FROM THE GROUND UP

Cooperative Extension
Colorado State University
Department of Agronomy
Fort Collins, Colorado 80523
(303) 491-6201
FAX: (303) 491-0564

AGRONOMY NEWS

Volume 16, Number 1 January 1996

TABLE OF CONTENTS

REGIONAL BEAN EDUCATION FORUM

Mark your calenders now to attend the Regional Dry Bean Education Forums in your area. The forum entitled "Manage Root Health to Enhance Bean Yield" will be held in Torrington, WY, Ogallala, NE and Burlington, CO on February 20, 21 and 22, respectively. The program features review topics presented by dry bean specialists from Colorado, Nebraska, and Wyoming and a trade show. Opportunities will be provided for direct interaction with the speakers and hands-on demonstrations. The event will include a morning speaker session, a lunch, and an afternoon trade show. Contact Mark Brick (970-491-6551), Howard Schwartz (970-491-6987), or Ron Meyer (970-346-5571) for more information. ▫Brick

INTEGRATED CROP MANAGEMENT WORKSHOPS

Extension Soil and Crop Science's first Integrated Crop Management Workshops were held at Montrose, Ft. Morgan, and La Junta during December 1995. Our goal in conducting these programs was to provide continuing education opportunities in the four competency areas of the Certified Crop Adviser program. These include soil fertility, soil and water management, crop production, and pest management. We attempted to concentrate on a few topics, encouraging in-depth discussion. We also attempted to minimize lecture presentations, utilizing various teaching methods to engage the audience. There were 133

individuals enrolled in the workshops at the three locations. The audience evaluations and comments from these programs indicate that this format was well received.

Based on the evaluations, we feel that there will be a continuing audience for this type of program. Plans for a 1996 program will begin soon, so please provide us with your suggestions for topics and locations. A few notebooks remaining from the 1995 program are available from Extension Soil and Crop Science (970-491-6201) for $25 each.
▫Shanahan

In November of 1994, EPA announced that it was placing three triazine herbicides -- atrazine, simazine, and cyanazine -- under Special Review.

However, no changes are expected in the availability or uses of atrazine and simazine throughout the Special Review process. Farmers can go ahead and book their herbicides for next spring as planned.

TRIAZINE SPECIAL REVIEW ENTERS SECOND YEAR

In November of 1994, the Environmental Protection Agency (EPA) announced that it was placing three triazine herbicides -- atrazine, simazine and cyanazine -- under Special Review. The EPA conducts a Special Review to evaluate labeled pesticides that may pose a possible risk to human health or the environment. The agency gathers data regarding the pesticides, performs a risk and benefit analysis, then issues a preliminary decision. The results can range from no label changes to product cancellation.

The Cyanazine Decision

In August, DuPont and the EPA announced a voluntary phaseout of cyanazine products, including Bladex® and Extrazine®. The phaseout will begin in 1997, with an incremental reduction in the cyanazine maximum use rate. DuPont plans to stop selling the herbicide in 1999, and all use in the U.S. will stop at the end of 2002.

According to officials at Ciba, the withdrawal of cyanazine from the U.S. market (which DuPont described as a business decision) will not cause Ciba to alter its commitment to atrazine and simazine. Atrazine is still the most widely used of all corn herbicides, - applied on nearly 70 percent of all corn and sorghum acres. In addition, atrazine is used on an estimated 2.5 million acres of fallow ground in Colorado annually. Simazine is labeled for 30 high-value crops, but is not widely used in Colorado. Ciba Crop Protection is the principal manufacturer of atrazine (AAtrex® and Bicep®, which is a mixture of atrazine and metolachlor) and simazine (Princep®). Ciba has clearly indicated its intention to continue to support the two herbicides throughout the Special Review.

EPA's Next Steps

The EPA has begun assessing risks and benefits for both atrazine and simazine. Its evaluations will be based on scientific data (including 14,000 pages of data submitted by Ciba) and the public comments received last winter, plus additional information provided by various commodity groups.

Once the data and supporting materials are evaluated, the EPA expects to make a preliminary decision regarding atrazine and simazine during the fourth quarter of 1996. The announcement of that decision will be followed by another public comment period. A final decision is expected in 1997.

