NDSU EXTENSION SERVICE

water spouts

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Is Your Irrigation System Ready?

Since last September, North Dakota has not received much rain. Between September 1, 2001 and May 1, 2002 eastern North Dakota has received an average of 4 inches and the western part of the state has received an average of 2 inches. Snowfall is not included, but not much snow accumulated this past winter anywhere in the state. What this means is you should be prepared to start your irrigation systems earlier than normal. Soil moisture levels below 18 inches may be low and early irrigation may be needed to make sure the root zone profile is filled. Be prepared. Use this checklist to prepare your irrigation equipment for the coming growing season.

- ✔ Open and check electric control panels for rodents or damage before starting any electrical equipment. Check ground rods and grounding lines to ensure that all equipment is properly grounded.
- ✔ Check all motor openings to see if they are properly screened, again to keep out rodents.
- ✔ Measure and record the static water level in all wells.
- ✔ Visually inspect the piping system.
- ✔ Check all air release valves to make sure they are working.
- ✔ Replace any broken or old pressure gages.
- ✔ Check the sprinkler system for damage.
- ✔ Check the gaskets on all portable aluminum or PVC pipe sections. Replace any cracked or broken gaskets.
- ✔ Check gearboxes on center pivot towers for water accumulation. Drain water and replace with oil.
- ✔ Check the tire pressure on center pivots.
- ✔ Grease the pivot swivel at the pivot point.
- ✔ With the center pivot running, visually check each sprinkler head to make sure it is working properly.

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Managing Potato Sugar-Ends – What Do We Know and Hope To Learn

Potato processors and growers have had to deal with a serious sugar-end problem the past two years. This physiological disorder is generally considered a minor production problem. However, when above normal temperatures occur during the growing season, significant economic losses can result from excess reducing sugars (glucose and fructose) in the stem end of tubers. These reducing sugars react with free amino acids during frying to form brown or black fry ends. For processors this results in reduced processing efficiency and economics and in some cases an unusable product.

The sugar-end disorder is also known as dark ends, translucent ends or, in more severe incidences when stem-end tissue breakdown occurs, jelly ends (usually during storage). Currently, there is no reliable method to identify the onset of this disorder. Evaluation of tubers following an environmental stress have shown that the formation of excess reducing sugars may not occur until weeks or even months after the stress. Affected tubers can also vary in shape. Sugar-end tubers are typically irregularly shaped with pointed stem ends. However, ideally shaped tubers may also have sugar-ends.

Several factors including moisture stress, high temperatures, drying winds, higher than desirable fertilization levels and soil types have been shown to cause sugar-ends. Of these factors, heat and moisture stress appear to be the most important. Unfortunately, no one can directly control outdoor temperatures. However, making adequate, uniform water applications can cool plants and the soil, while providing moisture to the plant's roots. Research at NDSU is looking at ways to reduce heat and moisture stresses during the growing season. A planting configurations project is evaluating whether the hilling procedure is the best way to grow potatoes in coarse-textured soil under sprinkler irrigation. There is also a trial investigating the use of soil surfactants to increase water penetration into the hill, reduce the formation of a dry root zone, and reduce the development of sugar-ends. In addition, researchers will be cooperating with several growers this year to monitor soil moisture and temperature conditions with hopes to compare producer perceptions of crop water status with those indicated by the soil moisture measurements, and to correlate the incidence of crop water and temperature stresses with the sugar-end defect.

Not all the potato sugar-end research in North Dakota is directed toward avoiding heat and/or moisture stress. One project is investigating the effect of nitrogen rate and timing in conjunction with a moisture stress during tuber initiation to better understand the interaction of nitrogen fertilization and a moisture stress on sugar-end development. NDSU is also collaborating with ARS and UMN researchers on two experiments evaluating the effect of storage temperatures. The first project is studying the factors regulating the onset of the sugar-end defect in Russet Burbank by altering the moisture stress timing and storage temperatures. The second project is investigating the effects of Russet Burbank tuber maturity and preconditioning temperatures on sugar levels and the conversion of sugar to starch.

Another project is focused on identifying potential replacements for the Russet Burbank. Research investigating tolerance to heat/moisture stress among potato genotypes has shown that cultivars differ in their sensitivity to the magnitude and timing of heat and moisture stress. Round or blocky clones are generally not as susceptible to sugar-end development as long types. However, elongated tubers are required for French fry contracts with the fast food industry. Russet Burbank, the industry standard for processors, is extremely sensitive to moisture stress, especially just after tuber initiation phase and into early bulking. Recent russet cultivar releases from the Tri-state Variety Development project are more resistant to sugar-end development than Russet Burbank. Many of these cultivars have not been grown in North Dakota; thus, cultivar response to growing conditions may vary. Research is under way to evaluate these cultivars and other advance selections for susceptibility to sugar-ends. It is an important step toward identifying superior genotypes for French fry processing.

