AGRI MAGAZINE
(International E-Magazine for Agricultural Articles)
Volume: 03, Issue: 11 (November, 2026)
Available online at http://www.agrimagazine.in
©Agri Magazine, ISSN: 3048-8656

Climate-Resilient and Nutri-Smart Fruit Varieties: Preparing Indian Orchards for a Changing Climate

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Indian orchards now face hotter flowering seasons, unseasonal rain and new pests. ICAR institutes are responding with fruit varieties that withstand such stress and also offer more nutrition. This article explains what climate-resilient and nutri-smart varieties are, reviews recent mango and guava releases from ICAR-CISH, and shows how growers can put them to use.

Keywords: Climate-resilient varieties; nutri-smart fruits; mango; guava; ICAR-CISH; vitamin C; high-density planting; clean planting material

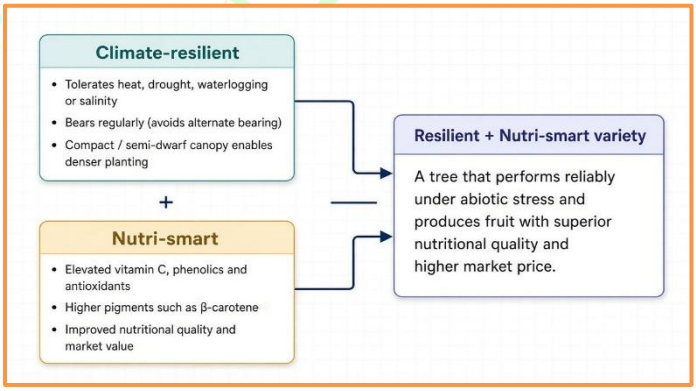
Introduction

A fruit variety was once judged mainly on yield, fruit size and colour. These traits still matter, but they are no longer enough. In northern India, sudden rises in temperature at flowering and unseasonal rain have become more common, and climate change is also bringing new and more virulent pests and diseases. Breeders have therefore added two goals: stable production under stress, and higher nutritional value.

Understanding climate-resilient and nutri-smart varieties

Climate-resilient varieties keep producing under adverse weather. They may tolerate heat, drought, waterlogging or salinity, and they bear regularly, avoiding the swing between heavy and light crops known as alternate bearing. Dwarf or semi-dwarf canopies are also useful, because they allow closer planting and make spraying and harvesting easier.

Nutri-smart varieties are selected for nutritional quality as well as yield. They contain more vitamin C, phenolic compounds and antioxidants, or pigments such as β-carotene. For the grower this adds market value; for the consumer it means a more nutritious fruit. The most useful releases combine both qualities: a tree that performs in a difficult season, and a fruit that earns a better price.



ICAR's breeding priorities

On its 98th Foundation Day (16 July 2026), ICAR reported 386 improved varieties across 44 crops in the past year. According to the Union Agriculture Minister, 94% of these are climate-resilient and 29 are biofortified. These figures cover all crops, not fruits alone, but they show clearly the direction of national breeding programmes (ICAR).

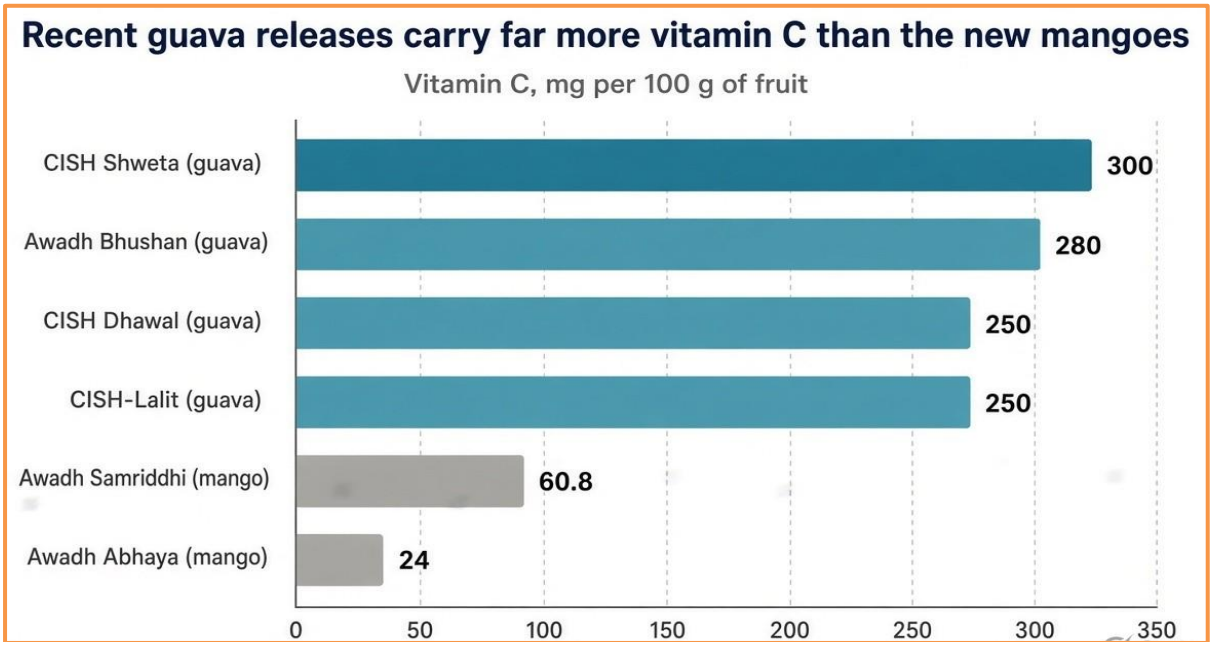
Fruit research follows the same direction. The 13th Group Discussion of the All India Coordinated Research Project (AICRP) on Fruits, held at Pantnagar in February 2026, stressed research under climate change and the need for disease- and pest-resistant varieties. Results were presented from 49 centres across the country (GBPUAT).

