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Evaluation of V-Shaped Rice Cultivation

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ABSTRACT

V-shaped rice cultivation was compared with the conventional method (Tamil Nadu Agricultural University method) using three tall *indicas* Co 29, ADT 27 and TKM 6 under two nitrogen levels namely 100 and 200 kg/ha. The V-shaped cultivation was found to increase the number of spikelets, percentage of ripened grains, thousand-grain weight and the length of the panicle and reduced the height and checked elongation of lower internode thus checking lodging.

INTRODUCTION

The concept of V-shaped cultivation was evolved by Matsushima (1969 in Japan based on his own exhaustive work on rice. This method aims at ensuring the necessary number of panicles in the early stages of growth, controlling the plant type and prevention of lodging in the mid-growth stage and finally in the later stages to increase the photosynthetic activity. Further, the method aims at increasing the number of spikelets per unit area in the early stages and to obtain higher percentage of ripened grains in the later stages.

In order to achieve these objectives both nitrogen and water management practices have been recommended. Nitrogen supply is subjected in such a way that heavy doses are given in the pretillering stage to ensure sufficient number of panicles and spikelets. Nitrogen as well water is with-held in the mid-growth stage (43 to 20 days) before flowering, with an aim of checking the excessive vegetative growth and to alter the plant type. Nitrogen is again supplied during the pre-flowering stage and flowering stage to ensure higher percentage of ripened grains. Intermittent drying is followed in the later stage of growth to revitalize the roots and to increase the photosynthetic efficiency.

The present study was initiated to examine the adoption of V-shaped rice cultivation method under Indian conditions and to know its effect on varieties of different plant types under two levels of fertility.

MATERIALS AND METHODS

The experiment was conducted during summer 1973, in the wet lands

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of Tamil Nadu Agricultural University, Coimbatore, India. The soil was clayey loam, low in nitrogen, phosphate and potash with a pH of 8.0.

The treatments included were : Methods of cultivation : 1. V. Shaped rice cultivation which consists of (a) applying nitrogen in four split doses in the ratio of 30:30:20:20 at planting, 15 days after planting (pre-tillering) 15 days before flowering and at flowering, (b) drying the soil during 43 to 20 days before flowering and (c) Intermittent drying of the plots in the later stages of growth 2. Control or Tamil Nadu Agricultural University (TNAU) method : Nitrogen is applied in two equal doses at planting and after 30 days of planting and maintaining 5 cm of water throughout.

Six varieties, three dwarfs, Kanchi, Kannaki and Karuna and three talls, Co. 29, ADT. 27 and TKM. 6 were used.

The two methods were evaluated at two levels of nitrogen namely 100 and 200 kg/ha. The plots were separated by double bunds to have a better control of water. There were 24 treatments and the experiment was laid as randomised block with three replications. Nitrogen was supplied in the form of urea. Phosphate and potash were applied at the rates of 50 kg/ha and supplied through single super phosphate and muriate of potash. The crop was given a spacing of 20 × 10 cm and two seedlings per hill were used. Necessary plant protection was given as per schedule.

The biometric data were collected following the All India Co ordinated Rice Improvement Project (Freeman *et al.* 1969) and data were statistically analysed.

RESULTS AND DISCUSSION

The yield of rice varied significantly due to varieties. Dwarf in general was found to give higher yield (5158 kg/ha) than talls (4254 kg/ha) (Table 1). All the varieties gave significantly higher yield than ADT 27 (3237 kg/ha) and they themselves were on par. Kanchi (5290 kg/ha) among the dwarfs gave highest yield while among talls Co 29 (4921 kg/ha), gave highest yield.

The grain yield was 4580 kg/ha with 100 kg/ha nitrogen which increased to 4816 with 200 kg/ha nitrogen. The difference was not significant.

The grain yield was 4580 kg/ha with TNAU method while it was 4790 kg/ha with V shaped rice cultivation, the difference, however, was not significant. The effect of V shaped cultivation was clear on the talls Co. 29 and TKM. 6.

Straw yield differed significantly among the varieties. Tall Co 29 gave highest yield (12160 kg/ha) while dwarf Karuna gave lowest (5211 kg/ha) Increasing the dose of nitrogen from 100 to 200 kg had increased the straw yield significantly. Method of cultivation had significant effect on the straw yield. However, the straw yield was lower with V shaped cultivation than TNAU method.

Height of the plant at flowering varied significantly among the varieties.

TABLE 1. Evaluation of V-shaped rice cultivation

Particulars	Grain Yield kg/ha	Straw (kg/ha)	Height (cm)	Number of good panicles m^2	Length of ear (cm)	Number of filled spikelets per panicle	Number of unfilled spikelets per panicle	Percentage of unifilled to filled spikelets	Thousand-grain weight
Varieties									
Kanchi	5290	8370	79.5	212.5	18.3	94	9	9.2	20.7
Kannaki	5237	5527	78.2	274.0	18.8	84	21	26.9	21.2
Karuna	4947	5211	65.9	253.5	18.6	96	11	12.3	18.5
Co. 29	4921	12160	105.6	198.0	21.7	71	20	29.2	22.1
TKM. 6	4605	12000	121.1	233.7	22.5	86	23	27.3	16.6
ADT. 27	3237	9159	100.6	178.5	19.9	86	31	36.3	14.9
CD at 5%	1342	3237	11.9	...	1.9	18	11	13.5	1.9
N levels									
100 kg/ha	4580	8054	90.3	217.0	19.7	83	19	24.8	19.2
200 kg/ha	4816	9475	93.4	233.0	20.1	89	19	22.3	18.9
CD at 5%	...	1200	...	...	...	..	...	...	...
Method of cultivation									
TNAU	4580	8686	93.9	240.8	19.4	79	22	29.1	18.8
V-shaped	4790	8659	89.8	209.5	20.5	93	16	18.0	19.2
CD at 5%		...	...	...	1.0	10	6	8.6	...

