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High Stability of Mycobiota from Desert Soil to the Impact of Ionizing Radiation (100 kGy) at Low Temperature and Pressure

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The aim

To study the effect of γ-radiation under low temperature and low pressure conditions on the eukaryotes (micromycetes communities of arid soil).

- The prokaryotes showed high resistance to ionizing radiation at low temperature (Cheptsov et al., 2018)
- The fungi are the most resistant to radiation organisms among eukaryotes (0,117 МГр (Pacelli et al., 2017))

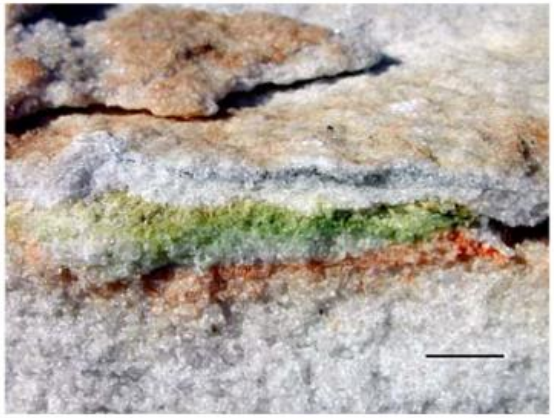
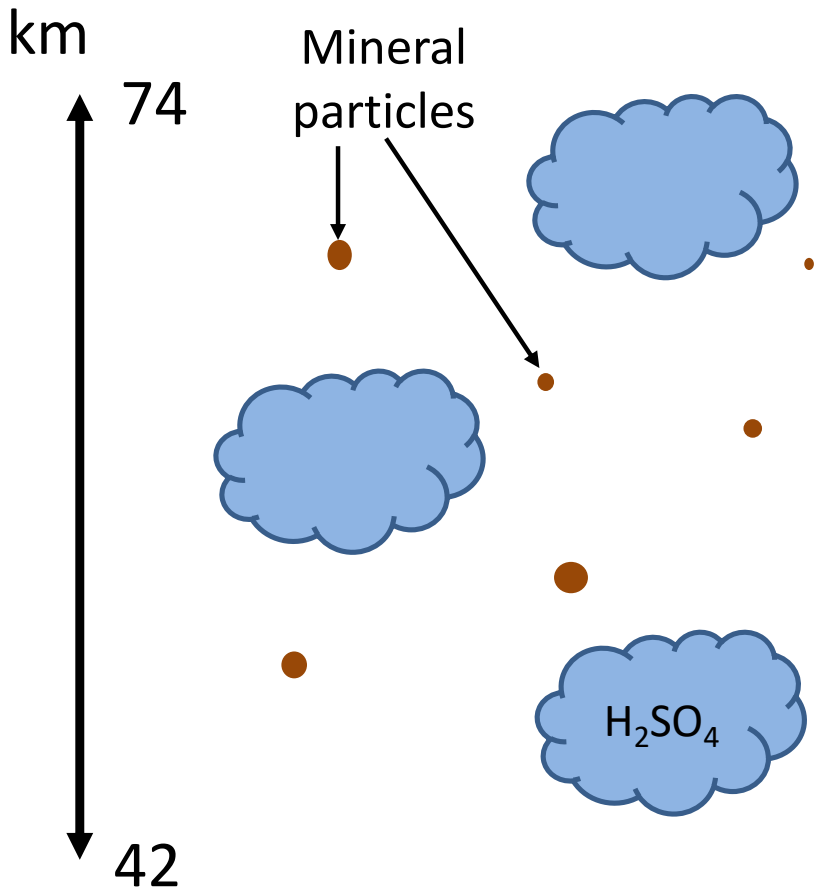


Fig. 1 Cryptoendolithic lichen dominated community colonizing sandstone in the McMurdo Dry Valleys, Antarctica (bar 10 mm) (Onofri et al. 2006)

Venus cloud habitability zone

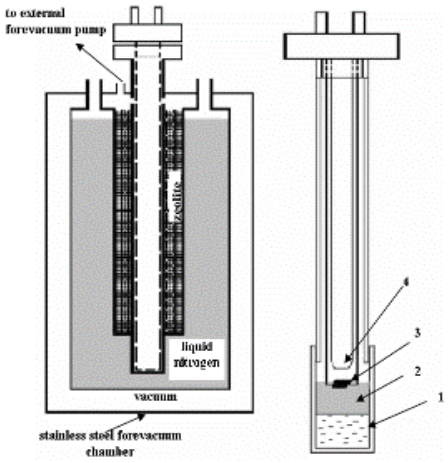


t, °C	p, bar	Radiation
+120 - -45	2- 0,05	6,5 * 10^{-3} Gy/year (7,4 *10^{-6} Gy/hour)

Materials and methods

Samples of grey soil
(Negev desert, Israil)

