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KNM 7037 (IET 28356) – A HIGH YIELDING, EARLY MATURING LONG SLENDER PJTAU RICE VARIETY SUITABLE FOR THE STATES OF ODISHA, UTTAR PRADESH AND WEST BENGAL

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ABSTRACT

KNM 7037 (IET 28356) is a promising high-yielding rice genotype characterized by long-slender grains and early maturity (115–120 days). It possesses high yield potential of about 5716 kg ha{ ^{1} and exhibits moderate resistance to leaf blast, contributing to its wide adaptability across diverse environments. Across multi-location agronomic nutrient management trials, KNM 7037 (IET 28356) produced higher grain yield with 100% recommended nitrogen (150 kg N ha{ ^{1}) than with 50% recommended nitrogen, indicating its responsiveness to the full recommended nitrogen dose for realizing optimum yield potential. The genotype, developed from the cross between KNM 605 and KNM 118, was subsequently released by the Central Varietal Release Committee for cultivation in the states of Odisha, Uttar Pradesh, and West Bengal. The variety has a semi-dwarf growth habit with moderate tillering capacity, green foliage, semi-erect flag leaves, and well-exerted semi-compact panicles with a semi-erect branching pattern. The grains are awnless, straw-coloured, translucent, and classified as long slender. It recorded a head rice recovery of 62.3% and an amylose content of 23.33%, making it suitable for consumer preferences and market requirements. Owing to its high productivity, favourable grain quality and resistance to leaf blast, the variety is recommended for cultivation during *kharif* season throughout Odisha, Uttar Pradesh, and West Bengal.

KEYWORDS: Amylose, blast, early duration, KNM 7037, long slender

Rice (*Oryza sativa* L.) is fundamental to global food security, serving as the primary dietary staple for over half of the world's population. Its significance is particularly evident in Asia, which contributes approximately 90% of global production and consumption (Geng *et al*., 2025). Notably, India allocates nearly 50 million hectares for rice cultivation, resulting in an impressive annual output of 145 million tons [Geng *et al*., 2025]. Recent analyses indicate that approximately 35% of global rice harvested areas are experiencing stagnation in yields and have reached a plateau in various countries. In parallel, grain quality has become a top priority for producers, millers, and consumers due to its key role in fetching premium market prices. The rising demand for high-quality rice fuelled by improved living standards and greater awareness of its nutritional benefits necessitates breeding programs that produce varieties excel in both yield and grain quality (Verma *et al*., 2024). Rice cultivation confronts escalating threats from climate variability, environmental stressors, and progressively erratic meteorological pattern (Gupta *et al*., 2025). These exigencies underscore the urgent need to develop climate-resilient, high-yielding rice varieties besides having quality to secure future food supplies, particularly amid projections of burgeoning global population and escalating rice demand (Katiyar *et al*., 2025). In this context, adoption of early-maturing rice varieties serves as a critical adaptation strategy to enhance mean yields while simultaneously mitigating exposure to climatic variability, production uncertainty, and downside yield risks. Beyond risk mitigation, these varieties offer the potential for increased cropping intensity, enabling farmers to optimize land use and achieve higher total annual productivity within a single growing year (Anshori *et al*., 2024). Furthermore in India, rice blast continues to be a primary biotic constraint, with significant yield reductions of 27% to 35% observed during natural epidemics in major rice-growing states (Ragulakollu *et al*., 2025). The development of rice cultivars with broad-spectrum resistance is widely recognized as the most cost-effective and environmentally sustainable strategy for managing rice blast disease (Feng *et al*., 2022). Considering these challenges, a targeted breeding programme was initiated to develop high-yielding, blast-resistant, early maturing rice genotypes with superior grain quality, adaptable to diverse agro-ecological zones across India.

MATERIAL AND METHODS

The study was conducted at the Agricultural Research Station, Kunaram, Telangana, over a span

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of eight years, from 2014 to 2021. The farm is geographically situated at 18.6oN Latitude, 79oE Longitude and an elevation of 231m AMSL. The soil is silty loam with *p*H 7.43 and EC 0.26 dS m-1. The breeding objective at Agricultural Research Station, Kunaram, focused on combining various traits desired by farmers, including high yield, blast resistance, earliness, and quality. In this connection, the pedigree method of breeding was followed to develop a variety with the required objective by selecting two parents, i.e., KNM 605 and KNM 118. The female parent, KNM 605, is noted for its high yielding potential with long slender grains, earliness, and tolerance to pests and diseases developed at the Agricultural Research Station (ARS), Kunaram. KNM 118 is a long slender variety with good marketability and selected for its earliness and resistance to leaf blast and moderately resistant to neck blast, developed at the Agricultural Research Station, Kunaram, and used as a male parent. The breeding line with Index No. KNM 7037 resulted from the uniform bulk harvest of an F5 family in *kharif*, 2017 having desirable height, panicle length, grain type, alongside blast resistance, and it was subsequently evaluated in the yield trials from 2017 to 2019 at the Agricultural Research Station, Kunaram (Fig. 1).

