

Effect of Integrated Nutrients Management on Nutrients Status of Soil under Pearl millet-Wheat Cropping System

Rajvir Singh and O.P. Rajput*

*Ex. Agronomist Cropping Systems Research Center, Bichpuri, Agra
Department of Agronomy
Raja Balwant Singh College, Bichpuri, Agra – 283105 (U.P.)

E-mail : drrajcb@gmail.com

Abstract

A field experiment was conducted at Agricultural Research Farm of Raja Balwant Singh College, Bichpuri, Agra taking twelve treatments having integration of organics with fertilizers and it was noted that the organic carbon percent, available N P and K nutrients increased with the application of FYM/WRC and green manure (dhaincha). Application of organics coupled with fertilizer increased the Fe and Cu and maintained the Mn in soil at the end of Rabi 1999-2000 while Mn and Zn decreased remarkably in control plot.

Key words : Integrated Nutrient Management, nutrient status, pearl millet –wheat cropping system.

Introduction

For higher production, higher and balanced fertilizer use is a must. Higher yield has become imperative, if ever growing population of India is to be fed properly. Therefore, if fertilizer use has to be reduced, so must be the population. In fact, our soils are at present poor ill rather to say depleted due to exhaustive crop sequences (like rice-wheat and maize/pearlmillet/sorghum-wheat) followed over years with a view only to harvest more and more;^[2,3] so are also our crops, animals and human population, because they are malnourished. Poorly fed plants supply poor quality and imbalanced diet to man and animals, resulting in wide-spread malnutrition and diseases as well as un-nutritional security. This, in turn, results in many nutrient deficiency disease, higher infant mortality and low human productivity. The best means to solve these serious problems is to supply balanced plant nutrient through integrated use of mineral fertilizers, organic manures (FYM, waste residue of crops, green manure,

biofertilizers etc.) without condemning any of these sources. Pearl millet–wheat is a traditional, popular and unreplaceable cereal based cropping system being widely adoption in western Uttar Pradesh. This had been pointed out earlier that in pearl millet-wheat cropping system, the total removal of plant nutrients in every high, which many often exceeds the applied nutrients. The best means to solve such problem is to supply balanced plant nutrients through integrated use of mineral fertilizers, organic manures and bio-fertilizers^[5].

Materials and Methods

A field experiment was conducted at the R.B.S.College Agricultural Research Farm, Bichpuri (Agra) during kharif and rabi seasons of 1998-99 and 1999-2000 in a continuous cropping sequence of pearl millet–wheat, commencing from 1990-91 onward on the fixed site. The experimental plot had 60.4% sand, 21.12% silt and 18.40% clay. Total twelve treatments consisting of no

fertilizer, no organic matter in kharif and rabi (T_1 as control), 50% recommended NPK dose through fertilizers (40-20-20) in kharif and 50% recommended NPK (60-30-20) dose through fertilizers in rabi (T_2), 50% recommended dose of NPK through fertilizers in kharif (40-20-20) and 100% NPK dose (120-60-40) in rabi through fertilizers (T_3), 75% recommended NPK dose through fertilizers (60-30-30) in kharif and 75% recommended NPK dose (90-45-30) through fertilizer in rabi (T_4), 100% recommended NPK dose through fertilizers (80-40-40) in kharif and 100% recommended dose of NPK (120-60-40) through fertilizers in rabi (T_5), 50% recommended NPK dose through fertilizers (40-20-20) + 50% N substitution through FYM @ 8t ha⁻¹ in kharif and 100% recommended NPK dose (120-60-40) through fertilizers (T_6), 75% recommended NPK dose through fertilizers (60-30-30) in rabi + 25% N substitution through FYM @ 4t ha⁻¹ in kharif and 75% recommended NPK dose (90-45-30) through fertilizers in rabi (T_7), 50% recommended NPK dose through fertilizers (40-20-20) + 50% N substitution through waste residue of crop @ 6.6t ha⁻¹ in kharif and 100% recommended NPK dose (120-60-40) through fertilizers in Rabi (T_8), 75% recommended dose through fertilizers (60-30-30) + 25% N substitution through waste residue of crop (WRC) @3.3t ha⁻¹ in kharif and 75% recommended NPK dose (90-45-30) through fertilizers in rabi(T_9), 50% recommended NPK dose through fertilizers (40-20-20) + 50% N substitution through green manure (dhaincha) @ 4t ha⁻¹ in kharif and 100% recommended NPK dose (120-60-40) through fertilizers in rabi (T_{10}), 75% recommended NPK dose through fertilizers (60-30-30) + 25% substitution through green manure (dhaincha) @ 2t ha⁻¹ in kharif and

75% recommended NPK dose (90-45-30) through fertilizers in rabi (T_{11}) and Farmer's practice (Conventional method) of the urea (40-0-0) in kharif and Farmer's practice (Conventional) (40-0-0) of the urea in rabi (T_{12}) were applied as per randomized block design of the experiment including four replications. The nutrients in soil samples of 0-15 cm layer were analysed using standard methods.

