added P was reported by Singaram (1988). The available P was lowest at absolute and P control treatments.

The progressive decrease in available P with advancement of the stages, at all the treatments might be attributed to the uptake by crop and also as a result of prolonged period of reaction of added P with soil which might be responsible for the reversion of the available P into unavailable form of P (Singaram, 1988).

References

Budhar, M.N., Ramasamy, C. and Kareem, A.R. (1991). Relative efficiency of coated N fertilizers in low land rice. *Indian J. Agron.* **36 :** 124-125.

Mohanty, S. K, and Kibe, M. M. (1968). Behaviour of coated and uncoated fertilizer under field conditions. *Oryza,* **5:** 1-3.

Patil, N.T. (1996). Effect of sources, doses and coating of P fertilizer on P availability and yield of transplanted rice under lateritic soils of Konkan Thesis M.Sc. (Ag.) K.K.V, Dapoli.

Saravanan,A. and Kothandaraman, G.V. (1984). Efficiency of P fertilizers as determined by IR 20 grain yield. *Int. Rice. Res. Nowsl.* **9:** 22

Sharma,B. M, and Agarwal, S.K. (1989). Relative efficiency of N fertilizers in rice. *Indian J. Agron.* **34 :** 101-102.

Singaram,P. (1988). Evaluation of phosphorus sources for a cereal based cropping sequence. Ph.D. Thesis, TNAU, Coimbatore.

(Received : April 2000; Revised : August 2001)

Madras Agric. J. 88(7-9): 406-409 July-September 2001
https://doi.org/10.29321/MAJ.10.A00355

Growth and yield of rice fallow green gram as influenced by methods of sowing, stubble management and nutrient application in Tambiraparani command area

B.J. PANDIAN, S. ANAND KUMAR, V. VEERABADRAN AND V.K RAVICHANDRAN
Department of Agronomy, Agricultural College and Research Institute, Killikulam - 628 252, Tamil Nadu.

Abstract : The influence of various methods of sowing, stubble management and nutrient application for rice fallow green gram has been studied at Agricultural College and Research Institute farm Killikulam during 1998-99. The treatment consisting of dibbling green gram seeds as rice fallow in rice stubbles immediately after the harvest of the rice with stubbles cut and mulched over soil along with basal N and P application @ 12.5:25 kg ha^{-1} and two per cent DAP spray twice produced higher green gram yield of 691 kg ha^{-1} which accounts 165 per cent increased yield over conventional method of raising rice fallow pulses. *(**Key words**: Rice fallow, Sowing methods, Stubble, Foliar spray)*

Cultivation of pulses under rice fallows as a relay cropping is an unique system in coastal and deltaic areas of India (Satyanarayana, 1998). The rice fallow pulses survive entirely on residual moisture and fertility left over by the preceding crop of rice. Rice fallow cultivation does not permit agronomic manipulations such as tillage, herbicide application and irrigation etc Under Tamil Nadu condition rice is being cultivated in nearly 18 lakh ha; of which Cauvery and Tambiraparani command accounts 7 lakh ha which is ideally suited for rice fallow cultivation. Barring seed material, farmers follow almost zero input cultivation under rice fallow pulses. Hence the productivity of rice fallow pulses is always far below than the normal. It is highly imperative to develop improved agro-techniques to exploit the yield potential of pulses under rice fallow condition.

Materials and Methods

Field experiment was conducted at Agricultural College and Research Institute farm Killikulam; Thoothukudi district, Tamil Nadu during June-Sep; 1998, under rice fallow condition after harvest of advance *kar* (April-June). The texture of the experimental field soil was sandy clay loam. The fertility status of the soil was low in available N (178 kg ha^{-1}), medium in available P (9.1 kg ha^{-1}) and medium in available K(240 kg ha^{-1}). The cultivar Co 5 green gram with the duration of 70-75 days was used in this study. The experiment was laid out in split plot design with three replications.

The method of sowing *viz.* Relay sowing and rice stubbles left intact (M_1), relay sowing and rice stubbles cut and mulched (M_2), dibbling in rice stubbles and stubbles left intact (M_3) and dibbling in rice stubbles and stubbles cut and mulched (M_4) were assigned to main plots. The nutrition treatments such as Control-No fertilizers (S_1), NPK @12.5:25:0 kg ha^{-1} as basal (S_2), two per cent DAP spray twice (S_3) and basal NPK @ 12.5:25:0 kg ha^{-1} + two per cent DAP spray twice (S_4) were assigned to sub-plot.

