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DETERMINATION OF THE EFFECTS OF MYCLOBUTANIL ON THE ACTIVITY OF SOIL ENZYMES AND COMMUNITIES OF SOIL MICROORGANISMS

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Abstract: This study aims to assess the effects of myclobutanil on activities of soil catalase and protease using a spectrophotometric method, respectively to assess the effect of myclobutanil on the soil microorganism's community. This study was performed using the commercial product „Systhane™ Forte” containing 240g/L myclobutanil. Experiments were performed on control soil sample (soil untreated with myclobutanil) and soil samples treated with various doses of myclobutanil: the normal dose (D, 0.2 L/1000 kg), ½Dose (0.1 L/1000 kg), and 2xD (0.4 L/1000 kg). In the case of catalase, it was found that, regardless of the dose of the fungicide applied, the highest value of the catalase activity was recorded in the first day of the study and the lowest value was recorded on day 14 of the study, similar with the catalase activity recorded for the control sample. Concerning the protease activity, the results showed that there was a downward trend in all the values until the 21st day of the study. Starting from the 28th day, the activities of catalase and protease increased, probably due to the recovery of the population of soil microorganisms and the degradation of the fungicide. Application of myclobutanil did not severely affect the population of bacteria, there was a slight increase in the number of bacteria per gram of soil. The population of soil fungi seemed to be affected by myclobutanil as it recorded a steady decrease starting on day 7. The limiting conditions of the laboratory and the lack of a more selective medium made it difficult to accurately monitor the population of fungi.

• Introduction

Society and the scientific community have been and continue to be interested in providing a sufficient amount of food for the growing population. The development of modern agriculture would be inferior to ensuring the quantity of food without the application of pesticides, but we must not forget that it is necessary that the quality of these foods is good so as not to endanger the health of the population. That is why care must be taken with the concentration of pesticides used.