Mango and guava: recent releases from Lucknow

The ICAR-Central Institute for Subtropical Horticulture (CISH), Lucknow, released several mango and guava varieties in 2024 and 2025, most of them notified for Uttar Pradesh. The institute describes its 2025 mango releases as climate-resilient and nutri-smart (Indian Horticulture, March–April 2026). The main features are summarised below.

Variety	Crop	Released	Why it stands out
Awadh Abhaya	Mango	2025	Very late, regular bearer; 24 mg vitamin C and 68 mg phenols per 100 g; firm fruit with up to 15 days' shelf life; about 89.5 kg/tree at 10 years
Awadh Samriddhi	Mango	2025	Semi-dwarf, regular bearer; 60.8 mg vitamin C and 106 mg phenols per 100 g; about 90 kg/plant at 10 years; tolerates rainfed conditions with assisted irrigation
CISH Arunika	Mango	2024	Dwarf, compact canopy for high-density planting; rich in β-carotene and mangiferin; about 70 kg/plant at 10 years
CISH Ambika	Mango	2024	Late, regular bearer with attractive colour for export; 21 °Brix; about 80 kg/plant at 10 years
Awadh Bhushan	Guava	2025	About 280 mg vitamin C per 100 g; responds to pruning, suits high-density planting; about 80 kg/tree at 6 years
CISH Shweta	Guava	2024	Snow-white pulp, about 300 mg vitamin C per 100 g, few soft seeds; about 90 kg/tree at 6 years
CISH Dhawal	Guava	2024	Soft-seeded, about 250 mg vitamin C per 100 g; roughly 20% more yield than Allahabad Safeda

Two points deserve attention. Three of the four mangoes are crosses with Amrapali, a regular-bearing parent, and two of them are dwarf or semi-dwarf, which suits high-density orchards. The guava varieties carry 250–300 mg of vitamin C per 100 g, a clear nutritional advantage that growers can use in marketing.



Indian Horticulture, Mar–Apr 2026 (ICAR-CISH variety descriptions) · 6 varieties

Each of the four guavas holds at least four times the vitamin C of the richer of the two mangoes.

CISH also released the jamun variety Awadh Jamwant and two bael selections, Awadh Arpan (drought-tolerant and early ripening) and Awadh Shrestha, applying the same approach to minor fruits. Among other recent releases, ICAR-IIHR, Bengaluru, introduced the jamun Arka Jamun Pride and the pummelo Arka Siva in May 2026 (ICAR).

What growers can do now

1. **Confirm regional suitability.** New varieties are often notified for particular states or zones. Consult the nearest Krishi Vigyan Kendra or the state horticulture department before ordering plants.
2. **Use clean, true-to-type planting material.** Participants at the February 2026 AICRP meeting noted limited availability of planting material for non-traditional fruits. The Government is also strengthening the Clean Planting Material Programme, including in Uttar Pradesh (FreshPlaza). Buy only from registered nurseries.
3. **Match the variety to the planting system.** Types suited to high-density planting, such as Arunika (mango) and Awadh Bhushan (guava), need pruning and canopy management from the first year.
4. **Choose rootstock and practices with care.** The variety is only one factor. The AICRP recommended the Dogridge rootstock for grapes in Tamil Nadu and clump management in banana for higher yield in Assam, Andhra Pradesh and West Bengal (ICAR).
5. **Plan the market early.** Late-maturing mango types can extend the marketing season, and the Agriculture Minister has urged greater attention to quality, shelf life and export standards.

The road ahead

Breeding work continues. The AICRP on Fruits has planned new multi-location trials in banana, kamalam (dragon fruit), rambutan, sapota, guava and mango, so that promising selections are tested across regions before release (ICAR). Participants also recommended registering new varieties with the PPV&FR Authority and using AI applications in future research (GBPUAT). A new variety is not a complete solution. Resilience claimed on paper must be confirmed in the field, and growers still need quality planting material, balanced nutrition and timely plant protection. Where variety, planting system and marketing plan are chosen together, however, orchards will be better prepared for the seasons ahead.

In brief

- ICAR reports 386 improved varieties in a year, 94% of them climate-resilient (all crops).
- Recent CISH mango and guava releases combine regular bearing with high vitamin C, phenols or β-carotene.
- Other recent releases include the jamun Arka Jamun Pride and the pummelo Arka Siva (ICAR-IIHR, May 2026).
- Before planting, confirm regional suitability and use clean planting material.

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