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Evaluation of Seed Quality Parameter of Rice (*Oryza sativa* L.) Varieties Under Aerobic Condition

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ABSTRACT

An experiment was conducted during *Summer* and *Kharif 2021* at AICRP on seed (Crops), UAS, GKVK, Bengaluru to evaluate seed quality parameter of rice (*Oryza sativa* L.) varieties under aerobic condition. Among the selected varieties for cultivation under aerobic condition the highest seed germination (97.67 %), seedling vigour index-I (2844), total dehydrogenase activity was (1.408 A_{480}nm g^{-1}) and lower seed mycoflora (0.17 %) were recorded in variety Jaya. Similarly, maximum speed of germination (32.58), higher mean seedling dry weight (97 mg) and highest seedling vigour index-II (9474) were recorded in variety MAS-26. However, mean seedling length (30.65 cm) was highest in KMP 220. Meanwhile, higher shoot to root ratio (0.54) and lower electrical conductivity (38.29 µS cm^{-1} g^{-1}) was more in MAS-946-1. Whereas, lowest seed germination (83.17 %), speed of germination (24.57), seedling vigour index-I (1912) were recorded in Pustic-1; lower mean seedling length (22.2 cm) and mean seedling dry weight (50.5 mg) were observed in IR-30864There was significant variation for seed quality parameters among the studied varieties.

Keyword: Seed Quality, Aerobic Rice, Paddy,

INTRODUCTION

Rice (*Oryza sativa* L.) is the most important staple food crop among the cereals consumed by more than half of the world's population and it is one of the significant cereal commodity of the world (Lopez and Joseph, 2008). India has the largest area under rice in the world and ranks second in production (Anon., 2013). The genetic classification of rice plant belongs to genus *Oryza* of family Graminae (Poaceae). The genus *Oryza*

includes 24 species of which 22 are wild and two are cultivated *viz*., *Oryza sativa* L. & *Oryza glaberrima*. *Oryza sativa* is grown in all rice growing areas, but *Oryza glaberrima* is confined to the only West Africa (Singh.,1988).

Aerobic rice has been identified as a potential new technology, which can reduce water use in rice production and produce more rice with less water. Water productivity is high and labour requirement is less under aerobic rice production system; it also minimizes greenhouse gas emission rates from rice fields. However, the hurdles in achieving potential yield under aerobic system has to be overcome by focused research, then only we can make aerobic rice a potentially viable alternative to lowland rice. (Daly, 2018).

Good quality seed can increase yield by 5−20%. However, the extent of this increase is directly proportional to the quality of seed that is being sown and the variety which we selected. High quality seed enables farmers to grow crops, which have the most economical planting rate, a higher percentage of seeds emerging in the field, a minimum of re-planting, vigorous seedling establishment, uniform plant stand, faster growth rate and better resistance to stress and diseases and uniformity in ripening. In this view a field experiment was conducted to know the variation in seed quality parameters of different varieties under aerobic condition.

MATERIAL AND METHODS

The field experiment was carried out to evaluate performance of paddy varieties for seed quality which are cultivated under aerobic condition at AICRP on seed (Crops), UAS, GKVK, Bengaluru during *Summer* and *Kharif* 2021. Experimental sites are situated between 12° 15' N latitude and 77° 35' E longitude at an altitude of about 930 m above mean sea level (MSL). The field experiment was laid out in Randomized Complete Block Design (RCBD) with fifteen varieties of paddy with three replications.