Irradiation in climatic chamber



(Pavlov et al. // International Journal of Astrobiology 9 (1) : 51–58 (2010))

-50°C

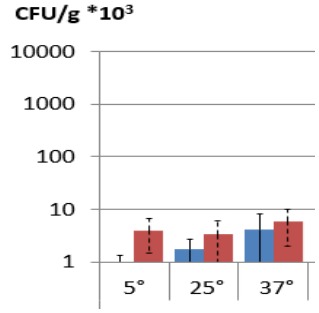
1 Torr

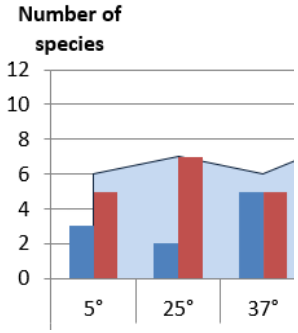
100 kGy

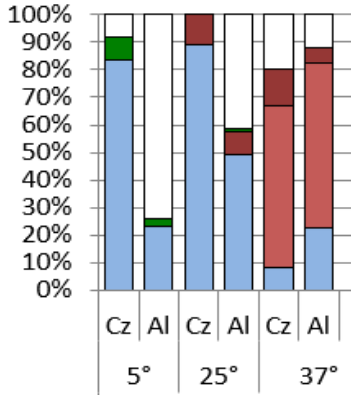
Soil suspensions inoculation method

The method of direct fluorescent microscopy

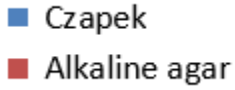
Results: the quantity of CFU, number of species and the structure of soil fungal communities

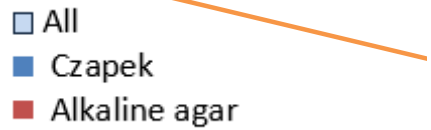


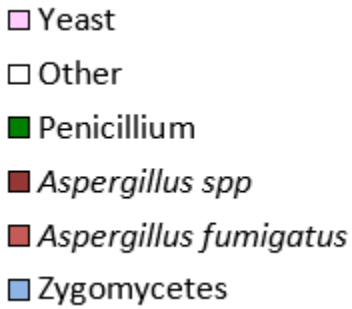




control

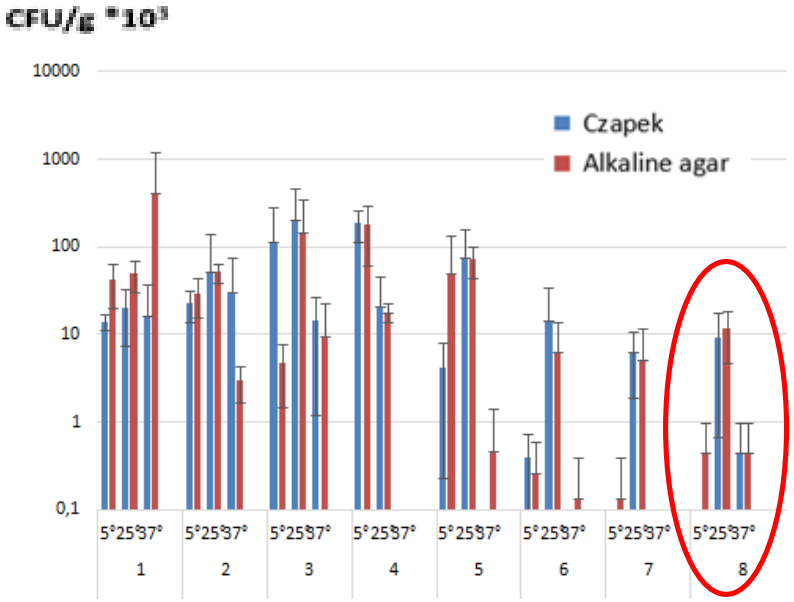






Irradiation by accelerated electrons of:

soil

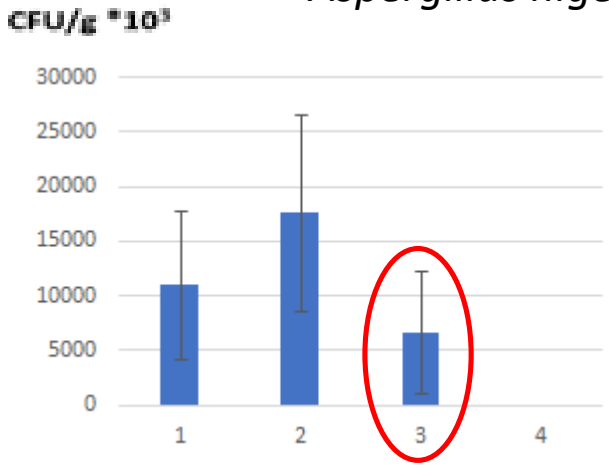


1- control, 2 – control, t, P, 3 – 0,05 MGy, 4-1 MGy, 5 – 2 MGy, 6- 3 MGy, 7 – 4 MGy, 8 – 5 MGy

pure strains

(montmorillonite immobilization)

