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Assessment of Seed Storage Potential of Traditional Rice Varieties

K RAJA[1]*, D THIRUSENDURA SELVI[1], R GEETHA[2], C MENAKA[2], T EEVERA[3] AND N PUNITHAVATHI[4]

[1]Dept. of Seed Science and Technology, Seed Centre, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu-641003, India; [2]Dept. of Seed Science and Technology, Agricultural College and Research Institute, Tamil Nadu Agricultural University, Madurai, Tamil Nadu-625104, India; [3]Anbil Dharmalingam Agricultural College and Research Institute, Tamil Nadu Agricultural University, Trichy, Tamil Nadu-620 027, India; [4]Tamil Nadu Rice Research Institute, Tamil Nadu Agricultural University, Aduthurai, Tamil Nadu-612 101, India

*kraja_sst@rediffmail.com

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ABSTRACT: Traditional rice varieties are gaining popularity because of their therapeutic and medicinal benefits. These varieties are used in breeding programmes for introducing useful traits in modern HYVs. Seed storage is one of the important criteria in varietal development, hence, an experiment was conducted to assess the storage potential of some important traditional rice varieties in the Department of Seed Science and Technology, Tamil Nadu Agricultural University, Coimbatore, India for the period of two years during 2020-22. Among 12 varieties studied, Kallundrikar, Kuruvai kalangium, Karunkuruvai and Vaasanai seeraga samba performed well in storage and recorded more than 80 per cent germination even after 18 months of storage under ambient conditions. Vigour potential was also maintained better in these varieties.

Keywords: Traditional rice varieties, Seed storage, Seedling vigour

Rice (*Oryza sativa* L.) is an important and most commercially exploited staple food crop for more than half of the world's population, particularly in Asia, Africa and South America. With an average of 47.83 million ha cultivated area, India produced 135.75 million tonnes having an average productivity of 2,722 kg/ha [1]. India has abundant rice landraces and traditional varieties cultivated since centuries. About 1,00,000 traditional cultivars are still grown by the farmers in India, while 3,00,000 had become extinct. Even though the yield is often less than the cultivated varieties, the traditional varieties or landraces are becoming popular due to their high nutritional and therapeutic properties. Traditional varieties also have specific features that may enable them to withstand a variety of biotic and abiotic stresses. The genetic diversity of landraces is an important part of global crop biodiversity and is considered as a paramount importance for future world production [2].

Seed deterioration during storage is an inevitable process which depends on seed storage environment *viz.,* moisture, temperature and relative humidity as well as on genetic makeup of the individual types [3]. In traditional rice varieties, seed deterioration is less when compared to domestically cultivated varieties due to higher antioxidant enzyme activities [4]. Many beneficial molecules such as phenolic compounds, vitamin-E and γ-oryzanols are fastened in the embryo fraction and bran layer of rice grains [5, 6, 7]. These phenolic compounds belong to a specific class of polyphenols that are typically involved in the process of protection against biotic and abiotic stresses, and have better benefit on the storability of the seeds [8]. Further, anthocyanin pigments play a significant biological function in lowering the risk of oxidative damage [9]. Hence, in order to assess the storage potential of traditional rice varieties, the present research work was conducted in some of the important varieties.

MATERIALS AND METHODS

Seeds of 12 traditional rice varieties *viz*., Mappillai samba, Mattaikar, Kuruvai kalangium, Vaasanai seeraga samba, Poongaar, Kothamalli samba, Nootripathu, Kallundrikar, Kallukkar, Kattanur, Karunkuruvai and Karukka were collected from the farmer holdings in different parts of Tamil Nadu during 2019. Then, the crop was raised in the university field for seed multiplication along with necessary package of practices. Freshly harvested seeds of all the 12 varieties were cleaned and packed individually in cloth bags in the Department of Seed Science and Technology, Tamil Nadu Agricultural University, Coimbatore. Seeds were stored in ambient conditions at different locations *viz*., Department of Seed Science and Technology, Tamil Nadu Agricultural University, *Coimbatore*; Department of Seed Science and Technology, Agricultural College and Research Institute, *Madurai;* Tamil Nadu Rice Research Institute, *Aduthurai* and Anbil Dharmalingam Agricultural College and Research Institute, *Trichy* during 2020-22 to assess the seed storage potential of these varieties. Samples were drawn at monthly intervals in each location and evaluated for its physiological and biochemical traits, as given below.

