Groups	3.849	2	1.924	2.480	.095
	Within Groups	36.471	47	.776		
	Total	40.320	49			
Freshness of cookie f	Between Groups	7.285	2	3.642	5.614	.007
	Within Groups	30.495	47	.649		
	Total	37.780	49			
Freshness of cookie g	Between Groups	2.763	2	1.381	3.762	.031
	Within Groups	17.257	47	.367		
	Total	20.020	49			

Freshness of cookie h	Between Groups	1.094	2	.547	1.243	.298
	Within Groups	20.686	47	.440		
	Total	21.780	49			
Freshness of cookie i	Between Groups	5.644	2	2.822	6.639	.003
	Within Groups	19.976	47	.425		
	Total	25.620	49			

Null hypothesis- The freshness of all cookies is same with respect to control cookie a.
Since, none of the value are matching Null hypothesis is rejected.

		Sum of Squares	df	Mean Square	F	Sig.
Freshness of cookie b	Between Groups	5.793	2	2.896	7.095	.002
	Within Groups	19.187	47	.408		
	Total	24.980	49			
Freshness of cookie c	Between Groups	8.970	2	4.485	7.707	.001
	Within Groups	27.350	47	.582		
	Total	36.320	49			
Freshness of cookie d	Between Groups	7.964	2	3.982	7.188	.002
	Within Groups	26.036	47	.554		
	Total	34.000	49			
Freshness of cookie e	Between Groups	3.384	2	1.692	2.153	.127
	Within Groups	36.936	47	.786		
	Total	40.320	49			
Freshness of cookie f	Between Groups	5.360	2	2.680	3.885	.027
	Within Groups	32.420	47	.690		
	Total	37.780	49			
Freshness of cookie g	Between Groups	2.315	2	1.158	3.073	.056
	Within Groups	17.705	47	.377		
	Total	20.020	49			
Freshness of cookie h	Between Groups	2.040	2	1.020	2.429	.099
	Within Groups	19.740	47	.420		
	Total	21.780	49			
Freshness of cookie i	Between Groups	5.184	2	2.592	5.961	.005
	Within Groups	20.436	47	.435		
	Total	25.620	49			

Null hypothesis- The freshness of all cookies is same with respect to control cookie j. Since, none of the value are matching.
Null hypothesis is rejected.

		Sum of Squares	df	Mean Square	F	Sig.
Odour of cookie b	Between Groups	2.942	4	.736	.641	.636
	Within Groups	51.638	45	1.148		
	Total	54.580	49			
Odour of cookie c	Between Groups	4.847	4	1.212	1.017	.409

	Within Groups	53.633	45	1.192		
	Total	58.480	49			
Odour of cookie d	Between Groups	.929	4	.232	.205	.934
	Within Groups	51.071	45	1.135		
	Total	52.000	49			
Odour of cookie e	Between Groups	11.249	4	2.812	3.377	.017
	Within Groups	37.471	45	.833		
	Total	48.720	49			
Odour of cookie f	Between Groups	6.899	4	1.725	1.418	.243
	Within Groups	54.721	45	1.216		
	Total	61.620	49			
Odour of cookie g	Between Groups	7.242	4	1.811	2.535	.053
	Within Groups	32.138	45	.714		
	Total	39.380	49			
Odour of cookie h	Between Groups	1.397	4	.349	.587	.674
	Within Groups	26.783	45	.595		
	Total	28.180	49			
Odour of cookie i	Between Groups	4.279	4	1.070	1.494	.220
	Within Groups	32.221	45	.716		
	Total	36.500	49			

Null hypothesis- The odour of all cookies is same with respect to control cookie a. Since, none of the value is matching. Null hypothesis is rejected.

