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ECONOMICS OF RICE AS INFLUENCED BY AGE OF SEEDLINGS, LEVELS AND METHODS OF FERTILIZER APPLICATION

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Abstract

A field experiment was conducted on plot No. 30 of 'C' block during *Kharif* season of 2016 and 2017 to evaluate the "Effect of age of seedling, levels and methods of fertilizer application on growth, yield and quality of Rice (*Oryza sativa* L.)" at Agronomy Farm, College of Agriculture, Dapoli, Dist. Ratnagiri (M.S.). The soil of experimental plot was clay loam in texture, high in organic carbon content, moderately acidic in reaction with pH 6.14 and 6.08 during the years 2016 and 2017, respectively. It was medium in available nitrogen (340.42 and 321.60 kg ha-^{1}), low in available phosphorus (11.08 and 10.58 kg ha-^{1}), fairly high in available potassium (276.21 and 256.20 kg ha-^{1}) and deficient in micronutrients (Zn, B and Cu) during both the years. The field experiment was laid out in split-split plot design comprising of 36 treatment combinations replicated thrice. The main plot treatment consisted age of seedlings *viz*., 20 days age seedling (A_1), 30 days age seedling (A_2) and 40 days age seedling (A_3). The sub plot treatment consisted three levels of fertilizer *i.e.*, 125% RDF (F_1), 100% RDF (F_2) and 75% RDF (F_3). While, sub-sub plot treatment comprised with four methods of fertilizer application, Basal K (K_1), Split K (K_2), K_1+ Zn, B and Cu spray (K_3) and K_2 + Zn, B and Cu spray (K_4). Available status of nutrients (kg ha-^{1}) also done. Economics of the treatment combinations was also worked out. The 20 days age seedling (A_1) also obtained higher gross income (` 1, 26, 379 ha-$^{1}$, ` 1, 20, 350 ha^{-1} and ` 1, 23, 364 ha$^{-1}$), net returns (` 34, 571 ha^{-1}, ` 29, 75 ha$^{-1}$ and ` 32, 073 ha^{-1}) and benefit to cost ratio (1.38, 1.32 and 1.35) than 30 and 40 days age seedling during 2016, 2017 and pooled mean. Among different levels of fertilizer application 125% RDF recorded maximum gross returns (` 1, 20, 303 ha$^{-1}$, ` 1, 12, 412 ha^{-1} and ` 1, 16, 357 ha$^{-1}$) and net returns (` 27, 353 ha^{-1}, ` 20, 219 ha$^{-1}$ and ` 23, 786 ha^{-1}) during the year 2016, 2017 and in pooled mean. The application of 125% RDF and 100% RDF recorded same and higher B:C ratio (1.26) than 75% RDF (1.20) in mean of 2016 and 2017. In respect of economics of treatment combinations, the maximum gross returns and net returns was obtained in treatment combination of $A_1 F_1 K_4$ *i.e.*, transplanting of 20 days age seedling received 125% RDF and split application of K along with micronutrients spray (Zn, B and Cu) followed by treatment combination $A_1 F_1 K_3$ *i.e.*, 20 days age seedling and 125% RDF with basal application of K along with micronutrients spray (Zn, B and Cu) than rest of the treatment combinations in 2016, 2017 and pooled mean. While, treatment combination of $A_1 F_2 K_3$ and $A_1 F_2 K_2$ recorded same and highest B:C ratio than rest of treatments in the year 2016 and treatment combination of $A_1 F_1 K_4$ and $A_1 F_1 K_3$ gained same and highest B:C ratio in year 2017 and mean of year 2016-2017 than all remaining treatment combinations under study.

