The Andhra Agric. J 68 (3): 297-301, 2021

Effect of Crop Stand Establishment and Nutrient Management on Growth and Yield of Rice Fallow Blackgram

B Rajendra Kumar, P V N Prasad and A Upendra Rao

Agricultural College, Naira, A. P.

ABSTRACT

A field experiment was conducted for two consecutive years (2017 -18 and 2018-19) at the Agricultural College Farm, Naira. During *rabi* significant increase in growth and yield attributes of rice fallow crop blackgram was remained with the treatment, which received 50**%** RDF **+** 25**%** RDF through FYM **+** 25**%** RDF through green manure crop (S_4) which was however at par with 75% RDF+ 25**%** RDF through FYM (S_2) during both the years of study. The residual effect of INM treatments imposed in *kharif* rice on succeeding rice fallow crops, resulted in recording higher net return and higher return rupee^{-1} investment with 50% RDF along with 25**%** RDF through FYM **+** 25**%** RDF through green manure crop which was at par with 75% RDF + 25**%** RDF through FYM during both the years of study.

In Andhra Pradesh, rice being one of the most important crops of coastal districts contribute 60 per cent of the state's rice production following different establishment techniques *viz*., direct dry seeding rice, transplanting, drum seeding and mechanized system of rice transplanting**.** Adoption of a particular establishment method by the farmers depends upon profitable return. Since, high labour cost makes rice farming an unattractive enterprise, it is necessary to enhance productive performance of rice-based cropping system without increasing the production cost. However, vibrant instinctiveness of cropping system result in judicious use of production resources and nutrient management in cropping systems being more complex. INM concept off late comprising use of dissimilar resources in the most efficient manner is gaining attention. Careful discretion in blending both organic and inorganic sources has been known to reciprocate strengthening the efficacy of both these sources resulting in higher productivity coupled with increased fertilizer use efficiency and economising the impact of costly mineral fertilizers.

Taking advantage of the residual soil moisture the farmers of North Coastal Zone who, have been traditionally following Rice-Rice fallow blackgram under zero tillage cropping sequence results in low yields but also deteriorates soil properties. The response of rice to applied fertilizers is inconsistent due to scarce moisture availability and number of factors have been identified as constraints for enhancing its productivity (Ramana *et al*., 2007). Black gram is an important pulse crop grown in North coastal, Andhra Pradesh under rice fallow condition, which is broadcast at 5-7 days before the harvest of paddy crop. However, yield recorded (300-500 kg/ ha.) in this ecosystem is highly variable. Information on sustaining crop stand to accommodate most of the *rabi* crops immediately after harvest of *kharif* rice to overcome the impact of residual moisture stress affecting their establishment is much more lacking. Influence of alternative establishment and nutrient strategies on decreasing system productivity need to be adequately investigated.

MATERIAL AND METHODS

The experiment was conducted during two consecutive years of 2017-18 and 2018-19 both *kharif* and *rabi* seasons and during *kharif* experiment was laid out in split plot design with three replications. The treatments consisted of two main plots *viz*., drum seeding and transplanting method and four sub plots *viz*., S_1: 100% RDF (Chemical fertilizers); S_2: 75% RDF+ 25**%** RDF through FYM; S_3: 75**%** RDF + 25**%** RDF through green manure crop **(**Sunhemp**)**; S_4: 50**%** RDF + 25**%** RDF through FYM + 25**%** RDF through green manure crop **(**Sunhemp**).** During *rabi* rice fallow crops *viz.*, blackgram, ragi and sunhemp were sown in *kharif* sub plot treatment plots which was sub divided into three sub-sub treatments and thus, double split plot design was adopted. The experimental soil was sandy loam in texture, slightly alkaline in reaction and 0.35% in organic carbon, 229 kg ha^{-1} in available nitrogen, 29 kg ha^{-1} in available phosphorus and 268 kg ha^{-1} in potassium. The quantity of sunhemp biomass used for incorporation as green manure crop is 7.14 t/ha during 2017-2018 and 7.47 t/ha during 2018-2019 after converting fresh biomass into dry biomass.

