FROM THE GROUND UP

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AGRONOMY NEWS

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WRITTEN COMMENTS ON PROPOSED EPA RULE

The article, "EPA Proposes to Restrict Use of Five Herbicides Due to Water Quality Concerns", was published in last month's newsletter. It briefly discussed the proposed rule and requested comments from farm organizations, commodity groups, and affected individual parties prior to October 24, 1996. This article also stated that comments could be sent to Mitch Yergert, Division of Plant Industry, Colorado Department of Agriculture, 700 Kipling St.,Suite 4000, Lakewood CO 80215-5894. However, this article neglected to include the EPA address for those who wanted to submit written comments directly to EPA.

Written comments, bearing the docket control number "OPP-36190", should be sent to: Public Response and Program Resources Branch, Field Operations Division (7506C), Office of Pesticide Programs, Environmental Protection Agency, 401 M St., SW, Washington DC 20460. Comments may also be sent by fax to 703/305-5558, including the same docket control number. ☛Mortvedt

EVERYTHING YOU'VE ALWAYS WANTED TO KNOW ABOUT MANURE BUT WERE AFRAID TO ASK

Come to the Colorado Manure Management Tours and learn more than you ever wanted to know about manure! We have planned two separate tours for October 3 (Yuma County, CO) and October 4 (Weld County, CO) to demonstrate innovative and sustainable manure management alternatives. Participants will be trained in soil, manure (solid and liquid), and irrigation water sampling; interpretation of laboratory results; manure spreader calibration; calculation of manure application rates and preparation of nutrient management plans. Salt and phosphorus buildup, air quality, and fly control will also be addressed.

Tour highlights will include:

- visits to a large corporate feedlot,
- feedlot runoff collection and storage in and reuse from holding ponds,
- flooding terraces with holding pond effluent,
- solid separation of swine and dairy wastes,
- swine effluent storage and land

application through irrigation systems,
composting swine, turkey, and dairy manure and dead birds,
a mid-size dairy with gravity flow flushing system,
recycling dairy lagoon effluent to flush alleys and irrigate corn, and
construction of swine lagoons.

Three CEUs (2 in soil fertility and 1 in soil and water management) will be provided for Certified Crop Advisers who participate in the tour. The registration fee is $10 due by September 20. For more information or a brochure, call Pamela Chase at (970)491-6201. ☛Davis

AGRICULTURAL LABORATORY ANALYSIS WORKSHOP

This workshop is designed to facilitate and enrich communication among agricultural labs. Discussion will focus on analytical methods, troubleshooting and improving accuracy, and interpretation of analytical results. The workshop will be held from October 17 at 5:00 p.m. through all day October 18 at the Holiday Inn in downtown Denver, CO. Speakers will be from both private and university laboratories and will address manure analysis, P extractants, pH troubleshooting, quality analysis and quality control, N fertilizer recommendations, and forage analysis. The workshop is designed to allow for ample discussion among labs and individuals. The registration fee is $55 and is due by October 1. For more information or a brochure, call Jim Self at (970)491-5061. ☛Davis

Solid fertilizers should be stored on pallets separately from liquid fertilizers; this will prevent wetting of dry fertilizers in case of a spill.

OH NO, NOT LEFTOVERS AGAIN?!

Nobody likes leftovers...there's no room in the refrigerator to keep them, nobody wants to eat them, and we may forget about them until they rot and can't even be identified! Food and fertilizer are judged the same way. Did you buy more fertilizer than you needed this year? Do you plan to store these leftover fertilizers on your property for use next year? Do you know what's in storage so you don't buy more of something you already have? Here are a few hints on what you can do to store your fertilizer safely in order to protect water sources from fertilizer spills.

