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SHORT COMMUNICATION

Identification, Description, and Establishment of a Year-Round Fruiting Type in Jackfruit (*Artocarpus heterophyllus* Lam.) Germplasm

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Abstract

A unique jackfruit germplasm (IC-0650715) with year-round fruiting is identified, characterized and conserved at the ICAR-NBPGR regional station, Ranchi. The germplasm was collected from Domtoli, Simdega and grafted plants are conserved in the field gene bank. Jackfruit in Jharkhand is primarily used for vegetable purposes and is relevant for meeting consumer demands during off-seasons. IC-0650715 fetches a higher price during the offseason, offering a commercial advantage to farmers.

Keywords: Jackfruit, *Artocarpus heterophyllus* Lam., year-round fruiting, Germplasm conservation.

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Introduction

Jackfruit (*Artocarpus heterophyllus* Lam.) is a member of the Moraceae family and originates from India's south-western rainforests (Boning, 2006). It is cultivated in tropical regions such as India, Bangladesh, Nepal, Sri Lanka, Cambodia, Vietnam, Thailand, Malaysia, Indonesia, Myanmar, and the Philippines due to its numerous applications and nutritional benefits. Compared to other fruits, jackfruit has higher levels of protein, calcium, iron, vitamins, and other essential minerals (Prem *et al*., 2015). Despite its nutritional advantages, jackfruit is considered an «underutilized crop» due to ignorance, lack of post-harvest technology, and shortcomings in supply chain systems leading to the wastage of fruits (Nair *et al*., 2017).

Jackfruit is cultivated across India, with certain states, such as Jharkhand, being particularly popular for its cultivation (Choudhary *et al*., 2022). According to the annual report of the National Horticultural Board of India, for the year 2021-22, Jharkhand ranked sixth in jackfruit production. Jackfruit cultivation in Jharkhand is a significant agricultural practice with social and cultural importance. The Sanskrit name for jackfruit, «phanasa,» is thought to be borrowed from Mundari, the indigenous language of the Mundas, a tribal ethnic group of Jharkhand, Madhya Pradesh, Bihar, and Odisha (https://map-india.org/). The Mundas have a rich intangible folk tradition, reflected in activities like the Jackfruit game, also known as Kantara-Lnu. In Jharkhand, jackfruit is commonly found along roadsides and in tribal communities' homesteads. The jackfruit is a versatile species that provides food, timber, fuel, fodder, medicinal, and industrial products. The fruit is the primary

economic product, used both when mature and immature. The flakes obtained from ripened fruit are sweet and are used as a dessert or preserved in syrup. The fruits and seeds are also processed for food and other products. Jackfruit value-added products include chips, papads, pickles, ice cream, jelly, sweets, beverages like squash, nectar, wine, preserved flakes, etc. When unripe (green and tender), it is remarkably similar in texture to meat. Tender jackfruits are used for vegetable purposes and have gained popularity as a vegetarian alternative to meat due to their similar texture (APARI 2012, Stukin, 2016). Un-ripened jackfruit, preserved in brine and canned, is known as «vegetable meat.»

Using tender jackfruit for vegetable purposes is an age-old practice in India, especially in Bihar and Jharkhand. Usually, off-season jackfruit, available early or late in the season, is used for vegetable purposes. The jackfruit genotype that produces fruits throughout the year is quite popular in Jharkhand. It provides a consistent source of fruits that command higher prices in the off-season and is specifically used for vegetable purposes. Additionally, it is of great interest to researchers due to its unique biological characteristics and potential agricultural applications.

Based on the information obtained from the locals, we identified a prolific, year-round fruit producer in Domtoli, Simdega. The geo-coordinates collected during the collection are mapped using DIVA GIS (Figure 1). Simdega, situated in the south-western part of Jharkhand and part of the Netarhat-Ranchi plateau region, is at 22.62°N 84.52°E, with an average elevation of 418 m (1371 feet). The temperature varies from 3 to 38°C, and the average annual rainfall is around 1100 to 1200 mm.

