

The difference between fermented and vinegar pickles

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1.0 The HISTORY of pickles

- Vegetables are highly nutritious and perishable foods that have very short shelf lives.
- Preservation of these important foods has been practiced for a long time using various methods.
- Pickling is a traditional process that preserves vegetables and fruits through anaerobic fermentation or acidification with vinegar, resulting in fermented products being regularly consumed in most societies throughout the world (Aljahani, 2020).
- Pickling is the oldest and useful method to preserve food. The word pickle is derived from Dutch language “pekel” which mean brine (Hassan & Sarfraz, 2018).
- The term ‘pickles’ generally refer to pickled cucumber in United States, which broader sense refer to all vegetables that are preserved using fermentation or direct acidification using various medium such as vinegar (Jyoti & Kasipathy, 2010).
- Usually, pickles refer to vegetable products, but sometimes, fish, eggs, or meat is also subjected to pickling. The process applied to meats is usually called curing.
- Cucumbers, cabbage, and green olives account for the largest volume of vegetables and fruits commercially pickled in Western countries. Capers, garlic, onions, carrots, cauliflower, beans, and other vegetables are also pickled, albeit in lesser quantities. In Asian countries, fermented vegetables are very popular too, scientific research being mainly concentrated on kimchi, which is the general name given to a group of acid-fermented vegetable foods that have a long tradition in Korea (Montaño, 2016).

2.0 The difference between fermented pickles and vinegar pickles

2.1 Definition and background

The main process used in vegetables pickling relies on microorganism biological activity that produces metabolites with the ability to suppress the growth of many contaminating and undesirable microorganisms.

Based on the preparation methods and ingredients used, pickle products are classified into two general classes:

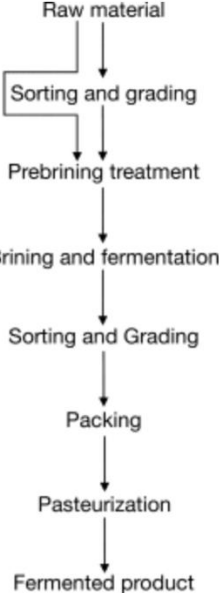
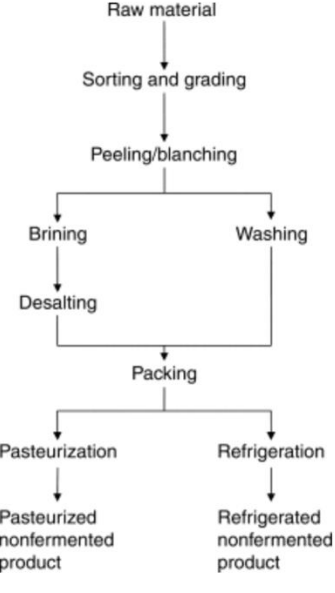
- (1) **Fermented or brined pickles** cured for several weeks during which fermentative bacteria produce acids, thereby lowering the pH and consequently preserving the products (Aljahani, 2020). These bacteria also generate flavour compounds which are associated with fermented pickles (Jyoti & Kasipathy, 2010). Fermented pickles may be pasteurised to ensure long term stability (Montaño, 2016).

- Fermented pickle is a typical food type representative of traditional Chinese fermented food, which dates back to 3,000 years ago. It is always served as a side dish accompanying an entree or alone as an appetizer.
- The fermented vegetable has attracted increasing attention in recent years due to the pleasant taste, nutritional value, and health benefits.
- The manufacturing of pickle is a major industry in China, and in 2018 annual production reached 5 million tons in Sichuan province, with an annual value of over 42 billion RMB (6.2 billion dollars). Unlike sauerkraut and kimchi, this particular pickle is a type of brine-salted fermented vegetable product. (Liu et al., 2020)

(2) **Vinegar pickles**, which is a type of fresh pack or quick process pickles, which are simply vegetables that are packed in jars, covered with vinegar and other flavourings, and then pasteurised by heat (Aljahani, 2020). The sour flavour of these vinegar pickles was due to the acetic acid content in vinegar and not by the natural fermentation of the vegetables (Jyoti & Kasipathy, 2010).

