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EFFECT OF AGE OF SEEDLINGS AND FERTILIZER MANAGEMENT ON YIELD, NUTRIENT CONTENT AND UPTAKE OF RICE (*ORYZA SATIVA* L.)

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ABSTRACT
An experiment was conducted under South Gujarat agro climatic condition on clayey soil of the Regional Rice Research Station, Vyara, (Gujarat) during *kharif*-2012 with a view to study the "Effect of age of seedlings and fertilizer management on yield, nutrient content anduptake of rice (*Oryza sativa* L.)".The result revealed that age of seedling and fertilizer treatments significantly influenced the yield and nutrient uptake. The grain and straw yield (4950 and 5598 kg ha^{-1}, respectively) were significantly higher with the19-21 days old seedling (A_2) being at par with 12-14 days old seedling (A_1). Significantly lower grain and straw yield of rice recorded under A_3 (25-28 days old seedling).Thegrain and straw yield (4928 and 5514 kg ha^{-1}, respectively) were significantly higher due to fertilizers treatment under the application ofurea briquettes + 20 per cent N through urea (F_3) which was remained at par with treatment urea briquettes (F_1) and whiletreatment recommended dose of fertilizers(F_2) was found inferior.N, P and K content and uptake in grain and straw recorded significantly higher under 19-21 days old seedling remained at par with 12-14 days old seedling.

INTRODUCTION

Among the cereals, rice occupied the second position next to wheat with regard to food value (Anon., 2010**a**). India has largest area 42.5 million hectare with production 106 million tonnes of rice and average productive was 3.45 tonnes ha^{-1}. (Anon., 2013).In Gujarat, about 8.36 million hectares area with the production of 17.90 lakh tonnes and a productivity of 2.14 tonnes ha^{-1}. (Anon., 2013). The rice productivity is less than 2 tons per hectare in most of the states (Dash, 2009).

Due to uncertainty of monsoon rains, the transplanting of rice gets prolonged. Under such situation, comparative evaluation of young aged seedlings needs to be done, to make the crop more accommodative in the system and to obtain the good yields.The chemical fertilizers are considered as essential part of modern farming and their use in different countries has increased considerably day-by-day. Their application directly or indirectly causes series of changes in physical, chemical and biological properties of soil (Divya and Belagali, 2012). Rice crop is a heavy feeder of fertilizers and need nitrogen for its rapid growth at all the stages of growth, as nitrogen is an element which gets rapidly mineralized and leached away its deficiency is found prominent in growth stages of crop hence to overcome this situations the fertilizer management practices like split application, use of briquettes has been formulated to ultimately achieve the goal of profitable rice cultivation and production.

The excessive use of chemicals in agriculture causeswater pollution and human health hazards. After years of highyields, rice soils are depleted of nutrients. Therefore theapplication system of rice intensification technology wouldbe necessary for sustainable rice production in the future and when the planting densities exceed the optimumlevel, competition among plants becomes severe andconsequently the plant growth slows and the grain yielddecreases. As the tiller production in rice is very lowand most of them are low yielding. This paper deals with theobjective to determine suitable spacing and number of seedlings for rice varieties under SRI based cultivationpractices to maximize their yield (Damini, *et al.*, 2014). In SRI use of young seedlings, TP of single seedlings with wide spacing, mechanical weeding, water management and use of compost as far as possible. The practice of limited use of glyricidia and deep point placement (8 to 10 cm soil depth) of fertilizer nitrogen as urea super granules (USG) or pillow shaped UB-DAP was agronomical most efficient than conventional application of prilled urea (PU) in transplanted rice with this technique the farmer could achieve yield potential of the improved high yielding varieties using about 40% less fertilizer compared with locally recommended NP rate of fertilizer The placement of UB-DAP helps in rice plant to use efficiently the applied nutrients by controlling their rate and duration of Bio-availability and reducing the lossesthrough. With the considering above fact, the present investigation entitledeffect of age of seedlings and fertilizer management on yield, nutrient content anduptake of rice (*Oryza sativa* L.) was planned.

