CHAPTER 1

INTRODUCTION
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The chemical analysis of food enables us to know the composition of food material with aid of nutritional and biochemical knowledge, to know what we should it avoids eating. Accepting the above as a base food analysis had its beginnings in times immemorial for we might say, by organoleptic analysis—that is analysis by use of the senses of smell, taste, sight and touch—man leaned that certain materials were not fit for food, either because they made one ill or had little food value.

A great advance made when Henneberg and his associates elaborated the method for the proximate analysis of food. A “proximate” analysis is distinguished from an “ultimate” analysis in that it is not a determination for a particular element of compound but is rather an estimation for a certain type of component as “Volatile matter”, “moisture”, “Fat”, “carbohydrate”, “ash” “nitrogenous matter” etc.

From these earlier analysis and nutrition investigations grew the belief that a proper diet must consist of correct amount protein, fat, carbohydrate water ash.

We eat food to get energy, but everybody requires the food which is well cooked and tasty to give taste to food spices, flavors and condiments are use. One of the condiments, which are widely used, is vinegar. Breakfast is considered by nutritionist to be essential for learning and performance, especially for young children. But food preparation time in the mornings is usually limited. Breakfast eaten in the car or in the office is continuing to
grow and portable hand held foods is becoming common for people to eat. Many consumers eat breakfast and lunch on-the-go and manufacturers have invented a host of "grab and go" food items that provide instant gratification. The commonest of such type of food item during breakfast is jam and jellies. In the present work the analytical parameters of vinegar and jam and jellies is found out.

**VINEGAR**

Vinegar is a well known food additive since ages throughout the world. In Hindi vinegar is known as “Sirka”. The word vinegar is derived from the French Vinaigre meaning sour wine. It may be prepared from almost any substance that contains sugar and other nutrients by alcoholic fermentation followed by an acetic fermentation. The character of vinegar is dependent upon character of the substrate.

In India the preparation of vinegar has been in practice from the time immemorial. It contains characteristic aroma and flavour with about 4 per cent acetic acid. In trade it is named according to the material used for preparation.

Vinegar can be obtained from natural sources or can also synthesize. Throughout history, vinegar has proved to be the most versatile of product and from more than 10,000 years ago to today, consumers continue to use vinegar is a variety of ways.
VINEGAR

Vinegar means a liquid derived from alcoholic and acetous fermentation of any medium such as fruits, malt, molasses, sugarcane juice, etc.

VINEGAR SHALL CONFIRM TO FOLLOWING STANDARDS:

1. It shall contain at least 3.75 g of acetic acid per 100 ml.

2. It shall contain at least 1.5 per cent w/w of total solids and 0.18 per cent of ash.

3. It shall not contain (i) sulphuric or any other mineral acids; (ii) lead cooper; (iii) arsenic in amounts exceeding 1.5 parts per million and (iv) any foreign substance or coloring matter except caramel.

4. Malt vinegar, in addition, shall have at least 0.05 per cent of phosphorus pentoxide (P2Os) and 0.04 per cent of nitrogen. Brewed vinegar shall not be fortified with acetic acid.

SYNTHETIC VINEGAR

Synthetic vinegar means the product prepared from acetic acid. It shall contain not less than 3.75 g of acetic acid per 100 ml.

IT SHALL NOT CONTAIN:

(a) Sulphuric or any other mineral acid.

(b) Lead or cooper.

(c) Arsenic in amounts exceeding 1.5 parts per million

(d) Any colouring matter, except caramel.
Synthetic vinegar shall be distinctly labeled as “Synthetic prepared from acetic acid.”

The dictionary defines vinegar as “sour wine” or a sour liquid obtained by acetic fermentation of dilute alcoholic liquids and used as a condiment or preservative.

**HISTORY OF VINEGAR**

Vinegar has been produced and used since the Gallo-Roman era; vinegar diluted with water was a common drink of the Roman Legionaries. Orleans, an important center for wine transport on the Loire, soon became the vinegar capital, and half of the French wine vinegar is still produced there. In 1862 Pasteur discovered that acidification was caused by a bacterium. Acidification takes place on contact with air; it gives good vinegar if the wine—red or white is light, acid and thoroughly strained to get rid of any residue. The operation takes place at a temperature of 20-30° C. The fermentation is caused by the bacteria present in an even velvety grey film, which forms on the surface and slowly sinks into the liquid in a folded sticky mass; this is a vinegar mother. The quality of vinegar always depends on the quality of wine or other alcohol used to make it.

**PRODUCTION OF VINEGAR**

Vinegar can be made from any fruit or from nay material containing sugar. Vinegar is made by two distinct biological processes both the results of the action of harmless microorganisms (Yeast & acetobacter) that turn sugar
into acetic acid. Proper bacteria cultures are important; timing is important; and fermentation should be carefully controlled.

The first processes are called alcoholic fermentation and occurs when yeast changes natural sugars to alcohol under controlled conditions.

\[ C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2 \]

Hexose Ethanol

In the second process, a group of bacteria called “acetobacter” converts the alcohol portion to acid.

\[ C_2H_5OH + 2O \rightarrow CH_3COOH + H_2O \]

Ethanol acetic acid

This reaction is really a combination of two reactions

\[ C_2H_5OH + O \rightarrow CH_3CHO + H_2O \]

Ethanol acetaldehyde

\[ CH_3CHO + O \rightarrow CH_3COOH \]

Acetaldehyde acetic acid

This is the acetic or acid fermentation that forms vinegar.