- Commercially produced vinegar pickles will undergo pasteurisation to ensure the safety and shelf life (Lau & Tang, 2002).
- Spices were added to these pickling sauces to produce different varieties of pickles (Brian, 2002).
- Acidification using vinegar to make pickles is the modifications to this centuries to old fermentation process, it allows the yielding of a wide array of finished commercial products.
- Cucumbers, cabbage, olives, onions and peppers account for the largest volume of vegetables and fruits that are commercially pickled worldwide. Lesser quantities of tomatoes, cauliflower, carrots, melon rinds, okra, artichokes, beans, and other produce are pickled (Perez Diaz et al., 2014).

2.2 The process of making fermented and vinegar pickles

Fermented pickles	Vinegar pickles
 <p>Figure 1. General procedure for the preparation of fermented vegetables. Pasteurization depends on the final conditions prevailing in the fermented vegetable (Montaño, 2016).</p>	 <p>Figure 2. General procedure for the preparation of nonfermented vegetables. Peeling/blanching depends on the type of vegetable (Montaño, 2016).</p>
<p>Examples: Cucumber, Sauerkraut, Kimchi, green olives etc (Montaño, 2016).</p>	<p>Examples: Cucumbers, capers, garlic etc (Montaño, 2016).</p>

Fermented pickles

The process of fermented pickles

- Commercially, fermentation of vegetables can be done by sodium chloride (NaCl) brines. NaCl serves two primary functions in the preservation of vegetable fermentation; it regulates the type of microbial activity, and it prevents softening and other degradative changes in the tissues (Iqbal, 2014).
- Vegetables are typically immersed in 6–8% salt solution and allowed to undergo spontaneous lactic acid fermentation for several days. The fermentation techniques may vary from place to place, but an essential element influencing the quality of the fermented product is the fermentation vessel. (Liu et al., 2020)
- The nature of fermentation will depend upon the nature of food, the types of microorganism present and environmental conditions affecting their growth and metabolic patterns. Fermentation of vegetables not only improves their flavour but also make them more nutritious and easier to digest. (Iqbal, 2014)
- During spontaneous fermentation, various compounds are produced, degraded, and converted, influencing the quality of the fermented pickle. (Liu et al., 2020)

Microbial interaction during the fermented pickles process

- Fermented pickles through anaerobic fermentation using lactic acid bacteria or immersion of vegetables in the vinegar which resulted as profound changes in flavour which produce vinegar pickles as final products (Hassan & Sarfraz, 2018).
- The natural succession of microbial populations in cucumber fermentations begins with high level of aerobic bacteria, sometimes including pathogenic and spoilage organisms.
- The lactic acid bacteria that are naturally present in the cucumber initially will outcompete the other presence of organisms during fermentation due to their ability to survive in extreme environment such as high acid and salt concentrations.
- *Lactobacillus plantarum* is the dominating species in natural cucumber fermentation and is detected in all phase of fermentation, as well as in the storage period.
- *Lactobacillus plantarum*-related (*Lb. plantarum* and *Lactobacillus pentosus*) and *Leuconostoc* species.
- During early hours of fermentation, *Lactobacillus* and *Leuconostoc* emerged as the dominant genera.
- *Pediococcus* as a dominant genera at the late stage of fermentation. (Jyoti & Kasipathy, 2010).

