

The Impingatron Seed Treater

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Grower acceptance of sugar beet seed treatment has become more general during the past decade. To meet the increased demand for seed treatment, processors have had to keep abreast of developments in the use of more efficacious protectants and improved means of their application to seed by machines.

There are numerous types of seed treaters in current use. Most of these embody too many moving parts, occupy excessive floor space for installation and are costly to purchase. This paper represents a progress report to our industry in the development of a treater of unique design which holds promise of correcting the above disadvantages.

The original machine, conceived and designed for the blending of solids with solids or the impingement of liquid coating materials upon solids, was called an "Impingatron." As a blender it performed so well in the dispersion of the coating media that other applications of the machine's use occurred feasible to the inventor (1)².

The blender and the seed treater are very similarly constructed. The operating principle of both is the same. In the seed treater, to which we will confine all further discussion, the principle is one of spinning a tumbling blanket of seed through a finely divided mist of treating chemicals.

The tumbling blanket or layer of seed, conceivably one seed in thickness, is obtained by feeding the seed into the top center of a dished plate which rotates at 350 rpm. The seed is moved outward by centrifugal force toward the edge of the plate. Due to the rotation of this plate, the seed mass tends to roll and tumble as it approaches the speed of the plate. Concurrent with this imparted tumbling action of the seed, liquid treating material is fed at gravity head to two circular rotating feed rings. The purpose of these rings is to disperse the liquid evenly about the periphery of a dispersion disc. The rings and this disc rotate at 3000 rpm. The dispersion disc is provided with inclined fingers which atomize and give depth to the mist pattern. The treating liquid, reduced in particle size to a fine mist, is thrown upon the surface of the blanket of seed. The treated seed moves outward to the edge of the dished plate which is sealed, as well as driven, by a v-belt. The v-belt arrangement conveys the treated seed to a central discharge point.

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² Numbers in parentheses refer to reference.

The machine is simple and has few moving parts, making it easy to clean and maintain. Power units consist of two 220-440 volt 60 cycle motors, one rated at 2 hp at 3600 rpm and one at $\frac{1}{2}$ hp at 640 rpm. The seed and treating material feed devices are in the process of being designed and constructed for installation on the machine. The former will be a vane-type feeder with the vanes arranged in a helical plane rather than straight so as to reduce pulsations in the flow of seed. A Robbins & Myers "Moyno" pump will be used for metering and delivering the treating materials. The abrasive action of materials currently in use for the treating of sugar beet seed may alter such plans. A small efficient pump would be advantageous. However, accuracy throughout the life of the machine of measurements of both seed and treating materials is an absolute requirement. Then, too, some means of continuous agitation of the treating materials must be provided because these materials are all wettable powders, made up as water suspensions.

Some flexibility in the output of the machine is possible. As currently designed, the treater is capable of handling 3000 to 4000 pounds per hour of processed sugar beet seed. The over-all dimensions of the unit are: height, 36"; width, 40"; and length, 50". These dimensions do not include seed and chemical metering equipment.

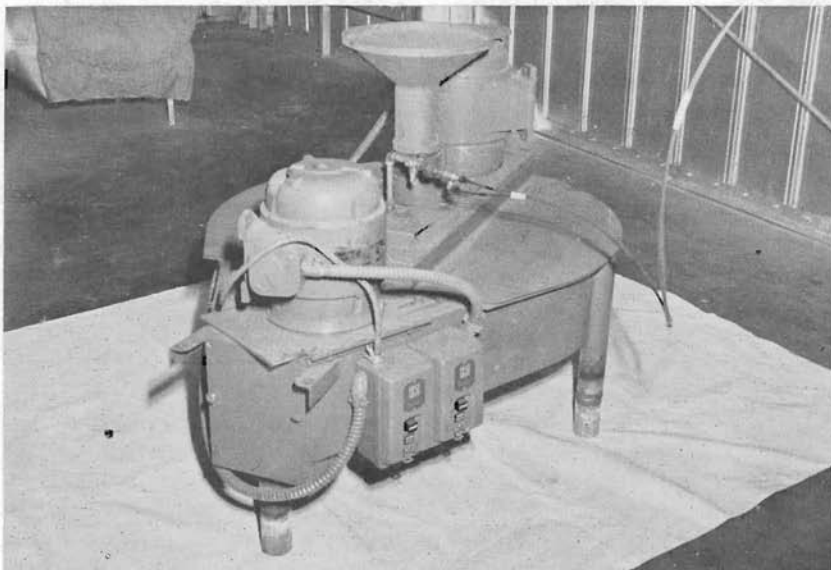


Figure 1.—Photograph of the Impingatron Seed Treater. The picture does not show the installation of the seed metering and treating material devices.

