

Graduating Thesis.

Some Foods and their Adulteration.

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Plan;—

I. Cause of Adulteration.

- a. Decrease cost of production.
 - 1. Cheapness demanded by consumer.
 - 2. Necessitated by competition.

b. To preserve food.

- 1. For shipment.
- 2. For other seasons.

c. To improve the appearance of poor material.

II. Discussion.

- a. An examination of some of our foods in regard to;
 - 1. Preparation for market.
 - 2. Composition.
 - 3. Adulteration.

b. Effects of adulteration.

- 1. Un health of the people.
- 2. Un morals.

III. Prevention of Adulteration.

a. By state laws.

b. By buying food known to be pure.

c. A national food law.

When people are in a low state of civilization the foods consumed are such as may be found near their homes and are not changed much from the form in which they are grown. As civilization advances the taste of the people develops and a greater variety of food is demanded.

This desire for a variety in diet has lead to the great industries which deal with the varied preparations in foods.

The spirit of democracy in this age leads everyone to desire all the luxuries which are produced and the manufacturer, in his endeavor to meet this demand, must produce all kinds of articles at low cost.

When the people want an article at a price below the cost of production the manufacturer is encouraged to substitute cheaper materials and make as good an article as he can to satisfy the demand.

When the consumer understands the difference between the two articles this is a commendable business and increases the prosperity of the country. It is a good thing for the people to have a great variety of food stuffs within their reach but the advantage to the consumer is entirely destroyed when the substitution of poorer material is made without his knowledge and he buys an article which

is not of the quality he supposes it to be. Substituting a cheap article without labeling it as such, allows the manufacturer to sell it at the same price as the genuine and thus defraud the purchaser.

The great competition which the manufacturer has to work against increases his temptation to adulterate, for most purchasers consider the price and appearance only and do not learn the flavor or examine the constituents of each brand. It is very difficult for an honest manufacturer with pure goods to compete against the adulterated material which is put up in an attractive way and often more highly colored than the natural article. In pure goods there is not always uniformity and sometimes the purest articles are rather colorless. Since it is customary for people to judge of the excellence or purity of an article by the color they are easily deceived when the color is artificially produced.

The preservation of food is another cause which leads manufacturers to adulterate food. The older methods of preserving food such as limited cold storage, desiccation, sterilization, salt, vinegar, or wood smoke are practically harmless. The other preservatives depend for their efficiency upon retarding or entirely stopping the action of fermentative organisms. Such substances will, if

taken in large enough doses, hinder the digestive processes. Even when the chemicals are taken in very small quantities to preserve the food their use should be discouraged because the same person might take a little from one food and a little from another until he had accumulated enough in his system to cause very serious trouble. Some foods, such as oysters or milk, which are handled by several persons before reaching the consumer, may have adulterates added several times by different people and, although each one puts in only a very small amount, the result of all additions is a very serious compound.

It is necessary to preserve foods because in one locality only a few things can be produced at the best advantage, and other foods must be shipped in to supply the market. Meat must be preserved to be sent to the localities where cattle are not grown and fruit and vegetables kept for winter use. This can all be accomplished without using anything which will injure the quality of the food material.

If only the best products were preserved the third cause for adulteration would not have to be considered. Many times the inferior and unsalable articles

are canned and then the public is injured by the excessive amount of preservative required to keep material which has begun to decay, and also by eating food which has partly decomposed. It is a common practice of grocers to send unsalable fruit or vegetables to the cannery and in that way their losses are decreased. These semi-decayed fruits are antiseptized, colored and flavored and thrown upon the market at reduced prices, at same time having the appearance of good material.

Coffee is a food product which is very often adulterated to increase the profits of producer, jobber or retailer.

Coffee beans are the seed of *Coffea arabica*. They are roasted at a temperature of 200°C . and ground before making the beverage. Sixty-three per cent of the coffee used in the United States is imported from Brazil and twelve per cent from Venezuela. Central America furnishes six and one-half per cent, Mexico and Columbia each about four per cent.

The composition of Mocha coffee is given by Bannister as follows:

	Raw.	Roasted.
Caffeine	1.08	0.82
Saccharine matter.	9.55	0.43
Caffic Acids.	8.46	4.74
Alcoholic Extract.	6.90	14.14
Fat and Oil.	12.60	13.59

	Raw.	Roasted.
Legumin.	9.87	11.23
Dextrin.	0.87	1.24
Cellulose & insol. coloring matter.	39.95	48.62
Ash.	3.74	4.56
Moisture.	8.98	.63

The chief physical change rendered by roasting is that the berries are rendered brittle so they may be ground. Caffeoil is the most important substance produced by roasting. This is the fragrant oil which renders the coffee aromatic.

