Index

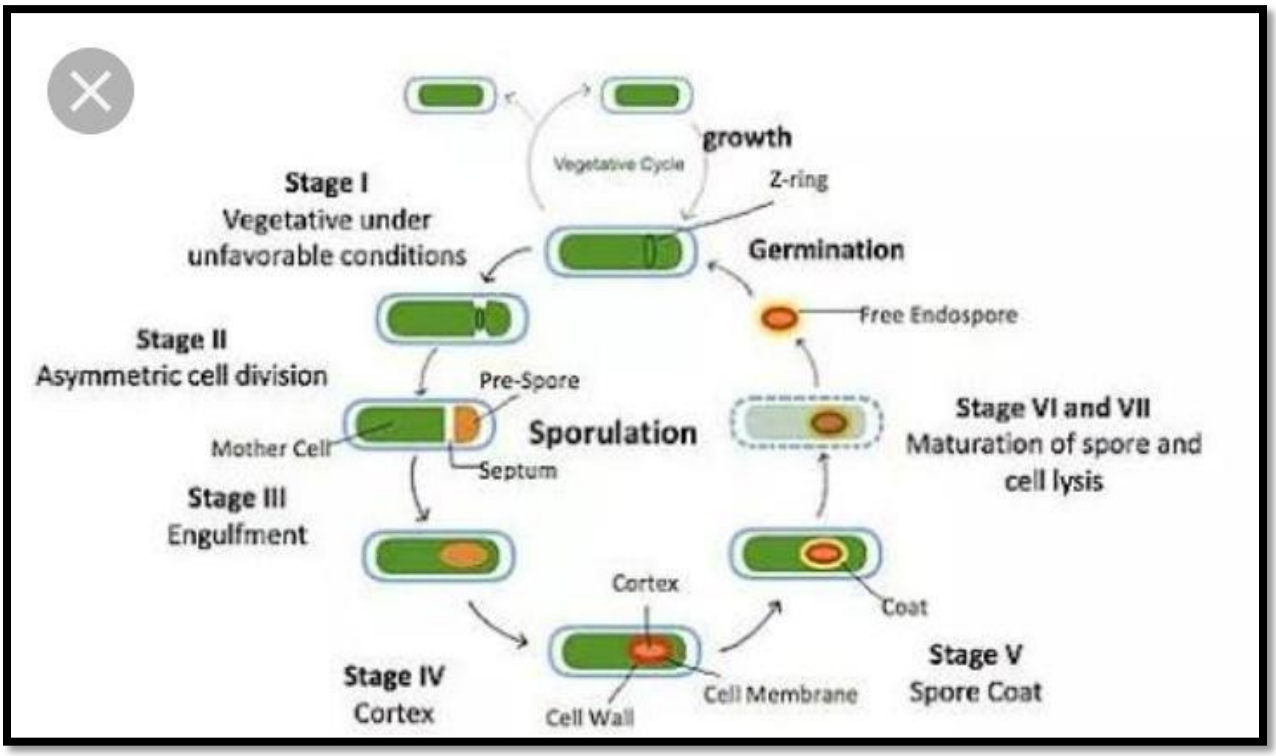
INTRODUCTION

Sporulation is the formation of nearly dormant forms of bacteria . In a limited number of bacteria, spores can preserve the genetic material of the bacteria when conditions are inhospitable and lethal for the normal (vegetative) form of the bacteria. The commitment of a bacterium to the sporulation process sets in motion a series of events that transform the cell.

Sporulation ultimately provides for a multilayered structure can be maintained for a very long time. Relative to the norm life span of the microorganism, spores are designed to protect a bacterium from heat, dryness, and excess radiation for a long time. Endospores of Bacillus subtilis have been recovered from objects that are thousands of years old. Furthermore, these are capable of resuscitation into an actively growing and dividing cell. Spores have been recovered from amber that is more than 250 million years old.

Given that resuscitation is possible, sporulation does not result in a completely inert structure. The interior of a spore contains genetic material, cytoplasm, and the necessary enzymes and other materials to sustain activity. But, this activity occurs at an extremely slow rate; some 10 million times slower than the metabolic rate of a growing bacterium.