Key words: Age of seedling, level, methods of fertilizer, economics, foliar spray Cu, Zn and B and split K

Introduction

Rice is the most important cereal food crop of the world providing major source of the food energy. It is a predominant crop in lowland ecosystem. Among the rice growing countries of the world, India ranks first in area and second in production. Rice is grown in 114 countries across the world on an area about 158 million hectares with annual production of over 527 million tonnes. In India, it is cultivated on an area of 43.39 million hectares with an annual production 104.32 million tonnes and productivity about 2.40 tonnes ha^{-1} (Jagtap *et al.*, 2018). This productivity of rice very poor as compared to other rice growing countries. In Maharashtra, area under rice is 1.53 million hectares with 2.63 million tonnes production with an average productivity of 1.714 tonnes ha^{-1} in the year 2016 (Jagtap *et al.*, 2018). In *Konkan*, rice is cultivated over an area of 0.3851 million hectares with an annual production of about 1.52 million tonnes with average productivity of 3.86 tonnes ha^{-1} (Anonymous, 2015)[b]. National share of Maharashtra in rice cultivation is about 5.3 percent in area and 4 per cent in production (Anonymous, 2015)[b]. The slogan "Rice is life" is most appropriate for India as this crop plays a vital role in our national food security and is a means of livelihood for millions of rural household. Rice in *Konkan* is being grown mostly as puddled transplanted crop. The main reasons for low productivity in *Konkan* are untimely transplanting, low plant population per unit area, application of fertilizers through broadcasting, imbalanced proportion of nutrients application, poor water and weed management practices, continuous adoption of puddling and transplanting for rice cultivation has been reported for declining crop productivity (Nambiar and Abrol, 1989). Timely planting and use of appropriate aged seedlings for transplanting are important non cash inputs for realizing higher productivity in rice (Pattar *et al.*, 2001). Timely transplanting of rice crop is also found to increase the rain water use efficiency as compared to the delayed planting. Labour scarcity during the peak season of transplanting is another reason for late planting with over aged seedlings. Agriculture still remains the backbone of Indian economy in spite of various technological advancements and industrial development with 56 percent of Indians dependent on agriculture and 17 percent GDP of country's coming from this sector. Among the various inputs in agriculture, fertilizer is a vital input since it replenishes the nutrients removed from the soil by crops and also boost the yield. The amount of fertilizer require for a crop depends upon the soil type, level of yield and water availability and type of crop. Hybrid rice showed better response to applied fertilizer. The higher yield of hybrids can be realized with proper fertilizer management practices. As the production potential and nitrogen use efficiency of hybrid rice is high. Hybrid rice produce 20-30 percent more yield than conventional varieties with proper management (Yuan and Virmani, 1988). The field rice could be produce 70-80 percent more yield by the application of nitrogen fertilizers (IFC, 1982). The optimum dose of nitrogen accelerate vegetative growth and enhance yield of rice. The efficient N absorption depend on age of seedling and rate of its application. Response of rice to P to the tune of 1.3 t ha^{-1} of grain yield, when P applied along with N (De Datta, 1983). The excess and low amount of fertilizer dose lead to soil deterioration, loss in yield and increased the cost of cultivation. The optimum dose of fertilizer not only reduce cost but make soil safe by supplying proper amount of nutrients to crop. The optimum dose of fertilizer which gave higher economic return at minimum cost. The considering above facts, different levels of nitrogen and phosphorus fertilizer tried to evaluate for selecting best one for obtaining economically higher production of rice.

Time of application may considerably influence crop response to applied potassium. Rice shows better response to applied potassium among all the cereals and millets because, it promotes healthy respiration of roots and tillering under submerged condition. Application of potassium as basal in combination with phosphorus is general practice in all over India and *Konkan* is not exception for this. Keeping above fact in mind split application of potassium tried in high rainfall area of *Konkan* in dapoli location (where precipitation > 3500 mm). Method of fertilizer application is a non-monetary input which influences on growth and consequently the crop yield. Foliar spray of micronutrients found equally or even better as soil application to overcome micronutrients deficiency in subsoil. Foliar nutrition, in which nutrients usually penetrate the leaf cuticle or stomata and enter the cells facilitating easy and rapid utilization of nutrients.