• Results and discussions

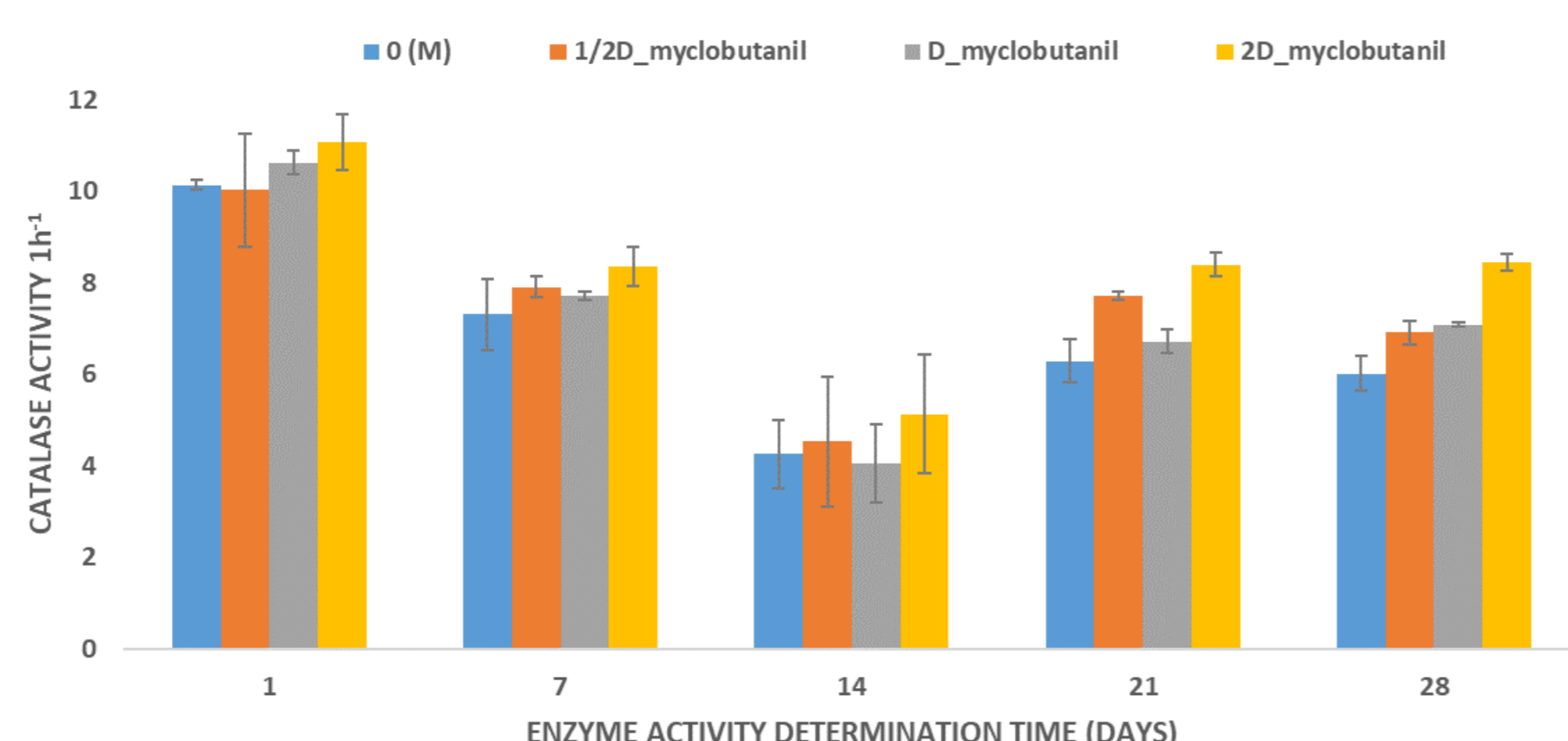


FIG 1. Highlighting the catalase activity values and standard deviations related to the 28 days of the experimental study: 0 (M) = soil control sample without myclobutanil applied; 1/2D_myclobutanil = half of the normal dose of myclobutanil applied; D_myclobutanil = normal dose of myclobutanil applied; 2D_myclobutanil = double dose of myclobutanil applied

