RESEARCH / INVESTIGACIÓN

Molasses as a new nutrition medium for *Scenedsmus quadricauda* growth and production of some bio compounds

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Abstract: Algae comprise a large group of Thallophyta, which may be used as direct nutrition of human beings. Molasses is the by-product of the sugar manufacturing facility. In this study, a locally isolated *Scendsmus quadricauda* from the environment of Mosul in the Shalalat region was obtained. Biomass of *Scenedsmus* was measurement by carried out and filtration then drying in an oven for 24 h and weighed, Estimation of chlorophyll and protein and carbohydrate content of *Scenedsmus*. The research has proved that the best growing period for *Scendsmue quadricauda* is 15 days when using sugar factory waste as a carbon source, the growth reached (1.42 nm) as optical density, biomass (1525 mg /L), chlorophyll (green), pigment (18 mg /l) protein content (396 mg /l) and carbohydrates (501 mg / l). The research showed that the use of sugar factory waste as a nutritional medium for algal growth in the dark (11.5%) achieved good growth of *Scendesmues quadricauda* (0.632 nm), biomass (820 mg / L), green pigment (Chlorophyll) (18 mg /L) protein content (235 mg / L) and carbohydrates (401 mg/L). while using phosphor (0.018%) of K2HPO4 in dark medium achieved highest growth rate (0.91 nm) , biomass (1110 mg / L) chlorophyll (22 mg/L) protein (301mg/L) and carbohydrate (461 mg/L) . It is noted too , that using IAA (0.5 g/L) in dark medium support best growth (0.888 nm) , biomass (1010 mg/L) chlorophyll (25 mg/L) , protein (230mg/L) and carbohydrate (440 mg//L) . The study showed that thiamine (1 g/L) in dark medium achieved highest growth (0.750 nm) biomass (218 mg/L), chlorophyll (29mg/L), protein (220 mg/L), carbohydrate (340mg/L). Therefore, using Molasses can enhance the growth, biomass, chlorophyll, protein, and carbohydrate content in the *S. quadricauda*.

Key words: *Scenedsmus quadricauda*, Chlorophyll contents, Molasses, Biomass.

Introduction

Algae can grow in different aquatic environments, whether fresh or salty water. These organisms are used as food for human beings to fulfill the increasing needs of nutrition due to the increase of population and malnutrition facing people in some regions of the world[1].

Also, many studies were carried out on the possibility of using algae for the natural environment to eliminate waste from factories, health centers, educational institutions. Algae can exploit the various wastes produced from the above sources and benefit from them in producing abundant algal growth, which is used as animal feed. Thus achieving two important objectives, ridding the local environment of the danger of industrial and productive pollutants, as well as exploiting these wastes as they are cheap basic materials to produce abundant algal growth[2,3].

Several research and references have indicated the possibility of switching algae from Autotrophic to Heterotrophic[4,5], indicated that some green algae could grow in heterotrophic medium, and (6), indicated that algae could exploit organic wastes as a medium for their growth. Molasses is a by-product of sugar manufacturing processes[4,7].

The current study aims to isolate and cultivate a local strain of green algae S. quadricauda. And its ability to exploit the wastes of the sugar manufacturing factory as a nutrition medium for growth.

Materials and methods

Isolation and preservation of algae

In this study, an isolate of *S.quadricauda* was obtained from the Iraqi environment (Shalalat region). *S.quadricauda* was cultured in modified Ch10 medium[8], that consists of the following components: 0.4 gm/L Ca $(NO_3)_2$, 0.1 gm/L K_2HPO_4, 0.2 gm/L Na_2CO_3, 0.25 gm/L $MgSO_4 7H_2O$, 0. 25 gm/L Na_2SiO_3, and 0.05 gm/L Ammonium Ferric-- figure (1,2).

The daily growth rate was measured using a spectrophotometer at (436 nm) wavelength, and the biomass was weighed for volume (100mL) of the culture[9]. The chlorophyll content, protein, and carbohydrates of alga were measured according to standard methods using spectrophotometry and specific wavelengths as described in the approved[9,10].

