



Textural analysis of edible spoons

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Abstract : Plastics can be easy and convenient for everyday use. However they have their own negative impacts on our health. In the long run, overuse of plastics and lack of proper recycling will create many undesirable effects on our health. Plastics are harmful to manufacture, use, and pose a great challenge of recycling the same time. Hence edible cutlery came as a boon for it. Edible cutlery is a new & interesting concept in which the cutlery like bowl and spoons are eaten along with the meal. They are environment friendly as they can easily disposed and eaten by animals. Edible spoon is a fast moving product around the world. Edible spoons are consumable and biodegradable. They can be eaten without serving anything in it. Edible spoon is considered to be very healthy. This study has been undertaken to study the various textural attributes of edible spoon made from soya flour, finger millet flour, refined wheat flour & whole wheat flour. The edible spoons were analyzed for its textural attributes by the texture profile analyzer. Hardness, springiness, cohesiveness, gumminess, chewiness, resilience were the different textural attributes analyzed. Edible spoon made with refined wheat flour was better in the textural attributes comparatively due to its good structure properties.

Index Terms – Plastics, biodegradable, Edible spoon, texture, texture profile analyzer

I. INTRODUCTION

Every year some 40 million tons of reusable plastic cutlery is getting thrown away, most of them after a single use. This plastic can take up to 1,000 years to break down in the environment, adding to an already long list of environmental concerns consumers face today. Edible Cutlery, is an upcoming line of plant-based eating utensils that are totally safe to eat and considered to be a boon for ecosystem.

This edible cutlery is considered as ready to eat because these do not need any further preparation. Edible cutlery can be used as utensils, solid, semi-solids things could be served in it and they do not get soggy soon. Edible spoons are environment friendly as they can easily discarded and eaten by the animals. They could be eaten without serving anything in it. Edible cutlery can be provided during wars, disaster prone areas where scarcity of food due to lack of resources. (Sangita Sood., 2018)[1]

II. TYPES OF FLOURS

2.1 Refined wheat flour

Flour provides the structure in baked goods. Wheat flour contains proteins which would interact with each other when mixed with water, forming gluten. It is this elastic gluten framework which stretches to contain the expanding leavening gases during rising.

2.3 Hard wheat flour

Hard wheat flours (both durum and common) tend to have higher protein content than soft wheat flours. In general, there is an inverse relationship between amount of protein and starch. Thus, if protein content is higher in a flour, starch content must be lower. Other differences in composition are relatively minor and not consistent. It is generally believed that the uniqueness of wheat is because of the gluten proteins. (Edwards., *et al* 2000). Hence the whole wheat flour was variety chose to make the edible spoon.

2.3 Soy flour

Defatted soy flour is found to give as good a loaf of bread as the 100% wheat bread. Fortification with soy flour is beneficial due to the increased nutritional value (higher mineral and protein content) and higher water absorption with acceptable consumer attitude in rheological and sensory characteristics. (Taghdir., *et al* 2017)[2]

Using of soy flour is considered not only as a corrective of bakery product, but also have a positive effect on health. It is found that soy flour contains more than 38% protein, so that the addition of soy in grain products, such as the bread, increases the amount of protein in food (Sana *et al.*, 2012)[3].

2.4 Finger millet flour

Finger millet (Ragi) is usually used for preparation of flour, pudding, porridge and roti (Chaturvedi *et al.*, 2008)[4]. With the changes in scenario of utilization pattern of processed products and awareness of the consumers about the health benefits, finger millet has gained importance because due to its functional components, such as slowly digestible starch and resistant starch (Wadikar *et al.*, 2007). Incorporation of different millet flours in conventionally used refined wheat flour can alter the functional properties of the flour and consequently the physical, textural and sensory characteristics of the baked products. (Renu Shrestha *et al.* 2015)[5]

III. Texture analysis of the spoons

The textural properties of the sample were analysed by the Texture Profile Analyser (STABLE MICRO SYSTEMS). Hardness, fracturability, springiness, cohesiveness, gumminess, chewiness, resilience of the sample were determined. 75mm probe was used to test the spoons.

