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PREPARATION OF A NEW CULTURE MEDIUM FROM *AVENA SATIVA* FOR CULTIVATION OF SOME MICROORGANISMS

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Abstract

The *Avena stiva* was used in preparation of a new culture medium for the growth of some microorganisms(bacteria and fungi) *in vitro*. In this study, made new medium prepared from *Avena stiva*, the agar were added to media for solid media. The isolates of fungi (*Candida albicans* , *Fusarium sp*, *Aspergillus*) and bacteria (*Staphylococcus aureus*, *Escherichia coli, Serratia* sp, *Salmonilla* sp), were cultured on new media. The results showed the ability of microorganisms tested to grow on the new medium and its typical specifications.

Key words: *Avena stiva*, culture medium, Oat agar

Introduction

Many cultural media were used to cultured microorganisms, including bacteria and fungi, for the purpose of isolating and diagnosing them, as well as studying their physiological and biochemical properties, etc. The media formula selection can refer to the main element needed in the fungal fermentation element such as C, H, G, N, S, P Mg and K are the most vital element required. Sometimes some trace elements such as Fe, Zn, Cu, Mn, Co, Mo and B are also necessary. In general, Media can be grouped into three broad categories based on their composition : Non reproducible natural media-occur in nature and require no preparation (Dung, Wood, Fruits and Vegetables), Reproducible natural media-entire chemical composition not known (Corn Meal Agar, Malt Extract Agar, Potato Dextrose Agar, Soil Extract Agar etc.) and Synthetic media-complete chemical composition known (Czapek's Agar, Czapek's Rose Bengal Agar, CN Screen Medium, sabouraud dextrose agar, Nutrient agar etc.) (Ajah and Mohammed, 2015).

Avena stiva is an annual herbaceous plant that belongs to the family of Poaceae, and it is an important cereal crop. Although oat consumption is low compared to other grains, it is one of the cheap and nutritious foods, which has led to increased interest in its use in many Countries of the world as a food or medicinal crop, as it is used in many products as grains, food for infants as well as for its medical uses. Studies have proven its use in treating many medical conditions such as high blood pressure, arthritis, fever, diabetics and some cases of cancer (Peterson, 2001; Peterson, 2004 Steinberg *et al.,* 2005; Masood *et al*., 2008). This can be attributed to the fact that it contains high concentration of compounds such as fibers such as glucan-β, compounds with high antioxidant effectiveness (tocopherol, phenolic), essential fatty acids, linolic acid, albumin, globel, glutin, etc. Most of these compounds are concentrated in the Oat brain which is the outer layer of the oat core (kernel) (Simpson, 2006; Verardo, 2011; Andersson and Hellstrand, 2012). Oats pulp contains starch with a ratio of 65-85% and soluble sugars such as fructose, proteins of 10-15%, such as glutelin and globulin, fats (3-11%) and contains many organic acids as malic acid, citric acid, many acids Amino acids such as L-arginine, lysine and tryptophan, also contain many minerals such as P, Cu, K and many vitamins A and E and high concentrations of vitamin B (Ruxton and Cobb, 2015; Jing *et al*., 2016).

In view of the lack of most of the chemical compounds involved in preparing the synthetic cultural media and their price is high, on the one hand these cultural media are devoted to special media for bacterial and other specialized for the growth of fungi, so this study came to prepare a new culture medium using oats available locally and cheap and used for growth both bacteria and fungi.

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Materials and Methods

Isolates

In this study, isolates of fungi (Candida albicans, *Fusarium* sp and *Aspergillus* sp.) and isolates of *Staphylococcus aureus, Escherichia coli, Serratia* sp, *Salmonilla* sp. obtained from laboratories of the Department of biology, College of Science, Mustansiriyha University. The fungal isolates preserved on the Sabourauds dextrose agar medium, while bacterial isolates were preserved on the Nutrient agar medium until they were used.

Preparation of *Avena sativa* agar

Oats were obtained from the local market (Quaker brand) and then ground with an electric mill. 50 g of ground oat meal was weighed and a liter of distilled water was added to it and then boiled for 30 minutes after it cooled and filtered through a medical gauze and completed the volume to a liter using distilled water, then added 20g of agar-agar to the medium and then sterilized with autoclave at temperature of 121°C for 15 minutes, cool the medium To a temperature of 45-55°C, then chloramphenicol was added to prevent bacterial contamination for the fungal media. Pour the medium directly into sterile dishes (Nandhakumar, 2007).

