A PRECISION SEEDING DEVICE FOR TRUE POTATO SEED

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Abstract

A prototype apparatus was developed which can select and deliver single true potato seed to a specific location. The principle features of the unit include a system of vacuum and pressure nozzles connected to a rotating head to select and hold the individual seeds then eject them for planting. An airbrush was incorporated in the design to remove multiple seeds from the nozzles. A small orifice and the radially oriented airbrush were fixed as a result of preliminary tests.

Results of performance studies of the unit indicated that 84% single seed selection was possible. Parameters which influenced the performance of the unit were airflow rate from the airbrush and the level of vacuum in the manifold.

Compendio

Se desarrolló un prototipo de dispositivo que puede seleccionar y depositar semillas sexuales de papa individualizadas en un lugar específico. Las principales características del dispositivo incluyen un sistema de vacío y boquillas de presión conectadas a un cabezal rotatorio que selecciona y retiene las semillas individualizadas y luego las expulsa para sembrarlas. Se incorporó un pulverizador de aire comprimido en el diseño, para remover las semillas acumuladas en las boquillas. Como resultado de las pruebas iniciales se colocó un orificio pequeño y se orientó radialmente el pulverizador.

Los resultados de los estudios de comportamiento de la unidad indicaron que era posible obtener 84% de selección de semillas individualizadas. Los parámetros que influyeron sobre el comportamiento de la unidad fueron la tasa de fluidez del aire en el pulverizador y el nivel de vacío en el dispositivo.

Introduction

Use of true potato seed (TPS) as an alternative method of potato production has been reviewed by Umaerus (6). Production aspects of potatoes from true potato seed (TPS) have been cited by Rowell et al. (5). Storage, handling, and transportation of TPS is relatively easy and inexpensive.
compared to seed tubers. Most plant viruses are not transmitted via true seed.

Several authors have agreed on methods for using TPS in current production systems (2, 5). They suggested that TPS can be sown in rows, and potatoes can be produced similar to other vegetable crops by direct seeding. TPS can also be sown in a greenhouse or seed bed to produce seedlings which can then be transplanted into a field. The third method is the production of small seedling tubers from TPS. The seedling tubers can then be planted similar to traditional methods. Umaerus (1989) indicated this latter method appears at present to be the most widespread utilization of TPS. It requires two growing seasons, but allows the prospect that seedling tubers be produced in a more suitable environment and under a sound management system.

Martin (3) described several methods of seeding TPS. These methods included using coated seed, gel solutions, and a "plug mix" approach. He indicated that direct seeding of TPS was difficult because of the small seed size. One of the limiting factors of commercial use of TPS application is the lack of mechanization developed to handle the tiny seeds (1, 4).

The objective of this project was to design, build, and test a precision seeding device to direct seed true potato seed. The functions of the seeder considered in the design included the selection and isolation of a single seed from a bulk quantity and delivery of it to a specific location at an adjustable spacing interval. The adjustable spacing is normally accomplished in the drive linkage for the seeder. Single seed depositing is a common goal for precision seeders, however, with the use of airflow to control the selection, multiple seeding is also within the realm of adjustment.

Seeder Description

The principle feature of the prototype seeder is the use of a vacuum nozzle to attract and hold one or more seeds while removing them from a bulk container. An air jet, acting like a brush, then removes all but the most firmly held seed/seeds. The seeds that are dislodged by the air jet drop back into the bulk container for later use. The remaining seed/seeds are held and then released at the appropriate spacing. The seeds are released by shutting off the vacuum at the nozzle and connecting it to a pressurized air source that reverses the direction of flow through the nozzle.

The prototype seeder has three main hardware components; the seed hopper, the seed head, and the airbrush. The seed hopper is fixed and holds the bulk seeds prior to planting. The seed head is a solid cylindrical section 100 mm in diameter that rotates on a center shaft with part of its circumference in contact with the seed in the seed hopper (Figure 1). Six pickup nozzles are located symmetrically around the circumference of the solid cylindrical section. The third component is an adjustable but non-moving