On farm assessment of short duration rice variety Sahabhagidhan

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***Abstract*—** *The study was carried out through on farm testing during kharif seasons of 2012 and 2013 under mid central table land zone of Odisha with an objective to evaluate the performances of short duration paddy Sahabhagi dhan as compared to the farmer's practice (Khandagiri). The late matured (98.3 days) Sahabhagi dhan recorded higher germination(48.4 m-2), plant height(87.5 cm), effective tillers plant-1(13.2), Length of panicle(22.6 cm), filled grains panicle-1(125.3) with spikelet fertility(93.65 %) and 1000 grain weight(22.3 g) than khandagiri. The same also produced grain yield 35.5 q ha-1 which is 28.6 % higher yield than Khandagiri with harvest index (47.9) and water productivity(3.17 kg mm-1). The variety gave higher gross return Rs. 50365 ha-1 with a benefit- cost ratio 1.38 and additional net return Rs.6059 ha-1 as compared to farmers practice and thus the existing variety Khandagiri can be replaced by Sahabhagi dhan for higher productivity and income.*

***Keywords*— Economics, effective tillers, on farm testing, paddy, water productivity**

I. INTRODUCTION

Rice is the predominant crop of Odisha with a total coverage of 4.0 million hectare which is about 65 % of the total cultivable area of the state. Area under rice crop in Angul district of the state is 0.08 million hectare with a productivity of 9.89 q ha-1 which is 48 % less than that of state(Anonymus 2012). Achieving self-sufficiency in rice production and maintaining price stability are important political objectives in low-income countries because of the importance of this crop in providing national food security and generating employment and income for low-income people (Ghosh et al., 2009).

Developing drought tolerant rice cultivars is considered to be one of the most effective and economic approaches to ensuring food security(Verma and Srivastava, 2004). A large portion about 70 % of area under rice in India is drought prone rainfed, but it has not been exploited to full potential due to lack of suitable drought tolerant or resistant varieties (Kumar et al., 2012).There is hardly any scope to replace the rice crop considering the precipitation of less than 1500 mm rainfall during the monsoon season. However, multiple cropping system using short duration rice varieties and intensive input management may enhance the land use efficiency and increase the production level if sowing of rabi crops are made in time(Khanda et al., 2005). It is called Sahbhagi Dhan, which means "rice developed through collaboration" in Hindi (Reyes 2009). This name was given to it because the variety was tested under a collaborative project between IRRI and many Indian organizations. Sahabhagi Dhan has shown a yield advantage of 0.8 to 1ton ha-1over other varieties under drought conditions (Yamano et al., 2013).

Hence, there remains a scope to introduce a short duration high yielding rice variety in existing rice-based cropping system in mid central table land zone of Odisha. If the farmers are able to harvest their kharif rice 25-30 days earlier than usual harvesting time then they could able to sow their next crop in time during rabi. The new improved technologies will eventually lead to the farmers to discontinue the old varieties and to adopt new variety. Similar results were reported by Sharma et al.(2011) .

Keeping in view such problems and after detailed survey the KVK, Angul made an attempt with an objective to evaluate growth and yield parameters of newly released promising high yielding variety paddy cv. Sahabhagidhan through on farm testing for its suitability in the existing farming situation for substitution of old variety(Khandagiri) with higher productivity and income.

II. MATERIALS AND METHODS

The study was carried out through on farm testing during kharif season of 2012 and 2013 at Thelkonali village in Angul district under mid central table land zone of Odisha with an objective to evaluate the performances of short duration paddy cv. Sahabhagi dhan as compared to the farmers practice (Khandagiri). The experimental site lies in 840 16′ to 850 23′ E longitude and 200 31′ to 210 41′ N latitude and average elevation of 300 m above sea level. Climate of the region is fairly hot and humid monsoon and the average rainfall in both the year during the study period from June to September was 1121.72 mm. The mean maximum and mean minimum temperature registered in both the year was 34.20 C and 20.80 C respectively . The soil of the experimental site was slightly acidic in reaction(pH-5.5), sandy loam texture with medium organic carbon content (0.57 %), medium in nitrogen(282.0 kg ha-1) , low in phosphorus(10.7 kg ha-1) and medium in