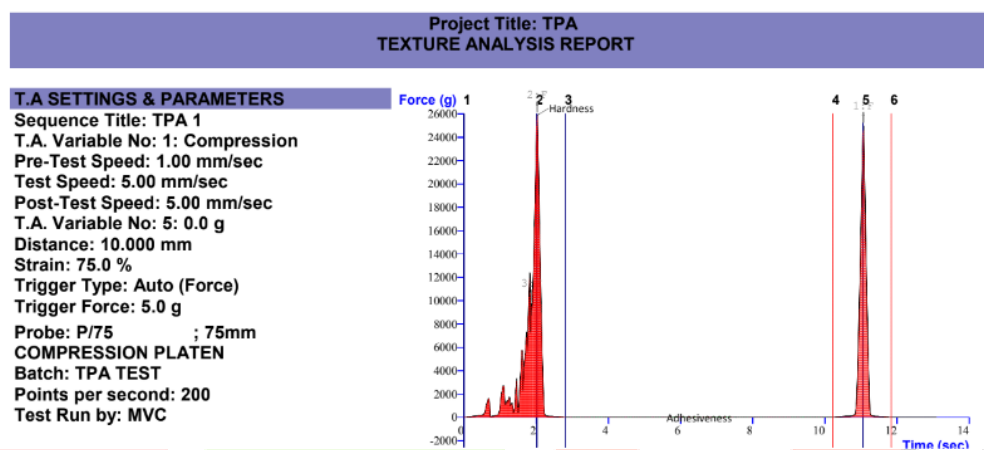


Fig 1: Graphical representation of textural analysis of refined wheat flour spoon

