Production of Selenium Enriched *Saccharomyces cerevisiae* using Yeast Extract Peptone Dextrose Broth

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Background

- Trace minerals (TM) play a vital role in growth and many metabolic processes (Branca and Ferrari 2002).

- Conventionally – In organic Trace minerals (ITM) - readily available and economical

- Bioavailability: ITM < OTM (Rama Rao et al. 2013). (Cu - Mb; S - Se; Ca - P, Zn, Mn)

- Poor utilization of ITM leads to growing environmental concerns. Excretion, Water contamination.

- OTM: alternative pathways (Webb et al. 2005), higher bioavailability, and decreased mineral excretion (Leeson 2003).

- Owing to higher absorption and better availability, OTM can be added at much lower levels (Rama Rao et al. 2013).

- Se is best known for its anti-oxidant properties; selenoproteins (Kryukov et al. 2003; Zhang et al. 2013).
- Yeast cells can accumulate large quantities of inorganic Se under appropriate conditions and they have the ability to transform it into organic Se (Suhajda et al. 2000). However, the concentration?

Growing the yeast cells in medium containing Se at the appropriate concentration will lead to uptake of these elements by Yeast Cells and will further make available (Se) in the organic form for feeding of broiler chicken.

Objectives

To develop the organic Se through yeast cells

To standardize the optimum conc. of Se - yeast biomass

