Green Façade to Improve Building Energy Performance in Summer and Winter

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**Abstract.** The need for a more sustainable and responsible approach to the territorial planning and managing is a date of fact. Systematic and widespread adoption of green systems can be a proper answer to that. With reference to the building sector, the application of green systems to the building envelope is the specific solution. These green technologies are passive systems which allow to increase buildings thermal control making these less energy-intensive. Among green systems for buildings, green façades seem to be a particular feasible solution. A long experimental test was carried out at the University of Bari, under Mediterranean climate conditions. An evergreen double skin green façade was tested together with an unvegetated wall to grasp their different energy behavior. The experiment was conducted throughout the year, allowing to study both the summer and winter functioning. Experimental data were used to compare microclimatic conditions characterizing the covered and the bare wall and to analyze the thermal energy transfer at the two walls. The presence of the green façade provided benefits both during summer and winter, at daytime and night-time, respectively. In summer days, the main positive effects concern the cooling of the wall surface and of the air near the wall. Sensible reduction of the energy input, thanks to solar shading and plant evapotranspiration was recorded too. In winter nights, the warming of the wall surface and of the nearby air and the lower air velocity near the wall were the most relevant effects. The reduced radiative and convective losses, thanks to the thermal and wind barrier role played by the vegetation, provided further advantages. The improvement of the building thermal performance due to the presence of green façade inevitably and positively affects the building energy requirements for cooling and heating. The findings of this research aid to increase the knowledge on the performance of green façades both in warm and cold periods and the specific benefits provided.