MATERIALS AND METHODS

An experiment was conducted under South Gujarat Agro Climatic condition at the Regional Rice Research Station (RRRS), Navsari Agricultural University, Vyara, Dist. Tapi (Gujarat) duringkharif-2012 with a view to study the "Effect of age of seedlings and fertilizer management on yield, nutrient content anduptake of rice (*Oryza sativa* L.)."The soil of experimental field was clayey in texture, low in available nitrogen (Kjeldahl method) medium in available phosphorus (Olesen's method) and medium in available potassium (Flam photometric method) and slightly alkaline in reaction with 7.5 pH (Potentiometric method).Split Plot Design was laid out with four replicationas age of seedlings in main plot treatments i.e. A_1 (12-14 days old seedling), A_2 (19-21 days old seedling) and A_3 (25-28 days old seedling) and fertilizer application in sub plots treatments, *viz*., F_1: apply N and P @ 60-30 kg ha^{-1} in the form of pellet, F_2:RDF (100:30: 00 NPK) and F_3: apply 60 per cent recommended dose of N and full dose of P in the form of pellets (Briquettes) at the time of planting at 8-10 cm deep in alternate row in square + 20 per cent N in the form of urea broadcasting at Panicle initiation stage.The paddy variety "NAUR-1" was selected for the present investigation.

RESULTS AND DISCUSSION

Yield

The results pertaining to grain yield and straw yield of rice revealed that treatment A_2 (4950 and 5598 kg ha^{-1}, respectively) found significantly superior over treatment A_3 (4290 and 4813 kg ha^{-1}, respectively) but remained at par with A_1 (4930 and 4813 kg ha^{-1}, respectively).The present findings are in close agreement with those reported by Patel *et al*. (1978), Singh and Singh (2009) and Manjunatha *et al*. (2010). The result pertaining to grain yield, revealed that due to application of treatment urea briquettes + 20 per cent N through urea (F_3) was found significantly higher grain yield (4928 kg ha^{-1}) was observed which was remained at par with treatment application of F_1 (4768 kg ha^{-1}) and treatment F_2 found significantly lower grain yield (4427 kg ha^{-1}). The straw yield, under treatment F_3 (5514 kg ha^{-1}) recorded significantly superior over treatment F_2 (4847 kg ha^{-1}) but remained at par with treatment F_1 (5200 kg ha^{-1}).This finding is in conformity with those of Mishra *et al.* (1999), Bulbule *et al.* (2005) and Damini *et al.* (2014).

Nutrient content (%)

A perusal of data in Table-1, showed that nitrogen, phosphorus and potassiumcontent (%) in grain and straw due to different age of seedlings were found non- significant.Data inTable 1 showed that nitrogen content in grain and straw due to application of treatment F_3 : urea briquettes + 20 per cent N through urea (0.99 and 0.75 per cent, respectively) found significantly highest as compare to F1: urea briquettes (0.85 and0.67 per cent,respectively) and treatment F_2:RDF(0.89 and 0.64 per cent,respectively). The phosphorus content in grain due to treatment F_3 (0.23 per cent) was found significantly highest over to F_2 (0.20per cent) and application of F_1 (0.21per cent). Where P content in straw due to application of urea briquettes +20 per cent N through urea was0.11 per cent and application of urea briquettes was 0.11per cent found significantly superior over recommended dose of fertilizer (0.10 per cent).The result showed that the potassium content in grain due to the application of treatment F_3 (0.18 per cent) and F_1 (0.18 per cent) found significantly superior over F_2 (0.16 per cent). Where, in straw potassium content in straw due toapplication all treatment found to be non-significant.Mahajan and Tripathi (1992).

N, P and K uptake (kg ha^{-1})

The result presented in Table 1 recorded that transplanting of rice at 19-21 days old seedling (A_2) recordedsignificantly higher N, P and K uptake by grain (46.20,10.98, 9.39 kg ha^{-1},respectively) which was remained at par with A_1:12-14 days old seedling (45.09,10.50, 8.72 kg ha^{-1}, respectively) and treatment A_3 (25-28 days old seedling) found significantly lower N,P and K uptake 38.28,8.79, 7.38kg ha^{-1}, respectively)

Table 1: Effect of age of seedlings and fertilizer managementon yield,nutrient contentand uptake of rice (*Oryza sativa* L.)"