Once completed, this sugar-end research will provide valuable information to North Dakota potato growers. However, until that time, growers need to know what production practices they should incorporate to help reduce sugar-end development. Currently there is no recipe to eliminate sugar-end development. Sugar-end research has been conducted in the Pacific Northwest since the early 1970s. Research results have enabled several states to develop management checklists to help avoid high sugar problems. The following list summarizes some of the available checklists. The list is not inclusive since it cannot encompass every grower situation. Its intent is as a guide to help growers identify and develop practices that will reduce sugar-end incidences when growing Russet Burbank (or other heat and moisture stress susceptible cultivars) under irrigation.

Management practices to reduce sugar-end and high sugar development

1. Determine whether irrigation system capacity is sufficient to supply the crop's moisture requirements during hot spells and the peak water use part of the season. If it isn't either, increase capacity or decrease acreage irrigated.
2. Plant potatoes after a crop that leaves large amounts of residue and helps break disease and insect cycles. Frequent potato cropping increases diseases that interfere with root development and water uptake.
3. Break up compacted layers and avoid field operations that compact the soil. Use reservoir tillage on sloping land to increase water infiltration.
4. Plant early enough to close rows before hot weather and to ensure maturity at harvest.
5. Avoid over-fertilization (especially nitrogen) and nitrogen application within 30 days of vine kill.
6. Make the last cultivation before plant emergence or at least before plants are 4 inches in diameter in order to reduce root pruning and soil moisture loss.
7. Plant healthy, treated seed no deeper than 3 to 4 inches below the original soil surface and when soil temperatures are above 45 °F to promote early, uniform emergence and reduce disease incidences.
8. Control weeds that will compete for water and harbor diseases, but also avoid herbicide injury.
9. Monitor and maintain an adequate level of plant-available soil moisture at the active rooting zone, especially during critical periods.
10. Harvest and process stressed crops early when possible. Harvest potatoes for storage before the tuber temperature in the soil drops below 50 °F. Utilize early storage practices that will help convert sugar to starch and wound healing yet control rot problems.

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Stubble Height Effects In Alfalfa

Leaving 3- to 5-inch alfalfa stubble height during harvest is very common because of rocks, pocket gophers or lodging. But what is the impact of stubble height on the yield and quality of alfalfa? Obviously, increasing the stubble height will reduce forage yield, but it is surprising by how much.

Three experiments evaluating stubble height effects have been conducted over the last five years, two at Fargo (dryland) and one at Carrington (irrigated). Forage yield averaged across the first two years of production has been reduced 1.04 tons/acre for each 2 inches of stubble left in the field when forage yield of the 1-inch stubble height yielded 6.69 tons/acre. That's a 15% reduction in forage yield for 2 inches of stubble left in the field or 30% for leaving a 5-inch stubble. Leaving a 5-inch stubble caused a yield reduction in these experiments greater than the state average alfalfa yield!

Harvesting at the higher stubble height increases the forage quality of the hay. The relative feed value (RFV) of the hay increased 31, 30, and 26 units in the first, second, and third harvests, respectively, when harvested at 5 compared with 1-inch stubble height. Likewise, crude protein (CP) increased 2.2, 2.6, and 1.4% in the first, second, and third harvests, respectively. Obviously, the lower stem (lowest 4 inches) is very poor in forage quality averaging only 10.1% CP, 51.3% acid detergent fiber (ADF), 61.5% neutral detergent fiber (NDF), and a RFV of 71 in the first harvest. The hay averaged 19.8% CP, 31.7% ADF, 41.7% NDF, and 144 RFV (nearly prime hay). However, the forage quality of the lower stem improves with each harvest.

Each producer must weigh the advantages of yield, forage quality, harvesting efficiency, over-wintering ability, and economics when deciding at what stubble height to harvest the alfalfa. Cash hay producers receive a premium for high quality, so leaving some stubble in the field to increase quality might be justified if harvest is delayed by rain. However, I believe it is better to harvest when the lowest stubble height will produce prime hay rather than sacrifice yield potential. In many cases, the premium price received will not offset the 30% reduction in yield. Re-growth rate is not affected by the stubble height, but over-wintering of the four-cut system was slightly better in the 5-inch than 1-inch stands during the 2000-2001 winter. Beef cow producers should harvest as low as possible since forage quality of alfalfa is greater than needed in rations.

Stubble height at which alfalfa is harvested has a greater impact on forage yield and quality than what you might anticipate, and it should be considered in your management package. More effort on pocket gopher control is warranted. Removal of rocks prior to seeding or rolling to push rocks back into the ground in established stands is also warranted.

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Bean Planting Suggestions

Soybeans

Date of Planting

Soybean is susceptible to frost and prolonged exposure to near freezing conditions in spring and fall. Plant soybean after the soil has warmed to 50° F and air temperatures are favorable. Soybean generally should not be planted prior to five days before the average last killing frost. This provides less than a 50 percent chance of frost killing the soybean. Earlier planting in cool, wet soil may result in low germination, increased incidence of seedling diseases and poor stands.