Tallest was TKM 6 and the shortest was Karuna. Height of the plant increased by three cms when the nitrogen level was increased from 100 to 200 kg/ha, but the result was not significant. Height of plant was reduced by

4 cm by adopting V-shaped cultivation Here again the result was not significant. The effect of method of cultivation was clear when 200 N was used with talls. Plant height was reduced by 14 per cent in case of Co. 29 and 16 per cent in case of TKM. 6. V-shaped cultivation reduced the plant height by 3 per cent when 100 kg/ha, Nitrogen was used and by 6 per cent when, 200 kg/ha nitrogen was used. The effect of method of cultivation was more clear in the latter stages when there was heavy lodging of TKM. 6 and Co. 29 with TNAU method reducing the yield. The loss in the grain yield was 1448 kg/ha when 200 kg/ha nitrogen was used with TNAU method of cultivation, whereas there was an increase in the yield of 394 kg/ha when V-shaped cultivation was adopted.

Length of the panicle was significantly affected by the varieties and in general talls had longer panicles than dwarfs. Increasing the levels of nitrogen increased this length of the panicle though not significantly. Length of the panicle was 19.4 cm with TNAU method and then it was 20.5 cm with V-shaped cultivation and the result was significant.

The number of filled and the percentage of unfilled to filled spikelets was found to vary with the varieties. The number of filled spikelets was found to vary with 71 to 96 per panicle among the varieties. Co. 29 gave lowest number of filled spikelets, but, comparatively it had lower percentage of unfilled spikelets. High yielder Kanchi, had lowest percentage of unfilled spikelet. Increasing the dose of nitrogen from 100 to 200 kg/ha increased the filled spikelets and also unfilled spikelets, but, had lower percentage of unfilled spikelets. Number of filled spikelets was significantly higher with V-shaped cultivation and the number of unfilled spikelets was significantly lower than the percentage of unfilled to filled spikelets was also significantly lower.

The thousand-grain weight differed significantly among the varieties. High yielder Kanchi and Kannaki had higher thousand-grain weight. Tall Co. 29 also recorded higher thousand-grain weight. Increasing the dose of nitrogen which increased the number of filled spikelets reduced the thousand-grain weight. The thousand - grain weight was higher when V-shaped cultivation was adopted.

Adoption of V-shaped cultivation had some effect on the plant type. The timely application of nitrogen and drying the soil during the mid growth stages recommended in the V-shaped cultivation reduced the plant height, especially on tall *indicas* Co. 29 and TKM. 6, thus checking the lodging. Yamasaki (1971) pointed out that when nitrogen was top dressed at later stages of growth prevented the elongation of lower internodes and checked lodging. In the present study, the effect of method of cultivation was clear (Table 2), when 200 kg/ha nitrogen was supplied to TKM 6 adopting TNAU method, which recommends two split application, reduced the yield of grain by 28 per cent compared to 100

kg/ha nitrogen. However when the same quantity was applied and V-shaped cultivation was adopted there was an increase in the yield by 9 per cent. Even in Co 29 the response was 16 per cent when V-shaped cultivation was adopted and there was no response when TNAU method was adopted. The beneficial effect of the V-shaped cultivation may partly be due favourable effect of this method on the plant type checking lodging. The beneficial effect of the method was seen only on tall *indicas* and not on dwarfs. The dwarf *indicas* with short stiff straw and erect leaves, according to Chandler (1970) has almost the ideal plant type.

TABLE 2. Effect of methods of cultivation on yield of grain of tall *indicas* (Yield in kg/ha)

	TNAU		V-Shaped	
	100 N	200 N	100 N	200 N
Co. 29	4869	4869	4744	5527
TKM.6	5132	3684	4606	5000

The beneficial effect of V-shaped cultivation seems to be two fold. First it seems to slightly modify the piant type favourably by reducing the height of the plant checking the lodging and secondly it has definite effect on number of filled grains. The number of filled grains as well as the percentage of ripened grains were more with V-shaped cultivation. Further, the method increased the length of the panicles and also the thousand - grain weight. Yamasaki (1971) has pointed the beneficial effect of late application of nitrogen on the length of the panicle and number of filled spikelets.

The effect of drying the soil during the mid growth stage seems to supplement the effect of split application of nitrogen. Yau Piau Hsu (1970) has pointed out that the method helped in saving the water without losing the grain yield. Matsushima (1969) has stated that mid growth stage drying is a supplementry means of reducing the nitrogen absorption by plant during critical periods when attempt is being made to alter the plant type.

V-shaped cultivation has significant favourable influence on the number of spikelets as well on the percentage of ripened grains, the effect was not reflected in the final yield possibly because the panicle number was not increased due to the treatments. The general effect of the method could be felt better if the crop has been raised on light soil and if the water management had been better, in which case the absorption of nitrogen by the plant could be controlled.

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