

### Apparent N recovery

N application increased its uptake, but the apparent recovery decreased at higher levels of N. The recovery was generally low in wet season than in dry season like *kuruvai*, because of greater leaching losses of applied N in wet season. In line with grain yield response, in *kuruvai* and *samba* seasons, N recovery was more when initial N was applied 20 DAS, while in *thaladi*, the same benefit was obtained with initial application at 10 DAS.

The results indicated that a N dose of about 100 kg ha<sup>-1</sup> in *kuruvai* and 125 kg ha<sup>-1</sup> in *thaladi* and *samba* seasons would be economical and first dose of N (50% of the total) could be applied 20 DAS in *kuruvai* and *samba* seasons when dry

seeding was done and 10 DAS in *thaladi* when sprouted seeds were sown in puddled field, for getting higher yields in direct seeded rice culture.

### REFERENCES

- BERINGER, H. 1980. Nutritional and environmental effects on yield formation. In : *Int. Potash Inst. Physiological aspects of Crop productivity*. Berna, Switzerland. pp. 155-174.
- GREENWOOD, D.J. (1982). Nitrogen supply and crop yield : The global scene. *Pl. Soil* 67: 45-59.
- MAHAPATRA, P.K., MAITY, K. and LENKA, D. (1986). Urea timing and application method in direct seeded lowland rice. *Int. Rice Res. Newsl.*, 11 (1) : 26.
- MAURYA, D.M. and VAISH, C.P. (1984). Upland rice in India. An overview of upland rice research. In : *Proc. of the Bouke Ivory Coast Rice Workshop, 1982*. IRRI. Los Banos, Philippines. 566 pp.

(Received : July 1996 Revised : February 1997)

Madras Agric. J., 84(4): 216-219 April 1997  
<https://doi.org/10.29321/MAJ.10.A00874>

## APPROPRIATE VARIETIES AND MANAGEMENT TECHNIQUES FOR DIRECT SOWN RICE UNDER PUDDLED CONDITION

P.MUTHUKRISHNAN., C.R.CHINNAMUTHU., K.PONNUSWAMY., P.SANTHI and M.N.BUDHAR

Tamil Nadu Rice Research Institute  
 Tamil Nadu Agricultural University  
 Aduthurai 612 101

### ABSTRACT

Field experiments were conducted during *kuruvai* seasons (June-Sept) of 1994 and 1995 to identify appropriate techniques and suitable rice varieties for direct seeding under puddled condition at Tamil Nadu Rice Research Institute, Aduthurai. Five rice varieties viz., Vikas, IET 9978, IET 9994, IET 9221 and ADT 36 were included during *kuruvai* 1994 and during 1995, the variety, IET 9221 was replaced by IET 10402 and ASD 16. Four management practices viz., transplanting, wet seeding, weed control and split application of fertilizer were included in the experiments. Grain yield obtained under direct seeding is comparable with transplanted rice. Rice varieties, ADT 36, ASD 16 and IET 9978 are found to perform well under direct sown situation with improved management practices viz., herbicide application followed by one hand weeding and application of recommended dose of N,P,K (125:50:50 kg/ha) and ZnSO<sub>4</sub> (25 kg/ha).

**KEY WORDS :** Direct seeding, puddled soil, wet seeding, appropriate varieties, technology

Rice is the most important cereal crop grown in Cauvery delta zone of Tamil Nadu. In recent years, increased irrigated areas, the availability of short duration modern rice varieties and cost-effective herbicides and high labour cost motivated the farmers towards direct seeding in puddled soil (De Datta and Nantasomsaran, 1990). The practice of direct seeding of sprouted seed is possible in areas where land is levelled with good water and weed control. It can help to reduce the labour requirement and duration of crop to some extent and provide comparable grain yields. Rachel

Sophia Alexander and James Martin (1995) reported that wet seeded rice cultivation could be a better alternative for transplanted rice. Direct sowing of rice is practiced in Tamil Nadu under conditions of delayed receipt of canal water or due to uncertain monsoon and scarcity for farm labour. Economic use of all inputs is essential, particularly under direct seeded condition. Under direct sown condition, higher dose of 150:75:75 kg N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O/ha registered higher grain and straw yields as well as net return/rupee invested in both *navarai* and *samba* seasons with variety ADT 37

and ADT 38 respectively (Wahab and Jayaprakash, 1995). Considering these facts, there is a need to identify appropriate varieties and also to develop management techniques like weed and nutrient management for direct seeded rice in comparison with transplanting.

## MATERIALS AND METHODS

Field experiments were conducted during *kuruvai* seasons (June-Sept) of 1994 and 1995 at the Tamil Nadu Rice Research Institute, Aduthurai to evaluate the performance of rice varieties under direct seeded conditions. The experiments were laid out in split plot design with three replications. The following management practices were accommodated in the main plots during 1994.

T1 - Transplanting 25 days old seedlings, farmers' practice of weed control (two hand weedings on 20 and 40 DAT), recommended dose of N, P, K + Zn application (50, 25 and 25% of N at basal, tillering and P.I. stages. Full P and Zn and 75% K as basal and 25% of N at basal, tillering and P.I. stages. Full P and Zn and 75% K as basal and 25% K at P.I. stage).