Inoculation of microorganism isolates on *Avena sativa* agar

Inoculate *Avena sativa* agar containing antibacterial and Sabourauds dextrose agar medium (control medium) with fungi isolates *Candida albicans, Fusarium* sp and *Aspergillus* sp, and then incubated at a temperature of 37°C and 28°C respectively for 48-72 hours, while inoculated medium of *Avena sativa* agar and Nutrient agar medium (control medium) with isolates of *Staphylococcus aureus, Escherichia coli, Serratia* sp, *Salmonilla* sp.and incubated at 37°C for 24 hours.

Results and Discussion

Avena sativa is a rich source of protein, minerals, lipids, β-glucan, avenanthramides, indole alkaloid, flavonoids, triterpenoidsaponins, lipids and sterols. It exerted many pharmacological effects including antioxidant, anti-inflammatory, dermatological, immunomodulatory, antidiabetic, gastrointestinal, hypolipidemic, neurological, cardiovascular and many other biological activities (Al-Snafi, 2015).

The results of the growth of *Candida albicans, Aspergillus* sp. and *Fusarium* sp. on *Avena sativa* agar medium showed their growth on the medium without any change in the cell and colons shapes, as shown in Fig. 1, 2 and 3. The results also showed the growth of *Staphylococcus aureus, Escherichia coli, Serratia* sp. *Salmonella* sp., on *Avena sativa* agar as shown in Figures (Peterson, 2001; Peterson, 2004; Simpson, 2006; Verardo, 2011). This is the first study conducted in Iraq and the world, which used Oat to prepare medium that use for growth of some fungi and bacteria. Many studies have been performed to formulate a culture medium that is effective for the presumptive isolation of fungi and bacteria isolates. This study prepared new medium, oat agar, composed by a few components, which were of low cost, easy to prepare and able to show growth of

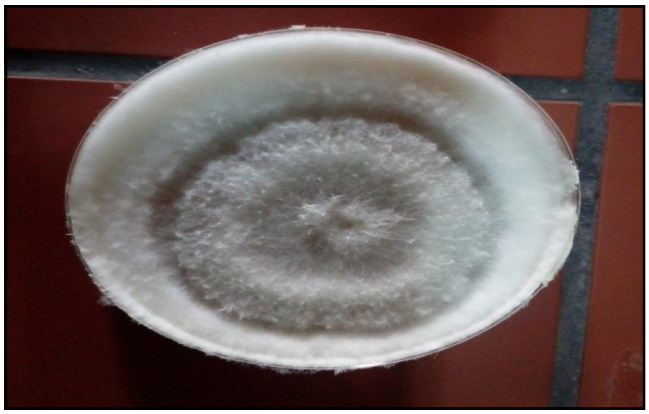

Fig. 1: *Fusarium* sp. On *Avena sativa* agar incubated at 28°C for 72 h.

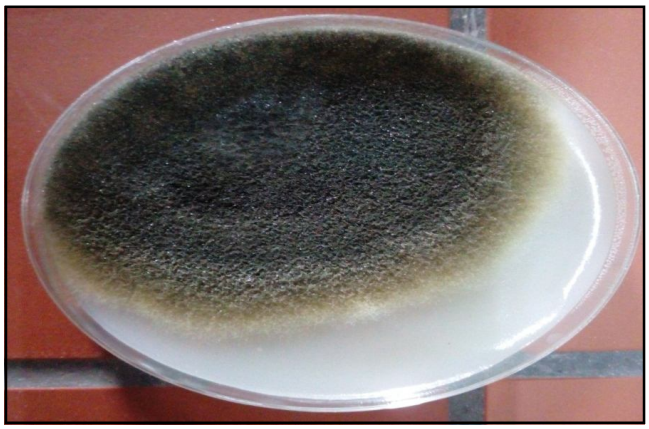

Fig. 2: *Aspergillus* sp. On *Avena sativa* agar incubated at 28°C for 72 h.