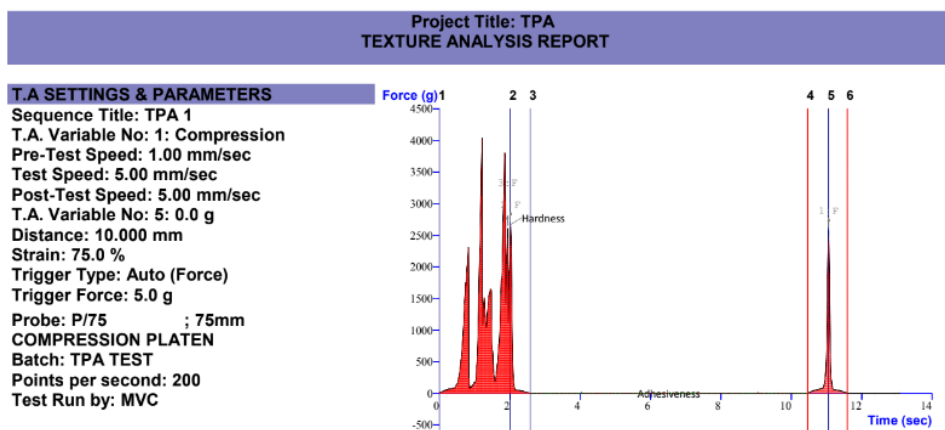


Fig 2: Graphical representation of textural analysis of Whole wheat flour spoon

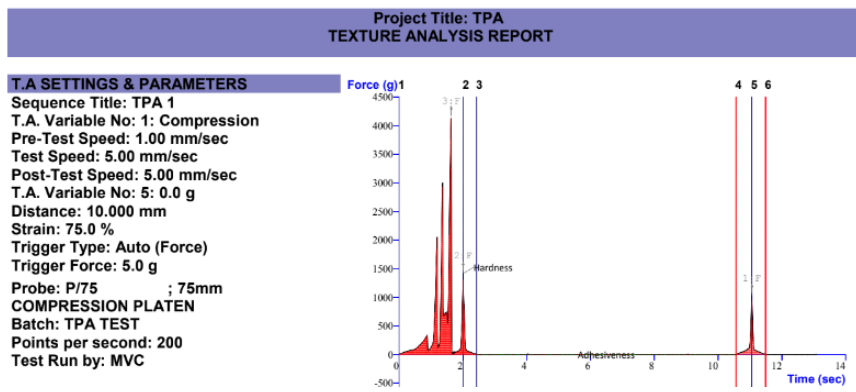


Fig 3: Graphical representation of textural analysis of soy flour spoon

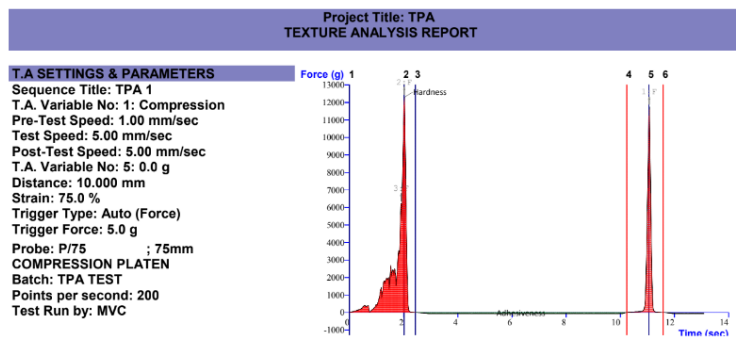


Fig 4: Graphical representation of textural analysis of finger millet flour spoon

PICTORIAL REPRESENTATION OF EDIBLE SPOONS



Plate 1



Plate 2

REFINED WHEAT FLOUR EDIBLE SPOON

WHOLE WHEAT FLOUR EDIBLE SPOON



SOY FLOUR EDIBLE SPOON



FINGERMILLET EDIBLE SPOON

IV. RESULTS AND DISCUSSION

The hardness,fracturability,pringiness,cohesiveness,gumminess,chewiness & resilience of all the edible spoons were analyzed. Refined wheat flour edible spoon , whole wheat flour & fingermillet flour edible spoons was found to be higher in its hardness, whereas in soyflour it ranged higher in its fracturibility . Comparatively, refined wheat flour edible spoon had good textural attributes.

Test ID	Batch	Force 1 g	Area-FT 1:2 g.sec	Time-diff. 1:2 sec	Area-FT 1:3 g.sec	Area-FT 2:3 g.sec	Area-FT 4:6 g.sec	Time-diff. 4:5 sec	Hardness g Force 2	Fracturability g Force 3	Adhesiveness g.sec Variable	Springiness J#F#	Cohesiveness M#G#	Gumminess K#O#	Chewiness P#N#	Resilience H#E#
		Force 1	Area F-T 1:2	Time Difference 1:2	Area F-T 1:3	Area F-T 2:3	Area F-T 4:6	Time Difference 4:5								
Start Batch TPA TEST	TPA TEST															
TPA TEST1	TPA TEST	24988.450	5420.307	2.020	8066.019	2645.711	4667.012	0.835	25881.616	9744.900		0.413	0.579	14975.146	6190.221	0.488
End Batch TPA TEST	TPA TEST															
Average:	TPA TEST (F) AVERAGE("BATCH")	24988.450	5420.307	2.020	8066.019	2645.711	4667.012	0.835	25881.616	9744.900		0.413	0.579	14975.146	6190.221	0.488
S.D.	TPA TEST (F) STDEV("BATCH")															
Coef. of Variation	TPA TEST (F) STDEV("BATCH") / AVERAGE("BATCH") * 100															
End of Test Data																