The test variety, 'Tirupati Minumulu' TBG 104 blackgram seed is soaked in water during morning hours and stored in tied gunny bag overnight for quick and early germination. Bold and healthy seeds of blackgram were broadcasted under rice fallow condition. To obtain required plant population seed is sown ensuring sufficient moisture in the rice field. After harvesting of rice crop, bunds were formed as per the *rabi* layout plan. Date collected on plant growth, plant population and yield attributes were recorded. The data was analysed as per the standard analysis of variance procedure for split plot design by Rangaswamy (2013) for split-split design as suggested by Gomez and Gomez (1984). Statistical significance was tested by applying F-test at 0.05 level of probability. Critical differences at 5 per cent level were worked out

RESULTS AND DISCUSSION

Plant height measurements were taken at 30, 60 DAS and at harvest of crop growth to know the influence of residual moisture and nutrients. There is no significant difference in plant height in both the previous rice crop establishment methods as shown in table-1. Interaction with fertilizer treatments was not observed. Among the fertilizer treatment methods 50**%** RDF + 25**%** RDF through FYM + 25**%** RDF through green manure crop **(**sunhemp**)** (S_4) significantly recorded highest plant height which was on par with 75**%** RDF + 25**%** RDF through FYM (S_2) at 30, 60 DAS and at harvest, lowest plant height was recorded in S_1 100% RDF (chemical fertilizers) treatment followed by S_3 75% RDF + 25% RDF through green manure crop (sunhemp). Interaction effect on plant height in all the stages of crop growth was not significant.

From pooled data, at 30 DAS, significant highest plant height was recorded with S_4 (24.40 cm) which is at par with S_2 (23.42 cm) and the lowest was recorded in 100% RDF through chemical fertilizers S_1 (21.46 cm) followed by S_2 (22.63 cm). The same line of observation was noticed in plant height at harvest. Similar trend was followed at 60 DAS and at harvest. It might be due to the fact that moisture retention capacity of the soil will increase due to addition of organic sources of fertilizers to the soil. In S_4, 50% of the recommended dose of fertilizers was added through organic sources which make the soil to retain moisture for long time. The organic matter added to the soil also enhances the nutrient retention capacity from the previous crop. In S_2 treatment, where 25% of RDF was replaced with FYM performed better in conserving soil moisture followed by 25% of RDF was replaced with green manure

crop (sunhemp). These findings are in agreement with Sai Sravan and Ramana Murthy (2014).

The effect of different crop establishment techniques of preceding rice did not show significant difference on initial and final population of blackgram as depicted in table-1. Interaction with fertilizer treatments was not observed. There is no significant difference in initial and final plant population in different fertilizer treatments. Amount of soil moisture is very important at the time of sowing rice fallow pulses excess moisture and less moisture will reduce the germination percentage.

The effect of different crop establishment techniques of preceding rice did not show significant difference on number of pods per plant, Significant number of pods were produced with fertilizer treatments in S_4 (13.38) 50% RDF + 25% RDF through FYM + 25% RDF through green manure crop (sunhemp) than with S_2 (12.23) 75% RDF + 25% RDF through FYM, S_3 (11.14) 75 % RDF + 25% RDF through green manure crop (sunhemp) and S_1 (10.19) 100% RDF (chemical fertilizers) treatments as depicted in table-1. Number of pods plant^{-1} is one of the yield attributing character which is having direct relation with yield. This might be due to vigorous growth of the plant which facilitates to put forth more number of pods plant^{-1}. The above results are in comparison with Subramani *et al*. (2005).

The effect of different crop establishment techniques of preceding rice and fertilizer treatments did not show significant difference on Number of seeds per pod, and Test weight (g). There is no interaction effect between methods of establishment and various sources of fertilizer treatments as shown in table-1.

Grain yield of rice fallow blackgram was unaffected by different crop establishment techniques of preceding rice as presented in table-2. The grain yield of rice fallow blackgram was significantly influenced by different fertilizer treatments applied to rice. The interaction effect of crop establishment techniques and fertilizer treatments of rice failed to influence the grain yield of succeeding rice fallow blackgram. The residual effect of fertilizer treatments applied to rice on succeeding blackgram was noticeably higher with application of 50% RDF + 25% RDF through FYM + 25% RDF through green manure crop (sunhemp) S_4 which was significantly higher over S_1 100% RDF (chemical fertilizers) however which was at par to S_2 75% RDF + 25% RDF through FYM and S_3 75% RDF + 25% RDF through green manure crop (sunhemp), where organic manure applied to preceding rice had significant residual effect on yield and nutrient uptake of blackgram.

Among all the fertilizer treatments the residual effect on succeeding blackgram is significant. Significantly higher grain yield was recorded with S_4 (621 Kg/ha) which was onpar with S_2 (601 Kg/ha). However lowest grain yield was recorded with S_1 (563 Kg/ha). The productivity of rice fallow blackgram is always less than with other cultivation practices of blackgram due to limited availability of nutrients and moisture as reported by Sasikala *et al*. (2014). One foliar application at flowering stage reduced flower dropping, increased pod formation, seed setting and enhanced overall yield attributes in blackgram crop which was also reported by Lavanya and Ganapathy (2010) and Mir *et al*. (2010).

