

The Extent of Adulteration of Selected Foods at Bahir Dar, Ethiopia

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ABSTRACT

A qualitative study was conducted to investigate the extent of adulteration of selected foods at Bahir Dar to give the consumers an opportunity to detect a few common adulterants in foods. Samples of butter, coffee powder, red pepper powder, honey and edible oil were analyzed for the presence of adulterants using standard physicochemical tests. Based on the results obtained, higher extent of adulteration (15%) was observed for honey adulterated with sugar and lower extent (1.3%) was observed for red pepper powder adulterated with brick powder grit during the period of the project from January to June, 2014. Adulteration of food cheats the consumer and can pose serious risk to health. The common man, unfortunately, remains largely unaware of these adulterants and consumes food without thorough checks. Mere visual inspection does not serve the purpose especially when adulteration has assumed high degree of sophistication. Consumer awareness is the remedy for eliminating the evil of adulteration and sale of substandard food articles.

Key words- Adulteration, butter, coffee powder, edible oil, honey, red pepper powder.

INTRODUCTION

Adulteration is the act of intentionally debasing the quality of food offered for sale either by mixing or substitution of inferior substances or by the removal of some valuable ingredient (Mansuri, 2011). We are very fortunate to be born in a country which is blessed with rich soil, diversified climate and many rivers where varieties of cereals, fruits, vegetables, spices and many more crops can be grown. In ancient times, the land was in abundance, the supply of food was more than the demand and people used fresh food materials in most natural form.

The population spurt in our country has given rise to unemployment and poverty. The demand for food has increased & our country has to import food grains, oil etc. from other countries. This shortage of food and ignorance of consumers is the main cause for adulteration of foodstuffs by the unscrupulous traders. It has become so common that the consumers have to run from pillars to pillars to get a foodstuff which is not adulterated. If the consumer knows the ways and means to check the commodities of daily use, they can save themselves and their families from this mind-boggling problem.

Food is mainly adulterated to increase the quantity and make more profit. The food is sucked of its nutrients and the place where the food is grown is often contaminated. For example; milk is mixed with water, vanaspati is used as an adulterant for ghee, ergot is used as an adulterant for cereals, chalk powder is used as an adulterant for flour, chicory is used as an adulterant for coffee, papaya seeds are used as an adulterant for black pepper, brick powder is used as an

adulterant for chili powder, tamarind seed powder is used as adulterant for coffee powder, argemone seeds are adulterant for edible oils (Lakshmi *et al.*, 2012 and Renée, 2014).

In addition, the increasing number of food producers and the outstanding amounts of imported food stuffs enables the producers to mislead and cheat consumers. Consumption of adulterated food causes diseases like cancer, asthma, ulcer, etc (FSSAI, 2012). Majority of adulterants used by the shopkeepers are cheap substitutes which are easily available. However, consumers are not aware of the hazards of consuming adulterated foods. It is very difficult to differentiate those who take advantage of legal rules from the one who commit food adulteration. Thus, the key objective of this project was to investigate the extent of adulteration of selected foods at Bahir Dar.

MATERIALS AND METHODS

Study area and period

The study was conducted at Bahir Dar from January to June, 2014 and the physical and chemical tests were carried out at Food Process and Food Analysis Laboratories.

Sample collection

The foods samples used for the study were selected based on high consumption rates and these foods are commonly adulterated in Ethiopia. Five random samples of butter, coffee, honey, red pepper powder and edible oil were collected from 5 market places (M) of Bahir Dar (M1= Kebele 04 Market, M2= Kebele 16 Market, M3= Kebele 13 Market, M4= Kebele 11 Market, M5= Kebele 17 Market) three times in a month interval.

Methods of adulteration tests

Simple physical and chemical screening tests of adulteration were carried out to investigate the presence of adulterants in the food samples (Table 1) based on the methods described below:

Table 1. Major adulterants and methods of analysis of selected foods.

Type of Food	Adulterants	Methods of Analysis
Oil	Argemone oil	Precipitation test
Honey	Sugar/invert sugar/jaggery	Fiehe's Test
Butter	Mashed potato, sweet potato	Iodine binding test
Red pepper powder	Brick powder grit, sand, dirt, filth, etc.	Settlement test
Coffee powder	Roasted cereals (starch)	Iodine binding test

Sources: FSSAI, 2012 and Mansuri, 2011.

Butter analysis

About 5 ml of butter sample was boiled in a test tube. It was then cooled and a drop of iodine solution was added. Blue colour indicates presence of starch and the colour disappears on boiling & reappears on cooling (FSSAI, 2012).

Coffee powder analysis

A decoction of the coffee was made and decolorized by adding acidified potassium permanganate and then add a drop of iodine solution. Blue colour shows starch or sccharides (Jaiswal, 2004 and Mansuri, 2011).

Honey analysis

Fiehe's Test was used to analyze honey adulteration. About 5 g of honey was mixed with 10 ml of ether in a mortar and pestle. The ether extract was decanted off into a petri dish. This step was repeated twice with more ether and all the extract was collected in the same dish. The ether was allowed to evaporate off at room temperature. To the remaining residues in the dish, a drop of 1% solution of freshly sublimed resorcinol was added in concentrated hydrochloric acid. Immediate appearance of a cherry red colour indicates presence of sugar (Mansuri, 2011).