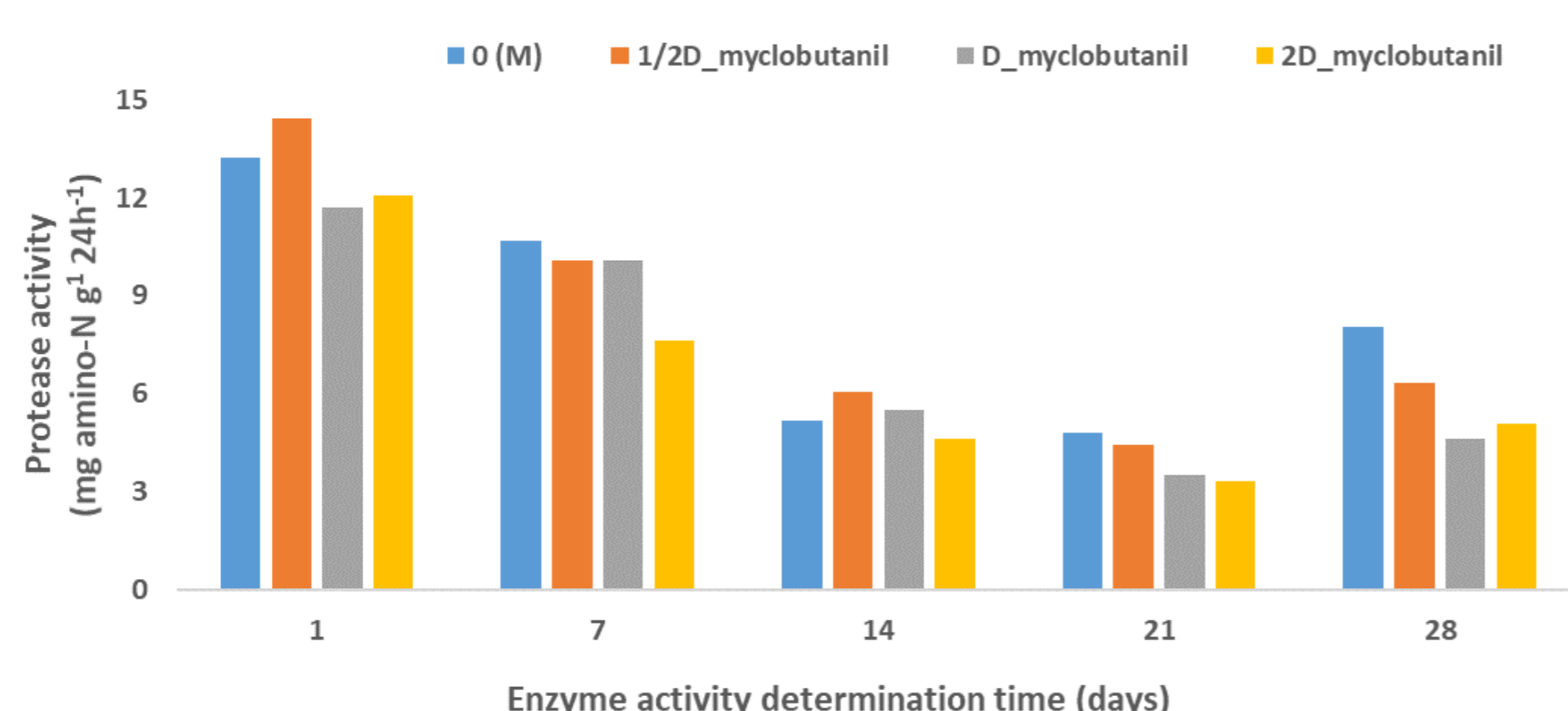


FIG 3. Highlighting the protease activity during the 28 days of experimental study: 0 (M) = soil control sample without myclobutanil applied; 1/2D_myclobutanil = half of the normal dose of myclobutanil applied; D_myclobutanil = normal dose of myclobutanil applied; 2D_myclobutanil = double dose of myclobutanil applied

• Conclusions

- the highest value of the catalase activity of the soil was recorded in first day of the study and the lowest value was recorded on day 14 of the study.
- the bacterial population in the soil was not severely affected by exposure to the fungicide myclobutanil, moreover, after a certain period of exposure an increase in the number of bacteria per gram of soil, an increase also evidenced by the intensification of catalase activity, and due to the carbon and nitrogen intake following the application of the triazole fungicide;
- until the 21st day of the experimental study, there was a downward trend in all the values of the protease activity related to the considered soil samples;
- the fungal population in the soil showed a steady decrease starting on day 7, which means that the fungicide affected the fungal population, but the limiting laboratory conditions and the lack of a more selective medium made it difficult to monitor the fungal population.

• Material and method

- UV-Vis spectrophotometer.

