

INVESTIGATIONS ON THE EFFECT OF HEAVY MANURING OF RICE SEED BEDS

R. R. NAIR, G. R. PILLAI, P. N. PISHARODY and R. GOPALAKRISHNAN

Rice Research Station, Pattambi, 679306

Transplanting is one of the most expensive but also one of the surest methods for obtaining good yields of rice (*Oryza sativa* L). The first step to the successful adoption of this method is the production of healthy seedlings in the seed bed. It is a common belief that for raising quality seedlings, the nursery beds should be of high fertility. Heavy applications of organic and inorganic manures are often recommended to increase the fertility of seed beds. It has even been claimed that application of phosphorus in the nursery decreased the nitrogen requirement of rice crop in the main field (Lee, 1965). Seedlings in the heavily manured seed beds will naturally be tall, stout and vigorous. Apart from this, will they be more productive in contrast to seedlings raised in nursery beds of low fertility? This was investigated in two experiments at the Rice Research Station, Pattambi.

Materials and Methods

The first experiment was conducted during the autumn (June-October) and winter (October-January) seasons of 1968-69 and autumn season of 1970-71 in order to find out whether the amount of nitrogen application in the main field could be reduced by applying enough phosphorus in the nursery beds. In this experiment pregerminated seeds of 'IR8' rice were sown in seed beds receiving 4 levels of phosphorus (0, 30, 60 and 90 kg P_2O_5 per ha) in the form of superphosphate. Twentyfive days after sowing, seedlings from each level of P_2O_5 were transplanted in the main field at 5 levels of nitrogen (0, 30, 60, 90 and 120 kg/ha) adopting a spacing of 20 cm x 10 cm. The design of the experiment was randomised block, with 20 treatments and 3 replications.

The second experiment, which was conducted during the autumn and winter seasons of 1970-71 and the autumn season of 1971-72, aimed to study the effect of applied nitrogen, phosphorus and potash, individually and in combination, on the productivity of rice seedlings. Treatments in the nursery comprised of 3 levels each of nitrogen (0, 40, 80 kg ha), phosphorus (0, 25, 50 kg P_2O_5 ha) and potash (0, 25, 50 kg K_2O /ha) in 27 factorial combinations. There were 2 replications. Seedlings from the nursery plots were transplanted when they were 25 days old. The design of the experiment and the replications remained the same in the transplanted field. The crop in the transplanted

field received 80 kg nitrogen, and 40 kg each of P₂O₅ and K₂O per hectare. The test variety was Jaya.

Seed beds for both the trials were prepared in a nursery site of moderate fertility (organic carbon 0.54%; available P₂O₅ 154 kg per ha; available K₂O 110.0 kg/ha and pH 5.4). The seed rate adopted as 1.5 kg per 40 m² (cent). The seedlings were well protected from insect pests and diseases.

Results and discussion

In the first trial, phosphorus applied in the nursery was observed to have no significant effect on the shoot and root length and the dry weight of seedlings. It also did not exert appreciable influence on plant height, number of ear bearing tillers per hill and grain yield in the transplanted field. The effect of applied nitrogen, on the other hand, was significant on the production of ear bearing tillers, per hill as well as grain yield (Table 1) indicating that response to nitrogen was independent of the level of phosphate manuring in the nursery bed. These results do not agree with those reported by Lee (1965),

Table 1

Grain yield (kg/ha) of 'IR8' rice as influenced by applied phosphorus in the nursery and applied nitrogen in the main field (mean of 3 seasons)

P ₂ O ₅ (kg/ha) applied in the nursery	Nitrogen (kg/ha) applied in the main field					Mean	F (0.05)
	0	30	60	90	120		
0	2938	3401	3722	3999	4048	3622	
30	3051	3410	3801	3814	3983	3612	
60	3065	3340	3733	3947	4028	3623	N.S.
90	2912	3464	3744	4009	4151	3656	
Mean	2992	3404	3750	3942	4053		
CD. (0.05)		130					