Results and Discussion

The data given in Table 1 indicated that organic carbon content decreased in control plot (T_1) from its initial value of 0.311 to 0.250 percent as also reported earlier[1]. Application of NPK alone through fertilizers and combined use with FYM (T_6 and T_7), WRC (T_8 and T_9 as well as green) manure dhaincha(T_{10} and T_{11}) increased appreciably the organic carbon content of the soil from its original value. Further integrated use of organics^[4] by either source was also appeared better in enhancing the organic carbon content of the soil than 100 percent NPK (T_5) through fertilizers. The combined use of NPK through fertilizers and FYM organic source of N, increased available NPK status of soil over 100 percent NPK through fertilizer (T_5) alone [2, 3]. Among the different organic sources of N, WRC was the interior source of NPK enhancement. Application of NPK through fertilizer alone and their combined use with FYM/WRC/GM through dhaincha increased the Fe and Cu and maintained the Mn status of soil in the treatment[4] where FYM was applied to compensate 50 percent N (T_6) for pearl millet resulted in nitrogen enhancement and the available Cu and Zn; while the green manure dhaincha (T_{10} and T_{11}) combined with fertilizer increased the available Fe status of the soil over 100 percent NPK through fertilizer.

Table 1 O.C. and available N, P, K and micro-nutrients status of soil after rabi wheat harvest (1999-2000) in pearlmillet-wheat system (in continuation w.e.f. 1990-91 as long term experiment)

Treatments	O.C. (%)	Available major nutrients			Available micro nutrients (mg kg ⁻¹ soil)			
		N (kg ha ⁻¹)	P (kg ha ⁻¹)	K (kg ha ⁻¹)	Fe	Mn	Cu	Zn
T ₁	0.250	108	6.9	190	10.0	7.2	0.80	1.60
T ₂	0.268	112	8.9	203	10.3	7.6	0.92	1.74
T ₃	0.307	121	12.3	207	10.5	7.5	0.93	1.75
T ₄	0.312	122	10.8	191	10.1	8.3	0.95	1.76
T ₅	0.374	149	13.1	216	11.4	9.6	0.92	1.77
T ₆	0.428	213	16.8	243	12.0	9.8	1.13	1.81
T ₇	0.415	196	12.7	232	10.9	9.7	0.97	1.78
T ₈	0.406	163	13.8	227	11.5	9.4	0.95	1.76
T ₉	0.388	170	12.9	210	10.9	9.5	0.97	1.01
T ₁₀	0.418	182	16.8	231	12.1	9.4	0.95	1.79
T ₁₁	0.396	166	13.7	224	11.7	8.9	0.92	1.76
T ₁₂	0.272	111	8.3	212	10.2	7.5	0.75	1.59
*Initial status (in 1990-91)	0.311	124	10.6	204	9.5	9.1	0.80	1.89

*Source : These data borrowed from Cropping Systems Research (ICAR), Bichpuri Centre on Long Term Integrated Nutrients Management Experiment [Expt 2(a)]

References

- Patil, B.P. and Pal, Mahendra (1988). Influence of pearlmillet + legume intercropping systems of physico-chemical properties of soil. *Indian Journal of Agronomy*, **34**(4) : 389-392.
- Raghuwanshi, R.K.S., Umat, R., Nema, R.L. and Dubey, D.D. (1991). Balance sheet of nitrogen, phosphorus and potash in soil as influenced by wheat based crop sequences. *Indian Journal of Agronomy*, **36**(3) : 322-325.
- Sekhan, G.S. and Puri, D.N. (1986). The input – output balance of plant nutrients in some intensive cropping system in India. *Potassium Review*, **6**(2) : 52-59.
- Singh, K., Singh, V. and Ram, P. (1988). Effect of Farm yard manure and fertilizers on herb, oil and sucker yield of menthaarvensis L. *Indian Journal of Agronomy*, **33**(3) : 287-89.
- Thakur, R.C. Bindra, A.D., Sood, R.D. and Bhargava, M. (1995). Effect of fertilizer application and green manuring on physico-chemical properties of soil and grain yield in rice wheat crop sequence. *Indian Journal of Agronomy*, **40**(1) : 4-13