

A method for the evaluation of seed disinfectants using a motor-driven miniature seed dressing machine

by

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Synopsis: The description and advantages of a new motor-driven miniature seed dressing machine constructed at the Agricultural Engineering workshop, Coimbatore are reported in this paper.

Treatment of seeds for the control of seed-borne diseases dates back to about two centuries. Several chemical seed dressings have been in vogue since. With the development of organo-mercurials by Riehm (1913) these came to be widely used against several seed-borne diseases below.

Seed treatment can also be used against seed spoilage organisms. In the comparative evaluation of the efficacy of seed dressing chemicals, it is necessary to apply the chemicals uniformly and evenly to the seed surface. The evenness and uniformity of deposition on them could be evaluated by the bioassay techniques such as that of Mead (1945) with some modifications as described below.

Molten Czapek-Dox agar medium, cooled to about 40° C was inoculated with a spore suspension in sterile water of the test fungus like *Curvularia pallescens*, *Aspergillus flavus* and *Helminthosporium tetramera* - isolated from seeds of rice and *sorghum* - and poured in Petri dishes. Immediately after, the seed treated with the fungicide to be tested, was placed on the inoculated agar with 3 seeds in each dish. The plates were then incubated at laboratory temperature, 30° C—34° C for 48 hours and observations recorded. It was seen that the fungus had failed to grow in areas, almost circular, around the treated seeds and there was very little growth on some of the plates even at a considerable distance from the seed. Untreated seeds however, were completely surrounded and often overrun by the mycelium of the fungus. The diameter of the clear zone (inhibition zone) that developed around the seed was measured. Using the above technique the efficacy of seed treatment with cercosan on rice and *sorghum* seeds by means of a manually operated seed dressing drum and a miniature motor-driven seed dressing machine was evaluated.

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Though several mechanical seed dressers are used in other countries (Tharp, 1931; Hurst *et al.* 1936; and Jacks, 1953.) for large and small scale seed treatments, such machines do not appear to be manufactured in this country and they are also not readily available in the market due to foreign exchange difficulties. Hence, a machine was constructed at the Agricultural Engineering Workshop of this Institute.

Description of the Machine: The machine consists of a rectangular box-like container made of mild carbon steel which holds 12 cylindrical tin cans with lid. The box is provided with a lid which can be secured by means of wing nuts. The

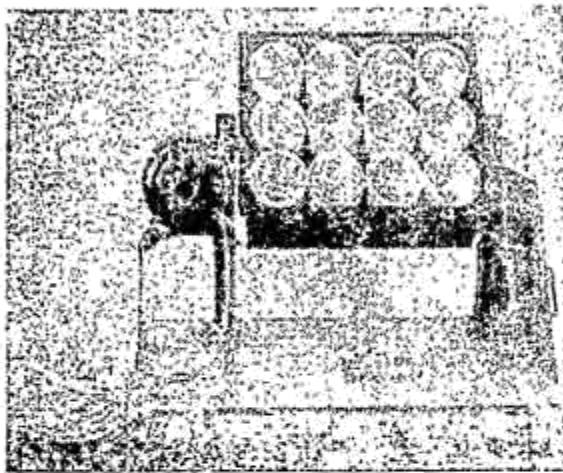


FIG. 1

tin cans are capable of holding 400 g. of paddy or 350 g of *sorghum* seeds. When the lid of the box is fixed over the closed cans, the cans are held firm and tight during the rotation of the box. The box is mounted on two vertical supports by means of an M. S. shaft, welded at either side. The rotation is achieved by attaching this box to a $\frac{1}{4}$ H. P. motor whose rotation has been stepped down to 45 r. p. m. by means of a worm reduction gear. This speed is sufficiently slow to eliminate cracking of the grains and still fast enough to afford thorough mixing. The machine is operated on 230 volts 50 cycles AC current. (Fig. 1 & 2)



1. Lid.
2. Wing nut.
3. Shaft.
4. Motor $\frac{1}{4}$ H. P.
5. Motor Base.
6. Switch.
7. Plug Pin.
8. Motor Base Strut.
9. Worm & Pinion Unit.
10. Base.
11. Brace.
12. Support.
13. Container.

FIG. 2

Advantages of the Machine: The efficacy of the machine was compared with the common manually operated seed dressing drum and the results are presented in table I. (Fig. 3, 4 & 5)

Zone of inhibition around treated seeds incubated on agar seeded with — fungus
 (1) Treating in Machine 10 mt. (2) Treating in Machine 5 mt. (3) Treating in Machine 1 mt.
 (4) Treating in seed dressing drum 10 mt. (5) No Treatment.