		Sum of Squares	df	Mean Square	F	Sig.
Odour of cookie b	Between Groups	9.269	4	2.317	2.301	.073
	Within Groups	45.311	45	1.007		
	Total	54.580	49			
Odour of cookie c	Between Groups	1.086	4	.271	.213	.930
	Within Groups	57.394	45	1.275		
	Total	58.480	49			
Odour of cookie d	Between Groups	2.383	4	.596	.540	.707
	Within Groups	49.617	45	1.103		
	Total	52.000	49			
Odour of cookie e	Between Groups	7.409	4	1.852	2.018	.108
	Within Groups	41.311	45	.918		
	Total	48.720	49			
Odour of cookie f	Between Groups	7.128	4	1.782	1.472	.227
	Within Groups	54.492	45	1.211		
	Total	61.620	49			
Odour of cookie g	Between Groups	8.386	4	2.096	3.044	.026
	Within Groups	30.994	45	.689		
	Total	39.380	49			
Odour of cookie h	Between Groups	3.102	4	.776	1.392	.252
	Within Groups	25.078	45	.557		
	Total	28.180	49			
Odour of cookie i	Between Groups	4.625	4	1.156	1.632	.183

	Within Groups	31.875	45	.708		
	Total	36.500	49			

Null hypothesis- The odour of all cookies is same with respect to control cookie j. Since, none of the value is matching. Null hypothesis is rejected.

		Sum of Squares	df	Mean Square	F	Sig.
Crispiness of cookie b	Between Groups	2.470	3	.823	1.615	.199
	Within Groups	23.450	46	.510		
	Total	25.920	49			
Crispiness of cookie c	Between Groups	3.697	3	1.232	1.373	.263
	Within Groups	41.283	46	.897		
	Total	44.980	49			
Crispiness of cookie d	Between Groups	3.630	3	1.210	2.360	.084
	Within Groups	23.590	46	.513		
	Total	27.220	49			
Crispiness of cookie e	Between Groups	8.614	3	2.871	4.014	.013
	Within Groups	32.906	46	.715		
	Total	41.520	49			
Crispiness of cookie f	Between Groups	1.466	3	.489	.563	.642
	Within Groups	39.914	46	.868		
	Total	41.380	49			
Crispiness of cookie g	Between Groups	1.535	3	.512	.772	.515
	Within Groups	30.485	46	.663		
	Total	32.020	49			
Crispiness of cookie h	Between Groups	.595	3	.198	.522	.669
	Within Groups	17.485	46	.380		
	Total	18.080	49			
Crispiness of cookie i	Between Groups	1.362	3	.454	.623	.604
	Within Groups	33.518	46	.729		
	Total	34.880	49			

Null hypothesis- The crispiness of all cookies is same with respect to control cookie a. Since, none of the value are matching. Null hypothesis is rejected.

		Sum of Squares	df	Mean Square	F	Sig.
Crispiness of cookie b	Between Groups	2.337	3	.779	1.519	.222
	Within Groups	23.583	46	.513		
	Total	25.920	49			
Crispiness of cookie c	Between Groups	2.533	3	.844	.915	.441
	Within Groups	42.447	46	.923		
	Total	44.980	49			
Crispiness of cookie d	Between Groups	7.647	3	2.549	5.991	.002
	Within Groups	19.573	46	.425		
	Total	27.220	49			
Crispiness of cookie e	Between Groups	6.591	3	2.197	2.894	.045
	Within Groups	34.929	46	.759		
	Total	41.520	49			
Crispiness of cookie f	Between Groups	4.048	3	1.349	1.662	.188
	Within Groups	37.332	46	.812		
	Total	41.380	49			

Crispiness of cookie g	Between Groups	5.601	3	1.867	3.251	.030
	Within Groups	26.419	46	.574		
	Total	32.020	49			
Crispiness of cookie h	Between Groups	1.302	3	.434	1.190	.324
	Within Groups	16.778	46	.365		
	Total	18.080	49			
Crispiness of cookie i	Between Groups	5.982	3	1.994	3.174	.033
	Within Groups	28.898	46	.628		
	Total	34.880	49			

Null hypothesis- The crispiness of all cookies is same with respect to control cookie j. Since, none of the value is matching. Null hypothesis is rejected.

		Sum of Squares	Df	Mean Square	F	Sig.
Flavour of cookie b	Between Groups	2.134	3	.711	.768	.518
	Within Groups	42.586	46	.926		
	Total	44.720	49			
Flavour of cookie c	Between Groups	8.924	3	2.975	2.309	.089
	Within Groups	59.256	46	1.288		
	Total	68.180	49			
Flavour of cookie d	Between Groups	.701	3	.234	.274	.844
	Within Groups	39.219	46	.853		
	Total	39.920	49			
Flavour of cookie e	Between Groups	1.799	3	.600	.502	.683
	Within Groups	54.921	46	1.194		
	Total	56.720	49			
Flavour of cookie f	Between Groups	2.887	3	.962	1.015	.395
	Within Groups	43.613	46	.948		
	Total	46.500	49			
Flavour of cookie g	Between Groups	2.198	3	.733	1.323	.278
	Within Groups	25.482	46	.554		
	Total	27.680	49			
Flavour of cookie h	Between Groups	.169	3	.056	.139	.936
	Within Groups	18.711	46	.407		
	Total	18.880	49			
Flavour of cookie i	Between Groups	1.194	3	.398	.653	.585
	Within Groups	28.026	46	.609		
	Total	29.220	49			