potassium(176.0 kg ha-1) contents . The tested high yielding variety "Sahabhagi dhan" was released from CRRI in 2009 can be suitably directs sown or transplanted in rainfed upland ecosystem and tolerant to drought and is resistant to leaf blast, moderately resistant to brown spot, sheath rot, stem borer, leaf folder. The treatments Sahabhagi dhan(T1) and Khandagiri(T2) were replicated thirteen times in a randomized block design. The crops were sown during 3rd week of June and harvested during 4th week of September. Thirteen different farmers each having 0.04 hectare of land cultivated the HYV paddy Sahabhagi dhan and Khandagiri(control) with recommended package of practices. Observations on different growth and yield parameters were taken and economic analysis was done by calculating cost of cultivation, gross return, net return and B:C ratio. Available soil nutrients as well as nutrient content were determined following the standard procedures (Jackson, 1973) .Water productivity (rain water productivity) was expressed as kilogram of rice yield obtained per millimeter of rain water received. Final crop yield (grain & straw) were recorded and the gross return were calculated on the basis of prevailing market price of the produce. Harvest index is the relationship between economic yield and biological yield (Gardner et al.,1985). It was calculated by using the Following formula;

Harvest index (%) = Economic yield × 100

Biological yield

The data were statistically analyzed applying the techniques of analysis of variance and the significance of different sources of variations were tested by error mean square of Fisher Snedecor's 'F' test at probability level 0.05 (Cochran and Cox, 1977).

III. RESULTS AND DISCUSSION

Yield attributes

The HYV Sahabhagi dhan was late matured (98.3 days) owing to delay in flowering(33.2 days), plant height (87.5 cm) with 11.2 per cent higher germination m-2 (Fig. 1) in comparison to local check Khandagiri. Similar observations were found in short duration rice variety PR 115 by Sidhu et al.(2014) .

Analysis of pooled data(Table 1) indicated that higher tillers plant-1 (19.3), Effective tillers plant-1 (13.2), 1000 grain weight (22.3 g) were recorded in Sahabhagi dhan where as lower effectivity of tillers (7.4 %) was observed in local check Khandagiri attributing to their genetic variability, varietal difference and environmental adaptability. The differential response of tillering in the genotype could be attributed to its genetic potentiality. These results are in agreement with Sarker at el . (2013) and Mondal et al.(2005).

The longer panicle (22.6 cm) and higher panicles m-2(224.4) were produced in Sahabhagi dhan. The same treatments also recorded higher no of filled grains panicle-1 (125.3) and spikelet fertility (93.65%) owing to reduced no of unfilled spikelet(8.5) than the local check(Table 1). This finding is in corroborated with findings of C.R.R.I (2014).

TABLE 1
EFFECT OF DIFFERENT TREATMENTS ON GROWTH AND YIELD PARAMETERS (POOLED DATA OF 2 YEARS)

Treatments	No of tillers plant^{-1}	No of effective tillers plant^{-1}	Effectivity of tiller (%)	Length of Panicle (cm)	No of panicles m^{-2}	No of Filled grains panicle^{-1}	Unfilled spikelet Panicle^{-1}	Spikelet fertility (%)	Test weight (1000 grain) (g)
Sahabhagi dhan	19.3	13.2	68.4	22.6	224.4	125.3	8.5	93.65	22.3
Khandagiri	12.2	7.4	60.7	21.9	202.6	112.5	11.3	90.87	21.4
SEm ±	0.124	0.103	0.314	0.038	0.227	0.307	0.061	0.036	0.207
CD at 5%	0.362	0.300	0.915	0.112	0.663	0.895	0.177	0.105	0.603

