

Fertilizing Small Grains

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Nitrogen

Nitrogen is the primary fertilizer nutrient required by small grains. A wheat crop contains 33-37 lbs N per 1000 lbs of grain in a range of grain protein from 12-14%. A barley crop will contain about 20% less N than wheat at similar yields due to lower grain N content (Table 1). If high yields are expected or high protein content is desired, then increase N fertilizer rates accordingly.

The amount of fertilizer N required for optimum yields varies from 150-300 lbs/acre for wheat and 120-240 lbs/acre for barley. Additional nitrogen fertilizer is usually needed for wheat after heading to increase grain protein content, but N fertilizer applied after heading usually does not affect grain yield. Insufficient N application reduces grain yield. Excessive nitrogen application increases fertilizer cost, reduces yield, and increases lodging.

Most crop nitrogen uptake occurs between the 5-leaf stage and heading, when crop N uptake is rapid (Fig 1). Nitrogen applications should precede or coincide with crop N needs. Nitrogen applied up to the heading stage has the potential to influence yield, while applications from heading to 2 weeks after flowering will have a minimal effect on yield but can increase protein content of the grain. An example of a nitrogen fertilizer schedule is contained in Table 2.

A combination of pre-plant soil testing and in-season tissue testing is recommended by the University of Arizona to guide wheat and barley fertilization. Refer to <http://cals.arizona.edu/pubs/crops/az1346.pdf>.

Phosphorus

Phosphorus is the only element other than nitrogen usually needed by wheat or barley in Arizona. Phosphorus fertilizer is not always required for optimum yields since some soils contain high levels of phosphorus. Soil phosphorus levels greater than 13 ppm sodium bicarbonate extractable P indicates that P is not needed.

Other Nutrients

Deficiencies of nutrients other than nitrogen and phosphorus have not been documented in Arizona, and presumably application of these nutrients is rarely economically justified.

Table 1. N content of wheat at various grain yield and protein levels.

Grain yield lbs/acre	Grain protein (%)		
	12	13	14
5000	166	176	185
6000	200	211	222
7000	233	246	259
8000	266	281	296

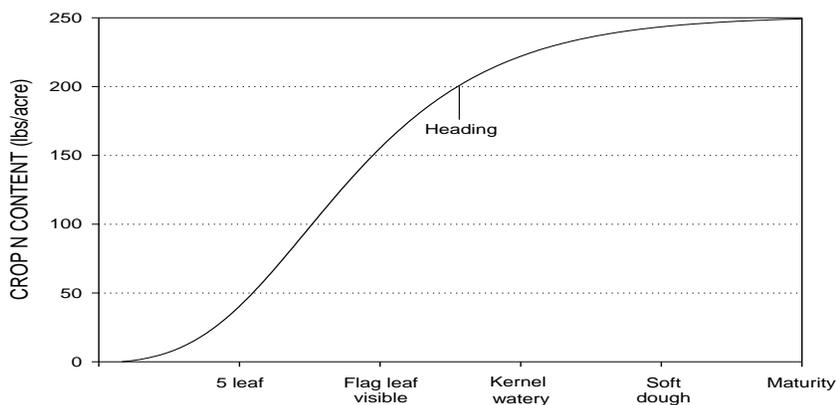


Fig.1 Generalized small grain N content over the progress of the season.

Table 2. Example of a nitrogen fertilizer schedule for barley and durum in Maricopa. Fertilizer applications after heading are intended to boost durum grain protein content and are not required for barley.

Date	Stage	Fertilizer Rate	
		Barley	Durum
		lbs N/acre	
Dec 10	Planting	75	75
Feb 04	5 leaf	40	40
Feb 27	2 nodes	40	40
Mar 16	Pre-boot	40	40
Mar 30	Heading-Flowering	0	30
Apr 11	Milk	0	30
TOTAL		195	255

Also see: Ottman, M. 2004. *Fertilizing Small Grains in Arizona*.

<http://cals.arizona.edu/pubs/crops/az1346.pdf>

Walworth, J.L. 2011. *Soil Sampling and Analysis*.

<http://ag.arizona.edu/pubs/crops/az1412.pdf>