Effects of sodium selenite on growth of Pleurotus Sajor-Caju

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ABSTRACT:

Increase in Selenium concentration in urban areas has caused a huge hazard for the biological environment. The aim of this project Is to analyse the effects of different concentrations of sodium selenite on a species of Oyster Mushroom – Pleurotus Sajor Caju. For this purpose, the mushrooms are artificially grown in petri dishes enriched with Selenium. Sterility is maintained while growing these mushrooms by autoclaving the growth medium. They are kept for incubation at 28^0C and 30^oC. Observations are taken after 7 and 11 days respectively. The analysis shows the harmful effects of excess selenium on the mushroom thereby resulting in inhibition of growth and colour change to red.

Keywords : *Autoclave , Sodium Selenite, Pleurotus Sajor Caju, Oyster Mushroom, inhibition*

I. INTRODUCTION :

Selenium is a biologically important element. It is essential for animals and plants even human beings for their metabolism in trace amounts. Deficiency of Se causes Keshan disease, thyroid dysfunction and osteoarthritis. In some areas it occurs in high concentrations in soil, water, etc. Such areas are named as seleniferous areas . Sodium selenite is a compound of selenium is present in dietary supplements , meat , etc. these things are great source of se but recent research shows that se enriched mushrooms are better source of selenium[4]. But the concentration of the selenium should be such that it should not affect mushroom's growth. It should also not cause toxicity due to its hazardous effects on the different plant and animal species.

Pleurotus Sajor-Caju is an edible mushroom found in India. It is warm weather variety of Pleurotus Plumonarius and is a common variety of oyster mushrooms. Edible mushrooms have different ranges of absorption of sodium selenite as well as different effects towards resistivity of selenium or seleniferous environment. Aim of this project is to find the growth effects on Pleurotus Sajor-Caju after enriching it with sodium selenite and observe changes in the effects by fluctuating the temperature at which the experiment is carried out.

II. PROCEDURE

Part 1: Preparation of artificial medium and Inoculation of Mushroom spawns.

1) Preparation of artificial medium requires a solution of 2.4 g of PD(potato dextrose) powder and 2% agar powder.
2) Artificial medium is then autoclaved for about 2 hours at 100kpa and at 121^{0}C.
3) After completion of autoclave, contents are transferred to a petri dish (40mm of diameter).
4) It is solidified at room temperature for about 15 minutes .
5) Spawns of Sajor-caju are inoculated in the petri dish under laminar flow in a bio safety cabinet which for the purpose of sterility.
6) Petri dishes are kept for incubation at 28^{0}C for 7 days till sufficient growth is observed and pure culture is obtained.

Part 2 : Preparation of Petri Dishes of growth medium enriched with Sodium Selenite.[3]

1) For Preparation of sodium selenite solution, 0.88g of anhydrous sodium selenite powder is taken and is mixed with 5 ml of distilled water.
2) Whole mixture is filtered using syringe filter.
3) Following 15 different concentrations are used for the observation : 5mg/L, 10mg /L , 20mg/L , 50mg/L, 80mg/L , 100mg/L, 200mg/L, 300mg/L, 400mg/L, 500mg/L, 600mg/L, 700mg/L, 800mg/L , 900mg/L, 1000mg/L.
4) 62 petri dishes are prepared containing different concentrations of Sodium Selenite along with PDA medium.

Part 3 : Inoculation of Mushroom Culture into Selenium enriched Petri dishes.

1) Division of petri dishes for each concentration is as follows[2]:
   (1) 2 petri dishes at 28^{0}C.
   (2) 2 petri dishes at 30^{0}C
   (3) 2 petri dishes as control – 1 at 28^{0}c and 1 at 30^{0}c respectively.
2) After adding desired concentrations mycelium discs are inoculated in all petri dishes and kept for incubation at desired temperatures.