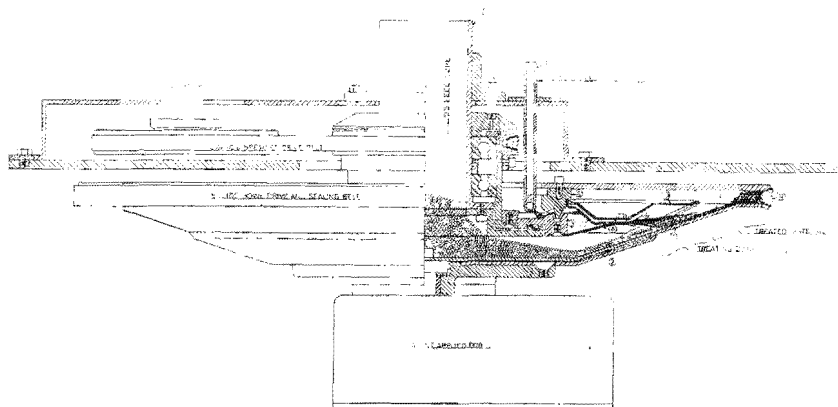


Figure 2.—Flow pattern in treating sugar beet seed. a). Seed is metered and gravity fed into the Solids Feed Tube (1) to the center of the Rotating Dishd Plate (2). b). Centrifugal force of this plate causes the seed to be rolled and tumbled to the periphery of said plate. c). In so doing, the seed tends to form a thin layer of the thickness of one or two seeds as it reaches and travels thru the Treating Zone (3). d). Treated seed is contained by the seal which is formed by the V-belt 11 and discharges at a port formed by passing the V-belt over an idler pulley. e). Treating material in the form of a water-suspension of a wettable powder is metered volumetrically to give the required treatment dosage to the seed flowing through the treator. The material is fed by gravity into the Liquid Feed Pipe (4), from thence onto a Rotating Liquid Dispenser Plate travelling at high speed (8), f). Centrifugal force causes the liquid to spread out into a thin film in its passage from a liquid dispensing ring (5) (7). Upon reaching the periphery of the Liquid Dispenser Plate, the liquid is broken up into a fine mist by a series of inclined fingers which compose the periphery of the plate (9). The treating mist covers the treating zone area (3).

For the purpose of test runs of the Impingatron Seed Treater, the unit was temporarily installed at the Seed Processing Plant at Tracy, California. Installation was made adjacent to our regular seed treater. It was possible to employ our University Treater metering devices for the exact measurements of seed and dosage of treatment applied. Transfer of treated seed from the unit was effected by a horizontal scroll conveyor which discharged into the plant transfer equipment. The seed was bagged in normal fashion. Composite samples of treated seed were taken during each trial run. These samples were analyzed for efficiency of the treater and effectiveness of the treatment.

For the first trial run, a processed lot of monogerm seed was used. In order to have some comparison for evaluating the application, seed from the same lot was later treated in the University

Treater. The treatment used in all tests was Phygon XI (75% WP) @ 8 oz./100# seed, and Lindane (95% WP) @ 3 oz./100# seed, with a small amount of green dye added to visually determine the distribution of the treatment on the seeds.

The first trial run was, however, halted when a bearing on the chemical dispersion disc burned out. It was also noted during this run that the design of the labyrinths on the chemical dispersion disc caused some separation and build up of solid particles in the slurry. The machine was returned to the manufacturer for the necessary modifications.

When the treater was returned it had been fitted with an entire new set of working components. The liquid distribution labyrinths were made shallower to correct for the separation of the solid particles. Also, the pitch of the rotating dished plate was modified. Further bearing trouble was eliminated by the installation of ball bearings on the dispersion disc.

For the second trial run a processed lot of multigerm seed, Variety US 75, was treated. This trial run proceeded quite satisfactorily, except for a certain amount of seed "escape" from the rotating dished plate. This occurred where the v-belt carried the treated seed to the discharge point.

To eliminate the possibility of under-treated and over-treated seed at the beginning and end of each trial run, a three-way valve was installed in the feed line where the treating materials entered the Impingatron. The flow of liquid was diverted into a container until air had been cleared from the line and the flow of liquid was steady. The seed and the suspension were then allowed to enter the treater simultaneously.

