

Soil fertility status as affected with and without farmyard manure in *kharif* crops and fertilizer levels in barley (*Hordeum vulgare*)

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ABSTRACT

A field investigation was carried out during rainy (*kharif*) and winter (*rabi*) seasons of 2003–04 and 2004–05 on sandy loam soils to study the effect of fertilizer levels and preceding crops grown with and without farmyard manure on soil fertility status after barley. Clusterbean (*Cyamopsis tetragonoloba* L. Toubert) – barley (*Hordeum vulgare* L.) crop sequence significantly increased the nitrogen status of soil (139 kg/ha). Whereas, available phosphorus status was significantly higher (19.45 kg/ha) under pearl millet [*Pennisetum glaucum* L.R. Br. emend. Stuntz.] – barley crop sequence. Application of farmyard manure significantly increased the available nitrogen, phosphorus and potassium content in soil compared with the control. Barley crop fertilized up with the 120 kg N + 60 kg P₂O₅/ha significantly increased the available phosphorus status of soil.

Key words: Barley, Farmyard manure, Fertilizer levels, Preceding crops

In traditional agriculture, legumes are known to be essential component of cropping system because of their ability to enrich soil by fixing nitrogen and added organic matter. Effect of legumes on succeeding cereals varies considerably depend upon the nature of the crop, its fertilization and soil type. Similarly, farmyard manure also enriches soil by adding essential nutrients as well as organic matter. However, optimum nutrition through fertilizer also requires for boosting production of any crop. Thus adopting proper cropping system, use of organic manures, especially farmyard manure and balanced use of nitrogen and phosphorus in combination, may enhance the status of soil and productivity of barley (*Hordeum vulgare* L.) in Rajasthan. Keeping all facts in view, present investigation was, therefore, undertaken with an objective to study the effect of fertilizer levels and preceding crops grown with and without farmyard manure on soil fertility status after barley.

MATERIALS AND METHODS

A field experiment was conducted during rainy (*kharif*) and winter (*rabi*) seasons of 2003–05 at Agricultural Research Station, SK Rajasthan Agricultural University, Bikaner to study the effect of fertilizer levels and preceding crops grown with and without farmyard manure on soil

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fertility status after barley. The soil was sandy loam in texture, saline in reaction (pH 8.30), low in organic carbon (0.08%), medium in available P (17.89 kg/ha) and high in available K (230 kg/ha). A total of 30 treatments were tested in split plot design as *kharif* crops and farmyard manure in main plots and fertilizer levels in sub-plots with 3 replications. The treatments consisting of 3 *kharif* crops (pearl millet, mothbean and clusterbean) with and without farmyard manure (applied to *kharif* crops only) in main plots and 5 levels of fertilizer applied to barley only (control, 30 kg N + 15 kg P₂O₅/ha, 60 kg N + 30 kg P₂O₅/ha, 90 kg N + 45 kg P₂O₅/ha and 120 kg N + 60 kg P₂O₅/ha) in sub-plots. 'HHB 67' pearl millet (*Pennisetum glaucum* L. R. Br.), 'RMO 40' mothbean (*Vigna aconitifolia* Jacq and Marechael) and 'RGC 986' clusterbean (*Cyamopsis tetragonoloba* L. Taubert) were sown in *kharif* season with full recommended dose of fertilizer, i.e. 80 kg N + 40 kg P₂O₅/ha, 20 kg N + 40 kg P₂O₅/ha and 20 kg N + 40 kg P₂O₅/ha, respectively. After harvesting of *kharif* crops, the 'RD 2508' barley was sown in rows, 22.5 cm apart, on 19 November 2003 and 21 November 2004. The barley was fertilized (N + P₂O₅) as per treatment. The whole of phosphorus and half dose of nitrogen was applied as basal through diammonium phosphate and urea, respectively and the remaining half dose of nitrogen fertilizer was applied through urea as top-dressing at the time of first irrigation. The harvesting of the barley was done on 23 March 2004 and 20 March 2005, respectively. The total rainfall in *kharif* season was 222.0 and 102.8 mm and in

and potassium) uptake by barley over control plot during 2003–04, 2004–05 and on pooled basis.

It was observed that application of farmyard manure to *kharif* crops significantly improved the available N, P and K status of soil after harvesting of *kharif* crops and barley. There was decline in nutrient status of soil where the farmyard manure was not applied during *kharif* season. This could be due to increased microbial population with addition of manure causing greater mineralization of added leaf fall, root biomass, incorporated trash, native nutrients and also due to high enzyme activity (Prakash *et al.* 2001). These results are similar to the results reported by Sharma *et al.* (2003).

Effect of fertilizer level

There was no difference in available nitrogen, phosphorus and potassium of soil estimated after harvest of *kharif* crops and barley due to fertilizer application during both the years of experimentation except in phosphorus status of soil after harvest of barley crop when fertilizer was applied up to 120 kg N + 60 kg P₂O₅/ha as compared to control during both the years of experimentation. The maximum phosphorus status (19.03 kg P₂O₅/ha) was estimated with 120 kg N + 60 kg P₂O₅/ha which were 13.75% higher than control on the basis of pooled analysis of experimentation.

Application of nitrogen and phosphorus nutrients in combinations significantly influenced the grain and straw yield of barley (Table 2). The highest nutrient uptake by grain and straw of barley was recorded in treatment 120 kg N + 60 kg P₂O₅/ha which was significantly higher than all other treatments.

There was build-up of available soil phosphorus content after the end of crop sequence. Build-up in the available soil phosphorus content could be attributed to low uptake of applied P by the crops leaving thereby a substantial residual P in the soil. Available P status in control or unfertilized plots declined with cropping due to crop uptake. Kumpawat (2002) reported that application of nitrogen from 0 to 120 kg N/ha to wheat crop significantly increased the available P contents of soil from their initial status. These results are in close conformity with the results of Hegde (1998), Padhi and Parida

(2000) and Sharma and Bali (2001).

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