Germination

Germination test was conducted in four replicates of 100 seeds each taken at random from each variety and placed on paper medium (between paper) and allowed to germinate in a germination room illuminated with fluorescent light at 25±2°C temperature and 95±2 % relative humidity. After 14 days, the seedlings were evaluated, number of normal seedlings produced was counted and the germination was calculated and then the mean was expressed in percentage [10].

$$\text{Germination (\%)} = \frac{\text{Number of normal seedlings}}{\text{Total number of seeds sown}} \times 100$$

Vigour index

During germination count, ten normal seedlings were picked at random from each replication and measured for seedling length. Then, vigour index was calculated by the formula as given below, expressed in whole number and average over replications was done [11].

$$\text{Vigour index} = \text{Germination (\%)} \times \text{Average seedling length (cm)}$$

Electrical conductivity

Biochemical properties of the seed samples were analysed at initial stage before storage and after three and six months of storage. Electrical conductivity of seed leachate was measured for all the 12 varieties at 3 different stages [12]. Four replications of 25 seeds each were soaked in 25 ml of distilled water for 18 h and electrical conductivity of seed leachate was measured using digital electrical conductivity meter with an electrode possessing a cell constant of one. Then, the average electrical conductivity of seed leachate was expressed in dSm^{-1}.

Alpha amylase activity

Alpha amylase activity was measured following the procedure given by Paul *et al*. [13]. Fresh seeds were pre-germinated by top of paper method and allowed for radicle emergence. The 500 mg pre-germinated seeds were homogenised in 1.8 ml of ice cold 0.02 M sodium phosphate buffer having pH 6.0. The homogenate was centrifuged for 20 min at 20,000 rpm to collect the extract. Then, 1 ml of 0.0067 percent starch solution was added in the extract and incubated for 10 min at 25°C. Subsequently, the reaction was stopped by adding 1 ml of iodine HCl solution containing 60 mg KI and 6 mg I_2 which were dissolved in 100 ml of 0.05 N HCl. The change of colour was observed at optical density of 620 nm and the enzyme activity was calculated and expressed as mg of maltose min^{-1}.

Starch

For starch analysis, anthrone reagent method described by Thayumanavan and Sadasivam [14] was followed. During analysis, 0.1 g of the rice sample was weighed and homogenized in hot 80% ethanol so as to remove the sugars. Then, the sample was centrifuged and the residue alone was retained. It was washed frequently with hot 80% ethanol until the washings have not given colour with anthrone reagent. Then the residue was dried in a water bath, after which, 5.0 ml of distilled water and 6.5 ml of 52% perchloric acid were added, then it was centrifuged and the supernatant was kept. This extraction process was repeated many times using fresh perchloric acid and then centrifuged. The supernatant was pooled together and made up to 100 ml with distilled water. Then, 1 ml aliquot of the sample was taken and added with 4 ml of anthrone reagent. It was heated for 8 min in a boiling water bath. The test tubes were cooled quickly and the intensity of green to dark green colour was read at 630 nm in UV-Vis spectrophotometer. The starch content was calculated and expressed in g / 100 g of sample.

Amylose

The amylose content of the seed samples was analysed using iodine reagent method described by Sadasivam and Manickam [15]. Rice seeds were dehusked and grains were finely powdered with pestle and mortar. 100 mg sample was weighed and transferred to a boiling tube by adding a few drops of alcohol. In that, 10 ml of 1 N NaOH was added and kept in a water bath for 15 min. Then, the contents were cooled and transferred to a 100 ml standard flask. Aliquot of 2.5 ml of sample was transferred to each test tube and the volume was made up to 20 ml with distilled water. Adequate volume of 0.1 N HCl was added to neutralise the pH using phenolphthalein indicator. After the disappearance of pink colour, 1 ml of iodine was added to make the final volume of 50 ml and the OD value was observed at 590 nm in double beam UV-Vis spectrophotometer. The amylose content was calculated and expressed in g / 100 g of sample.

Amylopectin

Amylopectin content of the varieties was determined by subtracting the value of amylose from that of total starch.

Statistical analysis

Observations recorded from different locations were pooled and subjected to statistical analysis [16] and the critical difference values were calculated at 5 percent probability level.