The adulterants used in coffee are usually chicory or cereals. These substances contain much caramel which produces the brown color and they have a bitter taste. That is about all the resemblance to coffee. An imitation bean is prepared and moulded to be mixed with the true coffee. When roasted it is tasteless but weighs twice as much as the same bulk of coffee will weigh. For this reason it is much used to increase weight. This imitation is called Kunst Kaffee and was first manufactured in Germany. The weight is also increased by steaming the roasted berries or by roasting in a syrup made from starch sugar. This sugar caramelizes and gives the berries a glossy dark color and prevents the evaporation of the moisture.

The imitation coffee used in the United States is usually made from cereals and ground because it is much easier to prevent

detection in that form. These cereal substitutes flooded the country in 1899 but now they are not so often sold in a fraudulent way.

Genuine coffee contains no starch so the adulteration of coffee with cereals, leguminous seeds or acorns may be detected by the microscope.

An easy way to detect chicory is to throw ground coffee in water. The coffee floats leaving the water quite clear but chicory sinks colouring the water. If the coffee has been over roasted or the chicory has been treated with fat this test is useless. Another method of separating coffee and chicory is by bleaching with chlorinated soda. Coffee is not easily bleached but chicory loses color quickly. The specific gravity of the extract or depth of color of the infusion are used to determine the proportions of chicory and coffee used in the mixture. The appearance of coffee is often improved by facing or coloring with Prussian blue, lead chromate, indigo, azo-orange or shaking with finely powdered iron. The last method gives the beans a blue color. Sometimes the facing mixture can be sufficiently separated from the coffee by shaking with cold water to make chemical tests possible. Inferior grades of coffee are colored to imitate Java. This is done with South American coffee by subjecting it to a high moist heat which changes the green beans to brown. Many color pigments are used so that a coffee of any quality may be given a pleasing color. The berries are

polished by rotating in cylinders with soap stone. In Bulletin 32 of the Department of Agriculture the result of the examination of five coffee preparations was given as follows:-

1. Chicory and Barley 33 $\frac{1}{3}$ %; Peas 33 $\frac{1}{3}$ %; Coffee 33 $\frac{1}{3}$ %.
2. Coffee 25%; Chicory 6%; Rye 69%.
3. Coffee 25%; Chicory 10%; Peas 25%; Rye 40%.
4. Coffee 90%; Chicory and cedar wood about 10%.
5. Coffee 5%; Chicory 5%; Peas 6%; Undetermined material 82%.

In the United States so small an amount of tea is used in making the infusion that about six times as much coffee is consumed as tea.

Tea is prepared from several species of the plant "thea". This plant is a hardy evergreen shrub. The difference in the teas which are found on the market is the result of different methods of curing and also be cause the leaves are of different stages of maturity.

There are many ways of adulterating tea. The most common is to improve the color by faking. This is accomplished by Prussian blue, plumbago, turmeric or indigo. These substances would be harmful if taken in any appreciable amount but the small quantity which is taken in the extract from the leaves does not have any effect upon the consumer.

It is important to know the characteristic venation, serration, and stomata of tea leaves

because they may be easily distinguished from the leaves which are commonly substituted for them. The leaves should be boiled a few minutes and then examined under the microscope. The veins recurve before reaching the edge of the leaf and each forms a loop with its neighbor. The serrations are almost lacking in the delicate leaf buds but are very distinct in the older leaves. There are few hairs on the older leaves but young leaves are covered with them. The stomata are quite characteristic and almost entirely on the lower side of the leaf.

It is difficult to distinguish exhausted leaves because the constituents of tea leaves varies so widely. The only method is to determine the relative amount of the various constituents, and this is not always a safe test. The United States government examined fifty one teas and found the following to be the composition of ordinary tea.

Moisture	3.70 %	-	9.55 %
Total ash.	5.36 %	-	7.69 %
Soluble ash.	1.66 %	-	4.61 %
Half-hour extract.	22.00 %	-	44.02 %
Tannin	4.77 %	-	15.21 %
Theine	1 %	-	3.43 %

Magnesium and potassium are always present in the ash of tea. The leaves substituted for tea have a low percent of soluble ash. This test is not reliable when the tea has been faced for the percent of insoluble ash is often very

increased in that way. The microscope is the only sure way of detecting foreign leaves.

There were attempts to adulterate sugar in this country several years ago when sugar was high priced but ordinary methods of adulterating it are not practiced in this country at the present time. There is a cheap grade of sugar made with a soft crystal which absorbs much water and molasses but the price corresponds to the amount of real sugar it contains so this could not be considered a fraud. Sometimes an excessive amount of ultra-marine is used in whitening the sugar but most of it is left in the molasses.