Planting dates in North Dakota between May 8 and 25 appear to be favorable for higher yields with a reduced risk of frost injury. Plant as early as the frost date permits on fields where weeds are not a serious problem so soybean can take full advantage of the entire growing season and produce maximum yields. Earlier seeding allows the use of full-season varieties, which typically yield more than shorter season varieties.

Four years' data from date-of-planting studies at the NDSU Fargo Experiment Station show that late plantings had lower seed yields, poorer seed quality, lower oil content, shorter plant height, and pods set closer to the ground as compared to optimum planting dates. Some early maturing varieties have had acceptable yields when weather factors like hail, late spring frost, floods, etc., necessitate very late planting or replanting.

Planting Rate

Soybean yields have not varied significantly over a wide range of plant populations. A plant population of approximately 150,000 plants per acre is desirable regardless of row spacing. One pound of medium sized soybean will contain about 3000 seeds. A bushel of soybean will produce about 150,000 plants per acre assuming 90% germination. This would give plants about 1.5 inches apart within the row at 30-inch row spacing. Seed per pound in currently available varieties ranges from 2200 to 3400. Seeding rates should be based on the number of viable seeds planted per foot of row. Low plant populations reduce lodging but contribute to reduced pod set and excessive branching. Extreme low seed number per foot of row may result in erratic stands due to lack of seedling energy necessary to break the soil surface. This may be critical in solid seeded stands where soils are prone to crusting.

Seeding rates should be increased (5 to 7%) to compensate for unavoidable plant thinning such as with rotary hoeing for early season weed control. Slightly higher seedling rates may also be advantageous with June plantings or with no-till plantings, where soil temperatures are lower. If planting in narrow row spacing or solid seeding, it's suggested that soybean seeding rates be adjusted upward. Seeding rates of 175,000 seeds per acre in 12- to 15-inch row spacing and 200,000 seeds per acre when drill-seeding (6- to 8-inch row spacing) are recommended. To ensure planting enough soybean seed, the planting rate should be based on a live seed count.

Dry edible beans

Planting

The planting window for dry edible beans is May 12-31 in North Dakota and Minnesota. Beans will not germinate if planted in soils cooler than 51-52 degrees F. Soil temperatures of 55° or higher is ideal for rapid germination and emergence. Plant shallow if planting early. One to 2 inches deep is ideal under most conditions. Avoid compaction! Research has shown that compacted soils when worked too wet can greatly reduce yields (300-400 lbs./A). Tillage can bring up slabs and clods will form. Poor seedbeds result in poor stands. Roots later will have difficulty penetrating the hard plow layer. Field selection is another important management consideration. Dry beans are quite selective in the type of soils they perform best on. Avoid poorly drained soils and those high in pH and high in saline. Also, avoid those fields with extensive perennial weed problems. Control and clean up the perennial weeds with other crops such as corn prior to planting dry beans under irrigation.

Planting Rates

Planting rates vary from 40 to 100 plus pounds per acre, depending on row spacing, plant type, bean class, and percent pure live seed. Navy beans range from 2,200 to 2,500 seeds per pound. Planting rates suggested for navy beans are 40 to 45 pounds per acre of pure live seed. Studies conducted at various plant populations do not indicate any significant advantage to having populations greater than 100,000 plants per acre for navy beans. Slightly higher planting rates are advised under irrigation.

Pinto beans range from 1,200 to 1,500 seeds per pound. Planting rates suggested for pintos are 50 to 60 pounds per acre of pure live seed. Populations of 70,000 plants per acre for pinto beans have been found adequate. In some instances, reduced yields were observed when plant populations were below these recommendations.

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For other classes of dry edible beans seeding rates suggested are as follows:

Bean Class	Seed Number per Pound	Seeding Rate per Acre (lbs.)
Pinto	1200 to 1600	50-60
Navy	2500 to 2900	40-45
Small Whites	3000 to 3500	35-40
Great Northerns	1300 to 1600	70-80
Black Turtles	2200 to 3000	40-45
Kidneys	900 to 1000	90-100
Pinks	1600 to 1800	55-60
Small Reds	1400 to 1800	75

Note – Seeding rates per acre are based on seed count per pound of seed. The seeding rate must be adjusted for low germination seed lots.

Ten steps to 2500 pound dry bean yields

1. Watch rotation, potential weed problems, rotation of herbicides, and volunteer beans in adjacent fields.
2. Pay special attention to tillage and seedbed preparation.
3. Select varieties carefully with an eye to disease resistance, maturity, and yield. Seed quality is important also.
4. Fertilize adequately. Remember, zinc may be the essential element.
5. Plant on time, use precision spacing and keep optimum harvest plant populations in mind.
6. Use chemical, cultural and mechanical weed control practices.
7. Monitor early for diseases, white mold and especially bean rust, and use fungicides if economically warranted.
8. Monitor for micronutrient deficiencies, including zinc.
9. Harvest when moisture levels remain high enough to prevent damage and continuously adjust combine settings to account for changes in moisture during the day. Don’t combine if beans are under 12% moisture.
10. Handle beans gently and store beans properly to prevent damage and/or spoilage.

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