The sporulation process has been well studied in Bacillus subtilis. The process is stimulated by starvation. Typically, sporulation is a "last resort," when other options fail (e.g., movement to seek new food, production of enzymes to degrade surrounding material, production of antimicrobial agents to wipe out other microbes competing for the food source, etc.). The genetic grounding for the commitment to form a spore is a protein called SpoA. This protein functions to promote the transcription of genes that are required for the conversion of the actively growing bacterium to a spore. The formation of an active SpoA protein is controlled by a series of reactions that are themselves responsive to the environmental conditions. Thus, the activation of SpoA comes only after a number of checkpoints have been passed. In this way a bacterium has a number of opportunities to opt out of the sporulation process. Once committed to sporulation, the process is irreversible.



Fungi Associated with Spoilage of Bread

The organisms found to be associated with the spoilage of bread were strictly fungal organisms which include; Rhizopus spp, Aspergillus spp, Mucor spp, Penicillium spp, and Fusarium spp.

a)Introduction & Insight:

Bakery products, like bread has become an important staple food in many countries. Cereals and bakery products serve as a valuable source of nutrients in the diet of many people. They provide most of our food calories. Bakery products provide nutrients such as carbohydrates, proteins, lipids vitamins and minerals.A variety of bakery products are available in the market. Earlier bakery products were considered as a sick man's diet or poor man's diet. It has now become the essential food item for a vast majority of the whole population. Bread is made by mixing flour, salt, yeast and other ingredients which is followed by baking.

The basic process involves mixing the above ingredients until the flour is made into dough. The dough is baked into a loaf. The dough is made in such a way that will rise easily and be able to give a bread of good quality to the consumer. Yeast is used in the dough which releases CO2 and the bread becomes spongy.

Earlier airborne yeasts were used in making bread. This was done by keeping the dough exposed to air for sometime before baking. But the technology has improved the bread making to a greater extent in which high energy mixing is involved. Usually the mold spoilage of bread is due to post processing contamination. Bread loaves fresh out of the oven are free of molds or mold spores due to their thermal inactivation during the baking process (Ponte and Tsen, 1978). Bread becomes

contaminated after baking, from the mold spores present in the atmosphere surrounding loaves during cooling, slicing,packaging and storage. Most common source of microbial spoilage is due to mold growth. According to the previous studies (Banwart, 2004) bread molds like Mucor and Rhizopus are found to grow first during bread spoilage.

This is followed by some other fungi like Aspergillus, Penicillium and Fusarium sp.

b)Formulation & Tabulation:

The following table is used in formulating contents of a bread:

Materials	Yudane 0% (Control) (g)	Yudane10%[2)] (g)	Yudane 20%[2)] (g)
Wheat flour			
Dough except of Yudane dough	100	90	80
Yudane dough	-	10	20
Wet yeast	2	2	2
Sugar	5	5	5
Salt	2	2	2
Shortening	5	5	5
L-Ascorbic acid	0.01	0.01	0.01
Water			
In dough except of Yudane dough	68.0	59.5	51
In Yudane dough	-	10	20

[1)]Formulation of Yudane dough was expressed on flour basis and formulation of all

c) Flour:

Flour is the most important ingredient in bread, and the type of flour we use will determine how good or bad our bread is going to turn out.

Wheat flour (the flours we'll be talking about) is composed of protein forming components called gluten. Gluten is made of two types of protein : glutenin, which gives elasticity and gliadin which adds resistance to stretching. These two components, in contact with water or any other liquid, work together in balance to create structure within the dough, which in the end leads to that beautiful loaf of bread.

There are 4 types of wheat flour that are most used in bread recipes. : all-purpose flour, bread flour, whole wheat flour and white whole wheat flour.

All purpose flour is, I think, one of the most used flour in bread recipes. It has a gluten content between 9-11%. It's usually made of a combination of hard and soft wheat and come in two varieties. Bleached and unbleached.

Unbleached flour is aged naturally to oxidize the proteins and bleach out the natural yellow pigment present in freshly milled flour. Unbleached flour has more nutrients.

Bleached flour is aged quickly with chlorine dioxide gas. Bleaching also removes some chemicals that interfere with gluten development. If you look carefully, you'll noticed that some bleached flour are enriched,

that means after the bleaching process some nutrients (mostly iron, B vitamins and sometimes calcium) are added back to the flour to match the nutritious value of the unbleached flour.