Materials and Methods

The present investigation "Effect of age of seedling, levels and methods of fertilizer application on growth, yield and quality of rice (*Oryza sativa* L.)" was conducted at Agronomy farm, College of Agriculture, Dapoli, Dist. Ratnagiri (M.S.) during *Kharif* season of the years 2016 and 2017. The field experiment was conducted in plot no. 30 of 'C' block. Geographically, experimental plot was situated in the subtropical region at 17°45'55" N latitude and 73°10'26" E longitude having elevation of about 157.8 m above mean sea level The site was selected on the basis of suitability of soil for lowland rice cultivation. The composite soil samples from 0-22.5 cm layer were taken with the help of screw auger before the layout of an experiment and after harvest during both years of experimentation. The soil of experimental plot was clay loam in texture which was determined by Triangular diagram of Persuit taglor and Marshall, high in organic carbon content, moderately acidic in reaction with pH 6.14 and 6.08 during the years 2016 and 2017, respectively. It was medium in available nitrogen (340.42 and 321.60 kg ha^{-1}) low in available phosphorus (11.08 and 10.58 kg ha^{-1}), fairly high in available potassium (276.21 and 256.20 kg ha^{-1}) which were determined by alkaline $KMnO_4$ method, bray's method no.1 and flame photometer, respectively. The soil deficient in micronutrients Zn, B and Cu determination with AAS and hot water soluble B using azomethine-H by colorimetric method on spectrophotometer during both the years. The field experiment was laid out in split-split plot design comprising of 36 treatment combinations replicated thrice. The main plot treatment consisted three age of seedlings *viz*., 20 days age seedling (A_1), 30 days age seedling (A_2) and 40 days age seedling (A_3). The sub plot treatment consisted levels of fertilizer application *i.e*., 125% RDF (F_1), 100% RDF (F_2) and 75% RDF (F_3) and sub-sub plot treatment comprised with four methods of fertilizer application, Basal K (K_1), Split K (K_2), K_1+ Zn, B and Cu spray (K_3) and K_2 + Zn, B and Cu spray (K_4). The gross plot of 3.20 m X 3.90 m and net plot 2.80 m X 3.60 m size used for the experimentation. The raised bed of 10 m length, 1 m breadth and 10 cm height were prepared for sowing of 'sahydri-3' hybrids. A well decomposed FYM @ 1 kg sq. m^{-1} was spread and mixed with soil over the beds. Chemical fertilizers, urea @ 1 kg and single super phosphate @ 3 kg 100 sq. m^{-1} were applied at the time of sowing. The seeds of sahydri-3 rice hybrids was treated with thirum @ 2.5 g kg^{-1} and sown in line 10 cm apart at 2-3 cm depth. Top dressing of urea @ 1 kg 100 sq. m^{-1} area was done 10 days after sowing. The experimental field was ploughed with tractor drawn plough 15 days before puddling. After received of good showers of monsoon, a day before transplantation of each treatment, the field was puddled with a tractor and leveled by a plank simultaneously. A thin film of water was maintained continuously from date of puddling to transplantation. For transplanting 20, 30 and 40 day age seedlings of hybrid rice, were pulled out from the nursery beds with carefully by without any damage to root and same seedlings were used for transplanting after washing the roots. Transplanted on the same day by adopting uniform spacing 20 × 15 cm with one seedling $hill^{-1}$. Basal dose of 40 percent nitrogen (urea) along with full dose of phosphorus (single super phosphate) applied at the time of transplanting. The remaining nitrogen applied into two split as 40% nitrogen at maximum tillering and 20% at panicle initiation stage (150:50:50 RDF for rice). A recommended dose of 50 kg of K_2O was applied through muriate of potash as basal and split as per treatments. Basal K treatment 100% RDK (50 kg K_2O) applied at the time of transplanting and in, split 100% RDK (50 kg K_2O) applied in three split as 40% potash as basal, 40% at maximum tillering and 20% at panicle emergence, respectively. Manual weeding done one day before the first top dressing. Foliar spray of 0.5% zinc sulphate, 0.5% copper sulphate and 0.2% borax applied in combination at panicle emergence (65 DAS) and at flowering (90 DAS), respectively. The spray solution was made by mixing the required quantity of nutrients and half of its quantity of lime (calcium hydroxide) to neutralize the solution and wetting adhesive at the rate of 0.05% also mixed in solution. All other cultural operation carried out time to time. Rice crop was harvested soon after attaining physiological maturity as per age of seedling. Physiological maturity of rice hybrid 'sahydri-3' has been decided upon having a constant watch over crop from few days before probable harvest time and testing whether the entire panicle attained the hard dough stage. Initially the border rows were harvested at the ground level with sickles. The grain yield and air dried straw obtained after threshing produce from each net plot and then it were sun dried for about 4 to 5 days and weight was then converted into q ha^{-1}. The high