Treatment	N content(%)		P content(%)		K content(%)		N uptake(kg ha^{-1})		P uptake(kg ha^{-1})		K uptake(kgha^{-1})		Grain yield (kg ha^{-1})	Straw yield(kg ha^{-1})
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw		
Main plot (Age of seedlings)														
A_1 (12-14 days)	0.92	0.69	0.21	0.11	0.17	1.53	45.09	35.81	10.50	5.67	8.72	79.11	4930	5152
A_2 (19-21 days)	0.93	0.70	0.22	0.11	0.19	1.47	46.20	39.42	10.98	6.30	9.39	81.62	4950	5598
A_3 (25-28 days)	0.89	0.67	0.21	0.104	0.17	1.49	38.28	32.30	8.79	5.01	7.38	71.48	4290	4813
S Em ±	0.018	0.014	0.005	0.0030	0.006	0.040	1.37	1.30	0.41	0.23	0.42	2.32	121.	142
CD at 5%	NS	NS	NS	NS	NS	NS	4.75	4.50	1.43	0.82	1.46	8.04	419	490
CV %	7.12	7.29	8.72	10.34	11.64	10.41	11.02	12.59	14.20	14.63	17.24	10.41	8.91	9.46
Sub plot (Fertilizer level)														
F_1 (UB)	0.85	0.64	0.21	0.11	0.18	1.49	40.86	33.57	10.03	5.63	8.88	77.77	4768	5200
F_2 (RDF)	0.89	0.67	0.20	0.10	0.16	1.47	39.50	32.52	9.07	5.03	7.46	70.91	4427	4847
F_3 (UB+ 20% N)	0.99	0.75	0.23	0.11	0.18	1.53	49.21	41.43	11.16	6.31	9.15	83.54	4928	5514
S Em ±	0.018	0.013	0.0046	0.0019	0.0046	0.045	1.26	1.19	0.25	0.14	0.23	1.93	75.14	114
CD at 5%	0.052	0.039	0.013	0.006	0.013	NS	3.7	3.53	0.75	0.44	0.70	5.75	223	338
CV %	6.74	6.71	7.47	6.28	9.01	9.43	10.11	11.50	8.69	9.14	9.63	8.67	5.53	7.60
Interaction														
A × M	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

. The N uptake by straw was recorded due to the application of treatment A_2 (39.42 kg ha^{-1}) and A_1 (35.81 kg ha^{-1}) over treatment A_3 (32.30 kg ha^{-1}) and treatment A_2& A_1 found atpar with each other. Significantly higher P up take in straw by treatment A_2 (6.30 kg ha^{-1}) which remained at par withA_1 (5.67 kg ha^{-1}) and A_3 found significantly lower P uptake (5.01 kg ha^{-1}) by straw.K uptake by straw was observed significantly superior due to the application of treatment A_2 (81.62 kg ha^{-1}) andA_1 (79.11kg ha^{-1}) over treatment A_3 (71.48 kg ha^{-1}).This might be due to vigorous and healthy growth plant, which developed more productive tillers and stronger root system and insure greater resource utilization and uptake of nutrient. The present findings are in close agreement with those reported byShekhar *et al*. (2009) and Hussain *et al.,* (2012).N uptakeby grain due to the application of urea briquettes + 20 per cent N through urea found significantly highest(49.21 kg ha^{-1}) over application of urea briquettes (40.86kg ha^{-1}) and withrecommended dose of fertilizer, (39.50 kg ha^{-1}). Phosphorus uptake due to the application of treatment F_3 found significantly higher (11.16 kg ha^{-1}), which remained at par with to F_1 (10.03kgha^{-1}) while, treatment F_2 (RDF) found significantly lower P uptake (9.07 kg ha^{-1}). Significantly higher K uptake by grainwas registered due to the application of treatment F_3: urea briquettes + 20 per cent N through urea (9.15 kg ha^{-1}) remained at par with applicationF_1 (8.8kgha^{-1}) while, treatment F_2 (RDF) found significantly lower K uptake (7.46 kg ha^{-1}) by grain.

N uptake by straw due to the application of treatment F_3 found significantly highest (41.43 kg ha^{-1}) over treatment F_1(33.57 kg ha^{-1}) and treatment F_2 (32.52kg ha^{-1}) while F_1 and F_2 remain at par with each other, while, P uptake due to the application of treatment F_3 (urea briquettes + 20 per cent N through urea) found significantly highest (6.31kg ha^{-1}) over treatment F_1 (urea briquettes, 5.63kg ha^{-1}) and treatment F_2 (RDF, 5.03 kg ha^{-1}). Potash uptake due to the application of treatment F_3 (urea briquettes + 20 per cent N through urea) found significantly highest (83.54 kg ha^{-1}) over treatment F_1 (urea briquettes, 77.77 kg ha^{-1}) and treatment F_2 (RDF, 70.91 kg ha^{-1}). The reason might be due to urea briquettes are slow releasing nitrogen and minimum losses of nutrient, compactness of the briquettes and continuous availability of nitrogen and higher absorption of nitrogen which has towards higher grain and straw yield. Through urea briquettes nutrient is provided to crop as per requirement so application of nitrogen through urea briquettes increasing further use efficiency and avoiding leaching losses.This finding is in conformity with those of Power and Despande (2001).

From the result, it can be concluded that for securing higher net realization and production of transplanted*kharif* rice variety 'NAUR-1', it is recommend to use 19 to 21 days old seedlings with the application of 60 per cent recommended dose of N and full dose of P in the form of pellets (briquettes) at the time of planting at 8-10 cm deep in alternate row in square + 20 per cent N in the form of urea broadcasting at panicle initiation stage.

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