New Spray-Type Seed Treater

uniform coverage of seeds, ease of operation and protection by enclosure among advantages

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Tests with an experimental continuous spray-type seed treater newly developed at Davis have been completed. A pilot model of a design suitable for commercial production has been built and is now being operated in a plant where sugar beet seed is treated commercially.

The chief advantages of the new seed treater are:

1. Uniform coverage, even on rough, absorbent seeds.

2. Protection of the operator from dangerous or obnoxious materials. The commercial unit is completely enclosed.

3. Reduction of dust nuisance in subsequent handling of treated seed, as compared to dusted seed.

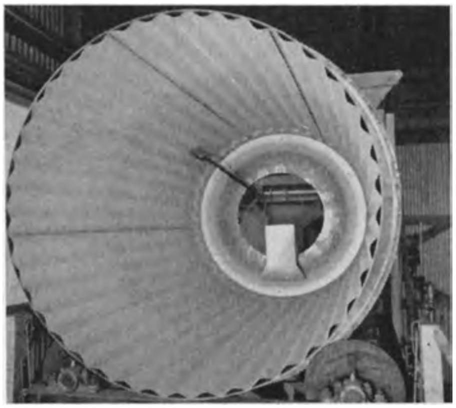
4. Ease of complete emptying and cleaning. The drum is self-cleaning, with no corners in which wet seed might stick and accumulate, and at a 2° slope will empty itself within a minute or two after the seed supply is stopped. The seed meter can be emptied completely by merely lowering a hinged flap.

The experimental spray-type treater was tested for treating decorticated sugar beet seed, milo and baby lima beans. For all treating runs, a green dye was used in the spray mixture so that sprayed seeds could be examined visually and rated as to uniformity of coverage.

With each kind of seed, the most uniform application was obtained when the drum axis was about 2° below horizontal. The maximum rate for satisfactory coverage of sugar beet seed was about 3,300 pounds per hour. A 2% application of moisture was used in most of the beet seed runs. In treating milo, the only seed rate tried was 6,300 pounds per hour, using a 1% moisture application. With baby limas, trials were made with ½% moisture added at a seed rate of 8,100 pounds per hour and with ¼% at 11,000 pounds per hour. Satisfactory coverage was obtained in each case, with no mechanical injury to the seed.

As a further test of the protection afforded by fungicides applied with the experimental treater, samples from a number of the runs were planted in greenhouse flats in soils infested by *Pythium ultimum*, in comparison with nontreated seeds and with dusted seeds.

In nearly all cases, the spray-treated seeds produced stands significantly higher than nontreated seeds.



Interior view of drum taken from the outlet end. Note corrugated liner, and nozzle on end of orm. Darkened area on liner indicates spray zone, which is about three feet long.

With sugar beets, the treatment runs that appeared most uniform in the visual color sorting tended to provide the highest degree of protection.

With milo, there were no significant differences in protection between the different spray applications or dusting, but all treated lots showed significantly better emergence than the nontreated seed. When milo seed infested with *Fusarium moniliforme* was given a spray treatment with Phygon paste following a spray application of 75% lindane, and was then planted in pasteurized soil, almost complete control of seed-borne root rot infection was obtained.

Treated milo seed planted in the field at the rate of 11 pounds per acre, produced 9.4 seedlings per foot, whereas nontreated seed planted at the same rate produced only 2.12 seedlings per foot of row. This difference is due in part to the protection of germinating seed against seed decay, provided by the Phygon, and in part, to the control of wireworms by the application of 75% lindane to the seed.

With small lima beans, emergence of sprayed, dusted, and nontreated seed appeared to be about the same in pasteurized soil. In infested soil, the sprayed seed produced stands lower than the dusted and higher than nontreated seeds, but the difference was not significant in either case. In field plantings, the sprayed and dusted seeds produced about equal stands, both considerably better than the nontreated seeds.