Null hypothesis- The flavour of all cookies is same with respect to control cookie a. Since, none of the value is matching. Null hypothesis is rejected.

		Sum of Squares	Df	Mean Square	F	Sig.
Flavour of cookie b	Between Groups	3.498	4	.874	.955	.442
	Within Groups	41.222	45	.916		
	Total	44.720	49			

Flavour of cookie c	Between Groups	12.880	4	3.220	2.620	.047
	Within Groups	55.300	45	1.229		
	Total	68.180	49			
Flavour of cookie d	Between Groups	1.314	4	.329	.383	.820
	Within Groups	38.606	45	.858		
	Total	39.920	49			
Flavour of cookie e	Between Groups	2.020	4	.505	.415	.797
	Within Groups	54.700	45	1.216		
	Total	56.720	49			
Flavour of cookie f	Between Groups	9.617	4	2.404	2.933	.031
	Within Groups	36.883	45	.820		
	Total	46.500	49			
Flavour of cookie g	Between Groups	.102	4	.026	.042	.997
	Within Groups	27.578	45	.613		
	Total	27.680	49			
Flavour of cookie h	Between Groups	.402	4	.101	.245	.911
	Within Groups	18.478	45	.411		
	Total	18.880	49			
Flavour of cookie i	Between Groups	.864	4	.216	.343	.847
	Within Groups	28.356	45	.630		
	Total	29.220	49			

Null hypothesis- The flavour of all cookies is same with respect to control cookie j. Since, none of the value are matching. Null hypothesis is rejected.

		Sum of Squares	df	Mean Square	F	Sig.
Mouth feel of cookie b	Between Groups	4.552	3	1.517	2.087	.115
	Within Groups	33.448	46	.727		
	Total	38.000	49			
Mouth feel of cookie c	Between Groups	2.427	3	.809	.633	.598
	Within Groups	58.793	46	1.278		
	Total	61.220	49			
Mouth feel of cookie d	Between Groups	1.512	3	.504	.621	.605
	Within Groups	37.308	46	.811		
	Total	38.820	49			
Mouth feel of cookie e	Between Groups	2.072	3	.691	1.396	.256
	Within Groups	22.748	46	.495		
	Total	24.820	49			
Mouth feel of cookie f	Between Groups	3.285	3	1.095	1.225	.312
	Within Groups	41.135	46	.894		
	Total	44.420	49			

Mouth feel of cookie g	Between Groups	.832	3	.277	.453	.716
	Within Groups	28.148	46	.612		
	Total	28.980	49			
Mouth feel of cookie h	Between Groups	3.927	3	1.309	2.214	.099
	Within Groups	27.193	46	.591		
	Total	31.120	49			
Mouth feel of cookie i	Between Groups	3.007	3	1.002	1.861	.149
	Within Groups	24.773	46	.539		
	Total	27.780	49			

Null hypothesis- The mouth feel of all cookies is same with respect to control cookie a. Since, none of the value are matching. Null hypothesis is rejected.

		Sum of Squares	df	Mean Square	F	Sig.
Mouth feel of cookie b	Between Groups	3.136	3	1.045	1.379	.261
	Within Groups	34.864	46	.758		
	Total	38.000	49			
Mouth feel of cookie c	Between Groups	2.225	3	.742	.578	.632
	Within Groups	58.995	46	1.283		
	Total	61.220	49			
Mouth feel of cookie d	Between Groups	2.146	3	.715	.897	.450
	Within Groups	36.674	46	.797		
	Total	38.820	49			
Mouth feel of cookie e	Between Groups	7.872	3	2.624	7.123	.000
	Within Groups	16.948	46	.368		
	Total	24.820	49			
Mouth feel of cookie f	Between Groups	6.808	3	2.269	2.775	.052
	Within Groups	37.612	46	.818		
	Total	44.420	49			
Mouth feel of cookie g	Between Groups	1.123	3	.374	.618	.607
	Within Groups	27.857	46	.606		
	Total	28.980	49			
Mouth feel of cookie h	Between Groups	3.780	3	1.260	2.120	.111
	Within Groups	27.340	46	.594		
	Total	31.120	49			
Mouth feel of cookie i	Between Groups	3.618	3	1.206	2.296	.090
	Within Groups	24.162	46	.525		
	Total	27.780	49			

