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Small Grain News
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Seasonal Planting Tips

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Planting Date

Choosing the correct planting time is important for managing foliar diseases, reducing the risk of frost injury at grain pollination, and achieving high grain yields. The window of opportunity to plant winter cereals successfully in the San Joaquin Valley begins in mid-November and generally ends mid-January for grain. Small grains for silage or for grains planted under dryland conditions should be planted before the end of December for the highest yields. Later plantings are fine for grain but result in shorter plants. In one study in the 80's with Yecara Rojo's we got optimum grain yield even as late as January 23.

Early plantings (prior to mid-November) and late plantings (after mid-January) are more susceptible to yield reductions from barley yellow dwarf (BYD), a disease caused by a virus that is transmitted by aphids. BYD is especially severe on all cereal crops when seedlings or early stages of growth are infected. Thus, a properly timed planting will ensure that winter cereal emergence and seedling growth does not coincide when aphid flights are most likely to occur. Planting after mid-November will also delay heading and pollination until at least late March when freezing temperatures (and frost damage to the grain spikes) are less likely to occur. Late plantings (after January 15) typically have a lower yield potential due to a shortened growing season and shortened grain filling period. Also, the grain filling period has a greater likelihood of coinciding with unusually high April and May temperatures which can cause lower yields and bushel weights.

Seeding Rates and Depth

Successful plantings will average about 25-30 seedling plants per square foot. If germination results in less than 13 plants per square foot, consider replanting when the existing stand is at the 2 to 3 leaf stage.

Table 1 outlines a range of reasonable seeding rates for wheat, barley, triticale, and oats for both irrigated and dryland conditions. Ranges are provided because the proper seeding rate will depend on soil conditions, planting date, planting method, seed size of the selected varieties, and intended end use of the crop.

Table 1. Suggested seeding rates for small grains in the San Joaquin Valley.

Crop	Irrigated (lbs/ac)	Dryland (lbs/ac)
Wheat	100-150	60-100
Barley	80-120	60-100
Triticale	100-150	60-100
Oats	80-150	60-100

Successful planting rates for small grains are usually at the lower end of the ranges given in Table 1 in non-saline, weed free soils, with a well prepared seed bed, especially if the crop is drilled and planted in a timely manner. For example, under these conditions, typical seeding rates are 110 to 130 lbs/ac for irrigated wheat and 90 to 100 lbs/ac for irrigated barley. As seed rates of drilled barley increase over 100 lbs, lodging may increase and subsequent yields decrease.

Seeding rates for small grains should be at the higher end of the ranges given in Table 1 if seed is broadcast rather than drilled. For example, plant 140 to 150 lbs/ac for irrigated wheat and 110 to 120 lbs/ac for irrigated barley when seed is broadcast. The higher rate is needed to allow for non-uniform depth of seeding, reduced uniformity in spacing between seeds, and reduced contact between the seed and soil. Higher rates are recommended for late plantings after January 15 even when the seed is drilled. The higher seed rate compensates for the lower amount of tillering that will occur with late plantings by producing more main stem plants. High seed rates are also desirable if grain is grown for hay production. For example, oats may be planted as high as 150 lbs seed/ac to increase the plant population and produce fine stemmed oats. However, high oat plant populations are more likely to lodge, particularly with the variety Montezuma.

Small grain varieties and seedlots vary widely in seed size; seeding rates should be adjusted accordingly. An example is durum wheat varieties; typically seed size of durum wheat is larger than hard red wheats, so the seeding rates for durum will need to be higher to assure adequate seed populations. Triticale seed is smaller so more seed will come out of the drill with a given wheat setting. Some saved seed may have low bushel weights resulting in smaller kernels so again more seed will be planted using a given seed rate listed on the drill. The certified seed tags may specify a thousand kernel weight which can be converted to seeds per pound and seeds per acre. An appropriate seeding rate will assure a minimum of 1.0 million seeds per acre and a maximum of 1.5 million seeds per acre.

A seeding depth of 3/4-11/2 inches is recommended for wheat and triticale; barley and oats can germinate successfully when planted as deep as 2 inches. Planting deeper than this delays crop development by reducing stand, seedling vigor, and in the end will reduce yield. Plant on the shallow side if you are planning on irrigating up right away.

Preplant Fertilizers

Nitrogen is usually applied every season. The amount of N required depends on the type of small grain selected, soil type, residual nitrogen left from the previous crop, rainfall and irrigation patterns, and grain yield and quality goals. Wheat and triticale will require more nitrogen than barley or oats because yields are higher and grain protein is typically more important. Durum wheat requires higher N rates than the red or white wheats.

Table 2 outlines reasonable nitrogen fertilizer rates for an entire season to produce wheat, triticale, barley, and oats for both irrigated and dryland conditions. The amounts listed for irrigated crops are for a high yield potential of 3-4 tons/ac for wheat and triticale and 2 -31/2 tons/ac for barley and oats. The total N requirement will be reduced when grain yields are lower. Total N needed by a wheat crop may be as low as 60-120 lbs N/ac for grain yields ranging from 1-2 tons/ac. A useful "rule of thumb" is that each 100 lbs of wheat produced wil1 require 3-31/2 Ibs N/ac to have adequate grain protein. Wheat or triticale for silage will need 125-140 lbs of N/ac.