III. OBSERVATIONS:

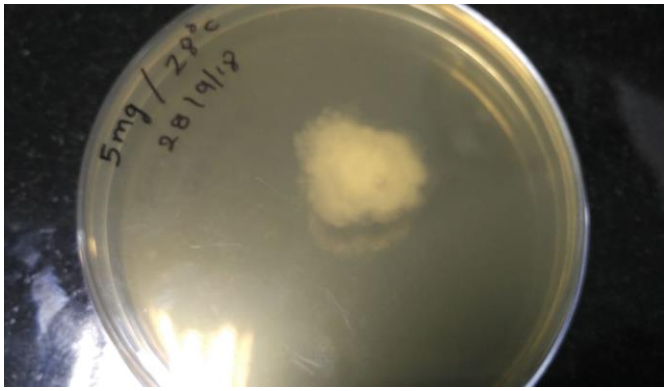
Fig.1 Control Plate : 28^{0}C

Fig.2 Control Plate : 30^0C

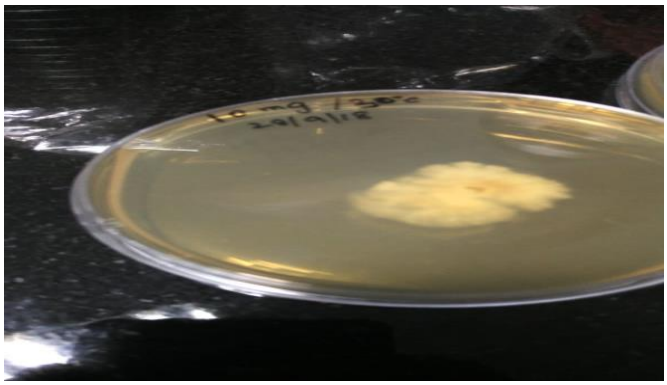
<u>First Observation:</u> Taken after 7 days of incubation of sample

Table 1 :

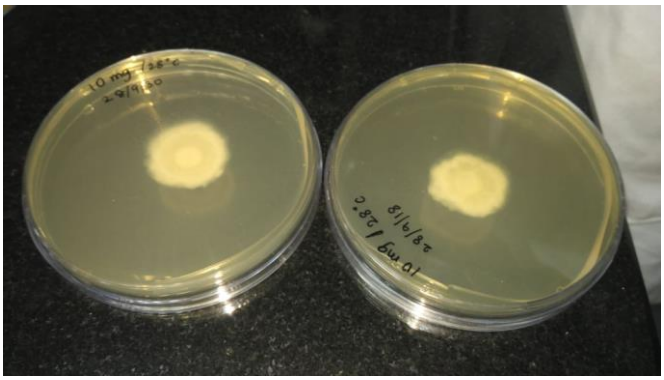
Sr. No.	Concentration of Sodium Selenite	Effect observed on Culture
1)	5mg/L	Regular growth of sample is observed. However, slight inhibition as compared to control is noted,
2)	10mg/L	Growth is less as compared to the control and 5mg sample. No other significant effect observed.
3)	20mg/L	Slight red areas are observed on the sample and the growth inhibits even further.
4)	50mg/L	Significant red colour is observed on the sample and growth inhibition increases.
5)	80mg/L	Sample completely changes its colour to red and very less growth is observed as compared to the control sample.
6)	100mg/L	Darker shade of red colour is seen in the sample and there is hardly any growth seen.
7)	200mg/L	Red colour is observed throughout the sample. Growth of the mushroom completely ceases at this temperature.
8)	300mg/L and above	Red colour border is observed on the inoculated mycelium disc. No growth is observed.