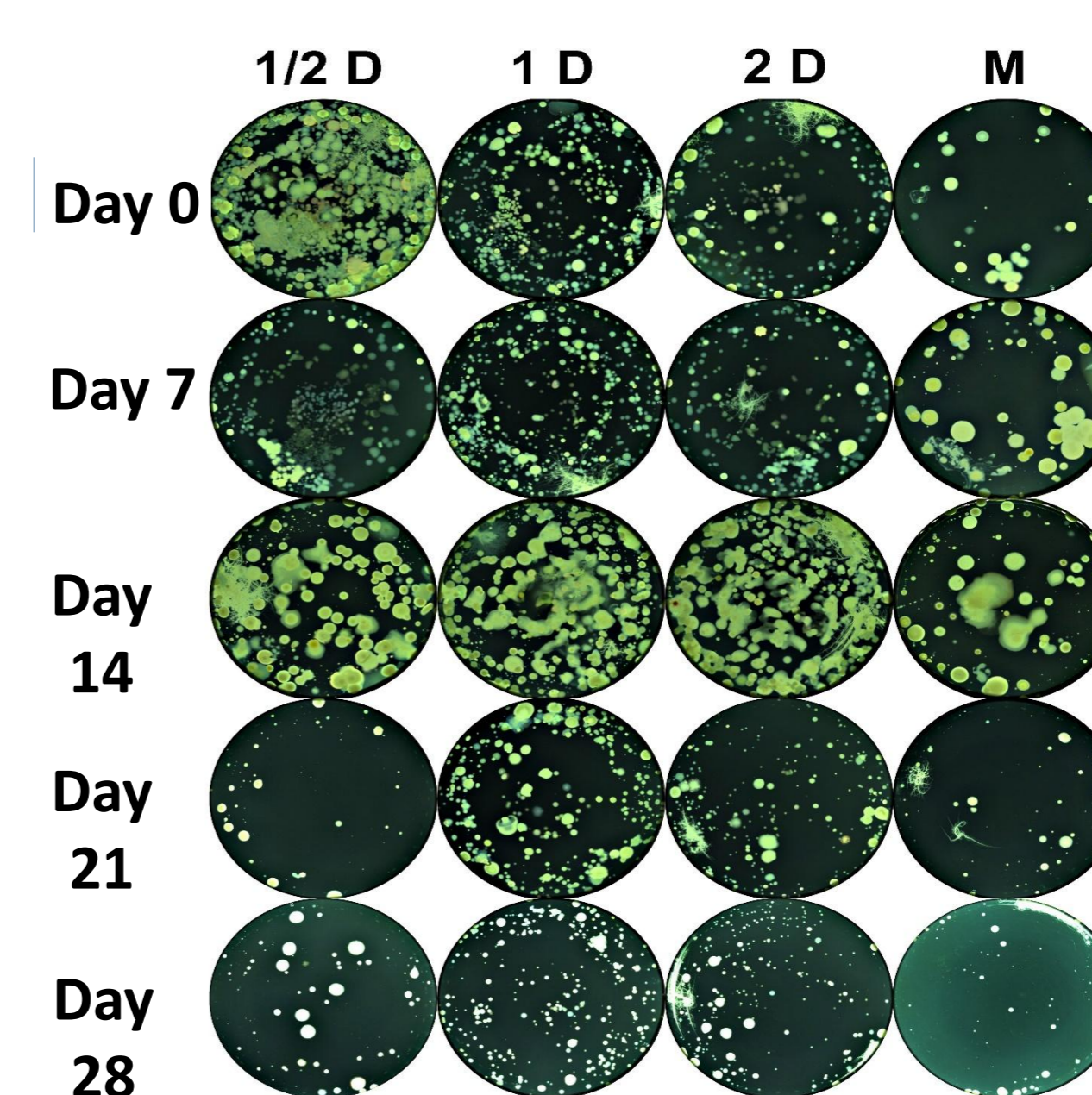


FIG 2. Illustration of the bacterial population developed on each day of the experiment as a result of the application/non-application of the dose of fungicide of interest: 0 (M) = control soil sample without myclobutanil applied; 1/2D_myclobutanil = half of the normal dose of myclobutanil applied; D_myclobutanil = normal dose of myclobutanil applied; 2D_myclobutanil = double dose of myclobutanil applied