Varying amounts of fruit acids, colouring matter and salts are few other fermentation products, which impart a characteristic flavour and aroma to it.

In trade, vinegar is labeled according to the material used in its manufacturing. For instance, vinegar made from malt is called malt vinegar and that from apple juice is called as cider vinegar and so on.

Other raw materials used are grapes, spirit, oranges, pineapple, bananas, pears, peaches and all other materials which contain at least 10 per cent of fermentable sugar and which will give more than the legal minimum of 4
gm of acetic acid per 100cc of vinegar. Vinegar should contain at least 4 gm of acetic acid per 100cc and a corresponding quantity of the mineral salt of the materials from which it is made. It should not contain arsenic in amount exceeding 0.0343 mg/100cc, not any mineral acid, lead, copper or colouring matter except caramel.

**GRAIN STRENGTH**

Vinegar manufacturers and dealers represent the percentage of acetic acid in terms of 'grain strength'. The grain strength of vinegar is ten times the percentage of acetic acid present in it. For example, a vinegar containing 5 percent of acetic acid is spoken as vinegar of 50 grain strength.

**TYPES OF VINEGAR**

Since vinegar can be made from anything with sugar, there are probably too many different types to count made in countries throughout the world.

**WHITE**

So-called "white vinegar" (actually transparent in appearance) can be made by oxidizing a distilled alcohol. Alternatively, it may be nothing more than a solution of acetic acid in water. It is used for culinary as well as cleaning purposes. People also believe that it can be used as a detoxification agent for drugs like marijuana.
MALT

Malt vinegar is made by malting barley, causing the starch in the grain to turn to maltose. An ale is then brewed from the maltose and allowed to turn into vinegar, which is then aged.

WINE

Wine vinegar is made from red or white wine, and is the most commonly used vinegar in Mediterranean countries, Germany, and other countries. As with wine, there is a considerable range in quality. Better quality wine vinegars are matured in wood for up to two years and exhibit a complex, mellow flavor. There are more expensive wine vinegars made from individual varieties of wine, such as Champagne vinegar and sherry vinegar.
APPLE CIDER

Apple cider vinegar, sometimes known simply as cider vinegar, is made from cider or apple must, and is often sold unfiltered, with a brownish-yellow color; it often contains mother of vinegar. It is currently very popular, partly due to its alleged beneficial health and beauty properties (see below). Some countries, like Canada, prohibit the selling of vinegar over a certain percentage acidity.

FRUIT

Fruit vinegars are made from fruit wines without any additional flavouring. Common flavors of fruit vinegar include black currant, raspberry, and quince. Typically, the flavors of the original fruits remain tasteable in the final vinegar.

BALSAMIC

Balsamic vinegar is an aromatic, aged type of vinegar manufactured in Modena, Italy, from the concentrated juice, or must, of white grapes (typically of the Trebbiano variety).
Its flavor is rich, sweet, and complex, with the finest grades being the end product of years of aging in a successive number of casks made of various types of wood (including oak, mulberry, chestnut, cherry, juniper, ash, and acacia). Originally an artisanal product available only to the Italian upper classes, balsamic vinegar became widely known and available around the world in the late 20th century.

RICE

The Japanese prefer a more delicate rice vinegar and use it for much the same purposes as Europeans, as well as for sushi rice, in which it is an
essential ingredient. Rice vinegar is available in white, red, and black variants, the last of which is most popular in China (see Chinese black, below). Black rice vinegar may be used as a substitute for balsamic vinegar, though its dark color and the fact that it is aged may be the only similarity between the two products. Some types of rice vinegar are sweetened or otherwise seasoned.

COCONUT

Coconut vinegar, made from the sap, or "toddy," of the coconut palm, is used extensively in Southeast Asian cuisine (particularly in the Philippines, a major producer of the product), as well as in some cuisines of India. A cloudy white liquid, it has a particularly sharp, acidic taste with a slightly yeasty note.

CANE

Cane vinegar, made from sugar cane juice, is most popular in the Philippines (where it is called sukang iloko), although it is also produced in France and the United States. It ranges from dark yellow to golden brown in color and has a mellow flavor, similar in some respects to rice vinegar, though with a somewhat "fresher" taste. Contrary to expectation, it is not sweeter than other vinegars, containing no residual sugar.
RAISIN

Vinegar made from raisins is used in cuisines of the Middle East, and is produced in Turkey. It is cloudy and medium brown in color, with a mild flavor.

BEER

Vinegar made from beer is produced in Germany, Austria, and the Netherlands. Although its flavor depends on the particular type of beer from which it is made, it is often described as having a malty taste. That produced in Bavaria is a light golden color, with a very sharp and not overly complex flavor.

HONEY

Vinegar made from honey is rare, though commercially available honey vinegars are produced in Italy and France.

CHINESE BLACK

Chinese black vinegar is an aged product made from rice, wheat, millet, or sorghum. It has an inky black color and a complex flavor.

FLAVORED VINEGARS

Popular fruit-flavored vinegars include those infused with whole raspberries, blueberries, or figs (or else from flavorings derived from these
fruits). Some of the more exotic fruit-flavored vinegars include blood orange and pear.