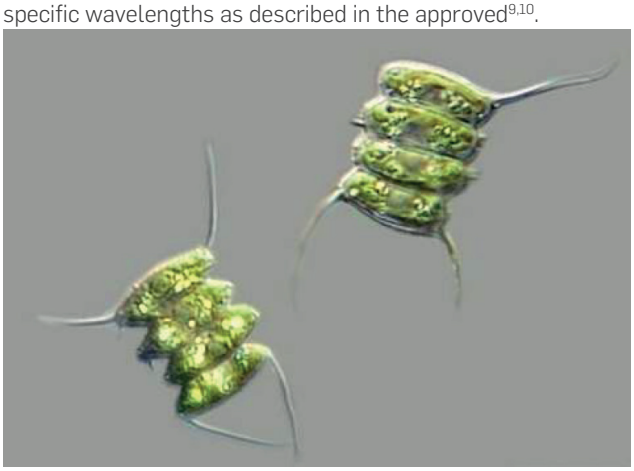

Figure 1. *S. quadricanda* microscopic picture magnification 40 X.

Results and discussion

The effect of growth periods in sugar factory wastes on the vitality of cells *Scendsmue*. After seventeen days of cultivation (figure3), the best growth (1.45 nm) as optical densi-

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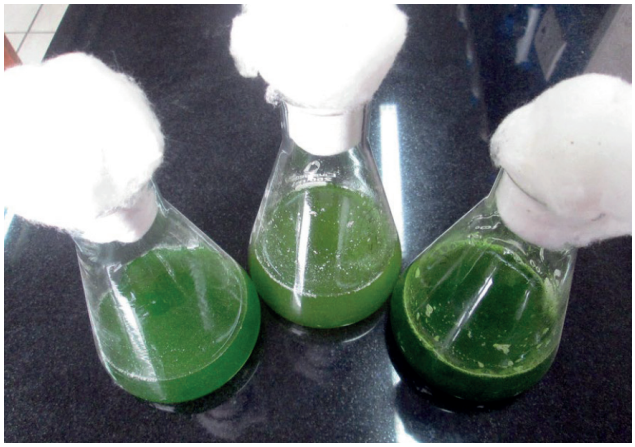

Figure 2. Pure cultures of algae *S. quadricanda*.

ty, biomass (1525 mg/L), green pigment (18 mg /L), protein content (369 mg/L), and carbohydrate content (501 mg/L) of the alga were reported on the fifteenth day of transplantation. Perez *et al.*(2010) noticed that the fifteen-day was the best period to obtain high growth and yield from the cells of some green algae and indicated the direct relationship between cell growth and vital components; this was confirmed by (11) while studying the photosynthesis of some algae. This is also shown by (12) since they noticed that number of cells correlates positively with the growth value of *S. obliquus*.

The effect of different concentrations of sugar plant wastes on vitality *S. quadricuda* alga.

Algae depend on light in the manufacture of their food, and their conversion to feed throwing into the dark depends on the presence of carbohydrate sources[11,12], The results (figure 4) showed that the best growth of alga was achieved (1.601 nm) and the best biomass weight (890 mg/L) when using molasses at the concentration (11.5). The results showed that the best green pigment content was (18 mg/L), protein content (235 mg/L), and carbohydrate content (401 mg/L) when using concentrate (9 .0%) from sugar production plant wastes (molasses). Shah (2012) recorded the best growth of *Chlorella* sp. achieved when using monosaccharides with (0.25 %) under dark conditions, whereas 13 also showed the ability of microalga *S. obliquse* to exploit sources of sugar such as glucose and acetate for heterogeneous nutrition. However, (14) explains that using common cultivation conditions (light and dark) and in the presence of a carbon source stimulates algae *Scenedesmues* to produce high carbohydrates and protein.

Effect of adding different concentrations of K_2HPO_4 on the vitality of alga *S. quadricuda*, which grows on sugar production plant wastes medium.

The results (figure 5) indicated that the best growth of alga *S. quadricauda* was reached (0.98 nm), biomass weight (1220 mg/L), green pigment (22 mg/L), protein content (299 mg/L), and carbohydrate content (461 mg/L) when using a substance potassium thiophosphate at a concentration (0.018 %). The positive effect of phosphorous on algae growth indicates the significant role of this element in building many cellular organelles and biomolecules[15]. These came together with biomass results, chlorophyll, protein, and carbohydrate content[16-19].