Null hypothesis- The mouth feel of all cookies is same with respect to control cookie j. Since, none of the value are matching. Null hypothesis is rejected.

		Sum of Squares	df	Mean Square	F	Sig.
Masticating property of cookie b	Between Groups	.430	3	.143	.204	.893
	Within Groups	32.390	46	.704		
	Total	32.820	49			
Masticating property of cookie c	Between Groups	12.924	3	4.308	6.742	.001
	Within Groups	29.396	46	.639		
	Total	42.320	49			
Masticating property of cookie d	Between Groups	5.944	3	1.981	3.640	.019
	Within Groups	25.036	46	.544		
	Total	30.980	49			
Masticating property of cookie e	Between Groups	1.434	3	.478	.724	.543
	Within Groups	30.346	46	.660		
	Total	31.780	49			
Masticating property of cookie f	Between Groups	8.561	3	2.854	4.555	.007
	Within Groups	28.819	46	.626		
	Total	37.380	49			
Masticating property of cookie g	Between Groups	2.174	3	.725	1.164	.334
	Within Groups	28.646	46	.623		
	Total	30.820	49			
Masticating property of cookie h	Between Groups	2.060	3	.687	1.001	.401
	Within Groups	31.560	46	.686		
	Total	33.620	49			
Masticating property of cookie i	Between Groups	3.672	3	1.224	2.212	.099
	Within Groups	25.448	46	.553		
	Total	29.120	49			

Null hypothesis- The masticating property of all cookies is same with respect to control cookie a. Since, none of the value is matching. Null hypothesis is rejected.

		Sum of Squares	df	Mean Square	F	Sig.
Masticating property of cookie b	Between Groups	1.620	2	.810	1.220	.304
	Within Groups	31.200	47	.664		
	Total	32.820	49			
Masticating property of cookie c	Between Groups	11.210	2	5.605	8.468	.001
	Within Groups	31.110	47	.662		
	Total	42.320	49			
Masticating property of cookie d	Between Groups	6.794	2	3.397	6.602	.003
	Within Groups	24.186	47	.515		

	Total	30.980	49			
Masticating property of cookie e	Between Groups	.952	2	.476	.726	.489
	Within Groups	30.828	47	.656		
	Total	31.780	49			
Masticating property of cookie f	Between Groups	6.614	2	3.307	5.052	.010
	Within Groups	30.766	47	.655		
	Total	37.380	49			
Masticating property of cookie g	Between Groups	.822	2	.411	.644	.530
	Within Groups	29.998	47	.638		
	Total	30.820	49			
Masticating property of cookie h	Between Groups	2.061	2	1.031	1.535	.226
	Within Groups	31.559	47	.671		
	Total	33.620	49			
Masticating property of cookie i	Between Groups	2.493	2	1.246	2.200	.122
	Within Groups	26.627	47	.567		
	Total	29.120	49			

Null hypothesis- The masticating property of all cookies is same with respect to control cookie j. Since, none of the value are matching. Null hypothesis is rejected.

		Sum of Squares	df	Mean Square	F	Sig.
Color of cookie b	Between Groups	8.058	3	2.686	6.887	.001
	Within Groups	17.942	46	.390		
	Total	26.000	49			
Color of cookie c	Between Groups	3.905	3	1.302	2.011	.126
	Within Groups	29.775	46	.647		
	Total	33.680	49			
Color of cookie d	Between Groups	2.528	3	.843	1.739	.172
	Within Groups	22.292	46	.485		
	Total	24.820	49			
Color of cookie e	Between Groups	9.213	3	3.071	4.945	.005
	Within Groups	28.567	46	.621		
	Total	37.780	49			
Color of cookie f	Between Groups	4.372	3	1.457	2.287	.091
	Within Groups	29.308	46	.637		
	Total	33.680	49			
Color of cookie g	Between Groups	.770	3	.257	.469	.705
	Within Groups	25.150	46	.547		
	Total	25.920	49			
Color of cookie h	Between Groups	6.253	3	2.084	.244	.865
	Within Groups	393.267	46	8.549		
	Total	399.520	49			
Color of cookie i	Between Groups	1.772	3	.591	.859	.469