SHERRY VINEGAR

This is a thrillingly rich, aromatic, sweet vinegar from Jerez in Spain, made with the must used in sherry—making. Think of it as seasoning, rather than an acidifier. It is often used in Spanish dishes, on salads, to deglaze pans, to enrich sauces and like balsamic vinegar, it is mellow enough to sprinkle straight on to hot cooked vegetables.

PERRY VINEGAR
Perry vinegar is made from perry, the pear based “cider”, and like cider vinegar is mild. If it is conscientiously made, a trace of fresh pear is detectable. Use this vinegar like cider vinegar.

BLACK RICE VINEGAR

An inky black rice vinegar from China. It is thicker than most vinegars, with a rich spicy fragrance, sharper but reminiscent of balsamic vinegar. It is used for braising, enriching sauces, and as a dipping sauce. Chinking vinegar from the province of the same name, is highly rated amongst black rice vinegar.

CHILLI VINEGAR
Preferably red chillies should be used for this, as they are riper and therefore hotter. Green, however, will do though the time for infusion may be little longer. Split the chillies in half, taking about 50 to a quart of vinegar. Boil the vinegar, put in the chillies and reboil. Turn all into a jar and cork, cover and leave for 5 to 6 weeks. Strain off in bottle.

USES OF VINEGAR

There are extra ordinary uses of vinegar for ordinary things its uses can be divided into two types i.e.: culinary uses and non culinary uses.

CULINARY USES:

- Vinegar is commonly used in food preparation, particularly in pickling processes and other salad dressings.
- It is an ingredient in sauces such as mustard, ketchup and mayonnaise.
- It is also used as a condiment.
- Fish can be soaked in vinegar and water before cooking for a tender, sweeter taste.
- The flavor of desserts can be improved by adding a touch of vinegar.
- Vinegar can be used instead of lemon on fried and broiled foods.
- When boiling meat, add a spoonful of vinegar to the water to make it tendered.
NON CULINARY USES:

- Vinegar can be a potent, inexpensive and environment friendly cleaning agent.
- Vinegar along with water makes a fine window washing fluid.
- Drains can be cleaned by using combination of baking soda and vinegar.
- It can also be used as a fabric softener.
- Vinegar can act as a very effective odor remover especially in situations involving sensitive surfaces.
- Vinegar is a folk medicine used in China to prevent the spread of virus such as SARS (severe acute respiratory syndrome) and other pneumonia outbreaks.
- Apple cider vinegar is a much more useful astringent than ice and will reduce inflammation, burning and swelling in approximately a third of the time than ice will take.
- To clear up respiratory congestion, vinegar is inhaled in the form of a vapor mist from steaming pot containing water and several spoonfuls of vinegar.
- Apple cider vinegar and honey as a cure-all: use to prevent apathy, obesity, hay fever, asthma, rashes, food poisoning, heartburn, sore throat, bad eyesight, dandruff, brittle nails and bad breath.
- Weight loss: vinegar helps prevent fat from accumulating in the body.
- Vinegar can be applied to chapped, cracked skin for quick healing.
- Vinegar promotes skin health: rub on tired, sore or swollen areas.
- Vinegar along with hydrogen peroxide is used in the livestock industry to kill bacteria and viruses before refrigeration storage.
- Two tablespoon of vinegar before a meal was found to prevent blood sugar spikes in a study by Carol Johnston, a professor of nutrition at Arizona state university.
- According to Prophet Mohammed (PBUH), vinegar is one of the best condiment.

**OTHER WORK RELATED TO VINEGAR:**

Achaerandio\(^3\), et al described a batch system for the decolouring of vinegar with modified activated carbons.

M L Morales, A M Troncoso\(^4\) determined twenty volatile compounds in two sherry wine vinegars by Gas chromatography before neutralization at pH 6 using NaOH or MgO. A substantial decrease for most of the volatile compounds was registered for neutralized vinegar.

Hironobu Konishi et al\(^5\) developed a flow titration method based on flow ratiometry from the viewpoint of simplicity, rapidity, automation, and cost efficiency. The proposed titration method was applied to commercial vinegar samples.

D. Sanarico , S. Motta , L. Bertolini , A. Antonelli\(^6\) The major constituents of Traditional Balsamic vinegar (TBV) of Reggio Emilia (including citric, malic, tartaric, lactic, acetic, gluconic, and succinic acids, fructose, and
glucose) were quantified in a single HPLC run. A cation exchange column was used, and the analytes were quantified by the standard addition method. These conditions provided a reliable method, which was applied to twenty one samples. Glucose and fructose were the main constituents. Acid concentration showed a great variability, and it was characterized by the presence of gluconic acid. Except in one sample, acetic acid was the main constituent of this class of compounds.

Young-Kyung Lee Kim, Eunmi Koh, Hyun-Jung Chung, Hoonjeong Kwon. Ethyl carbamate has been associated with cancer for several decades. It is mainly found in fermented foods and beverages. Ethyl carbamate in commercial samples of kimchi, soy sauce, vinegar, soybean paste, and alcoholic beverages were determined by gas chromatography-mass spectrometry/selective ion monitoring (GC-MS/SIM). Homemade soy sauce and kimchi were also analysed. The maximum ethyl carbamate concentrations observed were 73 µg/kg in soy sauce, 7.9 µg/kg in soybean paste, 2.5 µg/l in vinegar, 16.2 µg/kg in kimchi and 15.4 µl in Korean traditional alcoholic beverages.

