

## **Summary Research Progress Report For 1997**

**Submitted to:** San Luis Valley Research Center Committee and  
the Colorado Potato Administrative Committee (Area II)

**Title:** Design of an Antiseptic Potato Seed Cutter Using a Water Jet Cutting System

**Project Leader:** Sheldon Rockey

### **Objectives:**

The purpose of this research project is to develop an antiseptic potato seed cutter that will reduce the spread of diseases. The main objective for this project is to design and analyze a water jet cutting system for cutting seed potatoes.

### **Project Justification:**

Potato seed cutters are typically designed around the use of metal knives. There is a growing concern that these knives are not antiseptic and therefore can cause the spread of diseases in the seed cutting process. In order to control the spread of diseases and keep the knives antiseptic, the knives are often sprayed with several types of disinfectants. Disinfectants are not completely effective and cause the machinery to corrode. This brings about the need for a cleaner and more effective way of cutting potato seed pieces.

Rather than using metal knives in the potato seed cutters, water could possibly be used to cut the seed piece. Water jet cutting systems are applied to several different areas of industry. Water jet cutting systems are used for cutting metals, ceramics, concrete, and are also used in the food industry. In order to cut with water, high pressured water must be forced through a small orifice to create a needle like jet. Unlike the cutting edge of a knife, a water jet does not become dull or contaminated. The application of water jets in a potato seed cutter will eliminate both knives and disinfectants.

There has been some extensive testing done with water and it's ability to cut raw potatoes under high pressures. In 1992, Robert Becker and Gregory Gray analyzed a water jet cutting system for cutting potatoes. In their analysis they tested pressures ranging from 10,000 to 30,000 psi. They found that these pressures were capable of cutting potatoes with ease. It was important, in this project, to determine if potatoes could be cut with pressures lower than 10,000 psi. Pressures of this caliber are easier to obtain and safer.

There are several high pressure pumps available on the market, however, these pumps are fairly expensive. Hydraulic rams are capable of creating high water pressures but do not develop continuous flows of water.

### **Project Status:**

This project has been completed and has met all of the objectives stated in the proposal.

## **Significant Accomplishments:**

The development of a water jet cutting system was researched. It was determined that a high pressure pump could be used to create a water jet cutting system but would be too expensive to purchase for this project. Therefore, it was determined that a hydraulic ram would have to be constructed to create high water pressures. A prototype potato seed cutter was designed and constructed. The prototype consisted of a hydraulic ram, and a conveyor table, which was used to transport the potatoes safely through the water jet. This hydraulic ram was capable of creating pressures up to 11,000 psi.

After the prototype was completed several samples were cut with it. From observations made during testing, it was concluded that the minimum pressure that could be used to cut a potato completely through is 5,000 psi. Pressures of 5,000, 7,000, 9,000, and 11,000 psi were used through out the testing. Three different conveyor belt speeds were also investigated using this prototype. The samples that were cut were placed in a storage for two weeks to establish whether or not the cut seed pieces would heal properly. Along with these samples a control sample was cut with a metal knife and place in the same storage. It was concluded that the faster the belt speed and the higher the pressure the smoother the cut surface was. Each tuber, after it was in storage for two weeks, was rated on the amount of decay that had occurred on the cut surface. It was calculated that greater than 90% of all of the cut samples had healed properly. From this analysis it was concluded that a water jet cutting system can be used for cutting seed potatoes that will heal and grow properly.