If you are storing fertilizer through the winter, check the condition of the bags and liquid containers. Solid fertilizers should be stored on pallets separately from liquid fertilizers; this will prevent wetting of dry fertilizers in case of a spill. If liquid fertilizers are stored, retaining curbs must be able hold a spill, and a containment structure must be designed to hold 125% of the contents of the largest bulk container. Fertilizers should also be stored separately from pesticides to prevent contamination in case of a spill.

Ideally, your fertilizer storage area should be used exclusively for chemical storage, and the storage building should be located downslope and at least 100 feet away from any domestic well. The floors should be impermeable so that a spill does not leach into soil or water resources. Locking your storage building or cabinet and posting signs indicating that this is a fertilizer storage area will enhance security. The mixing/loading area should be close to the storage area in order to reduce the chances of a spill during chemical transport.

Lastly, recordkeeping of what you have in storage can keep you from spending money on something you already have. Knowing what you have used in the past and what you have in storage allows you to make better purchasing decisions. Also, don't buy your fertilizer until after you have your soil test results back and know exactly what you need. You don't buy groceries until you know how many people are coming to dinner, so don't buy fertilizer until you know who's coming to dinner (crop acreages and expected yields) and what you've already got in your refrigerator (storage of nutrients in the soil). Then, by buying only what you actually need, you can avoid storing leftovers for an indefinite period of time. So go home and clean out your refrigerator, use up your leftovers, and try to plan better to avoid producing more leftovers next year! ☛Davis

SOME BASIC PRINCIPLES OF FIELD PLOT TECHNIQUE

Many agricultural producers and extension personnel are exposed to considerable research data which is used to promote products or varieties. This data originates from university research, seed companies,

chemical companies, or other agencies. Most of these groups are reputable and report accurate data. However, there are a few "snake oil" salesmen out there. Therefore, it is important to be able to evaluate the reliability of the research data. To evaluate the quality and reliability of research data we need to understand a few basic principles of experimental pro- cedure.

There are three essential features of a soundly conducted experiment. These features ensure the reliability and repeatability of the results. These features are 1) randomization, 2) replication and, 3) freedom from bias. Each of these features are equally important and must be rigidly followed. If any one is violated, the result of the entire experiment is questionable as in the "weakest link" theory.

Randomization refers to the method in which the treatments are assigned to the unit of material to which one treatment is applied (experimental units). Most researchers equate the experimental unit with a plot. For example, if you are conducting a field trial to evaluate wheat varieties and each variety is planted in a plot which is four feet wide by ten feet long, this area is considered the experimental unit. To assure proper randomization, one must be sure that the treatments are assigned to the experimental units at random and not in a way which would bias the results. Randomization can be accomplished by first assigning each experimental unit a number, then assigning treatments to these numbers at random. Assignment of treatments at random can be done by simply picking numbers out of a hat or using a random number table. A common violation of randomization occurs when the treatments are assigned to the experimental units in some preferential manner so that the product the researcher is promoting is assigned the more favorable experimental units. If you are viewing strip plots in which one company has all their product grouped together and their competitors in another group, the treatments were likely not assigned at random.

Without replication, it is impossible to determine if products differ due to error or real differences among the products.

Replication refers to the procedure of repeating treatments more than once to measure experimental error. Three or four replicates are often used in agronomic research. Without replication, it is impossible to determine if products differ due to error or to real differences among the products. Replication of treatments can occur at one location or different locations, as in the case of multiple strip plots at several locations.

During all phases of the experiment the researcher must remain unbiased. A good example of biased data collection occurs when the researcher knows the treatment during collection of data. This is especially true when the data being collected is an arbitrary score such as a visual rating system for lodging in cereal crops. To prevent bias the researcher should always keep the identity of the plots anonymous during the collection of data. If more than one person collects the data it is a good idea to have each person collect data on separate replicates. If you need to label the plots for public display limit the labeling to the first replicate and take the notes on the unlabeled replicates.