Test the addition of different concentrations of IAA in molasses medium on the vitality of alga *S. quadricauda*

IAA is a natural plant hormone that can be synthesized and has a vital role in the vitality and growth of plants in general, and many references indicated the ability of microalgae and cyanobacteria to produce IAA[20].

The results showed (figure 6) that the best values were obtained for the growth of alga *S. quadricauda* (0.891 nm), the biomass (1022 mg/L), the best photosynthetic pigment (25 mg/L), protein content (230 mg/L), and carbohydrate content (440 mg/L) when adding IAA (0.5 %) prove[21], The *Scenedsmus* sp. and other microalgae is growth highest with the addition of IAA to the nutrient medium. Many studies have confirmed the relationship of IAA in stimulating algae growth, but the high concentration of IAA has an opposite focus on development and effectiveness[22]. A high concentration of IAA inhibits building up the photosynthetic pigment, protein, and carbohydrate content of algae *Chlorella*[23].

The effect of adding different concentrations of thiamine on the vitality of *S. quadricauda* in the dark.

Vitamins are essential in the growth and activity of algae in general; many studies indicate the importance of adding some vitamins in specific concentrations in algae development media to support their growth and biomass production[24,25].

The results indicated (figure 7) the best growth of *S. quadricauda* (0.766 nm), the best value for biomass (218 mg/L), the best content of the green pigment (28 mg/L), the best protein (220 mg/L), and carbohydrate content (340 mg/L) where achieved in (0.01) thiamine concentration. (24) confirm the importance of adding thiamine in the medium microalgae growth. (25) indicated that a minimum of thiamin, ascorbic acid (40 _ 80 mg/L) have an essential role in increasing the content of the photosynthetic pigment, protein, and carbohydrate content. Vitamin thiamine has a strong position and relationship in building amino acids[10].

Conclusions

The study proved that the local isolate of *S. quadricauda* alga could exploit the industrial wastes of the sugar production plant (molasses) to grow and produce biomass and thus rid the environment of industrial pollution with these wastes.

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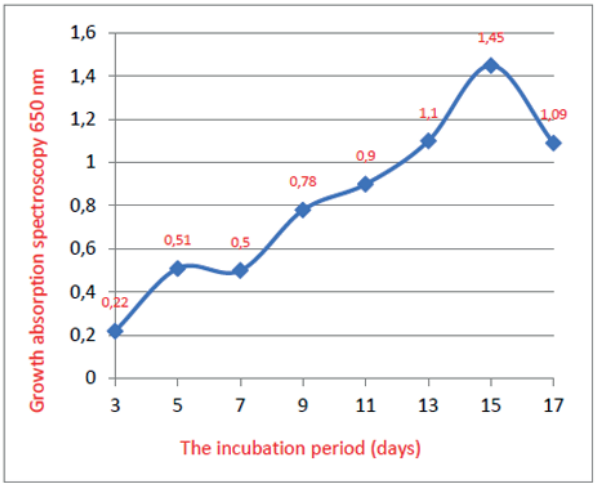