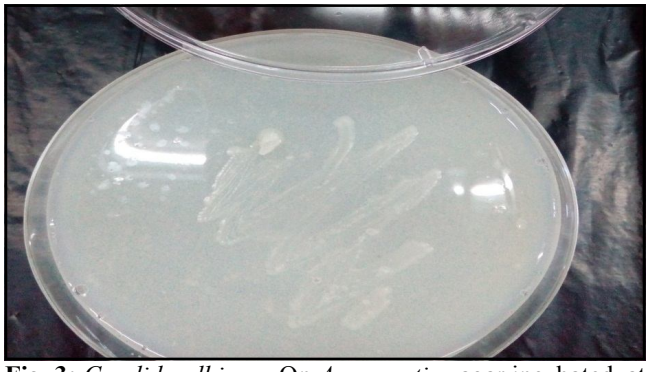

Fig. 3: *Candida albicans* On *Avena sativa* agar incubated at 37 C° for 48 h.

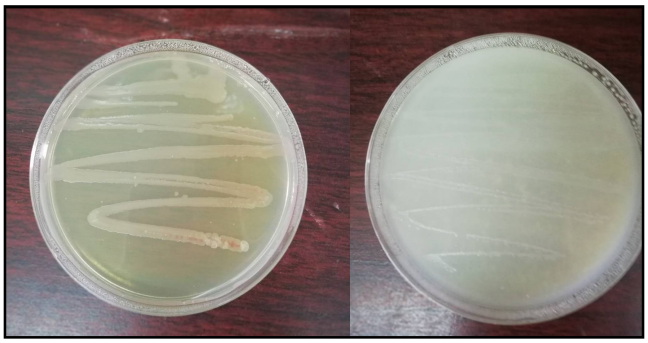

Fig. 4: *Serratia* spp A:On *Avena sativa* agar, B: Nutrient agar incubated at 37°C for 24 h.

Fig. 5: *Escherichia coli,* A: On *Avena sativa* agar, B: Nutrient agar incubated at 37°C for 24h.

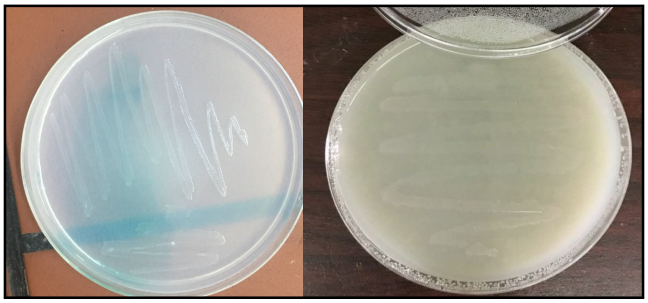

Fig. 6: *Staphylococcus aureus* A: On *Avena sativa* agar, B: Nutrient agar incubated at 37°C for 24h.

microorganism. Oat used for the preparation of a simple medium contain only the oat and does not need to other compound only agar -agar for hardening of the medium.

The ability of microorganisms to grow on the oat medium is attributed to the oat core having more fat than wheat and protein (34%) and it contains many amino acids such as arginine, allicin and tryptophan. Oatmeal contains vitamin B of particular importance, as it works to produce glucose, as it secretes an enzyme that contributes to the oxidation of sugar and contains many minerals such as iron and phosphorus, especially manganese by 233% and also contains starch and carbohydrates by 233%. Whole oat groat contained high amounts of valuable nutrients such as soluble fibers, proteins, unsaturated fatty acids, vitamins, minerals, and other phytochemicals. Each 100g of oat groat contained

Fig. 7: *Salmonella* sp On *Avena sativa* agar incubated at 37°C for 24 h.

17.1% protein, 67.9% carbohydrates, 8.6% fat, 15-22% dietary fiber, 10.4% β-glucan, 1.3 mg niacin, 171 mg magnesium, 0.17 mg copper, 441 mg potassium and α-tocopherol less than 0.5 mg (Saunders, 1985; Welch *et al*., 2002; Czerwinski *et al*., 2004).

Conclusion

Oat (*Avena stiva*) agar was used in preparation of a new culture medium for the growth of some microorganisms (bacteria and fungi) *in vitro*. The results showed the ability of microorganisms tested (*Candida albicans*, *Fusarium* sp, *Aspergillus*, *Staphylococcus aureus*, *Escherichia coli, Serratia* sp*, Salmonella* sp, to grow on the new medium (*Avena stiva* agar). This is the first study conducted in Iraq and the world, which used Oat to prepare medium that use for growth of some fungi and bacteria.

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