	Within Groups	31.608	46	.687		
	Total	33.380	49			

Null hypothesis- The color of all cookies is same with respect to control cookie a. Since, none of the value are matching. Null hypothesis is rejected.

		Sum of Squares	df	Mean Square	F	Sig.
Color of cookie b	Between Groups	8.571	3	2.857	7.541	.000
	Within Groups	17.429	46	.379		
	Total	26.000	49			
Color of cookie c	Between Groups	3.641	3	1.214	1.859	.150
	Within Groups	30.039	46	.653		
	Total	33.680	49			
Color of cookie d	Between Groups	3.452	3	1.151	2.477	.073
	Within Groups	21.368	46	.465		
	Total	24.820	49			
Color of cookie e	Between Groups	11.535	3	3.845	6.740	.001
	Within Groups	26.245	46	.571		
	Total	37.780	49			
Color of cookie f	Between Groups	4.059	3	1.353	2.101	.113
	Within Groups	29.621	46	.644		
	Total	33.680	49			
Color of cookie g	Between Groups	1.760	3	.587	1.117	.352
	Within Groups	24.160	46	.525		
	Total	25.920	49			
Color of cookie h	Between Groups	10.139	3	3.380	.399	.754
	Within Groups	389.381	46	8.465		
	Total	399.520	49			
Color of cookie i	Between Groups	3.239	3	1.080	1.648	.191
	Within Groups	30.141	46	.655		
	Total	33.380	49			

Null hypothesis- The color of all cookies is same with respect to control cookie j. Since, value of cookie a and cookie e are matching , they have same color.

		Sum of Squares	df	Mean Square	F	Sig.
Texture of cookie b	Between Groups	6.736	3	2.245	5.662	.002
	Within Groups	18.244	46	.397		
	Total	24.980	49			
Texture of cookie c	Between Groups	4.845	3	1.615	2.347	.085
	Within Groups	31.655	46	.688		
	Total	36.500	49			
Texture of cookie d	Between Groups	5.048	3	1.683	3.914	.014
	Within Groups	19.772	46	.430		

	Total	24.820	49			
Texture of cookie e	Between Groups	9.961	3	3.320	5.848	.002
	Within Groups	26.119	46	.568		
	Total	36.080	49			
Texture of cookie f	Between Groups	9.620	3	3.207	5.423	.003
	Within Groups	27.200	46	.591		
	Total	36.820	49			
Texture of cookie g	Between Groups	9.242	3	3.081	7.989	.000
	Within Groups	17.738	46	.386		
	Total	26.980	49			
Texture of cookie h	Between Groups	4.443	3	1.481	3.876	.015
	Within Groups	17.577	46	.382		
	Total	22.020	49			
Texture of cookie i	Between Groups	3.465	3	1.155	2.032	.123
	Within Groups	26.155	46	.569		
	Total	29.620	49			

Null hypothesis- The texture of all cookies is same with respect to control cookie a. Since, value of cookie a and cookie e are matching , they have same texture.

		Sum of Squares	df	Mean Square	F	Sig.
Texture of cookie b	Between Groups	5.825	3	1.942	4.663	.006
	Within Groups	19.155	46	.416		
	Total	24.980	49			
Texture of cookie c	Between Groups	6.524	3	2.175	3.337	.027
	Within Groups	29.976	46	.652		
	Total	36.500	49			
Texture of cookie d	Between Groups	4.558	3	1.519	3.449	.024
	Within Groups	20.262	46	.440		
	Total	24.820	49			
Texture of cookie e	Between Groups	11.854	3	3.951	7.503	.000
	Within Groups	24.226	46	.527		
	Total	36.080	49			
Texture of cookie f	Between Groups	9.272	3	3.091	5.161	.004
	Within Groups	27.548	46	.599		
	Total	36.820	49			
Texture of cookie g	Between Groups	10.718	3	3.573	10.106	.000
	Within Groups	16.262	46	.354		
	Total	26.980	49			
Texture of cookie h	Between Groups	4.294	3	1.431	3.714	.018
	Within Groups	17.726	46	.385		
	Total	22.020	49			
Texture of cookie i	Between Groups	3.465	3	1.155	2.032	.123
	Within Groups	26.155	46	.569		
	Total	29.620	49			

Null hypothesis- The texture of all cookies is same with respect to control cookie j. Since, value of cookie e and cookie g are same, they are having same texture.