KNM 7037 (IET 28356) was evaluated for grain yield during the *kharif* season from 2019 to 2021 under transplanted conditions in the All India Coordinated Research Project (AICRP) on Rice at multiple locations, including Cuttack and Jeypore (Odisha), Varanasi (Uttar Pradesh), and Chinsurah and HTW (West Bengal). The trials were conducted at a spacing of 20 × 15 cm. The genotype was also evaluated under two nutrient regimes, namely 50% and 100% of the recommended dose of fertilizers (RDF), along with standard and locally adapted check cultivars, to identify stable, high-yielding, and nutrient-efficient genotypes across diverse agro-climatic conditions. The reaction of KNM 7037 (IET 28356) to leaf blast disease was assessed through the National Screening Nurseries using both natural epiphytotic and artificial inoculation methods across 65 screening locations. Resistant and susceptible check varieties were included at regular intervals among the test entries to ensure reliable disease assessment. The mean Location Severity Index (LSI) of the susceptible checks was used as the basis for identifying promising entries exhibiting stable resistance to leaf blast. In addition to agronomic and disease resistance evaluations, KNM 7037 (IET 28356) was assessed for important grain quality attributes, including hulling recovery (%), milling recovery (%), head rice recovery (%), kernel length (mm), kernel breadth (mm), alkali spreading value and amylose content (%), following standard evaluation procedures.

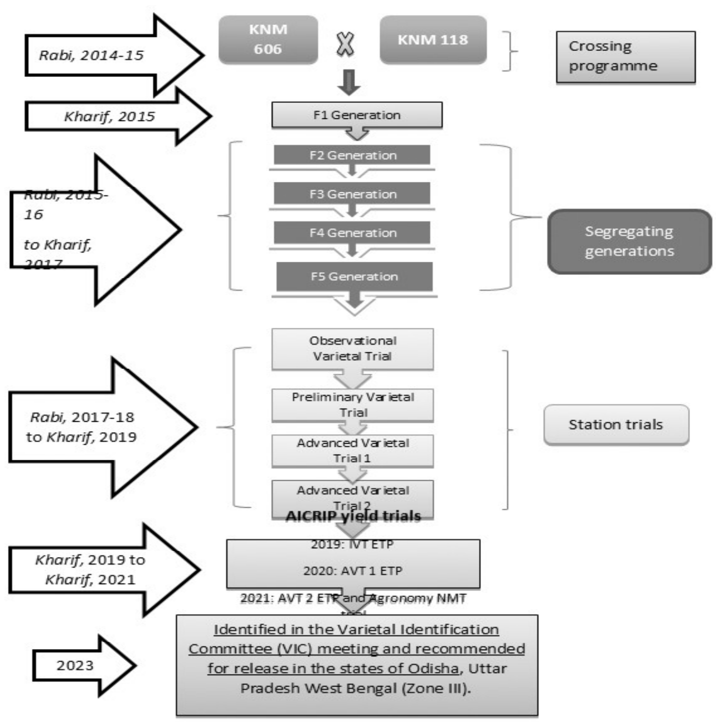

Fig. 1. Pedigree Flow chart of development of variety, KNM 7037 (IET 28356)

RESULTS AND DISCUSSION

The early duration (115-120 days) entry, KNM 7037 (IET 28356) was nominated and tested in AICRP on Rice (Irrigated Early-Transplanted) trials, i.e., IVT-E-TP (2019), AVT-1-E-TP (2020) and AVT-2-E-TP (2021) during *kharif* seasons and yielded+19.11%,+46.64% and +10.87%, higher than national, zonal and local checks respectively on overall mean and found suitable for irrigated wet lands in the states of irrigated areas of Odisha, Uttar Pradesh, and West Bengal. In the overall performance, KNM 7037 recorded a mean productivity of 5716 kg ha-1 in three years of all the 12 trials (Table 1 and Table 2).

