Comparative Analysis of Gluten Content of Raw and Processed Materials

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Abstract-Gluten intolerance /allergies is now a silently rising problem world-wide. Gluten is a protein composite found in cereals, wheat, rice, barley and certain oat varieties. It also causes Celiac disease which is an autoimmune disease (most severe form of gluten intolerance), resulting from gluten intolerance and is based on genetic intolerance. The only therapeutic treatment for the patients with gluten allergies and celiac disease is a strict gluten free diet. Rising demand for gluten free products is a task for the bakers and manufacturers to eliminate gluten completely from their products which is technically not possible. This draws the attention to the fact that mandatory analysis in this field is required. The aim of this work is to find a way to reduce the gluten content in the available materials, and also to find the source of gluten contamination after processing of raw materials. It was noted that garlic and sugar containing combination were found effective and showed decrease in gluten content and that they were better additivities in the processing process than rest of others.

Keywords: Gluten intolerance, autoimmune disease, Celiac disease, Gluten contamination, Allergies.

Introduction

Gluten is a naturally found protein mixture of prolamin and glutelin proteins present in wheat, barley, rye and other grains (Janssen, A. M., et. al.1996).Gluten comprises 7585% of the total protein in bread wheat. Wheat gluten is composed of mainly two types of proteins, the glutenins and the gliadins.(St. Paul, US 2001)

Gluten helps food maintain their shape, acting as a glue that holds food together. It's what makes dough elastic and gives bread its chewy texture (Brevis, J. C., Morris, et al).

These properties, and its relatively low cost, make gluten valuable to both food and non-food industries.(C. Wrigley,et al). Apart from its use in industries and food products it is also responsible for allergies mainly celiac disease.

Celiac disease is an autoimmune disorder that's triggered when you eat gluten. It is also known as celiac sprue, nontropical sprue, or gluten-sensitive enteropathy. (Briani, C. et.al. (2008).

When someone with celiac disease eats something with gluten, their body overreacts to the protein and damages their villi, small finger like projections found along the wall of their small intestine. Damaged villi can lead to malnourishment as well as loss of bone density (L.Augustin, et al 2006).Symptoms include- Abdominal pain, Anemia, bloating, bone or joint pain, constipation, diarrhea, gas, heartburn, itchy blistery rash, headache or fatigue, mouth ulcers, nausea, weight loss, nervous system injury, miscarriage, infertility or even neurological disease or certain cancers, all this due to inability of your small intestine to absorb nutrients from food(St. Paul, US 2001).

Most of the people with celiac disease never know that they have it. Only few as 20% of people get the right diagnosis. The damage to your intestine is very slow, and symptoms are so varied that it can take years to get a diagnosis.

Gluten content in the test samples were analysed by Enzyme Linked Immunoassay (ELISA) using ELISA kit from r- biopharm.

It is first discovered by Eva Engvall and Peter Perlman. Antigen from the sample to be tested are attached to a surface. Then a matching antibody is applied over the surface, so it can bind the antigen. This antibody is linked to an enzyme and then any unbound antibodies are removed. In the final step, a substance containing the enzyme's substrate is added. If there was binding the subsequent reaction produces a detectable signal, most commonly a colour change (D., Sidney, et al (2009). The assay uses a solid-phase type of enzyme immunoassay (EIA) to detect the presence of a ligand commonly protein in a liquid sample using antibodies directed against the protein to be measured. ELISA has been used as a diagnostic tool in medicine, plant pathology. Biotechnology, as well as a quality control check in industries. (Ehren, J., Govindarajan, et al 2008).

Material and Methods

Samples of wheat flour and maida was collected from shop. For processing Additives-powders (ginger,garlic, fenugreek, ajwain,and sugar), water,

milk, butter milk and oil were used. (Goesaert, H.et al.2005). Different combinations (table-1) A, B, C, D, E, F, G, H, I, J, K, L, M were prepared -using additives for the test. Samples were prepared according to the provided protocol of the ELSA test kit. Prepared samples were loaded in microwells and incubated for 30 min's. The wells of microtiter strips are coated with R5 antibodies against Gliadins. By adding the standards or sample solution to wells, present gliadin will bind to the specific capture antibodies. The result is antibody-antigen complex. Components not bound by the antibodies are then removed in a washing step. Then R5 antibody conjugated to peroxidase is added to the wells and incubated. Bound conjugate converts the colorless chromogen into a blue product. The addition of the stop solution leads to a colour change from blue to yellow. The measurement is made photometrically at 450nm. The absorbance is proportional to the gliadin concentration of the sample (RIDACREEN® Gliadin Art.Nr. r7001 manual).

Results and Discussion

Gluten content in wheat samples after being processed was found to be near the value of raw wheat flour in most of the samples that is greater than 80, but some combination of samples **F** and **I** showed a remarkable fall in the gluten content after processing. Sample **I** containing garlic and **F** containing sugar showed value less than 80mg/kg (table-1).

In case of Maida- it was found that gluten content was 67.93 mg/kg in raw form which get increased upto 10-11mg/ kg after processing. Gluten content was found highest in combination containing oil that is 77.59, (table-1).

Table-1

S.NO	SAMPLE NAME	SAMPLE CODE	GLIADIN (mg/kg)	GLUTEN CONTENT (mg/kg)
1	Wheat flour (dry)	A	>40	>80
2	Wheat flour + Water	B	>40	>80
3	Wheat flour + Milk	C	>40	>80
4	Wheat flour + Butter Milk	D	>40	>80
5	Wheat flour + Oil + Water	E	>40	>80
6	Wheat flour + Garlic + Water	F	**39.21**	**78.43**
7	Wheat flour + Ginger + water	G	>40	>80
8	Wheat flour + Ajwain + water	H	>40	>80
9	Wheat flour + Sugar	I	**36.97**	**73.94**
10	Wheat flour + Methi	J	>40	>80
11	Maida(dry)	K	33.97	67.93
12	Maida flour + Water	L	34.78	69.57
13	Maida + Oil + Water	M	38.79	77.59

- In wheat flour samples **F** and **I** decrease in gluten content was observed.
- In maida samples anrise in gluten content was observed from K to M

Conclusion

1. Garlic (F) and sugar (I)containing combination were found effective and showed decrease in gluten content. Hence from our study and results we can conclude that garlic and sugar were better additives in the processing process than rest of the others. Both can be used in lowering/processing the gluten content in wheat flour.
2. Conclusion drawn from maida samples, oil, tends to increase gluten content in maida, it's not recommended for processing/lowering gluten.

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