The experimental layout was done before transplanting of advance *kar*. The relay sowmg was done 7 days before harvest in the standing rice crop adopting a seed rate of 25 kg ha^{-1}. In dibbling method of sowing seeds were hand dibbled in rice stubbles immediately after harvest at a spacing of 30 x 10 cm using a seed rate of 20 kg ha^{-1}. The DAP application was done at 45 days after harvest of rice and 15 days thereafter using high volume sprayer in evening hours.

Results and Discussion

Growth and yield characteristics are presented in Tables 1 and 2.

Plant population

Dibbling in rice stubbles with stubbles left intact (M_3) and stubbles mulch (M_4) significantly favoured the germination and registered more population of 2.17 and 2.13 lakh plants ha^{-1} respectively whereas relay sowing by broadcasting with stubble mulch (M_2) or stubbles left intact (M_1) had only 1.54 and 1.46 lakh plants ha^{-1} respectively. Dibbling seeds at proper depth gives firm contact with soil and ensures proper germination. Relay sowing by broadcast in standing rice crop registered lower population, as most of the seeds lost in paddy stubbles and some seeds failed to establish due to less contact with soil and due to higher moisture (Satyanarayana, 1998).

Plant height

Dibbling of green gram seeds in rice stubbles with stubble mulch (M_4) significantly recorded higher plant height (73.3 cm) at harvest and found at par with M_3 (72.8 cm). Significantly lesser plant height at harvest was recorded in M_1 (66 cm). Among the nutrition treatments, application of basal fertilizer along with two per cent DAP spray twice (S_4) registered significantly higher plant height of 73.5 cm when compared to control (67.4 cm).

LAI at 50 per cent flowering

Dibbling of green gram seeds in rice stubbles with stubble mulch (M_4) produced significantly higher LAI of 3.94 and it was at par with dibbling in stubbles with stubble left intact (M_3) and relay sowing by broadcasting with stubble mulch (M_2) produced 3.90 and 3.82 of LAI respectively at 50 per cent flowering. This could be attributed to increased population per unit area of land under dibbling as observed by Ramasamy (1979) in black gram. Application of basal fertilizer along with two per cent DAP spray recorded significantly higher LAI of 3.90 and it was comparable with the application of either basal @ 12.5:25 NP ha^{-1} (S_2) or two per cent DAP spray twice (S_3) which recorded 3.79 and 3.82 respectively. The control registered significantly lower LAI of 3.63.

Yield Characters

Pods per plant

Dibbling in rice stubbles with stubble mulch (M_4) had significantly increased the pods per plant (28.1) and was followed by dibbling in rice stubbles with stubbles left intact (M_3) producing 26.4 pods per plant. The other methods recorded significantly lower number of pods per plant. Fertilization has got significant and positive effect on number of pods per plant. Application of basal dose of N and P fertilizers along with two per cent DAP spray (S_2) registered significantly higher number of pods per plant (29.1) followed by two per cent DAP spray twice alone (25.3) when compared to control (21.1). This might be due to additional nutrition through foliage which might have caused more number of pods and efficient translocation of photosynthates from source to sink as observed by Rajendran (1984).

Table 1. Effect of sowing methods, stubble management practices and nutrient application on growth and yield of green gram under rice fallow condition

Treatment	Plant population (lakh ha^{-1})	Plant height harvest (cm)	LAI at 50% flowering	No. of pods plant^{-1}	No. of seeds pod^{-1}	Test Weight (g/100 seeds)	Grain yield (kg ha^{-1})	Net return/ Rupee invested
Main plot								
M_1	1.46	66.0	3.49	21.1	11.4	3.30	392	1.44
M_2	1.54	69.3	3.82	23.9	11.6	3.36	484	1.79
M_3	2.17	72.8	3.90	26.4	11.0	3.35	532	1.86
M_4	2.13	73.3	3.94	28.1	11.5	3.48	593	2.02
CD (P=0.05)	0.477	2.048	0.159	0.159	NS	NS	11.58	NA
Sub plot treatment								
S_1	1.80	67.4	3.63	21.1	10.6	3.04	432	1.71
S_2	1.78	71.2	3.79	24.1	11.3	3.33	492	1.55
S_3	1.88	69.4	3.82	25.3	11.3	3.44	485	1.93
S_4	1.83	73.5	3.90	29.1	12.4	3.68	594	1.92
CD (P=0.05)	NS	1.582	0.161	0.479	0.340	0.173	28.32	NA

NA - Not analyzed

Table 2. Grain yield (kg ha^{-1}) as influenced by sowing method, stubble managment and nutrient application in green gram

