

**Title** Sulfur fertilization affects onion quality and flavor chemistry during storage

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### Abstract

Sulfur fertilization of onions in the field can increase yield and bulb size, but reports of its effect on storage-life and flavor chemistry have been varied. To clarify these effects, 2 cultivars of yellow cooking onions, Frontier and Prince, were grown in 4 fields by 2 commercial producers during 3 growing seasons. Prior to planting, two sources of sulfur, Langbeinite ( $K_2Mg_2SO_4)_3$ ) and potassium sulfate ( $K_2SO_4$ ), were incorporated into the onion beds at rates of 0, 30, or 50 kg/ha of S. Onions were harvested by hand, cured, and stored in 2 commercial common storage facilities. Samples of onions were evaluated for quality after 4, 8, 12, and 16 weeks of storage and for total S and S-metabolites after 4 and 16 weeks. Both sulfur fertilizer treatments increased the sulfur content of both 'Frontier' and 'Prince' onion bulbs by an average of 25%. Associated with the increased sulfur content was an increase in onion pungency/flavor measured as increased pyruvate content in macerated onion tissue and changes in S-alk(en)yl cysteine sulfoxides (ACSOs) content. Pyruvate increased an average of 35% in onions receiving S-fertilization compared to controls. Differences decreased during storage as a result of pyruvate content increasing in control onions. The content of propenyl cysteine sulfoxide, the precursor of the tear inducing lachrymatory factor, was 2-fold greater in S-fertilized 'Frontier' onions than controls throughout storage, but was only 60% greater in 'Prince' onions after 16 weeks of storage. Propyl cysteine sulfoxide was 17% greater in S-fertilized onions. Methyl cysteine sulfoxide, which contributes to fresh onion odor, decreased an average of 22% during storage. Sulfur fertilization had little effect on onion storage-life. Over three seasons S-fertilization treatments had a minimal effect on soluble solids, titratable acids, and fresh weight loss during storage. Bulb firmness was affected slightly by fertilizer treatments but the variable response among seasons indicates that environmental factors may interact with the effects of S nutrition. Sulfur applications did not affect sprouting, root formation, decay or the development of surface discoloration or mold during storage.