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# Achikka: First Global Documentation of a Pre-Gelatinised Tribal Millet Ready-to-Eat Food

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Tribal hill communities of South India maintain millet-based food systems of remarkable complexity, yet quantitative data on their consumption patterns remain largely absent from the scientific record. This paper reports findings from the first structured survey of traditional millet food consumption across five tribal communities, Toda, Kota, Irula, and Badugas in the Nilgiris, and Malaiyali in the Kollimalai Hills, conducted through household food-frequency questionnaires, 24-hour dietary recalls, and participatory processing observations. Thirty-four distinct traditional millet preparations were catalogued across both study areas. One product stood apart consistently in every community visited, a pre-gelatinised, sun-dried millet food known as Achikka, consumed without any further cooking by mixing with water, milk, or buttermilk. This paper presents the first scientific documentation of Achikka anywhere in the world. The product is manufactured through complete starch gelatinisation of millet grain by boiling, followed by thin-layer sun-drying to shelf-stable moisture levels. The dried grain reconstitutes instantly in cold or warm liquid, delivering a nutritious, palatable meal with no requirement for heat, fuel, or cooking equipment.

**Keywords:** Achikka; pre-gelatinised millet; finger millet; tribal food systems; traditional food processing; ready-to-eat food

## Introduction

Millets are experiencing renewed global attention following the United Nations International Year of Millets (2023), yet the living food cultures that have sustained millet consumption for millennia including sophisticated processing traditions have attracted far less systematic documentation than the crops themselves. The tribal hill communities of Tamil Nadu's Nilgiris and Kollimalai Hills maintain millet food systems of extraordinary diversity, but no quantitative study has previously described their consumption patterns or the foods produced within them.

This study was designed to produce the first structured quantitative account of millet food consumption in these communities, using household food-frequency questionnaires and 24-hour dietary recall methods. During fieldwork, a traditional food product, Achikka was encountered that is present and well-known in every community visited but that could be in no scientific publication, ethnobotanical survey, food science database, or ethnographic monograph anywhere in the world's literature. Every community knew it, women of all ages consumed it, agricultural workers described carrying it to the fields, mothers spoke of it as one of the first foods given to weaning infants. The food was entirely present in community life. It was simply absent from the written record.

This paper documents both the millet consumption survey findings and the first scientific description of Achikka, a pre-gelatinised, shelf-stable, ready-to-eat millet food of

profound practical utility and cultural significance. Documentation here does not constitute discovery, Achikka is fully known where it matters most. This paper establishes its existence in the scientific record, with the explicit intent of placing it in the public domain as prior art that cannot be subject to patent by any party.

## Study Area

### The Nilgiris

The Nilgiris plateau, situated between 1,000 and 2,600 m above sea level at the convergence of the Western and Eastern Ghats, is designated a UNESCO Biosphere Reserve (1986) and is home to four tribal communities included in this study. The Toda are pastoralists with millet cultivation at community margins. The Kota, traditionally artisans and musicians, maintain finger millet kitchen gardens around their settlements. The Irula are the most agriculturally active of the Nilgiris tribes and maintain the broadest millet species portfolio in cultivation. The Badugas integrate wild-gathered and cultivated millet in a distinctive food system. Survey work was conducted across twelve hamlets covering an elevation range of 1,050 - 2,150 m, deliberately chosen to capture variation in millet species composition and drying conditions relevant to Achikka production.

### The Kollimalai Hills

The Kollimalai Hills rise to approximately 1,300 m in Namakkal District and are occupied almost entirely by the Malaiyali tribal community. Physical isolation has historically contributed to preservation of traditional processing practices. Malaiyali agriculture operates across a pronounced elevational gradient, finger millet dominates higher fields, foxtail and kodo millet occupy mid-slope plots, little millet is grown in valley floors. Post-harvest processing in Kollimalai is notably collective women from neighbouring households gather to process grain communally following harvest, a social context highly relevant to knowledge transmission and to the community meaning of Achikka as a shared food.