N. S., not significant.

In the second experiment, nitrogen applied in the nursery plots produced significantly taller seedlings having good girth and high dry weight (Table 2). Neither phosphorus nor potash by itself had such effect on the young seedlings. Nevertheless, in combination with nitrogen, these nutrients produced

Table 2

Response of rice **seedlings** to applied nutrients in the nursery
(mean of 3 seasons)

Nutrient	Level of nutrient (kg/ha)	Height (cm)	Girth (cm)	Dry weight of seedling (g)
Nitrogen	0	31.4	11.2	0.12
	40	36.7	12.2	0.15
	80	44.0	12.7	0.18
C. D. (0.05)		4.4		0.12
Phosphorus	0	38.0	12.1	0.15
	25	37.5	11.7	0.14
	50	37.5	12.3	0.16
C. D. (0.05)				
Potash	0	37.1	11.8	0.14
	25	37.1	12.3	0.16
	50	37.1	12.0	0.15
C. D. (0.05)				

healthy and vigorous plants. In contrast, seedlings in the unmanured plot were apparently weak with slender stems and pale green leaves. Their establishment in the main field seemed to be slow, but once they established, they tillered fast and produced nearly as much tillers as did the seedlings from the manured plots. At the end of the reproductive phase, there was no significant variation between the manured and the unmanured seedlings in the production of ear bearing tillers per hill (Table 3),

Nitrogen application in the seed bed had an important advantage in that the seedlings came to flower 5 days earlier than the seedlings receiving no nitrogen. Higher the level of nitrogen applied in the seed bed, earlier was the duration of flowering. Similar observations have been recorded by Subbiah Pillai (1958) on tall *indica* rices. Phosphorus and potash when applied without nitrogen in the nursery had no such influence on flowering.

Table 3

Number of panicles per hill as influenced by applied nutrients in the seed bed

Season	Nitrogen (kg/ha)			F (0.05)	Phosphours (kg/ha)			F (0.05)	Potash (kg/ha)			F (0.05)
	0	40	80		0	25	50		0	25	50	
Autumn, 1970	6.97	6.95	6.95	NS	6.90	6.93	6.91	NS	6.24	6.99	6.80	NS
Winter, 1970	6.13	5.99	5.80	NS	6.00	5.91	6.02	NS	5.99	5.94	5.99	NS
Autumn, 1971	6.58	6.59	6.70	NS	6.61	6.56	6.39	NS	6.70	6.64	6.54	NS
Mean	6.56	6.51	6.48	NS	6.50	6.47	6.44	NS	6.31	6.52	6.44	NS

Table 4

Grain yield (kg/ha) of Jaya rice as influenced by applied nitrogen, phosphorus and potash in the nursery

Season	0	40	80	F (0.05)	Phosphorus			F (0.05)	Potash			F (0.05)
					0	25	50		0	25	50	
Autumn, 1970—71	5051	4880	4873	NS	4884	5003	4922	NS	5058	4763	4980	NS
Winter, 1970—71	5358	5255	5153	NS	5319	5179	5268	NS	5179	5255	5332	NS
Autumn, 1971—72	4885	4821	4603	NS	4744	4770	4808	NS	4872	4744	4667	NS
Mean	5098	4985	4876	NS	4982	4984	4999	NS	5036	4921	4993	NS

Apart from their effect on the vegetative development of young seedling in the seed bed, applied fertilizers produced no significant effect on grain yield. In fact, the starved seedlings—the seedlings which received no manuring in the nursery -- produced slightly higher yields compared to the seedlings which were supplied with nitrogen, phosphorus and potash (Table 4) in the nursery. Though rice seedlings start nutrient absorption about 5 days after germination' active absorption' takes place only 2 weeks after germination

(Yoshiaki Ishizuka, 1964). Therefore, the period of nutrient absorption in the nursery beds is limited to about 10 days during which period, what is absorbed is mostly assimilated and used for the formation of roots and leaves. Obviously, nutrients absorbed during this stage are not large enough to exert much influence on grain production or at least to reduce the nutrient requirements in the later stages of growth in the main field.