Methodology

- Collection of *Saccharomyces cerevisiae*
- Purification

- Enumeration
- Adaptation with sodium-selenite

- Comparison of different yeast strains capability
- Biomass and Se estimation

Collection of *Saccharomyces cerevisiae*

NDRI

- 042, 045, **050**, 047 and 186

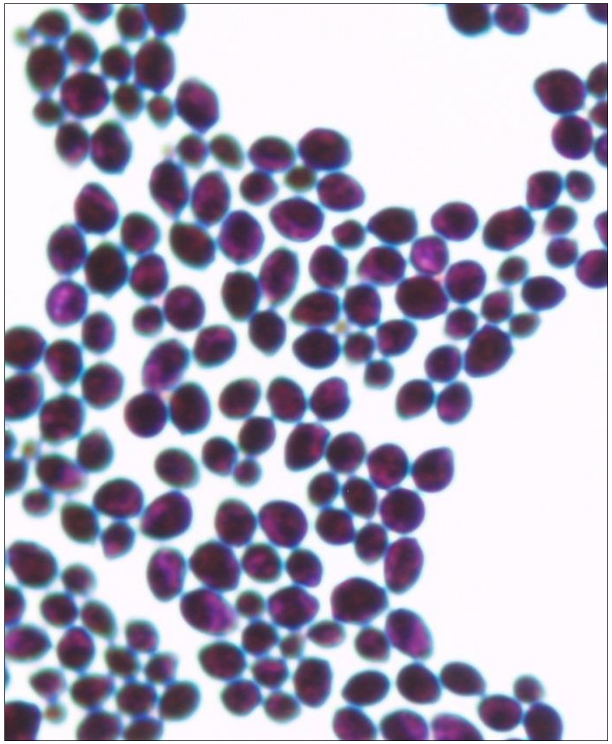
Local source

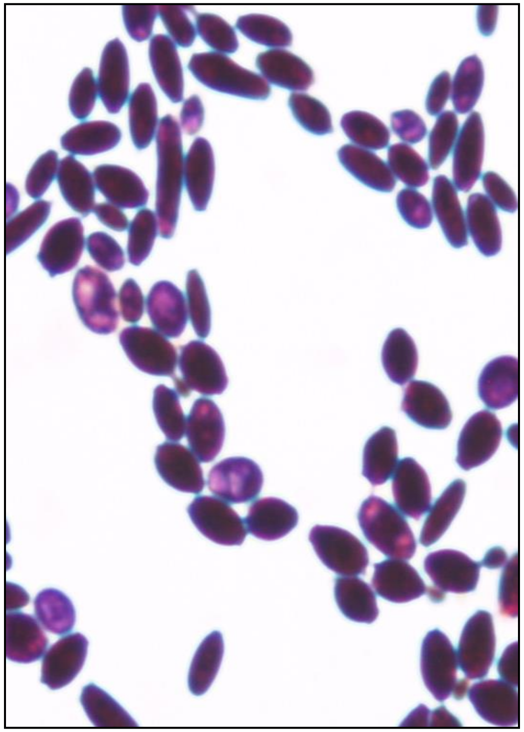
- SC 101, 3455, WY, SCSB and F

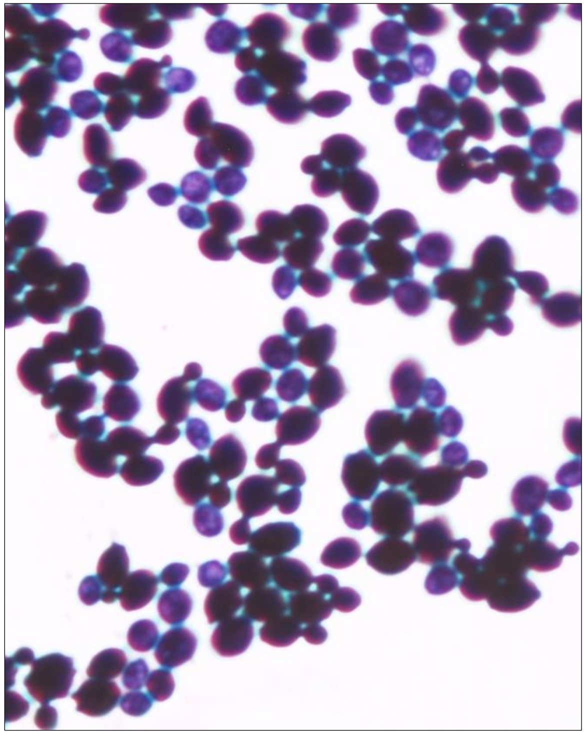
Purification

- SC collected were in the lyophilized form
- Revived in the YPD broth- SD- shifted to agar plates
- Picking colony -streaking

Microscopic observation



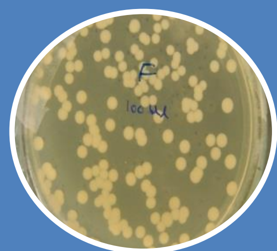




Confirm the purity of the yeast cells

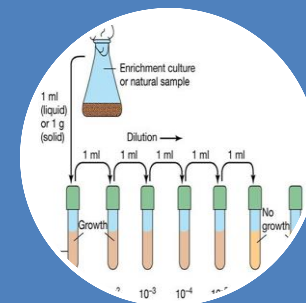
Enumeration of yeast cultures

To verify the growth capability of different strains



Inoculation PC in YEPD

Activation for 48 h



1 ml broth - dilution up to 10^{-5}

CFU/ml = volume × no of colonies × dilution factor

Results

Screening for Se tolerance

Challenging The Yeast Cells With Na_2SeO_3

	Strain	CFU /ml	
		Control	**10 ppm**
1	050	0.34x10^{12}	0.32x10^{12}
2	186	0.23x10^{12}	**0.11x10^{12}**
3	Wy	0.2x10^{12}	**0.174x10^{12}**
4	Scsb	0.22x10^{12}	**0.16x10^{12}**
5	045	0.294x10^{12}	**0.196x10^{12}**
6	F	0.25x10^{12}	**0.17x10^{12}**
7	042	0.43x10^{12}	**0.22x10^{12}**
8	Sc101	0.49x10^{12}	0.306x10^{12}
9	3455	**0.29x10^{12}**	**0.24x10^{12}**