Avoid conducting research near roadways, field paths, or where there is a potential for a portion of the plots to be influenced by the environment. It is always a good idea to place a border around the entire experiment to avoid a "border effect" which we often see at the edge or end of most fields.
☛Brick

HARVESTING, STORING AND FEEDING OF HIGH MOISTURE CORN

Advantages vs. Disadvantages
Harvesting corn as either high moisture shelled corn (HMSC) or high moisture ear corn (HMEC) allows for earlier harvests which reduces field losses and allows the use of higher-yielding full season hybrids. Ensiling high moisture corn as an alternative to artificially drying reduces fuel and labor costs and eliminates costly delays during harvest. In the case of HMEC, additional dry matter is harvested since the cob and husk are retained.

The biggest disadvantage of harvesting corn as HMSC or HMEC is that the producer has lost the flexibility of being able to market the grain through the normal commercial channels. Storage losses are generally

higher for ensiled HMSC and HMEC than bin stored corn and inventory and handlingcosts are higher than dried grain.

Feeding Value

How does the feeding value of ensiled HMSC and HMEC compare to dried shelled corn or dry ear corn? HMSC will have a protein and energy content similar to dry shelled corn while HMEC will contain substantially more fiber and have a lower protein and energy value compared to dry shelled corn. Feeding trials have demonstrated that properly managed high moisture corn has a feeding value equal to or slightly higher than dry corn when fed on an equal dry matter basis. The feeding value of HMEC is generally superior to dried ear corn since the cob is more digestible when harvested at the higher moisture content. The feeding value of HMEC is more variable than HMSC and will depend on how much non-ear plant parts are included in the material. Picked HMEC will have a higher feeding value than snapped HMEC.

Storage Methods

Common storage methods used for storing high moisture corn include processing and packing into conventional upright silos, bags, or bunkers, or storing the corn whole in oxygen-limiting silos. The storage method of choice will depend on the type and size of the feeding operation. Regardless of the type of storage used, careful management is required to insure proper preservation and maximize the feeding value of high moisture corn.

Feeding trials have demonstrated that properly managed high moisture corn has a feeding value equal to or slightly higher than dry corn when fed on an equal dry matter basis.

Management Considerations

The key management factors involved in making high quality HMSC or HMEC are:

1. harvesting the corn at the correct moisture content,
2. processing the grain to assure that at least 90% of kernels are cracked in non-oxygen limiting silos,
3. packaging to exclude air in non-oxygen limiting silos,
4. inoculating with a quality high moisture corn inoculant to assure a good fermentation,
5. sealing with plastic and discarded tires in the case of bunkers.

Table 1. gives the harvest moisture recommendations and processing requirements for HMSC and HMEC.

Table 1. Ideal moisture content for harvesting high moisture corn.

	Silo Type				
Crop	Upright	Bag	Bunker	Oxygen-Limiting	Process-ing
HMSC	26-32	26-32	26-32	—	Rolled or Ground
HMSC	—	—	—	22-26	Whole
HMEC	32-38	32-38	34-40	30-36	Ground or Chopped

When storing HMSC in non-oxygen limiting silos the grain must be processed. This can be accomplished using a hammer mill, roller mill, or a blower equipped with a recutter attachment at the silo. The roll setting and/or screen size should be selected so at least 90% of the kernels are cracked. Avoid grinding the corn too fine. HMEC can be picked and processed through a tub grinder or a hammer mill prior to ensiling or harvested using a forage harvester equipped with a snapper head. A recutter screen ranging from one-half to one inch should be used to assure that the cob is broken into pieces of one-half inch diameter or less prevent separation in the silo and sorting by cattle.

When storing HMSC or HMEC in bunker silos packing is critical to eliminate entrapped oxygen and achieve anaerobic conditions. The key to achieving a good pack is to spread the material in uniform layers of no more than 4 inches thick across the surface of the silo, and stay on the material until you can see defined tire tracks. When using upright silos it is highly recommended that a distributor be used while ensiling HMEC to prevent separation of the cob and grain in the silo. The material should be leveled off and tamped around the silo walls after each day's filling. The key elements that affect the ensiling process are:

1. oxygen level,
2. level of fermentable carbohydrates,
3. moisture content,
4. microbial population.