Results and Discussion

Samples of the monogerm seed obtained from the first run of the Impingatron Treater along with comparative samples from the University Treater and a non-treated check were planted in soil infested with *Pythium ultimum*. The emergence and survival were calculated per 100 seed units and the results shown in Table I.

From the results, it would appear that the seed treated in the University Treater produced as much emergence as indicated by the laboratory germination tests of 75 percent. Survival rate 12 days after planting was also fairly good. Both the emergence and survival of the seeds treated in the Impingatron were about 10 percent less than from the University Treater. Both treatments, however, were considerably better than the non-treated check.

Table 1.—Emergence and Survivors of Seed From the First Trial Run of the Impingatron as Compared to a Similar Treatment in the University Treater and a Non-Treated Check. Seed Was Planted into Soil Infested with *Pythium ultimum*.

Chemical Protection (Monogerm Seed)		
	Emergence	Survivors
	Per 100 Seed Units	
Untreated	30	8
Impingatron Treater	66	40
University Treater	77	50

Samples of the US75 seed from the second trial run along with the two checks also were planted in the soil infested with *Pythium ultimum*. These results are shown in Table 2.

A statistical analysis showed that there was no significant difference in emergence from the seed treated in the Impingatron and seed treated in the University Treater. The post emergence damping-off was a little greater with the seed treated with the Impingatron so that the final survival was about 10 percent less than from the University Treater. The analysis showed, however, the difference for survivors was not quite significant at the 5 percent level. It can, therefore, be assumed that there was little or no difference in the protection afforded by treatment of the US 75 seed with the two treaters. Both provided considerable protection as compared with the non-treated seed. The data in Tables 1 and 2 were furnished by the Division of Plant Pathology, University of California at Davis.

Table 2.—Emergence and Survivors of Seed from the Second Trial Run of the Impingatron Treater as Compared to a Similar Treatment in the University Treater and a Non-Treated Check. Seed Was Planted in Soil Infested with *Pythium ultimum*.

Chemical Protection (Variety US75)		
	Emergence	Survivors
	Per 100 Seed Units	
Untreated	9.4	1.1
Impingatron Treater	153.3	97.7
University Treater	146.6	107.2

To evaluate the uniformity of the application of the treating materials by the Impingatron, a visual analysis was made of the treated seed. The seed was divided into three categories: a) under-treated, b) uniformly treated, and c) over-treated, depending on the coverage and the amount of treating material on each seed. Three 10 gram samples were analyzed and a mean determined. An identical test was run on seed from the University Treater in order to have a comparison. The results shown in Table 3 indicate that the majority of the seed from the Impingatron was not uniformly covered.

Table 3.—Uniformity of Treatment on Seed Treated in the Impingatron Treater as Compared to Seed Treated in the University Treater.

Chemical Distribution (Monogerm Seed)			
	Under-Treated	Uniformly Treated	Over-Treated
Impingatron Treater	83.4%	15.2%	1.4%
University Treater	3.9%	96.1%	1 seed

Taking into account the results of the tests where the seeds were planted in infested soil it would appear that even though the seed treated in the Impingatron Treater lacked the uniform coverage of seed treated in the University Treater, it still provided sufficient coverage for adequate protection.

Summary and Conclusions

A new machine called the Impingatron, originally designed for the blending of materials, has been adapted for seed treating. The principle of its operation is centrifugal force. The seed falls on the center of a rotating dished plate and is carried outward toward the edge thereof. The liquid suspension of treating chemicals is fed from two rotating feed rings attached to the cover of the seed plate onto a dispersion disc. This disc which revolves about nine times as fast as the seed plate disperses the suspension evenly as a mist about its periphery. The mist is impinged upon the seed.

The advantages of this seed treater are its small space requirements, and its simplicity of construction which results in ease of cleaning and maintenance. These features make it ideal for permanent installation or portable seed treater. As the latter, it

could be transported in a pickup truck to small seed processing plants and to grower cooperative warehouses where adequate seed treating equipment is not available.

The results of two trial runs under actual commercial sugar beet seed treating conditions, demonstrated the place for such a machine in the industry. The treatment, although not being as uniformly applied as by some treaters now in use, does provide adequate protection for the seed under disease conditions found in the field.

Further modifications of the Impingatron which are designed to improve its operating efficiency are planned. Trials will be continued in an effort to determine the place of the Impingatron in the treatment of processed sugar beet seeds (1).

Reference

- (1) O'BRIEN INDUSTRIAL EQUIPMENT Co. Various communications.
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