

## **A Literature Review Comparing the Effects of Different Binder Types on Hemp Building Block Properties**



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### **ABSTRACT**

Hemp-based building materials have been given renewed interest in academia in Türkiye over the last few years. Hemp-based building materials are among the most promising sustainable options due to their superior thermal performance, zero carbon footprint, good fire resistance, and biodegradability. However, hemp building blocks require further development because they have some disadvantages, such as low mechanical strength, high water absorption, and a lack of production standards. The type of binder used in the material directly affects these properties and the final performance of the material. This study primarily investigated and compared the effects of different binder types used in hemp-based building blocks on material properties. A total of 32 scientific sources and literature reviews published between 2013 and 2025 regarding experimental research on hemp-based building blocks using clay, lime, and MgO binders were analyzed. The effects of using clay, lime, and magnesium oxide (MgO) binders in hemp building block production on the physical properties of the material, such as mechanical strength, thermal performance, porosity, and density, were investigated. The results found in the literature were analyzed and compared considering different parameters such as binder type, binder/hemp ratio, binder/water ratio, hemp particle size, presence of additives, initial compaction, and production process. The literature review conducted has revealed that there are significant differences in the properties of hemp building blocks depending on the type of binder used. According to the studies examined, lime binders are the most commonly used type, exhibiting a low compressive strength and a low thermal conductivity depending on their density, while building blocks using MgO as a binder have comparatively higher mechanical strength and a lower thermal conductivity. Clay binders stand out with significantly lower carbon emissions because they do not require incineration like other binders and are readily available. Furthermore, hemp building blocks using clay binders have a very high hygrothermal performance. However, these blocks exhibit lower mechanical strength.

### **KEY WORDS:**

hemp block, binders, physical properties, thermal properties, mechanical properties