RESULTS AND DISCUSSION

The viability and vigour of seeds are highly influenced by the factors *viz*., genetic make-up of the cultivars, seed moisture content, storage temperature and relative humidity. It may also be due to the depletion of food reserves combined with a degradation of antioxidant enzymes in paddy [17]. The results in the present study showed that the reduction in germination and vigour was recorded in all the traditional varieties during storage. However, the rate of decline varies with the varieties. In general, the varieties such as Mattaikar, Vaasanai seeraga samba, Poongaar, Kallukkar, Kattanur and Karukka recorded the initial germination of 80 percent or more as prescribed for rice in the Indian Minimum Seed Certification Standards (IMSCS). Instead, the varieties *viz*., Mappillai samba, Kuruvai kalangium, Kothamalli samba, Nootripathu, Kallundrikar and Karunkuruvai recorded lesser germination (<80%) during initial evaluation, which increased to 90 percent after one month of storage (Table 1) and such enhancement continued with the advancement of storage in variety specific manner; less germination during initial period in these varieties is due to the presence of dormancy. Similar kind of increase in germination up to 4 months of post-harvest storage was recorded in landraces [18]. Also, all the varieties have recorded more than 80 percent germination for the initial validity period of nine months.

Further, seeds of the varieties Kuruvai kalangium (86%), Vaasanai seeraga samba (82%), Kallundrikar (90%) and Karunkuruvai (86%) maintained its germination above IMSCS for more than 18 months in all the locations and hence recorded as good storers (Table 1). Among the varieties studied, Kattanur performed poor in storage and recorded 84 percent germination after 10 months of storage and then declined below IMSCS. Similarly, the variety Nootripathu has maintained 80 percent germination upto 12 months period. These two varieties can be indicated as poor storer. Other varieties *viz*., Mappillai samba, Mattaikar, Poongaar, Kothamalli samba, Kallukkar and Karukka were stored with above 80 percent germination between 13 and 17 months. Similar pattern of reduction in all physiological factors including germination rate, seedling length, dry matter and vigour index with the increase in storage period in traditional rice varieties were reported earlier [19, 20]. Storage container and temperature decide the seed longevity of which jute-made gunny bag and earthen pot as well as low temperature (8±2°C) storage were found suitable for maintaining higher germination as well as to produce better seedlings of rice stored for six months [18]. Seeds with poor storability can be stored better by hydropriming for 72 h and storage at 8°C in sealed polythene bags [21].

Generally, red and black coloured traditional rice varieties are known to be rich in anthocyanins which have free radical scavenging and antioxidant capacities. Presence of these anthocyanins helps in better storage of seeds [22]. Also, the anthocyanins are found on the external surfaces of rice grain such as the pericarp, seed coat, nucellus, aleurone layer and embryo surface but absent in the endosperm [23, 24].

Vigour index of all traditional rice varieties reduced with the progress in storage period. Initially, the vigour index was lesser due to the presence of dormancy in seeds which lead to poor germination and seedling growth. Subsequently, the vigour index increased with the advancement of storage period and after certain period of storage, it started declining due to reduction in seed germination and seedling length (Table 2). This decline is attributed to the deterioration of seeds resulting in loss of enzyme activities, loss of cellular integrity and leaching out of the metabolites present in the seed. This was evidenced with the increase in the electrical conductivity of the seed leachates (Table 3). Increase in electrical conductivity during storage indicates the progress of seed deterioration process in rice over time, it is based on the principle that more deteriorated seeds have less capacity

Table 1. Pooled data indicating the seed germination (%) of traditional rice varieties during storage at different locations