Treatment	M_1	M_2	M_3	M_4	Mean
S_1	260	432	474	560	432
S_2	393	492	526	558	492
S_3	436	410	530	564	485
S_4	481	606	599	691	594
Mean	392	484	532	593	-
	SE_d	CD (P=0.05)			
M	4.73	11.58			
S	13.72	28.32			
M x S	24.24	50.37			
S x M	27.45	56.64			

Seeds per pod

The number of seeds per pod was not significantly altered by various methods of sowing and stubble management practices. However combined application of basal fertilizer along with two per cent DAP spray twice found to record significantly higher number of seeds per pod (12.4) whereas basal application of fertilizer (S_2) and DAP only sprayed (S_1) plants were found to record 11.3 seeds per pod. The no fertilizer applied plant either through soil and foliar registered only lower number of seeds (10.6) per pods.

Test Weight

The test weight of green gram was unaffected due to various methods sowing. Basal application of fertilizer coupled with two per cent DAP spray (S_4) was found to significantly increase the test weight (3.68 g) as compared to control which

recorded only 3.04 g. Foliar application of N and P through DAP may be effective in extending the maturity period by delaying senescence *ie.*, increased leaf area duration, which ultimately reflected in number of seeds and test weight through translocation of more quantity of metabolites as reported by Patel *et al.* (1984).

Yield

Dibbling in rice stubbles with stubble mulch (M_4) produced higher grain yield of 593 kg ha^{-1} which was 28 per cent more than relay sowing. Optimal plant population evenly distributed over the land surface resulted in greater LAI which inturn produced increase in yield under dibbling (Kumar *et al.* 1992). Application of basal and foliar nutrient increased the grain yield by 37.5, 20.7 and 22.5 per cent over control, basal N and P fertilizer only and DAP spray respectively. Foliar application of DAP might have created a positive source - sink gradient of photosynthates translocation resulting in increased yield attributes and yield of green gram under rice fallow condition.

Economics

Higher grain yield of green gram under rice fallow condition was noticed in dibbling with stubble mulching combined with basal application of N and P fertilizers and two per cent DAP spray twice (M_4S_4) led to increased net return as compared to other treatments. But the net return per rupee invested was higher under dibbling and stubble mulched with two per cent DAP alone sprayed plots (M_4S_3) since the involvement of higher cost towards basal N and P fertilizer to the former treatment.

References

Kumar, V., Bishnoi, O.P., Rao, V.V.M., Diwan singh and Surender Singh. (1995). Biomass production in summer mung under various mulching treatments. *Indian J.Plant Physiol.* **38**:94-96.

Patel, R.G., Patel, M.P. Patel, H.C. and Patel, R.B. (1984). Effect of graded levels of nitrogen and phosphorus on growth, yield and economics of summer mung bean. *Indian J Agron.*, **29**: 291-294.

Rajendran, R. (1984). Studies on the response of green gram Co 4 to foliar nutrition of urea and Diammonium phosphate under irrigated condition. *M.Sc.(Ag.) Thesis,* TNAU, Coimbatore.

Ramasamy, S. (1979). Methods of sowing and foliar nutrition of Diammoniwn phosphate on rice fallow blackgram. *M.Sc. (Ag.) Thesis,* TNAU, Coimbatore.

Satyanarayana, A. (1998). Pulse in rice fallows - An overview. In: *Proc.* Short course on rice fallow pulses. (20-29 May, 1998) Lam, Guntur. pp. 5-10.

(Received:September 2000; Revised: August 2001)

Madras Agric. J. 88(7-9): 409-413 July-September 2001

Stability of yield and its components in black gram

C. NATARAJAN
Agrtcultural Research station, Pattukkottai - 614 602, Tamil Nadu.

Abstract : Sixty five genotypes of black gram consisting of fifteen parents and their fifty hybrids were evaluated for stability in four environments differentiated by locations. Both linear and non-linear components of G x E interaction were significant for clusters/plant and pods/plant, while only non-linear component was significant for grain yield. The study of stability parameters revealed that the parent T9 and hybrids ADT 3 x TAU 5 were found to be stable over the environments with desirable high mean yield. *(Key words : Black gram, Yield stability)*

Seed yield is quantitatively inherited character and there is considerable interaction between genotypes and environments. Some of the crop varieties are widely adapted, whereas others are not so. Multilocation / multi-environtnent testing of genotypes provides an opportunity to the plant breeders to study the adaptability of a genotype to a particular enviromnent and also the stability of the genotype over different environments. The genotypes x environment interaction is of major