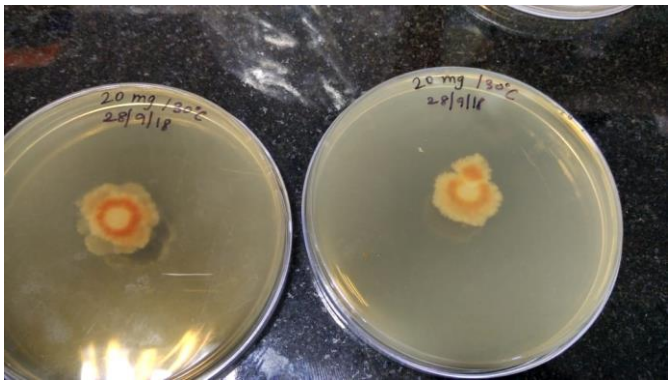
5mg/L at 28 degree Celsius. Day -7



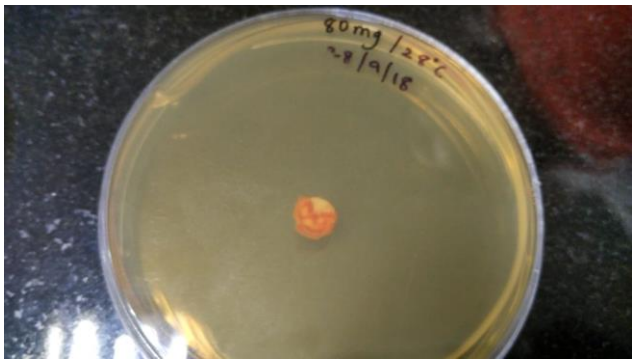
10mg/L at 30 degree celsius Day -7



10mg/L 28 degree Celsius. Day-7

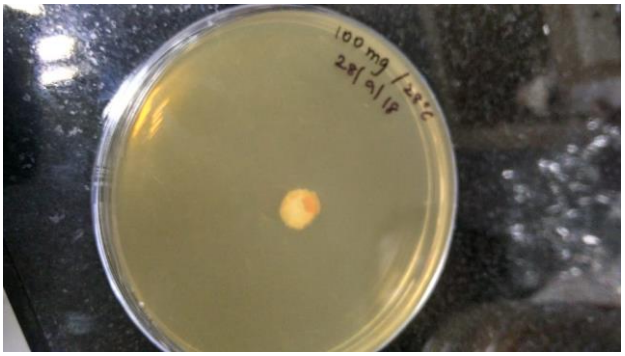


20 mg/L 30 degree Celsius . Day-7



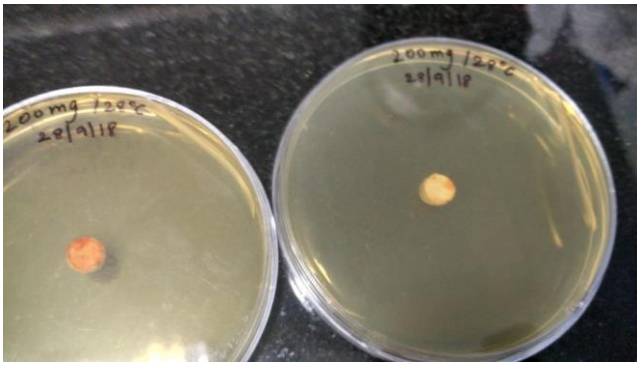
80 mg/L at 28 degree Celsius. Day-7

80 mg/l at 30 degree Celsius . Day-7

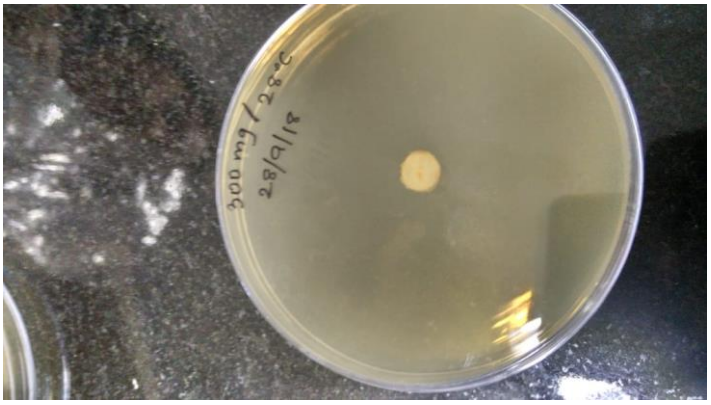


100 mg/l at 28 degree Celsius- Day 7

100 mg/L at 30 degree Celsius . Day-7



200mg/L at 28 degree Celsius Day-7



300 mg/L at 28 degree Celsius

Second Observation : Taken after 11 days

Temperature: 28^0C

Table 2 :

Sr. No.	Concentration of Sodium Selenite	Effect observed on Culture
1)	**5mg/L**	Growth increased considerably . No significant effect of sodium selenite is observed on the growth.
2)	**10mg/L**	Significant growth is seen as compared to previous observation. Slight colour change is also observed.
3)	**20mg/L**	Red colour more prominent as compared to previous observation. However, sufficient growth is observed after previous observation.
4)	**50mg/L**	Dark red spots are observed. Growth significantly inhibited
5)	**80mg/L**	Only slight growth observed from previous observation,
6)	**100mg/L**	Very less growth after previous observation. Red spots more prominent.
7)	**200mg/L**	No growth as compared to first observation. Sample completely red.
8)	**300mg/L and above**	Growth completely ceased. No change after first observation.