Molasses and syrups are very frequently misrepresented when sold on the market. Molasses has been defined as, "The natural product of the manufacture of sugar from sorghum, maple sap, cane sugar, or any product from which part of the sugar has been removed." Syrup is the product of the refining of these articles or mixing of various other articles together.

Glucose is the chief adulterant used in syrups. It is harmless and not an adulteration when marked so that the public are not deceived. When flavored with an extract of hickory bark, glucose is sold as maple syrup.

In the manufacture of sugar, chloride of tin is used to clarify it and this remains in the molasses. The tin is poisonous and so

this is a very serious adulterant.

The standard of purity for honey is easily determined. It is stated in a report of the Department of Agriculture as follows:

"Pure honey is the nectar of flowers and other saccharine exudations of plants, gathered by bees and stored in cells, and built in part, at least, by the bees themselves." In the strained honey there should be no substance which the comb honey does not contain. The strained honey should contain no other material than pure honey. In the many samples examined by the Department of Agriculture, none of the comb honey which was still in the frame was found to be adulterated. The amount of water in pure honey varies from 12% to 20%. The quantity of sucrose varies from nothing to 8% depending upon the extent of inversion in the organism of the bee and the quantity originally in the nectar. The reducing sugar should consist of dextrose and levulose naturally existing in the sugar of the nectar. Artificial addition of dextrose is indicated when the amount of dextrose exceeds the amount of levulose. The total quantity of reducing sugar should be between 60% and 70%.

In California honey is so cheap that it is never found to be adulterated. Much of the honey sold over the country in glass jars is largely glucose even though a part of the comb is put in the jar. An adulteration in

the comb may be discovered by chewing it. If it crumbles it is probably pure but the comb which forms a gum is always adulterated.

The methods of adulteration which have just been outlined serve to illustrate the way in which dishonest producers of food stuff may manipulate the goods to increase their own profits. In almost all cases the material substituted for the desired food contained less nourishment and is often in a form which is harder to digest. In spices which are adulterated much of their valuable constituents are lost and the cellulose which is substituted is practically valueless. The starch which we buy in the spices, cocoa, or baking-powder could be obtained for a very few cents a pound under its proper name, and it is the article which is usually in excess in the average diet.

When foods which are partly decayed, especially animal foods, are taken into the system they are very irritating and their continued use will cause disease. Every form of food should be solid and of good quality to form strong muscles and a clear brain.

The chemicals which are used in coloring foods or preserving them are often powerful medicines when taken in larger amounts. Compounds of tin, copper, lead or

arsenic should not be taken without a knowledge of the amount of the substance and its effect upon the system. These metals are supposed to have a cumulative effect and as their use is extended the effect becomes more pronounced. The amount of a chemical which would be quite harmless for a vigorous person in active life might have a serious effect upon an invalid or small child. There is reason to think that if the foods were pure and of good quality the general health of the people would be improved.

Even though the people never suffered physically from eating food which has been adulterated it should not be sold because it is dishonest to sell goods which are not as they are represented. This is very discouraging to an honest dealer and makes it almost impossible for him to compete with adulterated goods. When the consumer allows the impure goods to be sold to him and does not try to get the genuine article he is countenancing a fraud and should receive his share of the blame.

Many states try to protect the public from dishonest dealers by pure food laws and a few have been quite successful. In these states the laws have been very strict and have been rigidly enforced by the officials. If the laws in the adjoining states are weak or ignored it makes the enforcement of

local laws much harder and in certain cases almost makes the law a dead letter.

Dr. Chancellor, Secretary of the Maryland State Board of Health said, "Proper inspection, supported by honest merchants and citizens, can largely protect the community from frauds and the underselling of unprincipled adulterators here and every where, and to possess a reputation for honesty in this respect would be worth millions to the trade of the city of Baltimore."

The people cannot be expected to examine foods for themselves and learn the relative purity of each brand for this must be done by experts. The government should have all goods examined frequently in each locality. Wherever the foods have been tested the reports have been made public and without expense the people may obtain bulletins, and learn who the honest dealers are. There are firms selling pure goods of every kind and it is the duty of every citizen to patronize such dealers and encourage them. This is the best way to improve the quality of the food consumed by the people of the country.

There are many people who are too ignorant or careless to learn the difference between foods and the only way to help them is to prohibit by law, the sale of adulterated

products. The best laws do not restrict the sale of any proper food or drink but aim to prohibit the addition of ingredients which are injurious to the health or deceptive in appearance and to insure that all foods and drinks are properly labeled. The purchaser has a right to know what he is buying and to know that it is harmless - no manufacturer should object to this.

A national food law is wanted by honest producers as well as consumers and the trouble caused by lack of harmony in State laws will then be overcome. This law should be enforced by the united assistance of Government inspectors and State officials. Then our people would have good food at home and our export trade would be greatly increased.