Varieties	Period of seed storage (Months)																					
	Initial	1 MAS	2 MAS	3 MAS	4 MAS	5 MAS	6 MAS	7 MAS	8 MAS	9 MAS	10 MAS	11 MAS	12 MAS	13 MAS	14 MAS	15 MAS	16 MAS	17 MAS	18 MAS	19 MAS	20 MAS	21 MAS
1. Mappillai	70	94	96	96	96	98	94	92	92	92	86	86	86	86	86	84	82	76	78	62	14	4
samba	(56.7)	(75.8)	(78.4)	(78.4)	(78.4)	(81.8)	(75.8)	(73.5)	(73.5)	(73.5)	(68.0)	(68.0)	(68.0)	(68.0)	(68.0)	(66.4)	(64.9)	(60.6)	(62.0)	(51.9)	(21.9)	(11.5)
2. Mattaikar	92	90	94	94	94	98	92	92	92	92	92	86	86	86	82	82	82	82	72	68	46	26
	(73.5)	(71.5)	(75.8)	(75.8)	(75.8)	(81.8)	(73.5)	(73.5)	(73.5)	(73.5)	(73.5)	(68.0)	(68.0)	(68.0)	(64.8)	(64.8)	(64.9)	(64.9)	(58.0)	(55.5)	(42.7)	(30.6)
3. Kuruvai	66	100	98	98	98	98	98	98	98	98	96	96	94	96	96	94	90	88	86	70	26	0
kalangium	(54.3)	(89.7)	(81.8)	(81.8)	(81.8)	(81.8)	(81.8)	(81.8)	(81.8)	(81.8)	(78.4)	(78.4)	(75.8)	(78.4)	(78.4)	(75.8)	(71.5)	(69.7)	(68.0)	(56.7)	(30.6)	(0.0)
4. Vaasanai	86	98	98	98	98	98	98	96	96	94	94	92	94	92	90	86	86	86	82	70	26	4
seeraga samba	(68.0)	(81.8)	(81.8)	(81.8)	(81.8)	(81.8)	(81.8)	(78.4)	(78.4)	(75.8)	(75.8)	(73.5)	(75.8)	(73.5)	(71.5)	(68.0)	(68.0)	(68.0)	(64.9)	(56.7)	(30.6)	(11.5)
5. Poongaar	88	96	94	94	94	94	92	90	90	90	88	88	88	88	86	86	80	80	68	66	20	0
	(69.7)	(78.4)	(75.8)	(75.8)	(75.8)	(75.8)	(73.5)	(71.6)	(71.5)	(71.5)	(69.7)	(69.7)	(69.7)	(69.7)	(68.0)	(68.0)	(63.4)	(63.4)	(55.5)	(54.3)	(26.5)	(0.0)
6. Kothamalli	66	90	92	92	94	96	94	92	90	90	90	82	82	80	78	74	72	70	71	66	56	0
samba	(54.3)	(71.5)	(73.5)	(73.5)	(75.8)	(78.4)	(75.8)	(73.5)	(71.5)	(71.5)	(71.5)	(64.8)	(64.8)	(63.4)	(62.0)	(59.3)	(58.0)	(56.7)	(57.4)	(54.3)	(48.4)	(0.0)
7. Nootripathu	50	96	88	88	88	100	96	90	90	90	82	80	80	78	78	78	54	54	50	34	4	0
	(45.0)	(78.4)	(69.7)	(69.7)	(69.7)	(89.7)	(78.4)	(71.5)	(71.5)	(71.5)	(64.8)	(63.4)	(63.4)	(62.0)	(62.0)	(62.0)	(47.3)	(47.3)	(45.0)	(35.6)	(11.5)	(0.0)
8. Kallundrikar	50	100	96	96	96	96	96	96	96	96	96	96	96	94	94	94	90	90	90	63	40	0
	(45.0)	(89.7)	(78.4)	(78.4)	(78.4)	(78.4)	(78.4)	(78.4)	(78.4)	(78.5)	(78.4)	(78.4)	(78.4)	(75.8)	(75.8)	(75.8)	(71.5)	(71.5)	(71.5)	(52.5)	(39.2)	(0.0)
9. Kallukkar	88	92	94	100	98	96	94	88	88	86	84	82	82	82	82	72	70	70	52	22	0	0
	(69.7)	(73.5)	(75.8)	(89.7)	(81.8)	(78.4)	(75.8)	(69.7)	(69.7)	(68.0)	(66.4)	(64.8)	(64.8)	(64.8)	(64.8)	(58.0)	(56.7)	(56.7)	(46.1)	(27.9)	(0.0)	(0.0)
10. Kattanur	90	82	94	96	98	98	96	96	94	88	84	78	76	74	72	70	62	54	54	50	38	34
	(71.5)	(64.8)	(75.8)	(78.4)	(81.8)	(81.8)	(78.4)	(78.4)	(75.8)	(69.7)	(66.4)	(62.0)	(60.6)	(59.3)	(58.0)	(56.7)	(51.9)	(47.5)	(47.3)	(45.0)	(38.0)	(35.6)
11. Karun	40	92	98	100	98	98	98	98	98	98	94	94	94	92	90	90	88	86	86	74	48	0
kuruvai	(39.2)	(73.5)	(81.8)	(89.7)	(81.8)	(81.8)	(81.8)	(81.8)	(81.8)	(81.8)	(75.8)	(75.8)	(75.8)	(73.5)	(71.5)	(71.5)	(69.7)	(68.0)	(68.0)	(59.3)	(43.8)	(0.0)
12. Karukka	80	90	90	98	96	94	94	92	90	92	92	88	88	86	82	68	66	62	58	46	20	10
	(63.4)	(71.5)	(71.5)	(81.8)	(78.4)	(75.8)	(75.8)	(73.5)	(71.5)	(73.5)	(73.5)	(69.7)	(69.7)	(68.0)	(64.8)	(55.5)	(54.3)	(51.9)	(49.6)	(42.7)	(26.5)	(18.4)
Mean	72	93	94	96	96	97	95	93	93	92	90	87	87	86	85	82	77	75	71	58	28	7
	(58.0)	(74.6)	(75.8)	(78.4)	(78.4)	(80.0)	(77.0)	(74.6)	(74.6)	(73.5)	(71.5)	(68.8)	(68.8)	(68.0)	(67.2)	(64.8)	(61.3)	(60.0)	(57.4)	(49.6)	(31.9)	(15.4)
				V								P							V×P			
SEd				2.1								2.8							9.6			
CD (P=0.05)				4.0								5.7							NS			