Table 2. Suggested seasonal rates of nitrogen fertilizer for small grains

Crop	Irrigated < N>	Dryland (lbs N/ac)
Wheat	160-240	10-50
Barley	125-175	10-50
Triticale	100-150	10-50
Oats	100-125	10-50

Knowing the seasonal nitrogen fertilizer requirement for small grains is just one part of effective nitrogen fertility management. How and when the nitrogen fertilizer is allocated during the season is equally important. Under irrigated conditions, split applications of N fertilizer throughout the growing season are strongly encouraged rather than a one time high rate of N fertilizer applied preplant. Under dryland conditions, applying all of the N fertilizer preplant is common practice.

Under irrigated conditions, split applications of N more closely supply nitrogen at rates that coincide with crop needs as the crop develops from a small seedling to a fully developed plant with a grain spike. Approximately one-half of the seasonal N requirement and no more than two-thirds of total nitrogen fertilizer should be applied preplant. For example, 100 to 130 lbs N/ac preplant should be a reasonable rate of preplant fertilizer for irrigated wheat. The remaining N fertilizer (70 - 100 lbs/ac) should be applied in at least two split applications. An example approach to split N fertilizer applications would include one application at 35 to 50 lbs N/ac during the main vegetative growth period of the cereal crop. This would coincide with the tillering to jointing stages of growth. The second split application of 35 to 50 lbs N/ac would occur midseason as the crop begins its reproductive growth, which occurs from the time the grain spike begins to emerge from the flag leaf to about two weeks after flowering. Split applications of N fertilizers will be discussed in further detail in the February issue of this newsletter.

Phosphorus nutrition is important to germination and seedling vigor in small grains. If a sodium bicarbonate soil test for phosphorus reveals PO_4-P levels less than 6 ppm for a field being prepared for small grain production, consider a preplant application of 60 to 80 lbs P_2O P_5/ac. Soils with PO_4-P levels between 6 to 10 ppm may be responsive to an application of 40 lbs P_2O P_5 per acre. Soils with PO_4-P levels above 10 ppm will be less likely to respond to preplant phosphate; soils with more than 12 ppm PO_4-P are commonly unresponsive. Phosphorus deficiency is typically not a management concern once the cereal crop development has advanced past early jointing stages of growth.

Economical yield responses to potassium and zinc deficiencies are highly unusual in the San Joaquin Valley. They will occur on only the most deficient soils such as soils with ammonium acetate extractable K levels less than 60 ppm or Zn EDTA extractable levels below 0.3 ppm.

Irrigating or Planting to Rainfall

Planting to a dry seedbed and then irrigating to germinate the crop is an option. Growers experience various degrees of success when irrigating the crop for germination. Early plantings, mid-November to early December, are more successfully germinated by irrigation. Irrigating early plantings assures warmer soil temperatures, while the risk of rainfall immediately after an irrigation is relatively low. Significant rainfall after an irrigation

prolongs standing water and poor aeration around the seed which may lead to seedling disease. Irrigating to germinate also tends to be more successful on fine sandy loam and loam soils than on silt loams, clay loams,and clays. An advantage of irrigating the crop to germinate seed over waiting for rainfall is that rainfall can be unpredictable. In some years no significant rainfall occurred during the month of December. Cereals planted in early December did not germinate until mid-January, thus the production season was shorter and resulted in lower yields. Make use of both short and long-term weather forecasts to help make this decision.

Planting in a dry seedbed and waiting for rain is the other alternative. Seed will retain its viability in dry soil for an extended period of time and stands will be normal once rainfall occurs to induce germination. As long as the crop germinates by the end of December, there will be minimal loss in yield potential. Oftentimes seed may germinate from moisture from light rain or fog and have dry soil underneath the seed. This often forces an irrigation to save what seed came up and to obtain more uniform stands. This may not be an option for some where surface water is unavailable and groundwater is expensive to pump or of undesirable quality.

Growth and Development of Small Grains

Table 3 outlines approximate dates when important crop growth stages occur for small grains produced in the San Joaquin Valley. The dates and corresponding growth stages are for Hard Red type wheats planted about December 15 with sufficient soil moisture to initiate germination. Seasonal weather conditions are considered average. lts intent is to assist growers and pest control advisors to anticipate and identify important growth stages for monitoring.

Development of barley and oats is similar up to boot stage; however, the grain filling period is usually about 10 days shorter than wheat. Growth of triticale is similar to wheat, perhaps slightly delayed. Crop growth and development will be most strongly influenced by planting date. Based upon one 1994/95 planting date trial in Kings county, a planting date of October 20 caused the respective crop development stages to occur about 30 to 35 days in advance of the same varieties and cereal types when they were planted about 50 days later in early December. Depending on the variety selected, the crop development may vary usually 7 days on either side of the dates specified in Table 3. Similarly, even under the most variable of weather conditions the crop development will be within about 7 days on either side of the dates specified in Table 3 as long as seedling emergence occurs near the end of December.

Table 3. Approximate dates of various small grain crop growth stages.

Growth Stage	Visual Description	Approximate Date
Emergence	First leaf	Dec. 30
Tillering Begins	By fourth leaf	Feb. 5
Jointing Begins	Seventh leaf	Mar. 10
First Boot	Ninth leaf	Apr. 1
Heading/Flowering	Pollen visible	Apr. 10
Milk	Grain filling	May 5
Soft Dough	Grain filling	May 12
Hard Dough	Grain drying	May 25

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