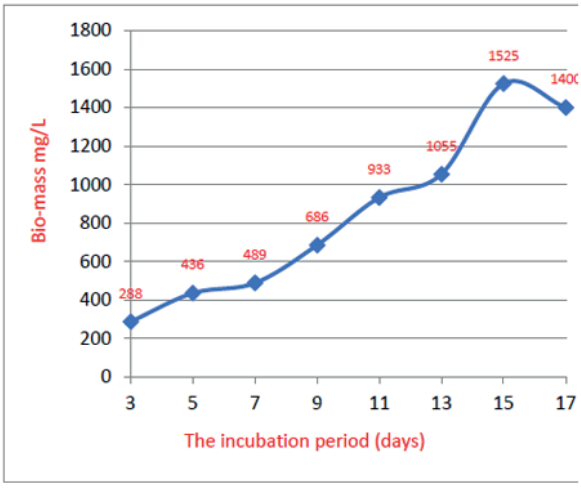

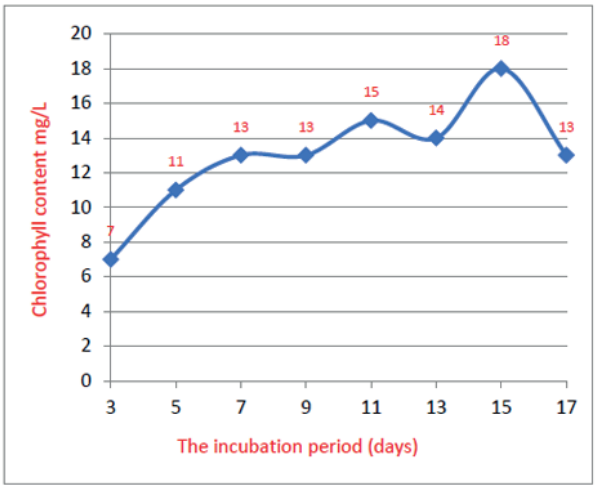

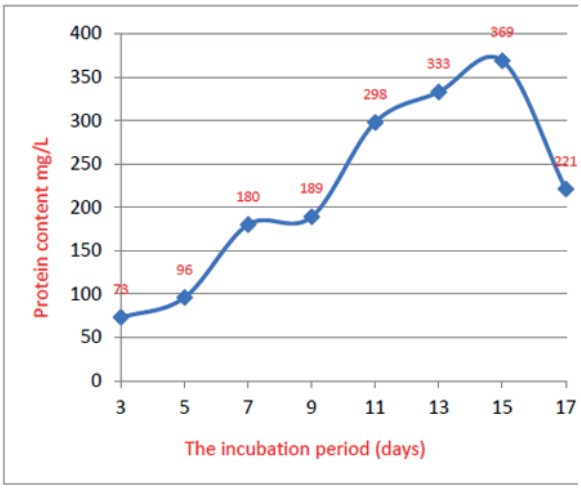

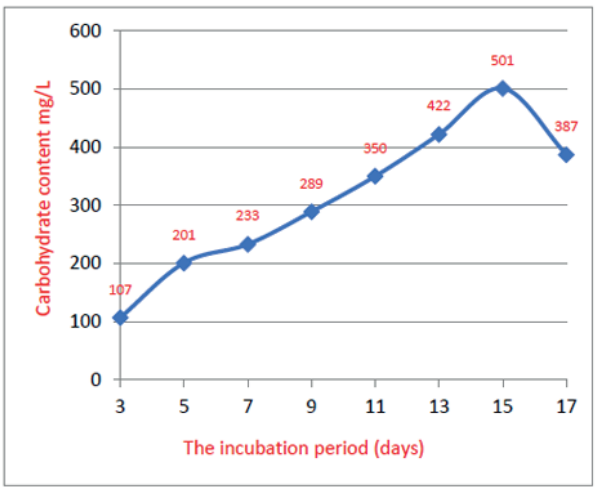

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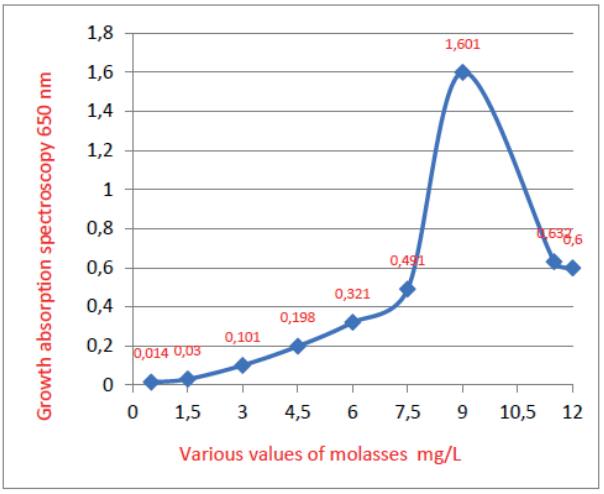