The effect of different crop establishment techniques of preceding rice and fertilizer treatments did not show significant difference on haulm yield (kg ha^{-1}), Bhusa yield (kg ha^{-1}) and harvest index. There is no interaction effect between methods of establishment and various sources of fertilizer treatments as shown in table-2.

Table.1. Pooled data for the years rabi 2017-18 and 2018-19 of Plant height (cm), Plant population, Number of pods per plant, Number of seeds per pod, and Test weight (g) of rice fallow blackgram as influenced by crop stand establishment and nutrient management in rice.

Treatments	Plant height			Plant population		Yield attributes		
	30 DAS	60 DAS	Harvest	Initial	Final	No. of Pods per plant	No. of Seeds per pod	Test weight
Rabi : Blackgram								
M_1	23.4	35.6	36.3	36.53	35.51	11.80	5.50	32.52
M_2	22.5	33.8	35.5	36.22	34.51	11.67	5.29	32.57
SEm ±	0.9	0.85	0.83	0.66	1.04	0.32	0.17	0.27
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS
CV (%)	13.54	9.4	8.04	6.3	10.27	9.36	10.95	2.73
Fertilizer treatments (Organic and in-organic sources)								
S_1	21.4	32.8	34.5	35.67	33.45	10.19	4.98	32
S_2	23.4	35.1	37	36.45	35.32	12.23	5.56	32.63
S_3	22.6	34.2	35.7	36	34.9	11.14	5.22	32.44
S_4	24.4	36.2	38.5	37.38	36.38	13.38	5.84	33.09
SEm ±	0.56	0.72	0.83	0.78	0.86	0.42	0.22	0.36
CD (P=0.05)	1.73	2.14	2.56	NS	NS	1.28	NS	NS
CV (%)	6	5.08	5.57	5.26	6.02	8.66	9.77	2.79
Interaction	NS	NS	NS	NS	NS	NS	NS	NS

Table 2. Pooled data for the years rabi 2017-18 and 2018-19 of Grain yield (kg ha^{-1}), haulm yield (kg ha^{-1}), Bhusa yield (kg ha^{-1}) and Harvest index of rice fallow blackgram as influenced by crop stand establishment and nutrient management in rice.

Treatments	Yield parameters			
	Grain Yield	Haulm Yield	Bhusa yield	Harvest index
Rabi : Blackgram				
M_1	598	2009	457	19.83
M_2	592	2007	443	19.64
SEm ±	19.33	51.8	9.83	0.44
CD (P=0.05)	NS	NS	NS	NS
CV (%)	11.25	8.94	7.73	7.77
Fertilizer treatments (Organic and in-organic sources)				
S_1	563	1960	422	19.6
S_2	601	2012	458	19.87
S_3	595	2025	441	19.64
S_4	621	2036	478	19.84
SEm ±	12.77	41.13	15.76	0.55
CD (P=0.05)	39.34	NS	NS	NS
CV (%)	5.26	5.017	8.64	6.85
Interaction	NS	NS	NS	NS

LITERATURE CITED

Gomez K A and Gomez A A 1984 Randomized block design in statistical procedure for Agricultural Research. *Published by Wiley International Science, USA*. 621-635.

Lavanya G A and Ganapathy M 2010 Yield maximization of blackgram in rice fallow blackgram through organic sources of nutrient management practices in cauvery deltaic areas. *Legume Res.* 33 (4): 291-294.

Mir M, Mobin N A, Khan M A, Bhat N A, Lone K A, Bhat S M, Razvi S A, Nowsheeba Wani Sabina Akhter, Shazia Rashid, Nasir Hamid Masoodi and Payne W A 2010 Crop responses to interaction between plant growth regulators and nutrients. *J. Phyto.* 2 (10): 9-19.

Ramana A V, Reddy D S and Ramkumar Reddy K 2007 Influence of sowing time and Nitrogen levels on growth, yield and N uptake of rainfed upland rice**.** *The Andhra Agricultural Journal***.** 50**:** 75-81**.**

Rangaswamy R 2013 A Text book of Agricultural Statistics. *New Age International Publishers,* New Delhi. *www.newage-publishers. com,* 2nd edition.

Sai Sravan U and Ramana Murthy K V 2014 Productivity and profitability of different rice (*Oryza sativa* L.) based cropping systems in north coastal zone of Andhra Pradesh, India. *Eco. Env & Cons.* 21 (1): 185-190.

Subramani T, Nalliah Durairaj S, Natarajan S K and Thiruvarasan S 2005 Effect of Nutrient Management on Yield and Yield Attributes of Rice based cropping system in Tambaraparani Command Area. *Journal of Agronomy*. 4(2): 127-129.

Received on 02.05.2021 and Accepted on 03.09.2021