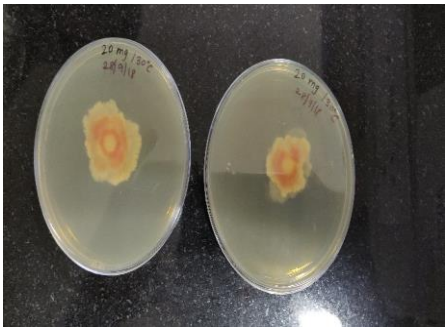


Fig.3: 20 mg/L 30^{0}C

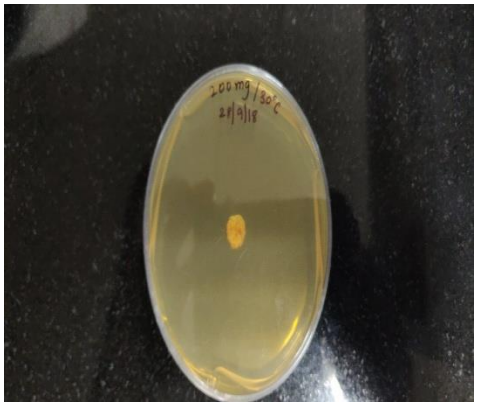


Fig.4: 200mg/L
30^{0}C

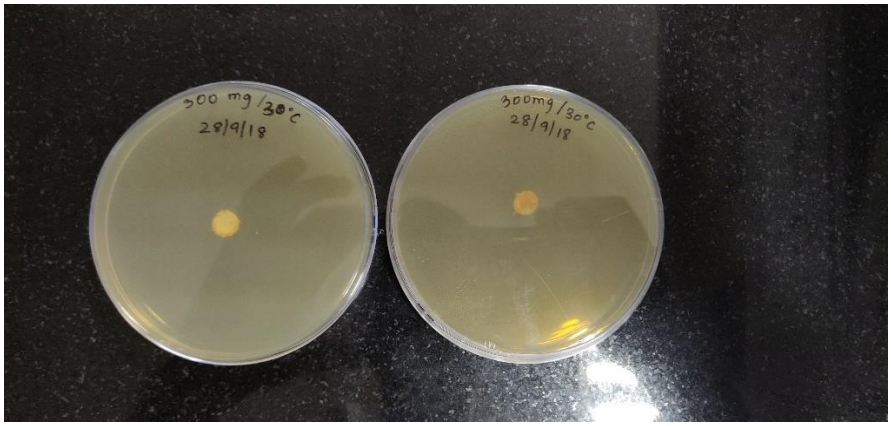


Fig 5: 300mg/L 28 and 30^{0}C

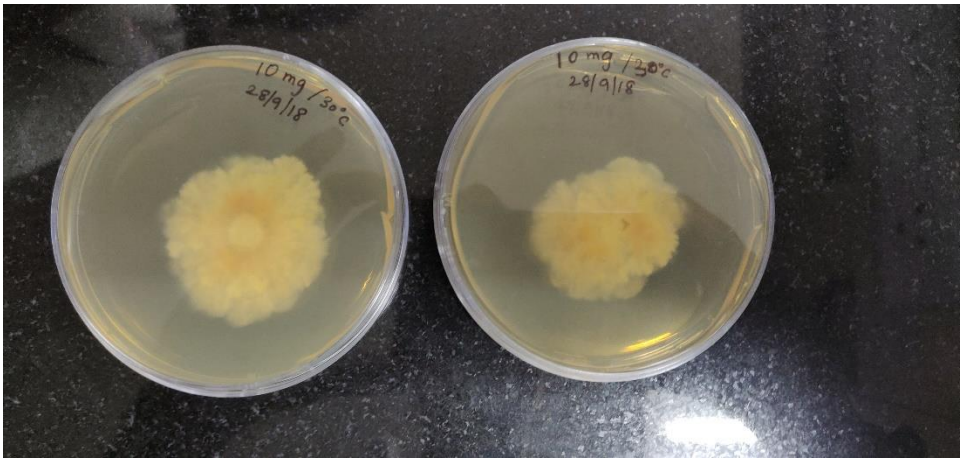


Fig 6. 10mg/L at 28 and 30^0C

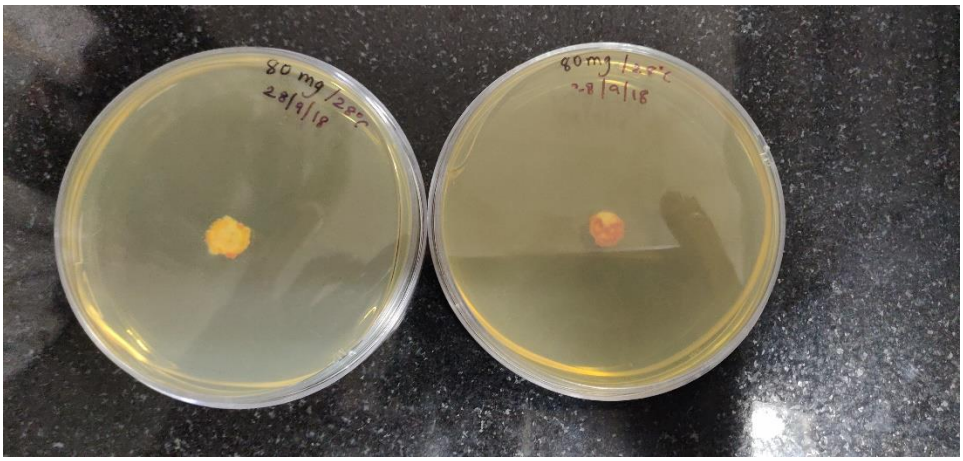


Fig 7: 80mg/L at 28 and 30^0C

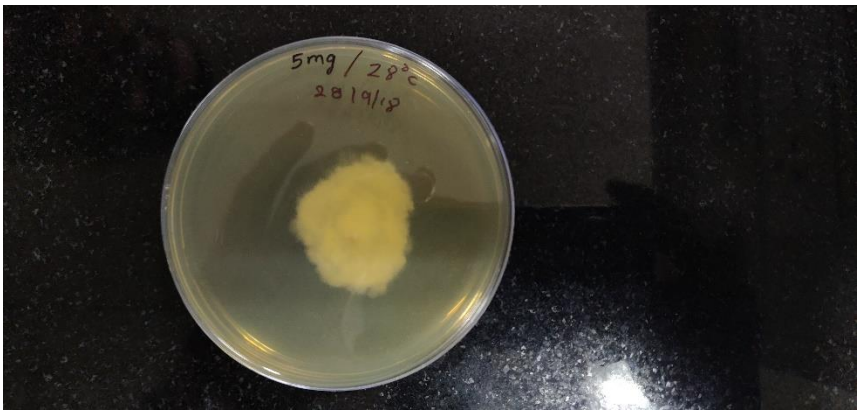


Fig 8: 5mg/L at 28^0C

Effect Of Temperature Fluctuation :

1) It is observed that the growth is more at 30^0C as compared to 28^0C
2) This suggests that the effect of sodium selenite on the mushroom is lower at higher temperature.
3) Moreover, it is also observed that the colour change is more prominent in the 30^0C sample.

IV. CONCLUSIONS:

1) The Sodium Selenite in different concentrations inhibits the growth of the mushroom
2) The inhibition of growth increases as the concentration of sodium selenite increases
3) Colour change to red is observed in the mushroom after the concentration of sodium selenite exceeds 80mg/L
4) Growth of the mushroom completely ceases after concentrations of sodium selenite exceeds 100mg/L
5) As the temperature at which the mushroom is kept is increased (30^0C), the growth of the mushroom at the same concentration increases
6) Thus at higher temperature the effect of selenium on the growth of the mushroom is retarded.

V. ACKNOWLEDGEMENTS:

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