Evaluation of nitrogen fertilizer and lime on grain yield, protein content and kernel weight of barley

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Abstract

Barley (Hordeum vulgare L.) is a cereal crop that grows over a wide range of environments and in Kenya it is grown primarily for malting. Barley requires adequate nitrogen (N) for good grain yields and quality malting, but the balance between adequate and excessive N is important therefore field experiments were set up between July 2011 and July 2012 to address the problems of nitrogen fertilizer use and liming on grain yield, protein content and the kernel weight. The experiment was conducted at medium altitude at University of Eldoret (Chepkoilel) (2185m asl) and at high altitude in Mau-Narok (2740m asl). The objective was to evaluate effects of nitrogen fertilizer rates and liming on the grain yield and malting qualities of barley (grain protein content and kernel weight). Nitrogen as C.A.N fertilizer was applied at 5 levels 0, 30, 40, 50 and 60kg N/ha, all at planting. Phosphorus inform of TSP at 45 kg/ha as P₂O₅, and potassium in form of muriate of potash at 35 kg/ha as K₂O, were applied both as blanket in plots with nitrogen treatments, and as a treatment. Lime was applied at 2 levels (0 & 1.5 t/ha). Split plot arrangement in RCBD design was adopted. The results indicated the soils of the two sites were acidic and deficient in phosphorus. Mau-Narok site had more soil N than University of Eldoret. The effect of nitrogen on grain yield was highly significant (P=.001). Increasing N rates beyond 40kg N/ha increased the grain protein content beyond the malting range. Effect of lime on grain was significant (P≤.01) both site soils. Lime treatments had higher grain protein contents than non-limed ones but not statistically significantly. Lime-nitrogen interaction on kernel weight was highly significant (P≤.001) but not significant for grain yield. The differences in grain yield, kernel weight due to soil type were highly significant (P≤.001). Application of lime in combination with N rates at 30 and 40 N kg/ha produced best results for grain yield (>7 t/ha), kernel weight and grain crude protein (10-13.5 Nitrogen rates at 30N and 40 N kg/ha produced highest grain yield, highest kernel weight and recommended maltale grain protein content for both site soils and therefore was recommended as optimum agronomic rates for both sites. In addition, liming was recommended for Eldoret soils while increase in phosphorus use for Mau-Narok.

Keywords: Nitrogen rates, lime, yield, grain protein content, kernel weight