Scions were collected from the source tree and propagated through grafting. The grafts were then allowed to grow for one year under net house conditions. This ensured the establishment of graft and the development of roots. Subsequently, the grafts were transferred to the field gene bank at ICAR-NBPGR regional station, Ranchi, for conservation. The passport data was deposited to ICAR-NBPGR, New Delhi, for IC number (Table 1). The IC number assigned to this accession is IC No-0650715.

IC No. 0650715 produces fruit round the year and is locally known as Barahmasi/Barahmoia kathal. The term is derived from two words «Barah,» which means twelve and «Mas/Mah» which means months.

The morphological traits of the source tree were recorded under field conditions (Figure 2). The observations were made according to the DUS descriptor developed by PPV & FR Authority India. The tree crown shape is spherical. Leaves are obovate with an acuminate apex, rounded base, and blisters on the upper surface. Leaf orientation is horizontal and the posture is flattened. Clavate-shaped fruits are born solitary throughout the tree, including roots. Stalk's attachment to fruit is depressed. Fruits are medium-sized and brown-coloured with sparse, pointed spines on the rind. The inner rind is thick, the core diameter is low and the latex exudate is high. Mature fruit bears soft, sweet,

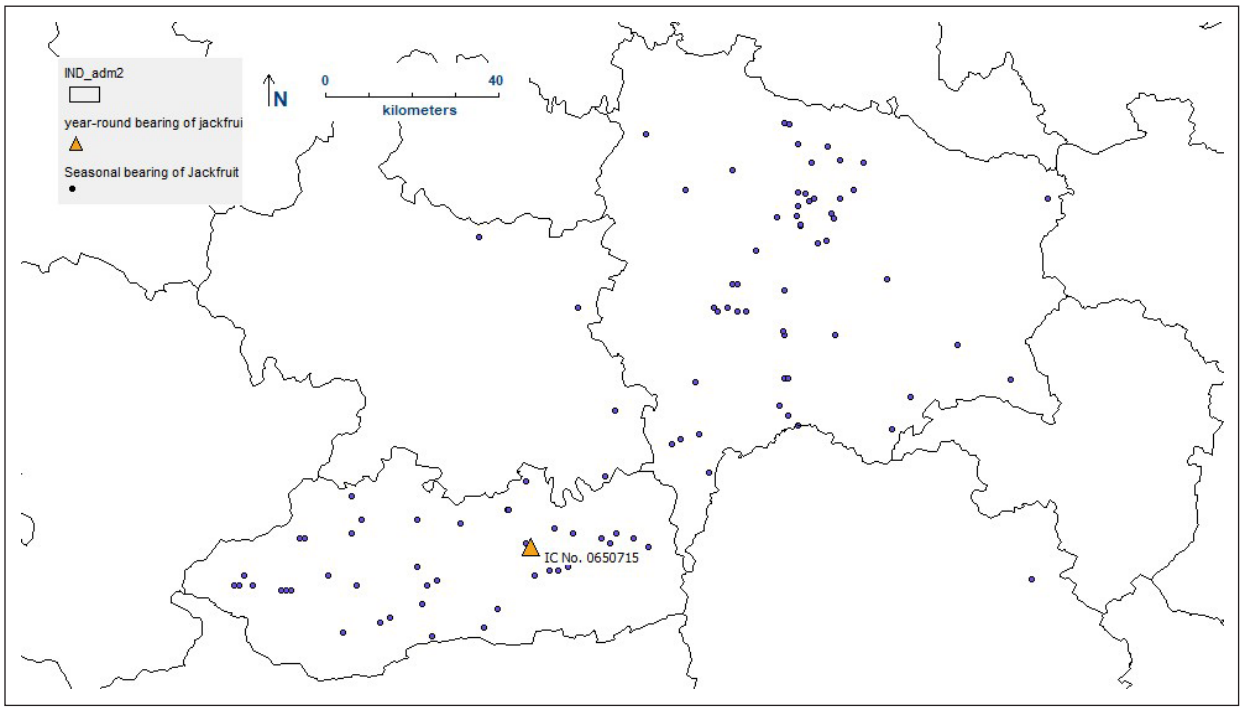

Figure 1: Mapping of coordinates indicating the area surveyed and place of germplasm collection