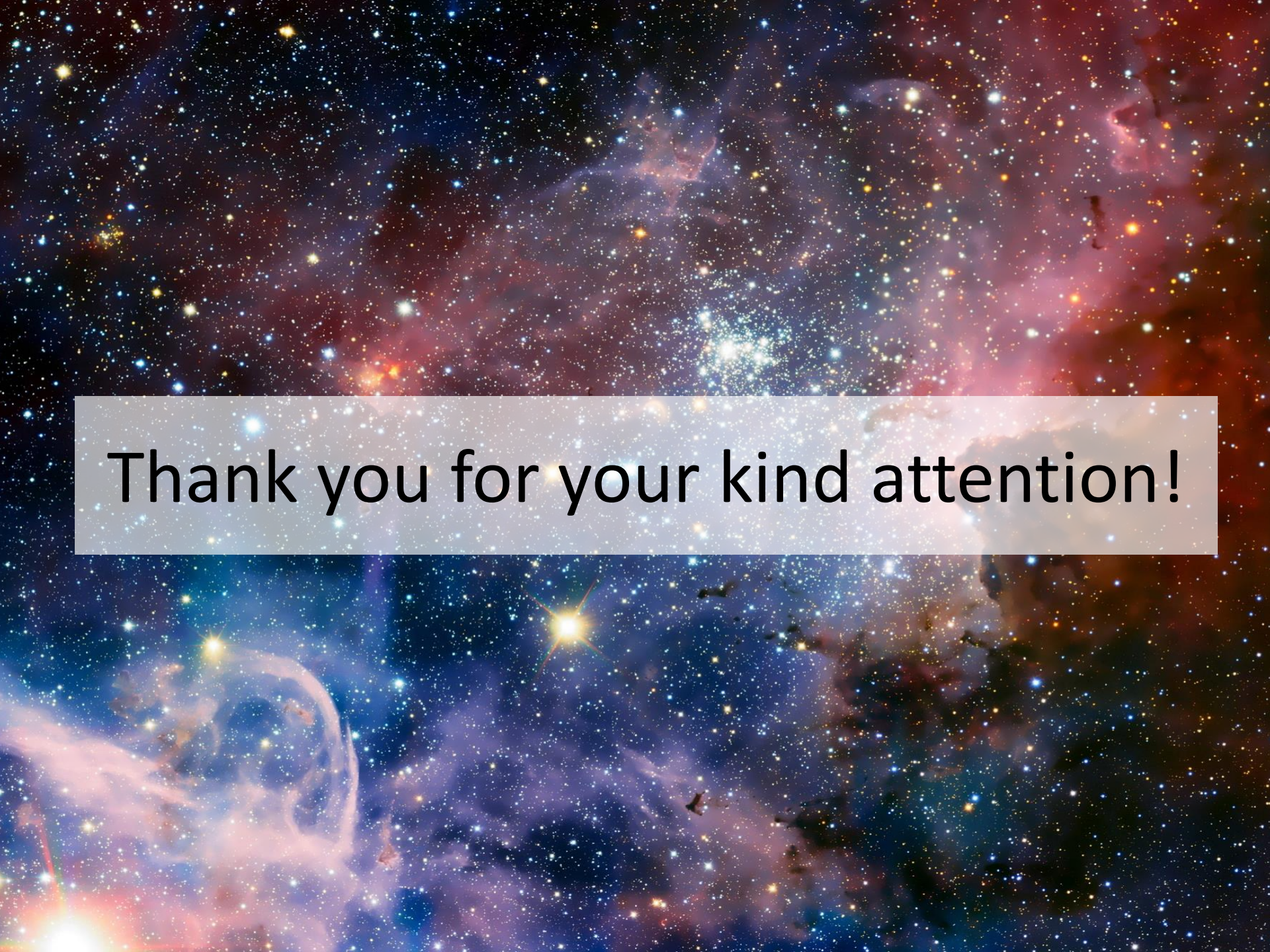
Aspergillus niger



1- control, 2 – control, t, P, 3 – 0,01 MGy, 4-0,05 MGy,

Conclusions

- It was shown that the influence of high doses of ionizing radiation (100 kGy) at low temperature and pressure didn’t lead to death of soil fungal communities formed in extreme conditions of terrestrial desert soil.
- Experiments with irradiation by accelerated electrons show that fungi communities in soil are more stable in response to extreme factors (radiation) than pure strains artificially immobilized in montmorillonite.


Thank you for your kind attention!