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Effect of different nutrient management practices in rice (*Oryza sativa* L.) –blackgram (*Vigna mungo* L.) *utera* cropping sequence

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ABSTRACT

The effect of different nutrient management practices on the performance of both rice and blackgram crop grown in rice-blackgram utera cropping sequence was studied in an on-farm trial carried out in five different villages of Tangi block in the Khurda district of Orissa during three consecutive crop growing season of 2001-02, 2002-03 and 2003-04. The highest grain yield (38.4 q ha^{-1}) of rice as well as the highest seed yield (5.87 q ha^{-1}) of blackgram was recorded in the treatment where additional 20 kg 'P_2O_5' of blackgram was applied to rice as basal along with the recommended dose of fertilizer. The highest net return (Rs. 15,618) and benefit : cost ratio (2.28) were also recorded from the same treatment plots.

Key words: *Nutrient management, rice, blackgram, utera cropping*

Traditional rice growing areas under rainfed shallow lowland of coastal Orissa are generally monocropped and there is very little scope to raise a second crop after rice by utilizing the residual soil moisture as water recedes quickly from the rice field during late November to early December resulting in poor soil moisture status. Under such situation, the blackgram crop performs well as *utera* crop in rice-based *utera* cropping sequence (Saha and Moharana, 2005). However, there is limited scope of nutrient management in *utera* crops as sowing of *utera* crops is done on the standing paddy field. As such it has to depend on residual nutrient after paddy cultivation. Thus, the nutrient management in rice cultivation exert great influence on the productivity of succeeding *utera* crop (Agarwal *et al.*1986). Keeping this in view, the present investigation was carried out in the farmers' field to study the effect of different nutrient management practices advocated to preceding rice crop on the performance of both rice and blackgram in rice- black *utera* cropping sequence.

On-farm trials were conducted in five different villages of Tangi Block in the Khurda district of Orissa during the three consecutive crop growing seasons of 2001-02 and 2002-03 and 2003-04. The soil of experimental sites was clay loam, having pH in the range of 8.2 - 8.6, organic carbon 0.60 – 0.78%, total N 0.067 – 0.081%, available P 18.0 – 24.6 kg ha $^{-1}$ and available K in the range of 112.3 – 129.0 kg ha $^{-1}$. The experiment was laid out in randomized complete block design in ten farmer's fields (two farmers from each village in five different villages). The treatments comprised of T_1- fertilizer application as per farmers practice (60:30:30 kg N, P_2O_5 and K_2O ha^{-1}); T-$_2$- 100% recommended dose of fertilizer (RDF) to rice (80:40:40 kg N, P_2O_5 and K_2O ha^{-1}); T_3- 100% RDF + 20 kg 'P_2O-$_5$' of *utera* crop to rice and T_4- recommended 'P_2O-$_5$' of rice to *utera* crop at sowing through di-ammonium phosphate (DAP). Rice (cv Pooja, 140 days duration) was established by seeding behind the plough at 20 rows apart with a seed rate of 80 kg ha $^{-1}$ during first week of June. Blackgram (cv. local) was sown in standing crop of rice by broadcasting the seeds with a seed rate of 30 kg ha^{-1} at two weeks after flowering of rice during early November. An area of 200 m^2 was considered as one treatment plot and each farmer's field with an area of around 800 m^2 was considered as one replication. Thus, there were 10 replications. Monsoon rainfall started on first week of June during 2001 and 2002 while it started late on third week of June during 2003 and it ceased on second week of October, fourth week of September and third week of October during 2001, 2002 and 2003, respectively. However a good rain occurred during late October to

early November in 2003 that helped the succeeding blackgram crop for better establishment. The rainfall details during 3 different crop growing season are cited in Figure 1,2 and 3. The rice crop was harvested during last week of November while the blackgram crop was harvested during second week of February. Yield and yield attributes of both the crops of rice and blackgram were recorded at harvest and the economics of different treatments were calculated based on the price of the produce in local market and wages prevalent in the area.

From the experimental results, it was observed that both the crops responded well with different nutrient management practices and produced significantly higher yield over farmer's practice. In case of rice, the highest grain yield (38.4 q ha^{-1}) was recorded in the treatment where additional 20 kg 'P_2O_5' of blackgram was applied to rice as basal along with the recommended dose of fertilizer indicating better response of rice due to application of additional 20 kg 'P' of succeeding blackgram crop to rice. But it was at par with the treatment where the recommended dose of 'P' of rice was applied at the time of sowing of blackgram through di-ammonium phosphate. It might be due to better availability of 'P' to rice during the wet season when applied to preceeding blackgram crop in the previous winter season. Thakur (1990) and Dwivedi *et. al.* (1997) also recorded similar response in case of chickpea and lentil, respectively, when grown as *utera* cropping. The increase grain yield might be attributed to respective increase in different yield attributing characters like panicles m^{-2}, grains per panicle and 1000-grain weight (Table 1).

