Cooperative Extension
Colorado State University, Fort Collins, Colorado 80523

Colorado State University

# AGRON-  -GRAM

Volume 11, Number 9 September 1991

TABLE OF CONTENTS



## Tests to Evaluate Seed Performance

Many crops that have been or soon will be harvested will be used for seed. Since seed must be viable to grow, it should be harvested in a manner that will prevent damage. Broken or cracked kernels may germinate but usually will not be strong enough to produce a plant. Harvested seed should be tested for moisture content. Excessive seed moisture could cause mold or sprout damage in storage, while seed that is too dry is subject to additional mechanical damage. In either case, the wrong moisture level can reduce seed viability.

The germination test is most important on a seedlot, telling if seed is expected to sprout under ideal conditions. A germination test at harvest will help determine seed quality. Poor seed should be diverted to other uses. Sometimes, seed conditioning removes low quality seeds that would change the average seed germination. A second test may be advised after seed conditioning.

Dormant seeds will be exposed by a germination test. A dormant seed is alive but does not germinate in the normally expected time. Hardy seedlots sometimes show varying degrees of dormancy, a mechanism of seed survival. In most agronomic crops, dormancy is virtually gone by planting time.

Sometimes, the germination potential is desired before the results of a germ test are available. Two tests that help determine field germination conditions are the Cold Test and Accelerated Aging. These tests are used on specific crops where viability is affected by environment. The Tetrazolium test (TZ), gives a very quick indication of the percent live seeds. It is used where an immediate indication of viability is needed as a predictor of germination, especially on seeds that germinate slowly or where dormancy exists. All grain sold for seed by law must have a current (within 12 months) germination test.

In all cases, a purity test should be conducted after seed conditioning. The purity test reveals impurities such as weed seeds, other crop seeds and inert material in a seedlot. A noxious weed test is done on a larger amount of seed to determine the presence of Colorado noxious weed seeds. If desired, the seed lab can report noxious weed seed content for interstate shipments.

Many seed labs now report seeds per pound or bushel test weight as part of the test. Growers use this information to adjust planting rates.

The harvested seed is the basis of next year's crop. A complete seed analysis indicates how the seedlot will perform. (Stanelle)

## Moisture Guidelines for Harvested Crops

During and after harvest, poor quality is the result of deviations from proper storage conditions. Improper moisture levels cause either poor quality or encourage mold. If grain is the stored product, aeration will prevent most problems. These problems usually are intensified by "moisture migration" even though initial moisture was at a "safe" level. It is advised that grain be aerated when outside average temperatures are more than 10° F different than grain temperatures, see SIA .117. Corrective measures are not available to apply to high moisture grain, haylage or hay. Moisture level guidelines for many crops are listed in Table 1. (Croissant)

Table 1. Recommended moisture levels for harvest and successful storage of grain and forage under several common conditions.

| Feedstuff | Moisture level % | Comments |
|---|---|---|
| Corn Grain | 30-34 | For high moisture ear corn (ensile or preserve with acid treatment) |
| | 27-31 | For high moisture shelled corn (ensile or preserve with acid treatment) |
| Corn Grain stored | 18 | Stores safely to April 1 |
| in aerated bins | 15½ | Stores safely to June 1 |
| | 14 | Stores safely for one year |
| | 12-13 | Safe for long term storage |
| Small Grain (Wheat, Oats, Barley) | 14 | Will store safely until spring |
| | 13 | Will store safely for one year |
| Sunflowers | 10 | To be stored up to six months |
| | 8 | To be stored up to one year |
| Silage and Haylage | 75 | Seeps too much; may need preservative |
| | 70 | Store in bunker, trench or stack |
| | 65 | Store in conventional upright silo |
| | 55 | Difficult to ensile; too dry to pack well; great chance of heat damage and molds; may preserve satisfactorily if crop is immature, fine chopped and stored in an upright silo of excellent construction |
| | 40 | Store in oxygen-limiting silo (practically air tight) |
| Hay | ≥35 | Too wet for hay, likely to mold and overheat |
| | 25-35 | Can be preserved as loose stacked hay in cage or on poles in low humidity conditions |
| | 20-25 | Will probably require an effective preservative for satisfactory storage in bales |
| | 15-20 | Preserves well as hay, dense packages should be near 15% moisture |
| | ≤15 | Hazard of excessive leaf loss. Minimize loss by picking up following heavy dew or during high humidity (night). |
| Dry Beans | 14-16 | Aeration is necessary for short term storage |
| | 10-14 | Aeration recommended; excessive cracking occurs |

## Handling and Storage of Dry Beans

Dry edible beans have a thin fragile seed coat which can be easily damaged during handling. Cracked seeds, splits and seed coat checks are the most common way seeds are damaged. All of these factors lower product quality and detract from the visual appearance of the cooked product. Since the price paid by canners is adjusted according to seed quality, it is imperative to maintain high quality from the field to the package. A quick method to assess seed coat damage involves soaking the seeds in water for 3 - 5 minutes, then evaluating the seed for breaks and slipped skins. The seed moisture content is the most important factor related to susceptibility to seed damage, however, seed size is also important. In general, larger seeds are more prone to damage, and damage increases as the moisture content decreases. Proper seed moisture content is also important for safe storage of beans.