V. F. Samanidou, C. V. Antoniou, I. N. Papadoyannis. In this paper, an automated reversed phase high performance liquid chromatographic method, using a multistep binary gradient elution, is developed for the determination of five phenolic acids: caffeic, ferulic, vanillic, salicylic, and p-hydroxy-benzoic acid. The separation method was based on mobile-
phase optimization and off-line solid-phase extraction (SPE) from wines and wine vinegar samples, using novel sorbent materials.

Dengru Liu, Yang Zhu, Rik Beeftink, Lydia Ooijkaas, Arjen Rinzema, Jian Chen, Johannes Tramper. In this article, the typical SSF process is discussed, with a focus on Chinese vinegars, especially those that are prepared through solid-state fermentation. Six well-known types are discussed in detail. Finally, possible ways to improve the traditional vinegar production process are discussed.

Tomas Herraiz and Juan Galisteo. Tetrahydro-γ-carboline alkaloids that occur in foods such as wine, seasonings, vinegar and fruit products (juices, jams) acted as good radical scavengers (hydrogen- or electron donating) in the ABTS (2,2'-Azinobis-(3-ethylbenzothiazoline-6-sulfonic acid)) assay, and therefore, they could contribute to the beneficial antioxidant capacity attributed to foods.

Chandika Vilashini Ethugala and Anjani Manjulika Karunaratne. The study had two distinct objectives: (1) to determine physicochemical changes and sensory preferences of bananas treated with 0.2% acetic acid, and (2) to explore the possibility of using vinegar available from local retail shops in place of glacial acetic acid, for treating bananas. A 0.2% acetic acid treatment was effective in improving the taste with a high significance, in addition to shelf life extension of bananas. Treatments with
vinegar improved the taste significantly but increased disease development.

**JAM AND JELLY**

The terms *jam* and *jelly* are used in different parts of the world in different ways.

Properly, the term *jam* refers to a product made with whole fruit, cut into pieces or crushed. The fruit is heated with water and sugar to activate the pectin in the fruit. The mixture is then put into containers.

Jams are usually made from pulp and juice of one fruit, rather than a combinations of several fruits. Berries and other small fruits are most frequently used, though larger fruits such as apricots, peaches, or plums cut into small pieces or crushed are also used for jams. Good jam has a soft even consistency without distinct pieces of fruit, a bright color, a good fruit flavor and a semijellied texture that is easy to spread but has no free liquid.

*Jelly* is made by a similar process, with the additional step of filtering out the fruit pulp after the initial heating. A cloth "jelly bag" is traditionally used as a filter.

Good jelly is clear and sparkling and has a fresh flavor of the fruit from which it is made. It is tender enough to quiver when moved, but holds
angles when cut. Pectin is best extracted from the fruit by heat, therefore cook the fruit until soft before straining to obtain the juice ... Pour cooked fruit into a jelly bag which has been wrung out of cold water. Hang up and let drain. When dripping has ceased the bag may be squeezed to remove remaining juice, but this may cause cloudy jelly.

In general jam is produced by taking mashed or chopped fruit or vegetable pulp and boiling it with sugar and water. The proportion of sugar and fruit varies according to the type of fruit and its ripeness, but a rough starting point is equal weights of each. When the mixture reaches a temperature of 104 °C (219 °F), the acid and the pectin in the fruit react with the sugar, and the jam will set on cooling. However, most cooks work by trial and error, bringing the mixture to a "fast rolling boil", watching to see if the seething mass changes texture, and dropping tiny samples on a plate to see if they run or set.

How easily a jam sets depends on the pectin content of the fruit. Some fruits, such as gooseberries, redcurrants, blackcurrants, citrus fruits, apples and raspberries, set very well; others, such as strawberries and ripe blackberries, often need to have pectin added. There are commercial pectin products on the market, and most industrially-produced jams use them. Home jam-makers sometimes rely on adding a pectin-rich fruit to a poor setter; for example blackberry and apple. Other tricks include extracting juice from redcurrants or gooseberries.
Making jam at home used to be common, but the practice is declining.

Jams and jellies come in dozens of flavors and varieties. The most popular are mix fruit jam and strawberry jam. They are followed by grape jam, red raspberry jam, orange marmalade, apple jelly, apricot jam, peach jam and blackberry jam, in that order.

Jelly is more popular among kids, while preserves are favored by adults. Consumers, who regularly purchase jam, jelly and preserves usually buy two flavors to have at home. And at home, adults and children eat the products with equal frequency.

Jams and jellies boast quick energy, delicious flavors and only 48 calories per tablespoon (less for jellies made with low-calorie sweeteners). On a tablespoon-for-tablespoon basis, jams and jellies have about half the calories of butter (or margarine) and they contain zero fat! For instance, a tablespoon of butter is loaded with 102 calories, not to mention 12 grams of fat, 7 grams of saturated fat and 31 milligrams of cholesterol.

A BRIEF HISTORY OF JAMS AND JELLIES

While the precise origin of preserved fruit remains a matter of historical debate, it is known that jams, jellies and preserves are centuries old and long have been recognized worldwide for their fragrance and rich fruit taste. The making of jam and jelly probably began centuries ago in the
Middle Eastern countries, where cane sugar grew naturally. It is believed that returning Crusaders first introduced jam and jelly to Europe; by the late middle Ages, jams, jellies and fruit conserves were popular there. In fact, the word "jelly" comes from the French word "gelee" which means to congeal. The use of cane sugar to make jam and jelly can be traced back to the 16th century when the Spanish came to the West Indies where they preserved fruit.

