

# Synergism between Carbon and Nitrogen Metabolism is Key to Maintain Yield under Nitrogen Deficiency

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**Abstract**—Nitrogen is the foremost needed nutrient for growth, development and yield of plant resulted in to overuse of nitrogen fertilizers worldwide. The over-use of nitrogenous fertilizer not only causes economic loss but also lead to several problems related to soil health and environmental pollutions. Therefore, identification of genotypes possessing higher nitrogen use efficiency at sub-optimal dose of nitrogen is the key challenge and need of the hour. Twenty percent of the nitrogen fertilizer is consumed for wheat production as it is one of the most important cereals in the world. We conducted a study to evaluate the potential of nitrogen uptake and utilization efficiency in wheat genotypes at different levels of applied nitrogen in soil. Detailed study was done on carbon and nitrogen content in plant tissue along with their assimilation pathway enzymes. Genotypes having high nitrogen use efficiency and responsiveness to exogenous nitrogen were able to maintain more active nitrogen assimilation in deficient nitrogen condition. In most of the studied genotypes, carbon metabolism was more active in nitrogen deficient condition as compared to nitrogen sufficient. We found that the activity of key enzymes of glycolysis i.e. pyruvate kinase and the TCA cycle enzymes i.e. citrate synthase, iso-citrate dehydrogenase showed general trend of increase in enzyme activity under nitrogen sufficient condition. These results points toward the higher need of energy and carbon skeleton requirement under nitrogen deficient condition. This study clearly showed that genotypes which are able to maintain synergism between carbon and nitrogen metabolism would serve as good donor for achieving greater nitrogen use efficiency without yield penalty in wheat under deficient nitrogen condition.