A full-scale experimental spray-type treater was designed and built after preliminary trials with small models had indicated that this type of machine could most nearly attain the objectives of high capacity, elimination of dustiness, and

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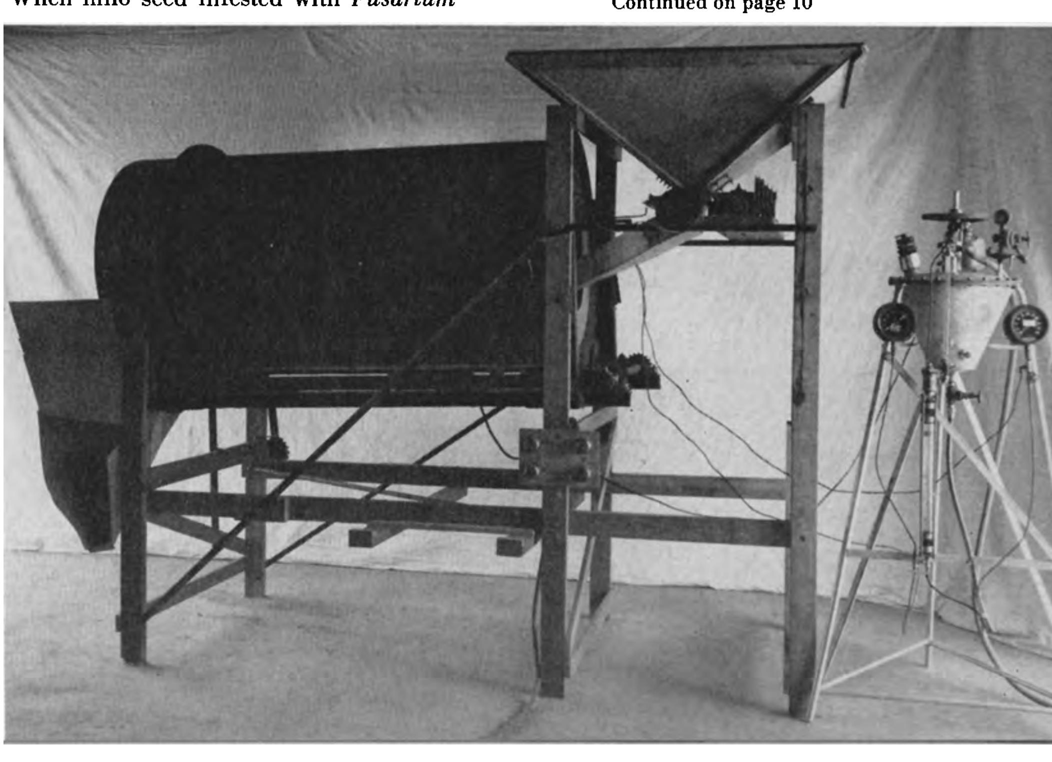

Experimental seed treater. Seed hopper is above right end of rotary drum with seed meter attached to bottom of hopper. Pressurized spray tank is in right foreground. Glass column in front of and below tank is for volumetric flow-rate checks.

MILK

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prices paid by Midwestern creameries and the net value of butter and nonfat solids. There is some evidence that California prices were relatively low from mid-1947 to mid-1948, but the actual and formula prices have been nearly identical for the past year.

The price calculations for condenseries—shown on the upper graph—do not show such a close relation to actual prices. While the prices paid by California condenseries increased rapidly during the last half of 1947, this increase lagged behind the increase in Midwestern condensery prices and the net value based on the price of evaporated milk. California producers were at a disadvantage compared to Midwestern producers until September, 1948. During the last of 1948 and the first quarter of 1949 this situation was reversed and California producers enjoyed an advantage ranging from 25 to 40 cents per 100 pounds of milk above adjusted Midwest prices. Since April, prices in the two areas have been nearly identical.

Prices paid producers by condenseries in California and in the Midwest were nearly $1.00 per hundredweight below computed net values throughout all of 1948 and 1949. The rapid drop in producer prices from September, 1948, to June, 1949, brought some narrowing of this margin, but paying prices were below estimated net values by more than 75 cents per hundredweight during the summer of 1949. Increases in producer prices during the fall months—reflecting normal seasonal patterns plus increases in Government support prices—plus more recent drops in the price of evaporated milk reduced the margin to less than 40 cents in November. This is about as low as the margin during the fall months of 1947.

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TREATER

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uniform application of soluble or wettable fungicides or insecticides to all types of seed.