Table 1. Location wise grain yield (kg/ha) data of KNM 7037 (IET 28356) over the three years in AICRP on rice yield trials

State/ Location	Year of Testing	Yield (kg/ha)				Name of local check	CD at 5%	CV (%)
		Proposed Entry IET 28356	CO 51 (NC)	Narendra 97 (ZC)	Local check (LC)			
Odisha								
Cuttack	2019	7643	3162	5006	4565	Satabdi	739	6.42
	2020	6424	6247	7043	5654	Naveen	952	8.99
	2021	4237	3738	2385	3857	Naveen	961	14.02
Jey pore	2019	8396	8042	1414	7998	Mandakini	1207	8.72
	2020	5525	4002	3314	5439	Mandakini	751	10.72
	2021	5266	4148	3544	4444	Mandakini	410	5.88
Uttar Pradesh								
Varanasi	2019	5825	4538	4788	4656	HUR-3022	699	7.74
	2021	4646	4078	1469	5323	HUR-3022	637	7.95
West Bengal								
Chinsurah	2019	4762	6085	4431	4828	-	770	6.95
	2020	4533	4268	4515	5256	Ajit	507	5.74
	2021	6353	5206	4774	5006	Ajit	885	9.69
HTW	2020	4982	4073	4093	4843	Lalat	1077	12.46

Table 2. Summarized grain yield (kg/ha) data of KNM 7037 (IET 28356) over the three years in AICRP on rice yield trials

Year of testing	No of trials/ Locations	Particulars	KNM 7037 (IET 28356)	National Check CO 51	Zonal Check	Local check
2019 to 2021	12	Weighted Mean (kg ha^{-1})	5716	4799	3898	5156
		Percent Increase over checks		19.11	46.64	10.87

In the Agronomy Nutrient Management trial, the application of 100% recommended dose of nitrogen manifested higher yields at Coimbatore, Dhangain, Faizabad, Ghaghraghat, Karjat, Mandya, Maruteru, Ranchi, Rewa, Sabour, Vadgaon and Varanasi (6.51, 4.63, 4.13, 4.10, 3.36, 3.92, 5.91, 4.50, 5.37, 4.46, 5.67 and 3.73 t ha-1, respectively) over 50% recommended dose of Nitrogen (Table 3). This highlighted 150 kg N/ha is necessary to achieve potential yields (Srikanth *et al*., 2023).

Table 3. Agronomic performance of the entry, IET 28356 in coordinated NMT of Early (TP) under transplanted conditions.

N levels kg/ha	Yield (t/ha) IET 28356	Check varieties Yield (t/ha)			For N level	
		NC (CO-51)	ZC (PR-124)	LC	CD (at 5%)	CV (%)
Location: Coimbatore						
75 kg/ha	4.92	4.84	3.94	-	0.10	1.84
150 kg/ha	6.51	6.45	5.32	-		
Percent gain or loss under other doses						
F1: 75 kg/ha	-32.31					
F2: 150 kg/ha						
Location: Dhangain						
75 kg/ha	3.17	2.36	2.60	2.66	0.30	8.51
150 kg/ha	4.63	3.33	3.93	3.46		
Percent gain or loss under other doses						
F1: 75 kg/ha	-46.05					
F2: 150 kg/ha						
Location: Faizabad						
75 kg/ha	3.09	2.93	3.09	2.15	0.20	5.83
150 kg/ha	4.13	4.44	3.80	3.01		
Percent gain or loss under other doses						
F1: 75 kg/ha	-33.65					
F2: 150 kg/ha						
Location: Ghaghraghat						
75 kg/ha	3.03	2.97	2.99	2.31	0.04	1.19
150 kg/ha	4.10	4.37	3.84	3.0		
Percent gain or loss under other doses						
F1: 75 kg/ha	-35.31					
F2: 150 kg/ha						
Location: Jagdalpur						
75 kg/ha	2.87	4.14	6.59	3.63	NS	18.38
150 kg/ha	2.74	5.87	5.95	4.14		
Percent gain or loss under other doses						
F1: 75 kg/ha	+4.53					
F2: 150 kg/ha						
Location: Karjat						
75 kg/ha	2.28	2.67	2.91	3.56	0.4	10.91
150 kg/ha	3.36	3.57	4.0	4.67		
Percent gain or loss under other doses						
F1: 75 kg/ha	-47.36					
F2: 150 kg/ha						
Location: Mandya						
75 kg/ha	3.83	3.91	3.57	-	NS	7.77
150 kg/ha	3.92	4.23	3.89	-		
Percent gain or loss under other doses						
F1: 75 kg/ha	-2.34					
F2: 150 kg/ha						

Cond.