Table 1: Economics of the rice cultivation as affected by different treatments during the years 2016 and 2017.

Treatment	Gross Returns (` ha^{-1})			Cost of Cultivation (` ha^{-1})			Net Returns (` ha^{-1})			B:C Ratio		
	2016	2017	Mean	2016	2017	Mean	2016	2017	Mean	2016	2017	Mean
A. Age of seedlings												
A_1: 20 DAS	126379	120350	123364	91808	90775	91292	34571	29575	32073	1.38	1.32	1.35
A_2: 30 DAS	114893	106220	110557	90055	88525	89290	24838	17695	21266	1.28	1.20	1.24
A_3: 40 DAS	102412	95829	99120	88278	87896	88087	14134	7933	11034	1.16	1.09	1.12
B. Levels of Fertilizers Application												
F_1: 125 % RDF	120303	112412	116357	92949	92194	92572	27353	20219	23786	1.29	1.22	1.26
F_2:100% RDF	115637	108393	112015	89326	88287	88807	26311	20106	23208	1.29	1.23	1.26
F_3: 75 % RDF	107744	101594	104669	87865	86716	87290	19879	14878	17379	1.23	1.17	1.20
C. Methods of fertilizer Application												
K_1: Basal K	111964	104217	108091	89460	87905	88682	22505	16312	19408	1.25	1.18	1.22
K_2: Split K	112411	105151	108781	89601	88794	89197	22810	16357	19583	1.25	1.18	1.22
K_3: Basal K with Cu,												
Zn and B spray	116790	109895	113342	90317	89510	89913	26473	20385	23429	1.29	1.23	1.26
K_4: Split K with Cu,												
Zn and B spray	117079	110603	113841	90810	90053	90432	26269	20550	23410	1.29	1.23	1.26
General mean	114561	107466	111014	90047	89065	89556	24514	18401	21458	1.27	1.20	1.24

(Grain yield 1460 Rs/qt and straw 200 Rs/qt) rainfall during initiation of flowering to end of flowering which was responsible for less pollen setup, increased number of chaffy grains and ultimately reduced the yield in rice crop during 2017. The gross monetary returns in rupees per hectare were worked out on the basis of grain and straw yield of rice. The prevailing market prices of grain and straw were considered. Similarly, the cost of cultivation of the crop under the individual treatment was worked out by taking into account the cost of all inputs and operations from preparatory tillage to harvest. The net returns per hectare calculated by deducting the cost of cultivation per hectare from the gross returns per hectare. Cost: Benefit ratio for each treatment calculated by dividing gross returns by cost of cultivation. Experimental data were analyzed statistically by applying technique of analysis of variance as applicable in split-split plot design, as described by Panse and Sukhatme (1967). The significance of the treatment difference was tested by variance ratio test (f value), critical difference (C.D=p) at 0.0 5 level of probability was worked out for comparison and statistical interpretation of significance between treatments mean. The data of grain and straw yield in case of rice were pooled over for two seasons.