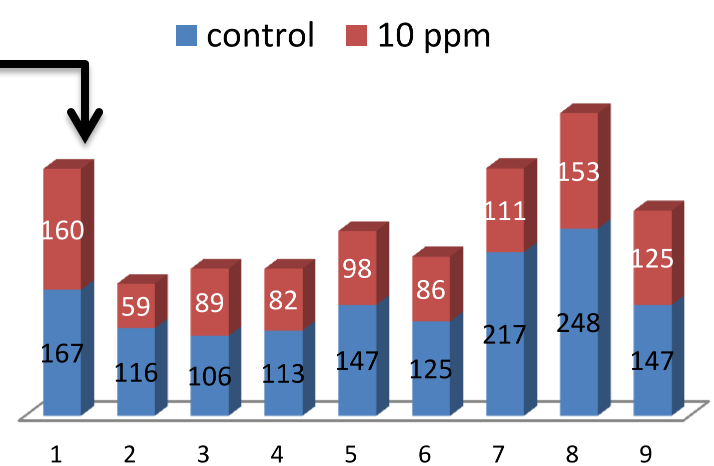
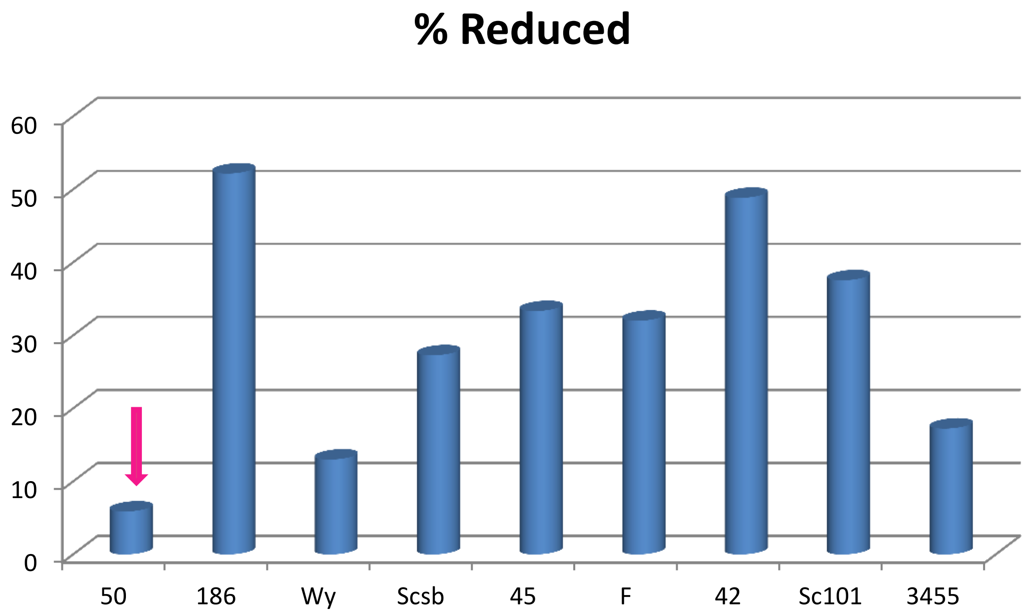
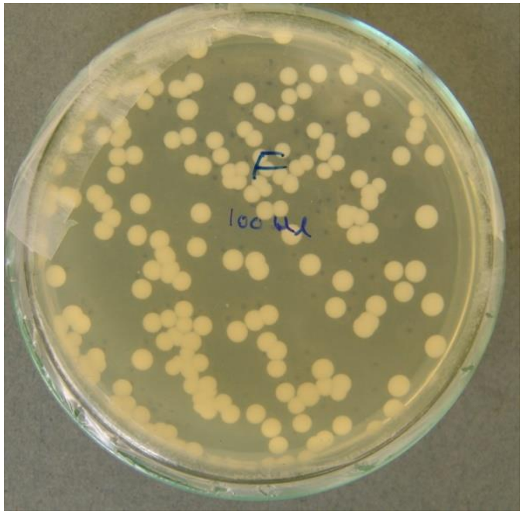
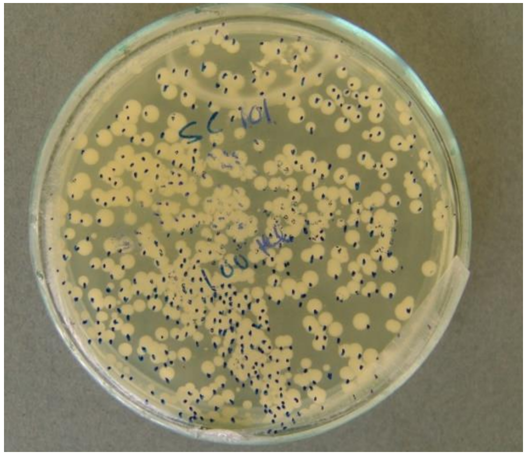