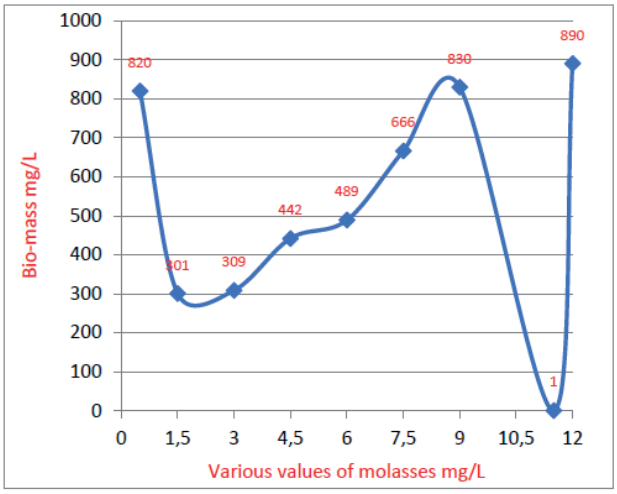

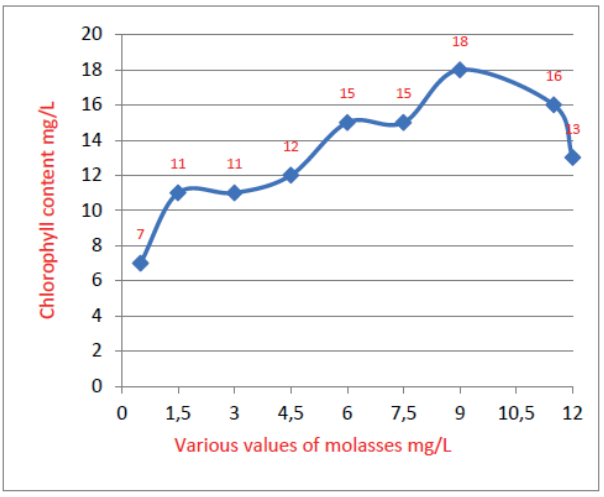

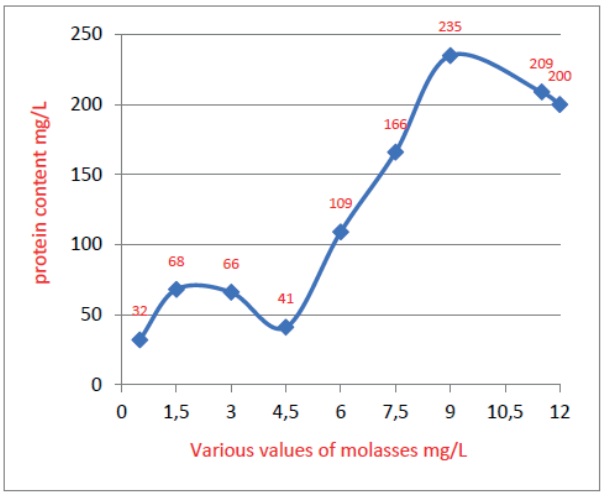

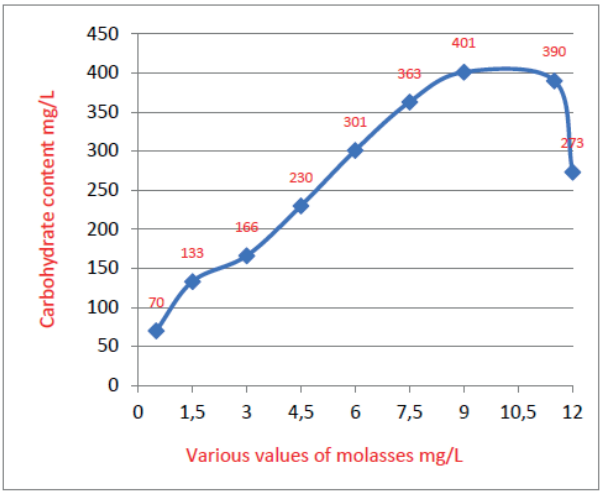

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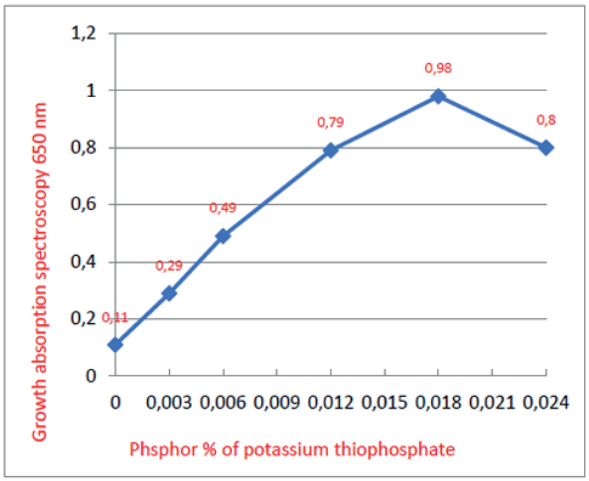