Table 1: Passport data of IC No 0650715

S.No.	*Items*	*Details*
1	Accession	IC-0650715
2	Alternate ID/Collectors No.	SA/NR/AK-2
3	Material Type	Grafts
4	Crop Species	*Artocarpus heterophyllus* Lam.
5	Common name	Jackfruit
6	Cultivar Name	Barahmasi Kathal
7	Bio-Status	Landrace/Traditional Cultivar
8	Sample Method	Selective
9	Sample type	Scion
10	Date of Collection	22 Nov 2021
11	Place (Village/Block/ District/State)	Domtoli/Kolebire/Simdega/ Jharkhand
12	Source	Private House
13	Frequency	Occasional
14	Habitat	Semi Cultivated
15	Pedigree	NA
16	Donor	Avinashi Baga
17	Trait	Year-round, prolific bearer
18	Latitude	22.62°N
19	Longitude	84.74°E
20	Altitude	497 AMSL

yellow-coloured flakes, which are thin, short, and irregular in shape. Flakes have oblong and white seeds.

Simdega is mainly a rural district, with 94% of its population inhabiting rural areas. The district is primarily settled by the Scheduled Tribes (ST), making up 70.2% of the population, possibly the highest in Jharkhand. The major tribal groups in the district are Munda, Oraon, and Kharia. A few families belonging to the primitive tribal group, such as Asur and Birhor, also live in the district. The relationship between the tribals and jackfruit is evident in a local game dedicated to this fruit called the Jackfruit game -Kantara-Lnu (Jena *et al*., 2020). The game is based on the social and cultural traditions of the Ho and Munda communities. It involves a dramatic presentation of stealing jackfruit, which is collected specifically for offering to the gods during pujas to ensure the well-being of society. It is believed that whoever steals the jackfruit will face the wrath of god. If the players cannot locate the stolen jackfruit, they call upon a religious performer to conduct a propitiation session, known as Sham Puja, to appease the gods. Immediately after the religious performance, the jackfruit is usually found, which is believed to be the result of divine intervention. This game symbolizes the folk behaviour and traditions of seeking the goodwill of the gods and spirits in the interest of society. It is also a way to protect the fruits from theft, a common practice in the village.

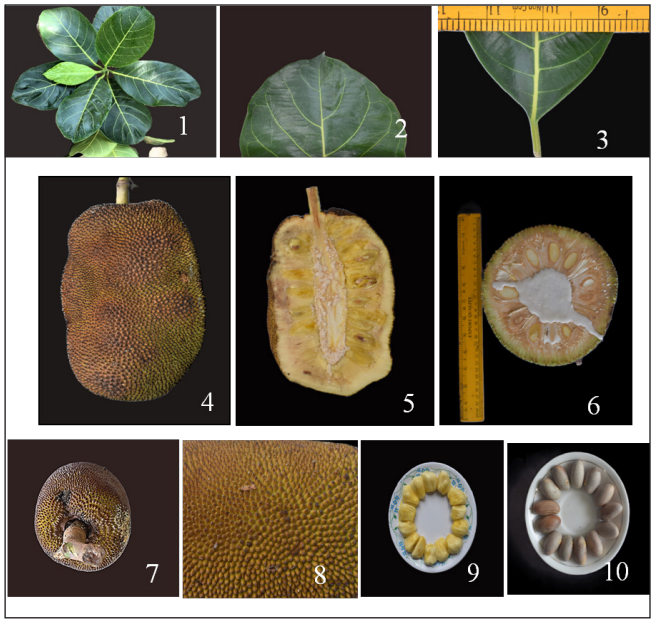

Figure 2: Morphological characteristics of IC No 0650715. 1. Leaf orientation (Horizontal), 2. Leaf apex (Acuminate) 3. Leaf base (rounded), 4. Fruit (Clavate shaped, medium-sized, brown in colour), 5. Vertical section, 6. Cross section, 7. Stalk attachment (depressed), 8. Spine shape (Pointed), 9. Flakes (irregular shape, thin, yellow), 10 seeds (oblong, white)