Results and Discussion

Effect of age of seedling

Among different age of seedlings, 20 days age seedling (A_1) obtained higher gross income (` 1,26,379 ha$^{-1}$, ` 1,20,350 ha^{-1} and ` 1,23,364 ha$^{-1}$), net returns (` 34,571 ha^{-1}, ` 29,575 ha$^{-1}$ and ` 32,073 ha^{-1}) and benefit to cost ratio (1.38, 1.32 and 1.35) than 30 and 40 days age seedling (A_2 & A_3) during the two successive years of experimentation and mean, respectively (Table 1). Transplanting of 20 days age seedlings was found to be economically most profitable as its mean B:C ratio was 1.35. The B:C ratio recorded under 30 days and 40 days age seedlings were 1.24 and 1.12, respectively. This might be due to higher grain and straw yield recorded under younger age seedling (20 day) than older age of seedling (30 & 40 days) during the two consecutive years. These finding confirmed with Naresh (2012), Barla *et al.*, (2013), Vishwakarma (2015), Gurjar, *et al.*, (2017), Bahure (2017) and Pawar (2017).

Effect of levels of fertilizer application

Data regarding to the economics of rice cultivation indicated that the gross return and net return increased with the increasing levels of fertilizer. Application of 125% RDF recorded maximum gross returns (` 1,20,303 ha$^{-1}$, 1,12,412 ha$^{-1}$ and ` 1,16,357 ha^{-1}) and net returns (` 27,353 ha$^{-1}$, ` 20,219 ha^{-1} and ` 23,786 ha^{-1}) followed by application of 100% RDF with the gross returns of

Table 2: Economics of the rice cultivation as affected by different treatments during the years 2016 and 2017.

Treatment Combination	Gross Returns (` ha^{-1})			Cost of Cultivation (` ha^{-1})			Net Returns (` ha^{-1})			B:C Ratio		
	2016	2017	Mean	2016	2017	Mean	2016	2017	Mean	2016	2017	Mean
$A_1F_1K_1$	129672	121122	125397	94931	93002	93967	34741	28120	31431	1.37	1.30	1.33
$A_1F_1K_2$	129739	123446	126592	95478	94201	94839	34261	29245	31753	1.36	1.31	1.33
$A_1F_1K_3$	136407	133889	135148	96482	94168	95325	39925	39721	39823	1.41	1.42	1.42
$A_1F_1K_4$	137886	134711	136298	97009	94800	95905	40876	39910	40393	1.42	1.42	1.42
$A_1F_2K_1$	126677	119627	123152	89229	89509	89369	37449	30118	33783	1.42	1.34	1.38
$A_1F_2K_2$	127551	119425	123488	89256	90805	90030	38295	28621	33458	1.43	1.32	1.37
$A_1F_2K_3$	127972	124677	126325	89451	89703	89577	38521	34973	36747	1.43	1.39	1.41
$A_1F_2K_4$	128725	124758	126742	91152	90259	90705	37574	34499	36037	1.41	1.38	1.4
$A_1F_3K_1$	116210	109696	112953	88856	87685	88271	27354	22011	24682	1.31	1.25	1.28
$A_1F_3K_2$	117092	110118	113605	89045	88330	88688	28047	21788	24917	1.32	1.25	1.28
$A_1F_3K_3$	119747	111228	115487	90085	88110	89097	29662	23118	26390	1.33	1.26	1.3
$A_1F_3K_4$	118868	111504	115186	90718	88734	89726	28150	22770	25460	1.31	1.26	1.28
$A_2F_1K_1$	116453	108441	112447	91575	90019	90797	24878	18423	21650	1.27	1.20	1.24
$A_2F_1K_2$	116144	109014	112579	91959	90354	91157	24185	18659	21422	1.26	1.21	1.23
$A_2F_1K_3$	119203	110275	114739	92303	91307	91805	26900	18967	22933	1.29	1.21	1.25
$A_2F_1K_4$	119503	110515	115009	93227	91689	92458	26276	18826	22551	1.28	1.21	1.24
$A_2F_2K_1$	112844	105083	108963	89482	86106	87794	23362	18977	21170	1.26	1.22	1.24
$A_2F_2K_2$	113299	106824	110062	89763	88332	89047	23536	18493	21014	1.26	1.21	1.24
$A_2F_2K_3$	118105	108482	113293	89901	89308	89604	28204	19174	23689	1.31	1.21	1.26
$A_2F_2K_4$	118331	110015	114173	91133	89866	90499	27199	20149	23674	1.30	1.22	1.26

Table 2 continued ....

