KING ABDULAZIZ UNIVERSITY

Lab # 9

The effect of adding different Nutrients sources on fungal growth

Physiology of microbiology
Bio 336

- Nutrients are of great importance to the growth of fungi and in the case of lack or change in the concentration of these elements, they affect the growth of fungi.

- The **most important of these elements are: carbon C - nitrogen N - phosphorus P - magnesium Mg - potassium K and calcium Ca** where the fungi need to feed them to major key elements and the need in large quantities and the **absence of any of them negatively affect Growth,**

- while **micro-nutrients are necessary elements but the need for fungi in small quantities and the absence of any of them can affect the growth of fungi (Fe) Iron, (Mn) Manganese, (Zn) Zinc, (Mo) Molybdenum.**

We will highlight the importance of some of the major essential elements for fungus:

First: carbon element (C):

1) Carbon forms about 50% of the dry weight of the cell
2) Carbon is a component of the structural and functional cell
3) There is carbon in most components of the cell and there are different images and concentrations
4) Enter into all metabolic processes
5) Carbon sources found in nature are exploited by fungi to obtain structural units or as sources of energy such as carbohydrates.

➢ **The ability of fungi to use carbon resources depends on:**

- A) Installation of the carbon source
- B) the ability of fungi to benefit from it.

➢ **Clarifying the impact of different sources of carbon:**

Fungi differ in their ability to use some compounds as a source of carbon, whether as simple as glucose and galactose or a complex such as starch and cellulose.

➢ To ensure the success of the experiment, the source of carbon should be simple, stable and accessible for the use of most fungus species and use composite environments with fixed and known structures that differ only in the source of carbon.

Experiment # 1

Study The effect of adding different Carbon sources on fungal growth.

- Material and Experimental Protocols:
- Observation and results:
- Conclusion:

We will use these sources of carbon in this experiment:

-Glucose
-Galactose
-Maltose
-Sucrose
-Lactose
-Starch
-Sodium carbonate

comment:

- The results showed that the highest fungal growth was on sources of starch, maltose and glucose.
- Starch is considered one of the best sources of carbon because it is extracted from living plant tissue when it contains some stimulating growth factors. This indicates that this fungus secrete the enzyme amylase, where the starch breaks down into a double and then a single sugar slowly until there is no accumulation of organic acids. That the starch turns into dextrin, which turns into maltose and then turns into glucose that the fungus absorbs and benefits from it.

- Growth on maltose is higher than glucose because the fungus secretes the maltase enzyme, which breaks down maltose into two units of glucose, which leads to high growth of fungi.
- Glucose is a mono sugar that most fungi can grow on.
- Growth on sucrose gives less growth due to the inability of the fungus to secrete the enzyme necessary to crack sucrose.
- Galactose is a weak carbon source of fungal growth since a number of fungi can not be used and in some cases toxic to a few fungi.
- Sodium carbonate is a growth inhibitor and it is possible to grow a little fungi on it because of the presence of some food stored inside the fungi, which helps to weak grow.

Second: Nitrogen element (N):

1. Nitrogen is used for the structural and functional purposes of the fungal cell, such as the formation of cellular membranes, nucleic acids, proteins and others.

2. Nitrogen form has a significant effect on the metabolism of microorganisms. The fungi have the ability to use nitrogen in **organic** or **inorganic** form.

3. There is no preferred nitrogen source for all fungus.

- **the ability of fungi to benefit from it depends on:**

A - concentration of carbon source

B - Other growth factors such as hydrogen ion concentration and temperature.

- **Nitrogen is added to the medium in two forms :**

organic image forms of amino acid, protein and inorganic form such as nitrates, nitrite and ammonia.

- **Explain the effect of different sources of nitrogen**: It is known that the fungi differ in terms of their use of nitrogen sources.
- **To determine the success of the experiment**,

the source of carbon should be simple, stable and accessible to use as many fungi as possible. A compound environment with a fixed and known structure is used and is different only in the source of nitrogen. The nitrogen weight in the various nitrogen sources must be constant.

Experiment # 2

Study The effect of adding different Nitrogen sources on fungal growth.

- Material and Experimental Protocols:
- Observation and results:
- Conclusion:

We will use these sources of nitrogen in this experiment:

- Peptone
- Asparagine
- Sodium nitrate
- Ammonium sulfate

- comment :
- The best growth of fungus on Asparagine was a sign of preference for fungus growth on amino acid as a nitrogenous source where the fungus absorb it without cracking to ammonia resulting in no side products and acids and therefore no change in hydrogen ion concentration And reach the best growth.
- fungi in the food medium containing peptone as a nitrogen source break down the peptone by protease enzyme, which leads to the synthesis of amino acids and thus rapid fungal growth.

- When adding sodium nitrate to the food medium, the fungus absorbs nitrates and benefits from it, leaving the sodium in the medium, which reacts with the rest of the compounds in the food medium component sodium bicarbonate, which leads to a slight rise in alkalinity leads to a slight reduction in growth.
- Addition of ammonia sulfate leads to weak fungus growth due to the absorption of ammonia by fungus, leaving sulfates that interact with the water in the medium component of sulfuric acid, which leads to increased acidity and severe inhibition of fungal growth and biological processes.

- Organic fungal growth on organic nitrogen such as asparagine and peptone was better than growth on inorganic nitrogen such as ammonium sulfate and sodium nitrate due to:
- 1. The availability of amino acids in the organic nitrogen source where there is no need to reconstitute them, which takes a long time
- 2. Nitrogenic organic sources contain vitamins and growth factors that increase the speed of growth and vital processes.