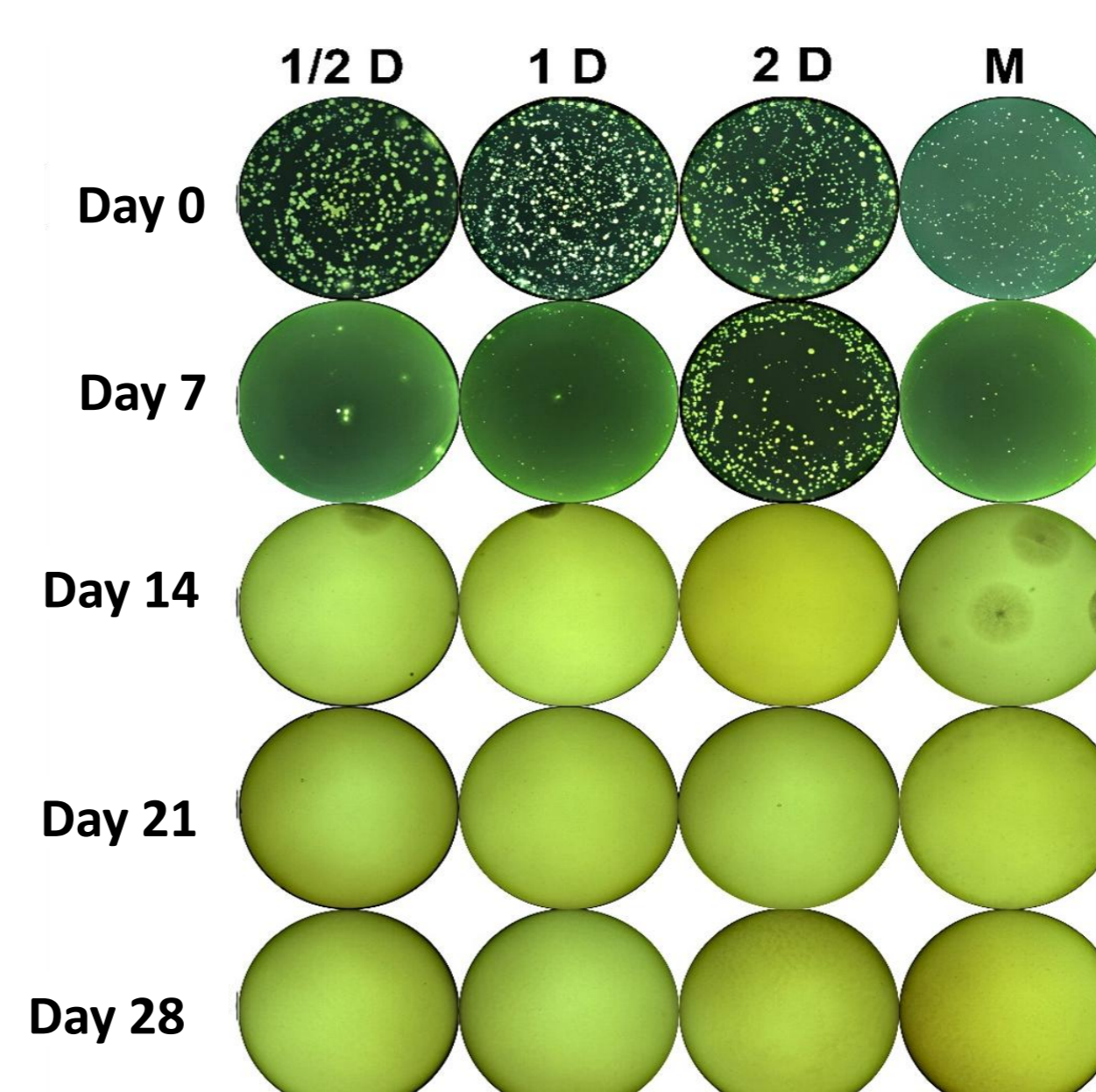


FIG 4. Illustration of the fungal population developed on each day of the experiment as a result of the application/non-application of the dose of fungicide of interest: 0 (M) = control soil sample without myclobutanil applied; 1/2D_myclobutanil = half of the normal dose of myclobutanil applied; D_myclobutanil = normal dose of myclobutanil applied; 2D_myclobutanil = double dose of myclobutanil applied

• References

- Alewu B., Nosiri C. 2011. Effects of Pesticides Exposure: Pesticides and human health. ed. 12, Editura InTech, Abuja. 250 p.
- Abbott D.A., Suir E., Duong G.H., de Hulster E., Pronk J.T., van Maris A.J. 2009. Catalase overexpression reduces lactic acid-induced oxidative stress in *Saccharomyces cerevisiae*. Appl. Environ. Microbiol. 75: 2320-2325.
- Ahmad W., Tayyab M., Aftab M.N., Hashmi A.S., Ahmad M.D., Firyal S., Wasim M., Awan A.R. 2020. Optimization of conditions for the higher level production of protease: characterization of protease from *Geobacillus*. Waste Biomass Valori. SBS-4S.

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