No Changes in Atrazine and Simazine Use for 1996

No changes are expected in the availability or uses of atrazine and simazine throughout the Special Review process. Farmers can go ahead and book their herbicides for next spring as planned. Until the EPA delivers its final decision, farmers

should: 1) Continue to use the products responsibly, according to their current labels; 2) Adhere to all of the appropriate Best Management Practices, especially set backs from any water source; and 3) Be on the lookout for more information and the EPA call-for additional public comments on the Special Review. ▫Waskom

NEW CROPS REQUIRE AN INTEGRATED APPROACH: CHICKPEAS AND MUNGBEANS FOR NOODLES

Over the past three years, the new crops project has taken a significant interest in legume crops potentially adapted to Colorado growing conditions. Two legume crops, chickpea and mungbean, show much potential. The potential value of these two crops is excellent with prices ranging from $35/cwt to $50/cwt. Mungbeans and chickpeas (garbanzo) grown under dryland conditions have yielded 825 and 940 lbs/acre, respectively. Irrigated mungbeans and chickpeas have yielded 3,250 and 3,360 lbs/acre on the average, respectively. Mark Brick will be reporting chickpea data from this year in this issue. While production doesn't seem to be a problem for mungbeans, identifying markets may. Virtually all mungbeans currently purchased are used in either the sprouting industry or as a soup base. About half of the dryland mungbeans do not make grade. So what do we do with those that do not meet specifications for these markets? Certainly, they would make excellent animal feed, but that means a significant reduction in price per pound. Mungbeans are among the highest in protein of the legumes but it would represent a new product to animal industry - even if they needn't worry about antinutritional factors. The answer may lie in the production of starch. The starch found in chickpea and mungbean is unique among starch sources.

Pastas are currently the fastest growing segment of the food industry and nonwheat pasta, based on legumes, has significant potential.

Mungbean starch produces various oriental noodles with interesting properties: the noodles are traditionally produced as a vermicelli and after extrusion, are boiled to produce a clear product called a glass or cellophane noodle. The dried noodles are extremely strong. Wheat pasta is normally cooked for 8 to 12 minutes prior to serving. Any longer and the noodles become very soft and undesirable. Mungbean noodles developed in the lab at the Food Science and Human Nutrition Department at CSU are resistant to breakdown after 30 minutes. Experiments with chickpea starch has shown a similar property. Neither of these products are currently produced in the U.S. and represent a significant development in a new market. Pastas are currently the fastest growing segment of the food industry and nonwheat pasta, based upon legumes, has significant potential. Currently, we are working to develop an "American" pasta which will have properties of both the Italian pasta and the Oriental noodle and it will be "gluten free".

If there is interest in production of mungbeans for the whole bean market, contact myself, Duane Johnson (970-491-6438). If there is interest in chickpeas, you can contact myself or Mark Brick (970-491-6551). If there is interest in the starch and noodle market, I am developing a cost analysis for these processing plants. I should point out that we are currently buying mungbean starch at $1.00 per pound from Thailand. The residual meal after starch extraction is very high in protein and at current soybean prices should be worth $240 per ton.

The noodles being marketed in the U.S. are selling at $1.85 to $2.50 per pound on the low end.

Chick pea production is very flexible but is primarily limited to cool season production. Planting dates vary but generally chickpeas are planted in late March to early April. Test plots have been planted as late as May but significant yield reductions were noted. Mungbeans can be planted prior to planting pintos and can be windrowed or direct combined. With mungbeans, I recommend delaying planting until the end of May so that the crop matures in mid-September and can be direct combined. Both crops have excellent drought tolerance and if irrigated, you should make excellent crops on about 65% of the water requirements of pintos. The beans for both of these crops are very fragile and an axial flow combine is recommended. ▫DJohnson

Most chickpeas produced in the U.S. are grown in the Palouse region in the Pacific Northwest or the central valleys of California.

CHICKPEA VARIETY PERFORMANCE

Chickpeas (*Cicer arietinum* L.), also called garbanzo beans, are a large-seeded legume seed popular in salad bars and soups. Most chickpeas produced in the U.S. are grown in the Palouse region in the Pacific Northwest or the central valleys of California. However, much of the domestic consumption is imported from Mexico and Turkey. Chickpeas are a cool season crop planted as a spring crop in the Palouse and a winter crop in California. Most commercial varieties grown in the U.S. were developed at either Washington State University or University of California-Davis.