Varieties

V_1: Gangavati sona	**V_6**: KMP-220	**V_{11}**: MTU-1010
V_2: IR-30864	**V_7**: MAS-26	**V_{12}**: Pustic-1
V_3: IR-64	**V_8**: MAS-946-1	**V_{13}**: Pustic-7
V_4: Jaya	**V_9**: MSN-99	**V_{14}**: Pustic-9
V_5: KMP-175	**V_{10}**: MTU-1001	**V_{15}**: Thanu

In the above selected varieties cultivated under aerobic condition observation have been recorded on seed quality parameters like first count (%), final count (%), speed of germination, mean germination time (days), mean seedling length (cm), mean seedling dry weight (mg), shoot to root ratio, seedling vigour index-I, seedling vigour index-II and seed mycoflora

RESULTS AND DISCUSSION

The data pertaining to different quality parameters of two seasons pooled and presented below with discussion. The seed germination among the varieties, the maximum seed germination was observed in MAS-26 (97.67 %) and followed by Jaya (97.17 %) and minimum seed germination was recorded in Pustic-1 (83.17

%) and followed by KMP-220 (85.5 %). (Table 1). Among the varieties, MAS-26 recorded highest speed of germination (32.58) and followed by Gangavati sona (32.39), while, the lowest speed of germination was recorded in Pustic-1 (24.57). Among the varieties, the highest mean seedling length was recorded in KMP-220 (30.65 cm) and followed by Jaya (29.92 cm) while, the lowest mean seedling length was recorded in MTU-1001 (3.89) which was followed by Thanu (3.72). while, the lowest mean seedling length was recorded in IR 30864 (22.2 cm). (Table 1). Variation in quality parameters between varieties might be due to genetical background and performs of varieties under aerobic condition. Similar results have been reported by Shah *et al*. (1999), Prasad *et al*. (2001), Hassan *et al*. (2003) Vishwanath *et al*. (2021) and Parashiva Murthy *et al.*, (2011).

Among the varieties, the highest mean seedling dry weight recorded in MAS-26 (97 mg) and followed by MAS-946-1 and it was similar with MTU-1001 (90 mg), while, the lowest mean seedling dry weight was recorded in IR-30864 (50.5 mg) (Table 1). Among the varieties, the highest shoot to root ratio recorded in MAS-946-1 (0.54) and followed by Gangavati sona and it was similar Pustic-1 (0.5) while, the lowest shoot to root ratio was recorded in MTU-1001 and similar Pustic-7 (0.36). Among the varieties, the highest seedling vigour index-I recorded in Jaya (2844) and followed by IR-64 (2824), MAS-26 (V_7) while, the lowest seedling vigour index-I was recorded in Pustic-1(1912). (Table 1). Among the varieties, the highest seedling vigour index-II was recorded MAS-26 (9474) and it was followed by MAS-946-1 (8652) while, the lowest seedling vigour index-II was recorded in IR-30864 (4685). Variation in growth and yield parameters between varieties might be due to genetical background and performs of varieties under aerobic condition. The same variability was reported by Zahid *et al*. (2005), Mirza *et al*, (1992) in Paddy.

The seedling vigour index-I is one of the most important distinguishing features used by several scientists to differentiate several quality parameters. (Table 2). The highest seedling vigour index-I was recorded in Jaya (2844) and followed by IR-64 (2824). Whereas the lowest seedling vigour index-I was recorded in Pustic-1 (1912) which was followed by Pustic-9 (2037). The seedling vigour index-II is one of the most important distinguishing features used by several scientists to differentiate several quality parameters. (Table 2). The highest seedling vigour index-II was recorded in MAS-26 (9474) and followed by MAS-946-1 (8652). Whereas the lowest seedling vigour index-II was recorded in IT-30864 (4685) which was followed by KMP-175 (5616).

Among the varieties, the minimum electrical conductivity was recorded in MAS-946-1 (38.29) and it was followed by Jaya (39.12) while, the maximum electrical conductivity was recorded in Pustic-7 (58.14). Among the varieties, the highest total dehydrogenase activity was recorded in Jaya (1.408 A_{480}nm g^{-1}) followed by MTU-1001 (1.05 A_{480}nm g^{-1}) while, the lowest total dehydrogenase activity was recorded in Pustic-9 (0.446 A_{480}nm g^{-1}). Among the varieties, the minimum seed mycoflora was recorded in Jaya and similar MTU-1001 (0.17) and it was followed by IR-30864 and similar KMP-175, KMP-220, MAS-26 and MTU-1010 and Thanu (0.33) while, the maximum seed mycoflora was recorded in MAS-946-1 and similar Pustic-1 (0.67) (Table 2). The seed quality variation in cultivars is mainly governed by its genetic make up and expression of genes at specific condition.