(MAS - Months after storage, V - Variety; P - Period of storage)

Table 2. Pooled data indicating the vigour index of traditional rice varieties during storage different locations

Varieties	Period of seed storage (Months)																					
	Initial	1 MAS	2 MAS	3 MAS	4 MAS	5 MAS	6 MAS	7 MAS	8 MAS	9 MAS	10 MAS	11 MAS	12 MAS	13 MAS	14 MAS	15 MAS	16 MAS	17 MAS	18 MAS	19 MAS	20 MAS	21 MAS
1. Mappillai samba	2366	3289	3139	3367	3489	3661	3249	3328	2975	3266	2845	2895	2804	2828	2740	2587	2619	2590	2083	1269	130	84
2. Mattaikar	2796	2817	2664	2693	2734	2952	2452	2559	2542	2503	2252	3050	2509	2506	2496	2545	2200	2220	1986	1643	804	166
3. Kuruvai kalangium	2038	3395	3223	3474	3585	3671	3626	4024	3584	3507	3242	3372	3526	3755	3433	3325	2930	2614	2271	1682	435	0
4. Vaasanai seeraga samba	2999	3607	3522	3709	3850	3751	3757	3710	3725	3328	3187	3374	3191	3029	2888	2670	2561	2461	2270	1835	494	62
5. Poongaar	2903	3555	3024	3336	3518	3439	3128	3184	3031	3492	2757	3163	2929	2786	2720	2692	2649	2490	2059	1415	250	0
6. Kothamalli samba	1687	2581	2619	2713	2828	2936	2901	2550	2671	2376	2611	2322	2289	2208	2158	2038	1961	1805	1721	1542	853	0
7. Nootri-pathu	1271	2796	2915	3078	2916	3444	3358	3101	3211	2898	2585	2480	2438	2371	2307	2405	1653	1549	1268	658	43	0
8. Kallun-drikar	1339	3928	3215	3367	3433	3662	3324	3472	3282	3333	3603	2322	2289	2208	2158	2038	1961	1805	1721	1542	853	0
9. Kallukkar	2600	3097	2845	2929	2852	2628	2710	2353	2407	2075	1865	2591	2385	2413	2238	1833	1712	1804	1702	1418	0	0
10. Kattanur	2724	2543	2537	2866	3000	3143	2653	2779	2957	2988	2789	3163	2929	2786	2720	2692	2649	2490	2059	1415	250	179
11. Karun kuruvai	992	3141	3302	3482	3555	3706	3385	3545	3178	3461	3152	3156	3145	3034	3138	3154	2917	2840	2792	2164	1036	0
12. Karukka	2422	2756	2482	2845	2940	2878	2648	2818	2698	2675	2553	2599	2479	2567	2179	1546	1470	1266	1187	907	263	112
Mean	2178	3125	2957	3155	3225	3323	3099	3119	3022	2992	2787	2874	2743	2708	2598	2460	2274	2161	1927	1458	450	50
					V						P								V×P			
SEd					42.3						57.3								198.8			
CD (P=0.05)					83.4						113.0								391.4			

(MAS - Months after storage, V - Variety; P - Period of storage)

Table 3. Biochemical seed quality attributes of traditional rice varieties during storage