Fig: Number of colonies formed

Growth Reduction

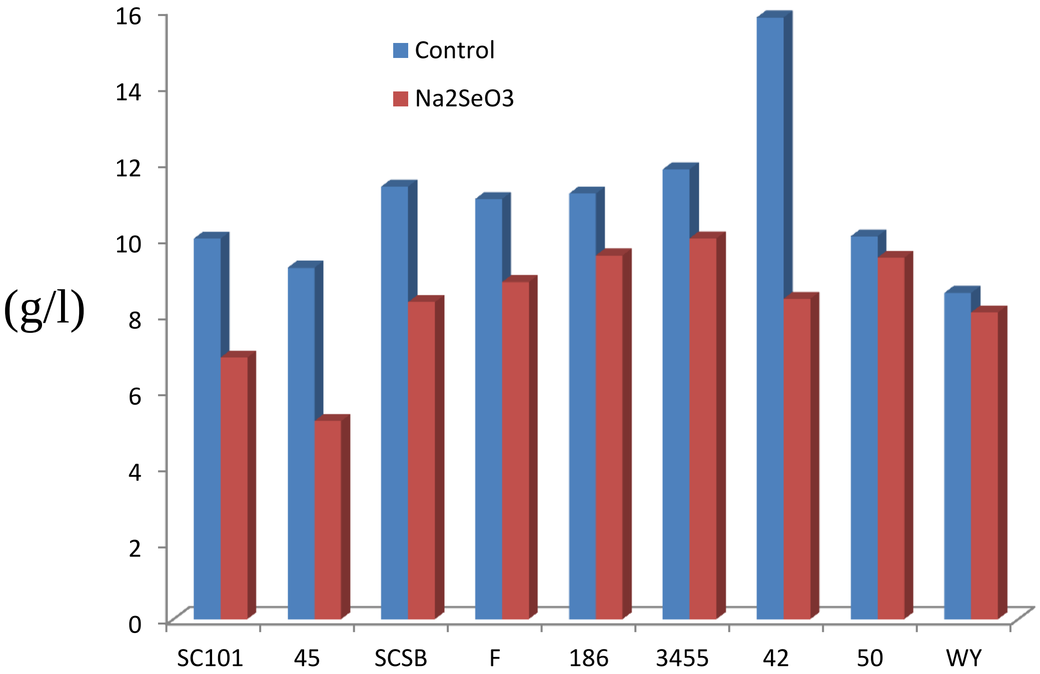






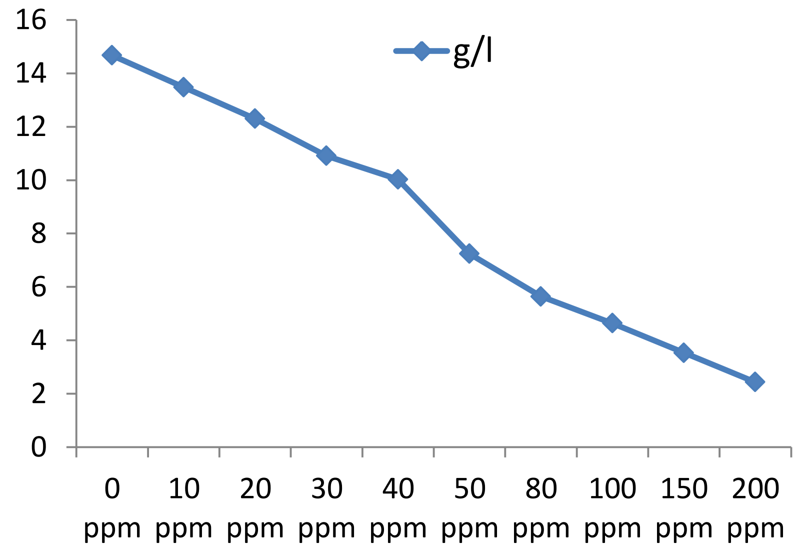
Biomass yield (Control Vs 10 ppm Na_2SeO_3)