A study was conducted at the Agricultural Research, Demonstration and Education Center, Ft. Collins, CO to compare yield levels of four commercial cultivars planted at two planting dates under irrigated and non-irrigated conditions. The cultivars were Kabuli seed types and included 'UC-15' and 'UC-27' from the University of California-Davis, and 'Sanford' and 'Dwelly' from Washington State University. All varieties were Kabuli seed types. The trials were planted in 30 inch rows on April 6 and 27,1995. The irrigated plots received approximately 8 inches of supplemental water with an overhead sprinkler irrigation system. The preemergence herbicide Dual 8E was applied at 2 lbs/acre on April 1. A granular form of *Rhizobium* appropriate for garbanzo beans was applied with the seed at planting.

Seedling emergence and establishment was delayed by cool weather during April and early May. On April 5, the soil temperature was 40° F at 2 inches, but later dropped below 35° F due to cold weather. Flowering and pod fill occurred during late June through early August. The plots were relatively disease free bu few plants expressed Pea Enation Mosaic Virus symptoms (confirmed by Dr. H. F. Schwartz). The virus significantly reduced yield of the infected plants. Seed yield was evaluated from approximately a 20 ft linear section of row and hand harvested during the first week of September. Because some areas of the plots had poor stand, yield levels reported herein are likely 10 to 20% higher than what would be obtained on a farmer's field. Perennial weeds, especially Canada thistle, significantly reduced yield potential in the irrigated plots.

RESULTS:
Yield results are shown in Table 1 (next page). Yield levels among varieties were not statistically different. In general, UC-15 and UC 27 showed better plant vigor and ha non-significantly higher yield levels

than Sanford or Dwelly. Mean yield in the irrigated trial was non-significantly higher than in the non-irrigated trial. The similar yield between irrigated and non-irrigated plots was likely due to the high rainfall in May and June, and the weed competition that reduced yield in the irrigated plots. Mean yield was also non-significantly higher for the early planting date in both environments. The early planted plots expressed better plant vigor and had more growth throughout the growing season.

Seed quality has not been evaluated by an independent source at this time; however, UC 15 and UC 27 appear to have better seed color than Sanford or Dwelly. Seed evaluations will be reported in an upcoming newsletter article.

The results of these trials suggest that planting on April 6 was superior to April 27 for both irrigated and dryland environments and confirm that chickpeas should be planted when soil temperatures reach 40° F at planting depth. The lack of significant differences among varieties does not allow clear varietal recommendation, but UC-15 and UC-27 had higher yield in three of the four environments and superior seed quality to Dwelly.
▫Brick

The results of the trials conducted at ARDEC in Fort Collins suggest that planting on April 6 was superior to April 27 for both irrigated and dryland environments. It also confirms that planting should occur when temperatures reach 40° F at planting depth.

Table 1. Yield of four chickpea varieties planted on April 6 and 27 in irrigated and non-irrigated environments at Ft. Collins, CO.

	Dryland		Irrigated	
	Planting Dates			
	04/06/95	04/27/95	04/06/95	04/27/95
	----------Yield lbs/acre----------			
UC-15	944	951	1147	1224
UC-27	1022	853	981	1079
Sanford	854	737	1163	639
Dwelly	853	784	1070	870
Mean	918	832	1090	953

TRIVIAL PURSUITS OR PREDICTABILITY IN WINTER WHEAT VARIETY TESTING RESULTS?

Several months ago I was asked to make a presentation to Colorado seed producers. With little idea of what I was going to present, I provided the title "Improving Predictability". Some busy weeks came and went and I had little more than a sketchy idea of what I wanted to say. To my way of thinking, the important kind of predictability is predictability from year to year or how wheat producers might use our small-plot trial results to optimize variety

selection. The typical university analysis of variance with least significant difference (LSD) is useful for describing past performance but not necessarily useful for helping growers choose varieties for future and largely unknown climatic, pest, and market conditions. Looking through variety performance results from other states didn't provide me with much guidance, gleaning from them only the general recommendation to growers to use data from several years or several locations to make variety choices. Improvements in our testing system - like our new combine with a yield monitor providing plot-by-plot yield, test weight, and grain moisture data - can and do improve predictability. However, the intended focus of my presentation was to demonstrate that there is little predictability for yield in the trial data but that, because the industry was so economically important (1995 Colorado wheat crop valued at about $420 million), even small improvements in predictability could be very valuable. Our trial data implies that Colorado producers may have been burned by choosing TAM 107 in 1995 as Lamar yielded 21% more than TAM 107, on the average, across low moisture locations. Jagger out yielded TAM 107 by 27% on the average over high moisture locations. Twenty percent of $420 million is mucho dinero! The important question was whether there was some way to have known, in advance, that TAM 107 was such a poor 1995 variety selection. At the outset of this study, I suspected that the 1995 climatic conditions were so abnormal that it would not have been possible to predict such a poor showing by Colorado's most popular winter wheat variety.