N levels kg/ha	Yield (t/ha) IET 28356	Check varieties Yield (t/ha)			For N level	
		NC (CO-51)	ZC (PR-124)	LC	CD (at 5%)	CV (%)
Location:Maruteru						
75 kg/ha	5.35	3.55	5.13	-	0.72	14.46
150 kg/ha	5.91	4.56	5.69	-		
Percent gain or loss under other doses						
F1: 75 kg/ha	-10.46					
F2: 150 kg/ha						
Location: Ranchi						
75 kg/ha	4.46	3.91	4.67	3.15	0.19	4.53
150 kg/ha	4.50	4.47	5.16	3.43		
Percent gain or loss under other doses						
F1: 75 kg/ha	-0.89					
F2: 150 kg/ha						
Location: Rewa						
75 kg/ha	4.80	4.20	4.70	5.27	0.07	1.72
150 kg/ha	5.37	5.47	5.13	6.23		
Percent gain or loss under other doses						
F1: 75 kg/ha	-11.87					
F2: 150 kg/ha						
Location:Sabour						
75 kg/ha	4.22	4.19	4.85	4.24	0.15	3.39
150 kg/ha	4.46	4.46	5.37	4.66		
Percent gain or loss under other doses						
F1: 75 kg/ha	-5.68					
F2: 150 kg/ha						
Location: Vadgaon						
75 kg/ha	3.72	3.12	3.56	3.13	0.26	6.19
150 kg/ha	5.67	4.71	5.14	4.52		
Percent gain or loss under other doses						
F1: 75 kg/ha	-52.41					
F2: 150 kg/ha						
Location: Varanasi						
75 kg/ha	2.47	2.6	3.9	3.8	0.23	6.43
150 kg/ha	3.73	3.6	5.2	4.94		
Percent gain or loss under other doses						
F1: 75 kg/ha	-51.01					
F2: 150 kg/ha						

The variety has a semi-dwarf growth habit with moderate tillering capacity, green foliage, semi-erect flag leaves, and well-exerted semi-compact panicles with a semi-erect branching pattern. The grains are awnless, straw-coloured, translucent, and classified as long slender. KNM 7037 possessed long slender grains with 6.40 mm kernel length, 2.08 mm kernel breadth and L/B ratio of 3.08. Further, the variety recorded a milling recovery of 68.0% and a head rice recovery of 62.3%. From an industrial standpoint, maximizing the milling recovery of whole grain polished rice is crucial in fetching higher revenues to rice farmers (Verma *et al*., 2024). It showed an intermediate amylose content (23.33%), which is considered desirable from a consumer perspective, as this range is typically associated with favorable cooking and eating qualities. Additionally, the genotype recorded an intermediate alkali spreading value (3.0) and amylose content (23.33%), further indicating its suitability for good cooking quality (Table 4). It also exhibited moderate resistance to leaf blast in pathology screening experiments of NSN-2 (2019), and NSN-1 (2020 and 2021) (Table 5).

Table 4. Mean performance (2020 & 2021) of KNM 7037 pertaining to grain quality traits

Designation	HR	MR	HRR(%)	KL(mm)	KB(mm)	L/B Ratio	ASV	AC (%)
KNM 7037	78.1	68.0	62.3	6.40	2.08	3.08	3	23.33

HR (%): Hulling Recovery (%); MR (%): Milling Recovery (%); HRR (%): Head rice recovery (%); KL (mm): Kernel length (mm), KB (mm): Kernel breadth (mm); L/B ratio: Length and breadth ratio; ASV: Alkali spreading value; AC: Amylose content.

Table 5. Mean Disease Score Index (DSI) (2019, 2020 & 2021) of KNM 7037 to blast disease

Disease	Year of Testing	Number of locations	Mean Disease Score Index (DSI)		
			KNM 7037 (IET 28356)	Resistant Check (IR 64)	Susceptible check (HR 12)
Leaf Blast	2019	17	4.6	5.4	7.9
	2020	20	5.3	5.6	8.0
	2021	28	5.1	4.6	7.6
	Mean	**65**	**5.0**	**5.2**	**7.8**

CONCLUSION

The variety, KNM 7037 (IET 28356) is high yielding, early-duration, long slender rice genotype with moderate resistance to leaf blast was identified and released for cultivation in the states of Odisha, Uttar Pradesh and West Bengal under irrigated ecosystems.

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