As the name stats, this type of flour is used for making the cream of the breads. Unbleached bread flour is made from hard red spring wheat that is aged without chemicals or preservatives(thus the higher price). Some national flour brands offer bread flour at a lower price, flour that was aged faster and enriched when the process was done.

The high percentage of gluten, usually between 11-14% , makes the dough more elastic and easier to work with creating light-textured breads.

Bread flour can be substituted with all-purpose flour, but you have to keep in mind that bread flour, since it has a higher gluten content, requires more liquid. When using all-purpose flour you can either add more flour (usually 1 tbsp per 1 cup flour) or add less water

Whole wheat flour is made from the whole wheat berry, including the oil-rich bran and germ. You should check the label to see if it's 100% whole wheat flour, that means nothing was added or taken away. The flour is as natural as possible straight from the mill. Whole wheat flour creates intensely nutty flavors and a variety of fine to coarse textures that bake up into chewy crusted breads.

Whole wheat flour has the highest gluten percentage, sometimes up to 16%. You may be wondering now, than why the whole wheat bread are not the fluffiest of all, in fact they are heavy and dense, especially 100%

whole wheat bread. That's a good question, and I do have the answer for you: since the whole wheat flour is not as finely ground as the bread

White whole wheat flour is made from a new type of white spring wheat that is light-colored and sweet. Its gluten percentage is around 12%, making this type of flour is a good substitute to all-purpose flour with no loss of light texture. It is a nutrition as the whole wheat flour but with a milder taste.

Physiology & Biochemistry Of Fungal Spore:

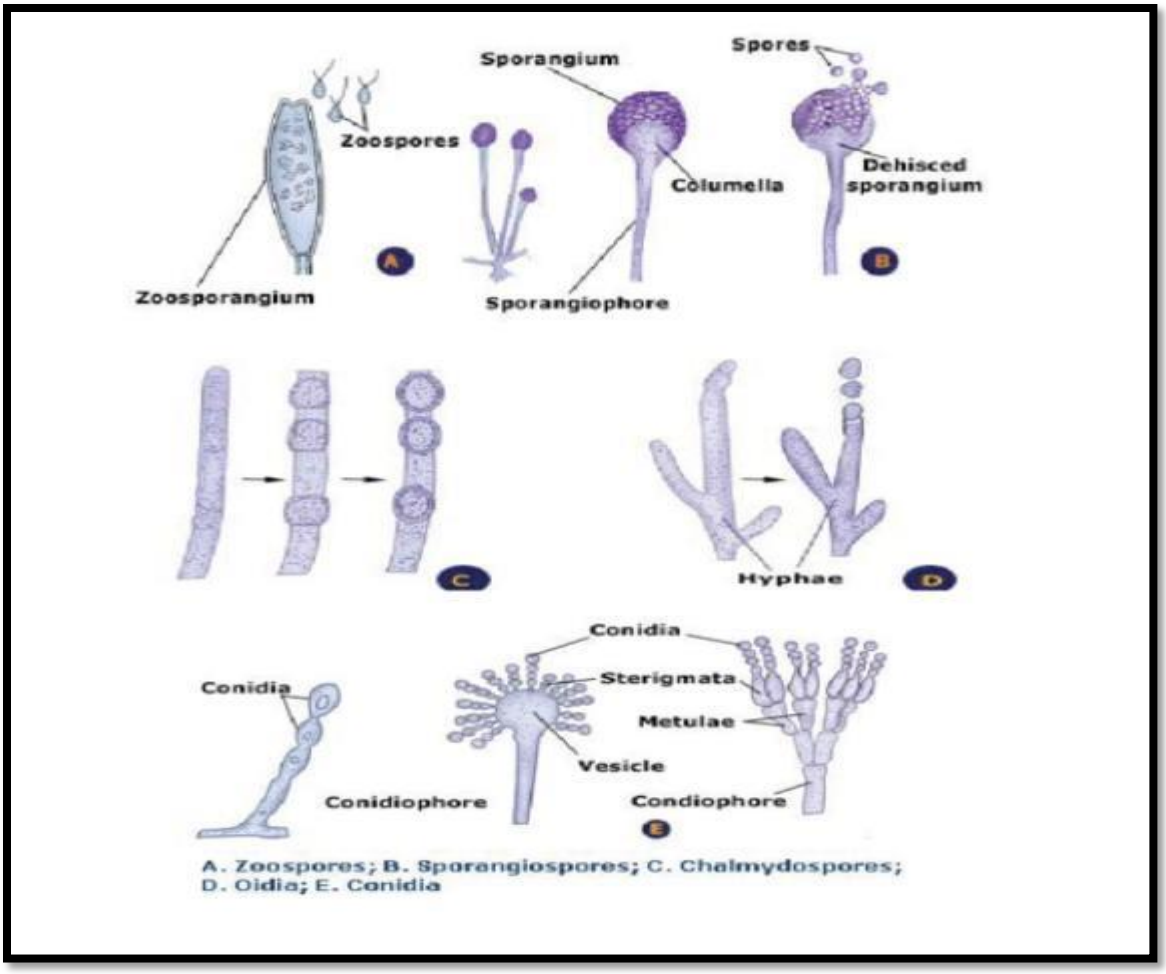
It is commonly accepted by fungal physiologists that conditions that favors rapid mycelia growth hampers sporulation and that spore formation occurs when the growth rate is reduced. Thus virtually any environmental condition can be shown to influence fungal sporulation,including light,humidity,temperature,aeration,PH,Injury to the culture and Nutrient Type and composition.It has been proposed that vegetative growth and sporulation compete for limiting nutrients but are not mutually exclusive processes.

