

**RESEARCH ARTICLE :**

## Influence of seedling age on yield and economics of different rice landraces in Tamil Nadu

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**SUMMARY :** A field study was conducted at Tamil Nadu Agricultural University, Coimbatore in wetland during *Samba* season 2014-15 with an objective to study the effect of seedling age on yield and economics of rice landraces under irrigated rice ecosystem. The experiment was laid out in Split Plot Design with three replications. The treatment in main plot with three age of seedlings viz., 15, 20 and 25 days seedlings and sub plot eight rice landraces viz., *Chandikar*, *Kuliyadichan*, *Kuruvaikalanjiyam*, *Norungan*, *Nootripathu*, *Black Kavuni*, *Red Kavuni*, *Njavara* and CO(R) 50 (one high yielding variety). Observations were recorded on grain yield and straw yield at the time of harvest. The economics of different treatments was also worked out. The study concludes that 15 days old seedlings recorded higher mean grain and straw yield of 2,459 kg ha<sup>-1</sup> and 6,762 kg ha<sup>-1</sup> over 20 and 25 days old seedlings with higher gross return, net return and B:C ratio. In rice landraces, *Red Kavuni* recorded higher grain, straw yield and B:C ratio compared to other rice landraces. *Njavara* recorded higher gross return and net return.

**KEY WORDS :**

Age of seedlings,  
 Economics, Rice  
 landraces

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### **BACKGROUND AND OBJECTIVES**

Rice is a major contributor to the human food supply of the world and Asia accounts for 90% of the production and consumption of rice. In India, rice occupied 39.16 million hectares area with a production of 85.59 million tonnes and average productivity of 2.2 t ha<sup>-1</sup> (Gill *et al.*, 2014). Transplanting is a common practice in rice cultivation. Improper planting technique is one of the important factors limiting rice yield. The age of seedlings is an

important factor which determines grain yield as it has a tremendous influence on the tiller production, grain formation and yield contributing characteristics in rice. The recommended age of seedlings is 18-21 days for short duration, 21-25 days for medium duration and 25-30 days for long duration varieties under irrigated transplanted rice ecosystem and 12-14 days old seedlings with mat nursery in SRI system of planting (CPG, 2012).

Rice crop has qualities beyond its nutritive value with high digestibility and least allergic

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properties compared to other cereal grains (Leena kumary, 2004). Traditional rice landraces in India and across Asia are under serious threat of extinction due to cultivation of modern and high yielding varieties (HYVs), hybrids and genetically engineered rice (Yogesh, 2011). Research on exploring the nutritional value of traditional rice varieties with its inherent medicinal values has poor documentation and hence should be encouraged and supported. These landraces are highly nutritive and are rich in minerals like potassium, sodium, calcium, micronutrients like iron and zinc. They contain higher proteins, carbohydrates and vitamins like thiamine, riboflavin and niacin. Though there is no scientific data on the medicinal properties, they are being used in ayurveda in treating diseases like arthritis, cervical spondylitis, skin diseases and neurological problems (Deepa *et al.*, 2008). So, these landraces are gaining interest for research studies. In Tamil Nadu, more number of red rice land races continue to exist in Ramnad District and they are found to be drought resistant. The average yield of many traditional rice varieties was found to be in the range of 1.7 to 2.5 t ha<sup>-1</sup> and has the chance to explore the possibilities of enhancing yield under irrigated ecosystem while in Ramnad district red rice landraces are raised under rainfed situation leading to less yield. Hence, the present study was planned to evaluate the best performing rice landrace and to find its effect on yield economics and due to different seedling age.

## RESOURCES AND METHODS

A field study was conducted in wetland during *Samba* season 2014-15 at Tamil Nadu Agricultural University, Coimbatore with an objective to study the different seedling age and to find its effect on yield and economics in different rice landraces of Tamil Nadu under transplanted irrigated rice ecosystem. The location of the study area is situated at 11° N latitude, 77° E longitude and at an altitude of 426.7 m above mean sea level. The soil of the experimental field was deep clay loam, moderately drained and grouped under *Vertic Ustochrep* taxonomical classification belonging to *Noyyal* series. In the experimental soil the available nitrogen was low, available phosphorus was medium and potassium was high. All package of practices were carried out as per recommendation of CPG, 2012. The experiment was laid out in Split Plot Design with three replications. The treatments in main plot were three age

of seedlings *viz.*, 15 (A<sub>1</sub>), 20 (A<sub>2</sub>) and 25 (A<sub>3</sub>) days old seedlings and in sub plot eight rice landraces with one high yielding variety *viz.*, *Chandikar* (V<sub>1</sub>), *Kuliyadichan* (V<sub>2</sub>), *Kuruvaikalanjiyam* (V<sub>3</sub>), *Norungan* (V<sub>4</sub>), *Nootripathu* (V<sub>5</sub>), *Black Kavuni* (V<sub>6</sub>), *Red Kavuni* (V<sub>7</sub>), *Njavara* (V<sub>8</sub>) and CO(R) 50 (V<sub>9</sub>) Observations were recorded on grain yield and straw yield at the time of harvest. The economics of different treatments was also worked out and reported.

## OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads :

### Effect on grain and straw yield :

In crop like rice, both grain and straw are more valuable economic products. While proposing the basic objective for any experiment in agronomical experiments, the final consideration are on the treatment effect on yield attributes and their influence on the economic yield. In rice the vegetative part stops growing after flowering and as a result, most of the net assimilates are translocated to the panicle, resulting in higher grain yield. Due to higher plant DMP with increased plant height, number of tillers hill<sup>-1</sup>, LAI, CGR and other yield bearing attributes like number of productive tillers m<sup>-2</sup>, number of filled grains panicle<sup>-1</sup> and test grain weight. All the above factors improved the performance of the crop which leads to higher grain and straw yields. In the present investigation, 15 days old seedling contributed to higher increase in grain yield (11.55 %) and straw yield (8.34 %) increase over 25 days old seedlings. The older seedlings (20 and 25 day) remained for longer period in nursery affecting the *phyllocron*, which enable rice tillering and resulted in lesser number of tillers in main field and reduced grain yield (Singh and Singh, 1999). Transplanting of young seedlings provided sufficient nutrients for vegetative growth and reproductive phase by better root growth. This might be due to efficient utilization of resources that ultimately lead to increased plant height and yield attributes thereby increased grain and straw yields. Similar results were reported by Vijayakumar *et al.* (2005). More *et al.* (2007) reported proportion of grain yield to straw yield was higher with 15 days old seedlings compared to normal seedlings of 20 and 28 days age suggesting efficient translocation of photosynthates from

**Table 1 : Effect of seedling age in rice landraces on grain yield, straw yield and harvest index**

Landraces	Grain yield (kg ha <sup>-1</sup> )				Straw yield (kg ha <sup>-1</sup> )				*Harvest index			
	15 days	20 days	25 days	Mean	15 days	20 days	25 days	Mean	15 days	20 days	25 days	Mean
<i>Chandikar</i>	2,266	2,020	1,930	2,072	7,312	7,145	6,800	7,086	0.24	0.22	0.22	0.23
<i>Kuliyadichan</i>	2,190	1,976	1,879	2,015	6,919	6,417	6,056	6,464	0.24	0.24	0.24	0.24
<i>Kuruvai kalanjiyam</i>	1,807	1,723	1,675	1,735	5,999	5,645	5,455	5,700	0.23	0.23	0.23	0.23
<i>Norungan</i>	2,325	2,043	1,960	2,109	7,417	7,183	6,834	7,145	0.24	0.22	0.22	0.23
<i>Nootripathu</i>	2,136	1,948	1,898	1,994	5,998	5,767	5,599	5,788	0.26	0.25	0.25	0.26
<i>Black kavuni</i>	2,338	2,269	2,030	2,212	7,487	7,267	6,932	7,229	0.24	0.24	0.23	0.23
<i>Red kavuni</i>	2,546	2,398	2,229	2,391	7,849	7,514	7,045	7,469	0.24	0.24	0.24	0.24
<i>Njavara</i>	1,425	1,325	1,275	1,342	4,924	4,867	4,735	4,842	0.22	0.21	0.21	0.22
CO(R)50	5,098	4,812	4,695	4,868	6,956	6,579	6,322	6,619	0.43	0.43	0.43	0.43
Mean	2,459	2,279	2,175		6,762	6,487	6,198		0.26	0.25	0.25	
	A	V	A at V	V at A	A	V	A at V	V at A	A	V	A at V	V at A
S.E. ±	61	129	219	223	144	326	551	564	-	-	-	-
C.D. (P=0.05)	169	259	NS	NS	400	655	NS	NS	-	-	-	-

\*Data statistically not analysed

NS=Non-significant

**Table 2 : Fifty per cent flowering and total crop duration in rice landraces**

Landraces	Fifty % flowering (days)				Total crop duration (days)			
	15 days	20 days	25 days	Mean	15 days	20 days	25 days	Mean
<i>Chandikar</i>	78	81	83	81	112	114	116	114
<i>Kuliyadichan</i>	74	79	81	78	107	108	109	108
<i>Kuruvai kalanjiyam</i>	78	81	82	80	108	110	112	110
<i>Norungan</i>	75	80	82	79	107	109	110	109
<i>Nootripathu</i>	77	81	83	80	108	110	112	110
<i>Black kavuni</i>	86	88	89	88	132	135	137	135
<i>Red kavuni</i>	87	89	91	89	133	137	138	136
<i>Njavara</i>	76	78	79	78	110	112	114	112
CO(R)50	87	88	90	88	132	134	135	134
Mean	81	83	85		117	119	120	

\*Data statistically not analysed.