Table 2 continued ....

Treatment Combination	Gross Returns (` ha^{-1})			Cost of Cultivation (` ha^{-1})			Net Returns (` ha^{-1})			B:C Ratio		
	2016	2017	Mean	2016	2017	Mean	2016	2017	Mean	2016	2017	Mean
$A_2F_3K_1$	108491	97961	103226	87366	85288	86327	21125	12674	16899	1.24	1.15	1.20
$A_2F_3K_2$	109576	98623	104099	87262	86401	86832	22313	12222	17268	1.26	1.14	1.20
$A_2F_3K_3$	113328	104612	108970	88142	86775	87459	25186	17837	21511	1.29	1.21	1.25
$A_2F_3K_4$	113440	104796	109118	88548	86860	87704	24892	17936	21414	1.28	1.21	1.24
$A_3F_1K_1$	106427	97209	101818	90295	90920	90608	16132	6290	11211	1.18	1.12	1.12
$A_3F_1K_2$	107163	97961	102562	90801	91009	90905	16362	6952	11657	1.18	1.08	1.13
$A_3F_1K_3$	112440	100971	106705	91889	92139	92014	20551	8831	14691	1.22	1.07	1.16
$A_3F_1K_4$	112594	101393	106994	89442	92715	91079	23152	8678	15915	1.26	1.09	1.18
$A_3F_2K_1$	99313	93237	96275	88017	85556	86787	11295	7681	9488	1.13	1.09	1.11
$A_3F_2K_2$	99522	94404	96963	86976	86039	86508	12546	8365	10455	1.14	1.10	1.12
$A_3F_2K_3$	107711	96314	102012	88309	86271	87290	19402	10042	14722	1.22	1.12	1.17
$A_3F_2K_4$	107590	97868	102729	89245	87693	88469	18346	10175	14260	1.21	1.12	1.16
$A_3F_3K_1$	91593	85577	88585	85386	83062	84224	6206	2516	4361	1.07	1.03	1.05
$A_3F_3K_2$	91613	86542	89078	85869	83675	84772	5745	2868	4306	1.07	1.03	1.05
$A_3F_3K_3$	96197	98604	97400	86287	87806	87047	9910	10798	10354	1.11	1.12	1.12
$A_3F_3K_4$	96777	99867	98322	86818	87862	87340	9959	12005	10982	1.11	1.14	1.13

` 1, 15, 637 $ha^{-1}$, ` 1, 08, 393 ha^{-1} and ` 1, 12, 015 $ha^{-1}$ and net returns of ` 26, 311 ha^{-1}, ` 20, 106 $ha^{-1}$ and ` 23, 208 ha^{-1} during the year 2016, 2017 and in the pooled mean, respectively. An application of 125% RDF and 100% RDF recorded same and higher B:C ratio (1.29, 1.26) than 75% RDF (1.20) in the year 2016 and mean of 2016 and 2017. Whereas, 100% registered higher B:C ratio (1.23) which was closely followed by 125% RDF (1.28). The 75% RDF registered lowest B:C ratio (1.23, 117 and 1.20) during 2016, 2017 and mean, respectively. This might be due to the lower cost of cultivation as compared to relatively higher yield under 125% RDF and 100% RDF than 75% RDF. The variation in the cost of cultivation under the different treatments were recorded due to the variable costs of fertilizers application as per treatments. Grain and straw yields were the major factors, which caused differences in the net return. These results are in close conformity with the findings of Shinde (2004), Singh *et al.*, (2007), Mohan and Pillai (2014), Paramasivan *et al.*, (2016) and Pawar (2018).