We have discussed the issue of packing to eliminate oxygen and the recommended moisture content for harvest previously. In regard to the level of fermentable carbohydrates, 2-4% sugar is required to achieve a good fermentation. If the corn is harvested within the recommended moisture range the sugar level will normally be adequate. In regard to the microbial population, it is desirable to minimize thenumber of yeast and molds and encourage the growth of the lactic acid bacteria.

The pH of HMSC, a measure of the acidity of the ensiled material, should drop to between 4-4.5 for proper preservation. HMEC will generally have a pH near 4 if properly ensiled. If the pH does not drop below 4.5 the ensiled material will be prone to spoilage.

Feeding Management

With proper management, total storage and feedlot losses can generally be kept to less than 5%. However, if poorly managed and ambient temperatures are high, losses can approach 10%. Losses are usually 2-4% units higher for HMEC compared to HMSC. Both HMSC and HMEC are excellent energy foods if put up right and fed correctly. They can generally be fed as the sole grain source in the diet if proper bunk management is practiced. The biggest concern with feeding HMSC or HMEC is that they are more prone to aerobic spoilage on feed out. It is advisable to feed rations containing HMSC or HMEC at least twice daily for optimum consumption. It is also important to note that the starch in HMSC is more readily fermented in the rumen than dry corn. This is advantageous in most dairy rations when we are trying to maximize ruminal starch digestion. However, the risk of rumen acidosis is increased when feeding high levels of HMSC compared to feeding dry corn to both dairy and feedlot cattle. Finely ground HMSC is especially rapidly fermented in the rumen and most feedlot nutritionists advise limiting its use to less than 50% of the concentrate for optimum performance.

(This article adapted from information from Pioneer Hy-Bred, Int.) ☛Shanahan

I hope that COFT will more actively engage our collaborating growers, agents, and company reps in the testing process to speed the identification and adoption of superior new varieties.

COOPERATIVE EXTENSION AGENTS TAKE THE LEAD! COLLABORATIVE ON-FARM TESTING OF HALT AND TAM 107 COFT 1996

Cooperative Extension agents in nine counties have assumed leadership for on-farm testing in their counties in the coming year. They have identified cooperating growers and are supplying the Halt and TAM 107 seed to growers. They will coordinate with the extension entomologists to complete fall and spring RWA surveys, and weigh production from the strips with a weigh wagon. Hats off to the following agents who are presently distributing seed for twenty-two new on-farm tests:

Baca County - Tim Macklin - four tests
Prowers County - Dick Scott - four tests
Kiowa County - George Ellicott - one test
Cheyenne County - Rob Smith - one test
Morgan County - Bruce Bosley - three tests
Weld County - Jerry Alldredge - four tests
Arapahoe County - John Adams - two tests
Akron Research Station - Scott Armstrong - three tests

Collaborating growers will receive 100 lb. seed of each variety to plant in long side-by-side strips. The strip will be wider than the header of the combine that will be used to cut it so that a full header-width of wheat will be cut from each variety. Strips will not be placed along a road, waterway or edge of a field. Growers are welcome to add other varieties to the COFT test but must provide the seed for any additional varieties.

We are very thankful for the generous contributions of seed made by Stratton seed producer, Kenneth Pottorff (2200 lb. Halt seed), and Holly seed producer, Douglas Melcher (2200 lb. TAM 107), for the 1996 COFT program.

These on-farm tests are of value to all of the wheat-producing community. On-farm test results are usually favored by producers because the tests are conducted under more real farm conditions, in large plots or strips, and using actual farm equipment. Economic analyses of alternative technologies are generally more reliable from on-farm data. I hope that COFT will more

actively engage our collaborating growers, agents, and company reps in the testing process to speed the identification and adoption of superior new varieties. I think that Halt is no longer a research question, but rather an extension challenge, an opportunity for our cooperative extension agents to do what they do better than anyone else - introduce and extend new technologies.