**Table 3: Effect of seedling age on economics of rice landraces**

Landraces	15 days				20 days				25 days			
	Cost of cultivation (Rs ha <sup>-1</sup> )	Gross returns (Rs ha <sup>-1</sup> )	Net returns (Rs ha <sup>-1</sup> )	B:C ratio	Cost of cultivation (Rs ha <sup>-1</sup> )	Gross returns (Rs ha <sup>-1</sup> )	Net returns (Rs ha <sup>-1</sup> )	B : C ratio	Cost of cultivation (Rs ha <sup>-1</sup> )	Gross returns (Rs ha <sup>-1</sup> )	Net returns (Rs ha <sup>-1</sup> )	B:C ratio
<i>Chandikar</i>	35,786	79,310	43,524	2.22	35,786	70,700	34,914	1.98	35,786	67,550	31,764	1.89
<i>Kuliyadichan</i>	35,786	76,650	40,864	2.14	35,786	69,160	33,374	1.93	35,786	65,765	29,979	1.84
<i>Kuruvai kalanjiyam</i>	35,786	63,245	27,459	1.77	35,786	60,305	24,519	1.69	35,786	58,625	22,839	1.64
<i>Norungan</i>	35,786	81,375	45,589	2.27	35,786	71,505	35,719	2.00	35,786	68,600	32,814	1.92
<i>Nootripathu</i>	35,786	74,760	38,974	2.09	35,786	68,180	32,394	1.91	35,786	66,430	30,644	1.86
<i>Black kavuni</i>	36,586	1,40,280	1,03,694	3.83	36,586	1,36,140	99,554	3.72	36,586	1,21,800	85,214	3.33
<i>Red kavuni</i>	36,586	1,52,760	1,16,174	4.18	36,586	1,43,880	1,07,294	3.93	36,586	1,33,740	97,154	3.66
<i>Njavara</i>	41,786	1,71,000	1,29,214	4.09	41,786	1,59,000	1,17,214	3.81	41,786	1,53,000	1,11,214	3.66
CO(R)50	34,506	71,372	36,866	2.07	34,506	67,368	32,862	1.95	34,506	65,730	31,224	1.90

\*Data statistically not analysed.

source to sink in the former case.

The rice variety CO(R)50 recorded higher grain yield of 4,868 kg ha<sup>-1</sup>, followed by *Red Kavuni* and *Black Kavuni* landrace which recorded grain yield of 2,391 and 2,212 kg ha<sup>-1</sup>. *Red Kavuni* recorded higher straw yield of 7,469 kg ha<sup>-1</sup>, but was on par with *Black Kavuni*; 7,229 kg ha<sup>-1</sup>, *Norungan*; 7,145 kg ha<sup>-1</sup> and *Chandikar*; 7,086 kg ha<sup>-1</sup>. *Njavara* recorded lower grain yield and straw yield of 1,342 kg ha<sup>-1</sup> and 4,842 kg ha<sup>-1</sup> respectively during the crop growth period (Fig.1).

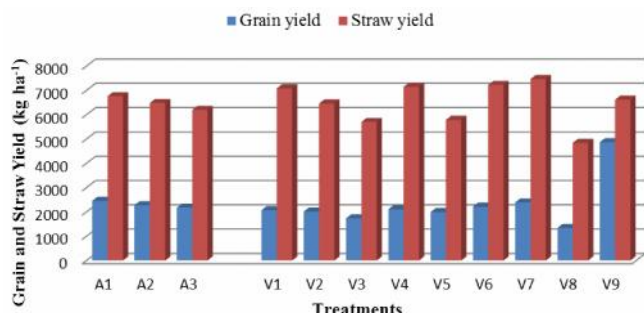


Fig. 1 : Effect of seedling age in rice landraces on grain yield (kg ha<sup>-1</sup>) and straw yield (kg ha<sup>-1</sup>)