Varieties	EC (dSm^{-1})			Alpha amylase (mg of maltose/min)			Starch (g/100g of sample)			Amylose (g/100g of sample)			Amylopectin (g/100g of sample)		
	Initial	3 MAS	6 MAS	Initial	3 MAS	6 MAS	Initial	3 MAS	6 MAS	Initial	3 MAS	6 MAS	Initial	3 MAS	6 MAS
1. Mappillai samba	2.8	3.0	3.1	18.2	17.8	17.5	86.4	79.0	78.1	22.9	27.2	27.0	63.6	51.8	51.1
2. Mattaikar	1.8	2.0	2.1	25.9	25.6	25.3	85.8	82.0	81.6	25.6	26.6	26.2	60.2	55.4	55.4
3. Kuruvai kalangium	2.1	2.3	2.4	23.7	23.4	23.1	83.5	80.0	79.2	17.4	29.1	28.7	66.1	50.9	50.5
4. Vaasanai seeraga samba	2.2	2.3	2.4	31.5	30.5	30.1	84.1	82.9	81.7	21.8	27.5	27.1	62.4	55.4	54.6
5. Poongaar	2.9	3.0	3.1	25.2	25.0	24.6	90.0	81.0	80.5	24.0	23.7	23.5	66.0	57.3	57.0
6. Kothamalli samba	2.8	3.0	3.1	25.0	24.6	24.4	86.5	86.2	86.0	24.0	30.0	29.6	58.5	56.2	56.4
7. Nootripathu	1.3	1.5	1.5	18.1	17.7	17.7	88.5	80.5	80.1	18.5	27.7	27.4	70.0	52.8	52.7
8. Kallundrikar	1.0	1.0	1.1	30.7	29.5	29.1	83.5	79.1	78.7	22.3	29.1	28.9	61.2	50.0	49.8
9. Kallukkar	2.5	2.9	2.9	18.9	18.3	18.0	83.5	80.0	79.5	24.5	26.8	26.3	59.0	53.2	53.2
10. Kattanur	1.1	1.2	1.2	19.8	19.5	19.3	90.0	81.0	80.8	23.4	25.0	24.8	66.6	56.0	56.0
11. Karun kuruvai	2.7	3.0	3.1	16.6	16.1	15.7	89.9	83.5	83.1	25.6	29.0	28.3	64.2	54.5	54.8
12. Karukka	2.9	3.2	3.2	25.4	25.1	24.8	88.3	80.0	79.7	26.7	29.6	29.1	61.6	50.4	50.6
Mean	2.1	2.4	2.4	23.2	22.7	22.4	86.3	81.2	80.7	23.0	27.6	27.2	63.3	53.6	53.5
	V	P	VXP	V	P	VXP	V	P	VXP	V	P	VXP	V	P	VXP
SEd	0.034	0.017	0.059	0.239	0.119	NS	1.068	0.534	NS	0.347	0.173	0.602	0.786	0.393	1.362
CD (P=0.05)	0.068	0.034	0.118	0.477	0.238	NS	2.129	1.064	NS	0.693	0.346	1.201	1.568	0.784	2.716

(MAS - Months after storage, V - Variety; P - Period of storage)

to repair cell membranes during the water absorption and results with greater solute leaching, culminating in the increase in electrical conductivity values [25]. Alpha amylase activity of seeds of traditional varieties varied not only in pre-storage condition, but also in both 3 and 6 MAS. Variety Vasanai seeraga samba had higher activity (31.5 mg of Maltose/Min) at initial stage and it showed least activity (16.6 mg of Maltose/Min) for Karunkuruvai. However, the enzyme activity was reduced during storage in all the varieties due to seed deterioration and ageing process (Table 3). Similarly, Galani *et al*. [26] reported that α-amylase activity is a biochemical indicator representing the different germination potential of rice varieties, corresponding to various seed vigour performances. Reduction in seed viability was in correlation with the decrease in ascorbate peroxidase and antioxidant activity in seed [27].

Richness of starch is an imperative element in rice and its quantity differed among the varieties. Poongaar and Kattanur had highest starch (90.0 g/100g of sample), followed by Karunkuruvai (89.9 g/100g of sample). While during storage the starch content was reduced variously and about 6.7 percent reduction was observed in six months period irrespective of the varieties. Amylose content on the other hand increased in the seed during short storage of three months from 23.0 to 27.6 g/100g of sample irrespective of the varieties and thereafter, it reduced. Similarly, amylopectin content varied with the varieties and Nootripathu had highest amount (70.0 g/100g of sample) at initial stage. Nevertheless, its quantity declined in storage in all varieties (Table 3). Similar study on lowering of the starch and amylose content after 6 and 12 months of storage period were recorded earlier [28].

CONCLUSION

The traditional rice varieties *viz*., Kallundrikar, Kuruvai kalangium, Karunkuruvai and Vaasanai seeraga samba exhibited good storability and recorded about 80 percent germination in more than 18 months at ambient condition. Therefore, these varieties can be used in the breeding programme during the development of new varieties for better storability.

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