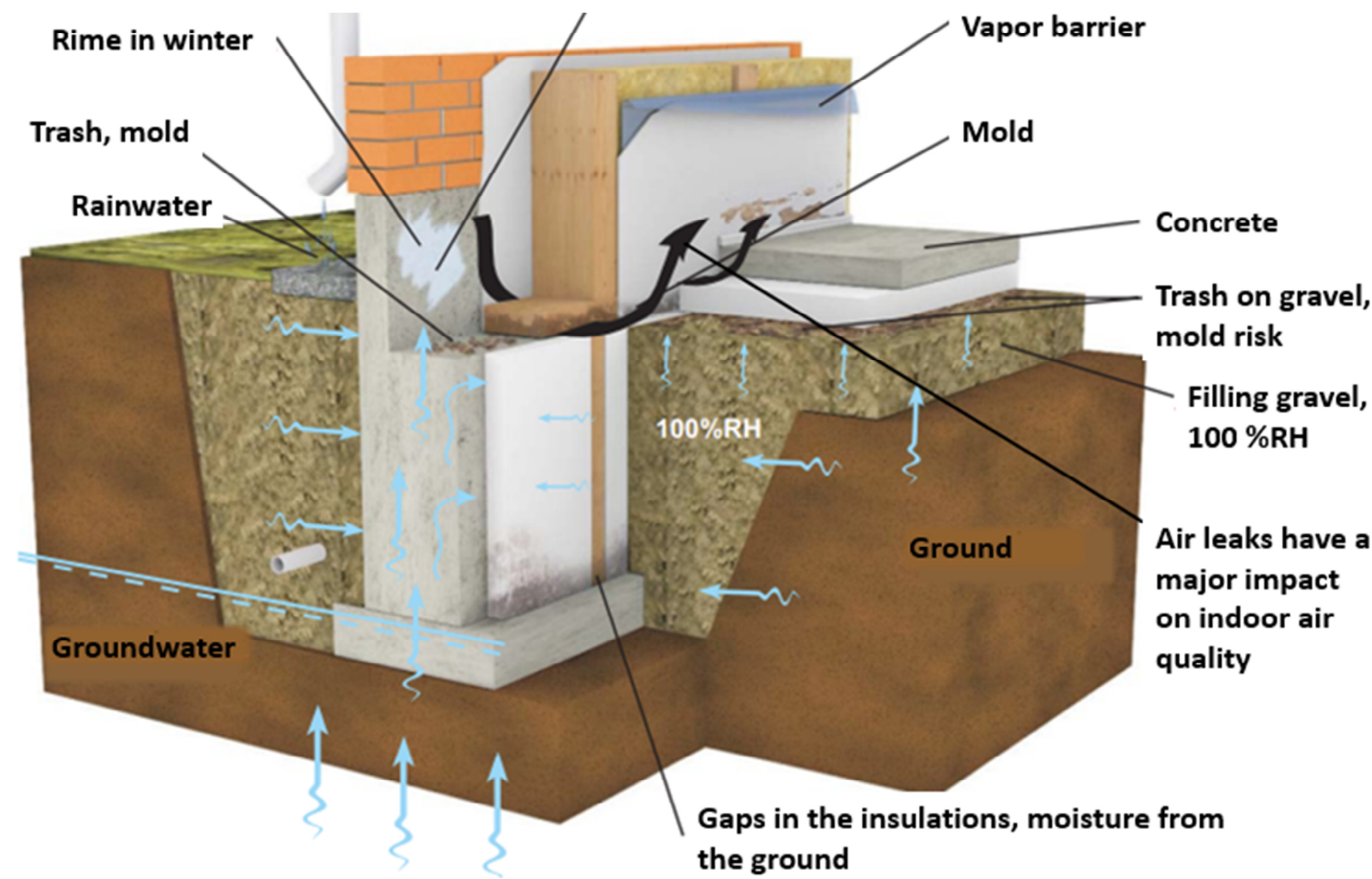


MICROBIAL GROWTH AND DIVERSITY IN BUILDING MATERIAL SAMPLES IN INDOOR AIR PROBLEM AND REFERENCE BUILDINGS

VUOKKO LAPPALAINEN, VESA KOSKINEN, MILLA RANTANEN, JANITA TÖRNROOS, TIMO MURTONIEMI
SIRATE GROUP LTD, VUOKKO.LAPPALAINEN@SIRATEGROUP.FI

