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Effect of system of rice intensification on yield attributes towards enhancement of grain yield in rice

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Abstract
The experiments revealed that effect of age old seedling, spacing, weed management by conoweeder, chemical weeding, manual weeding, nutrient management with organic and inorganic fertilizer and alternate wetting and drying on the yield attributes, (number of panicle m-2, number of grain panicle), was favourably influenced by SRI (use of 8-12 days old seedling, 25x25 cm of spacing, saturation of water, four times conoweeding only with inorganic) in both the cropping seasons. Subsequent high yield is obtained from SRI (use of 8-12 days old seedling, 25x25cm of spacing, four times of conoweeding, saturation water, use of 75% inorganic+ 25% organic). The least grain yield and straw yield was recorded in conventional method of transplanting.

Keywords: Rice intensification, yield attributes, towards enhancement, grain yield, rice

Introduction
Rice contributes 20 to 25 percent agricultural GDP in India. Rice production has to be necessarily increased in the world level and in India to meet the growing population. SRI is a holistic agro-ecological crop management technique seeking alternatives to the conventional high input oriented agriculture through effective integration of crop soil water continuum. SRI has the edge over others as the method offers not only water saving but also enhances the yield and helps in environmental protection (Norman Uphoff, 2006) [10]. SRI increases rice yield two or three folds compared to farmers current rice yields (Norman Uphoff, 2002) [3, 9]. Excessive weed growth is one of the major constraints in intermittent irrigation practice followed under SRI. Early and frequent weeding by cono or rotary weeder solves this problem (Stoop *et al*., 2002) [14]. Burying the weeds in the fields rather than removing them improve the crop yields. Besides, the soil gets aerated and the weeds get decomposed in the soil and turn into organic matter. Due to this, the root and plant grow healthier and higher yields can be achieved. In SRI, methodology productivity will not only increase but input use efficiency will also be enhanced (Ghosh *et al*., 2007) [4].

Materials and Methods
Field experiments were conducted at Annamalai University Experimental Farm, Annamalai nagar during Navarai and Late Samba season with cultivars of CO 43 and ADT 43 respectively to study the evaluation of SRI and their contribution towards enhancement of grain yield. The experimental Farm is situated at 11^0 24' North latitude and 79° 44' East longitude at an altitude of +5.79 m above mean sea level. The first season crop received a rainfall 0f 8.8 mm distributed over 2 rainy day. The mean maximum temperature ranged from 33.12 ^{0}C with a mean minimum temperature ranged from 23.36 ^{0}C and with a mean relative humidity of 86.6 percent were observed during Navarai season.The second season crop received a rainfall of 125.8 mm distributed over 7 rainy days. The mean maximum temperature of 29.95^{0}c with a mean minimum temperature of 22.04^{0}c and with a mean relative humidity of 86.36 percent were observed during Samba season. The experiments were taken up in randomized B lock Design with four replication with seven treatments viz., (T1) - SRI (Use of 8-12 days old seedling raised bed nursery, transplanting at a spacing of 25x25 cm, weed management with conoweeder 4 times, saturation of water management use of 75% inorganic + 25% organic(FYM). (T2) - T1 with 20 to 25 days old seedlings (instead of 8-12 day old seedlings), (T3) – T1 with 20x15cm spacing (instead of 25x25cm spacing), (T4) – T1 with only inorganic (RDF) (instead of organic + inorganic). (T5) – T1 with herbicide (butachlor @ 1.5 kg)+ manual weeding 40 DAT(instead of conoweeding), (T6) – T1 with alternate wetting

and drying (instead of saturation of water management), (T7) – Conventional transplanting (location specific best management practice) (120:38:38).