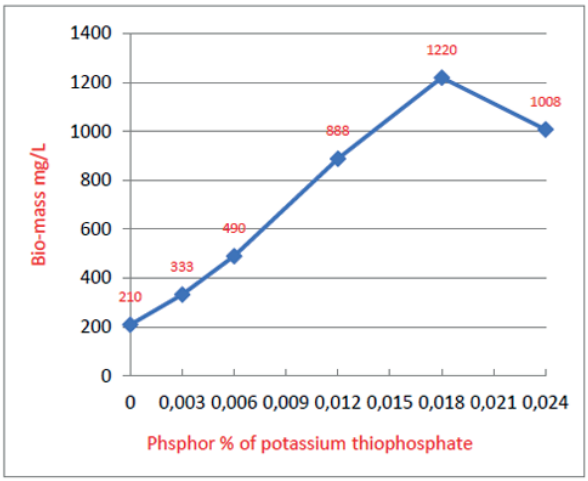

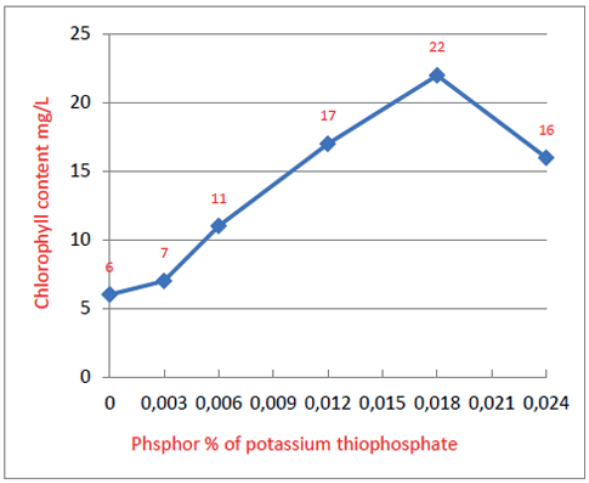

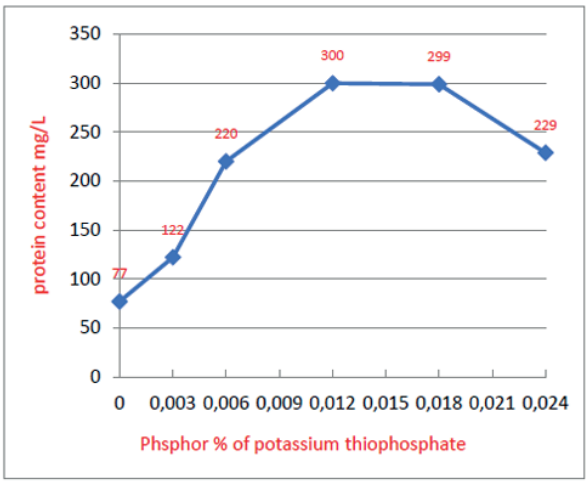

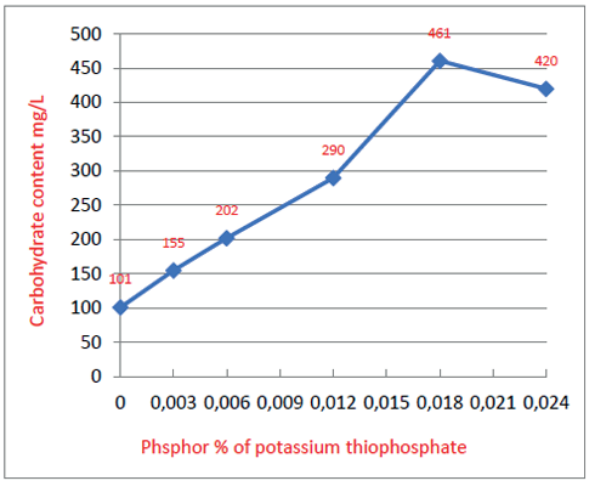