In the operation of the treater, seed is metered into one end of the rotating drum—three feet in diameter—and is spilled out of the opposite end after being treated. On the inside of the drum is a liner made from sheets of corrugated aluminum roofing. As the drum rotates, the corrugations carry seed up from the bottom, spreading it over a band about one to two inches thick, extending from the lowest part of the drum up through an angle of 80° to 100°.

The spray material is directed onto this band of seed by a fan-type weed nozzle mounted inside the drum about two feet from the inlet end.

The corrugated liner is self-cleaning because of the absence of sharp corners, the flatness of the corrugations with respect to the drum, and the resultant scouring action of the seed.

To obtain a constant rate of application or dosage of the treating material, it is necessary that the seed be accurately metered into the drum at a constant rate and that the nozzle flow rate be constant. Metering of the seed is accomplished by means of a 4½-inch diameter vaned wheel 14 inches long, which maintains a practically constant volumetric rate at a given number of revolutions per minute.

The spray system is the most involved part of a spray-type seed treater and is the part most likely to give trouble in field use, primarily because most of the presently used treating materials are insoluble powders which must be kept in suspension—usually in water—during application. Continuous agitation of the material in the spray tank is required, and the suspended materials tend to clog screens and nozzles.

Nozzle pressures from 25–60 pounds per square inch were found to be satisfactory for treating seeds such as sugar beets, on which uniform coverage is difficult to obtain. The lower pressure is more desirable from the operational standpoint, as it allows the use of a larger nozzle and thus reduces the tendency to clog.

Pressures somewhat less than 25 pounds per square inch can be used when treating smooth-coated seeds, such as beans, where redistribution from seed to seed contributes to uniform coverage.

In general, the uniformity of application obtained with a particular spray pattern, especially on seeds where there is no appreciable redistribution, is affected by the following conditions:

1. Small seeds are more difficult to treat than larger ones, because the chances of exposure when passing down through the spray zone are fewer.

2. Uniformity of application improves considerably as the seed rate is decreased.

3. Increasing the drum speed improves uniformity of coverage. However, speeds much above 25 revolutions per minute are not desirable because seed would tend to shower down through the spray or carry over the top.

4. Increasing the drum slope below horizontal improves uniformity, until a slope is reached where the seed band becomes so thin that it is unstable and has excessive slippage on the drum.

This seed treater is essentially a high capacity constant rate machine and is not particularly suited to the treatment of small lots of seed.

The maximum seed rate is determined by the ability of the machine to apply the treating material uniformly. The minimum seed rate when applying materials suspended in water is determined chiefly by the minimum size of nozzle which can be used without clogging and by the maximum percentage of moisture which can be added to the seed. The principal problems encountered in the use of such a treater are:

1. Clogging of nozzles and screens by suspended materials. Proper selection of nozzle and screen sizes minimizes this problem. The use of soluble or liquid materials and the improvement of present formulations of insoluble materials would also help.

2. Abrasive action of suspended materials. Pump troubles have been eliminated by use of a pressurized supply tank with the agitator shaft entering from the top. Erosion of nozzles apparently can be kept within reason by use of stainless steel instead of brass.

3. Settling of suspended materials in pipe lines. Overcoming this problem requires the use of small-diameter lines to maintain adequate velocities and involves flushing the lines with air or water whenever the machine is shut down.

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MECHANIZATION

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mechanical program. Work aimed at better weed control is now underway.

California ranks 9th in total cotton acreage, 4th in total yield, and 1st in yield per acre. The high yield, plus a mechanical production program, along with the absence of certain cotton insects, will keep California in cotton production in competition with the rest of the country. The labor requirement on a 90-acre test plot in Fresno County last year was reduced from 160 man-hours per acre for hand methods to 40 man-hours for the mechanical system.

High speed mowers, new rakes, automatic balers and loaders, and field choppers have reduced much of the labor requirements for hay making.

Mechanical tree shakers have become quite common as an aid in harvesting prunes, walnuts and to a limited extent almonds. Sloping catching frames, under the trees, collect and deliver the fruit to field boxes. Vacuum and brush pickups have appeared for gathering nuts off the ground. Pneumatic shears and portable pruning towers offer promise in labor saving in orchards.

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