# BARLEY YIELD AND PROTEIN RESPONSE TO NITROGEN AND SULFUR RATES AND APPLICATION TIMING

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## ABSTRACT

The introduction of new barley varieties, as well as changes in management practices, necessitate a re-evaluation of nitrogen (N) and sulfur (S) nutrient management guidelines. Nitrogen has a significant impact on barley grain quality and yield. Overapplication of N can result in lodging, groundwater pollution, and high protein content, resulting in lower end-use quality of barley, while underapplication of N results in reduced grain quality and yield. Sulfur promotes N utilization in barley plant tissues, resulting in increased yield and end-use quality. This research aims to provide barley growers with an accurate diagnosis of nutrient deficiencies as well as estimates of appropriate supplemental fertilizer rates in order to improve yields and grain quality. Three barley classes were grown: malt (Moravian 179), feed (Claymore), and food (Julie). At planting, we applied five urea N rates ranging from 0 to 180 kg $ha^{-1}$ in 45 kg $ha^{-1}$ increments. Additional treatments included 45 kg N $ha^{-1}$ applied at heading and top-dressed with 23, 45, or 90 kg $ha^{-1}$. At planting, three S rates of potassium sulfate were applied in 17 kg $ha^{-1}$ increments from 0 to 34 kg $ha^{-1}$.

We investigated fertilizer rates for N and S, but S had no effect on yield, yield components, or protein content. Increasing the N rate increased lodging, while splitting the N rate reduced lodging by approximately 10% across all barley classes. Claymore produced the most grain, while Julie produced the least, because Claymore has more heads per meter of row (124) than Moravian 179 (109) or Julie (94). A single N application increased yield over a split application by about 5% across all barley classes and locations. Split applications increased Moravian 179's grain protein content to near maximum levels of acceptability for malt barley protein content (12.5%), and Julie had the highest grain protein content.