Figure 1. Ethnographic survey conducted for dietary assessment using qualitative ethnographic approaches among the study participants

## Materials and Methods

The study combined quantitative dietary assessment with qualitative ethnographic approaches. Free, prior, and informed consent was obtained from community leadership structures and individual participants before any data collection began. Thirty households participated in the quantitative component; an additional 15 households engaged only in qualitative and processing documentation phases. Households were selected by systematic random sampling from census lists maintained by tribal welfare offices and gram panchayat records.

Each household completed a millet-specific food frequency questionnaire (FFQ) covering 41 items, validated through a six-week pilot phase, supplemented by three non-consecutive 24-hour dietary recall interviews administered at intervals of at least ten days to capture day-to-day variation. Portion sizes were estimated using calibrated household measures and a portable digital scale. Data were entered and analysed in IBM SPSS Statistics.

Achikka documentation was conducted through direct observation of preparation across 15 households in both study areas, recording each unit operation in written field notes and photographs. Semi-structured interviews with each lead preparer covered raw material selection, process decision points, quality indicators, storage practices, consumption patterns, and knowledge origins. A structured reconstitution assessment tested common liquid media with Achikka samples from multiple batches, evaluating reconstitution time, texture, and acceptability as assessed by community members.

## Results: Millet Consumption Patterns

### Species Diversity

Six millet species were documented in active consumption across the two study areas: finger millet (*Eleusine coracana*; locally kezhvaragu or ragi), foxtail millet (*Setaria italica*; thinai), kodo millet (*Paspalum scrobiculatum*; varagu), little millet (*Panicum sumatrense*; saamai), barnyard millet (*Echinochloa frumentacea*; kuthiraivali), and proso millet (*Panicum miliaceum*; panivaragu). Finger millet was consumed in virtually every surveyed household, anchoring the millet diet across all meal occasions. The breadth of this six-species portfolio far exceeds what surveys of non-tribal Tamil Nadu communities document, where typically one or two species appear in regular use a level of dietary millet complexity not previously quantified for this region.

### Consumption Frequency and Preparation Diversity

The majority of households consumed millet-based foods on five or more days per week, with a substantial proportion consuming them daily across all three main meal occasions. Morning meals frequently featured finger millet gruels or porridges, midday meals consumed away from home by agricultural workers were the primary context for Achikka and other field-portable preparations, evening meals most commonly featured cooked whole-grain preparations or flatbreads. Seasonal variation was pronounced, with post-harvest months showing the highest consumption frequencies and the lean pre-monsoon period showing notable reliance on processed storage foods, Achikka specifically being mentioned in both study areas as the food reserved for when cooking energy and food security are under greatest pressure.

Thirty-four distinct traditional millet preparations were documented across seven functional categories, whole-grain porridges, thin gruels, unleavened flatbreads, fermented beverages, leaf-wrapped steamed preparations, dry-roasted grain snacks, and processed storage foods. Achikka belongs to the last category but was consistently distinguished by community members for a single defining property and it requires no cooking.

## Achikka: First Scientific Documentation

### Name and Identity

The term Achikka is used consistently across both the Nilgiris and Kollimalai communities. In local language varieties, the root carries a sense of completion something already fully done, fully cooked. The name is technically precise, and it encodes the defining functional property of the product. No reference to Achikka or any product matching its description was found in ethnobotanical literature on the Nilgiris tribes, food science literature on South Indian millet products, ethnographic literature on Kollimalai Malaiyali communities, FAO or ICRISAT databases of traditional cereal foods, or any other source examined. This is the first documentation of Achikka in the scientific record.

### Raw Material

Finger millet is the grain of choice for Achikka production in both study areas, chosen for its reliable annual availability, the satisfying body of the reconstituted product, and superior keeping quality as raw grain. Grain selected for Achikka is held to a higher cleaning standard than grain for immediate cooking, as defects that might be masked in fresh-cooked preparations can become apparent after drying and storage.

