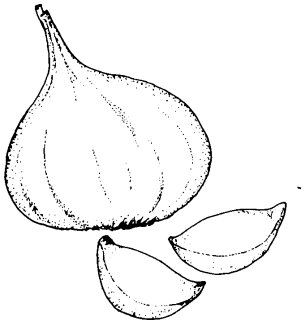
Alliin in Garlic

by Marita Cantwell, Department of Vegetable Crops, UCD

Health benefits have been attributed to garlic and other *Allium* species since ancient times. Garlic is reported to have cancer preventing, antimicrobial, antibiotic, antihypertensive, hypoglycemic, and cholesterol-lowering properties, among others. Epidemiological studies on humans using garlic products have sometimes shown inconsistent results. Some researchers have considered this due to differences in the garlic products used in these studies and also to variation in the concentration of the compounds responsible for biological activity.



Garlic flavor is due to the formation of organosulfur compounds when the main odorless precursor, *alliin*, is converted by the enzyme *alliinase*. This occurs at low rates unless the garlic cloves are crushed or damaged. The main compound formed by this reaction is a thiosulfinate, *allicin*, the compound responsible for the characteristic odor and flavor of fresh garlic. Allicin is considered the most important biologically active compound in garlic since it decomposes to other sulfur containing molecules (thiosulfonates and disulfides) which have purported activity in the human and model systems under investigation.

The content of alliin in garlic can vary considerably due to garlic variety but also production practices. Figure 1 shows that lower irrigation levels resulted in lower alliin concentrations whereas nitrogen fertilization regimes did not notably affect concentrations. Among about 30 garlic varieties we studied, there was a >2 fold variation in alliin concentration.

Alliin and the enzyme alliinase are quite heat stable, but allicin is not. Alliin and alliinase are also stable when dry and therefore dried powders can potentially preserve the biological activity of garlic. However a large variation has been found in the allicin-releasing capability of commercial dried garlic preparations. This has been attributed to variations in the preparation procedures, but storage conditions (length of storage, temperature and relative humidity) may also be important.

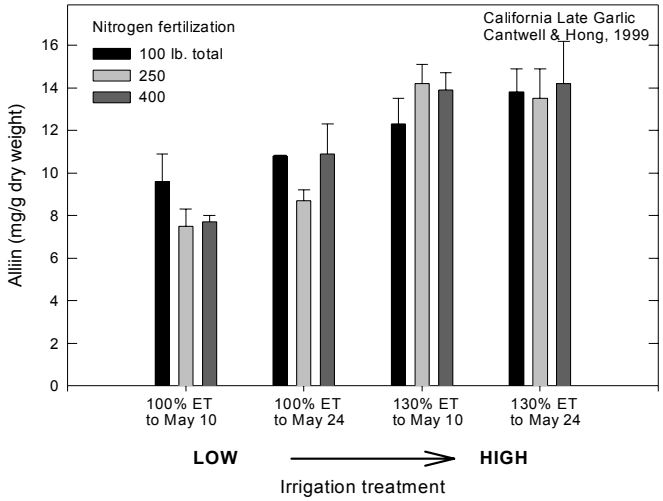


Figure 1. *Alliin content of garlic (cv. California Late) produced under different nitrogen fertilization and irrigation regimes in the Central Valley of California.*

We have conducted some storage studies on garlic bulbs and fresh-peeled garlic. In fresh-peeled garlic, the thiosulfinate (mostly alliin) content of the cloves decreased only 10-15% during 3 weeks storage at 5°C (41°F). Storage at 10°C (50°F), however, resulted in a much larger loss of alliin over the same period. Intact garlic bulbs lost about 25-40% of their pungency after 4 months storage at 0-1°C (32-33°F) in air, but controlled atmospheres with 0.5% O_2 alone or in combination with 5 or 10% CO_2 maintained pungency levels. Although these results are from studies in progress, they provide some indication of the variation in alliin content due to storage conditions of fresh garlic.

References

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