Jam was originally made in the ancient days probably to preserve certain foodstuffs.

One of the earliest descriptions - very much like a jam recipe - can be found in Pliny's "Natural History", dating from the first century A.D. Later on, in the fourth century, the agronomist Palladius gives us a couple of short recipes for fruit candied in honey.

By the 14th century, these first approximate recipes have become more sophisticated: quinces, almonds, pears, but also carrots are being used.

In the 15th century, a book called "How to make all sorts of jams " gives us a great number of recipes. The book was written by a certain Michel de NOSTRE-DAME, better known to us under the name of Nostradamus...

Subsequently, in the 17th and 18th centuries, the range and variety of jams became considerably larger: thanks to the discovery of faraway
lands and the establishment of colonial trading posts in many regions of the world, exotic fruits found their way to Europe.

In the 19th century jam making was without doubt at its height. Indeed, the price of fruit had become reasonable, the technical means accessible, and a lot of people - in the town as well as in the country - made the most of these advantages.

Nowadays, the industrialized means of production have made it possible to manufacture large amounts of jam, which has brought certain standardization. At the same time, there is more and more demand for different, more sophisticated and imaginative jams.

**TYPES OF PRODUCTS**

**JAMS**

These are solid gels made from fruit pulp or juice, sugar and added pectin. They can be made from single fruits or a combination of fruits. The fruit content should be at least 40%, In mixed fruit jams the first-named fruit should be at least 50% of the total fruit added (based on UK legislation). The total sugar content of jam should not be less than 68%.

**JELLIES**

These are crystal clear jams, produced using filtered juice instead of fruit pulp.
RAW MATERIALS USED FOR PREPARING JAM AND JELLIES

FRUIT

For best color, flavor, and consistency, choose ripe fruit (shape is irrelevant). Unsweetened, canned, or frozen fruit or fruit juice can also be used. If you preserve your own fruit or fruit juice, use slightly under ripe fruit (usually 1/4 slightly under ripe and 3/4 fully ripe is recommended.) Fruit is best if canned in its own juice. If adding sugar, note on each jar how much sugar it contains. This will be needed to adjust recipes later.

Jams and jellies are made from a variety of fruits, either singly or in combination. Most of the fruits are harvested in the fall. The level of ripeness varies. Pears, peaches, apricots, strawberries, and raspberries gel best if picked slightly underripe. Plums and cherries are best if picked when just ripe. The fruit is purchased from farmers. Most jam and jelly producers develop close relationships with their growers in order to ensure quality. The production plants are built close to the fruit farms so that the time elapsed between harvest and preparation is between 12-24 hours.

SUGAR

Sugar must be present in the proper proportions with pectin and acid to make a good gel. Sugar also prevents the growth of
microorganisms in the product and contributes to the taste. Never change the amount of sugar in a recipe.

Granulated white sugar (pure cane or beet) is usually used in homemade fruit products. Sweeteners such as brown sugar, sorghum, and molasses are not recommended because their flavors overpower the fruit and their sweetness varies. Extra fine sugar or sugar blends with dextrose, fructose, or other sweetener added should not be used.

You can replace part but not all of the sugar with light corn syrup or light, mild honey. For best results, use tested recipes that specify honey or corn syrup.

Artificial sweeteners cannot be substituted for sugar in regular recipes because gel formation specifically requires sugar. Jellied fruit products without added sugar must be made using special recipes or special jelling products.

Sugar or high fructose corn syrup, or combinations of the two are added to the fruit to sweeten it. Cane sugar chips are the ideal type of sugar used for preserving fruit. Granulated and beet sugar tend to crystallize. Sugar is purchased from an outside supplier. High fructose corn syrup is processed by fermenting cornstarch. It is purchased from an outside supplier.
PECTIN

The element that allows fruit to gel, pectin is present in varying degrees in all fruit. Apples, blackberries, cherries, citrus fruits, grapes, quinces, and cranberries have the best natural gelling properties. Strawberries and apricots are low in pectin. Jams made from such fruits are either blended with fruits high in pectin, or extra sugar is added to the mixture. Sometimes pectin is extracted industrially from dried apples.

Pectin is a "gum" found naturally in fruits that causes jelly to gel. Tart apples, crab apples, sour plums, Concord grapes, quinces, gooseberries, red currants and cranberries are especially high in pectin. Apricots, blueberries, cherries, peaches, pineapple, rhubarb and strawberries are low in pectin. Under ripe fruit has more pectin than fully ripe fruit. Jellies and jams made without added pectin should use 1/4 under ripe fruit.

Pectin is widely used in the food industry as a gelling agent to impart a gelled texture to foods, mainly fruit-based foods such as jams and jellies. It also has pharmaceutical applications. Pectin is used in combination with the clay kaolin (hydrated aluminum silicate) for the management of diarrhea. It is used as a component in the adhesive part of ostomy rings. Pectin is also marketed as a nutritional supplement for the management of elevated cholesterol.
Many recipes call for the addition of pectin. Pectin is available commercially either in powdered or liquid form. These two forms are not interchangeable, so use the type specified in the recipe. Powdered pectin is mixed with the unheated fruit or juice. Liquid pectin is added to the cooked fruit and sugar mixture immediately after it is removed from the heat. When making jellies or jams with added pectin, use fully ripe fruit.

