Search of factors causing reaction of metachromazmy of volutin granules of yeast

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Seasonal variations of metachromasy
Periodicity of the MTC phenomenon (2002-2009 years)
Peculiarities of metachromasy during 2002 – 2008 years

Quantity of one-day MTC ( ) and over seven days MTC ( )
Change of MTC and different Solar-Terrestrial activity

- Metachromasy and Solar flux
  approximated data (N=1071)

- Metachromasy and Planetary A index
  approximated data (N=1071)

- Metachromasy and Sunspot number
  approximated data (N=1071)

- Metachromasy and Solar wind speed
  approximated data (N=1071)

**MTC**

**Solar-Terrestrial indexes**
Dispersion analysis of MTC data in connection to Cosmic rays index

"Var3"; LS Means
Current effect: F(2, 2245) = 7.8332, p = .00041
Effective hypothesis decomposition
Vertical bars denote 0.95 confidence intervals
Dependence of MTC changes under Interplanetary Magnetic field sign
Effects of different shields on the metachromasy phenomenon

Correlation indexes of control sample with shielded samples

<table>
<thead>
<tr>
<th>Shield</th>
<th>Control cells</th>
<th>Steel cylinder</th>
<th>Lead cylinder</th>
<th>Water bottle</th>
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</thead>
<tbody>
<tr>
<td>Paraffin bottle</td>
<td>0.66</td>
<td>0.69</td>
<td>0.89</td>
<td>0.76</td>
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<tr>
<td></td>
<td>158*</td>
<td>156*</td>
<td>158*</td>
<td>92*</td>
</tr>
<tr>
<td>Permalloy</td>
<td>0.97</td>
<td>0.83</td>
<td>0.49</td>
<td></td>
</tr>
<tr>
<td></td>
<td>58*</td>
<td>58*</td>
<td>51*</td>
<td></td>
</tr>
<tr>
<td>Water bottle</td>
<td>0.65</td>
<td>0.65</td>
<td>0.83</td>
<td></td>
</tr>
<tr>
<td></td>
<td>92*</td>
<td>92*</td>
<td>92*</td>
<td></td>
</tr>
<tr>
<td>Lead cylinder</td>
<td>0.73</td>
<td>0.75</td>
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</tr>
<tr>
<td></td>
<td>206*</td>
<td>204*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel cylinder</td>
<td>0.70</td>
<td></td>
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<tr>
<td></td>
<td>243*</td>
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</tbody>
</table>

* - number of measurements
MTC of parent and mutant strains of *Saccharomyces cerevisiae*

**S. cerevisiae CNX (parent strain)**

**S. cerevisiae CRY (mutant)**

\[ R = 0.71, \ p < 0.05, \ N = 179 \]
Saccharomyces cerevisiae

Rhodococcus arylithropolis S741

Yeast and Bacterial Metachromasy

$R = 0.06$, $p = 0.29$, $N = 356$
The general features of MTC and macroscopical fluctuations phenomena

✓ Cosmo-physical conditionality
✓ Inverse relation with Solar activity (Wolf number)
✓ Disconnectedness with A-index
✓ Connected to the structure of Interplanetary Magnetic Field
✓ Possible connection with Galactic Cosmic Rays
✓ Independent of electromagnetic shielding
✓ Varied sensitivity of different objects to Cosmo-physical factors
✓ Visual method of estimation is more exact
Volutine grains (dancing bodies) images by Confocal Microscopy

( LSM 510 META, Zeiss)
3D images of *Saccharomyces cerevisiae* intracellular polyphosphates

Phosphate (-) 24 hours

Phosphate (+) 24 hours
Volutine grains in conidia of *Fusarium solani*

**Initial samples** have no visible grains;

**After 7 days** without nutrients some conidia (shown by arrow) included large regions of condensed material possibly polyphosphate;

**After 14 days** the same conditions all conidia included grains similar to the yeast volutine grains.
Volutine grains in the hypha of *Fusarium solani*
Volutine grains in Bacillariophyta

Frustulia rhomboides
THANKS

To be continued …