These studies conclusively prove that nursery manuring is not essential as far as rice yield is concerned. However, it can be practised in situations which demand planting taller and sturdier seedlings.

Summary

Two field experiments were conducted at the Rice Research Station, Pattambi on seed bed manuring using ... and Jaya as test varieties.

The first experiment (1969—70, 1970—71) aimed to study whether nitrogen application in the main field (0, 40, 80, 120 kg/ha) could be reduced by phosphate manuring (0, 30, 60, 90 kg/ha) of the seed bed. The results showed that response to nitrogen was independent of the dose of phosphours applied in the seed bed.

The effect of nitrogen (0, 40, 80 kg/ha) phosphorus (0, 25, 50 kg/ha) and potash (0, 25, 50 kg/ha) individually and in factorial combinations, on the productivity of rice seedlings was investigated in tde second experiment (1970-71, 1971—72). The results conclusively proved that applied nutrients had no significant influence on grain yield.

സംഗ്രഹം

ഞാറടിയിലെ വളപ്രയോഗത്തെ സംബന്ധിച്ചു പട്ടാമ്പിയിലെ ffxngj ഗവേഷണ കേന്ദ്രത്തിൽ രണ്ടു പഠനങ്ങൾ നടത്തുകയുണ്ടായി.

ഞാറടിയിൽ വേണ്ടത്ര തോതിൽ ഭാവഹവളം ചേർത്താൽ നെൽച്ചെടിയുടെ പാ കൃഷ്ണകാവശ്യകത കുറയ്ക്കുവാൻ സാധിക്കുമോ എന്നു മനസ്സിലാക്കുകയായിരുന്നു ആദ്യ പരീക്ഷണത്തിന്റെ ഉദ്ദേശം. ഈ പഠനത്തിൽ ഞാറടിയിലെ ഭാവഹ വളപ്രയോഗം നെല്ലിന്റെ പാകൃഷ്ണകത്തോടുള്ള പ്രതികരണത്തെ കാക്കുകയോ കൂട്ടുകയോ ചെയ്യുന്നില്ലെന്നു വ്യക്തമായി.

ഞാറടിയിൽ ചേർത്ത സസ്യ പോഷക മൂലകങ്ങൾ ഞാറിന്റെ ഉല്പാദന ശേഷിയെ എത്ര കണ്ട് സ്വാധീനിക്കുന്നു എന്നു പഠിക്കുകയായിരുന്നു രണ്ടാമത്തെ പഠനത്തിന്റെ ലക്ഷ്യം. വളപ്രയോഗത്തിന് വിധേയമായ ഞാറുകൾ ഉയരം കൂടിയതും കരുത്തുററുമായിരുന്നു. എന്നാൽ, അവ രാസവളങ്ങൾ ലഭിക്കാത്ത ഞാറുകളെ അപേക്ഷിച്ചു ഉൽപാദനശേഷിയിൽ ഒട്ടും മെച്ചമായിക്കണ്ടില്ല. ഞാറടിയിൽ രാസവളങ്ങൾ ലഭിക്കാത്ത ഞാറുകളാണ് താരതമ്യേന കൂടുതൽ വിളവു നൽകിയത്.

നീരടിയിൽ പാകൃഷ്ണക വളപ്രയോഗത്തിന് വിധേയമായ ഞാറുകൾ സുമാർ ൩൫ ഷ്യൂ ദിവസം നേരത്തെ കതിരിടുന്നതായും ഈ പാണം വെളിപ്പെടുത്തി.

REFERENCES

- Lee, J. K., 1965. Reaearch report of the office of Rural Development (Korea), 8, pp. 119--123.
- Subbiab Pillai, M. 1958. Cultural trials and practices of Rice in India. **ICAR** Monograph pp. 32--33.
- Yoshiaki Ishizuka. 1964. Nutrient uptake at different stages of growth. *The Mineral Nutrition of the Rice Plant*. John Hopkins Press, **Baltimore**. pp. 199--201.

ftf

(M. S. received: 24-1-1977)