

Research Insight

Open Access

Factors Influencing Honey Quality in Different Production Environments

Hongjian Chen^{1,2} ✉¹ Hangzhou Linan Hongjian Bee Breeding Family Farm, Hangzhou 311313, Zhejiang, China² Zhejiang Agronomist College, Hangzhou 310021, Zhejiang, China✉ Corresponding author: 564871933@qq.comBioscience Methods, 2026, Vol.17, No.2 doi: [10.5376/bm.2026.17.0008](https://doi.org/10.5376/bm.2026.17.0008)

Received: 29 Jan., 2026

Accepted: 07 Mar., 2026

Published: 20 Mar., 2026

Copyright © 2026 Chen, This is an open access article published under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Preferred citation for this article:

Chen H.J., 2026, Factors influencing honey quality in different production environments, Bioscience Methods, 17(2): 82-94 (doi: [10.5376/bm.2026.17.0008](https://doi.org/10.5376/bm.2026.17.0008))

Abstract As a natural and nutritious food product, the quality of honey is subject to the combined influence of various environmental factors. Based on a comprehensive system of quality evaluation indicators, this paper systematically analyzes the mechanisms by which different environmental conditions impact honey quality, examining aspects such as physicochemical properties, nutritional composition, and functional activity. The study focuses specifically on exploring the pathways through which climatic factors (temperature, humidity, and precipitation), geographical environments (altitude, soil type, and vegetation), and ecological settings (pollution levels and biodiversity) influence honey quality. Furthermore, by integrating an analysis of nectar source plant structure, bee population characteristics, and foraging behaviors, the paper elucidates the underlying causes behind variations in honey composition. Additionally, the study examines the impact of processing and storage conditions on the stability of honey quality, and validates the pivotal role of environmental factors in shaping honey quality through comparative case studies of representative regions. The findings indicate that environmental conditions ultimately determine the nutritional value and sensory attributes of honey by influencing the composition of nectar source plants and the foraging behaviors of bees. This paper provides a theoretical foundation and practical reference for optimizing honey production environments and enhancing product quality.

Keywords Honey quality; Environmental factors; Nectar source plants; Climatic conditions; Quality evaluation

1 Introduction

Honey is a natural sweetener valued for its nutritional, sensory and medicinal properties, and its quality strongly shapes consumer trust, market price and regulatory control (Awulachew, 2025). Quality is defined by a combination of sensory, physicochemical, microbiological and bioactive parameters, which in turn depend on botanical and geographical origin, bee species, and production and storage conditions. The rapid growth of international trade, coupled with rising demand for “natural” and premium honeys, has intensified concerns around quality deterioration and fraud, making rigorous characterization of honey quality an important scientific and economic issue (Ntakoulas et al., 2024).

From a regulatory and technical perspective, honey quality is typically evaluated through moisture content, sugar profile (fructose, glucose, sucrose, reducing sugars), electrical conductivity, free acidity, diastase activity and hydroxymethylfurfural (HMF), alongside melissopalynological and sometimes sensory analyses. These parameters are codified in international and regional standards to ensure product stability, prevent fermentation, and detect overheating or poor handling (Vijan et al., 2023). At the same time, honey contains minerals, organic acids, phenolics, flavonoids, enzymes and volatile compounds that both influence its health value and provide fingerprints of botanical and geographical origin (Geană et al., 2020). Consequently, research has increasingly examined how soil, climate, floral resources, beekeeping practices, processing and storage jointly shape these physicochemical and bioactive traits in diverse production environments.

Current research spans broad mapping of composition and stability, as well as specialized work on authenticity and origin. Large regional surveys have quantified how floral origin, harvest year, region and climate affect sugars, acidity, conductivity, HMF and enzyme activities, often revealing significant differences among honey types and areas, and identifying non-compliant or adulterated samples (Tsagkaris et al., 2021). Comparative studies of local versus imported honeys, or honeys from contrasting climates, show consistent impacts of geographical origin and