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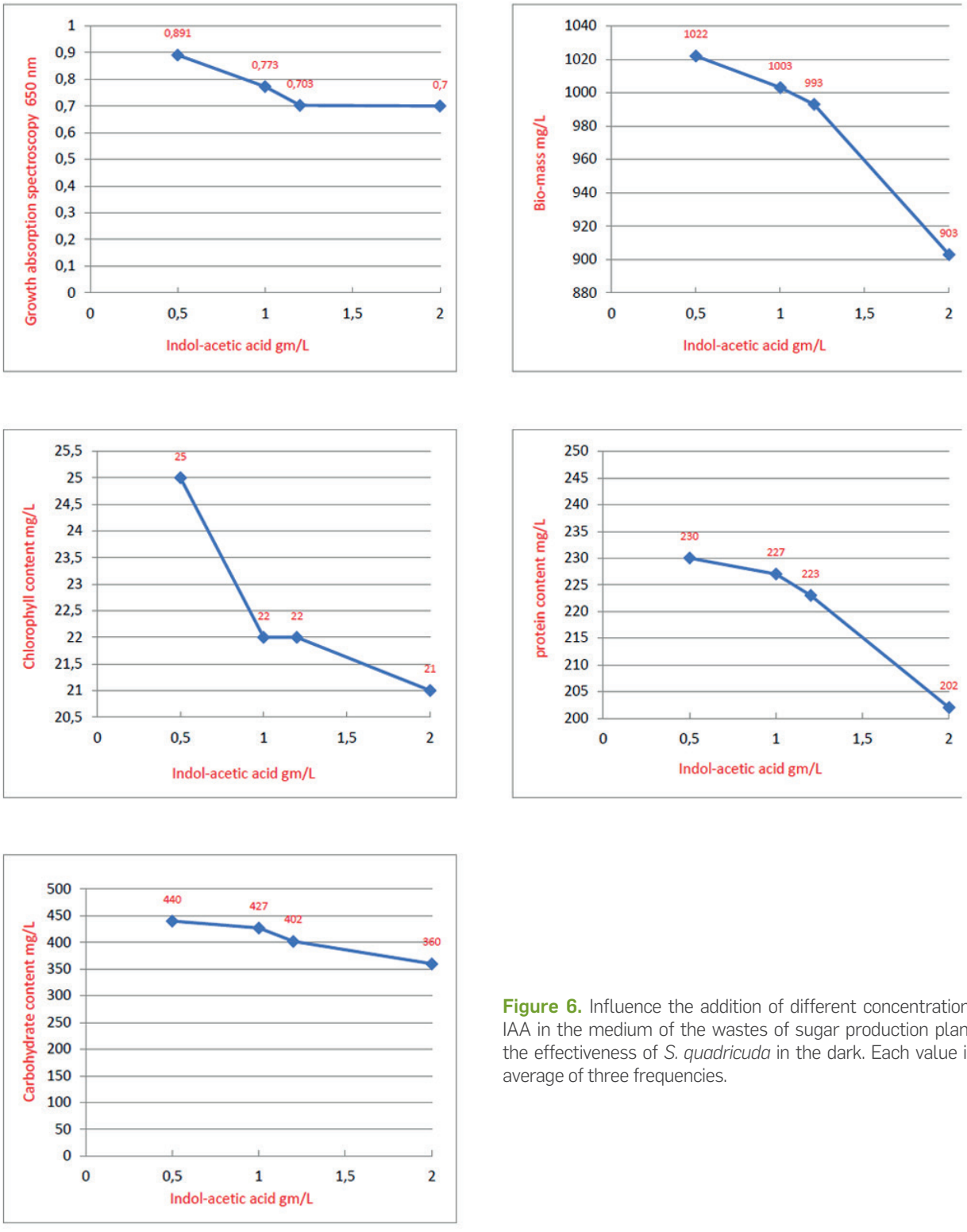

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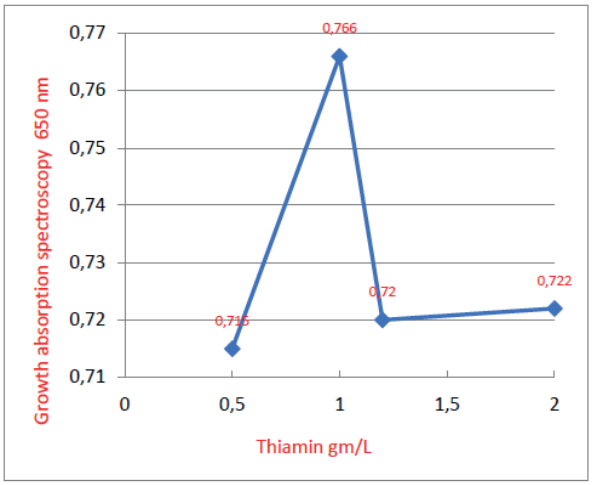