Table 1: Effect of SRI on yield attributes towards enhancement of grain yield in rice

Treatments	No of filled grains panicle^{-1}		Thousand grain weight (g)		Grain yield (kg ha^{-1})		Straw yield (kg ha^{-1})	
	Navarai	Late Samba	Navarai	Late Samba	Navarai	Late Samba	Navarai	Late Samba
T1	82.6	84.76	15.52	20.52	4242	4445	7635	7998
T2	69.93	70.97	15.28	20.32	3632	3758	6174	6388
T3	70.88	72.89	15.33	20.39	3750	3937	6562	6889
T4	85.46	86.27	15.60	20.62	4250	4450	8075	8455
T5	79.51	80.25	15.40	20.43	4236	4437	7582	7942
T6	80.31	82.14	15.47	20.49	4238	4440	7628	7090
T7	64.99	65.01	15.21	20.00	3250	3538	5200	5600
SEd	0.32	0.64	0.02	0.02	225	231	125	120
CD	0.70	1.41	NS	NS	382	385	373	371

Result and Discussion

Among the various treatment combination, four times conoweeding adopted in 8-12 days old seedlings resulted in the highest number of filled grains panicle^{-1} (85.46 and 86.27) observed during Navarai and Late Samba seasons, respectively. Between 8-12 and 20-25 days old seedlings in respect of total number of grains panicle^{-1} and filled grains panicle^{-1} in both the seasons, 8-12 days old seedlings performed better. Among the weed management practice, 8-12 days old seedling, saturation of water, 25x25 cm spacing, only using inorganic four times conoweeding resulted in the highest total number of grains panicle^{-1} (502.75, 505.7) in both season. The thousand grain weight was not influenced significantly by any of these treatments. The least number of grains and percentage of filled grains were observed in conventional method of transplanting. 8-12 days old seedlings, 20-25 old seedlings and 25x25 cm, 20x15 cm spacing significantly influenced the yield parameters of rice. Four times conoweeding, saturation of water, 25x25 cm adopted in plots transplanted with 8-12 days old seedling reduced the weed population to a greater extend and increased the availability of nutrients to rice crop. Further, it increased the growth attributes, microbial activity mobilization of nutrients and better source to sink conversion could have contributed for filled grains panicle^{-1}in this treatment. This finding was earlier reported by Gani *et al*., (2002) [3], Ashokkumar Singh *et al*. (2008) [2], Krishna and Bairadarpatti (2009) [6] and Hugar *et al*. (2009) [5]. Agronomic practices like age of seedlings, type of spacing and weed management practices positively influence all the yield attributes namely total number of grains panicle^{-1} and filled grains panicle^{-1}. All these increased attributes contributed for increased grain yield. This finding was earlier reported by Sujatha (2011) [16]. Among the age old seedlings 8-12 days old seedlings increased the grain yield to the tune of 540.22 kg ha^{-1}during Navarai season and 495.92 kg ha^{-1} during Late samba season over 20-25 days old seedlings. This might be due to early establishment and vigour of the 8-12 days old seedlings compared to 20-25 days old seedlings. These findings supported by Abha Mishra and Salokhe (2008) [1]. The stirring effect of weeder has positive impact on grain and straw yield. 8-12 days old seedlings, 25x25 cm of spacing, saturation of water, only inorganic with four times conoweeding gave maximum grain and straw yield and comparable with 8-12 days old seedlings, saturation of water, organic and inorganic with application of butachlor @1.5 kg a.i. ha^{-1}+ one hand weeding. This finding fall in line with earlier reports of Senthil Kumar (2003) [11], Vijayakumar *et al*. (2006) [17]. Butachlor application reduced the weed density, provide better weed control efficiency, higher assimilation rate and increased the nutrient uptake, which favoured higher yields This observation was confirmed by the earlier reports of Singh and Rath (2000) [13] and Latif *et al*. (2005) [7], Subramanian and James Martin (2006) [15], Singh *et al*. (2006) [12], Mirza Hasanuzzaman (2009) [8].

Result

Among the various treatment combinations, four times conoweeding adopted in 8-12 days old seedlings resulted in the highest number of filled grains panicle^{-1} (85.46 and 86.27) observed during Navarai and Late Samba seasons, respectively. Between 8-12 and 20-25 days old seedlings in respect of total number of grains panicle^{-1} and filled grains panicle^{-1} in both seasons, 8-12 days old seedlings performed better. Among the weed management practices, 8-12 days old seedling, saturation of water, 25x25 cm spacing, only using inorganic, four times conoweeding resulted in the highest total of grains panicle^{-1} (502.75, 505.72) in both of the seasons. The thousand grain weight was not influenced significantly by any of these treatments. The least number of grains and percentage of filled grains were observed in conventional method of transplanting.

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