T2 - Transplanting as in T1, herbicide application (butachlor at 1.25 kg/ha 3-5 DAT) followed by one hand weeding on 40 DAT, N, P, K and Zn at recommended dose, N was applied in 3 splits (50:25:25 as basal, tillering and P.I. stages). P and Zn all basal and K in 2 splits (75:25 as basal + P.I. stages).

T3 - Wet seeding of sprouted seeds @ 100 kg/ha sown in lines, hand weeding twice (20 and 40 DAS), recommended dose of N, P, K + Zn application as in T1.

T4 - Wet seeding as in T3, herbicide butachlor @ 1.25 kg/ha at 6 Days After Rice Emergence followed by one spot weeding at maximum tillering stage, recommended dose of N, P, K and Zn; 1/3 N, full P and Zn and 75% K as basal; 1/3 N at tillering and 1/3 N with 25% K at P.I. stage.

During *kuruvai* 1995, an additional treatment (T5) was included *viz.*, broadcasting of sprouted seeds @ 100 kg and herbicide application 4-6 DARE followed by one hand weeding; N, P, K and Zn at recommended dose as in T1.

The varieties tested were: Vikas (V1), IET 9978 (V2), IET 9994 (V3), IET 9221 (V4) and ADT 36 (V5) during 1994 and Vikas (V1), IET 9978 (V2), IET 9994 (V3), IET 9221 (V4) and ADT 36 (V5) and ASD 16 (V6) during 1995. The varieties were included in the sub plots. All the varieties tested in this study for both the years are of short duration group maturing in about 110-120 days. 125:50:50 kg/ha of N, P and K and ZnSO<sub>4</sub> 25 kg/ha is the recommended level. The soil type of the experimental field is Udorthentic chromusterts. The available nutrient status of the soil is as follows: Available nitrogen (permanganate) 182 kg/ha, available phosphorus 64 kg/ha and available potassium 330 kg/ha. The soil pH, EC and organic carbon values are 6.8, 0.36 and 0.98 per cent respectively. Observations *viz.*, number of panicles per m<sup>2</sup>, panicle weight (g) and grain yield (t/ha) were recorded.

## RESULTS AND DISCUSSION

*Echinochloa crus-galli*, *Cyperus difformis*, *Cyperus iria*, *Fimbristylis mileacea*, *Eclipta alba*, *Ammania baccifera* and *Marsilea quadrifolia* were the major weed flora of the experimental site. During *kuruvai* 1994, the grain yield under direct seeding either by broadcast or sowing in lines was comparable with transplanting. Weed control by herbicide application followed by hand weeding and N, P, K and Zn application at recommended level (50% N, full P, Zn and 75% K as basal, 25% N at tillering and 25% N and 25% K at panicle initiation stage) was found to be the appropriate management practice for direct seeding. Averaged over management practices, variety ADT 36 recorded significantly higher mean grain yield (4.88 t/ha) compared to all other test varieties. Grain yield differences among IET 9978 (4.63 t/ha) and IET 9221 (4.61 t/ha) were non-significant but superior to Vikas (3.23 t/ha) and IET 9994 (3.70 t/ha). The interaction between varieties and management practices, indicated that variety ADT 36 recorded highest mean grain yield (5.02 t/ha) and panicle number (603/m<sup>2</sup>) under T3 indicating the suitability of this variety for direct sowing.

During *kuruvai* season of 1995, maximum grain yield (5.36 t/ha) was recorded under T3 treatment *viz.*, adopting broadcast method of sowing sprouted seed, weed control by hand

