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Performance of blackgram (*Vigna mungo*) as *utera* crop in relation to stubble height of preceding rice (*Oryza sativa*) crop in rice – blackgram *utera* cropping sequence

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ABSTRACT

The effect of stubble height of preceding rice crop on establishment and performance of succeeding utera crop of blackgram in rice – blackgram utera cropping sequence under rainfed shallow lowlands of coastal Orissa revealed that the blackgram crop performed well when the stubble of preceding rice crop was cut to a minimum height of 10 cm above ground level during crop harvest. The highest seed yield of blackgram (5.97 q ha^{-1}) was recorded where the stubble height of preceding rice crop was kept at 10 cm during crop harvest. The net return (Rs.16091 ha^{-1}) and benefit : cost ratio (2.44) was also higher in the same treatment plot.

Key words: *Stubble height, rice, blackgram,* utera *cropping and economics*

Utera cropping is a traditional system of relay cropping in paddy fields, which is done by broadcasting the seeds of short duration pulses or oilseed crops in standing paddy field. In coastal Orissa, there is a very limited scope to raise a second crop after rice under rainfed shallow lowlands as the soil moisture recedes very fast during the month of November or early December. Under such situations, the blackgram crop performs well as utera crop in rice-based *utera* cropping sequence. Since sowing of *utera* crops on standing paddy limits the scope of introduction of modern crop management technologies and inputs for improving the productivity of *utera* crops, cultural practices like keeping rice stubble at proper height during harvest exerts an important role in the performance of succeeding *utera* crops (Agarwal *et. al.,* 1986). Leaving rice stubble at appropriate height not only minimizes the chances of damage to newly emerge young seedlings during harvest, but simultaneously, helps to conserve soil moisture for a certain period of time which finally results in better establishment of *utera* crop. Keeping this in view, the on-farm trials were conducted to study the effect of stubble height of preceding rice crop on the performance of succeeding *utera* crop of blackgram.

On-farm farmers' participatory trials were conducted in five different villages in the Tangi block of Khurda district of Orissa during three consecutive crop growing season of 2001–02 and 2002–03 and 2003–04. The soil of experimental site was clay loam with alkaline in reaction, having pH in the range of 8.0 - 8.7, organic carbon 0.60 – 0.78%, total 'N' 0.067 – 0.081%, available 'P' 18.0 – 24.6 kg ha^{-1} and available 'K' 112.3 – 129.0 kg ha^{-1}. The experiment was laid out in randomized complete block design in ten farmer's field (two farmers from each village in five different villages). The treatments comprised of T_1- Stubble height according to farmers practice (2 – 4 cm); T_2 – Stubble height of 10 cm and T_3 – Stubble height of 20 cm. Rice crop (cv. Pooja of 140 days duration) was established by seeding in rows behind the plough with a seed rate of 80 kg ha^{-1} during the first week of June. Fertilizer dose of 60 : 30 : 30 kg N, P_2O_5 and K_2O ha^{-1} was applied to rice crop. Blackgram (cv. T_9) crop 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. An area of 200 m^2 was considered as one treatment plot and each farmer field with an area of 600 m^2 was considered as one replication. Thus, the total number of replications were ten. Yield and yield attributes of both the crops of rice and blackgram were recorded at

crop harvest and the economics of different treatments were calculated based on the price of the produce in local market inputs and wages prevalent in the area. Productivity of rice as well as *utera* crop were recorded and finally economics was computed for the entire rice–based *utera* cropping system.

The results (Table 1) revealed that the blackgram crop performed well in the plots of treatment 'T_2' where stubble height of preceding rice crop was kept at 10 cm during harvest. Leaving the rice stubble height at 10 cm during harvest helped in better establishment of blackgram crop as reflected from different yield attributing characters like more number of plants m^{-2} and higher number of pods $plant^{-1}$. Better crop stand in the treatment 'T_2' might be due to the availability of optimum soil moisture for a longer period owing to the microclimate created by higher stubble height. Though the stubble height was more (20 cm) in T_3, but due to mortality of some newly emerged blackgram seedlings, the ultimate crop stand was relatively less in comparison to T_2. The seedling mortality might be due to excess soil moisture in the crop field for relatively longer period because of taller rice stubble in the field. It was also observed that the crop stand (65 plants m^{-2}) and number of pods (35 $plant^{-1}$) was significantly less in 'T_1' where farmers' cut the rice crop at ground level leaving stubble with a height of 2–4 cm. The poor performance of blackgram crop in 'T_1' might be due to damage of newly emerged blackgram seedlings during harvesting of the rice crop. Das and Das (1994) reported similar results while studying the establishment of different *utera* crops under rainfed rice-based *utera* cropping system in West Bengal.

The highest seed yield of blackgram (5.97 q ha^{-1}) was recorded in T_2 because of better establishment of crop as reflected from different yield attributing characters like more number of plants m^{-2} and higher number of pods $plant^{-1}$ (Table 1). About 22% higher seed yield of blackgram was recorded in 'T_2' over 'T_3'. The plants became tall and slender in 'T_3' where stubble height was left at 20 cm resulting less number of branches $plant^{-1}$ which ultimately reduced the total number of pods $plant^{-1}$ and final seed yield. There was about 61% higher seed yield of blackgram in 'T_2' over 'T_1'. The result is in conformity with the findings of Acharya *et. al.* (2002).

It was revealed that the highest net monetary return (Rs. 16091 ha^{-1}) as well as benefit cost ratio (2.44) was recorded in the treatment 'T_2'. The increased net return was due to better performance of blackgram crop as reflected from higher seed yield of blackgram in the same treatment (Table 1).

Thus the stubble height of preceding rice crop plays an important role on the establishment of succeeding *utera* crop of blackgram and is considered to be the most important cultural management practice for enhancing the yield performance of blackgram crop in rice-blackgram *utera* cropping sequence under rainfed shallow lowland of coastal Orissa.

Table. 1 Performance of blackgram crop as influenced by stubble height of preceding rice crop (3 year's pooled data)

Treatments stubble height	Plant population m^{-2}	No. of pods $plant^{-1}$	No. of seeds pod^{-1}	1000 seed weight(g)	Seed yield (t ha^{-1})	Net Return (Rs ha^{-1})	B:C ratio
T_1 (2-4 cm)	65	35	5	36.57	0. 37	12376	2.16
T_2 (10 cm)	95	49	7	37.75	0.60	16091	2.44
T_3 (20 cm)	88	44	7	37.86	0.49	14059	2.26
CD (P = 0.05)	2.23	1.50	0.44	0.27	0.29	-	-

Rice yield : 3.8 t ha^{-1} ; Price of paddy : Rs. 500 q^{-1}, paddy straw : Rs 50 q^{-1} and blackgram Rs. 1600 q^{-1}

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