planting time and pinching schedule affect days to first bud initiation, 50% flowering, and first harvest, while robotic or AI-based recognition can support standardized selective harvest under labor constraints (Khandre et al., 2025). Therefore, each harvested lot should be assigned a unique batch code linked to plot number, cultivar, seedling source, planting date, pinching or topping record, harvest date, harvest maturity, picker or device identity, and inspection result, so that later quality differences can be traced back to the biological and operational causes of the batch.

4.2 Processing procedures and recording of key parameters

Processing is the second major quality-control node, because post-harvest treatment directly affects storability, color, aroma, active compounds, and safety. Drying is consistently identified as a crucial post-harvest step for medicinal chrysanthemum, and different drying methods produce different outcomes in phenolics, flavonoids, amino acids, volatiles, shrinkage, and microstructure (Sun et al., 2022). Evidence across drying studies shows that process choice matters: infrared-assisted hot-air drying improved volatile retention and increased chlorogenic acid, luteolin, total phenolics, and flavonoids; tempering combined with infrared-assisted hot-air drying reduced drying time and energy use while increasing chlorogenic acid, luteolin, total phenolics, total flavonoids, antioxidant capacity, and volatile number; and pulsed vacuum drying preserved phenolics and flavonoids while yielding high chlorogenic acid and 3,5-dicaffeoylquinic acid under specific settings. These findings show that traceability records must capture not only whether drying occurred, but also the exact method, equipment, temperature, duration, tempering time, pulsed ratio where relevant, and endpoint moisture.

The kill-green step should be treated as a separate traceability item, because it is a critical determinant of downstream drying behavior and product quality. Kill-green increased water mobility and shortened subsequent drying time by up to 46.15%, and high-humidity air impingement kill-green for 60 s gave better PPO and POD inactivation, color, phenolic retention, amino acids, volatiles, and sensory acceptance than steam kill-green for the same duration (Xu et al., 2025). Earlier work similarly found method-specific optima, including microwave power of about 680~850 W for 8~13 min, steam kill-enzyme time of 2~4 min, kill-enzyme time of 0.5~1 min, and oven temperature of about 55~65℃, while another Hangbaiju study dried flowers at 50℃ to constant weight for later analysis. Processing traceability should therefore record the name and order of each process, start and end time, operator, equipment, environmental conditions, moisture measurements, and key quality indicators such as color, relative density, pH, extraction ratio, transfer rate, or fingerprint where applicable, since standardized process parameters are the basis for consistent evaluation of chrysanthemum products.

4.3 Packaging, storage, and batch information linkage

After processing, packaging and storage determine whether earlier quality control is maintained through circulation. In Chinese herbal medicine supply chains, storage errors and poor standardization in storage, transportation, and retail management remain recognized sources of quality risk, alongside problems from harvesting, processing, and packaging (Ngai and Shaw, 2025). Storage enterprises are expected to upload warehousing time, storage methods, and pest- and mold-prevention records, while warehouse humidity should be monitored in real time so that environmental conditions can be adjusted when materials fall outside the standard moisture range. Recent TCM traceability designs also treat warehousing as an independent sub-chain that records temperature, humidity, storage duration, and inventory level, and logistics records should include transport time, mode, and environmental monitoring during transit (Chen et al., 2026). For dried chrysanthemum specifically, final moisture content is a practical control target, and one community-scale processing model required moisture below 8% and vacuum-sealed packaging before distribution (Leelapattana and Assawarachan, 2025).

Batch linkage across packaging, storage, transport, and sales should preserve one continuous identity code from harvested raw material to final commercial unit. Existing herbal-medicine traceability systems number the planting, processing, purchasing, and selling links, upload package QR codes or barcodes with product name, specification, and manufacturer, and use blockchain or multi-chain architectures to connect stage-specific records while preventing tampering (He and Shi, 2021). Circulation systems based on blockchain, cloud platforms, and NB-IoT also support real-time collection, review, and third-party validation of source information, forming an