Strain	Control	Na_2SeO_3
	(g/l)	
SC101	10	6.88
045	9.236	5.208
SCSB	11.368	8.336
F	11.04	8.86
186	11.18	9.56
3455	11.82	10.01
042	15.8	8.424
050	10.06	9.5
WY	8.58	8.07

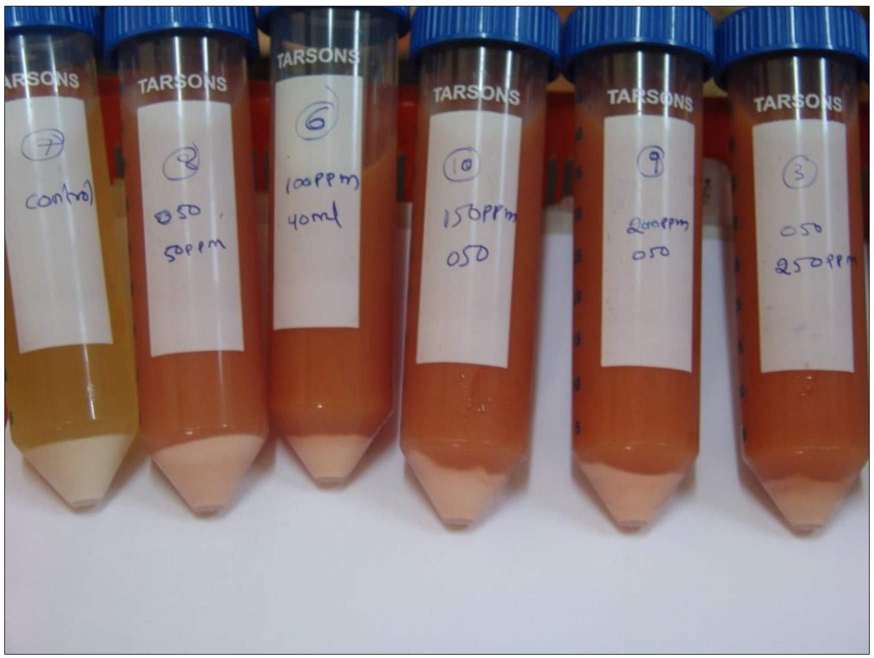


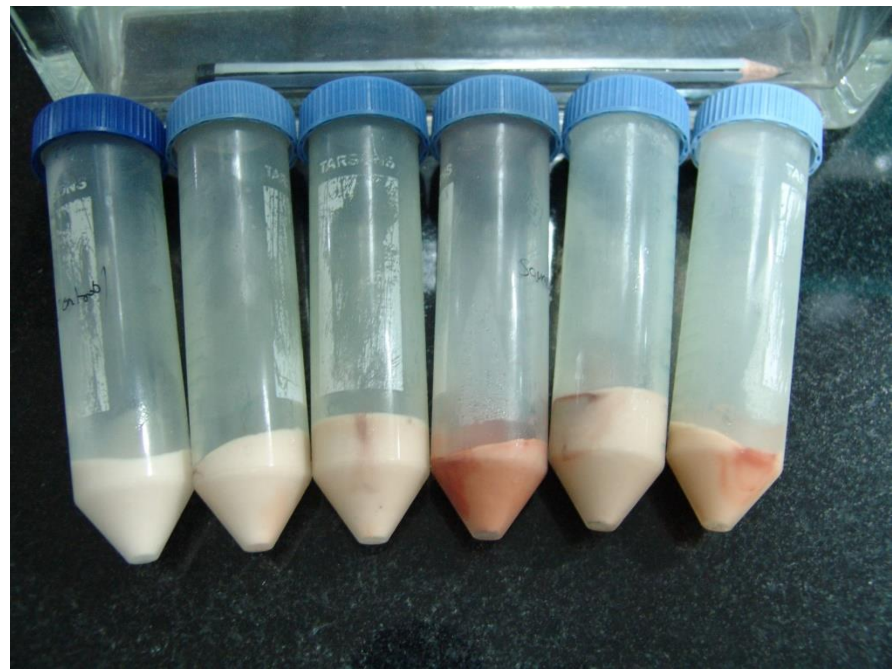
050 Biomass yield variation at different concentration of Na_2SeO_3