Objectives of Collaborative On-Farm Testing

1. Identify improved wheat cropping practices (including varieties) that are economically beneficial.
2. Give better feedback to researchers for fixing research priorities that better reflect the felt-needs of producers.
3. Study agronomic research questions which are more effectively or more efficiently answered in farmers' fields than on research stations.
4. 'First look' at new technologies by producers, extension agents, and seedsmen. ☛JJohnson

FUTURE PASTA

Approximately 1% of the U.S. population is believed to have an intolerance to wheat gluten, limiting their diets. Recent combined efforts in the Departments of Soil & Crop Sciences and Food Science and Human Nutrition have resulted in several pastas which can be suitable substitutes for wheat pasta. Millet pastas are currently under evaluation and produce a product very similar to durum-wheat pastas. The most exciting developments have been from legumes, however. Several members of the "cowpea" group, including mungbeans and azuki beans, have some very unusual starch structure within their seed which can be converted to Asian noodle products. These Asian noodles are capable of withstanding very long cooking time without loss of structural integrity (up to two hours - try that with a wheat pasta!). Typically the starch is partially gelatinized, extruded, gelatinized further and chilled prior to drying. The result of a pure mungbean starch is a transparent noodle frequently called a glass or cellophane noodle. What we have done is produce a blended a noodle product which is unlike other noodles using a multitude of legume and grain starches. One of the most intriguing is a blend of mungbean and pintobean starch. The resulting noodle is snow white in appearance and has the structural integrity of the mungbean noodle. Would consumers accept this? Sensory panel evaluations at CSU indicate that (at least for college-age adults) the noodles are preferred to wheat pasta for texture and flavor.

Several members of the "cowpea" group, including mungbeans and azuki beans, have some very unusual starch structure within their seed which can be converted to Asian noodle products.

How does this impact Colorado agriculture? Mungbeans are an excellent potential rotation crop for wheat, corn and barley in the warmer regions of the state. The problem has been a limit in market volume. Currently, all Colorado-grown mungbeans end up in the bean sprout industry or indirectly utilized in feedlots which limits interest in production. With the development of a bean pasta industry, grower/processors would have three products to sell: mungbean starch, mungbean protein and whole mungbeans. Sale price for mungbean starch is expected to be about $0.40 to $0.50/lb. Add another $0.25-$0.35 to process and package the pasta and you are there. Currently, crystal noodles are retailing at $2.50-$5.00/lb. What about a blended mung/pinto pasta? This does offer opportunities for sub- standard pintos or pintos when market prices fall as they did last year. A 20 to 30% pinto starch blend gives a similar texture and flavor to the mungbean noodle.What about the value of such a product? Well, a new product such as this has no established value so the processor can write his/her own ticket as long as they are aware consumers need to be educated about the product.

So we have potentially solved several problems and created others. 1) We can potentially develop new markets for mungbeans, which could serve as a rotation for grain crops; 2) we can salvage what could be an economic disaster for Colorado pinto beans; and 3) we can provide alternative employment for rural Colorado communities by providing value-added jobs. On the down side, processing and marketing will require training and hustling to market a new crop product, but it is out there for the adventurous. ☛DJohnson

FAX

Just a reminder that we now have our own fax machine. The number is:

970/491-2758

NEWSLETTER ON WEB

Another reminder: Our Newsletter is available on our department Web page

http://www.colostate.edu/Depts/SoilCrop/.

It can be found under Extension Information on this page. The file is in the Adobe Acrobat PDF format and can be viewed and printed with the same software as used for SIAs.

Sincerely,

John F. Shanahan
Editor and Extension Agronomist

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