Typical university analysis of variance with least significant difference (LSD) is useful to describing past performance but not necessarily useful for helping growers choose varieties for future and largely unknown climatic, pest, and market conditions.

Unable to take on the whole of eastern Colorado at one time, my approach was to try to predict which variety should have been planted at each location where our small-plot trials are actually planted. I put myself in the shoes of the growers who generously host our small-plot trials and figured that if I could show low predictability for yield in actual test locations, that non-test locations had to be even worse. I restricted my investigation of predictability to yield, even though I know that many other factors can and should influence variety selection. I used 1992, 1993, 1994, and 1995 yield data and developed three decision 'scenarios' that might be used to choose the highest yielding variety for the next year. The first scenario (S1) was to plant the variety that had been the highest yielding at that location the previous season. The second scenario (S2) was to imitate the majority of winter wheat producers and just plant TAM 107 every year. The third scenario (S3) was to plant the variety that had yielded the highest, on the average, across a group of locations. We have three groups of variety trials in Colorado. We plant one group of varieties in lower moisture conditions generally south of I-70, another group of varieties in high moisture conditions north of I-70, and a third group in two irrigated locations. I only considered commercially viable public varieties and did not include private varieties nor the numbered CO lines from the CSU wheat breeding program. I applied the scenario approach to the data by location, for example, Julesburg (Ovid) is in the HM group of locations.

Sandy would have been planted in the fall of 1992 by decision scenario, S1, because it was the highest yielding variety at Ovid in 1992. TAM 107 is always the variety planted by S2 and it would have been planted by S3 as well because it was the highest yielding variety over high moisture locations in 1992. In 1993, Arapahoe topped Sandy by 12.8 bu/ac, TAM 107 by 6.3 bu/ac, and was planted

Table 1. Julesburg (Ovid) - High Moisture Location
Yield loss from variety decision in bu/ac

	Decision Scenario	S1	S2	S3
1993	Variety planted fall 1992	Sandy	TAM 107	TAM 107
	Highest yielding variety 1993	Arapahoe	Arapahoe	Arapahoe
	Yield difference or loss 1993	-12.8	-6.9	-6.9
1994	Variety planted fall 1993	Arapahoe	TAM 107	Vista
	Highest yielding variety 1994	Yuma	Yuma	Yuma
	Yield difference or loss 1994	-2.7	-3.5	-1.2
1995	Variety planted fall 1994	Yuma	TAM 107	Yuma
	Highest yielding variety 1995	Akron	Akron	Akron
	Yield difference or loss 1995	-6.5	-13.7	-6.5
Average yield loss over three years		-7.3	-8.0	-4.9

for S1 at Ovid for the next year. Vista topped the HM location trials in 1993 and would have been planted for S3. Yuma was the highest yielding variety at Ovid in 1994, topping Arapahoe by 2.7 bu/ac, TAM 107 by 3.5 bu/ac, and Vista by 1.2 bu/ac. Yuma was also the highest yielding variety over high moisture locations in 1994 so Yuma would have been planted by S1 and S3 in the fall of 1994. Akron was the highest yielding variety at Ovid in 1995, topping Yuma by 6.5 bu/ac and TAM 107 by 13.7 bu/ac. The average yield losses for each decision scenario are shown at bottom of Table 1, suggesting that our trial cooperator would have suffered lower yield losses due to variety selection by planting the variety that topped the high moisture trials each year. To assess the repeatability of the Ovid example, the same calculations were made at four other trial locations and summarized in Table 2.

Table 2.
Ave. losses (1993-95) for 5 locations
Yield loss from variety decision in bu/ac

	S1	S2	S3
Akron	-3.0	-9.3	-6.3
Burlington	-9.2	-8.6	-5.9
Bennett	-5.2	-3.6	-1.8
Ovid	-7.3	-8.0	-4.9
Lamar	-3.9	-5.4	-1.5
Ave. loss	-5.7	-7.0	-4.1

On the average, decision scenario 3 resulted in less yield loss than planting TAM 107 (S2) at every location, and resulted in less yield loss than S1 at four of the five locations. Even though it may not seem like 4.1 bu/ac is much different from 7.0 bu/ac, it has a large potential economic implication for loss of yield due to variety selection. It implies that basing variety selection on moisture group average yields could have resulted in 40% less loss of yield over the past four years than simply planting TAM 107. ▫JJohnson

