MANAGING THE POTATO PLANTING OPERATION

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Introduction

The final step in "improving potato stands" is the planting operation. The planting operation should strive to achieve the optimum stand as determined by variety and marketing strategies. Establishing the desired stand of vigorous and healthy plants is key to optimizing yields and tuber quality.

For purposes of this discussion, the planting operation has four components: seed handling, seed holding (temporary storage), seed cutting and planting the seed. Effective management of these components can result in improved stands by reducing mechanical damage, maintaining desire physiological age and providing conditions which minimize disease problems and promote rapid sprouting, emergence and plant development. The following briefly reviews these four components of the planting operation.

Seed Handling

To maintain seed quality, potato seed must be handled carefully from the time it is received, held for cutting, cut and loaded into the planter. The objective of good seed handling practices is to minimize bruising of the seed. As a previous topic pointed out, bruising of seed can detrimentally impact stands and thus yields. The bruising of potato seed has at least two detrimental effects. Bruising tends to increase seed tuber respiration rate. This in turn hastens physiological aging. Physiologically old seed is associated with lower yields and smaller tuber size. The second detrimental effect of bruising is mechanical damage to the seed. Such damage usually breaks the periderm or shin of the tuber. This allows the entrance of seed piece decaying organisms. Thus bruising increases the potential for seed piece decay and reduced stands.

To minimize bruising, conveyors and other handling equipment should not drop seed more than 6 inches. Ideally seed should be warmed to at least 45 F before it is handled. Seed with pulp temperatures below 45 F are more susceptible to bruising. The key is to evaluate seed handling during the entire planting operation to pinpoint areas where bruising is occurring. Once identified, corrective steps can be taken to reduce seed bruising.

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Seed Holding

Seed is usually delivered well in advance of cutting and planting. This means that the seed must be held or stored for a period of time. Several factors need to be considered in this "temporary" storage of seed. First, where possible seed lots should be kept separate and not mixed together. This helps in "tracking" the seed should problems develop after it has been planted. Keeping seed lots separate also reduces the spread of disease problems. Secondly the storage bins or other storage areas must be cleaned of old potato debris which could harbor potential disease problems. Cleaning is best done by pressure washing with hot, soapy water to remove all organic matter which can reduce the effectiveness of disinfectants. The bins or other storage areas should then be disinfected using labeled materials.

As seed is being loaded into storage areas, it should be carefully checked for frost damage and any disease problems such as fusarium dry rot, scab, late blight etc. Storage management will need to be adjusted if significant levels of frost or disease are found.

Storage bins (or other storage areas) should have ventilation systems for proper maintenance of temperature and relative humidity. For relatively long storage, temperature should maintained at 38-40 F and relative humidity at 90-95%. Fluctuations in temperatures should be voided because such temperature fluctuations physiologically ages seed.

Warming of the seed should begin about 7 to 10 days before seed cutting. Allow the temperature to increase 1/2 to 1 F per day during this period. The seed should have a pulp temperature of
50-55 F at the time of handling for cutting. Warming the seed to 50-55 F has three purposes; it minimizes bruising during handling, it promotes rapid suberization (wound healing) after cutting and it initiates the sprouting process.

Seed Cutting

Seed cutting is an important step to establishing good plant stands. Poor seeding cutting can result in reduced stands for two reasons; lack of sanitation which increases potential for disease spread and poor seed piece size distribution. Lack of proper cutter sanitation increases the potential to spread disease from an infected lot to a clean seed lot. This increases the potential for seed piece decay and thus reduced stands. To reduce disease spread, seed cutting equipment should be cleaned and disinfected at least daily and definitely between seed lots.

Poor seed size distribution results in skips because of poor feeding into the planter. Seed piece size distribution depends upon seed cutter adjustment and on the size uniformity of the seed tubers being cut. The cutter must be properly set to produce the maximum number of seed pieces in the desired range (1 1/2 - 2 ounces). Improper adjustment results in too many seed pieces less than 1 1/2 ounce and more than 3 ounce. The smaller seed pieces are often blinds (without eyes) or produce weak plants. Seed pieces larger than 3 ounces produce too many stems per plant. This can result in small tuber size and lower yields.