INTRODUCTION

In the Healthy Building database project (2022–2024), detailed and classified indoor air data from condition surveys of public buildings in 2011–2022 have been collected into a relational database. About one third of surveys were carried out as a starting point for renovations, where no IAQ problems have been reported (control buildings). This article examines the results of microbial material samples analyzed by the direct culture method in IAQ problem and reference buildings. The purpose of the study is to produce significant new information to advance research on moisture damaged buildings and to refine analysis methods and repair recommendations.



Source: Moisture and mold problems, identify and examine the risk structure - teaching material. 2012. (In Finnish)

METHODS

- The dataset of 5603 material samples taken from structures of 343 buildings in Finland.
- 3180 samples from IAQ problem buildings.
- 1462 samples from control buildings.
- The samples were analyzed by direct cultivation method on three or four cultivation media: 2% malt extract agar (M2), dechlorane 18% glycerol agar (DG18), Rose Bengal chloramphenicol agar (Hagem), tryptone glucose yeast extract agar (THG).
- In this study, the results of the material samples were classified based on the analysis answers into three categories: 0= no microbial growth (-), 1= minor or moderate microbial growth and MIF (indicator ++ or >2 different indicator colonies), 2= distinct microbial growth (+++/++++).

CONCLUSIONS

- According to this study, only the amount and extent of the microbial growth in the structures has no connection with the reported indoor air problems.
- However, a more detailed analysis of the moisture damage indicator species may bring more detailed information in this matter.
- According to the current guidelines in Finland, the material samples are cultured on four different culture media. In this research material, the M2 and Hagem media are very similar based on the microbial results obtained.

RESULTS

The prevalence of mold growth in IA problem and reference buildings

The proportions of the sample results (0 to 2) in both IAQ and reference (CB) buildings are shown in Figure 1. In both building groups, there exists microbial growth in a quarter of the samples. The proportions of samples with no (0) or minor microbial growth (1) were also quite similar in both building groups. The observation is confirmed by the chi-square test that showed no statistical difference in the proportion of damaged samples in renovation sites and indoor air problem sites, $\chi^2(2, N = 4642) = 5.7, p = 0.06 > .05$.