### Preparation Sequence

Achikka is prepared through eight-unit operations:

**Step 1:** Grain is winnowed and hand-picked to remove dust, chaff, stones, and damaged seeds more thoroughly than routine pre-cooking cleaning.
**Step 2:** Approximately half the observed households-soaked cleaned grain in cold water for 2-4 hours before cooking, reporting reduced cooking time and more even gelatinisation.
**Step 3:** Grain is placed in 3-4 volumes of water and cooked over a wood or biomass fire with regular stirring until fully swollen, uniformly soft when pressed, and the cooking water is thick and starchy. Experienced preparers describe the endpoint grain as feeling as though it has 'no centre left.' This is the most skill-intensive step.
**Step 4:** Gelatinised grain is drained through a bamboo sieve for 10–20 minutes, producing a cohesive, sticky mass described as 'wet but not dripping.'
**Step 5:** Drained grain is spread in 1–2 cm layers on bamboo mats, flat rock surfaces, or clean plastic sheets placed in direct sunlight.
**Step 6:** Drying takes 2-3 days under favourable conditions clear sun, low relative humidity, moderate breeze with daily turning and breaking of clumps. The endpoint is identified acoustically and properly dried Achikka makes a dry rattling sound when shaken.
**Step 7:** Some households use whole-grain Achikka; others pound or grind to a coarse or fine powder. Powdered Achikka produces a smoother reconstituted product; whole-grain form retains textural character.
**Step 8 – Storage:** Dried Achikka is stored in sealed clay pots, lined baskets, or metal/plastic containers in cool, dry, dark conditions. Preparers report shelf lives of 3-6 months, with some reporting successful use after nearly one year.

**Consumption**

Achikka is consumed by placing 2-4 tablespoons of whole-grain or 1-2 tablespoons of powdered product into a vessel and pouring liquid over it, reaching edible consistency within 30 seconds to 2 minutes. Cold buttermilk is most commonly used by agricultural workers, valued for cooling properties and its lactic tang. Fresh milk is preferred for children and elderly household members. Warm water is used when other liquids are unavailable. Sweetened preparations with dissolved jaggery are common morning foods; savoury preparations with salt and dried chilli in cold buttermilk are the standard field food form. The adaptability of Achikka to a wide range of liquid media and flavour directions is itself a significant practical asset.

**Food Science Basis**

Native millet starch granules are semicrystalline structures that are water-insoluble in cold conditions and require heating to gelatinise (approximately 74–80°C for finger millet). Boiling causes irreversible disruption of this crystalline order. When the pre-gelatinised grain is subsequently dried, the amorphous starch structure is preserved in collapsed form. On rehydration, water re-enters the open network without any gelatinisation energy threshold to overcome, explaining why Achikka reconstitutes in cold liquid within seconds to minutes (Tester and Karkalas, 2002). This principle pre-gelatinisation followed by drying is the same that underlies industrial instant cereals, achieved here through traditional knowledge rather than controlled industrial equipment.

Shelf stability is achieved through water activity control. Thorough sun-drying in the low-humidity hill environments of both study areas reduces moisture to below 12% (wet weight basis), placing water activity below the threshold for microbial growth (Beuchat, 1981). Nutritionally, finger millet provides approximately 344 mg calcium and 3.9 mg iron per 100 g of whole grain; gelatinisation and drying do not remove the bran layers where these nutrients are concentrated (Devi et al., 2014). Extended boiling also reduces phytate and tannin concentrations, potentially improving mineral bioavailability relative to quickly cooked preparations (Sripriya et al., 1997).

## Conclusion

This study provides the first quantitative documentation of millet food consumption patterns among five tribal communities of the Nilgiris and Kollimalai Hills, Tamil Nadu. Six millet species are in active daily use across thirty-four distinct traditional preparations, a dietary

complexity without precedent in the documented literature for this region. Within this richness, Achikka stands apart as a technically sophisticated traditional ready-to-eat food: pre-gelatinised by complete starch transformation, dried to shelf-stable moisture levels without refrigeration, reconstituted in seconds without heat, and nutritionally dense. It has served agricultural workers, mothers, children, the elderly, and entire communities through seasons of scarcity for generations within these hill communities.

This paper places Achikka on the public scientific record for the first time, establishing clear prior art. The Achikka preparation method, as practised by the tribal communities of the Nilgiris and Kollimalai Hills, is hereby recorded as an indigenous traditional food technology in the public domain. Any future commercial development of products inspired by the Achikka principle should involve the originating communities like Toda, Kota, Irula, Badugas, and Malaiyali as co-developers and beneficiaries. Future research priorities include systematic physical and nutritional characterisation, water activity measurement across storage durations, and process standardisation that translates traditional quality indicators into communicable technical parameters.

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