Vinegar pickles

The process of vinegar pickles

1. Vegetables used for pickle-making are more than four-fifths water. Unless this water is removed, it will weaken the vinegar so that the pickles may not keep. This excess water should be removed by one of the following methods before the vegetable is placed in the vinegar: (a) Whole vegetables are soaked over night in a brine made from one pint of salt and one gallon of water. (b) Sliced vegetables are placed in layers, salt is sprinkled between the layers and left over night. They are drained and if necessary squeezed dry in a thin cloth bag. (c) Finely chopped vegetables may be treated as in (b) or may be pressed in a bag or press without the salt.
2. Use only a good grade of vinegar and keep it tightly covered. Cider vinegar is best. Avoid long boiling which spoils the flavor.
3. Use agate or porcelain lined kettles because of the chemical action of the acid in vinegar on metals.
4. Horseradish root added to pickles helps to prevent mould. It should not be boiled, but when used in pickles which are to be heated, it should be added after they are removed from the fire.
5. Spices are usually added for flavour rather than for their preservative qualities. They are varied to suit the taste. If tied in a small bag they may be removed when the pickles are sufficiently flavoured. Loose spices make the pickles dark.
6. Do not use alum to make pickles crisp, since it is harmful. Pickles will be crisp if not cooked too long or at too high a temperature. Observe one of these methods: (a) vegetables may be heated merely to the boiling point in the vinegar mixture. (b) The boiling vinegar may be poured over them. Drain off and reheat if the vegetable is in large pieces. (c) Finely chopped vegetables may be covered with cold vinegar.
7. Sealing is the best method for keeping pickles but they will keep in stone jars or crocks if the liquid comes well over the pickles. Keep well covered. If pickles mould

the vinegar should be poured off, reheated and poured back, or fresh vinegar used (Meyer, 1917).

2.4 Nutritional value

Fermented pickles	Vinegar pickles
Fermented vegetables are nutritious, owing to the presence of the vegetable nutrients and viable LAB, which may in some cases beneficially affect the human intestinal system (Montaño, 2016).	Generally lower nutrition value compared to fermented pickles, since these vegetable products are frequently preserved in high salt brine with exudation of cell contents and then desalted with excessive water leaching and nutrient losses (Montaño, 2016).

2.5 Shelf life

Fermented pickles	Vinegar pickles
Up to 2 years (Iqbal, 2014)	<ul style="list-style-type: none"> • Depends on different food, up to 1 year under room temperature (pickled, canned) (Renne & Julie, 2018)

2.6 Flavour and texture

Fermented pickles	Vinegar pickles
<ul style="list-style-type: none"> • They have a very sharp and complex flavor and their texture is somewhat softer than other types. (Iqbal, 2014) • The sour taste is contributed by the fermentation process by the bacteria. As the fermentation process is initialized, lactic acid and acetic acid are produced by lactic acid bacteria, thereby lowering the pH value, which produce the sour taste. The organic acid and free amino acid (FAA), as well as volatile chemical substances, influence the pickle quality and the overall flavour of the pickles. (Liu et al., 2020) • Firmness was improved by blanching, especially in CaCl₂ solution in both fermented and fresh-pack pickles. 	<ul style="list-style-type: none"> • Sharp sour taste contributed by acetic acid in vinegar (Da Conceicao Neta et al., 2007 & Montaño, 2016), however, the taste and flavour differ depending on the ingredient added (amount of salt, spices, sugar, water), quality of vegetables (Brian, 2002) and different type of vinegar used (Montaño, 2016). • The preservation action of vinegar is due to its acetic acid content but is not simply a pH effect. Activity is associated with the unionized, lipophilic molecule that can penetrate the cell membrane, disrupting membrane transport processes and dissociating within the cell to increase acidity and produce toxic levels of the anion. Besides its preservative action,

<p>Fermentation and acetic acid brine treatments produced the firmest pickles. Size of fruit and length of storage affected quality attributes. The carbohydrate fractions, water-soluble pectin and sodium hexametaphosphate-soluble (SPS) pectin, were correlated with shearpress and sensory firmness (Sistrunk & Kozup, 1982).</p>	<p>acetic acid is very important as a flavoring and acidulant (Montaño, 2016).</p>
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2.7 Packaging

Both fermented and vinegar pickles commonly use glass containers for packaging. This is due to the high acidity of pickles solution (acetic acid (vinegar pickles), lactic acid (fermented pickles)) may induce chemical reaction with some active materials, therefore, pickles had to be stored in glass/stoneware jars that has the most inert properties to avoid food poisoning (Oddy & Drouard, 2013).

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