		Sum of Squares	df	Mean Square	F	Sig.
Size of cookie b	Between Groups	6.603	3	2.201	4.237	.010
	Within Groups	23.897	46	.520		
	Total	30.500	49			
Size of cookie c	Between Groups	12.740	3	4.247	7.928	.000
	Within Groups	24.640	46	.536		
	Total	37.380	49			
Size of cookie d	Between Groups	5.620	3	1.873	.783	.509
	Within Groups	110.000	46	2.391		
	Total	115.620	49			
Size of cookie e	Between Groups	6.546	3	2.182	3.141	.034
	Within Groups	31.954	46	.695		
	Total	38.500	49			
Size of cookie f	Between Groups	4.123	3	1.374	1.793	.162
	Within Groups	35.257	46	.766		
	Total	39.380	49			
Size of cookie g	Between Groups	.363	3	.121	.179	.910
	Within Groups	31.017	46	.674		
	Total	31.380	49			
Size of cookie h	Between Groups	2.073	3	.691	.873	.462
	Within Groups	36.427	46	.792		
	Total	38.500	49			
Size of cookie i	Between Groups	4.770	3	1.590	2.180	.103
	Within Groups	33.550	46	.729		
	Total	38.320	49			

Null hypothesis- The size of all cookies is same with respect to control cookie a. Since, none of the value are matching. Null hypothesis is rejected.

		Sum of Squares	df	Mean Square	F	Sig.
Size of cookie b	Between Groups	5.360	3	1.787	3.269	.029
	Within Groups	25.140	46	.547		
	Total	30.500	49			
Size of cookie c	Between Groups	6.752	3	2.251	3.381	.026
	Within Groups	30.628	46	.666		
	Total	37.380	49			
Size of cookie d	Between Groups	1.622	3	.541	.218	.883
	Within Groups	113.998	46	2.478		
	Total	115.620	49			
Size of cookie e	Between Groups	1.353	3	.451	.558	.645

	Within Groups	37.147	46	.808		
	Total	38.500	49			
Size of cookie f	Between Groups	2.443	3	.814	1.014	.395
	Within Groups	36.938	46	.803		
	Total	39.380	49			
Size of cookie g	Between Groups	1.533	3	.511	.787	.507
	Within Groups	29.848	46	.649		
	Total	31.380	49			
Size of cookie h	Between Groups	3.353	3	1.118	1.463	.237
	Within Groups	35.147	46	.764		
	Total	38.500	49			
Size of cookie i	Between Groups	2.770	3	.923	1.195	.322
	Within Groups	35.550	46	.773		
	Total	38.320	49			

Null hypothesis- The size of all cookies is same with respect to control cookie j. Since, none of the value is matching. Null hypothesis is rejected.

RESULT AND DISCUSSION

Data obtained from the clustered graphs suggested that : taste of cookies H , I , G was liked by most people, cookie I had excellent freshness, cookie H had the best odour , mouth feel and crispiness, cookie F , G , I had the best flavour, cookie I had best masticating property and texture, colour of cookie B was best, size of cookie was seen best in cookie G , C , E. One way annova concluded that : Cookie E, G have same texture with respect to cookie J as control although cookie E , A have same texture with respect to cookie A as control. Also cookie A, E is having same colour with respect to cookie J as control. Hence, from clustered and annova, we came to a conclusion that cookie I and cookie H were not having any of the attributes same as other cookies. Also, cookie I and cookie H were rated excellent maximum number of times in majority of the attributes.

CONCLUSION

When the sensory properties of different cookies were compared with the help of SPSS software it was seen that the cookies with additional nutritive ingredients along with conventional substrates were liked by most of the people. The additional substitutes provide nutrition and health related benefits and this can be further proved by doing nutrition analysis.

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