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SITE-SPECIFIC NUTRIENT MANAGEMENT (SSNM) ON BARLEY UNDER RICE-BASED CROPPING SYSTEM IN WATER LOGGED AREA

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ABSTRACT

The field experiment was conducted during rabi season of consecutive three years from 2004-05 to 2006-07 at Crop Research Station, Paglabhari (Masodha) of NDUA&T, Kumarganj Faizabad to examine site-specific nutrient management on barley under rice barley cropping system in water logged areas. Ear length, number of grains/ear, test weight, grain and straw yields were recorded significantly higher with the application of N80P40 kg/a over rest of the treatments. The highest benefit cost ratio (B:C) was observed with the application of N60P40 kg/ha.This treatment was most economical and beneficial under water logged condition over N80P40 kg/ha nutrient application.

Key words : *Barley, rice-barley cropping system, SSNM and water logged*

Barley is one of the most important cereals crop in world. It is widely grown and ranked fourth among to 110 crop plants in the world after wheat, rice and maize (1). The average yield, production and area of barley of India during 2011 were reported 23.57 q/ha, 0.705 mha and 1.66m tonne, respectively. Barley is an economically important cereals used for producing malt, beverage industries, human food and animal feed. Presently, its food use is limited to its consumption in the form of “Sattoos” (course flour as a sweetened drink) in summer. Its potential uses are, however, numerous and the major ones are the use of its straw in the production of paper, paper laminates, card board and mill board; and its grain as an ingredient in the feed for cattle, sheep, goat and poultry etc. Many of these become human food. In addition barley is a primary source of carbohydrate and bio-active compounds (2). More comprehensive nutrient use strategies are required to offset the rates of nutrient depletion and emergence of multi-nutrient deficiencies within the Indo-Gangetic Plain (IGP) region. This study’s site-specific nutrient management (SSNM) strategy increased crop yield, system productivity, and profitability within different rice-based systems compared with treatments based on existing recommendations or farm practice. Depletion of native nutrient reserves, emergence of multi-nutrient deficiencies, and decline in factor productivity of applied nutrients – the latter a measure of nutrient use efficiency defined by (3) as yield of harvested portion divided by amount of fertilizer nutrient applied – are major reasons for productivity stagnation in rice-based systems in the Indo-Gangetic Plain region of India (4). On the other hand, long-term experiments and other studies indicate that crop productivity can be sustained with balanced fertilization. SSNM can take into account all nutrient deficiencies to ensure crop demands are met and soil fertility is improved, which in turn ensures higher nutrient use efficiency, higher crop productivity, and higher economic returns (5). In rice-barley cropping system, soil testing is pre-requisite to know the nutrients balance in soil and to apply required amount of nutrients to correct imbalances and optimize crop nutrients. Farmers generally applied fertilizers in the field without prior knowledge of soil fertility status and nutrients requirement of crops which may have adverse effect on soil as well as crops both in term of nutrient deficiency and toxicity either by over use or inadequate use. Fertilizer recommendations on the soil test basis takes in to account of soil fertility status and nutrient requirement of the crop. Thus, the present study was undertaken to prescribe the fertilizer base site specific nutrient management practices in maximize in barley under rice-barley cropping system and economics and to enhance the nutrient use efficiency through balance fertilization.

MATERIALS AND MATHODS

Three years field experiments were conducted during rabi season 2004-05, 2005-06 and 2006-07 after the harvest of rice at Crop Research Station, Paglabhari (Masodha) of Nardendra Deva University of Agriculture and Technology, Kumarganj Faizabad under project (UPCAR) on “Management of water logged area,

through characterization, identification of crops and verities and to develop appropriate agro techniques" to study the site specific nutrient management (SSNM) in rice-barley cropping system under water logged area comprising fifteen treatments viz. N_0P_0, $N_{20}P_0$, $N_{40}P_0$, $N_{60}P_0$, $N_{80}P_0$, N_0P_{20}, $N_{20}P_{20}$, $N_{40}P_{20}$, $N_{60}P_{20}$, $N_{80}P_{20}$, N_0P_{40}, $N_{20}P_{40}$, $N_{40}P_{40}$, $N_{60}P_{40}$, $N_{80}P_{40}$, were laid out in a randomized block deign along with three replications. These treatments used only in barley crop. The soil of the experimental field was sandy loam in texture containing organic carbon (0.48%), available nitrogen (119 kg/ha), phosphorus (24.1 kg/ha) and potassium (271.0 kg/ha) with pH 7.8 and EC 0.47 ds/m. The experimental site falls under subtropical zone in Indo-Gangatic Plains and lies between 26.47°N longitude and 81.12°E latitude and at altitude of about 113 m from MSL. Jyoti variety of Barley was sown in line at a row distance of 22.5 cm apart on first week of January on each year. Half dose of nitrogen and full dose of phosphorus as per treatment were applied to barley as basal. Top dressing of remaining nitrogen was done in two equals at maximum tillering and at spike initiation stage. The crop received normal irrigation and plant protection measures during the crop growth stages.