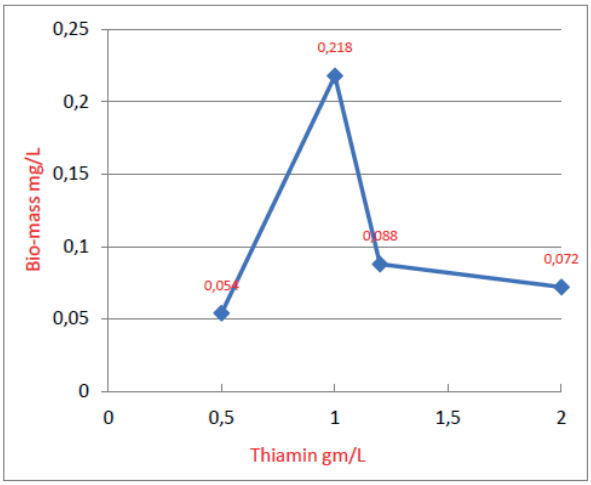

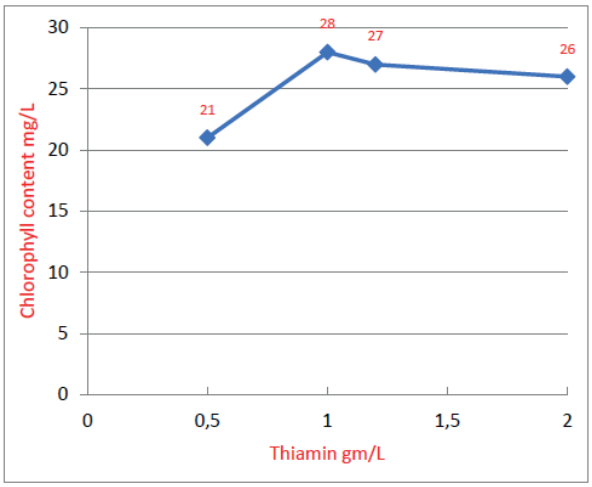

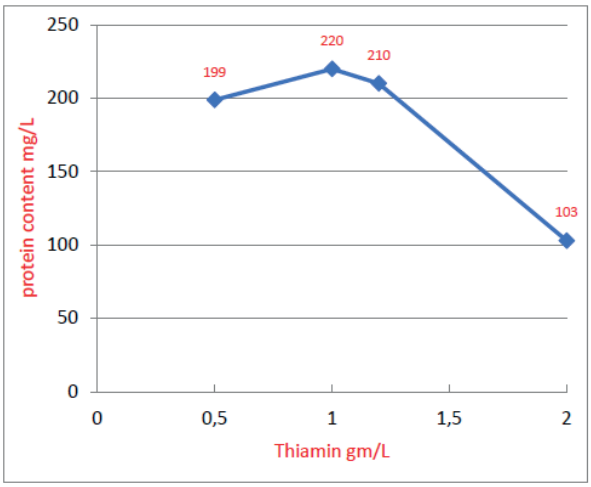

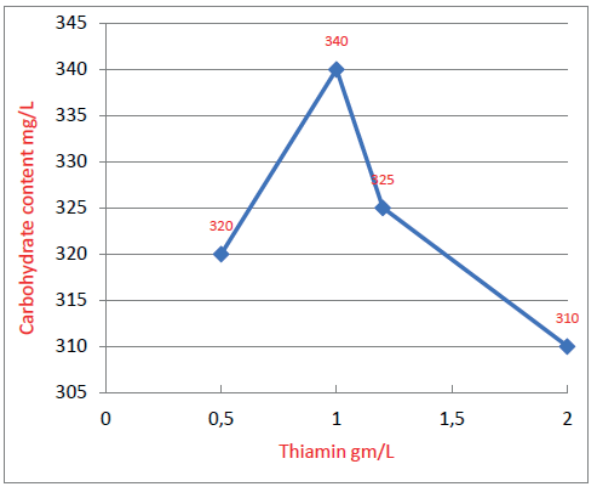

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