Similar variation for seed quality in various genotypes of paddy grown under aerobic conditions were reported by Hobbs *et al*. (2000), Singh *et al*. (2002) and Sharma *et al*. (2005).

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Table 1. Variation in germination per cent, speed of germination, mean seedling length, mean seedling dry weight and shoot to root ratio of different varieties of paddy varieties cultivated under aerobic condition (*Pooled data of summer and kharif 2021*)

Varieties	Germination (%)	Speed of germination	Mean seedling length (cm)	Mean seedling dry weight (mg)	Shoot to root ratio
V_1: Gangavati sona	96.17	32.39	26.20	69.17	0.50
V_2: IR 30864	92.83	31.90	22.20	50.50	0.44
V_3: IR-64	94.67	32.08	28.73	78.83	0.44
V_4: Jaya	97.17	32.10	29.92	85.33	0.42
V_5: KMP-175	93.50	32.36	24.85	60.00	0.45
V_6: KMP-220	85.50	30.43	30.65	82.67	0.45
V_7: MAS-26	97.67	32.58	28.55	97.00	0.44
V_8: MAS-946-1	96.17	31.86	27.98	90.00	0.54
V_9: MSN-99	93.67	30.12	25.33	65.00	0.46
V_{10}: MTU-1001	92.50	25.78	26.03	90.00	0.36
V_{11}: MTU-1010	94.17	28.36	24.55	84.33	0.43
V_{12}: Pustic-1	83.17	24.57	22.93	89.33	0.50
V_{13}: Pustic-7	88.33	25.94	26.05	67.50	0.36
V_{14}: Pustic-9	90.33	27.26	22.50	63.83	0.46
V_{15}: Thanu	96.17	27.56	23.90	64.83	0.45
S. Em±	**1.30**	**0.97**	**0.65**	**2.32**	**0.03**
CD (P=0.05)	**3.77**	**2.81**	**1.88**	**6.69**	**0.09**
CV %	**2.4**	**5.7**	**8.3**	**5.3**	**11.5**

Table 2. Variation in seedling vigour index-I, seedling vigour index-II, Electrical conductivity, total dehydrogenase activity and seed mycoflora of different varieties of paddy varieties cultivated under aerobic condition (*Pooled data of summer and kharif 2021*)

Varieties	Seedling vigour index-I	Seedling vigour index-II	Electrical conductivity ($\mu S\ cm^{-1}\ g^{-1}$)	Total dehydrogenase activity ($A480nm\ g^{-1}$)	Seed mycoflora (%)
V_1: Gangavati sona	2474	6649	45.42	0.831	0.50
V_2: IR 30864	2062	4685	47.16	0.797	0.33
V_3: IR-64	2824	7466	39.92	1.002	0.50
V_4: Jaya	2844	8292	39.12	1.408	0.17
V_5: KMP-175	2333	5616	39.91	1.027	0.33
V_6: KMP-220	2541	7056	55.94	0.79	0.33
V_7: MAS-26	2777	9474	43.22	0.832	0.33
V_8: MAS-946-1	2643	8652	38.29	1.027	0.67
V_9: MSN-99	2383	6088	47.94	0.793	0.50
V_{10}: MTU-1001	2440	8324	39.18	1.045	0.17
V_{11}: MTU-1010	2352	7933	42.36	0.914	0.33
V_{12}: Pustic-1	1912	7428	49.08	0.522	0.67
V_{13}: Pustic-7	2233	5955	58.14	0.786	0.50
V_{14}: Pustic-9	2037	5767	51.13	0.446	0.50
V_{15}: Thanu	2287	6233	42.11	0.943	0.33
S. Em±	**78**	**204**	**2.08**	**0.06**	**0.29**
CD (P=0.05)	**226**	**590**	**5.9**	**0.19**	**0.84**
CV %	**5.6**	**5.0**	**7.9**	**8.1**	**23**