Pectin is concentrated in the skins and cores of fruit; that is why some recipes call for those to be included. Commercial pectins may be used with any fruit. Many homemakers prefer the added-pectin method for making jellied fruit products because fully ripe fruit can be used, cooking time is shorter and more precise and the yield from a given amount of fruit is greater. Fruit pectins should be stored in a cool, dry place so they will keep their gel strength. They should not be held over from one year to the next.

Fruits rich in pectin are the peach, apple, currant, and plum. Protopectin, present in unripe fruits, is converted to pectin as the fruit ripens. Pectin forms a colloidal solution in water and gels on cooling. When fruits are cooked with the correct amount of sugar, and when the acidity is optimum and the amount of pectin present is sufficient, jams and jellies can be made. In overripe fruits, the pectin becomes pectic acid, which does not
form jelly with sugar solutions. Commercial preparations of pectin are available for jelly making. An indigestible, soluble fiber, pectin is a general intestinal regulator that is used in many medicinal preparations, especially as an ant diarrhea agent.

Commercial pectins are made from apples or citrus fruit and are available in both powdered and liquid forms. Be sure to follow the manufacturer's directions when using commercial pectin. The powdered and liquid forms are not interchangeable in recipes.

Commercial pectins may be used with any fruit. Many consumers prefer the added pectin method for making fruit products for a number of reasons: 1) fully ripe fruit can be used. Instead of a mixture of ripe and unripe fruit; 2) cooking time is Shorter and set, so there is no question when the product is done; and 3) the yield from a given amount of fruit is greater. However, the additional sugar required when using commercial pectin may mask the natural fruit flavour.

**ACID**

Acid must be present in sufficient amounts for a gel to form. Acid is needed both for gel formation and flavour. The acid content varies among fruits and is higher in under ripe fruits. When fruits are low in acid, lemon juice or citric acid may be added. Added acid is always required with certain types of commercial pectin.
Citric acid is added to obtain the correct balance needed to produce the jam or jelly. Lime and lemon juice are high in citric acid, therefore they are the most prevalent source used. Citric acid can also be obtained by the fermentation of sugars. It is purchased from outside suppliers.

Other flavorings, such as vanilla, cinnamon, mint, alcoholic beverages such as rum or Kirsch, can be added to the jam or jelly. These flavorings are purchased from outside suppliers.

**FOOD SAFETY**

Foodborne illness, commonly called "food poisoning," is caused by bacteria, toxins, viruses, parasites, and metal contamination. Roughly 7 million people die of food poisoning each year.

The two most common factors leading to cases of foodborne illness are cross-contamination of ready-to-eat food from other uncooked foods and improper temperature control. Acute and adverse reactions can also occur if chemical contamination of food occurs, for example from improper storage, or use of non-food grade soaps and disinfectants. Food can also be adulterated by a very wide range of articles (known as 'foreign bodies') during farming, manufacture, cooking, packaging, distribution or sale. These foreign bodies can include pests or their droppings, hairs, cigarette butts, wood chips, and all manner of other contaminants. It is possible for
certain types of food to become contaminated if stored or presented in an unsafe container, such as a ceramic pot with lead-based glaze.

Nutrients in food are grouped into several categories. Macronutrients means fat, protein, and carbohydrates. Micronutrients are the minerals and vitamins.

Living organisms require trace amounts of some heavy metals, including cobalt, copper, manganese, molybdenum, vanadium, strontium, and zinc, but excessive levels can be detrimental to the organism. Other heavy metals such as mercury, lead and cadmium have no known vital or beneficial effect on organisms, and their accumulation over time in the bodies of mammals can cause serious illness. The pathway for toxic effects on humans is normally:

- for the entry of heavy metals into the atmosphere as industrial stack gas
- to enter the soil as a soil contaminant
- to enter groundwater as a water pollutant
- to be deposited in ocean bottoms or bay mud, which materials at a later time be dredged to the surface
- Heavy metals can also enter the human body through the food products.
In medical usage, the definition is considerably looser, and heavy metal poisoning can include excessive amounts of iron, manganese, aluminium, or beryllium (the seventh-lightest metal) as well as the true heavy metals.

When free radicals react with heavy metals in the body, the number of free radical molecules can increase by an estimated 1,000,000 times. When a free radical (atoms or molecules with an unpaired electron) is present in the body it can cause a harmful chain reaction. The free radical steals an electron from another molecule in an oxidation reaction. The victim molecule must cause another oxidation reaction. Unsolicited oxidation reactions are bad for the cells because it damages DNA (leading to mutations and cancer) and hardens cell walls (leading to poor nutrient absorption and waste expulsion). If one of these free radicals collides with another heavy metal the proliferation of free radicals can be enormous.

Free radicals are connected with aging and their negative effects are thought to be greatly exacerbated by the presence of metals in the body. Some treatments have been suggested to purge the body of excess heavy metals which accumulate due to air pollution, pesticides and water contamination, such as eating green algae. But the best advice to limit the negative effects of heavy metals on free radicals is to eat a lot of vegetables which contain molecules called phytonutrients which have an extra electron that is used to deactivate free radicals. Also, limit your exposure to metal pollutants by purchasing a water filter and refraining from smoking.
Metal ions like lead, cadmium, chromium, tin and mercury are highly toxic in nature. The presence of such type of metal even in very trace quantity can be very harmful to human body. It is therefore necessary that presence of these metal ions must be investigated to warn about their toxicity.