Table 1. Effect of treatments on growth and yield components of rice

Treatments	Varieties	Panicles/m <sup>2</sup>		Panicle weight (g)		Grain yield (t/ha)	
		1994	1995	1994	1995	1994	1995
T1	V1	497	515	3.11	2.83	3.15	4.85
	V2	492	484	2.60	2.77	4.87	5.16
	V3	457	563	2.57	2.68	3.72	4.82
	V4	550	475	2.55	2.84	4.57	4.32
	V5	559	492	2.42	2.40	4.95	5.76
	V6	-	502	-	2.60	-	5.35
T2	V1	488	484	2.50	2.60	3.15	4.26
	V2	484	440	2.66	2.87	4.47	4.68
	V3	497	564	2.71	2.40	3.55	4.82
	V4	602	541	2.69	3.03	4.48	4.55
	V5	435	590	2.79	2.58	4.68	6.03
	V6	-	502	-	2.32	-	5.45
T3	V1	500	466	2.72	3.59	3.50	4.48
	V2	550	431	2.75	2.39	4.62	5.50
	V3	469	436	2.55	2.97	3.83	5.59
	V4	597	515	2.67	2.72	4.53	5.21
	V5	603	449	2.75	2.17	5.02	5.90
	V6	-	471	-	3.39	-	5.49
T4	V1	471	484	2.55	3.28	3.13	4.05
	V2	484	422	3.11	2.86	4.57	4.55
	V3	488	480	2.76	3.39	3.68	4.60
	V4	602	541	2.70	3.26	4.87	4.85
	V5	501	497	2.47	2.47	4.85	6.63
	V6	-	497	-	3.20	-	6.14
T5	V1	-	602	-	3.05	-	4.41
	V2	-	559	-	3.70	-	4.79
	V3	-	546	-	2.70	-	4.70
	V4	-	471	-	3.20	-	4.26
	V5	-	555	-	2.94	-	6.11
	V6	-	462	-	2.48	-	6.78
CD (P = 0.05)	T	NS	NS	NS	0.24	0.08	NS
	V	52	NS	NS	0.33	0.11	NS
	TxV	NS	NS	NS	NS	0.22	1.53
Mean of Management Practices							
T1	511	505	2.65	2.68	4.25	5.05	
T2	501	520	2.67	2.63	4.07	4.97	
T3	544	461	2.69	2.94	4.30	5.36	
T4	509	487	2.72	2.57	4.22	5.14	
T5	-	533	-	3.01	-	5.17	
CD (P = 0.05)	NS	NS	NS	0.24	0.08	NS	
Mean of Varieties							
V1	487	510	2.72	3.07	3.23	4.41	
V2	502	467	2.78	2.92	4.63	4.94	
V3	478	518	2.65	2.93	3.70	4.90	
V4	588	509	2.65	3.01	4.61	4.64	
V5	525	517	2.61	2.51	4.88	6.09	
V6	-	487	-	2.80	-	5.84	
CD(P=0.05)	52	NS	NS	0.33	0.11	0.59	

\* Legends as in the text



weeding (20 and 40 DAS) + recommended dose of N, P, K and Zn, followed by T5 treatment (5.17 t/ha), wherein line sowing of sprouted seed and improved practices (herbicide application followed by one hand weeding, N, P, K + Zn at recommended dose) were adopted. Similar results were reported by Rachel Sophia Alexander and James Martin (1995) at Coimbatore in clay loam soil condition. Averaged over management practices, varieties ADT 36 (6.09 t/ha) and ASD 16 (5.84 t/ha) recorded higher grain yields indicating the positive response of these varieties to improved management practices (T5) such as wet seeding and herbicide application.

From the two years of study, it could be concluded that direct seeding under puddled condition is as good as transplanting. Varieties ADT 36, ASD 16 and IET 9978 responded positively for direct seeding and improved management practices *viz.*, direct seeding of sprouted seeds by broadcasting, butachlor application at 1.25 kg/ha 6 days after rice

emergence followed by one hand weeding at maximum tillering stage and application of recommended dose of N, P and K (125:50:5 kg/ha) and ZnSO<sub>4</sub> (25 kg/ha); 1/3 N, full P and 2/3 K and 75% K as basal; 1/3 N at tillering and 1/3 N with 25% K at P.I. stage.

#### ACKNOWLEDGEMENT

The authors are grateful to the ICAR (All India Co-ordinated Rice Improvement Programme) for the financial assistance and for providing the seed materials for conducting the experiments.

#### REFERENCES

- DE DATTA, S.K. and NANTASOMSARAN, P. (1990). Status and prospects of direct seeded flooded rice in tropical Asia. Paper presented in the International Rice Research Conference, 27-31, Aug. 1990, Seoul, Korea.
- RACHEL SOPHIA ALEXANDER and JAMES MARTIN, C. (1995). Effect of rice establishment methods on succeeding pulses. *MADRAS Agric. J.* 82: 399-401.
- WAHAB, K. and JAYAPRAKASH, T. (1995). Economics of direct seeded rice as influenced by water and fertilizer application. *MADRAS Agric. J.* 82: 409-410.

(Received : July 1996 Revised : February 1997)

*MADRAS Agric. J.*, 84(4): 219-222 April 1997

## POPULATION DENSITY OF EARTHWORMS UNDER DIFFERENT CROP ECOSYSTEMS

P.T.RAMESH, R.SAGAYA ALFRED and K. GUNATHILAGARAJ

Department of Environmental Sciences  
Agricultural College and Research Institute  
Tamil Nadu Agricultural University  
Coimbatore 641 003

#### ABSTRACT

The population density of earthworms under four different crop ecosystems *viz.*, rice, cotton, sugarcane and pulse was assessed in six districts of Tamil Nadu. Among the four crop ecosystems studied, rice supported maximum earthworm population followed by sugarcane, cotton and pulses in that order. Among the different soils in the study area, organic matter rich soils supported more earthworm.

**KEY WORDS :** Earthworms, population density, crop ecosystems, soil types.

Earthworms are nocturnal invertebrates of agro ecosystems. This wonderful creature beneath our feet silently does the job of decomposition and humification by ingesting soil and organic matter remains and make them undergo complex biochemical changes in its intestine, excretes and mixes it well with the soil (Nivak and Rath, 1996). Thus, they enable the formation of nutrient rich humus that improves soil physical and chemical

characters, which in turn will improve crop growth. It is clear that a good population of earthworms helps in improving soil properties and boost crop yield. But modern agricultural practices drastically affect the population of earthworms. So, the present study was undertaken to estimate the population density of earthworms in six districts of Tamil Nadu with varying soil types.