Apart from social and religious connotations, tender jackfruits are used for cooking, while mature fruits are used for table purposes. Flakes obtained from unripened but mature fruits and seeds from ripened fruits are also used for cooking purposes, and the inflorescence is used in salads. The leaves are preferred as fodder for goats. Additionally, the jackfruit has medicinal properties utilized by tribal and local Vaidya. The leaves can help with fever, boils, wounds, and skin diseases. The young fruits are acrid, astringent, and carminative, while the ripe fruits are sweet, cooling, laxative, aphrodisiac, and can also be used as a brain tonic. The seeds are diuretic and constipating. The wood is a nervine, anti-diabetic, and sedative and can be useful in convulsions. (Hembrom, 1996; John *et al*., 1999). The Jack tree wood is used as firewood, for making furniture, musical instruments, *etc*.

The rising popularity of tender jackfruit as a substitute for meat has led to a significant increase in its global market demand. This genotype holds immense potential in the market. The tribal community of Domtoli, Simdega, has been harnessing the versatility of jackfruit for culinary purposes, particularly as a vegetable. The custodian farmer of IC No 0650715 has revealed that the jackfruit she produces serves both her family's needs and is sold in the local market. Despite the prevalent theft of tender jackfruit, she harvests an impressive quantity—around 200 or more tender jackfruits, each weighing approximately 0.8 to 1.5 kg, from a single tree. This harvest is done in batches of 40 or more fruits at a time, allowing her to sell the produce at a

premium price during the off-season and use it for personal consumption during the main season when the price is less. She mentioned that she earns roughly 20 to 30 k per year by selling a portion of the produce during the off-season from a single tree that is over 100 years old. It provides a continuous supply of vegetables and a stable source of income for the native people in the region. Expanding the cultivation of this genotype on a large scale, supported by organized market initiatives, can fully realize its market potential.

In Jharkhand, jackfruit is primarily grown for vegetable purposes and is often seen growing by the roadside or practically in the backyard of every household. In addition to fetching a higher price, vegetable jackfruit minimizes post-harvest waste, allowing farmers to make more money. It is more expensive in the off-season and becomes the most popular alternative during India's festivities when most Hindus abstain from eating non-vegetarian cuisine. There is a global trend among people to choose vegetarian meals; jackfruit is the best choice under such circumstances. Consequently, it has gained worldwide traction among vegetarians. Considering this, a jackfruit cultivar with extended or year-round availability is highly sought after. It provides a consistent source of fruits that command higher prices in the off-season, enabling farmers to get a premium price for their produce. IC 0650715 produces fruits throughout the year and is suitable for cultivation for commercial gain. Besides commercial gain, this trait also has important scientific implications for researchers and jackfruit breeders. The jackfruit germplasm that bears fruit year-round can lead to insights into plant physiology, genetics, and agricultural practices, with potential benefits for crop improvement, food security, environmental conservation, and resilience to climate change, hence valuable germplasm for our field gene bank

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Data Availability

Data is included in the paper. Any further information is available on a request basis.

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Author Contribution

- Shephalika Amrapali: Survey, identification, and collection of germplasm, data recording, preparation, review, and editing of the manuscript
- S.B. Choudhary: Survey and identification of germplasm
- Raj Kumar Gautam: Review and editing of the manuscript
- Gyanendra Pratap Singh: Review and editing of the manuscript

Conflict of Interest

The authors declare no conflict of interest.

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