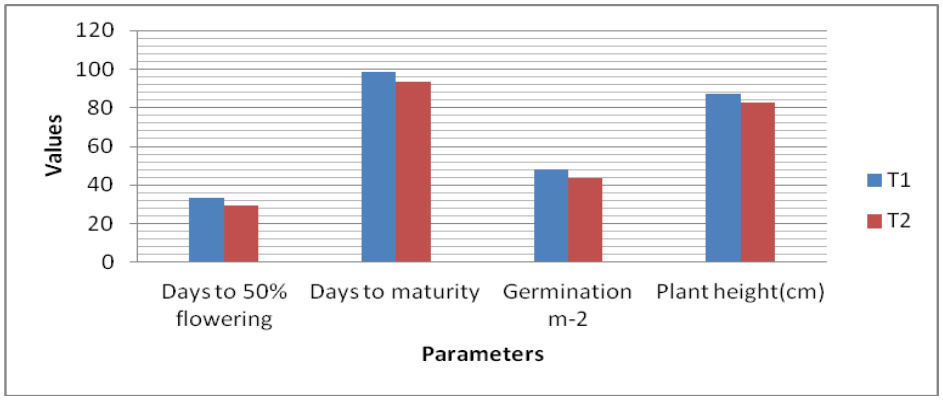

FIG. 1. EFFECT OF TREATMENTS ON DAYS TO 50% FLOWERING, DAYS TO MATURITY, GERMINATION M-2(NOS) AND PLANT HEIGHT(CM)

Yield

An economic analysis of the pooled data(Table 2) revealed that Sahabhagi dhan produced higher grain yield 35.5 q ha-1 which is 28.6 % higher yield than Khandagiri. This may be attributed to high vegetative biomass production, large panicles and high tillering capacity in some cases (C.R.R.I, 2013). The trend of straw yields of two varieties was similar with grain yields. Sahabhagi dhan recorded the higher straw yield (38.6 q ha-1) with harvest index(47.9 %) in comparison to Khandagiri(IRRI, 2013). These results are in conformity with Tripathi at el. (2013). Water productivity was also higher(3.17 kg grain per mm of rain water received) in Sahabhagi dhan as comparison to farmers practice owing to its higher grain yield (Mishra et al, 2011).

TABLE 2
EFFECT OF DIFFERENT TREATMENTS ON YIELD (POOLED DATA OF 2 YEARS)

Treatments	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})	Harvest index (%)	Crop seasonal rainfall(mm)	Water productivity (kg mm^{-1})
Sahabhagi dhan	35.5	38.6	47.9	1121.72	3.17
Khandagiri	27.6	30.5	47.5	1093.65	2.52
SEm ±	0.172	0.109	0.092		0.380
CD at 5%	0.503	0.317	0.267		1.109

Economics

An analysis on economics(Fig. 2) revealed that the Sahabhagi dhan recorded higher gross return of Rs. 50365 ha^{-1} with a benefit- cost ratio of 1.38 and additional net return of Rs.6059 ha^{-1} as compared to farmers practice which gave the net return (Rs.7706 ha^{-1}) and benefit-cost ratio(1.24). Mitra *et al*, 2014 also reported the advantages of growing newly introduced variety over the traditional with higher return, the variation in net return and benefit-cost ratio may be attributed to the variation in the price of agri inputs and produce . These finding are also similar with the findings of Nirmala *et al.* (2012).

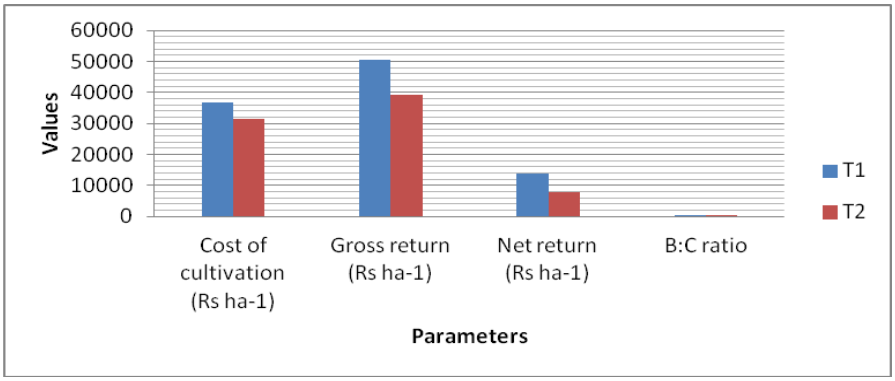

FIG.2 EFFECT OF TREATMENTS ON COST OF CULTIVATION, GROSS RETURN , NET RETURN AND B:C RATIO

IV. CONCLUSION

Thus, the cultivation of paddy Sahabhagi dhan was found to be more productive and can replace the local check since it fits to the existing farming situation for higher productivity and income and also it had been appreciated by the farmers due to its drought tolerance and higher tillering capacity.

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