



## **Application of nitrogen forms such as nitrate, urea, and amino acids effects on leaf and berry physiology and wine quality**

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### **Abstract**

Nitrogen (N) uptake by grapevine roots in forms like nitrate, ammonium, urea, or amino acids influences vegetative and generative growth, impacting grape quality and wine sensory profile. The study examined nitrogen's influence on phenolic compounds in leaves, berries, and wine across different scales — hydroponics, soil culture, and vineyard trials. Nitrogen forms altered metabolite patterns in leaves and wine significantly, affecting aroma and flavor. Key nitrogen assimilation enzymes (NR, NiR, GS) in grapevine rootstocks responded to nitrogen forms and timing. Hydroponically grown rootstocks fertilized with various forms showed differences in enzyme expression and activity, suggesting rootstocks can assimilate amino acid glutamine (Gln). Nitrogen forms also regulate NR and NiR, influencing nitrate assimilation. The study highlights the importance of nitrogen form on leaf physiology, berry composition, and wine quality, with implications for organic fertilization and vineyard management.

**Keywords:** nitrogen application, amino acids, quality, phenolics, wine quality