### Handling

The use of bucket elevators and belt conveyors as opposed to augers or paddle elevators for moving beans will reduce seed damage, especially if seed moisture content is low. If augers are used, they should always be run at the slowest speed to operate efficiently and at full capacity. When paddle elevators are used, it is important to run at reduced speed and keep the flight chains tight to prevent them from riding and grinding on the beans. While beans are being moved, they should never be allowed to drop long distances. Padded bean ladders or a sleeve can be used to slow the fall. Careful adjustment to reduce discharge drop distances from the combine onto the truck, and from the truck to the elevator pit should be observed.

### Storage

Storage facilities for dry edible beans can be constructed of wood, steel or concrete. The most important considerations for a storage bin is protection from water and contamination from other crops, rodents, chemicals, insects and temperature extremes. A good aeration or drying system is necessary for storage of beans which have high moisture or where moisture can accumulate due to humidity or temperature fluctuations. Bean seeds should be 14-16% moisture for short-term storage and 11-14% for long term storage.

For additional information on moisture migration, temperature control and aeration, see SIA .117.

## Water Quality

### Drinking Standards for Nitrate

Some confusion may exist as to the human health standards for nitrate levels in drinking water. The EPA established limit is 10 ppm or 10 mg/L N in the form of $NO_3$. The same standard expressed on a nitrate basis is 45 ppm. This value is usually expressed on an elemental basis, as are soil test levels, to avoid confusion. Unfortunately, people often erroneously report that 10 ppm nitrate is the established health standard.

The difference in these two values can be derived as follows:

$NO_3$ mol wt. = 62

N = 14
O = 16

$$\frac{14}{62} = .2258$$

.2258 x 45 ppm = 10 ppm N as $NO_3$

To avoid any ambiguity in data collection and reporting, be sure to report water quality data on the basis of the 10 ppm $NO_3$-N standard. (Waskom)

## Phosphorous Needs For The 1992 Wheat Crop

Research conducted in Colorado has shown that 33 percent of the fertilizer sites on winter wheat in Colorado have responded to phosphorous (P) fertilizer. The average response to P fertilizer was 5.2 bushels per acre.

Wheat is very responsive to P fertilizer on deficient soils. Recent studies in Colorado, Kansas and Nebraska show the benefits of band applications on winter wheat.

First, a sound soil testing program is a must. Make sure the laboratory selected uses a testing procedure calibrated for your area. Of course, soil test results are the basis for determining the rate of P to apply. Results from recent studies, however, indicate that method used is just as important as rate applied. P dribbled over the seed or bandcd below the seed are equally effective placement methods - and are generally better than broadcast, especially on low P soils with limited tillage. Likewise, dual N-P application is also a good method of application and under certain conditions may result in higher uptake and yield than other methods. If broadcast applications of phosphorous must be made, apply early and incorporate.

Results from studies in the Central Plains have shown that phosphorous applications of 30-45 lbs $P_2O_5$/acre may be necessary to optimize production on low testing soils, and that reducing rates when banding may leave profits in the field.

Diammonium phosphate (DAP, 18-46-0), monoammonium phosphate (MAP, 11-52-0), and liquid ammonium polyphosphate (APP, 10-34-0) represent most of the P used in Colorado. Research results clearly show these P sources to be equally effective and selection should be based on availability, adaptability to management system, and price.

In summary, don't overlook the importance of P as a key component of a successful, profitable wheat management program. (Follett)

## Late Nitrogen Deficiency in Corn

A yellow-orange color on lower corn leaves is an indication of nitrogen (N) shortage. This coloration starts from the bottom of the plant progressing upward, leaf by leaf as the N is removed from lower leaves and transported to the ear. The yellowish symptoms show an inverted "V" on each leaf with the base of the "V" pointed toward the plant. In classic examples, the part next to the plant may be green, then the "V" shaped yellowish color with the leaf tip a tan-dried coloration.

These symptoms may be an indication of inadequate soil N, especially if they occur in late July or early August. Symptoms that begin showing in early September still indicate low soil N; however, additional N probably is not beneficial to grain yield. At the milk to dent stages of kernel formation, N uptake in the plant is almost complete.

Normal functions of the corn plant dictate that N is taken up by the roots, then sent up the stalk into the leaves and finally the ear. When roots cannot supply enough N for plant needs, reserves are taken form the lower leaves first, then progressing up the plant and finally drawing N from the stalk.

Any restrictions of the root system may exhibit these yellow-orange symptoms even though soil levels of N are high. Soil compaction is a cause as is severe root damage from the corn root worm. Excessive irrigation water, N leaching or denitrification may be a primary cause. Be sure to evaluate the situation before concluding that insufficient nitrogen was applied. (Croissant)

**Where trade names are used, no discrimination is intended, and no endorsement by the Cooperative Extension Service is implied.**


**CONTRIBUTING AUTHORS**

**Brick, Mark A.,**
Extension Agronomist - Bean Breeding,
Colorado State University
**Croissant, Robert L.,**
Extension Agronomist - Crops,
Colorado State University
**Follett, R. Hunter,**
Extension Agronomist - Soils,
Colorado State University
**Stanelle, James R.,** Manager,
Colorado Seed Growers Association,
Colorado State University
**Waskom, Reagan M.,**
Extension Agronomist - Water Quality,
Colorado State University


Sincerely,

Robert L Croissant

Robert L. Croissant
Editor
Extension Agronomist - Crops