Paper No.: 03

Paper Title: FOOD MICROBIOLOGY

Module – 05: Intrinsic factors affecting microbial growth and survival in foods

CONTENTS

1.Introduction

2. Factors affecting microbial growth

2.1 Moisture content

2.2. Oxidation-reduction potential

2.3. Hydrogen ion concentration (pH)

2.4. Nutrient content

2.5. Biological structure

2.6. Antimicrobial components

INTRODUCTION

- Microbial growth is defined as increase in number of cells, not the size of the cells.
- Microbial cells obtain all required nutrients from food nearby.
- Food may be plant or animal origin.
- Each type of food has its own characteristic constituents which may affect the growth of microbial cells.
- The growth depends on the availability of nutrients and other factors present over there.

FACTORS AFFECTING MICROBIAL GROWTH

Factors affecting microbial growth

In general, there are of two types of factors exist:

- (i) Intrinsic Factors : pH, moisture etc.
- (ii) Extrinsic Factors : Temperature, Oxygen etc.

INTRINSIC FACTORS: MOISTURE CONTENT

- Microbial cells require water in an available form to grow in food products.
- In ancient time foods are preserved by controlling their moisture content.
- Microbiologists usually express the water requirements of microorganisms in terms of the water activity (a_w) of the food or environment.
- It is defined as the ratio of water vapor pressure of the food substrate to the vapor pressure of pure water at the similar temperature.
- Most fresh foods i.e. fresh meat, vegetables, and fruits, have aw values that are close to the optimum growth level of most microorganisms (0.97 - 0.99).

INTRINSIC FACTORS : OXIDATION- REDUCTION POTENTIAL OR REDOX POTENTIAL

The growth of microorganisms in food differs if the growth medium will act as electron donor or electron receptor.

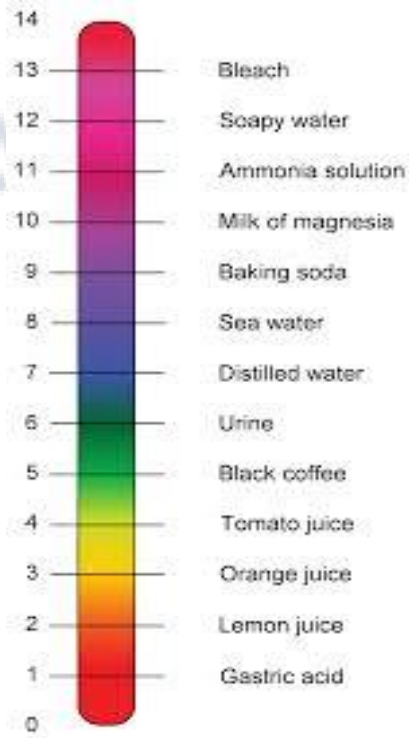
- It is the ratio of the total oxidizing (electron accepting) power to the total reducing (electron donating) power of the substance.

Microorganisms can be classified into four groups on the basis of Eh values:

- Aerobe: high Eh value (positive or oxidized)
- Anaerobe: low Eh value (negative or reduced)
- Facultative anaerobe: at both high and low Eh
- Micro-aerophilic: at relative low Eh values i.e. LAB

INTRINSIC FACTORS : HYDROGEN ION CONCENTRATION (PH)

- It is a measure of the activity of the (solvated) hydrogen ion.
- It measures the hydrogen ion concentration.
- Pure water: pH very close to 7 at 25°C.
- Solutions with a pH less than 7 are said to be acidic and
- Solutions with a pH greater than 7 are basic or alkaline.
- The intrinsic pH of foods varies with origin and types of food i.e. in their natural state, most foods such as meat, fish and vegetables are slightly acidic while most fruits are moderately acidic.



commons.wikimedia.org

INTRINSIC FACTORS: NUTRIENT CONTENT

- Microorganisms have need of certain basic nutrients for their growth and maintenance of physiological functions.
- These nutrients include water, a source of energy, nitrogen, vitamins, and minerals.
- Microorganisms select their food as substrate on the basis kinds and proportions of nutrients present in foods.

Varying amounts nutrients are present in foods :

- Plant foods have high concentrations of different types of carbohydrates and varying levels of proteins, minerals, and vitamins.
- Milk and milk products and eggs are rich in nutrients.
- Meats : protein, lipids, minerals, and vitamins.

INTRINSIC FACTORS : BIOLOGICAL STRUCTURES

- Biological structures are basically natural covering found on plant and animal origin foods, may prevent the entry and growth of microbial cells.
- Such type of structures is considered physical barriers provide excellent protection from pathogenic microorganisms.
- Examples include outer covering of fruits and vegetables, testa of seeds, shell of nuts, animal hide, egg cuticle, shell, and membranes.

http://i1.tribune.com.pk/wp-content/uploads/2014/03/687686-fruitsCREATIVECOMMONS-1395899763-435-640x480.JPG

INTRINSIC FACTORS : ANTIMICROBIAL COMPONENTS

- Some foods intrinsically contain inherent naturally-occurring antimicrobial compounds that can provide microbiological stability to them.
- There are a number of plant-based antimicrobial constituents known.
- Examples are essential oils, tannins, glycosides, and resins that can be found in certain food.

http://upload.wikimedia.org/wikipedia/commons/b/b0/Mint-leaves-2007.jpg

THANK YOU