In case of blackgram, all the yield attributing characters like plant population m^{-2}, number of pods per plant, seeds per pod and 1000-seed weight were significantly higher in the same treatment plots where 20 kg 'P_2O_5' of blackgram was applied to rice at sowing along with 100% recommended dose of fertilizer showing better crop performance. The highest seed yield (5.87 q ha^{-1}) was recoded from the same treatment plot and it was about 23% higher in comparison to the treatment where only recommended dose of fertilizer was applied to rice (Table 2). Similar finding was also reported by Agarwal *et. al.* (1986) with different pulses.

While considering the economic benefits obtained from different treatments, it was revealed that the highest monetary return of Rs.15,618 ha^{-1} and B:C ratio of 2.28 was achieved in the treatment where additional 20 kg 'P_2O_5' of blackgram was applied to rice as basal along with the recommended dose of fertilizer (Table 2). Thus, it may be concluded that application of 100% recommended dose of fertilizer to the preceding rice crop along with the 'P' of blackgram to rice at sowing substantially improve the seed yield as well as net monetary benefit in rice-blackgram *utera* cropping sequence.

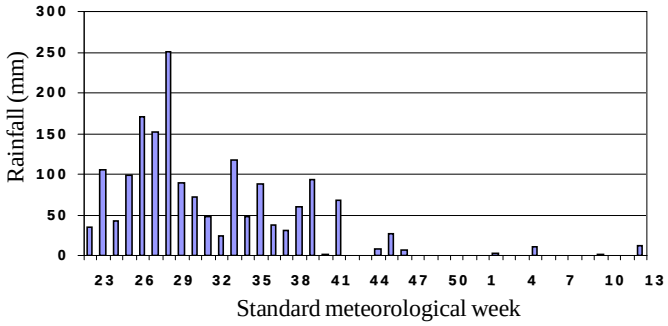

Fig. 1. Weekly rainfall distribution pattern during 2001-02

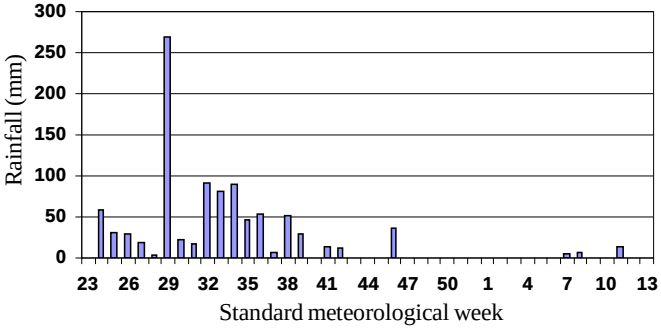

Fig.2. Weekly Rainfall Distribution Pattern during 2002-03

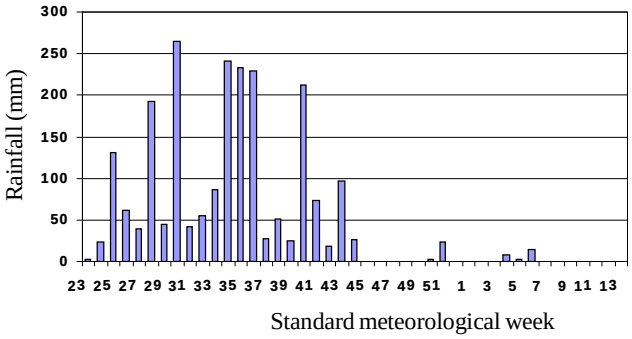

Fig.3. Weekly Rainfall Distribution Pattern during 2003 -04

Table. 1. Yield attributes of rice and blackgram as influenced by different nutrient management treatments

Treatment*	Rice			Blackgram			
	Panicls no. m^{-2}	Grain no. $panicle^{-1}$	1000 grain weight (g)	Plant Population no. m^{-2}	Pods no. $plant^{-1}$	Seeds no. pod^{-1}	100 seed weight (g)
T_1	246	140	20.03	66	30	5	35.58
T_2	255	161	20.14	91	38	5	36.92
T_3	272	168	20.70	100	47	8	38.04
T_4	252	157	20.27	89	39	6	37.19
CD(P= 0.05)	15.00	21.91	2.96	17.54	6.14	1.89	0.85

*Treatment details are given in text

Table 2. Yield performance and economics of rice-blackgram *utera* cropping sequence

Treatment*	Grain yield (q ha^{-1})	Seed yield (q ha^{-1})	Net Return (Rs. Ha^{-1})	B : C ratio
T_1	33.8	3.67	11448	2.07
T_2	35.6	4.78	13030	2.11
T_3	38.4	5.87	15618	2.28
T_4	36.9	4.67	13118	2.09
CD(P= 0.05)	2.12	0.78	-	-

*Treatment details are given in text

Price of paddy – Grain - Rs. 400/q and straw – Rs. 40/q ; Price of blackgram - Rs 1600/q

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