### Days to Fifty per cent flowering :

Fifty per cent of the plant population completely exerted panicles, was considered and when recorded as 50 per cent flowering. Among the age of seedlings 15 days old seedlings took 81 days for 50 per cent flowering, followed by 20 days old seedlings with 83 days and 25 days old seedlings took 85 days to attain 50 per cent flowering. With regard to rice landraces, *Njavara* took 78 days, *Norungan* - 79 days, *Kuliyadichan* - 78 days, *Chandikar* - 81 days, *Kuruvaikalanjiyam* - 80 days and *Nootripathu* - 80 days, respectively to attain 50 per cent flowering and at harvest it recorded (108 to 114 days). *Black Kavuni* took 88 days, *Red Kavuni* took 89 days and CO(R)50 took 88 days to attain 50 per cent flowering and at harvest it recorded 134 to 136 days (Fig.2a and 2b).

### Economic analysis :

The data on cost of cultivation, gross returns, net income and benefit cost ratio are presented in Table 3. There was no variation with the age of seedlings in cost of cultivation. Because of higher yield obtained from 15 days old seedlings, recorded higher gross returns, net returns and B:C ratio. The lower yield from 25 days old seedlings, recorded lower gross returns, net returns with

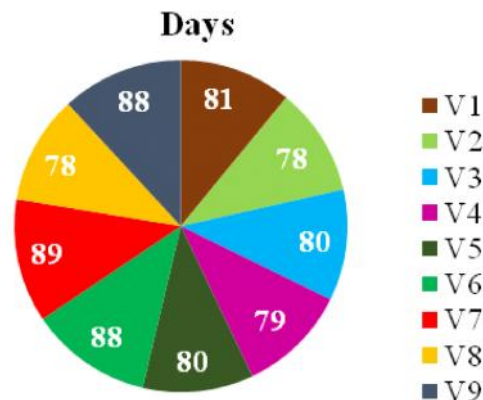


Fig. 2a : 50 % flowering (days)

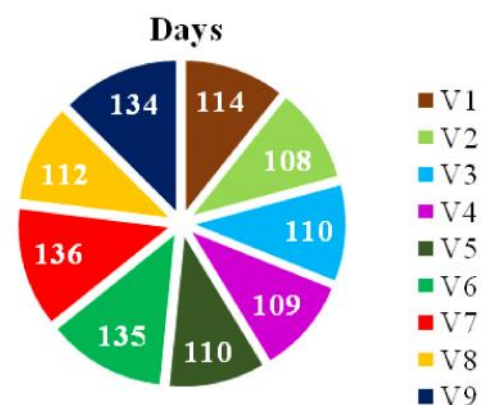


Fig.2b. Total crop duration (days)

B:C ratio. Santheepan (2012) noted that transplanting with 15 days old seedlings recorded higher net returns of 49,078 ha<sup>-1</sup> and higher B:C ratio. Lower net returns and lower B:C ratio (Rs.28,460 ha<sup>-1</sup> and 2.0), respectively were obtained with 25 days old seedlings. In rice landraces, *Njavara* recorded higher cost of cultivation (41,786 Rs.ha<sup>-1</sup>), higher gross return (1,71,000 Rs.ha<sup>-1</sup>) and net return (1,29,214 Rs.ha<sup>-1</sup>) followed by *Red Kavuni* and *Black Kavuni*. The B:C ratio was higher in *Red Kavuni* (4.18) followed by *Njavara* (4.09). Lower gross return (65,765 Rs. ha<sup>-1</sup>), net return (29,979 Rs.ha<sup>-1</sup>) and B:C ratio (1.84) were obtained from *Kuruvaikalanjiyam* with 25 days old seedlings. Rice landraces recorded higher returns; because price is four to five times higher than normal rice varieties. Income from a crop is determined by its yield level, market price of the produce and cost incurred on its cultivation.

### Conclusion :

From the experimental results, it is concluded that,

15 days old seedlings performed well and recorded higher yield with better economics, as compared to 20 and 25 days old seedlings in all rice landraces. In rice landraces, *Red Kavuni* recorded higher grain, straw yield and B:C ratio compared to other rice landraces. *Njavara* recorded higher gross return and net return. Higher yield and better economics were obtained in the treatment combination of *Red Kavuni* with 15 days old seedlings. *Kavuni* landraces are best suitable for cultivation in western zone of Tamil Nadu and it would be more profitable for small and marginal farmers. As per the findings of the experimental result, concluding that transplanting of 15 days old seedlings in landraces viz., *Chandikar*, *Kuliyadichan*, *Kuruvaikalanjiyam*, *Norungan*, *Nootripathu*, *Black Kavuni*, *Red Kavuni*, *Njavara* is found to be a better agronomic option for obtaining higher yield and economics.

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