

Review Article

Open Access

Seasonal Management Strategies for Improving Honey Production

Jianjun Xu ^{1,2} ✉¹ Lishui Chuzhou Bee Industry Co., Ltd, Lishui 323000, Zhejiang, China² Zhejiang Agronomist College, Hangzhou 310021, Zhejiang, China✉ Corresponding authors: 3466808409@qq.comGenomics and Applied Biology, 2026, Vol.17, No.4 doi: [10.5376/gab.2026.17.0019](https://doi.org/10.5376/gab.2026.17.0019)

Received: 26 Jun., 2026

Accepted: 31 Jul., 2026

Published: 15 Aug., 2026

Copyright © 2026 Xu, 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:

Xu J.J., 2026, Seasonal management strategies for improving honey production, Genomics and Applied Biology, 17(4): 240-253 (doi: [10.5376/gab.2026.17.0019](https://doi.org/10.5376/gab.2026.17.0019))

Abstract Honey production is strongly influenced by seasonal variations in floral resources, climatic conditions, and honeybee colony dynamics. Effective seasonal management strategies are essential for maintaining colony strength, optimizing foraging activity, and improving honey yield and quality. This review summarizes the key seasonal management approaches for enhancing honey production, including colony development regulation, nutritional supplementation, environmental adaptation, disease control, and advanced beekeeping technologies. During spring, stimulating colony expansion, preventing swarming, and synchronizing colony growth with major nectar flows are critical for maximizing honey collection. In summer, temperature regulation, supplementary feeding, and pest management help reduce heat stress and maintain colony productivity. Autumn and winter management focus on strengthening colonies, improving overwintering survival, and preparing for the next production cycle. Furthermore, precision beekeeping technologies, including environmental monitoring, intelligent hive systems, and data-driven management, provide new opportunities for optimizing seasonal decisions. Case studies of commercial honey production demonstrate that integrated seasonal strategies can significantly improve honey yield by coordinating colony development with nectar availability. Future research should focus on climate-smart beekeeping systems, genetic improvement, and the integration of artificial intelligence technologies to achieve sustainable and efficient honey production under changing environmental conditions.

Keywords Honey production; Seasonal management; Honeybee colony dynamics; Nectar flow; Precision beekeeping

1 Introduction

Modern apiculture depends on more than maintaining bee colonies alive; it requires aligning colony management with the annual biological cycle of the hive and the environmental conditions that shape nectar and pollen flows. Honey bee health and productivity are strongly linked to management practices, and large evidence syntheses show that colony management is one of the most frequently studied applied themes in beekeeping, alongside pathogen control (Gratzer et al., 2025). This importance is especially clear in regions where honey production remains below potential despite favorable ecological conditions, because low yields are often tied to suboptimal colony management, limited technical adoption, and weak alignment between beekeeping operations and seasonal resource availability (Nganso et al., 2024). Seasonal management therefore matters not only for colony survival, but also for profitability, pollination service continuity, and the efficient conversion of floral resources into marketable honey. At the biological level, colonies shift between summer and winter physiological states, and successful overwintering depends on seasonal transitions in brood rearing, nutrient storage, and the production of long-lived winter bees adapted to thermoregulation and spring restart (Knoll et al., 2020). For this reason, seasonal hive management is best understood as a strategic framework that coordinates feeding, colony strength, queen status, disease prevention, and harvest timing with predictable seasonal transitions in colony metabolism and resource use.

The relationship between seasonal environmental change and honey production is direct, multidimensional, and increasingly unstable under contemporary climate conditions. Beekeeping is one of the most weather-sensitive agricultural activities, and honey yield responds to short-term effects on bee flight and foraging as well as longer-term seasonal effects on plant phenology and blooming dynamics (Vincze et al., 2024). Seasonal conditions influence not only nectar secretion and foraging opportunities, but also colony growth, because the amount, richness, and diversity of pollen collected by honey bees vary significantly across seasons and are