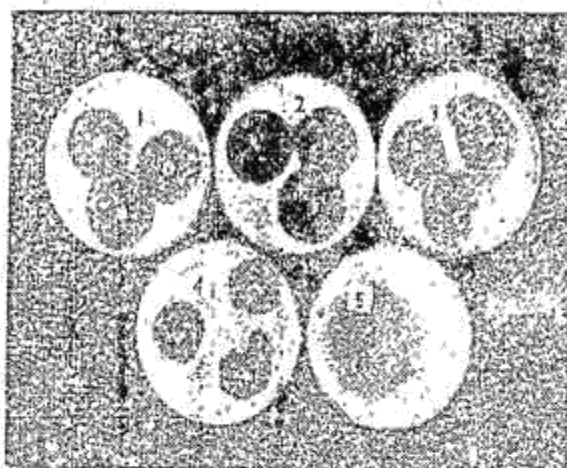


FIG. 3
 Inhibition against growth of *Curvularia pallescens* (Paddy)

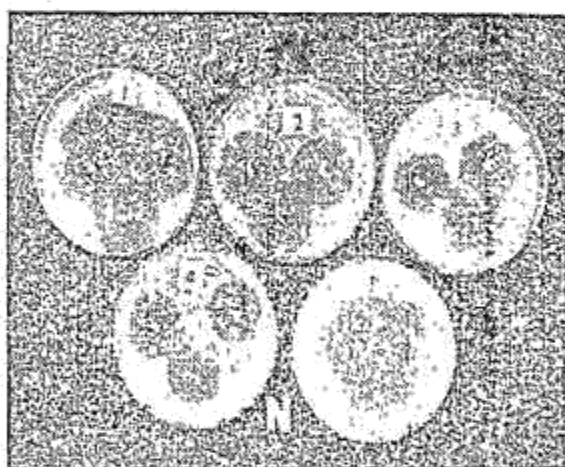


FIG. 4 (Paddy)

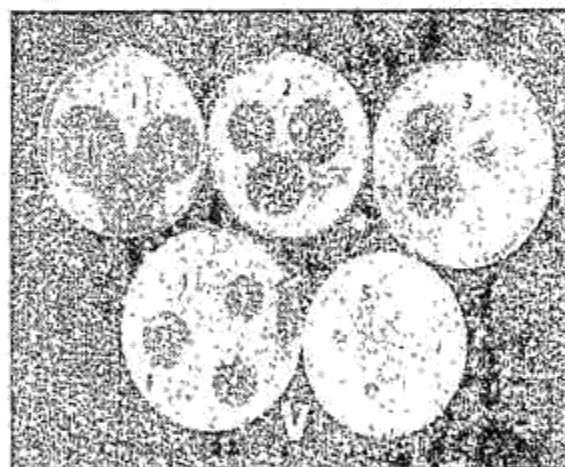


FIG. 5 (Cholam)

Inhibition against growth of *Helminthosporium tetramera*

TABLE I

Diameter of the zone of inhibition in mm. around the ceresan treated seeds in paddy and sorghum

(Mean of 3 replications)

Test Fungus	Machine 1 mt. 45 revolutions	Machine 5 mt. 225 revolutions	Machine 10 mt. 450 revolutions	Check: manually operated drum 10 minutes
I PADDY:				
1. <i>A. flavus</i>	26.3	33.3	35.6	26.6
2. <i>C. pallescens</i>	33.3	38.6	39.8	32.5
3. <i>H. tetramera</i>	38.3	38.3	39.0	30.0

TABLE I (Contd.)

Test Fungus	Machine 1 mt. 45 revolu- tions	Machine 5 mt. 225 revolu- tions	Machine 10 mt. 450 revolu- tions	Check: manually operated drum 10 minutes
II SORGHUM:				
1. <i>A. flavus</i>	21.6	25.3	28.3	21.6
2. <i>C. pallescens</i>	25.0	28.3	28.6	19.6
3. <i>H. tetramera</i>	30.3	34.3	39.0	28.0

It is seen from the table that the treatment with the machine for one minute (45 revolutions) is as effective as treating in the commonly used manually operated drum for 10 minutes. Further the efficacy of the fungicide is found to be improved when treated for 10 minutes (450 revolutions) with the machine. Optimum period of treatment is however found to be 5 minutes.

Thus the equipment described above is more efficient than the common seed dressing drum. Besides added mechanical advantage due to electrical operation it is possible to standardise the revolutions at a constant speed. The treatments are therefore easily reproducible. Besides a number of samples could be treated at the same time.

REFERENCES

- Hurst, W. H., F. D. Fulton, W. R. Humphries and R. W. Leukel 1936 Equipment for applying dust fungicides to seed grain. *U. S. D. A. Circular No. 415*.
- Jacks, H. 1953 Seed disinfection: V. A seed-dressing apparatus for the smaller seeds. *N. Z. J. Sci. Tech. Sect. B. 34 249-25*.
- Mead, H. W. 1945 A biological method of detecting the presence of fungicides on seeds *Sci. Agric. 25: 7, 458-61*.
- Riehm, E. 1913 Prufung einiger Mittel zur Bekämpfung des stein brandes. *Mitt K. Biol. Anst. f. Land. u. Forstw. 14: 8-9*. Abs. in *Zentbl. F. Bakt. 11, 40: 424*, 1914. Quoted after Walker (1957)
- Tharp, W. H. 1931 A machine for the treatment of small samples of seed grain with disinfectants. *Phytopathology: 21, (1931) 1203-04*.
- Walker, J. C. 1957 *Plant Pathology*. Mc.Graw-Hill Book, Co., Inc. New York 707 pp.