Red pepper powder analysis

The sample was poured in a beaker containing a mixture of chloroform and carbon tetrachloride. Brick powder and grit settle at the bottom (FSSAI, 2012).

Edible oil analysis

About 5 ml of filtered edible oil was shaken with 2 ml of concentrated hydrochloric acid in a test tube and the mixture was heated for 5 minutes in a water bath with occasional shaking. The oil was decanted gently from the top and added to the remaining acid layer, 1 ml of 10% ferric chloride solution. The tube was rotated between the palms of the hands to mix the solutions and the mixture was heated in a boiling water bath for 10 minutes. Formation of reddish brown precipitates or crystals show presence of argemone oil (Jaiswal, 2004).

RESULT AND DISCUSSION

Adulteration tests

Butter

The butter samples collected from 4 different markets were analyzed for the presence of adulterants. Based on the results obtained, 6.7% of the samples were adulterated with vegetable sources, mainly mashed potatoes indicating a blue color. This color disappears on boiling and reappears on cooling (Appendix 1). Derewiaka *et al.*, 2011 mentioned that adulteration of butter is a serious problem due to economic advantages taken by replacing expensive milk fat with cheaper vegetable products without informing the customers. According to these authors, the most efficient method for butter authentication is qualitative and quantitative analysis of sterols and tocopherols. This analysis will determine if components of plant origin were used for butter production.

Coffee Powder

Coffee powder samples were analyzed for the presence of adulterants. The results revealed that 8% of the samples from 5 different markets showed blue color for the presence of high concentration of starch or saccharides which implies that the coffee powder is adulterated with roasted cereals (Appendix 1). Briandet *et al.*, 1996 mentioned that coffee could be adulterated with roasted cereals like barely, maize, soybean, coffee husks and straw, etc. Nogueira and Lucio do Lago (2009) detected adulterations in processed coffee with cereals and coffee husks and found that the adulteration of coffee by other vegetable products changes the concentration profile of the saccharides.

Honey

Fiehe's test was used to analyze the presence of adulterants in the samples of honey. Cherry red color was observed in 15% of the samples indicating that the honey was adulterated with sugar or invert sugar (Appendix 1). Irudayaraj *et al.*, 2003 determined 1% to 25% of invert cane

sugar adulteration in honey using Fourier transform infrared spectroscopy with an attenuated total reflection sampling accessory combined with multivariate analysis and concluded that adulteration of honey is not only a major economic fraud, but also has major health implications for consumers.

Red pepper powder

It is observed that 1.3% of the samples contain brick powder and grit that settled at the bottom of the sample of red pepper powder (Appendix 1). This is in line with the results of Lakshmi *et al.*, 2012 who reported brick powder is the common adulterant for chilly-powder.

Edible oil

Different edible oil samples were analyzed for the presence of argimone oil. It is observed that 2.7% of the samples contain argimone oil because the samples indicated reddish brown precipitate (Appendix 1). Lakshmi *et al.*, 2012 found that argemone seeds oil which is used to add bulk and weight to edible oils proven to be carcinogenic for humans if consumed over a long period of time.

CONCLUSIONS

Adulteration is becoming a serious problem in Bahir Dar and this might be a health risk in the near future. Some of the consumers are unaware of the problem, others have no access to methods of identification and the rest are due to carelessness. Research to develop new analytical methods for determination of food adulteration is very difficult because ways of adulterating food are more and more sophisticated. In view of the current food safety situation, use of the above mentioned simple screening tests for detecting adulteration of foods is vital which can be easily applicable to ascertain the purity of food products to protect the consumer against food. Future works could be done by increasing the number of food samples with extended period of study and on awareness creation of consumer about the public health risk of adulteration.

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Appendix 1. Adulteration test results of selected foods at different market places of Bahir Dar from January – June, 2014.

Market/Sample	Butter			Coffee Powder			Honey			Red Pepper Powder			Edible Oil		
M1,1	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
M1,2	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-
M1,3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
M1,4	-	+	-	+	-	-	-	-	+	-	-	-	-	+	-
M1,5	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-
M2,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M2,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M2,3	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-
M2,4	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-
M2,5	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-
M3,1				-	-	-				-	-	-	-	-	-
M3,2				-	-	-				-	-	-	-	-	-
M3,3				-	-	-				-	-	-	+	-	-
M3,4				-	-	-				-	-	-	-	-	-
M3,5				-	-	-				-	-	-	-	-	-
M4,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

M4,2	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-
M4,3	-	-	-	-	-	-	-	-	+	-	-	-	-	-	+
M4,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M4,5	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
M5,1	-	-	-	-	+	-				-	-	-	-	-	-
M5,2	-	-	-	-	-	-				-	-	-	-	-	-
M5,3	-	-	-	-	-	-				-	-	-	-	-	-
M5,4	-	-	-	-	-	-				-	-	-	-	-	-
M5,5	-	-	-	-	-	-				-	-	-	-	-	-

Keys:	M1= Kebele 04 Market	M1,1= Market 1, Sample 1
	M2= Kebele 16 Market	M2,1= Market 2, Sample 1
	M3= Kebele 13 Market	M3,1= Market 3, Sample 1
	M4= Kebele 11 Market	M4,1= Market 4, Sample 1
	M5= Kebele 17 Market	M5,1= Market 5, Sample 1 etc.

+ indicates the food sample is adulterated.

- indicates the food sample is not adulterated.

The shaded areas indicate the samples which were not obtained in the market place.