A problem encountered in biochemical and physiological studies of sporulation is that of obtaining uniform material,since several cell types may participate in the process and sporulation is often asynchronous in addition a few fungi sporulate synchronously under natural conditions.

Some Examples of Sporulation of Fungi:

1. Asexual spores (e.g. exogenous spores produced by Conidia oidia) 2.Sexual spores such as Oospores and Zygote

3. Vegetative spores (e.g. 13Chlamydospores) Megaspores of plants (female gametophyte)



Advantages Of Spore Formation:

Advantages of spore formation are:

i.)Spore can survive under unfavorable conditions as they are covered by a hard protective coat.

ii.) Spores can grow to produce new plants and does not require sexual interaction with another organism.

iii.)Due to their small size and light weight, they can be dispersed easily.

Conclusion:

Kingdom Fungi diverged from Kingdom Plantae and Animalia about 1100 million years ago. For many years, plants and fungi were under Kingdom Plantae due to its supposed similarities. Through genetic analysis of modern fungi, it has been determined that fungi are in fact more related to kingdom Animalia than they are to Plantae. Fungi are considered a sister group to Animalia, in that they most likely shared a common ancestor 1100 million years ago. Fungi gained recognition as its own kingdom due to its method of food consumption, genetic diversity, and cellular make up (chitin in cell walls). It has since been categorized into seven phyla, 10 subphyla, 35 classes, 12 subclasses, and 128 orders. Fungal phyla are determined due to phylogenetic similarity, much in the same way kingdom Animalia is divided. As each group of fungi diverged from its ancestor through the addition of specialized traits, it is classified as divergent enough to be a new phylum. Examples of this classification system are Basidiomycota (a more modern fungi phylum) and Chytridiomycota (a most likely ancestral fungi phylum). The phylum Basidiomycota was named after its reproductive structure the basidium, a specialized structure for

sporulation found only in fungi of this phylum. The origin of Chytridiomycota was from the Greek word meaning “little pot”, and they have a chytrid (or anterior) flagellum. Chytridiomycota was once considered a much broader category of fungi but genetic differentiation classified fungi within this phylum as those who contain zoospores and are primarily considered parasitic.

The kingdom Fungi has a wide variety of species with some beneficial and some harmful to the human physiology. Fungi interact with the human body in ways of parasitism, medicinal, and nutritional. The human body acts like the host for the parasitic fungus allowing the organism to take in nutrients. Parasitic fungi also infect harmful diseases like the the super-infection found in the cornea that was caused by two different fungi and a bacteria. Fungi also reside on human skin. A majority of fungi are found to be harmful, but it was found that a small amount of fungi also have medicinal purposes, for one’s mental health. Penicillium griseofulvum is a fungi that was used to make the antibiotic Penicillin. Penicillium griseofulvum kept in a culture will use up sugars for nutrients and growth.

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