COMPARING EXTRACTANTS FOR SOIL TEST PHOSPHORUS

Soil testing laboratories use various extractants for determining plant-available soil P levels. Some of the extractants were developed for particular soil types or regions of the country. For example, the Mehlich-1 extractant was developed for acid, sandy soils dominated by kaolinitic clay minerals. Later, the Mehlich-3 extractant was designed to improve the applicability of the extractant over a wider range of soil conditions. The Bray-1 extractant was developed for acid and neutral soils, but can be modified for effective use on high pH soils. The $NaHCO_3$ and AB-DTPA

extractants were developed for western soils which are generally neutral to basic in pH.

Optimum fertilizer recommendations depend on accurate soil tests using appropriate extractants. The best extractants for use on Colorado soils are those developed for our conditions, namely the $NaHCO_3$ and AB-DTPA extractants. However, it is possible (though not optimal) to convert extractable P values from one extractant to another by using the factors given in the table below. Relationships between extractants can vary depending on soil texture or mineralogy. Therefore, the factors given in the table are generalizations which may not be accurate for all situations.

The best extractants for use on Colorado soils are the $NaHCO_3$ and AB-DTPA extractants.

These conversion factors may be useful if you are using another lab's results to make fertilizer recommendations using CSU's Service in Action sheets. Another use may be in comparing results from different laboratories. Use these conversion factors with care; they are rules of thumb, not precise calibrations.
▫Davis

Multiply extractable P values by these factors to convert to the following extractants.

Results given as...	Mehlich-1	Mehlich-3	Bray-1	$NaHCO_3$	AB-DTPA
Mehlich-1	1	2	2	0.67	0.33
Mehlich-3	0.5	1	1	0.33	0.17
Bray-1	0.5	1	1	0.33	0.15
$NaHCO_3$	1.5	3	3	1	0.5
AB-DTPA	3	6	6.7	2	1

References for Further Information

Hanlon, E.A., and G.V. Johnson. 1984. Bray/Kurtz, Mehlich III, AB/D and ammonium acetate extractions of P, K, and Mg in four Oklahoma soils. Commun. in Soil Sci. Plant Anal. 15:277-294.

Labhsetwar, V.K., and P.N. Soltanpour. 1985. A comparison of NH_4HCO_3-DTPA, $NaHCO_3$, $CaCl_2$, and Na_2-EDTA soil tests for phosphorus. Soil Sci. Soc. of Am. J. 49:1437-1440.

Michaelson, G.J., C.L. Ping, and G.A. Mitchell. 1987. Correlation of Mehlich 3, Bray 1, and ammonium acetate extractable P, K, Ca, and Mg for Alaska agricultural soils. Commun. in Soil Sci. Plant Anal. 18:1003-1015.

Olsen, S.R., and L.E. Sommers. 1982. Phosphorus. pp. 403-430 In A.L. Page (ed.) Methods of Soil Analysis. Part 2. Chemical and Microbiological Properties. American Society of Agronomy; Madison, WI.

Soltanpour, P.N., and A.P. Schwab. 1977. A new soil test for simultaneous extraction of macro and micronutrients in alkaline soils. Commun. in Soil Sci. Plant Anal. 8:195-207.

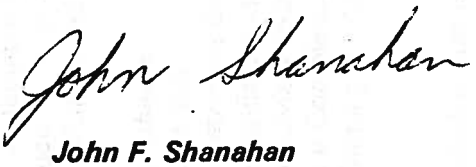
Wolf, A.M., and D.E. Baker. 1985. Comparisons of soil test phosphorus by Olsen, Bray P1, Mehlich I and Mehlich III methods. Commun. in Soil Sci. Plant Anal. 16:467-484.

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 Production,
Colorado State University
Davis, Jessica G.,
Extension Agronomist - Soils,
Colorado State University
Johnson, Duane L.,
Extension Agronomist - New Crops,
Colorado State University
Johnson, Jerry J.,
Extension Agronomist - Crop Production,
Colorado State University
Shanahan, John F.,
Extension Agronomist - Crops,
Colorado State University
Waskom, Reagan M.,
Extension Agronomist - Water Quality,
Colorado State University

Sincerely,



John F. Shanahan
Editor and Extension Agronomist