TABLE 1: RESULTS OF REFINED WHEAT FLOUR EDIBLE SPOON

Test ID	Batch	Force 1 g	Area-FT 1:2 g.sec	Time-diff. 1:2 sec	Area-FT 1:3 g.sec	Area-FT 2:3 g.sec	Area-FT 4:6 g.sec	Time-diff. 4:5 sec	Hardness g Force 2	Fracturability g Force 3	Adhesiveness g.sec Variable	Springiness J#F#	Cohesiveness M#G#	Gumminess K#O#	Chewiness P#N#	Resilience H#E#
		Force 1	Area F-T 1:2	Time Difference 1:2	Area F-T 1:3	Area F-T 2:3	Area F-T 4:6	Time Difference 4:5								
Start Batch TPA TEST	TPA TEST															
TPA TEST1	TPA TEST	2576.600	1860.617	2.020	2005.551	144.934	259.857	0.590	2669.881	2607.694	-0.213	0.292	0.130	345.933	101.040	0.078
End Batch TPA TEST	TPA TEST															
Average:	TPA TEST (F) AVERAGE("BATCH")	2576.600	1860.617	2.020	2005.551	144.934	259.857	0.590	2669.881	2607.694	-0.213	0.292	0.130	345.933	101.040	0.078
S.D.	TPA TEST (F) STDEV("BATCH")															
Coef. of Variation	TPA TEST (F) STDEV("BATCH") / AVERAGE("BATCH") * 100															
End of Test Data																

TABLE 2: RESULTS OF WHOLE WHEAT FLOUR EDIBLE SPOON

Test ID	Batch	Force 1 g	Area-FT 1:2 g.sec	Time-diff. 1:2 sec	Area-FT 1:3 g.sec	Area-FT 2:3 g.sec	Area-FT 4:6 g.sec	Time-diff. 4:5 sec	Hardness g Force 2	Fracturability g Force 3	Adhesiveness g.sec Variable	Springiness J#F#	Cohesiveness M#G#	Gumminess K#O#	Chewiness P#N#	Resilience H#E#
		Force 1	Area F-T 1:2	Time Difference 1:2	Area F-T 1:3	Area F-T 2:3	Area F-T 4:6	Time Difference 4:5								
Start Batch TPA TEST	TPA TEST															
TPA TEST1	TPA TEST	1029.508	902.267	2.020	957.103	54.836	104.796	0.490	1415.453	4127.967	-0.220	0.243	0.109	154.981	37.594	0.061
End Batch TPA TEST	TPA TEST															
Average:	TPA TEST (F) AVERAGE("BATCH")	1029.508	902.267	2.020	957.103	54.836	104.796	0.490	1415.453	4127.967	-0.220	0.243	0.109	154.981	37.594	0.061
S.D.	TPA TEST (F) STDEV("BATCH")															
Coef. of Variation	TPA TEST (F) STDEV("BATCH") / AVERAGE("BATCH") * 100															
End of Test Data																

TABLE 3: RESULTS OF SOY FLOUR EDIBLE SPOON

Test ID	Batch	Force 1 g	Area-FT 1:2 g.sec	Time-diff. 1:2 sec	Area-FT 1:3 g.sec	Area-FT 2:3 g.sec	Area-FT 4:6 g.sec	Time-diff. 4:5 sec	Hardness g Force 2	Fracturability g Force 3	Adhesiveness g.sec Variable	Springiness J#F#	Cohesiveness M#G#	Gumminess K#O#	Chewiness P#N#	Resilience H#E#
		Force 1	Area F-T 1:2	Time Difference 1:2	Area F-T 1:3	Area F-T 2:3	Area F-T 4:6	Time Difference 4:5								
Start Batch TPA TEST	TPA TEST															
TPA TEST1	TPA TEST	11749.315	2881.808	2.020	3818.416	936.608	1642.543	0.820	12296.391	6225.662	-450.391	0.406	0.430	5289.457	2147.205	0.325
End Batch TPA TEST	TPA TEST															
Average:	TPA TEST (F) AVERAGE("BATCH")	11749.315	2881.808	2.020	3818.416	936.608	1642.543	0.820	12296.391	6225.662	-450.391	0.406	0.430	5289.457	2147.205	0.325
S.D.	TPA TEST (F) STDEV("BATCH")															
Coef. of Variation	TPA TEST (F) STDEV("BATCH") / AVERAGE("BATCH") * 100															
End of Test Data																

TABLE 4: RESULTS OF FINGERMILLET FLOUR EDIBLE SPOON

CONCLUSION

The textural analysis of different types of edible spoon revealed that, spoon made with 100% refined flour had better textural attributes than the other spoons. Hence, spoon made as a combination with different types of flour with refined wheat flour as a main ingredient will have good textural attributes.

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