The size of the seed tuber being cut will affect seed piece size distribution. In

general seed tubers between 3 and 9 ounces will give the most uniform seed piece size distribution
(about 75-80% in the optimum size range). Seed piece size distribution should be frequently monitored during cutting. This can be done by collecting seed piece sample and sizing into three catagories: less than 1 1/2 ounce, 1 1/2 - 2 ounces and over 3 ounces. Determine the percent in each category and make adjustments if the size distribution is not what is desired.

The cutting action initiates the wound healing process. This involves suberization in which suberin is produced by cells just below the cut surface. The suberin seals the wound thus preventing water loss and entrance of disease organisms. Suberization takes 1-3 days and is followed by the formation of wound periderm. The new periderm is a corky layer of cells which provides permanent protection against water loss and disease infection. The wound healing process is favored by 55-60 F temperatures, 90-95% relative humidity and oxygen.

When seed is cut and immediately planted, wound healing will take place in the soil if conditions are favorable. Thus it is desirable to plant when both the seed piece and soil temperatures are in the 50-60 F range and soil moisture is moderate, about
70-80% available soil water. Such conditions will favor rapid wound healing. Avoid planting unhealed seed into cool wet or hot dry soils. Such conditions slow wound healing and favor seed piece decay. Excessively dry soils should be irrigated, if possible, before planting. Irrigating after planting and before emergence can increase seed piece decay thus reducing stands. Cut seed should not be exposed to direct sunlight as this can dry cut surfaces and slow wound healing. Loads of cut seed should be covered until unloaded into the planter.

Some seed is precut and held until planting. Precutting must be managed carefully to minimized seed piece decay problems. Seed for precutting must be warmed to 50-55 F. The precut seed is held under conditions which favor wound healing, namely 55-60 F and 90-95% relative humidity. Precut seed can be held in pallet bins or boxes or in piles no deeper than 4-6 feet. Ventilation is essential to prevent condensation on the cut surfaces. Ventilation also provides oxygen needed for wound healing. Avoid excessive air movement which could dry cut surfaces thus slowing wound healing. Do not allow temperature to go above 60 F since this can cause physiological aging and can increase seed piece decay problem from Fusarium.

Planting the Seed

Two type of mechanical planters are use in planting table, process and some seed stocks. The pick type planter is the more common, but many growers favor the cup planter. For either planter to do a good job of planting, it must be well maintained, properly adjusted and operated. Both types of planters work best if seed pieces are relatively uniform in size. Avoid using very small or very large seed pieces if optimum stands are to be obtained.

The between and in-row spacings used are determine by several factors. These include soil type, availability of irrigation, fertility programs, variety and markets. The most common between row spacings are 36 and 34 inches. There is now some movement toward

30 inches between rows. There is more variation in in-row spacing due to varieties grown and the markets for which they are grown. In-row spacings may vary from 6 to 18 inches. Whatever spacings are selected, the planter must be adjusted accordingly if the desired stands are to be obtained.

Planting depth is also important to stand establishment. Commonly, seed pieces are planted 2-3 inches below the surface and cover with another 2-3 inches of soil. This provides for rapid emergence under normal conditions. In addition, the placement of the row fertilizer can impact stands. Properly placed row fertilizer avoids injury to sprouts which can increase susceptibility to soil borne diseases.

When to plant is a key decision in establishing good stands. As previously indicated, seed piece and soil temperatures should be in the range of 50-60 F and soil moisture at moderate levels, neither excessively wet nor dry. However, "Mother Nature" doesn't always cooperate by providing these ideal conditions. The 1993 growing season was a perfect example of poor planting conditions. Thus some adjustments need to be made. For example, if planting must occur under poor conditions, use either well suberized or fungicide treated seed. Avoid planting in rain which excessively wets the seed pieces. Reduce planting depth if cool wet conditions are predicted to continue for some time. On the other hand deeper planting may be indicated if hot dry conditions are to continue.

Summary

Achieving profitable potato yields and quality is the overall goal of Wisconsin potato growers. While many factors are involved an optimum stand of vigorous healthy plants is essential. Such stands begin with the planting operation which has four components; seed handling, seed holding, seed cutting and planting the seed. Effective management of each component of the planting operation
can lead to the establishment of optimum stands and a step toward the goal of profitable yields and quality.