Effect of methods of fertilizer application

The economics of different fertilizer management methods showed that, split application of K with Zn, B and Cu spray and basal application of K with Zn, B and Cu spray recorded the highest gross monetary return (` 1,17,079 ha-$^{1}$, ` 1,10,603 ha-^{1}, ` 1,13,841 $ha^{-1}$ and ` 1,16,790 ha-^{1}, ` 10,98,95 $ha^{-1}$ and ` 1,13, 342 ha^{-1}) and cost of cultivation, (` 90,810 $ha^{-1}$, ` 90,053 ha^{-1}, ` 90,432 $ha^{-1}$) and (` 90,317 ha^{-1}, ` 89,510 $ha^{-1}$, ` 89,913 ha^{-1}) in 2016, 2017 and mean respectively. While, in respect of net returns basal application of K with micronutrients spray treatment recorded slightly higher values (` 26,473, ` 20,385 and ` 23,429) than split application of K with Cu, Zn and B spray (` 26,269 ha^{-1}, ` 20,550 $ha^{-1}$ and ` 23,410 ha^{-1}) in 2016 mean of 2017 and vice-versa in 2017 but both treatments recorded comparatively higher net returns than either basal or split application of K during in 2016, 2017 and pooled mean. The split application of K with Zn, B and Cu spray and basal application of K with Zn, B and Cu spray recorded similar and maximum benefit: cost ratio (1.29, 1.23 and 1.26) as compared to either basal or split application of K without micronutrient spray (1.25, 1.22 and 1.18) during 2016, 2017 and mean, respectively. These results are in agreement with those reported by Gill and Walia (2013) and Kankal (2015).

Economics of treatment combinations

The data pertaining in cost of cultivation, gross monitory returns, net monitory returns and B: C ratio as influenced by different treatments combinations are presented in Table 2. Data revealed that, the treatment combination of $A_1F_1K_4$ found better and recorded highest gross monetary, (` 1,37,836 $ha^{-1}$ ` 1,34,711 ha^{-1} and ` 1,36,298 $ha^{-1}$), cost of cultivation (` 97,009, ` 94,800 & ` 95,905 ha^{-1}) net returns (` 40,876 $ha^{-1}$, ` 39,910 ha^{-1} & ` 40,393 $ha^{-1}$) followed by treatment combination $A_1F_1K_3$ which recorded gross return (` 1,36,407 ha^{-1}, ` 1,33,889 $ha^{-1}$ & ` 1,35148 ha^{-1}), cost of cultivation (` 96,482 $ha^{-1}$, ` 94,168 ha^{-1} and ` 95,325 $ha^{-1}$), net returns (` 39,925 ha^{-1}, ` 39,721 $ha^{-1}$ and ` 39,823 ha^{-1}) during the year

2016, 2017 and pooled mean. While, treatment combination $A_1 F_1 K_4$ and $A_1 F_1 K_3$ recorded highest B:C ratio (1.43) in the year 2017 and the treatment combination $A_1 F_1 K_3$ & $A_1 F_1 K_4$ recorded highest B:C ratio (1.42) in 2017 and pooled mean. From pooled data mean, the lowest gross returns, cost of cultivation and B:C ratio recorded in $A_3 F_3 K_1$ and lowest net returns was found in $A_3 F_3 K_2$ all remained treatment combinations and B:C ratio recorded in $A_3 F_3 K_1$.

Conclusion

The overall economic study (Table 1) concluded that, 20 days age seedling with 100% RDF and either basal or split application of K gave maximum benefit from hybrid rice Sahydri-3 under lateritic soil of Konkan. However (Table 2), the treatment combination of $A_1 F_1 K_4$ *i.e*. transplanting of 20 days age seedling of rice followed 125% RDF with split application K along with micronutrient spray (Zn, B and Cu) were recorded the maximum gross returns and net returns than rest of the treatment combinations which was closely followed the treatment combination $A_1 F_1 K_3$ during 2016, 2017 and pooled mean. However, the treatment combination of $A_1 F_1 K_4$ and $A_1 F_1 K_3$ recorded same B:C ratio in pooled mean.

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