The undesirable toxic metal can enter the food product through the utensil in which it is prepared or through the container in which it is stored. Hence it is very important to investigate the food product for the presence of toxic metals.

Hence, it is essential to investigate the quality of food sample on day to day basis. “Jam and Jelly” are the food products prepared in batch wise. Hence every batch of these products must be characterized for various physiochemical parameters and nutritional status of these products. It is made mandatory FDA act that this information must be made available to the consumers. However, even after defining the optimum value of metal ions, these food products do not indicate the quantitative determination of suspected metal toxicants. ISI 1993 has established the limits for metallic contamination in jam and jelly.

**THE FUTURE OF JAM AND JELLY**

Because it is a relatively simple process, the production of jams and jellies is not expected to change dramatically. What is apparent is that new
flavors will be introduced. Certain vegetable jellies such as pepper and tomato have been marketed successfully. Other, more exotic types including garlic jelly are also appearing on grocery shelves.

OTHER WORK RELATED TO JAM AND JELLY

O. Acosta, F. Viquez, E. Cubero, and I. Morales\textsuperscript{12} studied Response surface methodology (Box-Behnken design) was applied to assess and model effects of 3 factors, sweetener, low methoxyl pectin, and calcium content (each at 3 levels), on the overall acceptability of a blackberry (\textit{Rubus irasuensis} Liebm.) jelly, as determined by 100 consumers. Jelly was produced using clarified juice, obtained from a cross-flow microfiltration process. Results showed that the model fit was significant, and there was satisfactory correlation between actual and fitted values ($R^2 = 0.925$ and adjusted $R^2 = 0.791$).

Outila TA, Simulainen H, Laukkanen TH, Maarit Kyyro A\textsuperscript{13}. In this study the authors have developed a new way of evaluating the healthiness of ready-to-eat foods. In the developed method, ready-to-eat foods were classified into specific product categories, and the nutritional quality of classified foods was analysed using the national dietary recommendations and the national dietary survey as a basis for the dietary calculations. The method was tested with the products of 'Saarioinen', which is the leading brand in the Finnish ready-to-eat food market. Results indicate that this
low-cost method can easily be used in the food industry as a tool in product development and marketing in order to develop healthy foods.

C. Char, S. Guerrero, L. González, S. M. Alzamora\(^\text{14}\). This work aimed at analysing the influence of water activity (aw range 0.74–0.85), pH (5.5 and 6.0) and the addition of 1,000 ppm potassium sorbate on Eurotium chevalieri, Aspergillus fumigatus and Penicillium brevicompactum growth response in milk jam stored at 25 °C or 35 °C during 90 days. Growth curves were successfully modelled by applying the modified version of Gompertz equation.

Abdul Waheed, M. Jaffar, Khalid Masud\(^\text{15}\). Levels of selected essential metals (Cu, Fe and Zn) and non-essential metals (Cd and Pb) were determined by the wet digestion based atomic absorption flame spectrophotometric method in twenty canned foodstuffs of local and foreign origin. The study revealed that on average, the concentrations of Fe, Cd and Pb in local foodstuff were more than those found in imported canned products. The contents of Fe and Pb in local canned food were almost double that of the counterpart imported versions. The results showed that the Cu concentration in various foodstuffs ranged between 0.04 and 8.88mg/kg, Fe between 3.07 and 126mg/kg, Zn between 0.19 and 22.8mg/kg, Cd between 0.15 and 1.16mg/kg and Pb between 0.11 and 2.04mg/kg.
Eva Maria Hubbermann, Anja Heins, Heiko Stöckmann and Karin Schwarz\textsuperscript{16}. Anthocyanin-rich concentrates from different fruits can be used as natural food colourants. The pigments’ stability is comparatively low and dependent on the composition of food matrices. Food ingredients relevant for soft drinks, jelly fruits and salad dressings were tested in model systems regarding their influence on the colour stability of elderberry and black currant concentrate determined by colour measurement ($CIE \ L^* a^* b^*$).

E. Álvarez, M. A. Cancela, R. Maceiras \textsuperscript{17}. The rheological behavior of selected jams was analyzed at different temperatures, from 20 to 40°C in a rotational viscosimeter (HAAKE VT550). The rheograms were fitted with Power-Law, Carreau, Herschel-Bulkley, and Cross models. It was observed that the jams presented a pseudoplastic behavior, and the suspended solids influenced the consistency index.

Sibel Kus, Fahrettin Gogus, Sami Eren \textsuperscript{18}. Thirty-six commercially and traditionally produced samples including seven fruit concentrates based on different fruit sources, seventeen boiled juices, and twelve tomato and paprika pastes were analysed for the determination of the hydroxymethyl furfural (HMF) and soluble solids content. The HMF concentrations of analysed food products showed a wide variability and were in a range between 0.4 and 3500 ppm. The HMF concentrations were found to be in
a range of 0.4-4.5 ppm for fruit concentrates, 12.8-3500 ppm for boiled
juices, and 0.4-18 ppm for tomato and paprika pastes.