RESULTS AND DISCUSSION

The plant height and number of effective tillers at harvest stage were significantly influenced by different nutrient treatments (Table-1). The 80 kg nitrogen application along with 40 kg phosphorus/ha ($N_{80}P_{40}$), recorded the highest plant height and effective tillers/ plants and it was significant over all other treatments expect application of 40 Kg phosphorus along with 20, 40 and 60 Kg/ha (i.e. $N_{20}P_{40}$, $N_{40}P_{40}$ and $N_{60}P_{40}$). The highest values ear length, number of grains/ear and test weight were also observed with the application of $N_{80}P_{40}$ in barley. However, it was found statistically at par with the application of $N_{60}P_{40}$ and $N_{40}P_{40}$ kg/ha. $N_{80}P_{40}$ recorded higher grain and straw yield over rest of the treatments except with the application of 40 kg/ha phosphorus along with 40 and 60 Kg N/ha. The data on grain and straw yield revealed that both were increased with increasing the dose of nitrogen from 20 to 80 kg/ha. Statistically similar grain and straw yield were observed with nitrogen at 20 and 40 kg/ha along with both the doses of phosphorus, respectively. Nitrogen

Table-1: Effect of nitrogen and phosphorus on yield and yield attributes of barley (Mean of three years)

Treatment	Pre harvest studies		Post harvest studies					B:C Ratio
	Plant height (cm)	No. of effective tillers/ plant	Yield attributing characters			Yield (q/ha)		
			Ear length (cm)	No. of grains/ ear	Test weight (g)	Grain	Straw	
N_0P_0	35.80	2.01	4.21	13.44	23.50	11.59	19.43	0.18
$N_{20}P_0$	38.55	2.19	4.51	14.20	24.65	12.29	20.32	0.20
$N_{40}P_0$	40.83	2.57	4.80	15.22	25.87	13.11	21.22	0.23
$N_{60}P_0$	42.14	2.81	5.28	17.13	27.40	14.39	22.60	0.26
$N_{80}P_0$	42.49	3.07	5.48	19.25	29.45	15.74	24.59	0.32
N_0P_{20}	42.00	3.05	5.43	18.47	27.89	14.07	21.89	0.27
$N_{20}P_{20}$	44.98	3.21	5.79	20.97	29.18	15.98	23.68	0.34
$N_{40}P_{20}$	47.93	3.52	6.28	23.53	32.72	17.79	25.53	0.44
$N_{60}P_{20}$	49.60	3.73	6.59	24.43	32.45	19.48	28.80	0.46
$N_{80}P_{20}$	50.59	3.83	6.69	25.23	33.00	20.15	31.49	0.51
N_0P_{40}	50.88	3.99	6.70	25.35	33.06	20.41	31.14	0.60
$N_{20}P_{40}$	54.35	4.31	6.99	26.72	34.49	22.33	33.35	0.67
$N_{40}P_{40}$	57.67	4.49	7.40	28.16	35.57	23.86	35.96	0.71
$N_{60}P_{40}$	58.95	4.66	7.70	29.14	37.30	25.26	38.63	0.75
$N_{80}P_{40}$	59.77	4.83	8.03	30.14	38.09	26.24	39.40	0.73
SEm+	2.46	0.19	0.29	1.01	1.06	0.89	1.49	-
CD (P = 0.05)	7.12	0.54	0.84	3.04	3.07	2.56	4.31	-

application at 60 and 80 kg/ha with phosphorus recorded significantly higher grain and straw yield of barley as compared to nitrogen 20 kg/ha with phosphorus These results corroborated earlier work done under rice-wheat and rice-rice system by (6, 7) reported that with increase in nitrogen rates from 0-60 kg/ha, average grain yield increased from 13.7 to 35.0 q/ha. Phosphorus application also significantly influenced the grain and straw yield. Phosphorus at 40 kg/ha recorded significantly lower grain and straw yield over 20 kg P/ha or no phosphorus application with respective combination of nitrogen doses (8) reported 40.0 q/haof barley grain yields with the application of $N_{60}P_{90}K_{90}$ kg/ha against the control yield of 13.3 q/ha. The highest benefit cost ratio (0.75) was recorded with the application of N60P40 kg/ha and it was followed by $N_{80}P_{40}$.

REFERENCES

1. Taketa (2008). Barley grains with adhering hulls in controlled by an ERF family transcription factor gene regulating lipid biosynthesis pathway. *The National Academy of Service* of the USA.
2. Madhujith, T. and Shahidi, F. (2008). Antioxidant properties of barley pearled fraction. *J. Agric. Food Chemist, 54 :* 3283-3289.
3. Snyder, C.S. and T.W. Bruulsema (2007). International Plant Nutrition Institute.June 2007. Reference # 07076. Norcross, GA, U.S.A. 4 pp.
4. Yadav, R.L., (2000). *Field Crops Res. 68 :* 219-246.
5. Dobermann, A., (2004). Increasing productivity of intensive rice systems through site-specific nutrient management. *Science Publishers and IRRI*. 410 pp.
6. Gill, M.S. and V.K. Singh, (2009). *Indian Journal of Fertilizer 5 (4) :* 59-80 and 106.
7. Singh, V.K.; Majumdar, K.; Singh, M.P.; Kumar, Raj and Gangwar, B. (2011). Maximizing productivity and profit through site-specific nutrient management in rice-based cropping systems. *Better Crops 95(2) :* 28-30.
8. Davidov, A.P.; Mozhar, K.T. and Kirilchik, A.P. (1976). Effect of fertilizers on grain yield and quilty of barley. Pochvennye issledovaniya primenenie udobrenni Minsk, Belorussian SSR; Uradzhai:89-97. (*Field Crop Abstr. 30(5) :* 2570-1977).