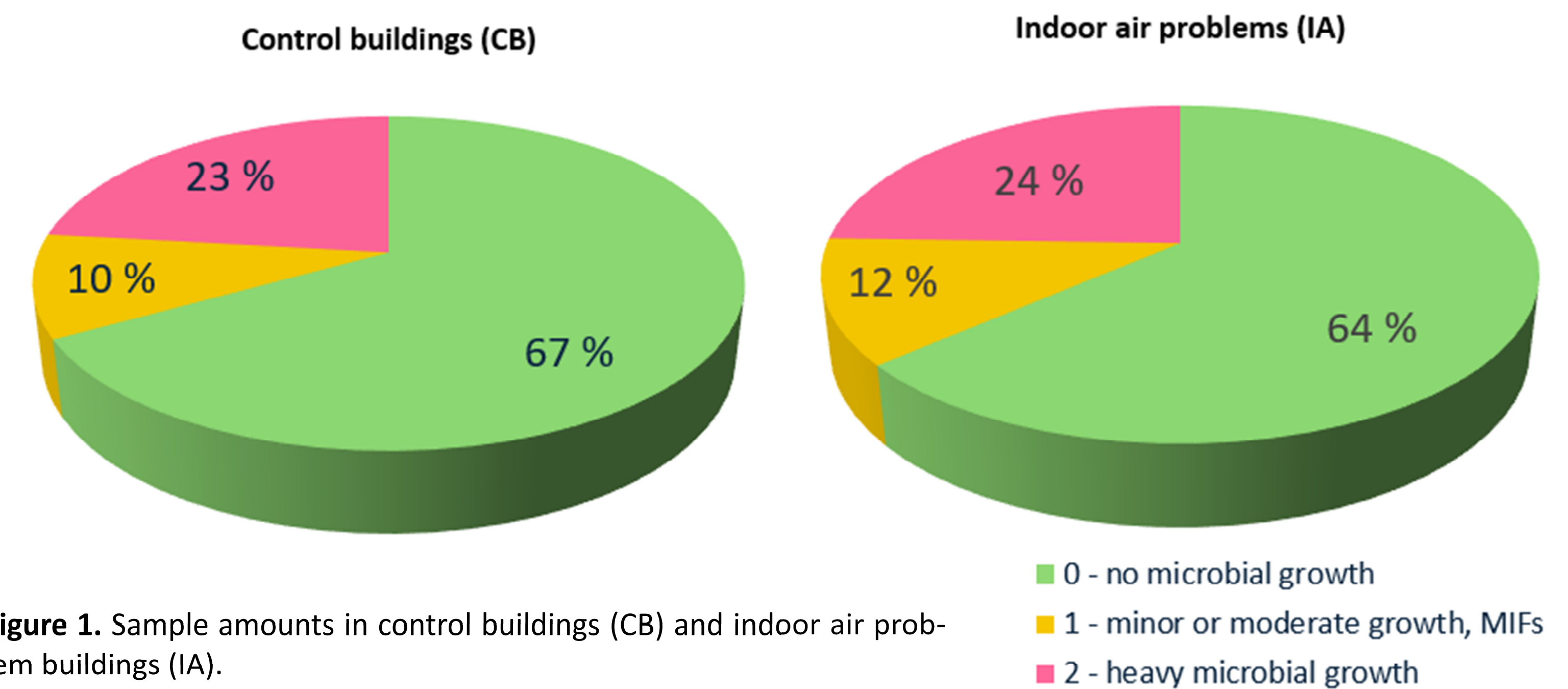


Figure 1. Sample amounts in control buildings (CB) and indoor air problem buildings (IA).

The amount of culture media

- Separately on DG18, M2, and Hagem media, more than half of the results were +/+ (minor or moderate microbial growth), which means species identification is required to interpret the result.
- On Figure 2 moisture indicator fungi percentages on DG18, M2, and Hagem media are presented. Based on the distribution per species (Figure 2) DG18 and M2 media best highlight the presence of moisture damage microbes in building material samples.
- All indicator species were observed more often on M2 than on Hagem.
- In addition, the difference between xerophilic fungi (DG18) and mesophilic fungi (M2, Hagem) and clear differences in indicator species distributions were observed.

ACKNOWLEDGEMENT

This study was funded by The Finnish Work Environment Fund and Sirate Group Ltd.

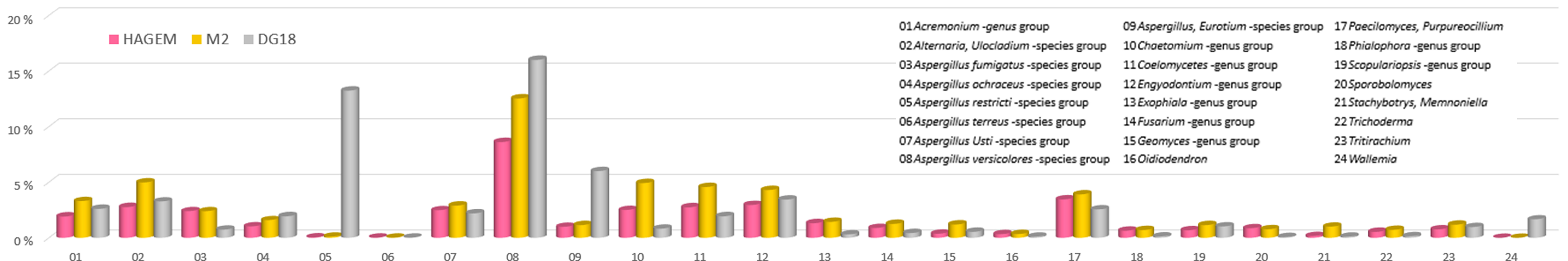


Figure 2. Percentages of the samples with Moisture indicator fungi (MIF) growth on DG18, M2, and Hagem media.