Catherine Leclercq\(^9\). The intake of saccharin, aspartame, acesulfame K
and cyclamate was assessed in 212 Italian teenagers aged 13-19 in 1996.
Total daily intake of intense sweeteners was assessed on the basis of
dietary records (14 consecutive days). The sweetener content of sugar-
free products (soft drinks, candies, chewing gums, yoghurts, jams and
table-top sweeteners) was provided by manufacturers. Sugar-free
products were consumed by 77\% of the subjects. Mean daily intake
among consumers was 0.24mg/kg body weight (bw) for cyclamate (13
subjects), 0.21mg/kg bw for saccharin (9 subjects), 0.03mg/kg bw for
aspartame (162 subjects), and 0.02mg/kg bw for acesulfame K (56
subjects). No subject exceeded the ADI (Acceptable Daily Intake) of an
intense sweetener. Projections based on the present levels of use of
intense sweeteners in sugar-free products and on the dietary pattern
observed in the sample suggest that approaching the ADI could be
possible only if subjects with high intakes of both soft drinks and table-top
sugar substituted these items with respectively sugar-free beverages and
table-top sweeteners containing either saccharin or cyclamate.

Ali Ezz El-Arab Fatma Khalil, Laila Hussein\(^20\). Vitamin A status was
evaluated among a cohort of preschool children (mean age 43 months)
pertinent to a traditional society in rural Egypt. The Helen Keller
International food frequency questionnaire, the 7-day 24-h dietary recall method and serum vitamin A concentrations were the criteria used for the evaluation. Mean values of 280 and 382 retinol equivalents (RE) were the daily estimates of vitamin A intakes among. A 10-week vitamin A intervention trial using either pharmaceutical vitamin A preparations or a food-based strategy consisting of carrot jam led to significant improvement in the growth velocity of the beneficiaries compared with the control group.

R. Jedrzejczak. Total mercury concentrations were determined in 573 samples of agricultural crops and foods of plant origin which included cereals, fruit and vegetables and their products commercially available on the Polish market. The method of cold vapour atomic absorption spectrometry was used. Values ranged from <0.1 to 14 wg kg\(^{-1}\), mean 2.4 - 2.3 wg kg\(^{-1}\) in wheat and rye grains; from <0.1 to 2.4 wg kg\(^{-1}\), mean 0.5 - 0.4 wg kg\(^{-1}\) in nine varieties of vegetables; from <0.1 to 5.1 wg kg\(^{-1}\), mean 1.1 - 0.9 wg kg\(^{-1}\) in seven varieties of fruit; from <0.1 to 5.6 wg kg\(^{-1}\) in cereal products and jams; and from <0.1 to 3.0 wg l\(^{-1}\) in fruit and vegetable juices, nectars and beverages.

M. L. Martins, A. Gimeno, H. M. Martins F. Bernardo. Patulin and citrinin are mycotoxins produced by certain fungi mainly belonging to Penicillium and Aspergillus and may be detected in mouldy fruits and fruit products. The data presented here refer to the simultaneous occurrence of patulin and citrinin in 351 samples of seven different varieties of apples with small
rotten areas (Casanova, Golden Delicious, Red Delicious, Reineta, Richared, Rome Beauty, Starking). A rapid multidetection thin layer chromatography (TLC) method was used. The minimum detectable concentrations of patulin and citrinin were 120-130 and 15-20 wg kg\(^{-1}\) respectively. These findings indicate that there may be a risk of human exposure to patulin through the consumption of juices and jams manufactured with apples with small rotten areas.

Koen Venema, Susanne H.F. Vermunt, Elizabeth J. Brink\(^{23}\). The effect of D-tagatose on the composition of the microbiota and production of short chain fatty acids (SCFAs) was studied in vivo and in vitro. Gastrointestinal (GI) complaints were also studied. The in vivo study was performed according to a randomized, placebo-controlled, double-blind, five-way cross-over design in healthy subjects (12 men and 18 women). All subjects consumed 30 g raspberry jam containing 7.5 or 12.5 g D-tagatose, 7.8 g fructo-oligosaccharides (positive reference), 7.6 g D-tagatose plus 7.5 g fructo-oligosaccharides, or 15.1 g sucrose (negative reference) at breakfast for 2 weeks in different orders. At the end of each treatment period lipids and safety parameters in blood and GI complaints were evaluated by questionnaires, and faecal microbiota and SCFAs were measured.
THE PRESENT WORK

In the present work, the different samples of natural and synthetic vinegar and different samples of jam and jelly were collected from local market and processed for various physicochemical characteristics.

Six different varieties of vinegar was selected for the study, namely, white synthetic vinegar, black berry vinegar, grape vinegar, red cooking vinegar, sugarcane vinegar, non fruit white vinegar. These samples of vinegar was analyzed for total solids, non volatile acids, volatile acids, ester number, oxidation number, iodine number, alkaline oxidation number, nitrogen, total solids, ethanol, reducing sugar, mineral acid and formal titration.

For the analysis of jam and jelly products, four different brands of jams were selected, namely, Warana, Picup, Manama and Mala jam which were packed in plastic containers and four different brands of jelly namely, Mougli fiber, Mougli ice tube; Hi- Po jelly and gold fish jellies were selected which were packed in different shaped container made up of plastic. These samples of jam and jelly were analysed for its physical parameters such as moisture, pH, acidity, refractive index and content of ash and content of tannin. For the chemical parameters, content of trace elements such as Iron, Copper, Zinc, Lead, Tin, Cadmium and Chromium were analysed.
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