Na_2SeO_3 (ppm)	g/l
0	14.67
10	13.48
20	12.30
30	10.91
40	10.03
50	7.244
80	5.645
100	4.640
150	3.532
200	2.436



After centrifugation

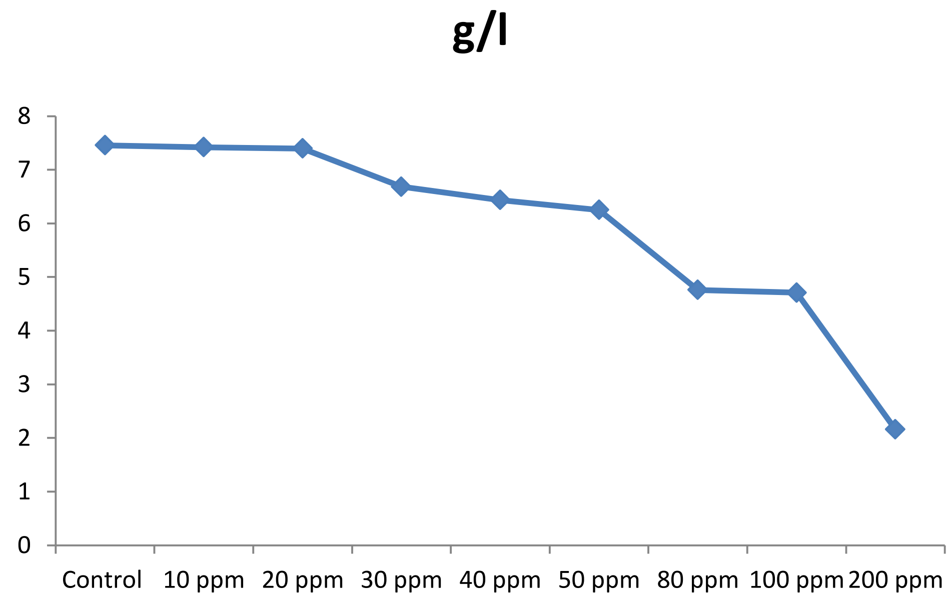




Oven dried Selenized Yeast

101 strain biomass variation at different concentration of Na_2SeO_3

Concentration	g/l
Control	7.456
10 ppm	7.42
20 ppm	7.396
30 ppm	6.684
40 ppm	6.436
50 ppm	6.252
80 ppm	4.76
100 ppm	4.708
200 ppm	2.160



Growth of *Saccharomyces cervisiae* in different concentration of sod. Sel.

Se uptake by the 050 strain of SC

Conc (ppm)	g/l	(Se mg/g)	(Se mg in BM produced)
0	14.67	0.00	0
10	13.48	1.96	26.42
20	12.30	3.25	39.97
30	10.91	5.92	**64.37**
40	10.03	6.12	61.18
50	7.244	9.08	65.92
80	5.645	10.69	62.09
100	4.640	14.28	64.96
150	3.532	18.33	63.58
200	2.436	24.57	60.90

Conclusions

- **The SC strain- 050 was found to grow well compared to other strains in the sodium selenite -YEPD broth**

- **It has been recorded that the optimum biomass and Se uptake was recoded at 30 ppm of sodium selenite by 050 strain of SC.**

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Thank You!